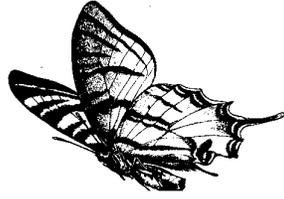
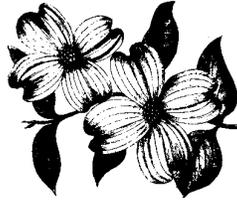


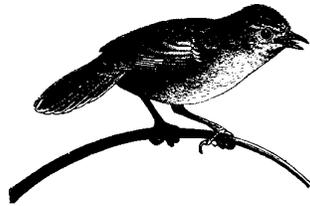
Revitalizing



Natural



History



by Thomas L. Fleischner

What is natural history? Although the term is as old as Christianity, you'd get a different answer depending where, when, and whom you asked. Modern Euro-American natural history traces its roots back centuries—to Aristotle and Linnaeus attempting to make sense of Nature's diversity, to Darwin on the *Beagle*, to English parsons chasing butterflies and painting wildflowers. Naturalists unraveled the "history of nature" by examining fossils, comparing them with their living counterparts, and drawing conclusions that shook the world. The foundation of natural history across the centuries has been careful observation. Observation leads naturally to description and identification, and then to comparison. Our systems of classifying the natural world—biological taxonomy, classification of rock types—are based on the observations, descriptions, and comparisons of these early naturalists. Natural history asks the most basic questions: What is this? Where am I?, and then penetrates deeper into the questions that connect us with all beings: Who are you? Who am I? How do we fit together in this world?¹ All cultures seek answers to these questions. (Natural history, as discussed here,

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is a product of Western culture. Other traditions, such as Native American and Asian,² offer interesting alternatives and parallels to the development of natural history in the West. They deserve full treatments of their own, and will not be addressed here.)

Although natural history undergirds several modern sciences, contemporary scientists are often muddled about its meaning. Natural history predates the sciences of geology, ecology, and anthropology, all of which bit off pieces of natural history, specialized them, and guarded them by creating their own vocabularies. The Oxford English Dictionary notes that the definition has narrowed from the branch of science dealing with all natural objects—animal, vegetable, and mineral—to the study of living organisms, especially animals. Further, the dictionary suggests that "natural history" now connotes material "presented in a popular rather than strictly scientific manner." How did this narrowing of definition occur? How did the most inclusive of sciences become relegated to quaint triviality?

Unraveling the lineage of natural history takes us back to Aristotle, whose appetite for understanding the world was unfettered by intellectual boundaries as we would see them today. His works ranged from philosophy to biology to metaphysics.³ Generally credited with being the father of biology and natural history,⁴ Aristotle was "a cataloger extraordinaire of natural plants and animals."⁵ He wrote the *Historia Animalium*, which described the anatomy and habits of native Greek animals.⁶ When studying animals, Aristotle declared, we should investigate all of them, however insignificant they might seem, for "in not one of them is Nature or Beauty lacking." He set a precedent for a comprehensive approach to natural history: "In natural science it is the composite thing, the thing as a whole, which primarily concerns us, not the materials of it..."⁷ Furthermore, he pointed the way toward another powerful aspect of natural history—the cross-pollinating relationship between natural science and philosophy. His metaphysics grew out of his biology⁸—that is, his understanding of the nature of the world was grounded in reflection upon the nature of Nature.

The term "natural history" was probably first used shortly after the death of Christ, when the Roman writer Pliny the Elder entitled his masterwork *Historia Naturalis*. (It is worth noting that the term *natural history* predated the word *scientist* by 18 centuries.⁹) Pliny explained his purpose as the study of "the nature of things, that is, life"; he simultaneously invented natural history and the encyclopedia. *Historia Naturalis* collected, edited, and arranged an enormous amount of material into 37 "books" that covered cosmology, astronomy,

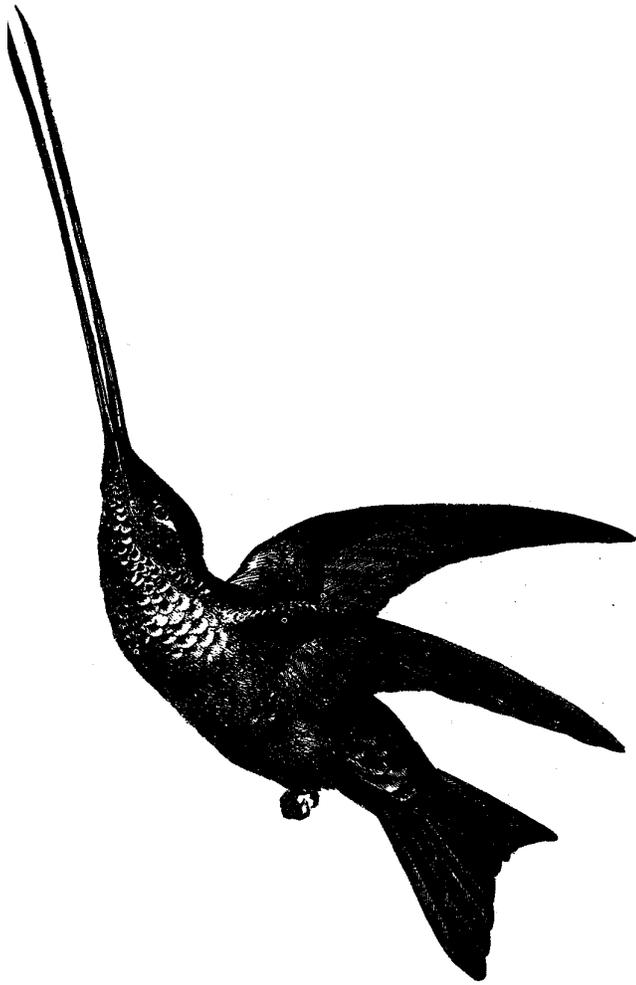
geography, zoology, botany, agriculture, medicine, and minerals. Pliny's all-inclusive approach to natural history influenced naturalists for at least 1500 years. Gonzalo Fernandez de Oviedo, a Spaniard who followed Columbus to the Americas, was well versed in Pliny's work, and sought to extend it with his *Natural History of the West Indies* in 1535.¹⁰

After the collapse of Rome, natural history fell on hard times. The Church held Western culture together, but at the expense of squelching independent thinking and directing attention away from the nonhuman world. Following the Middle Ages, Nature was rediscovered, and people again felt free to express "delight in birds and flowers."¹¹ Still, natural history was peripheral to the cultural surge that transformed the Medieval Era into the Modern. Francis Bacon, in the late 16th century, declared that natural history was merely the compilation of copious data—descriptions of plants, fossils, and the like.¹²

During the 18th and 19th centuries, new generations of naturalists avidly pursued the discovery, description, and naming of new plants and animals.¹³ Not coincidentally, this was a time of global exploration, and travelers continued to bring stories and specimens home to European museums. The Linnean revolution in taxonomy in the mid-18th century stimulated a boom in descriptive natural history in the 19th century. Linnaeus's binomial system provided a simplified and orderly framework for naming new discoveries, and also offered a convenient mechanism by which naturalists could claim lasting credit for their work.¹⁴ After more than a dozen centuries of inattention, it became a full-time job for natural historians simply to describe what was out there. Description, classification, and naming became the standard operating procedures of natural history.

The German natural scientist and philosopher Alexander von Humboldt explored Latin America as the 18th century turned into the 19th. His natural history works influenced subsequent generations of European naturalists in several important ways. His writings extolled the "excitement of the scientific adventure, the need for a wide integrative view, and the geographical approach to botany." Historian Donald Worster notes that "all of Alexander von Humboldt's writing was marked by an effort to arrive at a holistic view of nature."¹⁵ David Douglas explored the Pacific Northwest's flora two decades after Lewis and Clark explored its geography.¹⁶ The following decade, a young naturalist by the name of Charles Darwin, whose zeal for scientific exploration was ignited by his reading of Humboldt,¹⁷ set out on a five-year voyage to South America. During the following two decades





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another English naturalist, Alfred Russel Wallace, explored the Amazon basin and Malaysia. Natural history study led both men independently to an identical revelation—the idea of evolution through natural selection.¹⁸ At the tail end of the 19th century, an American natural historian, C. Hart Merriam, applied natural history study to Arizona's San Francisco Peaks and emerged with an important contribution on the relationship between species and their habitats.¹⁹

By the beginning of the 18th century, two streams of natural history had begun to emerge. Historian Donald Worster has called the streams *arcadian* and *imperial* ecology. The former advocated a humble life for humans, in hopes of restoring peaceful coexistence with other lifeforms, while the latter sought to use modern knowledge of Nature to establish dominion over it.²⁰ Each of these streams was typified by one man—the arcadian attitude by the English parson-naturalist Gilbert White, and the imperial by Linnaeus. These 18th century contemporaries shared a pious attitude toward Nature, but diverged from there. White wrote *The Natural History of Selbourne*, a lyrical tribute to the flora and fauna of his native village, while Linnaeus, who "had an unusually intense passion for the delights of arrangement,"²¹ devised our system of biological taxonomy and described dozens of species. Both men lived and worked in the afterglow of the scientific revolution—on the heels of great advances in astronomy, mathematics, and physics (exemplified by the work of Galileo, Descartes, and Newton). The intellectual zeal of the times pointed toward mechanistic, mathematical explanations of the world—Nature as a machine became the prevailing metaphor of the age.²² Linnaeus's ordered approach fit the life sciences neatly into this new way of looking at the cosmos. Soon, natural history became a matter of finding new species, labeling them with a Linnean name, and filing specimens away in a drawer.

Imperial ecology inherited much of its impetus from the physical sciences—an attempt to explain the workings of Nature by a set of mechanistic, quantifiable laws. Natural history began to be demoted in the eyes of some scientists because it was overly descriptive and insufficiently theoretical. Ernst Mayr, in *The Growth of Biological Thought*, notes that a well-known historian of Isaac Newton was dismissive of Darwin because the theory of evolution was developed largely on the basis of Darwin's field observations: "The naturalist is indeed a trained observer, but his observations differ from those of a gamekeeper only in degree, not in kind; his sole esoteric qualification is familiarity with systematic nomenclature." Mayr, however, repeatedly asserts the crucial—and underappreciated—contribution of natural history to modern evolutionary biology. "Anything," he

said, "that contributed to a flowering of natural history is part of the history of evolutionary biology."²³

While Linnaeus's work catapulted him from humble, rural origins to an insider in the royal councils of Sweden, Gilbert White died largely unknown. *The Natural History of Selbourne* lay unread for half a century. But when it was discovered around 1830, readers flocked to its pages. In fact, it became one of the best-loved books in the English language (by the mid-20th century it had appeared in over a hundred editions), helping establish the literary genre of the natural history essay in the process. By the middle of the 19th century Selbourne had become emblematic of a simpler, halcyon time when parson-naturalists gleefully bounded after life's simple pleasures—the observation and description of birds, butterflies, and flowers. As the Romantic movement was transplanted across the Atlantic, it came to fruition, especially in the person of Henry David Thoreau, who both pointed the way to a deeper-rooted philosophy of wild Nature, and further developed the nature essay as a mode of exploring it.²⁴

Confusion About "Nature"

Studying the history of Nature implies a clear understanding of what "nature" means. But people have never been clear about the meaning of this word, and the lack of clarity has led to conceptual confusion—with profound implications. The word "nature" derives from the Greek *phusis*, which referred to what a thing is like ("the nature of something"). Because *phusis* was employed in the questioning of the entire creation, it came to be equated with *cosmos*—the universe, or "everything." This larger meaning as the entire universe was eventually transferred to "nature." C.S. Lewis suggested that a coterie of Greek thinkers essentially *invented* nature ("Nature with a capital"). He referred to "nature in the dangerous sense," because it was the word most frequently used where not needed—the opposite of "everything," after all, is a vacuum. But the creation of this "conceptual container" for the entire world was the necessary precursor to a dualistic view of humans as separate from the rest of creation. Environmental philosopher Neil Evernden likened it to a fish discovering the concept "ocean"—for the first time the fish could conceive of itself as distinct from its medium. In the same way, "nature" allowed humans to stand back and feel apart from everything else in the world. In time, Nature came to mean the nonhuman world, as distinguished from the concerns and activities of people.²⁵

Postmodern deconstructionists, led by historian William Cronon, offer a contemporary twist to this confusion. Nature, they assert, is simply a cultural construction of the Euro-American



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elite. As such, it is undeserving of special consideration: why protect wilderness when it doesn't really exist? A chorus of rebuttals has sounded from other thinkers. Poet and essayist Gary Snyder, for example, confessed to "getting a bit grumpy about the dumb arguments being put forth by high-paid intellectual types in which they are trying to knock Nature, knock the people who value Nature, and still come out smelling smart and progressive." This seemingly academic issue becomes highly politicized when the deconstructionists denounce wilderness preservation, on the grounds that wilderness is an invalid intellectual fabrication. This argument provides a cloak of academic respectability for economic interests that would love to open more of the North American landscape to exploitation. If prominent environmentalists disagree about the value of Nature and wilderness, who can justify its preservation?²⁶ At the center of this debate lies this simple question: Is Nature something real, or just the contrived product of intellectuals? Of course, it is both. Natural history, with its focus on empirical observation, description, and comparison, offers a path out of this mental quagmire, a way to distinguish between living world and cultural artifact.

Honing a Definition

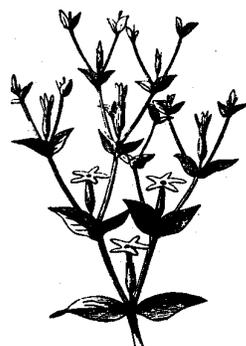
But just what *is* natural history? One would think that a clear meaning would have emerged during its two millennia lifetime. In fact, though, the term is only infrequently defined—and then somewhat inconsistently. Confusions about "nature" aside, the parameters of natural history remain fuzzy. Recall Pliny's original definition—the study of "the nature of things, that is, life." A contemporary museum director says natural history is "the study of nature over time."²⁷ One thing is clear: natural history is descriptive (both qualitatively and quantitatively) and based on direct observation. The subject of its description varies among natural historians, however.

The general historical trend has been a narrowing of the scope of natural history. In its earliest incarnations, natural history examined everything—organic and inorganic, human and nonhuman—that existed on or could be seen from planet Earth. Pliny's *Historia Naturalae* included people, bugs, gemstones, and stars. While some modern works²⁸ take a similar comprehensive approach, most focus on plants and animals, or some subset of these groups. Humans, regrettably, have been largely dropped from the realm of natural history. As with the word "nature" centuries earlier, humans were separated from the rest of creation.

It is instructive to look at recent books that describe themselves as works of natural history. Of the 15 contemporary natural history books I surveyed, only three bothered to define it. Richard Pimentel stated "natural history is the study of a single thing, nature Whether it is normally a science or an art is a matter of debate, but there is no doubt about its tremendous scope: all living and nonliving things, their activities, and interrelationships"²⁹ Mammalogist David Armstrong said, "Natural history is history in an old-time sense, not history as chronology but history as stories, in this case natural stories, the stories of nature mostly and not stories about people and their artifacts."³⁰ Allan Schoenherr simply states that "a natural history is an account of natural phenomena." Ever since the days of Aristotle and Pliny, he adds, "the expression 'natural history' has been used to refer to a description of living organisms, their habits, and how they relate to the environment."³¹ Marston Bates viewed natural history as an important subset of biology. He defined it as "the study of life at the level of the individual—of what plants and animals do, how they react to each other and their environment, how they are organized into larger groupings like populations and communities."³² Landscape ecologist Monica Turner observed that "ecology and natural history have a long tradition of interest in the spatial patterning and geographic distribution of organisms."³³ Works on particular biotic groups³⁴ share the following common characteristics: classification, geographic distribution, physical description, habitat, reproductive ecology; and, for animals, feeding relationships. Works on the natural history of particular places³⁵ cover a, similar set of concepts, some organized taxonomically and others ecologically.

As the definition of natural history narrowed, its relationship to ecology became murky. In the late 19th and early 20th centuries, scientists in quest of a new level of credibility wanted to distance themselves from the museum-stuffing habits of natural historians. One observer in the late 19th century commented that "natural history is encumbered by multitudes of facts which are recorded only because they are easy to record."³⁶

In the wake of Newton, such mundane work couldn't pass muster as rigorous science. Nevertheless, in 1927 Charles Elton began one of the first books on ecology with these two sentences: "Ecology is a new name for a very old subject. It simply means scientific natural history."³⁷ Similarly, Aldo Leopold, in 1938, proclaimed that "modern natural history deals only incidentally with the identity of plants and animals, and only incidentally with their habits and behaviors. It



deals principally with their relations to each other, their relation to the soil and water in which they grow, and their relations to the human beings who sing about 'my country' but see little or nothing of its inner workings. This new science of relationships is called ecology, but what we call it matters nothing."³⁸

But a patronizing attitude toward natural history among some modern ecologists is palpable. According to one science historian,³⁹ Darwin's ideas "stimulated a *more rigorous* approach to natural history" in the late 19th century (emphasis added). Another notes that by the beginning of the 20th century, practitioners of natural history often preferred to call themselves biologists, and that "the word *naturalist* was often used in a derogatory sense, usually prefixed with the word *oldfashioned*."⁴⁰ Today, says one biologist, natural history "is *maturing* to become ecology"⁴¹ (emphasis added). Even more striking, though, is how most modern ecologists act as if natural history never even existed. Recently, I checked ten standard ecology texts⁴²—not one even mentioned natural history. Similarly, neither *The Concise Oxford Dictionary of Ecology* nor *The Encyclopaedia of Ecology and Environmental Management* have entries for it.

One of the more useful frameworks for understanding the relationship between natural history and ecology was put forth by James Halfpenny and Roy Ozanne.⁴³ They describe ecology as a five-tiered pyramid, with a descriptive approach the foundation, and comparative, causal, experimental, and theoretical approaches, respectively, resting atop this base. According to Halfpenny and Ozanne, the lower two rungs (description and comparison) comprise natural history, while ecology is the entire pyramid. One of the values of this model is that it demonstrates that ecology *is*, in part, natural history. A limitation of the model is that it neglects the human element of natural history. Also useful is Paul Colinvaux's characterization of ecology as "the science that reasons why."⁴⁴ Natural history, by such a reckoning, asks "who," "what," "where," and "how many" questions. Without these, the "why" questions of ecology cannot even be conceived. Although this may be an artificial dichotomy, we see again that natural history is the foundation of ecology—the latter simply cannot exist without the former.

I would offer as a model a set of four partially overlapping circles, with natural history being the center circle and zone of overlap between three less inclusive circles—ecology, geology, and cultural anthropology (and the parent of all three). There is a proud tradition of a descriptive, comparative approach to studying humans and Nature as an integrated whole. Practitioners of natural history such as Charles Darwin and Alfred Russel Wallace did exactly

this sort of work. Great creative and scientific breakthroughs, such as the idea of natural selection proposed by these two men, derive more easily from a broad natural history approach than from a narrow experimental focus. Jacob Weiner points out that natural history is far from being soft science—in fact, most theoretical breakthroughs in ecology have been made by practitioners skilled in field natural history.⁴⁵

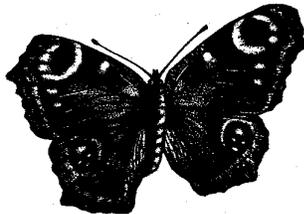
Rebraiding Two Fibers

Worster's two streams of ecology, imperial and arcadian, that began to diverge in the 18th century, yielded separate streams of natural history—scientific and literary. Scientific natural history became increasingly obsessed with cataloging biodiversity (a term not yet invented), and eventually metamorphosed into the newly labeled science of ecology. Meanwhile, a popular, literary version of natural history found a more artistic outlet. Beginning with Gilbert White and then Henry Thoreau, a people's natural history was given voice.⁴⁶

Literary nature writing blended three primary dimensions, in varying proportions: natural history information, personal responses to Nature, and philosophical interpretations of Nature.⁴⁷ In so doing, it became "a way of seeing the unseen."⁴⁸ As Thomas Lyon has observed, "a distinguishing mark of the nature essay ...is precisely the attempt to harmonize fact knowledge and emotional knowledge."⁴⁹ Literary naturalists in the 19th century, however, tended to write with an excess of "middleclass, middlebrow Euro-American" perspective, and "a rhetoric of beauty, harmony, and sublimity."⁵⁰ Writer Joyce Carol Oates famously criticized contemporary nature writing for similar sins, saying it still "inspires a painfully limited set of responses in 'nature writers'—reverence, awe, piety, mystical oneness."⁵¹

Unfortunately, literary and scientific natural history grew further and further apart during the past two centuries; as they split apart, both camps forfeited vigor. What had made natural history vibrant was the integration of science, art, and philosophy—a unified approach to understanding and expressing Nature's ways. Literary natural history lost scientific grounding, while scientific natural history drifted away from an honest acknowledgment of its subject's impact on human emotion. As literary naturalists became more flowery, the scientific natural historians seemingly sped to distance themselves from anything resembling literary grace, and instead emphasized more dry and analytical descriptions of natural processes.

Richard Nelson, cultural anthropologist and award-winning nature writer, reflected that reading the accounts of early 20th century





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naturalists was "a striking reminder of how desiccated and mechanical most scientific literature has become." These earlier naturalists, he noted, "not only wrote differently from the way biologists do today, they also had different goals. It was their purpose to observe nature as meticulously as possible, to acquire knowledge through direct experience, to rely principally on their senses as the source of information, and to publish their results in richly descriptive field reports."⁵² As scientific natural history, and its offshoot, ecology, focused increasingly on statistical analysis and lifeless prose, it lost its capacity to move the hearts and minds of ordinary readers.

We need to revitalize this venerable tradition of natural history, by going beyond a focus on mere cataloging and naming, and to once again allow natural history to be used as a basis for philosophical interpretation, as Aristotle did. To consciously seek a holistic view of Nature, as Humboldt did. To keep the broad, holistic approach to understanding Nature—including the living and nonliving worlds, the human and the nonhuman. To reunite literary and scientific natural history—to seamlessly stitch information, scientific interpretation, and human emotional response in an engaging package. To again recognize that natural history is the honest and honorable practice of learning as directly and expansively as possible from Nature.

Increasingly, laments for the loss of natural history can be heard. Reed Noss, for example, expressed concern in the professional journal *Conservation Biology* that "middle-aged biologists of today may be the last generation ... to have been taught serious natural history as part of their professional training." He worried, "Will the next generation of conservation biologists be nothing but a bunch of computer nerds with no firsthand knowledge of natural history? Does it follow that they will have no personal emotional ties to the land?"⁵³ Judging from the gush of affirmative letters in response—one of the largest outpourings in the history of the journal—Noss is not alone in this concern.

It is noteworthy that Aldo Leopold, the intellectual godfather of conservation biology, frequently deplored the loss of traditional natural history study. In 1938, he delivered an address at the University of Missouri on "Natural History—the Forgotten Science."⁵⁴ He criticized the new wave of science that increasingly took things apart, but failed to explain how they were connected. He bemusedly observed that, should we drop in "on a typical class in a typical zoology department, we [would] find there students memorizing the names of the bumps on the bones of a cat." It is important to study bones, he continued, "but why memorize the bumps?"⁵⁵ Curt Meine, Leopold's biographer, notes that he objected to the way science "relegated natural history to the dusty backroom at a time when society needed it most."⁵⁶

Two things are worth noting here. First, that six decades after Leopold made his comments on the forgotten science of natural history, it remains forgotten. Society's need for a revitalized natural history—a fusion of natural science and philosophy, propelled by literary grace—is more pressing than ever. And second, Leopold would never have exerted such towering influence had he not spent so much effort not only on science, but also on the craft of writing.⁵⁷ In the person of Aldo Leopold, scientific and literary natural history merged into a more powerful whole. More such mergings are urgently needed in these days of ecological crisis.

Poet and essayist Gary Snyder recently called for a "new nature poetics." Speaking to literati, he insisted that nature writing must become *nature literate*—that is, "know who's who and what's what in the ecosystem"—and *place literate*, "informed about local specifics on both ecological-biotic and sociopolitical levels" as well as social and environmental history.⁵⁸ The reverse could be seen as equally true: that scientists have a responsibility to communicate with clarity and passion, with heart as well as head. Whole stories of landscapes must be told. The tellers must be grounded in science and fluent in their native tongue.

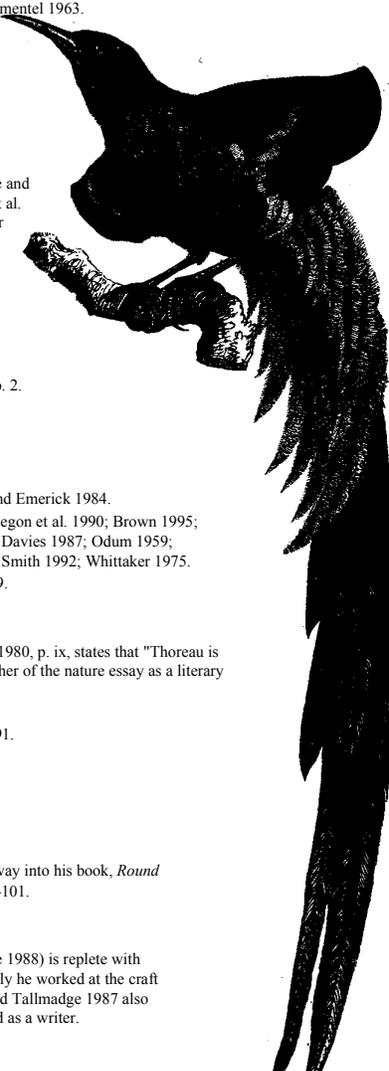
9.
My thanks to Walt Anderson, Tom Butler, Ellen Cole, Ed Grumbine, Joe Meeker, Gary Nabhan; Reed Noss, David Orr, John Tallmadge, and Saul Weisberg for their helpful feedback on these ideas.

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NOTES

1. Fleischner and Weisberg 1992.
2. Hughes 1983 and Callicott and Ames 1989 provide good starting points for looking at Native American and Asian approaches, respectively, to Nature.
3. Kerferd 1967; Glacken 1967, pp. 46-49.
4. Coonen 1977.
5. Oelschlaeger 1991, p. 59.
6. Aristotle 1965.
7. Glacken 1967, p. 47.
8. Durant 1961, p. 69.
9. The word "scientist" was coined in 1840 by the English philosopher and mathematician William Whewell, and "suggested a growing professional consciousness." See Worster 1977, p. 130.
10. H. Evans 1993, p. 2.
11. Mayr, p. 317; see, in general, Tamas 1991, pp. 91-221.
12. Berman 1981, p. 30.
13. H. Evans 1993, p. 10.
14. H. Evans 1993, p. 263.
15. Worster 1977, pp. 133-138; quotes are from pp. 133 and 135.
16. H. Evans 1993, pp. 62-64.
17. Mayr 1982, p. 397.

18. Mayr 1982, pp. 394-425; see George 1964 and McKinney 1972 for insight into Wallace's contributions.
19. Worster 1977, pp. 195-197, refers to Merriam's approach as "that critical step from one kind of geography to another"—from a simple catalogue of species to an attention to the habitats that largely prescribe where the species dwell. Phillips et al. 1989 (and most modern ecology textbooks) point out that this relationship is not as tidy as Merriam proposed. Nevertheless, his work made a lasting contribution to natural history and ecology.
20. Worster 1977, pp. 2-55.
21. Worster 1977, p. 31.
22. Tamas 1991, pp. 248-323; Collingwood 1960.
23. Mayr 1982, pp. 14-15, 317.
24. Oelschlaeger 1991, pp. 133-171; Worster 1977, pp. 59-76.
25. See Evernden 1992, pp. 18-20 and 88-90; see also Collingwood 1960, pp. 43-44. Evernden's entire book is essential reading for penetrating this issue of "the social construction of nature."
26. The opening salvo by the deconstructionists was Cronon 1995. A flurry of responses have followed—see Soule and Lease 1995; Rothenberg 1996; Worster 1997; and the theme issue of *Wild Earth* on "Opposing Wilderness Deconstruction." Especially noteworthy in this issue are Sessions 1996; Snyder 1996 (the source of the quote); Waller 1996; and Willers 1996. This controversy, largely in the hands of humanistic scholars, has an analogue in the more scientific debate concerning the role of indigenous North Americans in unraveling pristine Nature. Here, too, revisionists argue that because there is no such thing as pristine Nature, land preservation strategies are misguided. See C. Kay 1994.
27. J. Mary Taylor, Director of the Cleveland Museum of Natural History, in Kempthorne-Snow 1995.
28. Palmer and Fowler 1975; Pimentel 1963.
29. Pimentel 1963, p. vii.
30. Armstrong, p. v, in Mutel and Emerick 1984.
31. Schoenherr 1992, p. ix.
32. Bates 1990, p. 7.
33. M. Turner 1989.
34. P. Evans 1987; MacGinnitie and MacGinnitie 1968; Maser et al. 1984; Peattie 1953; Scheffer 1976; Findley 1987, Forbush and May 1955.
35. Bums 1960; Mathews 1988; Mutel and Emerick 1984; Schoenherr 1992; Storer and Usinger 1963; Trimble 1989.
36. Miall 1897, in Elton 1927, p. 2.
37. Elton 1927, p. 1.
38. Leopold 1991, p. 99.
39. Kingsland 1991.
40. H. Evans 1993, p. 263.
41. Armstrong, p. v, in Mutel and Emerick 1984.
42. Allen and Hoekstra 1992; Begon et al. 1990; Brown 1995; Colinvaux 1993; Krebs and Davies 1987; Odum 1959; Ricklefs 1997; Smith 1974; Smith 1992; Whittaker 1975.
43. Halfpenny and Ozanne 1989.
44. Colinvaux 1978, pp. 5-9.
45. Weiner 1995.
46. Lyon 19-9a, p. 24; Brooks 1980, p. ix, states that "Thoreau is generally considered the father of the nature essay as a literary form."
47. Lyon 1989a, p. 3.
48. Tallmadge 1997, pp. 190-191.
49. Lyon 1989b, p. 3.
50. Snyder 1995, p. 163.
51. Oates 1986, p. 236.
52. R. Nelson 1991, p. 161.
53. Noss 1996.
54. This speech later found its way into his book, *Round River-Leopold* 1991, pp. 92-101.
55. Leopold 1991, p. 96.
56. Meine 1988, p. 383.
57. Leopold's biography (Meine 1988) is replete with descriptions of how diligently he worked at the craft of writing. Ribbens 1987 and Tallmadge 1987 also provide insight into Leopold as a writer.
58. Snyder 1995, p. 171.



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