

Rachel Carson's Legacy

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The panel commemorated the centennial year of Rachel Carson's birth, May 27, 1907, by examining her work in the context of the conference theme — Confluence: literature · art · criticism · science · activism · politics.

Together, the papers discussed interdisciplinary approaches to Carson's writing that made connections with the conference theme. They considered Carson's dual role as a writer and scientist and reflected on her work in relation to language, place, nature, and culture.

The panel was organized by NEW-CUE, Nature and Environmental Writers-College and University Educators, which sponsors a biennial Environmental Writers' Conference in honor of Rachel Carson in Boothbay Harbor, Maine.

Chair: Vivienne Shaffer, Independent Researcher

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Rachel Carson's Legacy

Rachel Carson and Edwin Way Teale:
Their Correspondence and the Shape of
20th Century Environmentalism & Environmental Writing
— Sydney Landon Plum, University of Connecticut

Correspondence

The writer-naturalists Rachel Carson and Edwin Way Teale began a correspondence in the mid-1940s that lasted until Rachel Carson's death in 1964. Their correspondence underscores aspects of their public personae: they were careful observers, meticulous and talented writers, and environmentalists before the term was commonly used. The letters and cards also reveal that they were both good at nurturing friendship and supporting each other in their common interests and goals. Good conservationists – concerned with passing along to the next generation a natural world more able to sustain itself than the one they lived in – they each conserved the written evidence of their work and friendship, evidence we have to peruse and study. In addition to being correspondents, they were regular visitors to each other's homes and favorite places: Silver Springs, Maryland; Baldwin, New York; Southport, Maine; and Hampton, Connecticut – meetings of which we can only surmise the content.

In looking at two writers' correspondence, one might think to find intellectual discussions of the work each was doing as writer and naturalist; self-conscious reflection on the tools of their trade; notes on the birth of the environmental movement. These are there, to a limited extent. More often one finds notes about cats (their lives and deaths); the illnesses of Mrs. Carson and Nellie Teale; complaints about publishers and their promises; worries about getting to the Burroughs Awards ceremony; advice about serializing books; notes on gardens and the cutting down of trees; questions about eelgrass and notes on

the sighting of Parula warblers in Southport. What follows are some initial observations about the correspondence between Rachel and Edwin, tracing the involvement of each in an environmental watershed, and returning to a brief analysis of their writings to try to tie together the personal and the political, the metaphors a writer uses and the potential impact of the work.

The first thing one finds upon opening the file of Rachel Carson correspondence in the Edwin Way Teale papers housed in the Dodd Collection of the University of Connecticut Library is a Christmas card from 1946 signed "Rachel". In 1946, Rachel Carson was already the author of *Under the Sea Wind*. Teale was a popular writer of articles on the insect world and other aspects of nature.

An early entry in their correspondence, from February 1947, is Rachel's response to a request from Edwin about where he might go to look at eels. As is the case with many of their notes to each other regarding professional concerns: there is an answer to a question, some further information on the subject, and the name of a contact who might prove useful. In return, Edwin takes pains to plan the visit he expects from Rachel to the Teale home on Long Island in 1952, and Rachel sends directions to the cottage in Southport and a map to aid the Teales on their planned visit to her in 1954. There is a draft of the letter of condolence Edwin sent on December 19, 1958, after the death of Rachel's mother. And there is the heartbreakingly stoic, handwritten note that Rachel sent to Edwin and Nellie in December of 1960 - offhandedly telling them of her radical mastectomy.

Much of the correspondence between Rachel and Edwin comprises helpful notes from one writer to another. As she is completing work on *The Sea Around Us*, Rachel writes to Edwin to acknowledge his part in the development of her work. In the same letter, she asks for his letter of reference for a Guggenheim, in order to work on a book for Houghton Mifflin - *The Edge of the Sea*. Teale obliges and Carson receives the Guggenheim. *The Edge of the Sea* was

serialized in *The New Yorker*, and Edwin kept in the correspondence file a copy of the letter he wrote to Rachel congratulating her on her writing. Rachel responds with this helpful hint – on the benefits of serialization – as Edwin finishes up *Autumn Across America* early in 1956.

The subject of DDT

As Martha Freeman notes in the introduction to *Always, Rachel: the Letters of Rachel Carson and Dorothy Freeman*, early in 1958 Carson’s concern about the indiscriminate use of pesticides – a concern which had been somewhat dormant since her years as a government employee – was reactivated “by a letter to the Boston Herald from her friend Olga Owens Huckins whose home and private bird sanctuary had been sprayed from the air with DDT, killing both birds and harmless insects.” (*Always*, xviii) So Carson took on the task of writing about this subject. Carson had tried to write about DDT in 1945; she approached *The Reader’s Digest* about an article, but was turned down.

In April 1958, Rachel wrote to Edwin of her intention of “writing about insecticides”. In alerting Teale to her intention, Carson was not only keeping up their regular correspondence on their writing projects, but also opening a trove of information. In 1945, Teale had written about DDT for *Nature* magazine: “DDT: The insect-killer that can be either boon or menace”. (*Nature*, 38, 3 [March 1945]) Although the title of the article seems to promise a “fair and balanced” look at the insecticide, Teale’s appraisal of the effectiveness of DDT weighed against its affect on other insects, and the general environment, seems to label the chemical a menace. In describing the use of DDT in the Philippines, to protect American soldiers against malaria, Teale calls the action “a bug-blitz binge”. Writing about the application of this same mentality, as well as the same layer of DDT, to American towns, he uses a list of man-made extinctions and

devastations to try to alert his readers to the potential danger of eliminating all insects from the countryside.

Teale was a recognized expert on insect life, thus his approach to noting the dangers of DDT might be expected to focus on the particular problems created by eradicating “good, bad and indifferent” insects. He draws attention to the importance of the honeybee, and weighs that against the fact that only half of one percent of insects are harmful to man. The details of his article are arresting – and it is chilling to hear them more than sixty years later and realize that little has changed in the general understanding of our dependence on the insect world.

Teale’s article is all the more noteworthy for his metaphoric choices and for his anchoring of the argument in a depiction of the web of life. DDT was developed as part of the war effort, and from the beginning of the media coverage of its effectiveness, its usage was described in terms of a war on another front. Teale picks up on this language, but uses it critically, even sarcastically – noting “lackwit officials” yelping for joy during their “bug-blitz binge”. He reports that: “Dusting a field or wood from the air will have all the judicious foresight of machine-gunning a throng of friends in order to kill a fleeing bandit.” He describes the crop-dusters flying over U.S. farmlands as “after-the-war” planes. His final metaphor on the wrong-headedness of this activity borrows from another favorite source for Americans acting out aggressions – football: “The U.S. Public Health Service is on guard. Such activity is our best bulwark against a popular outcry for a crusade against the insects – that and an understanding of what the consequences would mean. It is to be hoped that these two aids are effective. For, unless they are, Our Team is likely to make another spectacular end-run in the wrong direction.”

Teale’s language draws attention to the (ill-suited) emotional basis for Americans resorting to this kind of overkill. His research and description push

his reader to take a step back from this position and consider a longer perspective. Again he is ready with examples of “unexpected by-products... when man tries to interfere with the balances of Nature... [out of] our ignorance of the interrelationships of natural life:” in Scotland so many squirrels were shot that wood-pigeons became too numerous; in Jamaica, colonists brought in mongooses to control rats, but the mongoose became a problem; Australia killed off their cormorants. He also cites the increasing trend toward monoculture in the United States as an example: “By planting immense areas to cotton, wheat, potatoes, and corn, we have ignored Nature’s own system of diversified farming, and we have provided ideal conditions for the multiplication of such insects as the boll weevil, the chinch bug, the Colorado potato beetle and the corn borer.”

Early in his article, Teale suggests that DDT will have repercussions beyond the insect world in addition to those caused by the elimination of insects. Next to a photograph of a mother wood peewee bringing an insect to young still in nest is the caption: “How lethal DDT is to birds eating insects dusted with it is one of the many undetermined facts.” He suggests further on that it was known in 1945 that the effects of DDT were cumulative. Still, he returns to the main thrust of his argument, on the deleterious effects of insect eradication, in a passage near the end of his article that is marked by an eerie image.

At the rate of more than 500 acres an hour, after-the-war airplanes can scatter DDT over the countryside. But such a plane would leave behind it far more than the fine particles of insecticide settling to earth. Its effect, if carried to its ultimate conclusion, would alter the whole face of the earth beneath its wings. If the insects, the good, bad, and indifferent insects, were wiped out in a wide area, the effects would be felt for generations to come. Songbirds, depending upon insects, or on seeds mainly produced

by the pollinating activity of insects, would feel the effect. A winter stillness would fall over the woods and fields.

Teale's was an amazingly prophetic piece, and I feel sure that it distressed him that his words had to be "prophetic", and not have a more immediate impact. He continued to collect articles about DDT and references to it in his many notebooks and files. In 1956, the U.S. Agriculture Department began a planned spraying of nearly a million acres of land in the Northeast in order to "eradicate" the gypsy moth. The ornithologist Robert Cushman Murphy led a group of concerned citizens seeking a court injunction to stop the spraying, and this legal action went to the Supreme Court, which declined to hear the case. Among those signing on to this legal action was Edwin Way Teale, who was at the time living in Baldwin, New York. In January 1963 in a speech to the Garden Club of America, Carson offered the wording of the Court of Appeals decision in this case as useful advice to those wishing to halt the use of blanket spraying.

Thus it was that after Carson notified him that she was writing about insecticides in early 1958, Teale was able to send her a clipping about Dr. Wayland Hayes study of the effects of DDT on humans, published in the *American Journal of Public Health* (volume 45, number 4) in April 1955, which gives Rachel a chance to show her own knowledge of the effects of this poison on neurological systems other than an insect's. Rachel has been doing a great deal of research of her own - "trying to collect all the specific data I can as to any actual declines in bird populations that have occurred" - and although she wants to rely on scientific studies, she is also soliciting anecdotal responses, once again calling upon Teale: "have you been in the field enough to have formed any impressions on your own, or have you heard any such reports from people whose judgment you respect?" Carson was, of course, a scientist by training, but this emphasis on the need for scientific evidence, as well as her ridicule of

Hayes's "science", foreshadows the criticism she will take when *Silent Spring* comes out.

It is not clear that Carson had read Teale's 1945 article. E.B. White, Richard Pough, and Ray Fosberg - writers with whom Carson was familiar - had also written immediately after the war about the dangers of DDT. An outspoken piece had appeared in "The Talk of the Town" in the May 26, 1946 *New Yorker* that William Shawn may have given to her at a meeting in June 1958 to discuss the serialization of *Silent Spring* in the magazine.

In spite of her optimism and the research already undertaken and anticipated, the book that Rachel elsewhere refers to as "her poison book" would not be published until 1962. Neither was the optimistic prediction, in the same letter, about the indiscriminate use of pesticides an effective prophecy. Edwin Way Teale carried on his practice of keeping track of news about DDT. In his "Log Cabin Journal" of 1971 he placed a newspaper clipping from the *Bangor News* of August of that year, with a note: "This record of the effect of herbicides on birds appeared while we were at Crocker Lake in August". The clipping is the column "On the Maine Street" with the byline of Mrs. Jerry Elwell of Sherman Station, who reports: "It's happened too often to be 'just a coincidence.' Despite assurances that the brush killing roadside sprays are harmful to neither bird nor beast, we 'beg to differ,' and feel we're in a prime position to do so." Mrs. Elwell reports on injured, ill and dying birds that have been brought to her after spraying. Even though many of her neighbors think of sparrows as pests, they are moved that these birds are so affected. Mrs. Elwell reports paralysis in evening grosbeaks and that even blue jays are affected. The skunks that eat the sprayed choke cherries die, and the pets that eat the disabled birds also become sick. Mrs. Elwell's complaint is not only about the death the spraying brings to her neighborhood, but the attitude of both those who initiate and those who carry out the spraying. It must have devastated Edwin Way Teale to read this

news 26 years after he published warnings about DDT and nearly a decade after the publication of *Silent Spring*.

The DDT debate

The debate about the uses and abuses of DDT, its positive and negative effects both immediate and long-term continue to this day – and Rachel Carson’s person and prose remain closely associated with the debate. As Dorothy McLaughlin says in the PBS special: Rachel Carson is still “valorized and villainized”. Carson’s association with this volatile topic is may have even been a burden she shouldered knowingly. Still, I think there are some things to be learned from the way this topic threads the correspondence between two mid-20th century environmentalists.

Edwin’s (inferred) help with Rachel’s research may have simplified her work, and his support may well have been crucial. As she wrote *Silent Spring*, Carson – in addition to her personal trials – did not have the unwavering emotional support for the project from Dorothy Freeman that she experienced elsewhere, as Freeman did not think “the poison book” an appropriate topic for Carson. Along with E.B.White and Wallace Shawn at the *New Yorker*, Teale believed in this work and provided Carson with a sounding board.

Both of these influential writers recognized the importance of finding an audience for their observations about the environment within the spectrum of “nature-lovers” and bird-watchers and suburban parents and gardeners. This was the audience Teale wrote for in *Nature*. These are the folk whose work Carson credits when she mentions the concerns of Olga Owens Huckins in the first line of the Acknowledgements of *Silent Spring*. This is the fieldwork Teale keeps track of when he clips Mrs. Elwell’s column from the *Bangor News*. The history of safeguarding the environment in the United States is a history of great

writing, and Carson and Teale contributed to the tradition, both in their published works and in their private correspondence.

The Environmental Ethics of Lawn Care

— Nancy Gift, Chatham University

Despite the increasing market for organic food and despite generally increased awareness of environmental problems resulting from pesticide use, pesticide treatments on lawns and other urban grounds remain a common occurrence. The all-grass lawn is a decision with artistic, social, and economic causes. Neighbor competition and convenience of lawn service contracts can push homeowners toward monoculture grass. The occasional bee-allergic child can make a clover-free lawn even seem to be a moral imperative. Though more diverse lawns were once the standard, marketing pressure from lawn seed and pesticide companies has created an aesthetic which seems irrefutably of the highest status and quality.

I argue that pesticide-free lawn care must be elevated in social, artistic, economic, and political stature. Researchers at Yale School of Forestry Bormann, Balmori, and Geballe introduced the concept of the Freedom Lawn (2001), a concept which can facilitate advocacy for pesticide-free lawn care. The Freedom Lawn is essentially a species-diverse, ecologically friendly alternative to the all-grass lawn. The name itself has none of the political baggage carried by the term “organic” and may therefore appeal to an even broader audiences. At the same time, daring to celebrate clover, violets, yarrow, creeping veronica (even dandelion) and other broadleaf species is a form of ecological activism.

In this presentation, I will focus first on the historical reasons for the current standard of the all-grass lawn, then follow by introducing the components and reasons for the Freedom Lawn. While in Rachel Carson’s time, DDT was a home-use pesticide, today lawn herbicides are among the most commonly used pesticides at home. Our lawns are manifestations of our

environmental ethics and our aesthetic values, and I argue that we must market a new aesthetic standard.

Lawns first appeared in Europe in the 18th century, at Versailles and other royal estates, and spread through imitation to other wealthy landowners. By the late 18th century, wealthy landowners in the U.S. began to imitate English gardens and lawns. (Jenkins p. 13) In 1818, William Cobbett wrote that the first U.S. settlers “found land so plenty, that they treated small spots with contempt. Besides, the *example* of neatness was wanting. There were no gentlemen’s gardens, kept as clean as drawing-rooms, with grass as even as a carpet.” Maintenance of such lawns required only monthly or twice-monthly cuttings with a scythe or grazing by sheep (Durand, 1853). Frederick Law Olmsted’s design of Riverside, IL (1868) incorporated at least 30 feet of park-like frontage for each residence. (Tatum, 1973) By 1890, lawn mowers were a standard item in hardware stores and mail order catalogues (Jenkins, p. 30). The growth of golf and the efforts of the Garden Club of America in the early 1900’s intensified the social pressure to produce “neatly carpeted front lawns.” (Jenkins, p. 37)

Seed and fertilizer companies began to market the components of such lawns by the 1920’s, when herbicides were still not available. Dandelions in particular were targeted (Jenkins 85), both as weeds worth digging out, and by 1929, the pesticide Dendalex was marketed and sold, but was ineffective (Jenkins 86). However, it was not until after World War II that effective herbicides were available - and then, they were used primarily agriculturally. A magazine article in 1955 reflects the attitude of the times:

It’s time to take up arms against the weeds. From now on, when man and nature meet on your lawn, it’s dog eat dog.... [Y]our best bet is not those infantry tactics but wholesale slaughter by chemical warfare, utilizing the

impressive arsenal of chemicals now available to every lawn owner beset by weeds. (Anonymous)

The herbicide 2,4-D was among the first of this new generation of herbicides.

We tend to think of Rachel Carson's *Silent Spring* as a directive for farmers. Virginia Scott Jenkins writes that *Silent Spring* was instead "a study of the development of the lawn and garden chemical industry in the United States and its impact on the environment." (p. 155) Carson herself wrote "Gardening is now firmly linked with the super poisons....Those who fail to make wide use of this array of lethal sprays and dusts are by implication remiss, for almost every newspaper's garden page and the majority of the gardening magazines take their use for granted." (p. 24) While Rachel Carson hoped to affect the pesticide industry itself, she certainly shows every sign of aiming her information at the common reader, more typically a city dweller than a farmer.

And, unimaginably, I believe that most homeowners still think of the products in Home Depot as being safer than what they might find in a farmer's shed, or in the hands of a professional applicator. It is an oddity of our pesticide laws that those who apply chemicals professionally may, on average, use lower rates of safer chemicals than those who try to achieve similar results through products available to homeowners. For example, ChemLawn stopped using 2,4-D after release of scientific study results linking this pesticide to lymphoma (Jenkins p. 166), but 2,4-D is still the most common ingredient in lawn weed killers in the Wal-mart or Home Depot garden sections. Homeowners, in addition, are unlikely to read the warnings on the pesticide containers (Balmori p. 76).

Lawns have, in many segments of American society, become the purview of the men of the household. Due to my husband's grass allergies and my own innate joy in being outdoors, I do much of the mowing in our household. The

first time our next door neighbor observed me mowing, he asked where my husband was. I have spoken to many people about lawn care during the Pittsburgh Home and Garden Show, and a common conversation would involve a woman describing how she tries to convince her husband that a modified version of the all-grass lawn would be better. "He" wants the perfect, weed-free lawn. "He" doesn't like mowing around flower beds. "He" wants to impress the neighbors. In our local Garden Club newsletter, Michele Spence writes of her husband, "He likes to see the flowers and enjoy my tomatoes but also likes to see nice, soft, weed free grass lawn." He is later convinced of his wife's methods not by the lawn's beauty, but by the reduced water bill - objective, financial proof of her methods' superiority. I believe, with only anecdotal proof, that purchases of many alternative lawn care products, such as corn gluten, are a result of compromise between chemical and organic perspectives, without either party truly having faith in the compromise product. A future paper on lawn care values will be more focused on how lawn care practices reflect the power balance among men and women in marriage.

Aesthetic control of weeds requires higher rates of pesticides than does profit-maximizing control, as might be used on a farm. Farmers realize that spraying to kill every last weed is not profitable, because the cost of the chemicals would be higher than the potential loss of yield from the last few weeds. When aesthetics, rather than profit, are the primary concern, the control of every last dandelion becomes "reasonable". Homeowners, in fact, use up to 10 times more chemical pesticides per acre than do farmers. (Balmori, p. 74)

Golf course maintenance is the ultimate in aesthetic weed control, and the aesthetic of ¼" weed-free putting greens requires the use of multiple applications of fungicides, insecticides, and herbicides throughout the growing season. The monoculture lawn reflects narrowness in our vision of beauty. Rachel Carson suggested "Even if you are a city dweller, you can find some place, perhaps a

park or a golf course, where you can observe the mysterious migrations of the birds and the changing seasons.” (1965) Yet most golf courses have higher rates of pesticides applied than even the most agribusiness-oriented of farmers, and a child on foot in a golf course would be unwise to remove her shoes and feel the chemically-treated grass on her feet.

Chemistry has advanced greatly since *Silent Spring*, as have the regulations regarding pesticides. Newer herbicides in agriculture can be effective at rates under 10 grams per acre, and many of these have no known effects on humans. The word “known” is critical, however, since registration of pesticides requires safety testing which is often performed or contracted by the pesticide company itself. Pesticides in surface waters were, at that time, “unseen and invisible”, because “The chemist who guards water purity [had] no routine tests for these organic pollutants and no way to remove them.” (p. 41) Now, at least, they can be detected, but how many homeowners have the resources to test their homes? Undergraduate chemistry research by Cronin and Falconer (2006) has shown DDT and other outlawed pesticide residues to be regularly present in stuffed animals, with a high likelihood of being present in upholstered furniture and insulation. The advances in chemistry and regulations are slow to affect the exposures we face on a daily basis.

One of the most common lawn herbicides for home use is still 2,4-D, which has been linked to malignant lymphoma. The primary target of this herbicide is dandelions. Though adults tend to not view dandelions with much affection, children know how to make good use of them. Herbicides also kill clovers and other small-flowered weedy species which are often the only flowers children are consistently allowed to pick and study. Also, despite the fact that fertilized areas or areas sprayed with pesticides are considered “safe” generally within 48 hours after application, children’s contact with the ground is much more intimate than adults’. Healthy children roll in grass, put plants in their

mouths, and are drawn to play with the colorful beads of common fertilizers. The use of pesticides and fertilizers on school grounds can only be justified by adults' aesthetic taste, not by children's safety or enjoyment. Rachel Carson wrote in *The Sense of Wonder* (and those who work with children know) "Many children, perhaps because they themselves are small and closer to the ground than we, notice and delight in the small and inconspicuous." We would all wish that the small and inconspicuous things children find on the playground are white clover flowers, yellow birdsfoot trefoil, and toe-knockers (buckhorn plantain), not fertilizer beads and the twisted head of a dandelion dying of herbicide exposure.

As much as children love to pick bouquets, we might think far more would wish to become florists. However, "Mommy, I picked these flowers for you" is not a promising indicator of lasting good looks in a vase. In fact, the last time they look beautiful to the unloving eye is in your hand, right after the child bestows them. Garden flowers are selected for large size, unusual color, and often, long stems, and the ability to maintain shape when cut and put in a vase of water. Lawn weeds such as dandelion, Queen Anne's lace, hawkweed, fleabane, and white or pink clover - as anyone loved by a child knows - turn muddy brown seemingly in the short journey between yard and kitchen sink. "Some of nature's most exquisite handiwork is on a miniature scale, as anyone knows who has applied a magnifying glass to a snowflake." (Carson 1965) The feathery texture and tangy odor of common yarrow may be told only with an eye for detail from pineapple mayweed. Moss keeps green and soft the wettest lawn; "a lens-aided view into a patch of moss reveals a dense tropical jungle, in which insects as large as tigers prowl amid strangely formed, luxuriant trees." (Carson 1965)

Pure-grass lawns are for adults. They are for adults to drive by, walk over, mow, and for adults to reassure their neighbors that they are good property

owners. But adults don't often sit on their lawns, and they at best rarely do the sprawling, running, tripping face-first in the softness that children delight in. Lawns are perhaps even a child's dystopia:

Below them the town was laid out in harsh angular patterns. The houses in the outskirts were all exactly alike, small square boxes painted gray. Each had a small, rectangular plot of lawn in front, with a straight line of dull-looking flowers edging the path to the door. Meg had a feeling that if she could count the flowers there would be exactly the same number for each house. (L'Engle 1962)

The garden at our last church in Chicago was loved by the resident Waldorf preschoolers, far more than by the adults on the garden committee. These adults had serious meetings about stump removal and shrub control, but rarely did they do more than stand and admire a blooming bulb there. The children knew every species intimately and consequently loved some of the weedy flowers to death, but still the weeds grew back new flowers, as if in the children's honor. A tree downed by a storm served as a balance beam, climbing structure, and trampoline for months, until the garden committee finally had it removed. The church, like most lawns, was governed and populated mostly by adults, but the garden was an area that the children, I think, earned a right to ownership purely through love.

A weed is a "plant out of place" - but whose place? As a child, I visited my grandparents in the mountains near Asheville, N.C., and my grandmother loved flowers and plants. I remember making moss gardens with her, picking the wild endemic buckberries all around their house, the pink mountain laurel and garden phlox growing around her driveway. With equal clarity, I remember a moment, walking with her along the gravel road of their community, finding

giant foxtail in full glory, and picking and stroking the seedhead with wonder at this animal-fur finding a place in the plant world.

In my graduate program in weed science, one of my earliest field experiences was soil sampling in a field of soybeans, deep green and dewy, with luxurious pockets of deep purple and pink morningglories tangled amongst their leaves. The combine would later weep, if it could, trying to cut through those dreadlocks, but my morning was a wonder. I remember a few weeks later being shocked by a native maypop passionflower, looking tropically exotic in a diversely populated soybean field in Bardstown, Kentucky. My college botany class had never prepared me for the fact that I might find this striking flower growing wild and unwanted 60 miles from my birthplace.

Well-managed cropland is typically home to small populations of a large array of weed species. Cropland not treated to diverse crop rotation, cropland with excessive repetitions of the same herbicide, cropland with compacted or eroded soil: these fields are more likely to be filled with common ragweed or cocklebur or lambsquarters in monoculture populations as uniform as the cropping and chemical history itself. Reason would tell you that the weediest fields would be the most diverse, but the best-managed, nearly weed-free fields were sometimes the most diverse in their weed species.

Farmers in Mexico actually categorize their weeds, much as we might categorize the aesthetic value of lawn weeds. Their terminology makes room for “good weeds” and “bad weeds”, the good including edible pigweeds and lambsquarters, the bad weeds being non-edible and non-medicinal (Watanbe 1992). For us, similar categorization would be a good start toward recognizing the qualities our children see. White clover and birdsfoot trefoil fix nitrogen, which can be used by grasses. Dandelions provide edible greens and flowers which can entertain children and contribute to a charming homemade wine. Poison ivy berries provide food for birds, but may prove an unacceptable risk of

the notorious rash. Violets add deep green ground cover in shady areas and offer an edible flower. Scarlet pimpernel yields a striking small orange, red, and purple flower in a plant which survives compacted, nutrient-poor soils. Blackseed plantain might be on the “bad” list, but buckthorn plantain might not, due to its thumb-flicking temptations for schoolchildren. Even yellow woodsorrel, a rather pernicious garden weed, offers tasty leaves for children who might not try a single vegetable put on a plate.

When I began graduate school at the University of Kentucky in weed science, I knew little about U.S. agricultural systems. I had learned, in conservation biology and environmental readings, that tropical agricultural systems had enormous problems: soil compaction, pesticide overuse and pest resistance, habitat and forest destruction. Growing up in the Bible Belt had given me a strongly-felt ethic against self-righteousness. I thought it best to focus on agriculture in my home state, rather than trying to tell someone else how to solve their problems.

Most of us don't farm. We of course have a right to influence the way our food is grown, through our purchases especially, but the land we have direct control over, the land which best reflects our personal environmental ethic, is – for most of us – simply our lawn. An environmentally and aesthetically beautiful lawn is a lawn of flowers and vegetables, a lawn which is of unquestionable safety for children and pets, and a lawn with species diversity to withstand drought and pest challenges.

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Fact and Fiction, Fear and Wonder:
The Legacy of Rachel Carson

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ABSTRACT: This essay charts Rachel Carson's use of the words mystery, enchantment, wonder, and reality from her early writings on the sea up to and including her best-known work, *Silent Spring*. Carson's early association of reality with mystery, wonder, and enchantment undergoes a dramatic shift in *Silent Spring*, where mystery becomes primarily associated with danger, and where new forms of enchantment with science and technology are critiqued. Carson's use of mythological and fictional elements in conjunction with alarming facts in *Silent Spring* served to underscore a sense of danger and fear, perhaps more than Carson intended, given the strong association of *Silent Spring* with apocalypse and doomsday scenarios both secular and religious. I argue that this legacy of fear should not be allowed to eclipse the dominant and positive theme of wonder in her writing as a whole. I conclude that the environmental movement needs both fear and wonder; it still needs Rachel Carson.

"The real world around us" is a recurring phrase in the work of Rachel Carson. "Reality" in Carson's writing is often synonymous with certain terms such as mystery, enchantment, and wonder that one might not immediately associate with reality. Throughout much of her writing, Carson delineates what she means by reality from factual knowledge. Facts teach us little about the essence of life and ultimate cosmic realities, and can even obscure clear comprehension of our

world. A close association of reality with mystery pervades much of her writing as a whole. The exception is *Silent Spring*, where terms such as enchantment and mystery take on a sinister flavor. Elsewhere portrayed as an inferior form of knowing the world around us, factual knowledge is foregrounded in *Silent Spring* and presented as a corrective to these dangerous and destructive forms of enchantment.

Carson's association of reality with mystery was significantly shaped by her childhood exposure to the nature-study movement. When Carson writes, for example, that the natural scientist is never bored by her studies because "every mystery solved brings us to the threshold of a greater one" (Carson 1998: 159), she echoes the convictions of early twentieth century nature-study advocates such as Liberty Hyde Bailey who wrote that "for every fact that [scientists] discover they turn up a dozen mysteries" (Bailey 1911: 44). In the early twentieth century, proponents of nature-study were at pains to distinguish their curriculum and goals from mechanical memorization and fact-based teaching of biology or natural history. Like environmental education initiatives popular today, the nature-study movement aimed to counter the effects of urbanization and technology on young children. It was hoped that a scientific and sensory acquaintance with natural realities, gained in childhood, would help sustain one's sense of wonder and empathy with other lifeforms well into adulthood. Nature-study advocates such as Bailey understood that for the child, the real world and the enchanted world are one and the same; they sought to capture the child's imagination and feed his curiosity at a formative stage in his development.

Carson retained a sense of enchanted and mysterious reality well into adulthood and she implicitly or explicitly encourages an adult audience to cultivate, or perhaps recall, childlike engagement with nature. Carson often bristled at the suggestion that love of nature, or nature writing, was in any way

an escape from reality, regardless of one's age. A portion of her writing was specifically devoted to helping parents instill a sense of wonder and enchantment in children. *The Sense of Wonder* succinctly and eloquently articulates the nature-study agenda that strongly influenced Carson's own childhood years. Published posthumously in 1965, the book began as an essay that appeared in the *Woman's Home Companion* in 1956 titled "Help Your Child to Wonder" (Carson 1956). There Carson laments that most of us have lost the child's "instinct" for wonder, his sensory and emotional engagement with nature, long before we reach adulthood. In this essay and elsewhere, Carson also suggests that facts and reality are not necessarily the same thing.

An observation attributed to D.H. Lawrence captures well Carson's sense of wonder at nature and its relationship to facts: "Water is H₂O, hydrogen two parts, oxygen one, but there is also a third thing that makes it water and nobody knows what it is." That is to say, Carson believed that scientific explanation, crucial as it is, does not exhaust the meaning of the thing we study, that in explaining it, science does not explain it away. Focusing on facts can damage our perception of natural realities—the natural processes and the relationships that obtain between entities, living and nonliving, in the natural world. She advocated exposure to nature using all the senses, rather than laboratory studies that isolate an organism from its ecological context. As she wrote in the introduction to an Animal Welfare Institute booklet in 1960, "any concept of biology is not only sterile and profitless, it is distorted and untrue, if it puts its primary focus on unnatural conditions" (Carson 1998: 193). Like Bailey, Carson worried that a diet of facts introduced too soon and too forcefully in the child's life might stunt his sense of wonder and mystery and turn him away from nature study. Echoing Bailey's lament that we "stuff our children so full of facts that they cannot digest them" (Bailey 1911: 48), Carson argued that it is better to "pave the way for the child to want to know than to put him on a diet of facts he

is not ready to assimilate” (Carson 1965: 56). Drawing on a different metaphor, she writes: “If the facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow” (Carson 1965: 56). Once sparked, the child’s curiosity will lead him to want to know more details and facts, but a young student “should first become acquainted with the *true meaning* of his subject through observing the lives of creatures in their *true relation* to each other and to their environment” (Carson 1998: 193). Reality, then, is also what is most “true.” But what is most true cannot be known through facts alone.

Much of Carson’s writing – passages of her three sea books as well as *The Sense of Wonder* and myriad other speeches and essays – repeat this refrain about the fundamental, wholesome relationship between reality, mystery, and essential truths. In a 1954 speech she titled “The Real World Around Us,” Carson contrasted the reality of earth and sea with the artificial world of human creation. Her primary concern was not the artificialization of our world per se but the way in which separation from nature fosters an illusion that humans are at the center and in control of our world. For Carson, mystery and wonder were not merely terms denoting a temporary state of ignorance, something to be solved by progress in science. These were essential, enduring categories of the natural world. Science may edge us closer to certain mysteries, allowing us to appreciate them more fully, but it could only increase, never displace, wonder, reverence, or awe. Carson characterized her adherence to evolutionary theory in these terms, arguing that “it is a method so marvelously conceived that to study it in detail is to increase – and certainly never diminish – one’s reverence and awe both for the Creator and the process” (Brooks 1972: 9).

Adults who, as children, never received the nature education Carson recommends in “Help Your Child to Wonder” were by no means beyond redemption. In accepting the John Burroughs Medal for nature writing in 1952,

Carson chided other nature writers for their lack of faith in a public capable of sharing their sense of natural wonder—or a public in whom, at the very least, that sense could be cultivated with a little effort. “I am convinced that we have been far too ready to assume that these people are indifferent to the world we know to be full of wonder,” she ventured. Insofar as the public is indifferent to nature, she continued, “it is only because they have not been properly introduced to it—and perhaps this is in some measure our fault.” She concluded this speech with a reference to the inseparability of mystery and reality: “If we have ever regarded our interest in natural history as an escape from the realities of our modern world, let us now reverse this attitude. For the mysteries of living things, and the birth and death of continents and seas, are among the great realities” (Carson 1998: 95-96).

Mystery and Wonder in Carson’s Sea Writing

A proper introduction to nature meant capturing the imagination, conveying mystery and wonder, without distorting the truth. For Carson, a key feature of this approach was to expose the fundamental reality that humans are but a small part of the natural world and natural history. Carson’s sea books attempt to instill this sense of smallness in various ways. The first in Carson’s sea trilogy, *Under the Sea-Wind*, looks and reads rather like a child’s book, featuring animals as main characters and numerous line drawings of sea life. Carson attaches personal names—Silverbar, Rynchops—to the shorebirds and sea creatures whose day to day lives and frequent adventures comprise the book’s plot. For the most part, the narrative voice emanates from the perspective of the sea creatures themselves, with occasional use of omniscient narration. Carson’s rationale for this approach is explained in detail in a marketing questionnaire for *Under the Sea-Wind*: “The ocean is too big and vast and its forces are too mighty

to be much affected by human activity," she wrote. "So I decided that the author as a person or a human observer should never enter the story but that it should be told as a simple narrative of the lives of certain animals of the sea ... I wanted my readers to feel that they were, for a time, actually living the lives of sea creatures" (Carson 1998: 55).

Carson effectively evokes nonhuman subjectivity but avoids sentimentality. The book contains many scenes of predatory violence: she conveys the panic and confusion that spreads through prey communities as sea waters around them redden with the victims' blood. There are cool reports of mass die-offs in the ocean, and many narrow escapes for Carson's marine characters. But the violence, as Carson portrays it, is not wasteful or senseless. The suffering of some lightens the burden of survival for others. In a process she terms "reincarnation," prey organisms are absorbed by their predators, in whose bodies they continue to "roam the sea, preying on their own kind" (Carson 1941: 120). Carson offers a rather graphic depiction of an Arctic blizzard descending on a nest of owl eggs, while suggesting how the misfortunes of some may benefit others in the natural world.

As the snow fell on the still-warm eggs and the hard, bitter cold of the night gripped them, the life fires of the tiny embryos burned low. The crimson streams ran slower in the vessels that carried the racing blood from the food yolks to the embryos. After a time there slackened and finally ceased the furious activity of cells that grew and divided, grew again and divided to make owl bone and muscle and sinew. The pulsating red sacs under the great oversized heads hesitated, beat spasmodically, and were stilled. The six little owls-to-be were dead in the snow, and by their death, perhaps, hundreds of unborn lemmings and ptarmigans and Arctic hares

had the greater chance of escaping death from the feathered ones that strike from the sky (Carson 1941: 52).

Carson's efforts to present the sea world at least partly from the standpoint of its inhabitants recalls a distinction in nature study literature between "intrinsic" and "extrinsic" forms of knowledge, as Bailey termed them (Bailey 1911: 130). The student was urged to imagine the world from the standpoint of the organism—the intrinsic perspective—in order to attain greater knowledge and sympathy, but also in order to reinforce the message that the natural world does not revolve around humans and their concerns. Extrinsic knowledge was largely discouraged, as it was motivated by a desire to locate the function or usefulness of things in nature relative to humans. "The long-continued habit of looking at the natural world with the eyes of self-interest—to determine whether plants and animals are 'beneficial' or 'injurious' to man," Bailey argues, "has developed a selfish attitude toward nature, and one that is untrue or unreal" (Bailey 1911: 114). Carson often adopts the intrinsic perspective, as when she describes owls as their prey know and fear them—the *feathered ones that strike from the sky*. The subtle reminder that these owls would have grown up to be killers of other creatures prevents the reader from sympathizing exclusively, or in too mawkish a fashion, with the doomed little owls.

Carson's next book, *The Sea Around Us*, abandons this narrative style but places similar stress on the insignificance of humans and human perspectives, compared to the vast and ancient oceans, while emphasizing our connection, evolutionarily, symbolically, and subconsciously, with ocean waters. We are children of the "mother sea," Carson writes, and man "has returned to his mother sea, only on her own terms" (Carson 1951: 15). Water, she reminds us,

was once the medium of every human life. Alluding to a recapitulationist¹ version of evolution, she explains that, “as life itself began in the sea, so each of us begins his individual life in a miniature ocean within his mother’s womb, and in the stages of his embryonic development repeats the steps by which his race evolved, from gill-breathing inhabitants of a water world to creatures able to live on land” (Carson 1951: 14). Our longing for the sea is thus a primal longing to return to an early stage in our development, both as individuals and as a species. In the closing paragraphs of *The Sea Around Us*—where the word mystery appears three times in three short paragraphs—Carson reiterates her central tenet of faith: “Even with all our modern instruments for probing and sampling the deep ocean,” she writes, “no one can now say that we shall ever resolve the last, the ultimate mysteries of the sea” (Carson 1951: 212).

The final book in Carson’s sea trilogy, *The Edge of the Sea*, is a study of shorelife. Superficially it resembles *Under the Sea-Wind* with drawings of shore creatures so dynamic and lifelike they seem to scuttle and dart around the page. But the book’s style is quite different, with something of a field guide flavor and frequent first person accounts of Carson’s own explorations and adventures. Here we find familiar themes of the enchantment and mystery that are bound up with nature’s true reality. Understanding requires “intuitive comprehension” that comes with “sens[ing] with the eye and ear of the mind” (Carson 1955: xiii).¹ Again, Carson evokes childhood and childlike associations—fairy creatures and children’s stories. Her description of a rockweed cluster recalls one of her favorite authors: “It is a fantastic jungle, mad in a Lewis Carroll sort of way. For what proper jungle, twice every twenty-four hours, begins to sag lower and lower and finally lies prostrate for several hours, only to rise again?” (Carson

¹ “Ontogeny recapitulates phylogeny,” in the phrase of evolutionists. That is, the individual’s development recaps the evolutionary stages of the species or lineage as a whole.

1955: 73). Carson stresses the ephemeral and mutable quality of life at the sea's edge, in contrast to the stability and constancy of the open seas. In the ever-changing boundary of land and sea, we are confronted with a "continuing creation" and a "relentless drive of life" unmatched in other regions, marine or terrestrial (Carson 1955: 2). Carson journeys into a "magical zone" of low water at spring tide where she uncovers a "fairy cave" full of creatures who seem too fragile and ethereal to live. "In this enchanted place on the threshold of the sea," she writes, "the realities that possessed my mind were far from those of the land world I had left an hour before" (Carson 1955: 5). She recounts a particular night time excursion into this magical place where, flashlight in hand, her discovery of a single ghost crab has the force of a revelation: "I have seen hundreds of ghost crabs in other settings," she writes, "but suddenly I was filled with the odd sensation that for the first time I knew the creature in its own world—that I understood, as never before, the essence of its being" (Carson 1955: 5).

Nowhere in Carson's writing is the association of mystery and magic with the unveiling of elemental and essential realities more pronounced than in *The Edge of the Sea*. Here too we encounter the theme that mystery continually outstrips scientific knowledge. Carson writes of a certain "elusiveness of meaning" that "haunts us, that sends us back again and again into the natural world where the key to the riddle is hidden ... and where the spectacle of living creatures faced by the cosmic realities of their world is crystal clear" (Carson 1955: 7). These realities touch something ancient and primal in us, she suggests. In the spirit of nature-study, *The Edge of the Sea* discourages preoccupation with mere facts and names. The book's preface makes this point clearly: "To understand the shore it is not enough to catalogue its life ... to pick up an empty shell and say, 'This is a murex,' or 'That is an angel wing,'" she insists. Carson does provide an appendix for those who, as she puts it—with perhaps the slightest note of derision—"like to pigeonhole their findings neatly in the

classification schemes the human mind has devised” (Carson 1955: xiv). These classifications may tell us more about the human mind than about the realities of nature as Carson understands them. To apprehend and appreciate science is not necessarily to apprehend and appreciate nature.

With *Silent Spring*, I believe, Carson was forced to rethink this portrayal of mystery, enchantment, and reality—and to reconsider the role of factual knowledge. *Silent Spring* is considered by many to be a (perhaps *the*) book that catalyzed the modern environmental movement, a shocking exposé of the indiscriminate use of pesticides and their ecological and human health consequences. With her decision to write this book came a dawning recognition that efforts to draw the public into a world of natural enchantment and wonder were not sufficient to motivate an immediate response to the pesticide problem. At the same time, Carson’s own beliefs about the possibility that humans were capable of altering the course of nature were undergoing dramatic change. By the late 1950s, Carson was no longer convinced that humans were so small and insignificant compared to the vast, eternal forces of nature that they could not inflict irreparable damage. Humans were dominating not only earth but space as well. “It was pleasant to believe,” she wrote to a close friend, “that much of Nature was forever beyond the tampering reach of man ... Of course, in pre-Sputnik days, it was easy to dismiss so much as science-fiction fantasies. Now the most farfetched schemes seem entirely possible of achievement. And man seems actually likely to take into his hands—ill-prepared as he is psychologically—many of the functions of ‘God’” (Carson 1995: 249). To be sure, she maintained throughout her writing that humility and wonder were wholesome and necessary—and could be learned through acquaintance with natural realities. But the urgency of her task in *Silent Spring* forced her to give a prominent place to facts—many of them quite alarming—and to expose what she saw as questionable forms of enchantment.

Silent Spring: From Enchanted Forest to Poisonous Forest

The least fable-like of all Carson's works, *Silent Spring* nevertheless begins like a child's fairy tale, with its once-upon-a-time opening. "There was once a town in the heart of America," Carson writes in her opening "Fable for Tomorrow," "where all life seemed to live in harmony with its surroundings." But it quickly becomes apparent that this fable is not meant to enchant the reader but to jolt him out of his enchantment. It is a cautionary tale depicting an "imagined tragedy" on the verge of becoming a "stark reality" – a town in which "some evil spell," some mysterious malady, "had settled on the community," silencing and stilling its life (Carson 1962: 2). The evil-doers, it turns out, are not witches, supernatural agents, or even human enemies. The truth is simpler and more terrifying: "The people had done it themselves" (Carson 1962: 3). They had poisoned their own town and now "only silence lay over the fields and woods and marsh" (Carson 1962: 2). *Silent Spring*, Carson explains, is an attempt to make sense of this baffling tale.

Fables often involve animal characters and present general, edifying truths rather than factual accounts. In fact Carson's first sea book, *Under the Sea-Wind*, bears some similarities to a fable. Presumably, the reader of a fable (particularly an adult reader) encounters the text with the understanding that it is not based in fact. Yet Carson concludes the Fable for Tomorrow with an abrupt shift to reality: she provides what seems an unnecessary disclaimer – given her clear identification of the story as a fable – that this is an *imagined* tale, that no single town has suffered all of the misfortunes she describes. The fabled town is a composite sketch of actual disasters occurring in communities all over America, she explains, and so it is not quite factual but neither is it a fabrication. It is the sort of "science-fiction fantasy" that Carson now fears is entirely possible.

In the more than forty-five years since its publication, *Silent Spring* has been praised repeatedly for its literary flair, its moving and effective blend of science and poetry, fact and emotion. Yet the blunt and sometimes strident rhetoric of *Silent Spring* actually presents a stark contrast with nearly all of Carson's previous writing, particularly the enchanting prose of her sea books. Carson all but abandons her previous efforts to appeal to childlike wonder and mystery or primal longing. Instead, *Silent Spring* urges greater maturity and accountability: we need to grow up, to evolve. We must *break* the spell, awaken from our slumber, and shed our primitive tendencies. She castigates the atavistic, caveman-like mindset that unleashed an indiscriminate chemical barrage on the natural world. She indulges in a bit of sarcasm, as when she mocks the attitude of the weed control expert bent on a mission of eradication: "We would seem deplorably weak that we can tolerate the sight of such 'weeds,' that we do not rejoice in their eradication, that we are not filled with exultation that man has once more triumphed over miscreant nature" (Carson 1962: 72). This is Carson angry.

Silent Spring exposes a kind of infantilized state or drugged stupor into which the public has fallen: "the publicis fed little tranquilizing pills of half truth," she writes. "We urgently need an end to ... the sugar coating of unpalatable facts" (Carson 1962: 13). She chastises citizens who put inordinate, childlike trust in authority, whether the authority of the chemical engineer or the government that condones mass spraying campaigns. This rhetoric is echoed in Carson's foreword to Ruth Harrison's book on factory farms, *Animal Machines*, published two years after *Silent Spring*. There she portrays a general public that "rests secure in a childlike faith that 'someone' is looking after things" (Carson 1998: 194). A diet of facts is now deemed salutary, for facts are the antidote for the tranquilized and "mesmerized state" into which we have fallen (Carson 1962: 12).

Some of the non-negotiable facts with which Carson reacquaints us are the basic features of natural selection, such as the dynamic but enduring balance that obtains between predator and prey; she summarizes the simple concept of pesticide resistance wherein the strongest of the species grow stronger and more numerous, by means of our attempts to eradicate their kind. Carson lays bare the workings of the food chain and the bioaccumulation and biomagnification of toxins in human and nonhuman bodies. These facts, she suggests, are clear and straightforward. And yet Carson does not always present these facts in an utterly straightforward fashion, as we shall see. This is not to say that she distorts the facts. Rather, she occasionally cloaks them in myths and fairy tales, much as she does in her opening fable. By employing these literary devices, Carson keeps the reader's interest and makes these facts more memorable. But these devices also have the effect of heightening and intensifying the sense of danger and fear.

Mystery, enchantment, and the unknown now carry sinister connotations and consistently signal danger far more than wonder. The chemical realm is portrayed as the realm of dark magic, where the threats to life remain largely invisible to us. Chemicals in our environment "pass mysteriously by underground streams" and emerge, through "an alchemy of air and sunlight" (Carson 1962: 6), in new and more dangerous forms. Carson uses similar language to describe the chemical aldrin, a "somewhat mysterious substance" that acts as "alter ego" to dieldren, to which it is linked by "alchemistic transformations" (1962: 26). In the "unseen world in our bodies, the same chemicals bring disease and death in ways we do not understand and cannot control" (Carson 1962: 189). The products of these new forms of sorcery—chemical pesticides—are "elixirs" not of life but of death. References to children's stories, fairy tales, and myths are sparse in *Silent Spring*, but they nearly always foretell doom or expose disastrous folly. Describing the scientific discovery that "the toxicity of an organic phosphate can be increased by a second agent that is

not necessarily an insecticide,” Carson turns suddenly to the story of the sorceress Medea from Greek mythology. In a jealous rage, Medea creates a robe with magical properties that brings violent death to its wearers, including her own children. “This death-by-indirection,” Carson warns, “now finds its counterpart in what are known as ‘systemic insecticides.’ These are chemicals with extraordinary properties which are used to convert plants or animals into a sort of Medea’s robe by making them actually poisonous” (Carson 1962: 32). This “weird world” of insecticides, as she terms it, “surpass[es] the imaginings of the brothers Grimm ... it is a world where the enchanted forest of the fairy tales has become the poisonous forest in which an insect that chews a leaf or sucks the sap of a plant is doomed” (Carson 1962: 33). Carson draws on a child’s nursery rhyme to describe the step-by-step process by which poisons move up and accumulate in the food chain, consumed by successive organisms: “It was a house-that-Jack-built sequence,” she writes, “in which the large carnivores had eaten the smaller carnivores, that had eaten the herbivores, that had eaten the plankton, that had absorbed the poison from the water” (Carson 1962: 48).

In *Silent Spring*, allusions to nature’s mysteries serve to underscore a kind of dangerous unpredictability rather than the power of nature to allure and enthrall. What makes these forms of enchantment unwholesome is that they are, at root, enchantment with *ourselves*, with human powers. The mysteries that now confront us are mysteries of our own making, not the eternal mysteries—and verities—of nature. Quoting Albert Schweitzer, Carson laments that we can hardly recognize the “devils” of our own creation. To suggest that pesticides are diabolical might seem excessive, but the positive press these chemicals were receiving at the time of *Silent Spring* was equally hyperbolic. In advertising campaigns and newsreels, pesticides were lauded as nothing short of magical and miraculous—DDT was a “wonder chemical” that “made the dream of a pest-free world realistic” (Russell 2001: 170). In Carson’s mind, these chemicals and

the claims made on their behalf were symbolic of human arrogance and hubris.² Excessive faith in scientific and government authority is a kind of idolatry, Carson suggests, as though the human instinct for wonder and reverence misfires, misapprehends its proper object. In writing *Silent Spring*, Carson had come to realize that it would no longer do to simply show her readers of the wonders and enchantments of the natural world, the ancient history of which humans were but a tiny part. Humans now threatened to take center stage and had set themselves on a path of destruction.

Silent Spring and the Apocalyptic Imagination

Both in scholarly discourse and in the public imagination, *Silent Spring* has often been characterized as an apocalyptic text. It is construed in other vaguely “religious” ways as well, despite the fact that *Silent Spring*, of all Carson’s works, *least* fits the mold of nature religion or nature spirituality and makes least reference to ultimate and essential mysteries of life. Numerous examples, some of them quite recent and some nearly a half century old, serve to illustrate these apocalyptic associations. The front cover of Frederick Buell’s *From Apocalypse to Way of Life: Environmental Crisis in the American Century* bears a photograph of a DDT spray truck. The text takes *Silent Spring* as its point of departure. “In 1962, Rachel Carson warned of ecological disaster in progress ... rais[ing] the specter of imminent human-made environmental crisis ...” (Buell 2003: xi). Carson’s “small-town-American ‘silent spring,’” Buell writes, has now morphed into an ominously global environmental crisis, and a veritable “tsunami of catastrophe rhetoric” has followed in her book’s wake (Buell 2003: xiii). The association of Carson with environmental doomsday rhetoric is often made without regard to

² For a discussion of the iconography of DDT, see Maguire (2008).

the specific content of the predictions. For example, prominent reviews of Alan Weisman's recent nonfiction eco-thriller titled *The World Without Us*—a scientifically informed thought experiment that envisions a future world where humans are extinct and insect and animal species take over the planet—begin with references to *Silent Spring*, though Carson's concern was arguably the opposite, that is, that humans would take over and leave no animals or insects.³

Infrequent as these elements are in *Silent Spring*, Carson's use of fables and myths has captured readers' imagination and shaped the legacy of *Silent Spring*, for better and for worse. References to the book in the popular media have always invoked not only apocalyptic motifs, but also children's tales, and dark, supernatural or mythological forces. In a cartoon that appeared in the *Washington Post* a year after *Silent Spring's* publication, a witch dressed in robes and a pointed hat gleefully presents a young maiden with an enormous, shiny apple; strapped onto the witch's back is a tank with skull and crossbones, labeled "uncontrolled pesticides." A disturbing cartoon appearing in *Punch* in 1964 depicts a skull-faced grim reaper figure scattering poisons on the ground from a satchel labeled "untested pesticides." In his wake numerous birds and animals lie dead or dying on a thoroughly blackened and desolate landscape. A somewhat more humorously morbid *Punch* cartoon shows two men gazing down at a dead dog. Echoing Carson's description of bioaccumulation couched within a nursery rhyme, one explains to the other, "This is the dog that bit the cat that killed the rat that ate the malt that came from the grain that Jack sprayed."⁴

The powerful industry that *Silent Spring* directly attacked—the chemical industry—was particularly eager to use the book's fictional elements in order to undermine its credibility. Perhaps the best known example of an apocalyptic rejoinder to *Silent Spring* is a publication distributed by the Monsanto

³ See, for example, Schuessler (2007).

⁴ These cartoons and many others are reproduced in Brooks (1972).

Corporation in 1962 titled “The Desolate Year.” Following the book’s publication, Monsanto sent some five thousand sets of galley sheets of “The Desolate Year” to newspaper editors and book reviewers (Graham 1970: 73). It is a direct parody of Carson’s opening fable in which the townspeople gradually awaken to the bewildering absence of birds and other familiar creatures. “There was a strange stillness,” Carson writes. “The birds, for example—where had they gone?” (Carson 1962: 2). In a reversal of this scenario, “The Desolate Year” depicts the devastation that would ensue in a single year *without* the use of pesticides:

Quietly, then, the desolate year began. Not many people seemed aware of the danger. After all, in the winter, hardly a housefly was about. What could a few bugs do, here and there? How could the good life depend upon something so seemingly trivial as bug spray? Where were the bugs anyway? The bugs were everywhere. Unseen. Unheard. Unbelievably universal. Beneath the ground, beneath the waters, on and in limbs and twigs and stalks, under rocks, inside trees and animals and other insects—and, yes, inside man (Monsanto 1962: 4).

Another chemical industry trade publication predicted similar scenarios in the wake of *Silent Spring*, though with decidedly less literary flair. It claimed that without pesticides, “plagues would destroy vast tracts of productive country, laying waste and famine in their path. Other insect parasites, the malaria-carrying mosquito or the rat flea, can spark off disease across whole continents” (Wildblood-Crawford 2006: 67).

Apocalyptic interpretations of and counter-narratives to Carson’s work may have evolved over time but they have never abated. In the past year, against the backdrop of nationwide centennial celebrations of Carson’s 1907 birth, the

vitriolic and hyperbolic rhetoric in newspaper editorials and internet weblogs reached a fevered pitch, resembling in tone and content the attacks on Carson and *Silent Spring* in the early 1960s. Much of this new wave of criticism holds Carson personally responsible for millions of human deaths from malaria in the developing world, owing to the discontinuation of DDT as a pesticide. Like the Monsanto parody, these critiques evoke visions of apocalypse, secular and religious, and turn these visions against Carson, *Silent Spring*, and the dangerous eco-colonialism and chemophobia that her work allegedly spawned. One such piece by Lisa Makeson decries what she calls “Rachel Carson’s Ecological Genocide” and portrays Carson as the primary figure behind a “pandemic” that is “slaughtering millions, mostly children and pregnant women.” This essay was picked up by numerous Web sites, one of which uses the essay to support the claim that Carson belongs in the company of “Hitler, Stalin, and Pol Pot.”⁵

Rather than generate their own apocalyptic scenarios in response to *Silent Spring*, some of Carson’s critics instead cast the book, and environmentalism as a whole, as a religious (or quasi-religious or pseudo-religious) movement. This dismissal of the book as religious – where *religious* typically means *not scientific* – is also a familiar old refrain but one that seems to have found a new generation of supporters. Early critics of Carson portrayed her as pantheistic or a mystical priestess devoted to the “cult of the balance of nature” (Graham 1970: 66). A growing body of Carson critics (and DDT defenders) is also presently engaged in denying the evidence of global warming – merely another cherished apocalypse of crypto-religious environmentalists, according to those who dispute the evidence. E. Bruce Harrison, a public relations expert who helped coordinate pesticide industry attacks on Carson in the 1960s and 1970s has recently helped

⁵ Lisa Makeson, July 31, 2003. For both the original essay and the additional genocidal spin, see <http://www.freerepublic.com/focus/f-news/955667/posts>

create the Global Climate Coalition, a supposedly nonprofit organization with links to such companies as Chevron, Exxon, General Motors, and the American Petroleum Institute. A widely circulated speech by climate change denier and novelist Michael Crichton posits climate change as a form of apocalyptic religion. He traces the trend of mixing religious narratives with environmental alarmism back to the campaign against DDT. “The greatest challenge facing mankind” is not climate change but “the challenge of distinguishing reality from fantasy, truth from propaganda” (Crichton 2003: n.p.).⁶ Some critics name Carson as the environmental movement’s most notoriously misguided prophet. “The apocalyptic is the major fulcrum of environmentalism,” writes J. R. Dunn. *Silent Spring* “represents the first environmentalist scripture—nothing other than a modern book of Revelations [sic].” (Pollution itself, the author notes with great erudition, “bears many religious connotations.”) Carson’s work “set the pattern for all the environmental apocalypses to come” (Dunn 2007: n.p.)

A similar example illustrates the tactic of depicting Carson’s work as muddle-headed religion rather than science; it also expresses skepticism that a book of genuine scientific merit could, or should, ever be used in ways that extend beyond its scientific content. An essay by Eli Lehrer titled “The Murderous Church of Rachel Carson” caught my attention not only because of its association of Carson with religious violence but also because of its cynical disparagement of a small and (I had assumed) relatively obscure writers’ conference in honor of Carson that I regularly attend. After mocking the conference call for papers, which includes such themes as “the timelessness and constancy of all things within the web of creation” and “cultivating a sense of wonder among children and adults as an emotional response to the living world,” the article concludes: “it is difficult to see much merit in the academic

⁶ Crichton interprets essentially all environmentalism as a fall from Eden narrative.

quasi-religion that has sprung up around [Carson]" (Lehrer 2007: n.p.). Lehrer conducted his own research in order to learn how *Silent Spring* is being assigned at "Ivy League" institutions. He considers it significant that the book is not being read in "hard science" classes but rather in soft subject courses dealing with politics, environmentalism, and even feminism, thus confirming his suspicion that Carson is a favorite among purveyors of political correctness "with few real scientific credentials" (Lehrer 2007: n.p.). Carson, who believed that science and nature writers had failed the public, and not vice versa, would have been surprised and discouraged by the view, not uncommon among her critics, that if a book contains scientific facts and makes scientific claims, it must not contain (or be read as containing) any other sorts of insights into the human condition. To say the least, these criticisms reflect an impoverished view of the relationship of science to other forms of knowledge and modes of expression.

In the midst of attacks such as these, a cover story by Michael Finkel on malaria appeared in *National Geographic*, a portion of which relies upon religious language and imagery in discussing Carson and DDT. Judging from the number of links to this article on internet websites seeking to discredit Carson, it also left many readers with the impression that this highly respected magazine was officially denouncing her findings, though apparently this was not the intention of the author. Attempting to convey a sense of malaria as a "confounding disease," one that appears to overturn accepted notions of good and evil, and undermine our basic environmental and humanitarian values, Finkel states: "Curing almost all malaria cases can be worse than curing none. Destroying fragile wetlands, in the world of malaria, is a noble act. Rachel Carson, the environmental icon, is a villain; her three-letter devil, DDT, is a savior" (Finkel 2007: n.p.).

One of the most troubling critiques of Carson and *Silent Spring* is a recent *New York Times* editorial by science writer John Tierney that assesses the impact

of *Silent Spring* at the centennial of Carson's birth (Tierney 2007). Tierney draws on associations of Carson's work with apocalypse, and religious hopes and fears, as a way of discrediting her research—a rather worn tactic, as we have seen. He also hones in on Carson's use of fictional elements and uses them to cast doubt on her credentials, as have many of her past critics.⁷ Tierney refers to *Silent Spring* as “Ms. Carson's apocalypse in Eden.” Carson's false move, her most “fundamental mistake” in *Silent Spring* is evident in her opening “Fable for Tomorrow,” he contends. This made-up story “set the tone” for what Tierney characterizes as the book's “hodgepodge of science and junk science.” The book depicted pesticides as evil and nature as good, he claims, and her fable similarly reveals Carson's misguided belief in nature as “a Disneyfied version of Eden” that was corrupted only by the introduction of the serpent DDT (Tierney 2007).⁸

⁷ For example, a very early and notoriously condescending dismissal of *Silent Spring* noted that “‘Silent Spring’ starts with a bit of dramatic description which the author then acknowledges does not actually exist” (Darby 1962: 60). For an interesting discussion of early reviews of *Silent Spring*, and the way in which those reviews highlighted Carson's gender, see Smith (2001).

⁸ The literature on Rachel Carson, DDT, and malaria is vast, daunting and much of it heavily biased. Carson understood that the use of DDT in agriculture and the use of DDT in the case of insect control for disease vectors (as with malaria) presented different problems. Regarding malaria and DDT, she endorses the advice given by a Dutch government official who claimed that one should “spray as little as you possibly can” instead of spraying “to the limit of your capacity” (Carson 1962: 275). In a nutshell—if such is possible—links between DDT and cancer in humans have not been documented definitively, though the same can be said of many suspected carcinogens (it is classified as a “possible carcinogen” for humans). However, DDT does appear to disrupt human endocrine function. Moreover, insect resistance to DDT, a problem Carson discusses at length, remains a concern, even in regions where DDT has not been sprayed for many years. There are some findings that indicate that DDT may decompose more quickly than was previously thought in tropical climates where, of course, mosquito-borne diseases are most problematic. For this reason, and because DDT is extremely cheap, its image has improved in recent years. Regarding wildlife, the effects on ecosystems that Carson warned of have been confirmed by animal and epidemiological studies and those effects include reproductive disorders. The U.S. ban on DDT in 1972 includes provisions for its use in times of public health or economic emergencies. The manufacture of DDT was not prohibited in the ban nor did international law prohibit

Carson's green "disciples," he concludes, carry on this manichean tradition and "still divide the world into good and bad chemicals."

Leaving aside for the moment Tierney's claims about Carson's apocalyptic vision, it is worth pointing out that no one who has read *Silent Spring* through to the end, as opposed to dwelling on the brief opening fable, could come away with the honest impression that Carson viewed nature as unambiguously good or benign. Carson never called for an end to all chemical control of our environment; moreover, *Silent Spring* is the work of a thorough-going Darwinist who saw that nature's constant war between the "strong" and the "weak" made our interference with chemical pesticides particularly risky: "Darwin himself could scarcely have found a better example of the operation of natural selection than is provided by the way the mechanism of resistance operates ... it is the 'tough' insects that survive chemical attack ... After a few generations, instead of a mixed population of strong and weak insects, there results a population consisting entirely of tough, resistant strains" (Carson 1962: 273). It was, in fact,

countries other than the U.S. from using it. When the patent on DDT expired, moreover, the powerful companies that once defended the chemical no longer had a vested interest in doing so; indeed, their interests were furthered by promoting the use of other chemicals and even by discrediting DDT. These are just a few of the facts that play a role in the complicated story of why use of DDT declined in developing countries, and many of them have little or nothing to do with Carson's work.

It is worth keeping in mind that at the time Carson was writing, DDT was viewed as miracle chemical whose uses were virtually limitless. It was turned against common nuisances such as the housefly, suburban yards were sprayed aerially, children at camp were dusted with it and their sleeping bags, camping equipment, and sometimes even food was directly sprayed with the chemical. At one point, it was believed that DDT might prevent polio. DDT was a national hero. A good overview of the effects of DDT and other chlorinated hydrocarbons on human and wildlife populations, with references to past and present research, is available on the U.S. Fish and Wildlife Service's website (<http://www.fws.gov/contaminants/Info/DDT.cfm>). The site includes a discussion of common myths about Rachel Carson and the DDT ban. See also Karaim (2005). A recent biography of Carson by Mark Hamilton Lytle (2007) contains an epilogue with a good discussion of the Carson-DDT controversy and its history.

Carson's appreciation of the "sometimes terrible intensity" of natural processes like predation—the "relentlessly pressing force by which nature controls her own"—that led her to advocate the use of "biological" controls of insects or what we would today call integrated pest control. She advocated these kinds of controls alongside (and not in place of) more moderate chemical controls. Why not turn nature's warfare to human advantage? The challenge that confronts us, she argues, is how to derive "weapons from the insect's own life processes" rather than resorting always to chemicals (Carson 1962: 285). It is simply false to claim, as Tierney does, that Carson's nature was a benign Disney caricature, whether he has in mind the human-nature relationship or the relationships within the natural world itself.

But more to the point I wish to pursue here: what exactly does Tierney mean when he claims that Carson's decision to open the book with a fable was a *fundamental mistake*? Is he charging that the portrait of life she paints in the fable is factually mistaken? Is he perhaps unaware that the truth of fables lies elsewhere than in factual content? Could anyone believe that Carson meant her fable to be taken as reality by her readers? The answers to these questions turn out to be fairly complicated. Perhaps Carson's creative decision to open *Silent Spring* with an imaginary tale really was a mistake, though not quite for the reasons that Tierney seems to suggest—i.e., not because it exposes the false reality to which Carson subscribed, the faulty foundation upon which the rest of the book was constructed. Rather, Carson's use of this fable, like her occasional use of fairy tale imagery and similar literary devices, opened the door to a certain kind of attack on her work and credentials, particularly by scientifically-minded readers who were confounded by a text that blended fable with fact. Carson's arrangement of particular elements in the fable, her choice of words there and elsewhere in *Silent Spring*, also created a profound sense of fear among some readers—perhaps far more fear than she intended. Carson, who had an abiding

faith in her audience, may also have simply overestimated the ability of some readers assimilate the mix of genres that characterizes *Silent Spring*. Her use of the fable, in other words, may have been a tactical error.

Fiction, Fact, and Fear

In this moment, fact and truth become separated and commence to wander like twins in a fairy tale, waiting to be reunited by that special someone who possesses the secret of telling them apart.

– Ann-Marie MacDonald, *Fall on Your Knees*

Carson seems to have been aware of the potential dangers of opening the book in this way, given her somewhat awkward disclaimer regarding the veracity of the tale. Yet despite her disclaimer—or perhaps because if it—some readers were confused and upset by her fable; they saw it as something dishonest, a “scary hoax” (Lear 1997: 431). Others interpreted Carson’s use of the fable and similar stylistic elements, as well as her established reputation as a popular writer, as signaling a lack of credibility, evidence that she was first and foremost a storyteller (Smith 2001). It is as though by beginning the book with a fable, she was effectively announcing at the outset: “What follows is based on an untrue story.” Carson chose to open the book in this way in order to make it more appealing to non-specialists who might be intimidated, or simply bored by a book about chlorinated hydrocarbons. While Carson may have successfully enticed many general readers, she alienated some scientists. *Audubon Magazine* staff biologist Roland Clement recalls that many scientists were “turned off” by the opening fable. As “literal-minded readers, with no background in literature,” Clement explains, these scientists did not understand that “an allegory is not a prediction” (Graham 1970: 72). Carson’s biographer makes a similar observation

that scientists “did not understand what Carson was trying to do or what the allegory was about. They were too literal and unimaginative to understand it” (Lear 1997: 573 n.7). Even scientists who more or less accepted the facts as Carson presented them were “intellectually capsized by the book’s opening chapter” (Graham 1970: 72). And yet, by and large, scientists are not an unimaginative or incurious lot. Scientific theorizing and modeling is a creative enterprise that frequently involves thinking metaphorically and analogically, and many scientists are themselves readers and even writers of science fiction and fantasy. Why should they have been capsized?

The “literalist” response to *Silent Spring* highlighted by Clement’s remarks points to a problem frequently encountered by writers of science fiction. The problem stems from “a tendency of readers to regard science fiction narratives as a predictive form of prophesy ... the writer is supposed to take a trend or phenomenon of the here-and-now, purify and intensify it for dramatic effect, and extend it” – much like a prediction – “into the future” (Killingsworth and Palmer 2000: 180). Carson struggled to strike the right tone, to get readers to take the fable seriously but not literally (nor as mere fiction). In very early drafts of the fable, the story was narrated by a young man returning home after a long absence; the town itself was given a name, “Green Meadows.”⁹ Carson radically altered this novelized version, eventually making herself the ostensible narrator, removing the town’s name, and presenting it as one that might exist anywhere, a place that potentially stands in for all places. One of Carson’s later revisions to the fable included the insertion of a space between the fable itself and the disclaimer that follows, in which Carson explains that while the town is not real, the threat is. “With this move, Carson comes full circle, separating fiction and fact once again. The myth is spatially liberated to stand on its own” (Oravec 2000:

⁹ Carson’s drafts of the fable are archived in the Rachel Carson Papers of the Beinecke Rare Book and Manuscript Library at Yale University.

52). One very late revision suggests that Carson lingered anxiously over the word *imaginary* in the disclaimer portion. She removed “imaginary” from a sentence describing the town and its tragedies; later she inserted “imagined” where *imaginary* had been, hoping perhaps to mitigate the impression of her tale as (merely) make-believe. The final version reads: “This imagined tragedy may easily become a stark reality we all may know” (Carson 1962: 3). Carson introduces these small changes, Oravec notes, “as if wishing to retain the idea that the *imaginary* is not necessarily unreal ... One gets the impression that she would still like to use the word *imaginary*” but wants to avoid any misreading (Oravec 2000: 54).

In the late 1950s and early 1960s, public anxieties about nuclear fallout and nuclear wastes were running high and Carson drew parallels, sometimes explicitly and sometimes subtly, between pesticides and radioactive materials (Lutts 2000). One such parallel occurs in the fable. There she describes a mysterious white powder—presumably pesticide residue, though she doesn’t actually identify it—that weeks before “had fallen like snow upon the roofs and lawns, the fields and streams.” An early draft of the fable stated outright that the powder reminded townspeople of fallout from bomb tests (Lutts 2000: 35). Carson removed the direct references to nuclear fallout in the final version of the fable but let the sinister white powder remain. Even in the absence of explicit connections to fallout, the fable suggests something almost globally apocalyptic. Taken as a whole, her revisions—made perhaps with the goal of reaching a wider audience¹⁰—also had the effect of enlarging the scope of catastrophe from one particular, and potentially negligible, instance of a poisoned town to a

¹⁰ Oravec contends that the “sequence of Carson’s revisions suggest that there is a danger in being too specific, especially in the realm of fiction. Carson’s choice not to write a story about a male character touring a town called Green Meadows in 1965 was crucial for reaching a wider audience, both in her own time and today” (Oravec 2000: 56).

universal crisis, a “collective nightmare” descending upon all towns (Oravec 2000: 54). In this sense, the fable never was a narrative of localized crisis—a small-town-American ‘silent spring,’ as Buell puts it—but contained within it already a vision of global catastrophe. For all of these reasons, *Silent Spring* continues to inspire fear.

And yet the book also contains a distinctly hopeful message, an alternative vision of the future. Carson insists that humans can attain a level of maturity and wisdom that will allow us to cooperate with natural processes and enable us to live, if not exactly peaceably with nature, then at least far less destructively. The necessary change begins with the average citizen, Carson tells us, with each and every one of us (empowering). It seems plausible to suggest that at least two competing narratives emerge from *Silent Spring* as a whole. One can be located in the fable itself; another is discernible in the overall thrust of *Silent Spring* but particularly in the final chapter. The fable sets the tone for a classic tale of human progress “inverted,” hubris thwarted: “The human attempt to control nature, to improve upon nature, leads finally to the death of nature” (Killingsworth and Palmer 2000: 178). In this respect, the storyline of the fable parallels the modern form of apocalypse which culminates in the end—completely—of humanity and perhaps the earth itself. But in attempting to draw from the fable a *warning*—and thus avert the apocalypse—*Silent Spring* points to a more “millennialist” notion of the end of the world which culminates in a “new kingdom,” something to be “accepted as inevitable, a sign of the new age, something hopeful, to be anticipated with joy” (Killingsworth and Palmer 2000: 178).¹¹ Carson’s belief that the disaster can be averted, and her plan for doing so, is spelled out in the final chapter of the book, “The Other Road.” There Carson

¹¹ See also M. Jimmie Killingsworth and Jacqueline Palmer, “Millennial Ecology: The Apocalyptic Narrative from Silent Spring to Global Warming,” in *Green Culture: Environmental Rhetoric in Contemporary America*, ed. Carl G. Herndl and Stuart C. Brown (Madison, Wisc., 1996), pp. 21-45.

celebrates the new science of ecology, a science based upon interconnection in nature, and the promise of biological solutions far superior to chemical ones as the paths to salvation. But Carson's heralding of a new era is not anticipated, not foreshadowed, in the fable. The negative message of the opening may have effectively eclipsed the hopeful ending, leaving readers merely stunned or depressed. Ultimately Carson may have created more alarm than she intended by relying on "a rhetorical structure that condemned many of her best and most positive points to relative neglect" (Killingsworth and Palmer 2000: 193). It is likely that many readers, past and present, never make it to the last chapter.¹²

From Wonder to Fear, and Back: Carson's Legacy

Nearly half a century after Carson's death, her legacy remains a complex and highly contested one. Perhaps one of the most interesting aspects of this legacy is how strongly Carson is associated with two emotions—fear and wonder—that, while sharing certain features, are often characterized as opposite to one another. Carson is frequently celebrated as the progenitor of nature wonder or nature religion (Fuller 2007), but she is also the environmental figure most often invoked in the context of apocalyptic fears and feelings of doom regarding the planet's future. The alleged apocalyptic dimensions of Carson's work—her legacy of fear—needs to be understood and evaluated not only in the context of the message of *Silent Spring* as a whole but in the context of Carson's entire body of work. At present, the strong association of Carson with fear has all but eclipsed what is arguably the dominant theme in her work: wonder and enchantment in response to the natural world. As I have suggested throughout, Carson's use of terms such as mystery, wonder, and enchantment underwent a

¹² Certain lines of criticism, including Tierney's, seem to support this.

radical change as she approached the subject matter of *Silent Spring*. To put the point differently, *Silent Spring* was a critique of a particular type of enchantment, a dangerous variety characterized by a sense of awe at our own powers and an almost delusional belief in technological advances as the only, or only important, mark of human progress. Carson did not live long enough after the publication of *Silent Spring* to give us her last word on the role a sense of wonder might play in the midst of environmental crisis. Would she have returned to themes of wonder and mystery in nature in her next book? Would she have found some way of weaving together more tightly the theme of natural wonder with pragmatic environmental action? *The Sense of Wonder*, published posthumously, is the only “final” word we have, though in fact it was written before *Silent Spring*. It gives us a glimpse of her understanding of how wonder generates ethical orientations, but she was never able to develop it into a book length treatment as she had long hoped to do.¹³ Nevertheless, the writing we do have from Carson suggest that she understood wonder and enchantment with nature to serve as a corrective to dangerous and delusional forms of enchantment with ourselves and our creations.

A strong sense of wonder takes time to develop; ideally, it should be instilled in early childhood in order for a sufficiently strong and enduring sense to take root, as nature-study educators and Carson herself maintained. Like those educators, Carson understood nature study as distinct from scientific study, not in the sense that it was *unscientific* but in that provides a moral and affective framework for later knowledge. The sense of wonder and enchantment with nature underpins factual knowledge. This is captured well in Carson’s analogy

¹³ It is not clear that even if she had completed it, the book would have developed such arguments, given that she seems to have envisioned it as book for or about children. Carson had at least two immediate book projects in mind following *Silent Spring*. One was the expansion of “Help Your Child to Wonder” into a book; another was a sea anthology for which she had signed a contract (Lear 1997: 444-445).

about facts that are sown into the soil of wonder. If the soil is not first prepared, these seeds have nothing in which to take root, nothing to enrich them, no context in which to reflect upon them. Wonder in response to nature was a mature and moral response that serves to remind us of our relative smallness, and therefore instills a sense of humility and caution. Wonder begins for many of us as a childhood response to our universe; children have an instinct for it, Carson believes. But as we mature—if indeed we retain this sense of wonder into adulthood—instinctive wonder may take on more deliberative qualities, ethically speaking. A sense of awe and wonder at our own scientific achievements, on the other hand, was worrisome to Carson because it could create the impression that we are in control of our world; it might encourage arrogance and recklessness in our dealings with nature.

However, the connection between a sense of wonder the development of an ethical stance (generosity, humility, compassion) is precarious and fragile. As a motivator, fear generally works more quickly and efficiently, though there are obvious downsides to cultivating fear as the primary or sole source of ethical action, whether in the context of the environmental crisis or other contexts. In what follows, I turn to a discussion of fear and wonder in order to suggest the role they play in environmentalism (and religion generally). The environmental movement needs both of these responses—the narrowed perception of fear and the expansive vision of wonder—and Carson, I think, understood this.

In studies of the human emotions, scientists working in areas such as psychology and cognitive neuroscience classify fear as one of the most basic human emotions. Basic, in this context, means an emotion that is universal and has a biological basis that is evolutionarily ancient (involving areas of the brain that are least affected by cultural influences and learning). Fear is often understood—both in scientific literature and personal, anecdotal experience—as an emotion that restricts or narrows one’s range of perception, focusing attention

on the source of the perceived threat. From a biological standpoint, this narrowed focus may be adaptive because it allows one to tune out extraneous information and direct one's energy toward responding to the perceived threat. Fear motivates behavior that helps the individual to escape the threatening situation. "Fear induced responses are likely to include modes of cultural discourse and communication characterized by tunnel vision, restricted cue utilization, and keen attention to the threatening agent" (Fuller 2007: 33).

In contrast to fear, wonder is often considered to be a far more complex and even moral emotion that connects us to a larger network of beings and expands our scope of cognition and perception. Wonder often entails an element of surprise over something novel or unknown, and is often followed by a desire to know more about it. In this sense, it is held by many theorists to be a starting point for knowledge and science (Hepburn 1984: 131). Wonder is also a starting point for ethical engagement. A key feature of wonder, some theorists maintain, is its ability to move us away from a self-protective stance toward a greater openness and vulnerability to others. The "other-acknowledging" qualities of wonder, and its "non-exploitative, non-utilitarian" dimensions suggest its affinity with compassion, generosity, and what Hepburn terms a certain gentleness—a "concern not to blunder into a damaging manipulation of another" (Hepburn 1984: 145-146). From this wondering appreciation of valuing others, it is "a short step to humility" (146).

Yet other accounts of wonder accentuate its contemplative qualities, its inducement of a certain type of passivity found in a transfixed or stunned state. Some philosophers have even regarded wonder as utterly unimportant because of its ability to "stall" the mind (Fisher 1998: 46). As Jane Bennett argues in *The Enchantment of Modern Life*, wonder and enchantment—terms that she, like Carson, tends to use interchangeably—begin with "the step-back immobilization of surprise" (Bennett 2001: 104). One hopes, and Bennett believes, that

immobilization eventually gives way to active engagement—ethical and intellectual—but she acknowledges the “precarious concatenation” that obtains between wonder and enchantment on the one hand and energized moral engagement on the other: “it requires a delicate balance of forces, a set of fortuitous circumstances, and some practice in order to develop the somatic habits” that are conducive to these states. “One wonders,” Bennett remarks, “how it ever occurs” (Bennett 2001: 105).

This lack of utilitarian and self-protective motives in wonder, while in one sense salutary, is bound up with its passive dimensions. While both wonder and fear can motivate a search for the source of the emotion—an explanation or cause—wonder does so in “ways that are not directly connected with our immediate physical survival” (Fuller 2007: 40). Fear produces a more short-term, focused reaction to its source, while wonder may sustain a long-term and often creative, open-ended response characterized by “receptivity rather than immediate utilitarian action” (Fuller 2007: 39). All of these features suggest that wonder as a general orientation to the world or a sensibility (as opposed to wonder at this particular surprising object) takes time and effort to cultivate and does not always or easily translate into action. As Bennett notes, there is no guarantee that the translation will happen at all.

Of course, fear and wonder are also emotions that play a significant role in religious constructions of our world. Infused with religious meaning, fear can lead one to interpret the world in apocalyptic ways. Apocalyptic literature, such as the book of Revelation, uses repetitive plots and frightening images of supernatural creatures to heighten fear and the sense of imminent danger, while at the same time eliciting solidarity from the threatened group who perceives a common enemy (Fuller). Thus fear can turn not only the individual but the focus of the community as a whole inward. Wonder, on the other hand, draws us out of our immediate context or social group and allows us to sense our place in

something much vaster or more enduring. For this reason, wonder too is frequently construed as a “religious” emotion, and yet fear and wonder are in some respects the antithesis of one another. To put it in the simplest terms, wonder is clearly central to what is referred to as nature religion or nature spirituality; fear lies at the heart of apocalyptic religions—and of course sometimes the two expressions of religion combine—but in any event, it is startling to think that Rachel Carson is so commonly associated, again, with these two rather different responses to our world. Fuller sums it up in the following way: “Just as fear can be implicated in the biological impulse to reconstruct the world in apocalyptic ways, so can wonder be linked with the genesis of an enduring form of nature religion that has persisted in North America for at least two hundred years” (Fuller 2007: 41). He goes on to argue that the progenitor of nature religion who best exemplifies this use of wonder is Rachel Carson. Carson showed a “pronounced sensibility for more-than-physical reaches of the universe” (Fuller 2007: 44) and she believed that “moral conduct flows naturally from emotions producing empathy and identification” such as are generated by wonder (Fuller 2007: 42). Nature, as Carson experienced it and encouraged others to experience it, “jars us out of everyday utilitarian rationality and elicits emotions that set us in search of meanings that somehow lie just beyond sensory appearances” (Fuller 2007: 43).

Fuller’s characterization of Carson’s use of wonder is accurate and, in many ways, refreshing: Few scholars of religion have paid attention to Carson’s work, particularly her work prior to *Silent Spring* (despite all the quasi-religious academic drivel that her critics claim has sprung up around her). I would emphasize that Carson’s sense of wonder and enchantment is distinct from the sort of wonder lauded by some scientists. Wonder in Carson’s writing is associated far more with ultimate *meaning* than with current *knowledge*. As we have seen, it is the “elusiveness” of meaning combined with what Carson sees as

the inescapability of the *reality* of mystery that enhances the sense of wonder.¹⁴ Researchers of the emotions who characterize wonder as a response linked with mystery (or spirituality) have something like this in mind. In Carson's words, wonder entails "a recognition of something beyond the boundaries of human existence" (Carson 1965: 100).

I have indicated my general concurrence with Fuller's account of Carson's view of wonder and her purposes as a nature writer. Yet I also think it was precisely this approach that she jettisoned when she wrote *Silent Spring*.¹⁵ Fuller quotes extensively from Carson's work in order to illustrate the expansive, moral sense of wonder that pervades her writing. But interestingly, his examples are culled (with one exception) from her writings *other* than *Silent Spring*. Many writers familiar with Carson's work, particularly nature writers, noted the abrupt change in Carson's style and agenda with the publication of this book. Loren Eiseley, for example, remarked in a review of *Silent Spring*, "If her present book does not possess the beauty of *The Sea Around Us*, it is because she has courageously chosen, at the height of her powers, to educate us upon a sad, an unpleasant, an un-beautiful topic, and one of our own making" (Graham 2000: 74). Her goal was a more pragmatic, pedagogical and urgent one. If a sense of wonder and enchantment takes years to instill and cultivate, she needed a different tactic. If wonder promotes passivity and a trustful sense of belonging, it

¹⁴ A rather different account is found in Richard Dawkins' work, for example. In *Unweaving the Rainbow* (Dawkins 2007), a book that claims to celebrate the appetite for wonder, Dawkins defends the wonder of science over and above nature. When science "explains away" what had been one of nature's mysteries, a sense of wonder remains but is now directed at the scientific solution itself (and by extension perhaps the scientist), rather than at nature. In many respects, Dawkins displays exactly the sort of enchantment with ourselves that Carson found worrisome.

¹⁵ That Carson was also undergoing treatment for metastasized breast cancer at the time she was writing *Silent Spring*--and constantly attempting to get the truth from her doctors--is far from irrelevant here. She was in a fact-facing mode and was becoming accustomed to processing very bad news. She may have overestimated the ability of others to do so.

was precisely these kinds of attitudes, whatever their source, that Carson needed to challenge with *Silent Spring*. My intention is not to disparage wonder, nor to claim that Carson gave up on it. Her plans to expand her book on this subject indicate that she continued to view the sense of wonder as a crucially important sensibility in the modern world. Yet in certain cases, creating a sense of fear—a concern with immediate physical survival—may be necessary. Carson never relinquished her belief that humans are connected to a larger, wondrous network of beings—*Silent Spring* is premised on this notion—but she also needed to evoke alarm, an immediate reaction to a perceived threat. There was, in a sense, no time to wait for wonder to enable a capacity for ethical action on the part of her readers; even among readers who shared Carson’s sense of wonder, she would have to activate precisely the sort of immediate, focused, utilitarian rationality—perhaps a self-protective response—that wonder seems often to suspend. Carson understood the American public, at that moment in time, to be in the grip of a powerful and perverse enchantment with science and human achievements, at the expense of nature. She needed to break that spell, to undermine “childlike” trust in authority, particularly of scientific authority, even while she relied on scientific facts to do so. She also had to give priority to a different vision of maturity—not the sort of moral maturity and steadfast humility that wonder can sustain but a more practical, face-the-facts kind of maturity. If we are being asked to take risks, she argues, then we have a right to know the facts. “The public must decide whether it wishes to continue on the present road, and it can do so only when in full possession of the facts” (Carson 1962: 13).

Yet Carson also hoped to impart these facts with some literary style, and many readers feel that she succeeded well in this endeavor. Perhaps it is because Carson blended these startling facts with fictional and mythical allusion that the book continues to feed the apocalyptic imagination, to generate responses of fear and anger. *Silent Spring*’s sparse but terrifying imagery—sorcery and dark fairy

tales, the poisoned forest and, most of all, the eerily silenced town of her fable—plays a role akin to the images of mythical beasts in the Book of Revelation. These elements intensify the perception of imminent threat and they reappear, they are reflected and refracted back, in popular representations of the book and its themes. By combining facts with fearful elements, Carson perhaps unwittingly created a too-powerful sense of fear and catastrophe. *Silent Spring* prompted the reaction Carson hoped it would, and then some. It led to sweeping environmental legislation and creation of agencies such as the EPA; it raised public awareness of toxins in the environment and emboldened citizens to defend their own environmental rights as well as the rights of nonhumans.

The environmental tale I have just told—namely, that fear was on the whole an effective catalyst of the environmental movement and that Carson’s work prompted meaningful environmental change—has itself recently been challenged as mere “fable” by some environmentalists (Nordhaus and Shellenberger 2007: 22). In October 2004 Ted Nordhaus and Michael Shellenberger, two young men who had spent years toiling in the trenches as environmental consultants and strategists, dropped a bombshell at a meeting of the Environmental Grantmakers Association when they pronounced the environmental movement dead. Their widely circulated paper, “The Death of Environmentalism,” argued that the environmental movement had become bogged down by gloom and doom, mired in both apocalypticism and nostalgia, and that it had persistently failed to provide an alternative hopeful vision, grounded in American values and ideals (Shellenberger and Nordhaus 2004). In a recent follow up book titled *Break Through: From the Death of Environmentalism to the Politics of Possibility*, Nordhaus and Shellenberger pursue the theme of failure further. They note that *Silent Spring*, the mother of all eco-tragedy texts, “set the template for nearly a half century of environmental writing: wrap the scientific research about an ecological calamity in a tragic narrative that conjures nostalgia

for Nature while prophesying ever worse disasters to come unless human societies repent for their sins against Nature and work for a return to a harmonious relationship with the natural world” (Nordhaus and Shellenberger 2007: 130).¹⁶ The “unstated aspiration” of the eco-tragedy is “to return to a time when humans lived in harmony with their surroundings. That tragic narrative is tied to an apocalyptic vision of the future—an uncanny parallel to humankind’s Fall from Eden in the Book of Genesis and the end of the world in the final Book of Revelation” (Nordhaus and Shellenberger 2007: 134).

This is an old refrain with regard to Carson’s critics. More interesting is that the authors go on to champion a counter-story, a narrative of “overcoming adversity” that will help us to envision and then create a better world. And this, they contend, requires a fundamental change in mood and new sources of motivation. The appeal of the eco-tragedy narrative was that it seemed at least initially to motivate action and environmental legislation. Because environmentalists think that *Silent Spring* is responsible for environmental victories in the past, they “continue to preach terrifying stories of eco-apocalypse, expecting them to result in the change we need” (Nordhaus and Shellenberger 2007: 131). The counter-narrative proposed by the authors provides a new form of motivation: an ethics and politics born of a sense of joy, mystery and gratitude in place of “the ethics born of the sadness of living in a fallen world pervaded by fears of the eco-apocalypse to come” (Nordhaus and Shellenberger 2007: 154). There is still much that is wondrous in our world—to wit, the “great wildness abounding inside and outside of ourselves” (Nordhaus

¹⁶ Echoing many of Carson’s critics, they also maintain that Carson’s opening fable took nature to be fundamentally harmonious and benign and balanced; they then go on to remind us all (and presumably Carson if she were here) that nature has a turbulent history—volcanoes, ice ages, asteroid impacts, great extinctions—and that animals in nature behave violently. They seem utterly unaware that Carson wrote volumes on topics such as these prior to taking up the issue of pesticides.

and Shellenberger 2007: 154). In short, what Nordhaus and Shellenberger recommend to motivate ethical action is a sense of wonder and enchantment. Granted, their narrative seeks to reclaim and celebrate hubris—“those who fear change always declare challenges to their authority to be hubris” (Nordhaus and Shellenberger 2007: 271)—and it embraces all manner of human achievements that some environmentalists see as problematic, including our impressive ability to expand our population to its current numbers. Their vision of the future also embraces the central thesis of Bennett’s work. For Bennett, as I noted previously, enchantment “entails a state of wonder” and creates a mood of “fullness, plenitude, or liveliness;” it may involve “a fleeting return to childlike excitement about life” (Bennett 2001: 5). Nordhaus and Shellenberger especially applaud Bennett’s resistance to the notion that the modern world is bereft of “mystery, ineffability, magic, and connectedness” (Nordhaus and Shellenberger 2007: 153). While I have doubts about the ability of successfully combining a wholesome form of enchantment and wonder with such an enthusiastic and uncritical embrace of hubris, it is clear that Nordhaus and Shellenberger have hit upon something important.¹⁷ They simply fail to realize that essential elements of the attitude they describe have previously been described and celebrated by nature writers and environmentalists for decades—most notably by Rachel Carson, whose work they denigrate.

¹⁷ As I read Bennett, she is more cautious about embracing human achievements and powers than are Nordhaus and Shellenberger, and she sees modesty and humility as more central. We should temper our technological interventions, she writes, with “modesty that comes from acknowledging the independent vitality of nonhuman forms and from admitting corollary limits in the capacities of human agents to know exactly what they are doing when they manipulate the world in which they participate” (Bennett 2001: 157). Compare this sentiment to that expressed in *Break Through*: “environmentalism has also saddled us with the albatross we call the politics of limits, which seeks to constrain human ambition, aspiration, and power rather than unleash and direct them.” Environmentalists focus too much on the “nonhuman world that has been lost rather than also on the astonishing human world that has been created ...” (Nordhaus and Shellenberger 2007: 17).

If it is to succeed, the environmental movement may well require both fear and wonder, a “nightmare” and a “dream,” to use the language of Nordhaus and Shellenberger—not the overwhelming fear that shuts us down, but the sort that can galvanize and focus our actions. To be sure, sustained and unmitigated fear can render us more passive than the most passive varieties of wonder, causing a kind of paralysis or apathy. Yet the fear of what we stand to lose remains real and important, just as it is important to cultivate, more positively, an awareness of the value of that which we fear losing. A certain amount of fear can help to jolt us out of our complacency, or what Carson called our mesmerized state. At the same time, a sense of wonder at the natural world might help to discourage these dangerous forms of enchantment from taking root in the first place. Those who devote their time to studying and trying to remedy environmental problems also need a sense of wonder just to sustain them (this, I think, is partly what Nordhaus and Shellenberger are suggesting in urging a vision of ourselves as overcoming adversity). A sense of wonder and enchantment, as Bennett argues, may carry with it a virtuous rather than vicious type of forgetfulness—not the forgetfulness of the escapist or of the elitist who does not have to trouble herself with the problems of the real world but the forgetfulness needed as a break from (legitimate) fears and anxieties. Enchantment generates an attachment to life, an enjoyment that “temporarily eclipses the anxiety endemic to critical awareness of the world’s often tragic complexity” (Bennett 2001: 10). To carry on our good work in the world, it helps to have occasions when “one’s critical faculties are suspended,” to be “sustained by periodic bouts of being enamored with existence” (Bennett 2001: 10-12). I would not want to overstate the similarities between Carson’s account and Bennett’s: the sites of enchantment that Bennett canvasses in her study include the artificial and technological as well as the natural world. Carson was clearly concerned that the world not be dominated by “artificial” human creations, and she feared humans might become overly

enamored with our own technological innovations. But Carson hit upon a similar point about the uses of enchantment and wonder. “What is the value of preserving and strengthening this sense of awe and wonder, this recognition of something beyond the boundaries of human existence?” she asks (Carson 1965: 100). Her answer is that “Those who dwell, as scientists or laymen, among the beauties and mysteries of the earth are never alone or weary of life. Whatever the vexations or concerns of the personal lives, their thoughts can find paths that lead to inner contentment and to renewed excitement in living” (Carson 1965: 100). Carson’s work already contains a hopeful vision, an alternative to the predominantly fear-driven environmentalism with which she is so strongly and wrongly associated. A counter-narrative of wonder and enchantment with the real world around us ought to remain a crucial part of Carson’s legacy, as seen from the perspective of her writing as a whole.

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Gleanings from the Field:

Rachel Carson's Transformation of Field Notes to Text

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Rachel Carson worked slowly and methodically as a writer, transforming her field notes as well as information from her extensive research in scientific publications into a distinctive lyrical prose style while maintaining their scientific accuracy and clarity. Like Henry David Thoreau, whose Journals she read avidly, Carson understood “field” to refer not only to a specific environmental setting- a marsh, a tide pool, a coral reef in the Florida Keys — where she made careful first-hand observations, but also to the “place” of an observation within a larger philosophical, ecological and literary framework; that is, within a conceptual and verbal “field.” Like Thoreau, Carson expands the boundaries of natural history writing beyond purely objective, scientific descriptions by employing a narrative method, an engaged perspective, and evocative metaphors that make a place or “field of inquiry” come to life as a personal, emotional experience.¹⁸ Like Thoreau, Carson felt a physical and emotional affinity with the individual creatures about whom she wrote. Her editor and friend Paul Brooks notes that “this sense of identification is an essential element

¹⁸ In her work on Henry Thoreau's *Journal*, *Writing Nature* (Oxford University Press, 1985), Sharon Cameron discusses Thoreau's struggle to keep his observations “green” that is, to preserve their sense of immediacy, the emotional impact of “the thing itself” even as he recognized that “preserving” the record of things seen alters them in the telling. (see esp. Chapter 5, *Writing Nature*). Carson is not caught in the dualities of Transcendentalism, which regarded nature as both reality and symbol; however, she shares his concern with striking a balance between precise detail and issues of perspective, light, and emotion, which do transfigure natural objects, so that readers see through the writer/observer's eyes. Much has been written about Carson's ability to convey her sense of “wonder” about nature. More study of its parallels to Thoreau and his influence on her style and perspective is necessary.

in her literary style.”² It was this authentic, if vicarious experience of nature that so attracted her readers.

Paul Brooks notes in his study *Rachel Carson: The Writer at Work* (1972; 1989), that in her five books and numerous magazine articles, Rachel Carson virtually transformed natural history writing into a new genre, inviting readers to share in her curiosity and wonder at the natural world and attracting a large and often passionate reading audience, many of whom had never read non-fiction natural history before. She did so deliberately.

In her acceptance speech for the National Book Award for *The Sea Around Us* 1951, Carson explains her method and purpose with a characteristic blend of modesty and absolute conviction.

Many people have commented with surprise on the fact that a work of science should have a large popular sale. But this notion, that “science” is something that belongs in a separate compartment of its own, apart from everyday life, is one that I should like to challenge. We live in a scientific age, yet we assume that knowledge of science is the prerogative of only a small number of human beings, isolated and priest like in their laboratories. This is not true. The materials of science are the materials of life itself. Science is part of the reality of living; it is the what, the how, and the why of everything in our experience. It is impossible to understand man without understanding his environment and the forces that have molded him physically and mentally.

² Brooks, *Rachel Carson, The Writer at Work* (1972), p. 10, originally published by Houghton Mifflin under the title *The House of Life: Rachel Carson's Work*. Brooks adds a quotation from Thoreau about feeling wiser for knowing that there was a minnow in the brook: “Methinks I have need even of his sympathy, and to be his fellow in a degree.”

The aim of science is to discover and illuminate truth. And that, I take it, is the aim of literature, whether biography or history or fiction; it seems to me, then, that there can be no separate literature of science.

My own guiding purpose was to portray the subject of my sea profile with fidelity and understanding. All else was secondary. I did not stop to consider whether I was doing it scientifically or poetically; I was writing as the subject demanded.

The winds, the sea, and the moving tides are what they are. If there is wonder and beauty and majesty in them science will discover these qualities. If they are not there, science cannot create them. If there is poetry in my book about the sea, it is not because I deliberately put it there, but because no one could write truthfully about the sea and leave out the poetry.

This paper explores Carson's transformation of field research into the larger "field" of a literary text. I began with several questions. What is required to "write truthfully"? (a question that Thoreau frequently raised in his Journals). What sort of discipline connects seeing and writing? To what degree is the poetry of Carson's writing inherent in the way that she perceives the physical world? To what extent does she rewrite her original field notes? When? And why? How does one keep a record of an experience or perception and leave it "green," so that it is not distorted when it is "preserved" by locating it in the body of a text? Like Thoreau, who consciously struggles with these issues, Carson must also find a way to convey to readers that though we must observe objects one at a time, sequentially, and record details with precision, what matters most is not their individual "natural history" but their relatedness within a habitat to other species and types, the drama of their existence.. The writing

must thus have the forward thrust of narrative, not remain a series of static pictures.

For this paper, I decided to focus my research on the Field Notes and drafts for Carson's second major book, *The Edge of the Sea 1955* because of its deliberate shift of purpose and direction from a more conventional field guide to shore life that had been proposed by Carson's publisher Houghton Mifflin, at the urging of one of its editor's Rosalind Wilson. Many readers know the anecdote that prompted this request. Wilson, who had been entertaining a number of literary guests at her home on Cape Cod was horrified when her guests, seeing the beach covered with horseshoe crabs, apparently stranded from the previous night's storm, returned them to the sea, unaware that this act of apparent "mercy" interrupted the normal mating procedure. Wilson dictated a memorandum the following Monday morning, suggesting that an author be found to write a layman's handbook to seashore life that would dispel such ignorance once and for all (Brooks 152-3).

Carson was contacted by the editors at Houghton Mifflin and began her study with the original working title "Guide to Seashore Life on the Atlantic Coast." As Brooks notes, the proposal gave her the opportunity to work on a book that she had wanted to write for several years. As early as 1948, she had written to her literary agent, Marie Rodell, "Among my remote literary projects is a book on the lives of shore animals, which Mr. Teale once asked me to write for his benefit." (Hubbell, preface xvii).

Now Carson had not only the encouragement of her publisher, but an essential for all good writing, a sympathetic and interested "ideal reader" in Edwin Way Teale. How could she fail?

Overcome by frustration at the masses of detailed field notes she had accumulated at Myrtle Beach, St. Simons Island, off the coast of Georgia, at Woods Hole, and the Florida Keys, but without a unifying thematic focus, she

nearly gave up. Writing to Brooks, Carson notes, "I decided that have been trying for a long time to write the wrong kind of book. . . I think . . . that the book has become an interpretation of . . . types of shore . . . the routine [biological] facts, that were so difficult for me to incorporate into the text, are now being saved for the captions . . . or for a tabular summary . . . at the end of the book." (Letter to Brooks, Carson archives)

Carson early on had begun to interpret shore life in relation to specific environmental factors, as her field notes attest, but not until she began reviewing her manuscript notes for the Florida Keys chapter, did she find her governing structure. Her field notes on the corals and mangrove forests of the Keys refer again and again to the impact of the ocean currents on this habitat. She realized then that she needed to go back over what she had written about other shore areas. What she found was that each of three (originally four) regions that she focused on had a distinctive ecology determined by a clearly definable natural factor: North of Cape Cod the seashore habitats were adapted to the tides; southward from the Cape, the determining factor was the waves, just as in the dense mangrove coastlines and coral reefs of the Keys, the ocean currents affected all living organisms. Enthusiastically, Carson wrote to Brooks, telling him she had found the narrative structure she needed to help "take the seashore out of the category of scenery and make it come alive." Here, as elsewhere, Carson appears to have been influenced by Thoreau.³ Like Thoreau, Carson is not interested in transforming nature into pretty scenes, but rather in conveying to her readers nature's inherent beauty and design. Like Thoreau, she used

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See Cameron, p. 114. Thoreau complains that Gilpin's interest in nature is too narrowly aesthetic. ("I wish he would look at scenery sometimes not with the eye of an artist" (IV:282) . Cameron notes: " Thoreau is not interested in nature as composition (as Burke and Gilpin are, albeit in different ways), but is rather interested in the composition of nature, and, in fact, hopes to replicate it. " Carson's goals are identical, although she has the advantage of her scientific background as well as her poet's eyes and ears.

words to reveal the inherent poetry she found in nature, which she also equated with the essential truth at the core of any scientific fact. (see Brooks, 9).

Box18 of the manuscript material of Rachel Carson, located in the Beinecke Research Library at Yale University, contains Carson's research materials, articles and pamphlets, field notes and draft materials for *The Edge of the Sea*. Her field notes are often written in long-hand on 6x8 inch loose-leaf notebook paper; some have been typed up that evening or the next day, a process encouraged by her long-time friend and correspondent, Edwin Way Teale, although Carson was not always faithful in following this tedious task or in dating and numbering her material. Like Teale as well, Carson wrote copious notes, recording detailed observations with accuracy and freshness, often in the present tense, and sometimes accompanying them with marginal sketches, although the finished text would be illustrated by the wonderful pen and ink drawings of Bob Hines. The field notes often consist of technically accurate descriptions of individual organisms: sponges, sea-worms, insects, birds, crustaceans, but again and again they are written as little vignettes, dramatic scenes of individual creatures, some of them microscopic in size, living within a complex environment to which they have adapted. Carson was fascinated by barnacles living in a cave that received water only at the highest tides, and regarded with wonder the many large chitons she saw in Key Largo, who sank into the sand, "each with a depression exactly the shape of its body and approximately its depth" that served as camouflage. Carson's sense of wonder and excitement is palpable, and comes through the field notes, which often utilize metaphor, rich description of color, sound, and sensation, like poetry. By writing such detailed field notes longhand, Carson captures the immediacy of her first-hand observations but also her emotional response, her delight, and the drama she found in the life of a region. There was no separation between the science and the poetry; the smallest details often led to a larger understanding of

the whole, at times, even to an epiphany, as in a note describing the beach at St. Simons Island, Georgia:

Evening of April 17 (6:30-7:30) near dark, (low tide 8:15 pm)

This part of the beach when the tide is out is always deeply crossed with wide ripple marks—a pattern of wavelets sculptured and preserved for the tidal interval in this curiously firm substance, a mixture of mud and clay several hundred feet below the high tide mark.

On the beach in front of the coast guard station and from there north to _____ Inlet, an immense stretch of sand is exposed at low tide. . . One could walk out probably half a mile, almost dry-shod. . . Away out there, so far from the building and shore, it was nice to think that this wide tidal area belonged to the sea and couldn't be built on. . . Out there, there are no sounds, but those of the wind and sea and the birds. It is curious how the sound of the wind moving over the water makes one sound, the water sliding over the sand and tumbling down over its own wave forms another. The bird voice of these flats is the call of the willets. I had always associated them with quiet water and salt marshes instead of the ocean beach. When I went down tonight one was standing at the edge of the water, looking out over it, and giving its low, urgent cry. Presently there was an answer and this bird flew to join the other.

With remarkably little change, because it already contained the sense of immediacy and wonder Carson wanted to convey and already accomplishes that synthesis of sound, sight and sensation that the poet strives for in a symbol, this passage appears in the first chapter of *The Edge of the Sea*. Carson adds a remembrance from another field note taken at St. Simons that emphasizes its thematic context: *“Looking back across that immense flat, crossed by winding, water-*

filled gullies and here and there holding shallow pools left by the tide, I was filled with awareness that this intertidal area, although abandoned briefly and rhythmically by the sea, is always reclaimed by the rising tide."

Carson drew nearly verbatim on her field notes from her visit to St. Simons Island at low tide partly because she was so struck by its symbol as a transitional, marginal world between sea and land and partly because the notes capture not only what she sees but the sense of wonder she feels as witness: the last evening light reflected in the scattered pools and creeks left by the receding tide, the dark shadows of the birds against the darkening sky, sanderlings scurrying across the beach "like little ghosts," a world of movement and change, at once ephemeral and eternal. Into this chapter she brings an observation of a ghost crab that she observed at Myrtle Beach, "a single small ghost crab near the sea . . . that became a symbol that stood for life itself-for the delicate, destructible, yet incredibly vital force that somehow holds its place amid the harsh realities of the inorganic world" (Carson 5).

As this last quotation from *The Edge of the Sea* so clearly illustrates, Carson wrote poetically because she saw the world not only as a scientist, but also with the eye of a poet. The language of her field notes, like her texts, is filled with evocative physical details that replicate the immediacy of sight, sound, color, and emotional response.

Carson's field notes are also filled with questions about her observations. Later, in the text, thinking about the interconnectedness between individual species and their habitats, she would find answers, for example, why the barnacle is able to survive so long above the high water mark by alternating brief and intense activity with long periods of a quiescent state similar to hibernation, like the plants of the Arctic. Or why, tube worms have managed to live in the intertidal zone for millions of years through a sensitive adjustment to conditions not only within the surrounding rockweeds but also to vast "cosmic forces" tidal

rhythms linked with the movements of earth, moon, and sun. Individual journal entries often conclude with a nearly palpable sense of discovery, as again at St. Simons when watching the tide ebb and the land “being built out of the sea”, she feels as if she is witness to a reenactment of the act of creation itself. (see also Lear, 231)

While I originally expected the field notes to be technically accurate detailed descriptions and the literary elements of Carson’s texts to be added later in the process of composition, many times the notes themselves were narratives, filled with the drama, excitement, movement, and exquisite sense of style that marks Carson’s finished work. *The Edge of the Sea* is filled with descriptions of habitats marked by the change, movement, and variety of creatures that inhabit such marginal regions. She saw herself as a participant/observer and invites readers to join her as she discovers the wonders that are all but invisible unless we have been taught to see them as she does, as here in a field note about the “black zone” on the Maine coast that appears in Chapter 2. The passage is marked, as the notes often are, by a conscious shift in perspective, from the smallest details to a larger cosmic, philosophical context, and then, following this insight, a playful return to a common, that is, human point of view.

The black zone of the shore has a meaning above and beyond its drab and lifeless aspect—a meaning obscure, elusive, and infinitely tantalizing. Whenever rocks meet the sea, the microplants have written their dark inscription, a message only partially legible although it seems in some way to be concerned with the universality of tides and oceans.

The field note describes what is gained by looking from a different perspective, learning to decode that inscription, losing self-consciousness by relinquishing objectivity, seeing from within. The vehicle here is not only

Carson's magnifying lens but also her willingness to see the world, even from an insect's perspective.

While the tide was out one day I lay face down on the rocks and with a strong hand lens sought to bring myself into perspective with all the margin of this rocky coast. At first it seemed to me that I was looking at a deep-piled felty fabric at the torn edges of which were minute threads that composed it. . But as I looked longer the focus shifted and the illusion of depth and distance increased. There I seemed to regard, as from a height, a sere and blackened landscape, eroded into innumerable canyons and gullies, an area as desolate and apparently lifeless as a great lava plain or desert. As I watched, nothing emerged from concealed tunnels in the walls of the canyon, nothing at all appeared to live here. Then, from the margin of the blackened area one of the little gray tide-pool insects appeared hurrying over the rocks, a traveler seeming impatient to make his way over the barren land. Now and then he paused as though uncertain of his path, confused by the many gullies . . . Several times he made false turns. . . when finally he came out after his long journey, for minutes are long to one whose life span is measured only by a year. Then I put away my lens and saw again only a slippery black film from which an almost invisible insect was just emerging onto dry, white rock. Which, I asked myself, was the true perspective?

The epilogue of *The Edge of the Sea* is an elegy on this same theme. Like all elegies it mourns the passing of time but acknowledges and celebrates the cycle of nature symbolized for Carson by "the sea's eternal rhythms-the tides, the beat of surf, the pressing rivers of the currents-shaping, changing, dominating the stream of life . . . from past to unknown future."

I set out to find where the scientist ended and the poet began, and I discovered that they were one and the same; the one flowed into the other

indistinguishably in the vision of Rachel Carson. I also discovered in my study of Carson's field notes that what it took to see and to write truthfully was Carson's life-long sense of joy and wonder, her boundless curiosity about the natural world, the knowledge and confidence of a scientist, her truly remarkable eye and ear for details, and the discipline to put it together into works of enduring greatness.

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