

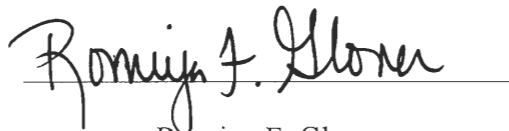
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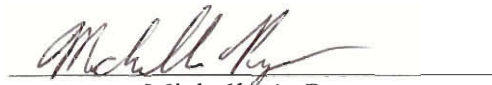
Thoreau's Role in a Scientific Society

An Interactive Qualifying Project Report
submitted to the Faculty
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WORCESTER POLYTECHNIC INSTITUTE
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Degree of Bachelor of Science
by



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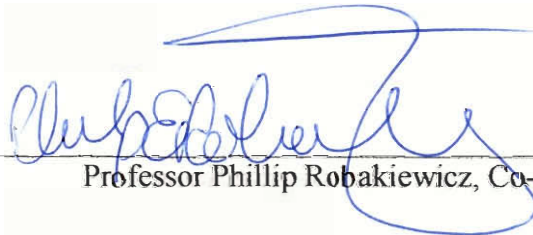
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3. ecology



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Abstract

Henry David Thoreau, highly appreciated as a 19th century transcendentalist and literary figure, also deserves recognition for his role in the emerging field of ecology at a time when the prevalent science was taxonomy. His position in the scientific community can be determined by carefully analyzing both his own works as well as those of contemporaries, critics and modern day scientists. An educational course will be outlined in the hopes that others will further explore his scientific relevance.

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1. Introduction

“Everyone’s heard of Thoreau and they have opinions about him. He’s not just a literary figure, he belongs to the culture at large.” So said Laura Dassow Walls, PhD, in an interview in January 2002 [2]. This is a point she realized early on in her life; however, it has only been within the last decade, that critics and other Thoreau scholars have begun to question the true purpose for many of Henry David Thoreau’s nature essays, and to examine him more as an environmentally conscious activist. Up until then the seemingly irrelevant lists of animals, plants, and trees in his writings were dismissed as simple ramblings. The readers of the time period did not fully realize his scientific influence. Contemporaries like Ralph Waldo Emerson recognized Thoreau’s love for nature and science, but believed that he was shiftless, and he was wasting his potential on trying to understand people. Emerson says of Thoreau in his posthumous essay “Thoreau”,

Had his genius been only contemplative, he had been fitted to his life, but with his energy and practical ability he seemed born for great enterprise and for command; and I so much regret the loss of his rare powers of action, that I cannot help counting it a fault in him that he had no ambition. Wanting this, instead of engineering for all America, he was the captain of a huckleberry party. Pounding beans is good to the end of pounding empires one of these days; but if, at the end of years, it is still only beans! [3].

Thoreau tried to relate to society through his writings, but he was more at home in nature. It was here, in the natural environment, where he was able to better communicate his thoughts and feelings through poems, essays, journals and books. These pieces are how he exhibited his knowledge and questioned those things he did not know. His honesty shows that there is more to

Thoreau than what can be seen on the surface. Upon reading a collage of Thoreau's works, both written for him and for the public, it is evident that Thoreau is more than just another literary writer. This other side, his scientific side, is what must be further studied and understood. Did Thoreau's writings have any ecological significance? How important was he to the scientific community? Is he a scientist at all? These are the questions to be addressed, challenged, and answered in this project.

Although he dismisses the idea of himself being a scientist in his writings, Thoreau does indeed deserve such recognition. Emerson makes note of this saying, "He resumed his endless walks and miscellaneous studies, making every day some new acquaintance with Nature, though as yet never speaking of zoology or botany, since, though very studious of natural facts, he was incurious of technical and textual science" [3]. With evidence to support these claims, it is hoped that Thoreau's scientific role in society can be appreciated, and efforts will be made to provide education on this subject.

2. *Background*

2.1. *On Thoreau*

Henry David Thoreau was a man who was always writing. His published books and manuscripts and journals, though quite expansive, are but a mere fraction of his writings. As Brad Dean [1] would clarify "it's not hard to write that much if that's all you do." Dean explained that Thoreau's days consisted of reading, walking and writing. It is therefore no surprise that he has so many opinions about the objects and occurrences that he constantly sees around him. Living during the peak of transcendentalism, Thoreau felt obligated to share his thoughts and observations with anyone who was willing to read them.

Among the most famous of Henry David Thoreau's works is *Walden*, a detailed account of his life on the shore of Walden Pond and its surrounding area— aptly named Walden Woods— in his hometown of Concord, Massachusetts. Much of his writing took place at a location called Brister's Hill, now in danger of being developed.

In the epilogue to *The Portable Thoreau* [4], editor Carl Bode proclaims it to be one of Thoreau's two best books—the other being *A Week on the Concord and Merrimack Rivers*, a story he wrote after the emotional loss of his brother. And yet, though “he has been damned as loudly as he has been praised—and praised as loudly as damned” [5], recognition for Thoreau's writings are mostly posthumous, even after the publishing of Emerson's eulogy.

Walter Harding believes Thoreau was discovered by the nature lovers, who “dismissed his philosophy as worthless, but delighted in his description of the great outdoors” [6] (nonetheless, Harding believes him to be “more fundamentally a philosopher than a naturalist” [ibid]), and later by other critics who saw him as more than just another nature writer. Brad Dean, Ph.D., director of the media center at the Thoreau Institute and lifetime scholar, verified this trend and attempted an explanation of how much of Thoreau's fame results from the 1840's time period (in which *Walden* was written) when he was more of a transcendentalist nature writer, however it was in the 1850's when Thoreau started to show more of his scientific side, and much of Thoreau's writing from that time period remains to be explored [1].

As a result, Henry David Thoreau's influence on society has been literary and political. Enthusiasts enjoy Thoreau's writings on a theoretical level. They take his writings and try to analyze his inspiration. Although this is a valid approach, it is not the entire perspective of him. Not only must the themes that he specifically points out be evaluated, but the patterns in his

observations and behaviors must be analyzed as well, in order to fully understand Thoreau's stance on science.

2.2. *On Science*

Science, as it is known today, was just developing into a profession during Thoreau's days, as even Harvard was just beginning to hire scientists. It was much different at this time because things had to be classified and described before they could be explained, so there was a blurring of the lines between science and natural history. The word "scientist" had been coined by William Whewell, a leading philosopher of science in 1833 [7], yet it had taken many years for it to take hold and to evolve into its present-day, narrowly defined meaning. Many modern scientists agree that a scientific theory or hypothesis must be "falsifiable" in that it can only be proven by some experiment or possible discovery to be untrue. Therefore, today there is a broadly accepted definition of the scientific method that consists of hypothesizing, testing this hypothesis through experimentation, and modifying the hypothesis until it cannot be disproved. Nonetheless, many science-based philosophers argue that there is no such thing as the scientific method.

2.3. *On Thoreau and Science*

Henry Thoreau lived during a period of religious, political, and scientific turmoil, and confirmation of such can be found in many of his works. In fact many of Thoreau's better-known essays deal with political and social issues, like "Civil Disobedience", "Slavery in Massachusetts," and "Life without Principle." However, Bronson Alcott, a contemporary writer and dear friend of Thoreau, remarks that "nature, poetry, life, --not politics, not strict science, not

society as it is, --were his [Thoreau] preferred themes” [8]. These preferred themes display the other side of Thoreau.

In works like “Natural History of Massachusetts,” “The Succession of Forest Trees”, and *Walden*, he takes a natural view of the world around him. This is the material that intrigues the scientist most because of the aptness and precision with which he observes, names and categorizes his findings on his walks. The works take on less of a literary stance due largely in part to their format and subject matter. Even Robert L. Stevenson notices this: “He began to fall more and more into a detailed materialistic treatment; he went into the business doggedly, as one who should make a guide-book; he not only chronicled what had been important in his own experience, but whatever might have been important in the experience of anybody else; not only what had affected him, but all that he saw or heard” [9].

Whether or not the two years and two months Thoreau spent in Walden Woods would fall under the classification of a scientific experiment is a matter of debate. He immerses himself in nature and comments on everything that surrounds him. He commits to writing exactly what he sees, hears and feels, showing the beauty that is known as Walden Woods. In *Genius Ignored*, a book about artists who were under-appreciated by their contemporaries, Lucius Furius, a classical art and literature enthusiast, makes an interesting observation: “It was sometime in 1859 that one of Thoreau's townsmen ‘innocently told him after riding through Walden Woods in his sleigh that he had never seen anything so beautiful in his life and that if there had been men there who knew how to write about it, it would have been a great occasion for them...’” [10]. Little did he know, Thoreau had already undertaken such a venture. His efforts were then included in his journals and *Walden*.

Thoreau's definition of "Nature" is meant to be all-inclusive. He means nature to be all that is around him, both effects of the natural world and those of society. Many of his references to nature are about the physical world around him, things whose presence and origin are not easily understood by anyone, including himself. Thoreau claims not to entirely understand nature, saying, "Man cannot afford to be a naturalist, to look at Nature directly, but only with the side of his eye. He must look through and beyond her. To look at her is as fatal as to look at the head of Medusa. It turns the man of science to stone" [11]; yet, he attempts to educate himself about her and to be at one with her. He does not insert scientific jargon into his works in hopes of making hypotheses that cannot be proved in the scientific world; he only comments on what he sees. Thoreau's categorical use of description shows that he has studied science. He identifies what he sees around him, noting both flora and fauna. These life forms serve as his inspiration of his own introspection. He not only tries to relate life to nature, but he also tries to lose himself in it and its intricate details. In "Natural History of Massachusetts," a short piece in which Thoreau attempts to quantify the natural occurrences he sees and reads about in Massachusetts, he says, "Entomology extends the limits of being in a new direction, so that I walk in nature with a sense of greater space and freedom. It suggests besides, that the universe is not rough-hewn, but perfect in its details. Nature will bear the closest inspection; she invites us to lay our eye level with the smallest leaf, and take an insect view of its plain" [12]. In the above report he shows his scientific side, commenting on the populations of certain plants and animals in the region, even giving the scientific binomial nomenclature on those he is familiar with. His extreme attentiveness to detail in this essay is quite evident.

3. Investigation and Analysis

3.1. Defining Science and Scientist

To know whether or not Thoreau was scientific in his work, one must first know what defines science. Through the mere language and structure of scientific works of the 19th and 20th centuries, it is evident that science has come a long way and it has expanded exponentially in the mere content of facts and relationships. Most of the 19th century scientists, like Linnaeus and von Humboldt, dealt with the classifications of naming and relationships, while 20th century scientists are very detail oriented and build upon the older knowledge by pointing out differences rather than similarities and explaining the intricate processes that go unobserved by the naked eye. This discrepancy calls for the re-evaluation of the word science; therefore, the definitions of science during both the nineteenth century and today need to be interpreted. Also, the type of science Thoreau is involved in, if that fact is so proven, must be defined. A basic assumption is made that Thoreau practiced and studied in the area of ecology, namely plant ecology. Modern day ecologists, naturalists, and scholars and their definition of what science is and what is scientifically relevant need to be explored to arrive at a uniform definition of science that encompasses both what has been and will be. Clues to the questions of scientific relevance and other matters that must first be answered are also found in the essays and criticisms of his contemporaries—notably Emerson and Alcott—and more recent writers and editors, such as Buell, Harding, Botkin, Dean, and Walls. Their analyses support the theory that Thoreau is indeed a pioneering environmentalist.

Thoreau's work also will be compared to the scientific writings of his contemporaries, namely Darwin and von Humboldt. The scientists' metaphorical form of nature writing will be

analyzed and compared to the philosophical writing style of Thoreau. This will be done to aid in the understanding of science and accepted scientific works of this era.

Other views of Thoreau and science will also be consulted through the critiques, essays, and interviews of scholars and laymen alike. The varied opinions that will be gathered will be compared and contrasted to derive a generalized opinion of science, Thoreau, and Thoreau's writings.

3.1.1 *A Progression of Scientific Thought*

One of the main points of controversy in deciding the validity of Thoreau's title as a scientist is defining the terms science and scientist. The etymology of the word science indicates that the science of a subject is the great knowledge of that subject, and a scientist is one who studies that subject for knowledge. Some books even compare a scientist to an intellectual. Today, these definitions are widely accepted. However, in Thoreau's time, transcendentalism, now seen as a noted progress towards real science, entered with a wave of "...scientific radicalism [and exited] totally opposed to scientific aims, methods, and assumptions..."[13].

A section entitled "Woodchopper and Scientist" in Thoreau's journal [14] likens a naturalist to a man of science, whereas the title scientist is barely used at all in the entry. The negligence to the use of the term may well be more evidence of Thoreau's paradoxical ways. It is safe to assume that the titles scientist, naturalist and man of science can be used interchangeably both in Thoreau's time and our own. The word "scientist" was not coined until the 1800's, so the title "Man of Science" was used to denote one such person. Yet, the definitive lines between them are—and have been-- blurred and are barely distinguishable. Even Charles Darwin, a noted scientist for his creation *Origin of Species*, denies that he himself is a scientist, instead

preferring to be called “a person interested in natural history” [15]. Laura Walls reiterates that fact by noting that in *Origin of Species* (1859), Darwin redefines evolution as a historical process, as opposed to being progressive, as other works of the time were suggesting. With Darwin’s work being widely recognized today as scientific literature—although it is clearly evidence of natural history—the definitive lines between natural history and natural science are further blurred, and the terms are once more proven to be vastly similar if not interchangeable. Even today the title scientist is synonymous with “Man of Science” and is defined as “a person with advanced knowledge of one of more sciences” [16]. However, it is quite evident of the confusion greatly experienced by the scientific society on all professional levels.

It must also be noted that, in Thoreau’s time, much of what was considered to be scientific thought was the naming and classifying of species, as Linnaeus was very popular. Even Thoreau commented in his journal “According to Linnaeus’s classification, I come under the head of the Miscellaneous Botanophilists” [17]. Thoreau didn’t like this “science” because he thought there was a lot more to the world to be discovered, and naming things was just a waste of time. In *Heaven Is Under Our Feet*, a collection of essays inspired by Thoreau in an effort to preserve Walden Woods, Sting wrote an amusing account of a modern man trying to teach the forest people “one language, one society.” The forest people laugh at the man because, as the elder explains “They are laughing because out in the forest there are thousands of different trees, each with a special spirit, a special use, a special names. You want to take them away and give us one name, and all you’re giving us in return is one word. How will we be able to tell them apart?” [18]. Thoreau made many similar comments throughout his works although Thoreau considered himself to be a man who could tell the different aspects of nature apart. Although Thoreau makes it obvious that he is quite adept at naming, he also tries to point out that he uses

the unique language of the naturalists to show the different species around him as more than just plants and animals.

I quarrel with most botanists' description on different species, say of willows. It is a difference without a distinction. No stress is laid upon the peculiarity of the species in question, and it requires a very careful examination and comparison to detect any difference in the description. Having described you one species, he begins again at the beginning when he comes to the next and describes it absolutely, wasting time; in fact does not describe the species, but rather the genus or family; as if, in describing the particular races of men, you should say of each in its turn that it is but dust and to dust it shall return. The object should be to describe not those particulars in which a species resembles its genus for they are many and that would be but a negative description, but those in which it is peculiar, for they are few and positive [19].

Thoreau claims that he learned the language of the naturalists in order to be able to communicate with them, but there seems to be more to that statement, as Thoreau willingly admits that he can identify nearly every species that he comes in contact with.

It is clear that Thoreau did have a very science oriented mind, even if he was unwilling to admit it. Scientists of the time even recognized him and invited him to join the AAAS (American Association for the Advancement of Science) but he declined, saying that he wouldn't be able to make their meetings, but he gave a different reason in his journals. "The fact is I am a mystic—a transcendentalist—& a natural philosopher to boot. Now I think—of it—I should have told them at once that I was a transcendentalist—that would have been the shortest way of telling them that they would not understand my explanations" [20].

3.1.2 *Speaking and Reading the Language of the Scientists*

In the beginning of his scientific quest to gain more knowledge Thoreau is enthralled by the greatest of the scientific works, especially works such as *The Illustrated Natural History*, *A Discourse of Forest-Trees*, *The Annual of Scientific Discovery*, *Philosophy of Natural History*, and *Philosophica Botanica*, to name a few. In his journal in August of 1851, he quips, “How copious and precise the botanical language to describe the leaves, as well as the other parts of a plant! Botany is worth studying if only for the precision of its terms – to learn the value of words and of system.” Thoreau is excited by the wealth of knowledge at his fingertips. He comes to rely on the uses of his botanicals, using them to reference new plants he finds on his walks and other excursions.

Nonetheless, he soon comes to realize in the 1850s that “one studies books of science merely to learn the language of the naturalist, to be able to communicate with them.” By 1853, Thoreau is convinced that the scientific language being accepted as the main way of communication among his contemporaries is just an obstacle to obtaining knowledge and relating it to ourselves.

As his life was nearing to a close, he “no longer saw scientists as pioneers, but as members of the reactionary fraternity”[21]; yet, his methods became more and more scientific. Thoreau’s dislike of science and the scientist grew from what science was becoming. Studies were tending to be more objectified, losing the philosophical and poetic and prose flow that could be found in such “scientific works” like Darwin’s *Origin of Species*, and Thoreau’s earlier writings. Science was becoming more professionally oriented and less personal. Baym sums him up as believing that “... a man cannot know the significance of a fact if he does not allow his

response to the fact to enter into his observations.” This is akin to observing only with the eyes, denying the presence of other senses and listing facts as they are seen. He writes in *Walden*, “I think that the man of science makes this mistake and the mass of mankind along with him: that you should coolly give your chief attention to the phenomenon which excites you as something independent of you, and not as related to you. The important fact is its effect on me” [22].

3.1.3 *The Learned Man vs. The Unlearned Man*

Because of the professionalism that society associates with being a man of science, it is assumed that a scientist is one who is educated and possesses a wealth of knowledge. However, Thoreau makes clear that the one with the greatest knowledge is the one that experiences life the most, as in the comparison of the woodchopper and the scientist in his journal of 1851. Thoreau compares the experiences of a scientist and a woodchopper that are gained when they each are in the same environment. He writes that the woodchopper “is more open in some respects to the impressions they [the woods] are fitted to make than the naturalist who goes to see them. He is not liable to exaggerate insignificant features... Not so the naturalist; enough of his unconscious life does not pass there.” He continues to say, “The man who is bent upon his work is frequently in the best attitude to observe what is irrelevant to his work.” Thus it is evident that one intent on studying details is most likely unable to see the whole phenomenon. Thoreau ends his comparison with: “...if the man of science can put all his knowledge in propositions, the woodman has a great deal of incommunicable knowledge.” He questions which man actually gains knowledge from the experience. In his answer, he further denies that being of scientific valor is worthy, in that the entire phenomenon cannot be totally experienced as a scientist.

In the journal, Thoreau continues to make other comparisons between the scientists and the laymen. He says, “The knowledge of an unlearned man is living and luxuriant like a forest, but covered with mosses and lichens and for the most part inaccessible and going to waste: the knowledge of the man of science is like timber collected in yards for public works, which still supports a green sprout here and there, but even this is liable to dry rot”. He truly believes that the knowledge of the man educated in the sciences is no more credible or superior to the man that has gained his knowledge through life experience. In that, he boastfully believes that he who has taught himself is more learned in the area than the one that has only read about it in books, or has studied the subject removed from its natural environment. How, Thoreau questions, can you learn about something natural if you study it in artificial surroundings? Truly that man whose life embodies the science is the most knowledgeable.

Thoreau makes many references to the idea that experience and time spent in an area makes one more knowledgeable about that area, even if they cannot communicate names. In the Maine Woods he notes “... the few small birds found in the wilderness are on more familiar terms with the lumberman and hunter than those of the orchard and clearing with the farmer” [23]. In his fifth journal, Thoreau says that the “true man of science will know nature better by his finer organizations: he will smell, taste, see hear, feel better than other men... The most scientific will still be the healthiest and friendliest man, and possess a more perfect Indian wisdom.” Here he asserts that he who knows best lives his studies and argues that “the man of science, who is not seeking for expression, but for a fact to be expressed merely, studies nature as a dead language.”

Throughout his journals, Thoreau denies science, yet his works show that he is indeed scientific. He stresses that the most scientific is the one working and living within the science,

but not regarding it as science. This is analogous to Dean's example of cleaning a rug: to clean the rug, you have to get off of it first. That is, you can know it, being science, while you're in it; but to interpret what is learned and to understand it, you must get out of it. This is why it is difficult for Thoreau to consider himself a scientist. He is on the rug, immersed in the science, and only sees those on the outside looking into his world. He is not able to step out and discover for himself the science he is involved in.

3.2.4 *Thoreau's Science*

Because Thoreau's works are the evidence of his scientific endeavors, they are often misunderstood for their literary status. Jayne Gordon asks, "If you were a bookstore owner, where would you put *Walden*, on the shelf?" It is evident that there are multiple genres under which it could be classified. *Walden* as a literary piece is obvious, but how would it be classified as a scientific work? What science was Thoreau's? In trying to further decide what Thoreau's studies might have been classified as, textbooks were consulted for their definitions of ecology. In *Biology*, 5th edition, the term ecology is defined as the study of how organisms interact with their environment and one another. According to the text, "ecologists try to determine the physical and biological variables that govern distributions and numbers of organisms... [and] principles that predict the future consequences of interactions between organisms and their environment that might have an impact on the world's uncertain future" [25]. Daniel Botkin, modern ecologist, says that "Ecology began in the latter part of the nineteenth century with three background elements: new observations of natural history, including the development and acceptance of the theory of biological evolution; pre-scientific beliefs about nature, including the age-old desire to find order and stability in nature; and a dependence on the physical sciences

and engineering for theory, mathematical approaches, concepts, models, and metaphors” [26]. The general definition of the ecology seemed too broad, but the ideas such as determining variables for distribution seemed quite relevant to what Thoreau might have been trying to accomplish in his study of forest tree succession and the dispersion of seeds. Brad Dean commented that Thoreau was in a way trying to pick up where Darwin left off in *Origin of Species*, trying to explain land phenomena that Darwin could not observe while aboard the Beagle [1].

For a more vegetative and comparative definition, ecology is referenced in *Botany, 5th Ed*, edited by Carl Wilson, Walter Loomis, and Taylor Steeves. Ecology-- or plant ecology as it is more specifically referred to-- is defined as “the study of the relationship between plants and their environment”[27]. They continue to say that the study “merges into plant geography, which treats of the distribution of plants over wide areas and attempts to account for the distribution and migration of species” [ibid]. Ecology, plant ecology and plant geography are listed as subdivisions of botany. This definition seems to pertain more to Thoreau and “Succession of Forest Trees”.

3.2.4 *Contemporaries*

Ralph Waldo Emerson obviously admired Thoreau, as Thoreau was somewhat of a protégé of Emerson but Emerson had some difficulty understanding and accepting Thoreau’s approach to certain matters. It seems that Emerson was awed by Thoreau’s seemingly unconcerned way of life, which contrasted with his vehement opposition to many societal views on religion, politics, and science. However, despite Thoreau’s final dislike of science, he is brought to nature through Emerson’s science. Even Emerson himself remarks on Thoreau’s

scientific method of living. In his biographical essay of Thoreau's life, he says of his daily habits: "He resumed his endless walks and miscellaneous studies, making every day some new acquaintance with Nature, though as yet never speaking of zoology or botany, since, though every studious of natural facts, he was incurious of technical and textual science" [3]. Here it is clear that Thoreau's interest and way of living is recognized as a method of scientific investigation, and is distinctly distinguishable from philosophical views of Nature. He refers to Thoreau's science as a "mild form of botany and ichthyology", which is "restrained by his [Thoreau] Massachusetts culture", and claims him as a naturalist of "perfect magnanimity" [3]. Emerson believed Thoreau truly believed Thoreau would have produced great results in his field had he lived longer. He says, "The scale on which his [Thoreau] studies proceeded was so large as to require longevity, and we were the less prepared for his sudden disappearance" [3].

Robert Louis Stevenson, contrastingly, doesn't endow Thoreau with such scientific heroism. Of Thoreau's expertise in the field, he says, "...His knowledge of nature was so complete and curious that he could have told the time of year, within a day or so, by the aspect of the plants" [9]. He remarks that there isn't much that Thoreau couldn't do, but he was "a surveyor, a scholar, a natural historian" [9]; he calls Thoreau's five years of simple living "an experiment... to prove the success of transcendental Yankeeism" [9]. Nonetheless, Stevenson is not convinced that Thoreau was living a life of science, stating instead that "Thoreau's art was literature; and it was one of which he had conceived most ambitiously" [9]. This gives another view that though Thoreau was admired for what he seemed to be trying to accomplish, he still was viewed and accepted more as a literary artist.

Thoreau's work was recognized not only by his friends, but also by scientific communities. In 1847, Thoreau begins more active in specimen collections, sending his findings

to Louis Agassiz, “the great Harvard Professor who is still the single person most responsible for the professionalization of American science during the middle of the nineteenth century” [15]. Agassiz classified for the Thoreau the specimens that he himself could not decipher. Agassiz is just one of the men of science Thoreau associated with. It is rather ironic to note that in his journals Thoreau notes that he disagreed with a number of points that Agassiz made, yet he still collaborated with him.

In furthering his membership of the scientific community, Thoreau is elected a corresponding member of “the new and energetic Boston Society of Natural History” [15] in 1850, of which he took advantage of by often visiting their rooms for specimen observation or library usage. At the end of that decade he is appointed a member of the Harvard Visiting Committee in Natural History, his duties being to review the curriculum of the college annually [15]. Even the Association for the Advancement of Science questions Thoreau’s field of study, the “branch of science [he] was specially interested in”, indicating that he was indeed recognized for his contributions in the science establishment. According to Dean, the area of Thoreau’s interests was the lives of the Native Americans whom he encountered on his journeys in the Maine Woods [1].

These contrasting views of Thoreau’s life show the discordance of the opinions of some of those men who knew Thoreau best. Nonetheless, there is a concurrent theme of scientific observations and experimentation throughout the biographies. His appointment to committees and scientific societies are powerful evidence arguing the true views of Thoreau’s contemporary scientists.

Many of the twentieth and twenty-first century critics of Thoreau and his work tend to be harsher in believing the validity of Thoreau’s scientific character. He is often compared to

modern day environmentalists and scientists, and his work is attacked under the umbrella of current definitions and ideologies of science. Early-twentieth-century Maine folklorist Fannie Eckstorm declares in her essay “Thoreau’s *The Maine Woods*” that “Thoreau is not a woodsman; he was not infallible; he was not a scientific observer; he was not a scientist at all. He could do many things better than most me; but the sum of many excellences is not perfection” [28]. It is evident her strong disbelief in Thoreau’s standings as a scientist. Her argument here is that experience and expertise –no matter the level –are no indication of one’s status as a science. At the beginning of the Transcendental period, these beliefs would have held true to a greater degree, as the occupation as a scientist was less acknowledge. However, Eckstorm’s influence could have been thwarted by the greater acknowledgement of science as a profession, and it being recognized more widely as thus.

3.2.4 *Evidence of Science in Selected Thoreau Works*

The definition of what is science now needs to be applied to Thoreau and his work. The answers to the questions—Did his writings have any ecological significance? How important was Thoreau to the scientific community? Is he a scientist at all? —lie within Thoreau’s books and essays as well as his journals. Once the issue of scientific discovery vs. non-scientific observation is addressed, these works will be searched for evidence of scientific study.

Subsequently, the field of study Thoreau was involved in must be determined. In this project, the most examined of Thoreau’s writings are *Walden*, “Natural History of Massachusetts,” “Succession of Forest Trees,” *The Maine Woods*, “Walking,” “Wild Fruits,” and selected portions of his journals. The evidence to be found should include such facts as his methods of note taking; the preciseness with which he documents his observations; the relevance

of his actual observations; and, the originality of his ideas. These facts will be used to evaluate Thoreau's work using the criteria that define science. This information will help to answer such as questions as whether Thoreau was involved in scientific study; if so, then what was he studying; how was he studying his subjects; how did he verify his studies; and can his studies be verified? The answers to these questions will help in laying a foundation for affirming Thoreau's scientific role.

After a detailed study of *Walden* along with supplemental journal readings, one would be lead to believe that Thoreau indeed held an important role in the scientific advancements of the time. *Walden* has to be Thoreau's best-known work. Why is this? It certainly isn't because it is his first publication. *A Week on the Concord and Merrimack Rivers* had failed to sell a few years earlier. The reason why *Walden, or Life in the Woods* seems to sell so well is its unique blend of philosophy and nature writing, the latter of which is becoming increasingly more of interest to scientists today.

Reading the book for the first time, one might only get the philosophical ideals that infiltrate the work. A second more detailed reading, however, can show a completely different side of Thoreau, his love of nature. To the modern scientist Thoreau's ramblings may not seem like works of science; the big question is how his observations fit into the growing sciences of the time.

Thoreau does not call his works science. He does not call them anything. Instead he seems to denounce the idea that his thoughts fall into any particular categorization. He tries to write everything he sees around him and tie it all together. Most importantly he tries to find out how people fit in with nature and how the animals and trees he sees around him are affecting

each other. These types of comparisons would be included in what is now known as the science of ecology.

Throughout *Walden* Thoreau's mode of thought seems to evolve. Near the beginning of the work he describes all of the nature around him, just pure observation. He uses a few scientific terms, although he appears to reject the thought of science. He focuses a lot on the sounds of the animals and the tracks they make, clues that they are there even when they can't be seen. At times Thoreau tries to insert himself into the animal world and comments on their behaviors, acting almost as if they are human. He vividly describes a war between two colonies of ants, an image that very few people would even consider looking at.

Thoreau acts with the eyes of a child and the brains of an educated man. He sees things that many people would look through and he makes simple observations. He then formulates questions as to why things are the way they are. Most importantly he tries to answer his own questions. When many trends are observed, patterns tend to appear. These patterns turn out to be quite useful in the scientific world.

Although Thoreau doesn't consider himself a scientist, he does consider himself learned about the natural world, even if it is merely because he lived alongside it for so long. He wishes to convey his knowledge to others by talking to them and teaching them as opposed to writing a book of diagrams that don't really convey anything except to those who already are somewhat informed on the topic. Thoreau says, "I would gladly tell all that I know about it, and never paint 'No Admittance' on my gate" [22, pg. 17]. Time and again throughout the book Thoreau points out how important he thinks experience is to learning about the natural world. He says:

If I wished a boy to know something about the arts and sciences, for instance,
I would not pursue the common course, which is merely to send him into the

neighborhood of some professor, where any thing is professed and practiced but the art of life;-to survey the world through a telescope or a microscope, and never with his natural eye; to study chemistry, and not learn how bread is made, or mechanics, and not learn how it is earned; to discover new satellites to Neptune, and not detect the motes in his eyes, or to what vagabond he is a satellite himself; or to be devoured by the monsters that swarm all around him, while contemplating the monsters in a drop of vinegar. Which would have advanced the most at the end of a month, -the boy who had made his own jackknife from the ore which he had dug and smelted, reading as much as would be necessary for this,-or the boy who had attended the lectures on metallurgy at the Institute in the mean while, and had received a Rodgers' penknife from his father [22, pg.51].

It is clear that Thoreau's advice to be would be to go out and live your own life and don't let anyone else live it for you.

Thoreau was acquiring the same kind of practical knowledge that he spoke of when he was talking about the woodchopper in his journal. However, unlike the woodchopper, Thoreau was also a poet and he tried to communicate the beauty of Nature in words. He saw all the interactions going on around him and he tried to appeal to the readers' senses so that they too could see these important interactions.

Thoreau realized that not everything could be conveyed in words. He knew that education could not come only out of books. True learning had to appeal to the senses, not just the eyes and ears. Thoreau attempted to teach those around him, but soon realized that this was

an impossible task even for him. He says, “The whole of my winters, as well as most of my summers, I had free and clear for study. I had thoroughly tried school-keeping, and found that my expenses were in proportion, or rather out of proportion, to my income, for I was obliged to dress and train, not to say think and believe, accordingly, and I lost my time into the bargain. As I did not teach for the good of my fellow-men, but simply for a livelihood, this was a failure” [22, pg. 69].

Aside from all the intrinsic observations that Thoreau made during his stay at Walden Pond, and the numerous lists of natural occurrences that he observed, Thoreau learned what it was like to truly live and experience the best that life has to offer. One of his most quoted passages is “I went into the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived” [22, pg. 90]. Walden Pond, as well as Cape Cod and the Maine Woods, taught Thoreau the science of life. Once he headed toward a life of the pursuit of science, there was no turning back.

In *The Maine Woods* Thoreau accounts his three trips into the widely unexplored regions of the Maine forests. Thoreau took many notes on all of his natural observations, and this is an often-referenced work when critics are discussing Thoreau’s role as a scientist. This is likely to become a vast source of information about Thoreau and his love of nature. His meticulous way of taking observations shows that there is indeed a methodology used to construct his form of writing. Careful observations made are the “measurements” he takes of what he sees, hears, feels, and smells. These steps are recognized as part of the formed scientific method.

The Maine Woods is unlike many of Thoreau’s other works because it is a day-by-day account of the people Thoreau encountered, the sites he saw, and thoughts that they provoked.

There is no direct evidence of science in this work, but a bit of scientific method can be detected. Much of the work concentrates on Thoreau learning the language of the Indians. There is a decent amount of quantitative measurement, mainly having to do with the measurements of moose, which seem to greatly interest his Indian companions.

Most of Thoreau's observations point to him as a natural historian as opposed to a scientist, as he tries to observe everything and predict what has happened as opposed to what will happen, but perhaps that is because of the learning environment he was in with his companions. They were constantly studying everything they saw around them, and at times it was almost as if they didn't even realize it. He says "At first we lay awake, talking of our course, and finding ourselves in so convenient a posture for studying the heavens, with the moon and stars shining in our faces, our conversation naturally turned upon astronomy, and we recounted by turns the most interesting discoveries in that science" [23, pg. 52].

Joe Polis serves as an important figure to Thoreau, as he has encountered European civilization and at the same time he is true to his roots and knows the world around him. Thoreau makes many observations about his actions because he believes that there have been many truths revealed to the Indians that may never be revealed to the white man [23, pg. 247]. He says of Polis, "I observed, while he was tracking the moose, a certain reticence or moderation in him. He did not communicate several observations of interest which he made, as a white man would have done, though they may have leaked out afterward. At another time, when we heard a slight crackling of twigs and he landed to reconnoiter, he stepped lightly and gracefully, stealing through the bushes with the least possible noise, in a way in which no white man does,— as it were, finding a place for his foot each time" [24, pg.151].

Thoreau seems to be greatly intrigued by everything that the Indians do, and that appears to be the main reason why he stayed with them throughout their moose hunting expeditions even though he thought that they were wasting valuable provisions when they left the carcasses to rot. Thoreau inserted a little bit of humor about this situation. “We saw a pair of moose horns on the shore, and I asked Joe if a moose had shed them; but he said there was a head attached to them, and I knew that they did not shed their heads more than once in their lives” [23, pg.131].

Some of Thoreau’s not so scientific traits are also found in this work, mainly his rambling about inconsequential events and lists, which serve almost no purpose to anyone aside from himself. This shows that Thoreau tried to not only live his life, but to write about it, and he succeeded more at the former. Someone who has never spent any time in the Maine Woods wouldn’t likely be able to get a good picture of what was going on, especially with all the Indian words thrown in, but it is a thought-provoking piece. Thoreau’s time in the Maine woods was well spent for him, gaining an incredible amount of experience on these three adventures. He says:

A scientific explanation, as it is called, would have been altogether out of place there. That is for pale daylight. Science with its retorts would have put me to sleep; it was the opportunity to be ignorant that I improved. It suggested to me that there was something to be seen if one had eyes. It made a believer of me more than before. I believed that the woods were not tenantless, but choke-full of honest spirits as good as myself any day,—not an empty chamber, in which chemistry was left to work alone, but an inhabited house,—and for a few minutes I enjoyed fellowship with them... [23, pg.247-248].

Again this shows Thoreau’s dislike of the concept and definition of science at the time.

In “Natural History of Massachusetts” Thoreau concentrates more on what he sees in front of him than interpretations of this information. He tries to discover what is right in front of his eyes. He says “You cannot go into any field or wood, but it will seem as if every stone had been turned, and the bark on every tree ripped up. But, after all, it is much easier to discover than to see when the cover is off” [28, pg. 5].

Thoreau speaks of the 280 birds that either reside or spend the summer in Massachusetts, as well as the 40 quadrupeds, the 107 species of fish falling into 75 genera, and 197 marine species. He mentions the eight kinds of tortoises, 12 kinds of snakes, nine kinds of frogs and toads, nine kinds of salamanders and the one lizard he observes. These lists represent the knowledge and level of expertise he has in the field of biology, a characteristic acknowledge as that of a natural scientist. He wants to know more about these animals. He wants to know the number of fin rays and how many scales compose the lateral line of the fish. He is in an observatory mood and uses a lot of the listing style of literature that he is often criticized for in *Walden*. Yet, it is this listing style that proves once again his method of logging his observations; more evidence of scientific work. It is however ironic that Thoreau made this a very general and taxonomical piece as opposed to his previously stated dislike of such science. This work shows how Thoreau’s definition of his own works has changed throughout his lifetime as he becomes more “scientific.”

In an essay entitled “Thoreau and Science,” Robert Richardson says, “Thoreau’s “The Succession of Forest Trees” is rightly considered an early founding text of modern technical ecology” [15]. Thoreau himself describes it as “a purely scientific subject” [15] when he delivered a talk on the subject. In “The Succession of Forest Trees” Thoreau spends most of his thoughts about the trees he sees in the distance. Over the years he has noticed that areas that

were once covered with pine trees are now covered with hardwoods and vice versa. Analyzing the situation, Thoreau realized that the forest had its own techniques of regenerating, even when it seemed as if these changes in scenery were coming from nowhere. He saw that once one went inside the forest, they could see that these trees were present all along, but they were unable to be nurtured while there were dominant trees in the area. He said “When you cut down an oak wood, a pine wood will not at once spring up there unless there are, or have been, quite recently, seed-bearing pines near enough for the seed to be blown for them...” [24,pg. 431].

The continued observation of tree growth is similar to conducting an experiment with a lifespan of decades and noting what happens over that time. The only difference is that this is not an experiment set up and prepared by Thoreau. The succession is a repetitive history. It can be argued that the history of nature, or natural history, is not truly a science. However, recall that Darwin and others considered *Origin of Species* to be a natural history, and yet it is regarded as one of the greatest scientific discoveries. The “discovery” was made by taking careful observation and drawing from it certain theories, facts, and conclusions. This process is the same employed by Thoreau.

Thoreau hypothesized that these saplings were able to grow in these particular areas because wind, water, or animals had transported their seeds there. He disagrees with the theories that seeds are spontaneously generated, can remain dormant for centuries or that they can survive burning. He verifies his statements by taking a closer look at the transport of seeds. He watches squirrels drop their nuts at the base of trees for later use, but if these squirrels are not to return then these nuts can grow into trees. He notices how birds eat cherries and swallow the seeds, later re-depositing these in other areas. Also, he looks at nature’s way of allowing the seeds to

transport themselves, with the use of wings. Throughout the essay he paints a picture to explain the entire phenomena that he has come up with.

Many argue that Thoreau was indeed a frontiersman in the area of natural science. Laura Dassow Walls discusses Humboldtian science in her essay “Wilderness and Wildness in Thoreauvian Science” [29]. She describes Humboldt’s type of science as “exact, detailed, holistic, and interactive field studies which gathered and collated a dazzling array of data from all points of the globe” [29, pg.18]. This she identifies as “protoecological” science, and argues that the uptake of this type of study, though not in Anglo-European mainstream, developed into the science known as ecology, thusly named in the 1890s. Walls states that Thoreau adapted Humboldt’s global study to a more localized one, therefore partaking in the founding of ecology, although on a smaller scale.

Walls claims that Thoreau is indeed “...first and foremost a writer,” and that “... he [Thoreau] would say the same thing” [2]. However, she clarifies, this is due to the state of science during the Transcendental period, a time when “humanities and science drift apart into two worlds; Thoreau is right at the point of the split,” she says [2]. Because Thoreau is human centered, and the word “scientist” is too limiting, the awareness of him as a scientist is dismissed and diminished until the sides of the two culture split is more closely examined. Walls affirms, “As literary studies got broader, scientists began to look at Thoreau and see him as one of their own; ecologists and other scientists are reading his literature and saying, ‘ Hey, he’s doing ecology. Hey, he’s a limnologist ’ ” [2].

Walls suggests the years following the publication of *Walden* are the cultivation of Thoreau as a scientist. She says, “He spent enough years in nature that patterns are coming to him. He’s reading science and others are asking questions, and he’s becoming better at

answering them. Thoreau was figuring out what was where, and was starting an answer to *why*, for Darwin about the dispersion of seeds. This was the major piece he was working on. He's just getting his work underway when he gets ill" [2].

In gathering data for *Origin of Species*, Darwin spent much time traveling from region to region. His work was quite thorough except in regards to the propagation of the area vegetation. He leaves the reader to wonder, and indeed wonders himself, the origins of much of the plant life of the lands. Walls feels this is indeed something Thoreau himself picked up on during his reading of *Origin*. In formulating his lists, he's keeping a record of the origin of his specimen. His study is another example of his work on a localized scale. Once he is adept on the patterns of change in the one region of study, his findings could then be applied to seed dispersion on a grand scale.

Many of Walls's same points are re-iterated by Dean. Like Walls, Dean feels that Thoreau related himself more as a natural historian because the natural history of something is the science of its relations. Darwin and Thoreau both considered a scientist to be one who studied in "purely object fashion"; in this case the study is of nature. They sought "humanity and humanistic element in research" over the quantification of data. Dean states, "He [Thoreau] had disdain for scientists because they had the attitude that they 'know'. You have the existent thing... and its relations. You can never *know* anything, but you can become better acquainted with it. Relations are restricted by science" [1].

Dean describes Thoreau as having incredible "intellectual curiosity" and "extreme earnestness" which is the reason for his interests in varied subjects. He remarks that he [Thoreau] spent much of his time doing field research, and made marvelous discoveries before others, such as the formation of peat bogs. He says, "The literary people have pooh-poohed his scientific

achievements. Thoreau was a scientific literary or a literary scientist. We study, love and adore the Thoreau of the *Walden* period... but the Thoreau who becomes the arch-scientist is of the 1850s... clearly a shift of interests. After 1851 [Thoreau] makes a clear transition into scientific mode” [1]. He continues to say that Thoreau was “... very, very clearly supplementing Darwin’s *Origin of Species*, especially seed dispersal.” His argument is remarkably similar to that of Walls. He proclaims that Thoreau had the data that Darwin needed for *Origins*.

Dean makes it clear that Thoreau wasn’t interested in objectifying the oak tree. He affirms that Thoreau didn’t want to live like scientists. Nonetheless, Thoreau’s interest in science is apparent. “Now,” he says, “scientists are coming out and saying, ‘Hey, this is important [work]!’” [1].

Daniel Botkin is a research professor in the department of ecology, evolution, and marine biology at George Mason University. In his book *No Man’s Garden* he evaluates the life and journeys of Henry David Thoreau, from his visits to Cape Cod to those in the Maine Woods. Botkin not only observes the life of Thoreau, but he also relates it to ecological phenomena and other notable scientists of the time period.

Botkin had written another book, *Discordant Harmonies*, ten years prior to *No Man’s Garden*, and at that time there was only one reference to Thoreau, merely mentioning that Thoreau was not the first to use the word succession when talking about forest trees. Even in the lack of Thoreau references in this book, many of Botkin’s statements, which can be considered typical statements of modern ecologists, greatly resemble many of the points that Thoreau had tried to point out 150 years prior. He says “We are accustomed to thinking of life as a characteristic of individual organisms. Individuals are alive, but an individual cannot sustain life. Life is sustained only by a group of organisms of many species—not simply a horde or

mob, but a certain kind of system composed of many individuals of different species—and their environment, making together a network of living and nonliving parts that can maintain the flow of energy and the cycling of chemical elements that, in turn, support life” [26, pg. 7]. Later in the work he goes on to say something that Thoreau would likely have said if he were alive today. “The qualities of a wilderness without human beings are crucial for us to understand so that we can know what it needed to preserve our surroundings, preserve ourselves, and understand the effects of our actions on nature. But at a more personal and deeper level, nature is our mirror. The way in which we view ourselves—as individuals and as members of societies—is in part a reflection of how we see ourselves in relation to nature” [26, pg.24].

In *No Man's Garden*, Botkin attempts to relate Thoreau's observations of both nature and humanity to modern ecology in a way that enlightens readers, and encourages them to look at life like Thoreau did. Botkin says, “This approach assumes that ideas arise from observations—of nature, of civilization, and of the self—including observations of what is important to a person in terms of the human spirit, religious feelings, and creativity. Ideas therefore can change over time with changes in nature, civilization, and technology. Information, knowledge, and understanding form a foundation from which ideas and then beliefs arise” [30, pg.xv-xvi].

Although this book is based around Thoreau, it isn't about him; he inspired it. Botkin had many thoughts similar to those of Thoreau. He says, “If we don't care for nature, nature will suffer. If we do not experience nature, both nature and we will suffer. If we do not have an inner sense of our connectedness to nature, our quest for a path that will allow civilization and nature to persist and prevail will not succeed. Forging this path will require each of us to understand the way we perceive our connection with nature, both physically and spiritually” [30, pg. 10].

Being a modern scientist in the field of ecology, Botkin sees a lot of the interrelations that were not apparent in Thoreau's lifetime. Going through Thoreau's journals, he picks up on Thoreau's observations and relates them to what is now known about the various ecosystems. For example he talks about the erosion of Cape Cod. Thoreau noted the fact that throughout his numerous trips to Cape Cod over the years the shoreline had been depleted, and he had predicted that in the years to come the Cape would eventually disappear altogether, wearing away at about 6 feet a year. As of this time the Cape is still in existence, so Thoreau's predictions don't hold true thus far. Nonetheless, his concept of erosion was correct.

Thoreau's trips to the Maine Woods also seem of interest to Botkin. What seemed especially of interest to him was Thoreau's need of experts to accompany him on his various trips. These experts either learned from experience or through professional training. The one time that Thoreau went unaccompanied, he managed to get himself lost. Thoreau used these different kinds of experts as a guide to what he did not know yet. "Thoreau made use of experts in a specific way: as a source of insights and ideas but not of complete understanding. They were for him a beginning, a source of hypotheses that could be tested using the scientific method—a beginning of new kinds of contact with nature." However Botkin says that "At Walden Pond, Thoreau was both the experiential expert and the professional expert" [30, pg.114].

According to Botkin's observations Thoreau was most scientific when he was at Walden Pond. Thoreau's descriptions of the time when he measured the depth of Walden Pond may seem boring to the philosophical reader, but more attentive reading shows that Thoreau was following the scientific method. Instead of considering the pond bottomless like many at the

time, he set out to take many measurements and determine exactly how deep the deepest part of the pond was.

Botkin, as a modern scientist, testifies to the fact that Thoreau had valid scientific observations, procedures, and theories in relation to forests and the ecosystems they encompass. He says “Each species has its place in the unfolding story of the growth of a forest after a clearing. It is a story that Thoreau was one of the first modern naturalists and scientists to understand” [30, pg. 19].

3.2.4 *Other Evidence*

Thoreau and his achievements have even been recognized by modern day societies. EcoTopia/USA is a non-profit corporation “dedicated to promoting ecological thinking and ecological behavior” based in California. Thoreau is one of the six charter members inducted into their Ecology Hall of Fame. They state that he “earned his place in history and in The Ecology Hall of Fame on July 4, 1845” [31]. They continue to say that though he was more recognized in his tight social and intellectual circle, his “reputation as a prophet for ecological thought” continues to grow with the passing years.

3.2.4 *Concluding Analysis*

With the evidence presented from the works of Thoreau and the research, opinions, and criticisms of others, we are able to arrive at a conclusion to our investigation. The definition of science has indeed shifted from Thoreau’s era to ours. Nineteenth-century terms “science” and “scientists” were less reformed and constrained, and those practicing, studying, or interested in any of the sciences, namely, physics, mathematics, chemistry, and biology were considered

scientists. In the early twenty-first-century, interest in a science does not indicate one's scientific status; only those who have been trained in the area are generally called scientists. However, both definitions generally indicate that a scientist is one studying a field of science. As Thoreau did not recognize himself as studying science formally, he is not always considered to be a scientist by those of today. Also, much of his scientific work was left unpublished until after his work, so he was not known as a writer of scientific matter. Nonetheless, the presence of this work denotes his status as a scientist.

It is evident from the claims of his friends, family, and admirers that Thoreau was at the forefront of ecological development. His studies of Nature and human interaction with her are defined as a mix of plant population ecology and human ecology, reiterating the broad range of studies encompassed with ecology. As indicated in the investigation and analysis, Thoreau's great immersion in seed dispersal would have proved his awareness of and in-depth fascination with environmental science.

4. Future Endeavors

In an effort to educate others about Thoreau's work as an environmental scientist, we propose establishing the Interdisciplinary Environmental Education Curriculum. This course is aimed at providing high school students with an effective means to learn the elements of an environmental education that encompasses, mathematics, plant and forest sciences, field research, social philosophies and policies, and environmental writing. The program curriculum consists of reading and analyzing a selected number of Henry David Thoreau's works and interpreting his role in the scientific community. Other works that could serve as background would be scientific works of the time period (such as Darwin and von Humboldt), as well as

works by contemporaries (namely Emerson) and modern ecologists and scientists (such as Daniel Botkin and Edward Wilson). The course also involves using Thoreau as a guide to nature writing. Hikes and unstructured field time are included in the program with the course concluding with a camping trip to Walden Woods in an effort to reinforce the lessons learned and enable the students to apply them in the field.

The program would be a means for teachers to provide interdisciplinary education for students. The range of subject matter and themes outlined in the appended Course of Action allow for the application of basic and intermediate skills learned in the classroom to real-life situations.

The program is more appropriate for institutions that offer flexibility and departmental interaction in their curriculum, as the studies are to be taught by educators of different backgrounds. The institutions may also find this course useful in meeting a group of educational standards in one unit, as opposed to a class-by-class method. This would indeed be useful for educating students by level, as the program allows teacher flexibility to focus on subject matter more difficult to grasp.

In order to fully understand who Henry David Thoreau was and what he represented, it must be understood how he studied and became accomplished in multiple areas. The proposed program is the method by which this is to be done. Further information about the proposed curriculum and a course of action for developing such a course can be found in Appendix B.

Appendix

A. References

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B1. Proposed Course Syllabus

The following works are chosen to give the students exposure to a few key topics that can be approached by a variety of fields.

- 1) Themes
 - a) Thoreau's Role In
 - i) Conservation
 - ii) Ecology
 - iii) Nature Writing
 - b) Thoreau's Relationship With Nature
 - c) Thoreau's Admiration Of The Indians
 - d) Thoreau's Influence On
 - i) Science
 - ii) Social Interactions
 - e) *Walden* As An Experiment
 - f) Thoreau's Use of Experts
 - g) Thoreau's Use Of The Scientific Method
 - h) Thoreau's Rejection Of Science
 - i) Thoreau's Use Of Lists
 - j) Thoreau's Interest In Botany
 - k) Thoreau's Definition Of "Wilderness" and "Nature"
 - l) Was Thoreau A Hermit

m) Was Thoreau A Natural Historian Or A Scientist

2) Thoreau's Works

- a) *Walden* (all)
- b) *The Maine Woods* (selected)
- c) *Wild Fruits* (selected)
- d) "The Succession Of Forest Trees"
- e) "Natural History Of Massachusetts"
- f) Journals (selected)

3) Other Works:

- a) Heaven Is Under Our Feet [compilation] (selected)
- b) Nature [Emerson]
- c) Thoreau [Emerson]
- d) No Man's Garden [Botkin] (selected)
- e) Origin Of Species [Darwin] (selected)
- f) Future Of Life [Wilson] (foreword)

B2. Work Reasoning

1. *Walden*

Because *Walden* is by far the best known of Thoreau's works, it makes sense that it should serve a major role in this proposed course. An early exposure to the themes presented in *Walden* can help one to understand much of what Thoreau stood for, both as a literary figure and also a person intrigued by the world. Choosing this as the first area of study also allows these same themes to be expanded upon in others of his works. Thoreau makes it easier to understand this particular work because he divides it up into themes himself. These are the themes that he would like the reader to at least think about if they get nothing else out of the work.

There are also a lot of themes that Thoreau doesn't note himself and these are among the most interesting to study. A careful analysis of these themes can allow one to understand Thoreau's scientific status. When analyzed as a part of the big picture, Thoreau's trip to Walden Woods can be thought of as a scientific experiment. Thoreau wished to test out his hypotheses about life by looking in from the outside. He still had contact with the outside world, but he wasn't immersed in it. Throughout the process he made numerous observations and recorded them, and he used these observations to prove his conclusions. Most importantly he wrote up his experiment for the public to read, leaving in every detail that he felt was important. Many of the sections in the book seem irrelevant to readers who are only looking for a written out answer to their questions, and don't wish to read the whole book and get the entire perspective, like Thoreau

wished to get of Nature. However, a close inspection of certain individual chapters can help one analyze Thoreau's actions and determine if he was acting scientific or not.

2. *The Maine Woods*

Although this work does not appear scientific when casually read, it contains some important information about Thoreau that few know. This book is a recount of the adventures that Thoreau had on his journeys up in the Maine Woods, but that isn't what is so important about the book. The important facts and ideas to get out of this book are the admiration and relationship that Thoreau had with the Native Americans that he encountered. They were one of Thoreau's main scientific interests. He was intrigued about how they managed their everyday natural lives after much of their culture was changed by the introduction of the European civilization. The way they lived and adapted was much more interesting to Thoreau than the "science" that he was reading about.

Certain sections of this book are valuable to understanding Thoreau's role in the scientific community, namely those in which he goes out of his way to make measurements and observations about things that others wouldn't give a second thought, like the measurements of the moose. It would not be feasible to require the reading of the entire book, both because of time restraints and the lack of directly applicable material, but certain sections should be assigned and others suggested to help the students see this different view of Thoreau. Also an introduction to sections of this book might inspire the students to go out read more of Thoreau's writing on their own time. This book would also help students

to get an understanding of what to look for when they are camping for the final part of the course.

3. *Wild Fruits*

This has to be the most directly scientific of Thoreau's works in publication. His analysis of the plants and fruits appeals to the major senses, sight, smell, taste and touch. Reading of this book reminds one of the intricate details of plants and fruits that they have no doubt seen throughout their lives, but never took the time to put into words. It wouldn't be plausible to read the entire book because much of it is a repetition of its previous sections, but it is important to note the detail that Thoreau spends on certain fruits, both those common to the kitchen table as well as those common to the knowledgeable camper who knows which berries to eat and which ones are poisonous.

This is much more laid back reading and would serve well to be the last section to be read before the camping trip. It would be an interesting exercise to ask the students to identify certain plants with only the descriptions given in this book, or perhaps even to have them write a detailed description of a plant or fruit and see if the others can identify what they are describing.

4. **“The Succession of Forest Trees” and “Natural History of Massachusetts”**

These two works are written later in Thoreau's life, when he is most scientific. They represent examples of his method of notation and observation. The works would provide a means to compare the application of the scientific method today to Thoreau's own method of compiling scientific data.

5. Journals

The journals are the best indicator of Thoreau's progression to science. They show that his work becomes more detailed and fact based, and his writings less philosophical. Selected pieces of the text provide a guide to examining nature. This guidance will help the students to develop a broader sense of investigation

B3. Course of Action for Interdisciplinary Environmental Education Curriculum Proposal

There are a many steps that must be worked through to implement an education program, especially if state funded. This course of action is to serve as guidance towards developing the proposal.

Course of Action

- 1) Proposition to Governing Organizations
 - a) Proposition of an environmental education course for students of a state high school requires the authorization and acknowledgement by the Massachusetts Department of Education¹. All courses approved by the Department of Education (DOE) are arranged in a curriculum framework. The framework categorizes all subjects and subsets thereof in an effort to organize and quantify what each student should learn at each grade level.
 - i) Into which curriculum framework does the program belong?
 - ii) What are the components of the framework?
 - iii) How does the program specifically fit into the framework chosen?
 - b) The Massachusetts Executive Office of Environmental Affairs (EOEA)² organizes courses into benchmarks. Environmental educational courses also require authorization for usage by MOEA in accordance to the “Benchmarks on the Way to Environmental Literacy.”
 - i) Which benchmark does the program meet?

¹ The Massachusetts State Department of Education web page may be accessed at <http://www.doe.mass.edu>.

²More information on the EOEA and its respective offices is available at <http://www.state.ma.us/envir/eoea.htm>. Information specifically on the education plan, *Benchmarks on the Way to Environmental Literacy*, may be obtained from <http://www.state.ma.us/envir/Elbhome.htm>.

- ii) How does the program specifically satisfy the benchmark?
- 2) Deciding Location and/or Sponsor Organization
- a) Locations selected must be evaluated for effectiveness³.
 - i) What are the attributes of an ideal location?
 - ii) Must the location be static or may the program involve a variety of locations?
 - iii) Can program be achieved in home environment⁴?
 - iv) What does the location have to offer?
 - v) What do the members of the sponsoring organization know?
 - vi) What can the members add to the program?
- 3) Addressing Issues within the Program
- i) How will the program be made interdisciplinary?
 - ii) What educators will be involved?
 - iii) How will the program entice the students to actively participate?
 - iv) What experience is wanted for the students?
 - v) How will the program be structured to allow for unstructured time?
 - vi) What is the sequence of the themes?
 - vii) How will concerns about living with other people be addressed?
 - viii) How will concerns about living in the woods be addressed?
 - ix) How will the program work to make the students more comfortable?
 - x) How will this all be connected?
- 4) Consulting and Obtaining Feedback

³ Locations thought to be ideal for the program are Worcester Polytechnic Institute (WPI)- Worcester, MA, Walden Woods- Concord, MA, and the Thoreau Institute- Lincoln, MA.

⁴ Home environment is defined as the region in which the participating school is located.

- a) An advisory group composed of teachers of varied disciplines, as well as scholars, scientists, and other experts will prove to be extremely beneficial. The advisory group will help to set objectives and goals for the program and will serve as a trouble shoot unit.
 - i) What type of teachers would comprise the group?⁵
 - ii) What field consultants are needed?
 - b) An informal consultant group of students would be valuable as a curriculum thermometer. The students can be used for their feedback and reactions to proposed ideas and activities.
 - i) What type(s) of students would be the target group?
 - ii) How would the students be used to evaluate the proposal?
 - iii) Would the students be a part of advisory group?⁶
- 5) Development of Pilot Program
- a) A trial run of the program would be essential to evaluating the effectiveness of the activities.
 - i) How long should the program be?
 - ii) Should those involved in the advisory groups be the participants of the pilot?
 - iii) How would the program be cut to include all themes intended?
 - iv) How will the pilot be evaluated?
- 6) Evaluation of the Program
- a) The goals of the program must be revisited.

⁵ It is suggested that humanities, science, and social studies teachers are used as these are the areas of study most evident in Thoreau's work.

⁶ See above, 4a.

- i) Were the goals of the program met?
- ii) Did the participants think, act, or behave differently?
- iii) Was the program effective as a teaching method?

C1. Brad Dean, Ph.D. Interview Notes (January 30, 2002)

- A scientist is someone who studies... objective nature.
- In Thoreau's time science was coming out of Enlightenment and was a time when professional sciences were coming to fore.
- Called science natural history; Darwin wanted to be called natural historian
 - To Darwin and Thoreau, someone who studied nature in purely object fashion was a scientist. They wanted humanity and humanistic element in research. Science was the quantification. Natural in 'natural history' is the science; history is its relations.
 - Thoreau characterized nature of interests as Humboldt's and White's (natural history oriented)
 - In response to AAAS letter, Thoreau says his scientific interest is the Algonquin Indians because he was interested in them as "historical phenomenon"
 - He wasn't interested in objectifying the oak tree
 - "He had disdain for scientists because they had the attitude that they 'know'. You have the existent thing... and it's relations. You can never *know* anything, but you can become better acquainted with it. Relations are restricted by science."
- His intellectual curiosity was incredible. His "extreme earnestness" was the reason for interests in many subject areas.
- His profession is always to be on the alert and to find God in Nature... he uses the tools of science to do it.

- The literary people have pooh-poohed his scientific achievements. Thoreau was a scientific literary or a literary scientist. We study, love and adore the Thoreau of the *Walden* period... but the Thoreau who becomes the arch-scientist is of the 1850s... clearly a shift of interests. After 1851 [Thoreau] makes a clear transition into scientific mode.
- [Thoreau was] very, very clearly supplementing Darwin's *Origin of Species*, especially seed dispersal. Thoreau had data that Darwin needed for *Origin*.
- ...scientists are coming out and saying, "Hey, this is important!"
- *Walden* period was to find out who he was, what kind of life did [he] want to live. Then, [he] developed a lifestyle that he lived the rest of his life that involved lots of research. [He] spent time doing field research. [He] made marvelous discoveries, like the peat bogs, before others. [He] didn't want to live like them [scientists], but [he was] interested in [science].
- In an interesting sense, he's an outsider. Thoreau believes you don't want to be compromised by position inside; but he believed that's the only place to be in a situation. The secret to Thoreau is he lived to improve his condition. Thoreau calls the soul the inward condition. He's living to improve his soul. He studied the Native Americans to improve his own condition.
- He had private business to transact: write a book and improve his condition. He infers that people should seek out and find their own way. He's not the kind of guy to give out rules because he chafed under rules himself. Everything you thought you knew is now up in the air to be re-assed. Most people don't want to deliberate.

C2. Laura Dassow Walls, Ph.D. Interview Notes (January 31, 2002)

- He [Thoreau] is first and foremost a writer, and I think he would say the same thing...
- ...ecologists and other scientists are reading his [Thoreau's] literature and saying, "Hey he's doing ecology. Hey he's a limnologist"...
- ...humanities and science drift apart into 2 worlds; Thoreau is right at the point of the split. This changes how he is perceived. William Channing instinctively realizes that Thoreau is two things in one: a poet-naturalist...
- Others began to "...pay more attention to scientific side because of two culture split..."
- [there is] awareness of [Thoreau] as a scientist, but [the awareness is] dismissed and diminished
- As literary studies got broader, scientists [began to] look [at] Thoreau and see him as one of their own.
- He was human-centered, anthropocentric.
- The fact isn't what interests him, but how it relates. There isn't a barrier between man and nature. [This is] what really makes nature interesting for us.
- In a practical sense he's trying to get a list of what's going on. [It's his] habit of trying to hold on to details. [This] is a way of trying to get a handle on the role of nature... so that he'll find a pattern ... and let them speak to him instead of imposing his own [role]. [He's] trying to see nature as a whole, but trying to keep everything in there. He's a man in love with little details.

- They [“scientists”] liked to think of themselves as philosophers. The new word scientists ran kind of ugly with people, [and] took a while to catch on. [I] think he would have found the word limiting.
- I like thinking of [*Walden*] as an experiment. There’s a sense that if you want to try something, you clear the space, create the conditions and run the experiment, set the time, walk away and see what you’ve learned.
- The trip to *Walden* was right for him [Thoreau], and if it’s right for you do it [you should]; but not because he did. *Walden* is asking each person to take seriously who they are in the world. They should view the world looking for who they are. *Walden* is an “...inner search with productive results.” Why nature? He’s trying to find what’s really important. Why do we live the way we do? He needs to get away to a place where there aren’t so many social conventions. There [*Walden*] none of [social conventions] applies. What are the basics needed to make life work? Nature provides proper setting for [the experiment].
- {*If Thoreau had lived longer...*} Might have seen *Walden* culminate early years. The new work [he was working on] culminates another period in his life. We’d have works of different flavors. After he publishes *Walden*, over several years he sees more patterns in nature. He spent enough years in nature that patterns are coming to him. He’s reading science and others are asking questions, and he’s becoming better at answering them. Thoreau was figuring out what was where and was starting an answer to why for Darwin about the dispersion of seeds. This was the major piece he was working on. He’s just getting his work underway when he gets ill. What we would have got out of that, I don’t

know, but it's costly. Whether it would have been called scientific, probably not; but scientist would have read it and it might have had a great impact.

- “He [Thoreau] values science much too deeply not to criticize it.”
- Everyone's heard of Thoreau and they have opinions about him. He's not just a literary figure; he belongs to the culture at large.

C3. Jayne K. Gordon Consultation Notes (February 9, 2002)

Ms. Gordon is the Education Program Director at the Thoreau Institute in Lincoln, MA. The Institute is a collaboration of the Walden Woods Project and the Thoreau Society. Ms. Gordon provided the background on the education courses implemented as of February 9, 2002. She also provided the contact information for the frameworks of education and the benchmarks of literacy. She notes the Institute web site is a resource for information about other projects designed and/or implemented by teachers that have attended a summer institute. Gordon reaffirms that the piece is interdisciplinary and questions, “if you were a bookstore owner, where would you put Walden on the shelf?” The information provided through the consult with Gordon led to the development of the course of action [Appendix B3].

More information on the courses is available at www.Walden.org or by sending electronic mail to Ms. Gordon⁷.

⁷ Contact: 44 Baker Farm Road, Lincoln, MA 01773-3004 U.S.A. ; jayne.gordon@walden.org.

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