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II

**Disciplinary
Connections: Scientific
Slouching Across
a Misconceived Divide**

No Science Without Fancy,
No Art Without Facts:
The Lepidoptery
of Vladimir Nabokov

The Paradox of Intellectual Promiscuity

NO ONE EVER ACCUSED FRANCIS BACON OF MODESTY, BUT when England's lord chancellor proclaimed his "great instauration" of human understanding and vowed to take all knowledge as his province, the stated goal did not seem ludicrously beyond the time and competence of a great thinker in Shakespeare's age. But as knowledge exploded, and then fragmented into disciplines with increasingly rigid and self-policed boundaries, the restless scholar who tried to operate in more than one domain became an object of suspicion—either a boastful pretender across the board ("jack of all and master of none," in the old cliché), or a troublesome dilettante

in an alien domain, attempting to impose the methods of his genuine expertise upon inappropriate subjects in a different world.

We tend toward benign toleration when great thinkers and artists pursue disparate activities as a harmless hobby, robbing little time from their fundamental achievements. Goethe (and Churchill, and many others) may have been lousy Sunday painters, but Faust and Werther suffered no neglect thereby. Einstein (or so I have heard from people with direct experience) was an indifferent violinist, but his avocation fiddled little time away from physics.

However, we grieve when we sense that a subsidiary interest stole precious items from a primary enterprise of great value. Dorothy Sayers's later theological writings may please aficionados of religion, but most of her devout fans would have preferred a few more detective novels featuring the truly inimitable Lord Peter Wimsey. Charles Ives helped many folks by selling insurance, and Isaac Newton must have figured out a thing or two by analyzing the prophetic texts of Daniel, Ezekiel, and Revelation—but, all in all, a little more music or mathematics might have conferred greater benefit upon humanity.

Therefore, when we recognize that a secondary passion took substantial time from a primary source of fame, we try to assuage our grief over lost novels, symphonies, or discoveries by convincing ourselves that a hero's subsidiary love must have informed or enriched his primary activity—in other words, that the loss in quantity might be recompensed by a gain in quality. But such arguments may be very difficult to formulate or sustain. In what sense did Paderewski become a better pianist by serving as prime minister of Poland (or a better politician by playing his countryman Chopin)? How did a former career in major-league baseball improve (if we give a damn, in this case) Billy Sunday's evangelical style as a stump preacher? (He sometimes began sermons—I am not making this up—by sliding into the podium as an entering gesture.)

No modern genius has inspired more commentary in this mode than Vladimir Nabokov, whose "other" career as a taxonomist of butterflies has inspired as much prose in secondary criticism as Nabokov ever lavished upon Ada, Lolita, and all his other characters combined. In this case in particular—because Nabokov was no dilettante spending a few harmless Sunday hours in the woods with his butterfly net, but a serious scientist with a long list of publications and a substantial career in entomology—we crave some linkage between his two lives, some way to say to ourselves, "We may have lost several novels, but Nabokov spent his entomological time well, developing a vision and approach that illuminated, or even transformed, his literary work." (Of course, speaking parochially, professional taxonomists, including the author of this

essay, might regret even more the loss of several monographs implied by Nabokov's novels!)

To allay any remaining suspicions among the literati, let me assure all readers about a consensus in my professional community: Nabokov was no amateur (in the pejorative sense of the term), but a fully qualified, clearly talented, duly employed professional taxonomist, with recognized "world class" expertise in the biology and classification of a major group, the Latin American *Polyommatus*, popularly known to butterfly aficionados as "blues."

No passion burned longer, or more deeply, in Nabokov's life than his love for the natural history and taxonomy of butterflies. He began in early childhood, encouraged by a traditional interest in natural history among the upper-class intelligentsia of Russia (not to mention the attendant economic advantages of time, resources, and opportunity). Nabokov stated in a 1962 interview (Zimmer, page 216): "One of the first things I ever wrote in English was a paper on *Lepidoptera* I prepared at age twelve. It wasn't published because a butterfly I described had been described by someone else." Invoking a lovely entomological metaphor in a 1966 interview, Nabokov spoke of childhood fascination, continuous enthusiasm throughout life, and regret that political realities had precluded even more work on butterflies (Zimmer, page 216):

But I also intend to collect butterflies in Peru or Iran before I pupate. . . . Had the Revolution not happened the way it happened, I would have enjoyed a landed gentleman's leisure, no doubt, but I also think that my entomological occupations would have been more engrossing and energetic and that I would have gone on long collecting trips to Asia. I would have had a private museum.

Nabokov published more than a dozen technical papers on the taxonomy and natural history of butterflies, mostly during his six years of full employment as Research Fellow (and unofficial curator) in Lepidoptery at the Museum of Comparative Zoology at Harvard University, where he occupied an office three floors above the laboratory that has been my principal scientific home for thirty years. (I arrived twenty years after Nabokov's departure and never had the pleasure of meeting him, although my knowledge of his former presence has always made this venerable institution, built by Louis Agassiz in 1859 and later tenanted by several of the foremost natural historians in America, seem even more special.)

Nabokov worked for Harvard, at a modest yearly salary of about one thousand dollars, between 1942 and 1948, when he accepted a teaching post in liter-

ature at Cornell University. He was a respected and recognized professional in his chosen field of entomological systematics. The reasons often given for attributing to Nabokov either an amateur, or even only a dilettante's, status arise from simple ignorance of accepted definitions for professionalism in this field.

First, many leading experts in various groups of organisms have always been "amateurs" in the admirable and literal (as opposed to the opposite and pejorative) sense that their love for the subject has inspired their unparalleled knowledge, and that they do not receive adequate (or any) pay for their work. (Taxonomy is not as expensive, or as laboratory-driven, as many scientific fields. Careful and dedicated local observation from childhood, combined with diligence in reading and study, can supply all the needed tools for full expertise.)

Second, poorly remunerated and inadequately titled (but full-time) employment has, unfortunately, always been *de rigueur* in this field. The fact that Nabokov worked for little pay, and with the vague title Research Fellow, rather than a professorial (or even a curatorial) appointment, does not imply nonprofessional status. When I took my position at the same museum in 1968, several heads of collections, recognized as world's experts with copious publications, worked as "volunteers" for the symbolic "dollar a year" that gave them official status on the Harvard payroll.

Third, and most important, I do not argue that all duly employed taxonomists can claim enduring expertise and righteous status. Every field includes some clunkers and nitwits, even in high positions! I am not, myself, a professional entomologist (I work on snails among the Mollusca), and therefore cannot judge Nabokov's credentials on this crucial and final point. But leading taxonomic experts in the large and complex group of "blues" among the butterflies testify to the excellence of his work, and grant him the ultimate accolade of honor within the profession by praising his "good eye" for recognizing the (often subtle) distinctions that mark species and other natural groups of organisms (see the bibliography to this essay for two articles by leading butterfly taxonomists: Remington; and Johnson, Whitaker, and Balint). In fact, as many scholars have stated, before Nabokov achieved a conventional form of literary success with the publication of *Lolita*, he could have been identified (by conventional criteria of money earned and time spent) as a professional lepidopterist and amateur author!

In conjunction with this collegial testimony, we must also note Nabokov's own continual (and beautifully stated) affirmation of his love and devotion to all aspects of a professional lepidopterist's life. On the joys of fieldwork and collecting, he effuses in a letter to Edmund Wilson in 1942 (quoted in Zimmer, page 30): "Try, Bunny, it is the noblest sport in the world." Of the tasks tradi-

tionally deemed more dull and trying—the daily grind of the laboratory and microscope—he waxed with equal ardor in a letter to his sister in 1945, in the midst of his Harvard employment (in Zimmer, page 29):

My laboratory occupies half of the fourth floor. Most of it is taken up by rows of cabinets, containing sliding cases of butterflies. I am custodian of these absolutely fabulous collections. We have butterflies from all over the world. . . . Along the windows extend tables holding my microscopes, test tubes, acids, papers, pins, etc. I have an assistant, whose main task is spreading specimens sent by collectors. I work on my personal research . . . a study of the classification of American "blues" based on the structure of their genitalia (minuscule sculpturesque hooks, teeth, spurs, etc., visible only under the microscope), which I sketch in with the aid of various marvelous devices, variants of the magic lantern. . . . My work enraptures but utterly exhausts me. . . . To know that no one before you has seen an organ you are examining, to trace relationships that have occurred to no one before, to immerse yourself in the wondrous crystalline world of the microscope, where silence reigns, circumscribed by its own horizon, a blindingly white arena—all this is so enticing that I cannot describe it.

Nabokov worked so long and so intensely in grueling and detailed observation of tiny bits of insect anatomy that his eyesight became permanently compromised—thus placing him in the company of several of history's most famous entomologists, especially Charles Bonnet in the eighteenth century and August Weismann in the nineteenth, who sacrificed their sight to years of eye-straining work. In a television interview in 1971, Nabokov stated (Zimmer, page 29):

Most of my work was devoted to the classification of certain small blue butterflies on the basis of their male genitalic structure. These studies required the constant use of a microscope, and since I devoted up to six hours daily to this kind of research my eyesight was impaired forever; but on the other hand, the years at the Harvard Museum remain the most delightful and thrilling in all my adult life.

Nonetheless, and as a touching, final testimony to his love and dedication to entomology, Nabokov stated in a 1975 interview (Zimmer, page 218) that his

enthusiasm would still pull him inexorably in (“like a moth to light” one is tempted to intone) if he ever allowed impulse to vanquish bodily reality:

Since my years at the Museum of Comparative Zoology in Harvard, I have not touched a microscope, knowing that if I did, I would drown again in its bright well. Thus I have not, and probably never shall, accomplish the greater part of the entrancing research work I had imagined in my young mirages.

Thus, in conclusion to this section, we cannot adopt the first solution to “the paradox of intellectual promiscuity” by arguing that Nabokov’s lepidoptery represents only the harmless diversion of an amateur hobbyist, ultimately stealing no time that he might realistically have spent writing more novels. Nabokov loved his butterflies as much as his literature. He worked for years as a fully professional taxonomist, publishing more than a dozen papers that have stood the test of substantial time.

Can we therefore invoke the second solution by arguing that time lost to literature for the sake of lepidoptery nonetheless enhanced his novels, or at least distinguished his writing with a brand of uniqueness? I will eventually suggest a positive answer, but by an unconventional argument that exposes the entire inquiry as falsely parsed. I must first, however, show that the two most popular versions of this “second solution” cannot be defended, and that the paradox of intellectual promiscuity must itself be rejected and identified as an impediment to proper understanding of the relationships between art and science.

Two False Solutions to a Nonproblem

In surveying commentaries written by literary scholars and critics about Nabokov’s work on butterflies, I have been struck by their nearly universal adherence to either of two solutions for the following supposed conundrum: Why did one of the greatest writers of our century spend so much time working and publishing in a markedly different domain of such limited interest to most of the literate public?

The Argument for Equal Impact

In this first solution, Nabokov’s literary fans may bemoan their losses (just as any lover of music must lament the early deaths of Mozart and Schubert). Still, in seeking some explanation for legitimate grief, we may find solace in claim-

ing that Nabokov’s transcendent genius permitted him to make as uniquely innovative and distinctive a contribution to lepidoptery as to literature. However much we may wish that he had chosen a different distribution for his time, we can at least, with appropriate generosity, grant his equal impact and benefit upon natural history. Adherents to this solution have therefore tried to develop arguments for regarding Nabokov’s lepidoptery as specially informed by his general genius, and as possessing great transforming power for natural history.

But none of these claims can be granted even a whisper of plausibility by biologists who know the history of taxonomic practice and evolutionary theory. Nabokov, as documented above, was a fully professional and highly competent taxonomic specialist on an important group of butterflies—and for this fine work he gains nothing but honor in my world. However, no natural historian has ever viewed Nabokov as an innovator, or as an inhabitant of what humanists call the “vanguard” (not to mention the *avant-garde*) and scientists the “cutting edge.” Nabokov may have been a major general of literature, but he can only be ranked as a trustworthy, highly trained career infantryman in natural history.

Vladimir Nabokov practiced his science as a conservative specialist on a particular group of organisms, not in any way as a theorist or a purveyor of novel ideas or methods. He divided and meticulously described; he did not unify or generalize. (I will explain in the next section why a natural historian can make such a judgment without intending any condescension or lack of respect.) Nonetheless, four arguments have been advanced again and again by literary commentators who seem driven by a desire to depict Nabokov as a revolutionary spirit in natural history as well.

1. *The myth of innovation.* Many critics have tried, almost with an air of desperation, to identify some aspect of Nabokov’s methodology that might be labeled as innovative. But taxonomic professionals will easily recognize these claims as fallacious—for the putative novelty represents either a fairly common (if admirable) practice, or else an idiosyncrasy (a “bee in the bonnet”) that Nabokov surely embraced with great ardor, but that cannot be regarded as a major issue of scientific importance.

As a primary example, many critics have stressed Nabokov’s frequent complaints about scientists who fail to identify the original describers when citing the formal Latin name of a butterfly—either in listing species in popular field guides, or in identifying subspecies in technical publications. Zimmer (page 10), for example, writes: “A growing number of non- and semi-scientific publica-

tions nowadays omit the author. Nabokov called it 'a deplorable practice of commercial origin which impairs a number of recent zoological and botanical manuals in America.'

By the rules of nomenclature, each organism must have a binomial designation consisting of a capitalized genus name (*Homo*) and a lowercase "trivial" name (*sapiens*), with the two together forming the species name (*Homo sapiens*). (Linnaean taxonomy is called "binomial" in reference to these two parts of a species's name.) It is also customary, but not required, to add (not in italics) the name of the first describer of the species after the binomial designation—as in *Homo sapiens* Linnaeus. This custom certainly helps specialists by permitting easier tracing of the history of a species's name. But this practice is also extremely time-consuming (locating the original describer is often tedious and difficult; I don't know the first authors for several of the snail species most central to my own research). Moreover, when hundreds of names are to be listed (as in popular field guides), rigid adherence to this custom requires a great deal of space for rather limited benefit.

Therefore, popular publications (especially the manuals of Nabokov's ire above) generally omit the names of describers. In addition, and for the same reason, technical publications often compromise by including describers' names for species, but omitting them for subspecies (trinomial names for geographically defined subgroups within a species). Honorable people can argue either side of this issue; I tend to agree with Nabokov's critics in this case—but I cannot generate much personal passion over this relatively minor issue.

In another example, Boyd (*The American Years*, page 128) praises Nabokov's methods: "Nabokov's mode of presentation was ahead of his time. Instead of showing a photograph of a single specimen of a butterfly species or a diagram of the genitalia of a single specimen, he presented when necessary a range of specimens of certain subspecies in nine pages of crowded plates." Here I side entirely with Nabokov and his proper recognition of natural history's primary subject matter: variation and diversity at all levels. But Nabokov did not proceed in either a unique or an unusually progressive manner in illustrating multiple specimens (I rather suspect that his decision reflected his fussy and meticulous thoroughness more than any innovative theoretical vision about the nature of variation.) This issue has provoked a long history of discussion and varying practice in taxonomy—and many other specialists have stood with Nabokov on the right side (as I would say) of this question.

2. *The myth of courage.* As an adjunct (or intensification) to claims for innovation, many literary critics have identified Nabokov as theoretically coura-

geous (and forward-looking) in his expressed doubts about Darwinian orthodoxies, particularly on the subject of adaptive value for patterns of mimicry in butterfly wings.

In this context, a remarkable passage from *Speak, Memory* has often been cited. Nabokov apparently wrote, but never published, an extensive scientific article (see Remington, page 282) in an attempt to refute natural selection as the cause of mimicry by denying the purely adaptive value of each component of resemblance. (Darwinians have assumed that mimicry—the evolution, in one butterfly species, of striking resemblance, generally in color patterns of the wings, to another unrelated form—arises for adaptive benefit, usually for permitting a "tasty" species to gain protection by simulating a noxious species that predators have learned to avoid). This paper has been lost, except for the following fragment that Nabokov included in *Speak, Memory*:

"Natural selection," in the Darwinian sense, could not explain the miraculous coincidence of imitative aspect and imitative behavior, nor could one appeal to the theory of "the struggle for life" when a protective device was carried to a point of mimetic subtlety, exuberance, and luxury far in excess of a predator's power of appreciation. I discovered in nature the nonutilitarian delights that I sought in art. Both were a form of magic, both were a game of intricate enchantment and deception.

An understandable prejudice of intellectual life leads us to view tilers at orthodoxy as courageous front-line innovators. Nonetheless, one may also attack a common view for opposite reasons of conservative allegiance to formerly favored ideas. On Nabokov's forcefully expressed doubts about Darwinian interpretations of mimicry, two observations identify his stance as more traditionally conservative than personally innovative or particularly courageous. First, when Nabokov wrote his technical papers in the 1940s, the modern Darwinian orthodoxy had not yet congealed, and a Nabokovian style of doubt remained quite common among evolutionary biologists, particularly among taxonomists immersed in the study of anatomical detail and geographic variation (see Robson and Richards, 1936, for the classic statement; see Gould, 1983, and Provine, 1986, for documentation that a hard-line Darwinian orthodoxy only coalesced later in the 1950s and 1960s). Thus Nabokov's views on mimicry represent a common attitude among biologists in his time, a perspective linked more to earlier consensuses about non-Darwinian evolution than to legitimate modern challenges. (I am, by the way and for my sins, well recog-

nized, and often reviled, for my own doubts about Darwinian orthodoxies, so I do not make this judgment of Nabokov while acting as *defensor fidei*.)

Second, although we must always struggle to avoid the primary error of historiography—the anachronistic use of later conclusions to judge the cogency of an earlier claim—in assessing Nabokov's views on mimicry, we may still fairly note that Nabokov's convictions on this subject have not withstood the standard scientific test of time (*veritas filia temporis*, to cite Bacon once again). The closing words of a world's expert on the evolutionary biology of butterflies, and a firm admirer of Nabokov's science, may be cited here. My colleague Charles Lee Remington writes (page 282):

Impressive though the intellectual arguments are . . . it would be unreasonable to take them very seriously in science today. Mimicry and other aspects of adaptive coloration and shape involve such superb and elaborate resemblances that various biologists had questioned the Darwinian explanations during the early decades of this century. Subsequent publication of so many elegant experimental tests of mimicry and predator learning . . . and color-pattern genetics . . . has caused the collapse of the basic challenges, in my view as a specialist in the field. However, I do guess that Nabokov had such a strong metaphysical investment in his challenge to natural selection that he might have rejected the evolutionary conclusions for his own satisfaction. He was an excellent naturalist and could cite for himself very many examples of perfect resemblances, but he may have been too untrained in the complexities of modern population genetics.

Finally, I must also note that several other prime components of Nabokov's biological work would now be viewed as superseded rather than prescient, and would also be judged as a bit antiquated in their own time, rather than innovative or even idiosyncratic. In particular, as a practical taxonomist, Nabokov advocated a definition of species based only on characters preserved in specimens of museum collections. Today (and, for the most part, in Nabokov's time as well), most evolutionary biologists would strongly insist that species be recognized as “real” and discrete populations in nature, not as units defined by identifiable traits in artificially limited data of human collections. Many species owe their distinction to genetic and behavioral features that maintain the cohesion of a population in nature, but may not be preserved in museum specimens. Nonetheless, Nabokov explicitly denied that such populations should be recog-

nized as species—a view that almost all naturalists would now reject. Nabokov wrote in one of his technical papers (cited in Zimmer, page 15): “For better or worse our present notions of species in Lepidoptera is based solely on the checkable structure of dead specimens, and if Forster's Furry cannot be distinguished from the Furry Blue except by its chromosome number, Forster's Furry must be scrapped.”

3. *The myth of artistry.* Nabokov made many drawings of butterflies, both published, and as charming, often fanciful illustrations in copies of his books presented to friends and relatives, especially to his wife, Vera. These drawings are lovely, and often quite moving in their sharp outlines and naïve brightnesses—but, putting the matter diplomatically, the claim (sometimes made) that these drawings should be judged either as unusual in their accuracy or as special in their beauty can only be labeled as kindly hagiographical, especially in the light of a truly great tradition for wonderful and sensitive art among the best natural history illustrators, from Maria Merian to Edward Lear (who wrote limericks as a hobby, but worked as a skilled illustrator for a profession).

4. *The myth of literary quality.* Some critics, recognizing the merely conventional nature of Nabokov's excellence in taxonomy, have stated that, at least, he wrote his non-innovative descriptions in the most beautifully literate prose ever composed within the profession. Zaleski (page 36), for example, extolls Nabokov for writing, in technical papers, “what is surely the most polished prose even applied to butterfly studies.” Again, such judgments can only be subjective—but I have spent a career reading technical papers in this mode, while applying at least a serious amateur's eye to literary style and quality. Nabokov's descriptive prose flows well enough, but I find nothing distinctive in his contributions to this highly restricted genre, where rules and conventions of spare and “objective” writing offer so little opportunity to spread one's literary wings.

The Argument for Literary Illumination

Once we debunk, for Nabokov's case, two false solutions to the paradox of intellectual promiscuity—the argument, refuted above, that his lepidoptery represented a harmless private passion, robbing no substantial time from his literary output; and the claim, rejected in the first part of this section, that his general genius at least made his lepidoptery as distinctive and as worthy as his literature—only one potential source for conventional solace remains: the proposition that although time spent on lepidoptery almost surely decreased his

literary output, the specific knowledge and the philosophical view of life that Nabokov gained from his scientific career directly forged (or at least strongly contributed to) his unique literary style and excellence.

We can cite several important precedents for such a claim. Jan Swammerdam, the greatest entomologist of the seventeenth century, devoted the last part of his life to evangelical Christianity, claiming that a fundamental entomological metaphor had directed his developing religious views: the life cycle of a butterfly as an emblem for the odyssey of a Christian soul, with the caterpillar (larva) representing our bodily life on earth, the pupa denoting the period of the soul's waiting after bodily death, and the butterfly marking a glorious resurrection.

In another example, one that would be viewed as more fruitful by most contemporary readers, Alfred Kinsey spent twenty years working as an entomologist on the taxonomy of the gall-wasp *Cynips* before turning to the surveys of human sexual behavior that would mark his notoriety as a pivotal figure in the social history of the twentieth century. In a detailed preface to his first great treatise, *Sexual Behavior in the Human Male* (1948), Kinsey explained how a perspective gained from insect taxonomy upon the nature of populations—particularly the copious variation among individuals, and the impossibility of marking one form as normal and the others as deviant—had directly informed and inspired his research on sexual behavior. Kinsey wrote:

The techniques of this research have been taxonomic, in the sense in which modern biologists employ the term. It was born out of the senior author's longtime experience with a problem in insect taxonomy. The transfer from insect to human material is not illogical, for it has been a transfer of a method that may be applied to the study of any variable population.

We know that Nabokov made continual and copious reference to entomological subjects, particularly to butterflies, in all his literary productions—in passages ranging from the minutely explicit to the vaguely cryptical, to the broadly general. Several scholars have tabulated and annotated this rich bounty. Nabokov's critics could therefore scarcely avoid the potential hypothesis, especially given the precedents of Swammerdam and Kinsey, that Nabokov's lepidoptery shaped his literature in direct and crucial ways.

Literary scholars have often ventured such a claim, particularly by asserting that Nabokov used his knowledge of insects as a rich source for metaphors and symbols. In the strongest version, most, if not nearly all, citations of butterflies

convey a level of deep symbolic meaning in Nabokov's prose. For example, Joann Karges wrote in her book on Nabokov's Lepidoptera (cited in Zimmer, page 8): "Many of Nabokov's butterflies, particularly pale and white ones, carry the traditional ageless symbol of the anima, psyche, or soul . . . and suggest the evanescence of a spirit departed or departing from the body."

Two arguments, one a specific denial of this search for symbolism, and the other a more general statement about art and science, strongly refute this last hope for the usual form of literary solace in Nabokov's dedication to science—a claim that the extensive time thus spent strongly improved his novels. For the first (quite conclusive and specific) argument, Nabokov himself vehemently insisted that he not only maintained no interest in butterflies as literary symbols, but that he would also regard such usage as a perversion and desecration of his true concerns. (Artists, and all of us, of course, have been known to dissemble, but I see no reason to gainsay Nabokov's explicit and heartfelt comments on this subject.) For example, he stated in an interview (quoted in Zimmer, page 8): "That in some cases the butterfly symbolizes something (e.g., *Psyche*) lies utterly outside my area of interest."

Over and over again, Nabokov debunks symbolic readings in the name of respect for factual accuracy as a primary criterion. For example, he criticizes Poe's symbolic invocation of the death's-head moth because Poe didn't describe the animal and, even worse, because he placed the species outside its true geographic range: "Not only did he [Poe] not visualize the death's-head moth, but he was also under the completely erroneous impression that it occurs in America" (in Zimmer, page 186). Most tellingly, in a typical Nabokovian passage in *Ada*, he playfully excoriates Hieronymus Bosch for including a butterfly as a symbol in his *Garden of Earthly Delights*, but then depicting the wings in reverse by painting the gaudy top surface on an insect whose folded wings should be displaying the underside!

A tortoiseshell in the middle panel, placed there as if settled on a flower—mark the "as if," for here we have an example of exact knowledge of the two admirable girls, because they say that actually the *wrong* side of the bug is shown, it should have been the underside, if seen, as it is, in profile, but Bosch evidently found a wing or two in the corner cobweb of his casement and showed the prettier upper surface in depicting his incorrectly folded insect. I mean I don't give a hoot for the esoteric meaning, for the myth behind the moth, for the masterpiece-baiter who makes Bosch express some bosh of his time, I'm allergic to allegory.

Finally, when Nabokov does cite a butterfly in the midst of a metaphor, he attributes no symbolic meaning to the insect, but only describes an accurate fact to carry his more general image. For example, he writes in *Mary* (cited in Zimmer, page 161): “Their letters managed to pass across the terrible Russia of that time—like a cabbage white butterfly flying over the trenches.”

Second, and more generally, if we wish to argue that Nabokov’s lepidoptery gave direct substance, or set the style, of his literature, then we must face a counterclaim—for the best case of explicit linkage led Nabokov into serious error. (And I surely will not propagate the smug scientist’s philistine canard that literary folks should stick to their lasts and leave us alone because they always screw up our world with their airy-fairy pretensions and insouciance about accuracy.) If I wanted to advance a case for direct linkage, I would have to emphasize a transfer from Nabokov’s artistic vision to his science, not vice versa—unfortunately, in this instance, to the detriment of natural history. Nabokov frequently stated that his non-Darwinian interpretation of mimicry flowed directly from his literary attitude—as he tried to find in nature “the nonutilitarian delights that I sought in art” (see page 37 for a full citation of this passage). And, as argued previously, this claim represents the most serious general error in Nabokov’s scientific writing.

The Solution of Accuracy

In standard scientific practice, when tests of a favored hypothesis have failed, and one is beating one’s head against a proverbial wall, the best strategy for reclaiming a fruitful path must lie in the empirical record, particularly in scrutinizing basic data for hints of a pattern that might lead to a different hypothesis. In Nabokov’s case, both his explicit statements and his striking consistency of literary usage build such a record and point clearly to an alternative solution. The theme has not been missed by previous critics, for one can hardly fail to acknowledge something that Nabokov emphasized so forcefully. But I feel that most published commentary on Nabokov’s lepidoptery has failed to grasp the centrality of this argument as a primary theme for understanding his own concept of the relationship between his literary and scientific work—primarily, I suppose, because we have been befogged by a set of stereotypes about conflict and difference between these two great domains of human understanding.

Conventional solutions fail because they have focused on too specific a level—that is, to the search for how one domain, usually science in this case, impacted the other. But the basic source of relationship may be hiding at a

deeper level (deeper, that is, in a geometric sense, not in any claim about morality or greater importance). Perhaps the major linkage of science and literature lies in some distinctive, *underlying* approach that Nabokov applied *equally* to both domains—a procedure that conferred the same special features upon *all* his efforts. In this case we should not posit a primary and directional impact of one domain upon the other. Rather, we should investigate the hypothesis that Nabokov’s art and science both benefited, in like measure, from his application of a method, or a mode of mental functioning, that exemplifies the basic character of his particular genius.

All natural historians know that “replication with difference” builds the best test case for a generality—for how can we prove a coordinating hypothesis unless we can apply it to multiple cases, and how can we be confident in our conclusion unless these cases be sufficiently different in their immediate context to demonstrate that any underlying commonality must lie in a single mental approach applied to disparate material? Among great twentieth-century thinkers, I know no better case than Nabokov’s for testing the hypothesis that an underlying unity of mental style (at a level clearly meriting the accolade of genius) can explain one man’s success in extensive and fully professional work in two disciplines conventionally viewed as maximally different, if not truly opposed. If we can validate this model for attributing interdisciplinary success to a coordinating and underlying mental uniqueness, rather than invoking the conventional argument about overt influence of one field upon another, then Nabokov’s story may teach us something important about the unity of creativity, and the falsity (or at least the contingency) of our traditional separation, usually in mutual recrimination, of art from science.

Above all else—and why should we not take him at his word?—Nabokov vociferously insisted that he cherished meticulous accuracy in detail as the defining feature of all his productions (as illustrated in the passage quoted on page 41 from *Ada*). All commentators have noted these Nabokovian claims (for one could hardly fail to mention something stated so frequently and forcefully by one’s principal subject). Previous critics have also recognized that a commitment to detailed accuracy not only defines Nabokov’s maximally rich and meticulously careful prose, but might also be greatly valued for professional work in the description of butterfly species. Unfortunately, however, most commentary then follows a lamentable stereotype about science (particularly for such “low status” fields as descriptive natural history), and assumes that Nabokov’s commitment to accuracy must have imposed opposite qualities upon his work in these two professions—thus, and again lamentably, reinforcing the conventional distinction of art and science as utterly different and generally

opposed. Such detail, we are told, enriches Nabokov's literature, but also brands his science as pedestrian, unimaginative, and "merely" descriptive (as in the cliché about folks who never see forests because they only focus on distinctive features of individual trees). The stereotype of the taxonomist as a narrow-minded, bench-bound pedant then reconfirms this judgment. Zaleski (page 38), for example, sums up his article on Nabokov's lepidoptery by writing:

In both books and butterflies, Nabokov sought ecstasy, and something beyond. He found it in the worship of detail, in the loving articulation of organic flesh and organized metaphor. . . . He was perfectly suited as a master novelist and a laboratory drudge.

Zaleski goes on to report that Nabokov importuned his Cornell students with a primary motto: "Caress the details, the divine details." "In high art and pure science," he stated, "detail is everything." Indeed, Nabokov often praised the gorgeous detail of meticulous taxonomic language as inherently literary in itself, speaking of "the precision of poetry in taxonomic description" (in Zimmer, page 176). He also, of course, extolled precision in anatomical description for its scientific virtue. He wrote a letter to Pyke Johnson in 1959, commenting upon a proposed jacket design for his *Collected Poems* (cited in Remington, page 275):

I like the two colored butterflies on the jacket but they have the bodies of ants, and no stylization can excuse a simple mistake. To stylize adequately one must have complete knowledge of the thing. I would be the laughing stock of my entomological colleagues if they happened to see these impossible hybrids.

In reading through all Nabokov's butterfly references (in his literary works) as preparation for writing this essay, I was struck most of all by his passion for accuracy in every detail of anatomy, behavior, or location. Even his poetical or metaphorical descriptions capture a common visual impression—as when he writes in "The Aurelian," a story from 1930, about "an oleander hawk [moth] . . . its wings vibrating so rapidly that nothing but a ghostly nimbus was visible about its streamlined body." Even his occasional fantasies and in-jokes, accessible only to a few initiates (or readers of such study guides as Zimmer's) build upon a strictly factual substrate. For example, Nabokov thought he had discovered a new species of butterfly during his Russian boyhood. He wrote a description in English and sent the note to a British entomologist for publica-

tion. But the English scientist discovered that Nabokov's species had already been named in 1862 by a German amateur collector named Kretschmar, in an obscure publication. So Nabokov bided his time and finally chose a humorous form of revenge in his novel *Laughter in the Dark* (quoted in Zimmer, page 141): "Many years later, by a pretty fluke (I know I should not point out these plums to people), I got even with the first discoverer of my moth by giving his own name to a blind man in a novel."

Literary critics sometimes chided Nabokov for his obsessive attention to detail. Nabokov, in true form, described these attacks with a witty (and somewhat cryptic) taxonomic reference—speaking in *Strong Opinions* (quoted in Zimmer, page 175) of detractors "accusing me of being more interested in the subspecies and the subgenus than in the genus and the family." (Subspecies and subgenera represent categories for fine subdivision of species and genera. The rules of nomenclature recognize these categories as available for convenience, but not required in practice. That is, species need not be divided into subspecies, nor genera into subgenera. But genera and families represent basic and more inclusive divisions that must be assigned to all creatures. That is, each species must belong to a genus, and each genus to a family.)

Nabokov generalized his defense of meticulous detail beyond natural history and literature to all intellectual concerns. In a 1969 interview, he scornfully dismissed critics who branded such insistence upon detail as a form of pedantry (my translation from Nabokov's French, as cited in Zimmer, page 7): "I do not understand how one can label the knowledge of natural objects or the vocabulary of nature as pedantry." In annotating his personal copy of the French translation of *Ada*, Nabokov listed the three unbreakable rules for a good translator: intimate knowledge of the language from which one translates; experience as a writer of the language into which one translates; and (the third great dictate of detail) "that one knows, in both languages, the words designating concrete objects (natural and cultural, the flower and the clothing)" (my translation from Nabokov's French original, cited in Zimmer, page 5).

Zimmer (page 8) epitomizes the central feature of Nabokov's butterfly citations: "They are all real butterflies, including the invented ones which are mimics of real ones. And they usually are not just butterflies in general, but precisely the ones that would occur at that particular spot, behaving exactly the way they really would. Thus they underscore, or rather help constitute, the veracity of a descriptive passage." In an insightful statement, Zimmer (page 7) then generalizes this biological usage to an overarching Nabokovian principle with both aesthetic and moral components:

Both the writer of fiction and the naturalist drew on a profound delight in precise comparative observation. For Nabokov, a work of nature was like a work of art. Or rather it *was* a profound work of art, by the greatest of all living artists, evolution, and as much a joy to the mind and a challenge to the intellect as a Shakespeare sonnet. Hence it deserved to be studied like it, with never ending attention to detail and patience.

But perhaps the best summary of Nabokov's convictions about the ultimate value of accurate detail can be found in "A Discovery," a short poem written in 1943:

h Dark pictures, thrones, the stones that pilgrims kiss
Poems that take a thousand years to die
But ape the immortality of this
Red label on a little butterfly.

(Again, some taxonomic exegesis must be provided to wrest general understanding from the somewhat elitist—scarcely surprising given his social background—and not always user-friendly Nabokov. Museum curators traditionally affix red labels only to "holotype" specimens—that is, to individuals chosen as official recipients of the name given to a new species. The necessity for such a rule arises from a common situation in taxonomic research. A later scientist may discover that the original namer of a species defined the group too broadly by including specimens from more than one genuine species. Which specimens shall then keep the original name, and which shall be separated out to receive a different designation for the newly recognized species? By official rules, the species of the designated holotype specimen keeps the original name, and members of the newly recognized species must receive a new name. Thus, Nabokov tells us that no product of human cultural construction can match the immortality of the permanent name-bearer for a genuine species in nature. The species may become extinct, of course, but the name continues forever to designate a genuine natural population that once inhabited the earth. The holotype specimen therefore becomes our best example of an immortal physical object. And the holotype specimen bears a red label in standard museum practice.)

Nabokov's two apparently disparate careers therefore find their common ground on the most distinctive feature of his unusual intellect and uncanny skill—the almost obsessive attention to meticulous and accurate detail that served both his literary productions and his taxonomic descriptions so well, and

that defined his uncompromising commitment to factuality as both a principle of morality and a guarantor and primary guide to aesthetic quality. Science and literature therefore gain their union on the most palpable territory of concrete things, and on the value we attribute to accuracy, even in smallest details, as a guide and an anchor for our lives, our loves, and our senses of worth.

This attitude expresses a general belief and practice in science (at least as an ideal, admittedly not always achieved due to human frailty). Of all scientific subfields, none raises the importance of intricate detail to such a plateau of importance as Nabokov's chosen profession of taxonomic description for small and complex organisms. To function as a competent professional in the systematics of Lepidoptera, Nabokov really had no choice but to embrace such attention to detail, and to develop such respect for nature's endless variety.

But this attitude to detail and accuracy carries no ineluctable status in literature—so Nabokov's unaltered skills and temperament, now applied to his second profession, conferred distinction, if not uniqueness, upon him. The universal and defining excellence of a professional taxonomist built a substrate for the uncommon, and (in Nabokov's case) transcendent, excellence of a writer. After all, the sheer glory of voluminous detail does not ignite everyone's muse in literature. Some folks can't stand to read every meandering and choppy mental detail of one day in the life of Leopold Bloom, but others consider *Ulysses* the greatest novel of the twentieth century. I ally myself with the second group. I also love *Parsifal*—and the writing of Vladimir Nabokov. I have always been a taxonomist at heart. Nothing matches the holiness and fascination of accurate and intricate detail. How can you appreciate a castle if you don't cherish all the building blocks, and don't understand the blood, toil, sweat, and tears underlying its construction?*

I could not agree more with Nabokov's emphasis upon the aesthetic and moral—not only the practical and factual—value of accuracy and authenticity in intricate detail. This sensation, this love, may not stir all people so ardently (for *Homo sapiens*, as all taxonomists understand so well, includes an especially wide range of variation among individuals of the species). But such a basic aesthetic, if not universal, surely animates a high percentage of humanity, and must evoke something very deep in our social and evolutionary heritage. May

*Incidentally, Nabokov represented an intractable mystery to me until I learned that he grew up trilingual in Russian, English, and French—a common situation among the Russian upper classes in his day. Even as a teenager reading *Lolita*, I couldn't understand how anyone who learned English as a second tongue could become such a master of linguistic detail. Indeed, one cannot. Conrad narrated wonderful stories, but could never play with his adopted language as Nabokov did with one of his native tongues.

I mention just one true anecdote to represent this general argument? The head of the National Air and Space Museum in Washington, D.C., once hosted a group of blind visitors to discuss how exhibits might be made more accessible to their community. In this museum the greatest airplanes of our history—including the Wright Brothers' biplane from Kitty Hawk and Lindbergh's *Spirit of St. Louis*—hang from the ceiling, entirely outside the perception of blind visitors. The director apologized, and explained that no other space could be found for such large objects, but then asked his visitors whether a scale model of the *Spirit of St. Louis*, made available for touch, would be helpful. The blind visitors caucused and returned with their wonderful answer: Yes, they responded, we would appreciate such a model, but it must be placed directly under the unperceptible original. If the aesthetic and moral value of genuine objects can stir us so profoundly that we insist upon their presence even when we can have no palpable evidence thereof, but only the assurance that we stand in the aura of reality, then factual authenticity cannot be gainsaid as a fundamental desideratum of the human soul.

This difficult and tough-minded theme must be emphasized in literature (as the elitist and uncompromising Nabokov understood so well), particularly to younger students of the present generation, because an ancient, and basically anti-intellectual, current in the creative arts has now begun to flow more strongly than ever before in recent memory—the tempting Siren song of a claim that the spirit of human creativity stands in direct opposition to the rigor in education and observation that breeds both our love for factual detail and our gain of sufficient knowledge and understanding to utilize this record of human achievement and natural wonder.

No more harmful nonsense exists than this common supposition that deepest insight into great questions about the meaning of life or the structure of reality emerges most readily when a free, undisciplined, and uncluttered (read, rather, ignorant and uneducated) mind soars above mere earthly knowledge and concern. The primary reason for emphasizing the supreme aesthetic and moral value of detailed factual accuracy, as Nabokov understood so well, lies in our need to combat this alluring brand of philistinism if we wish to maintain artistic excellence as both a craft and an inspiration. (Anyone who thinks that success in revolutionary innovation can arise *sui generis*, without apprenticeship for basic skills and education for understanding, should visit the first [chronological] room of the Turner annex at the Tate Gallery in London—to see the early products of Turner's extensive education in tools of classical perspective and representation, the necessary skills that he had to master before moving far beyond into a world of personal innovation.)

This Nabokovian argument for a strictly *positive* correlation (as opposed to the usual philistine claim for negative opposition) between extensive training and potential for creative innovation may be more familiar to scientists than to creative artists. But this crucial key to professional achievement must be actively promoted within science as well. Among less thoughtful scientists, we often encounter a different version of the phony argument for disassociation of attention to detail and capacity for creativity—the fallacy embedded in Zaleski's statement (cited on page 44) that Nabokov's obsessive love of detail made him a "laboratory drudge," even while opening prospects of greatness in literature.

The false (and unstated) view of mind that must lie behind this assertion—and that most supporters of the argument would reject if their unconscious allegiance were made explicit—assumes a fixed and limited amount of mental "stuff" for each intellect. Thus, if we assign too much of our total allotment to the mastery of detail, we will have nothing left for general theory and integrative wonder. But such a silly model of mental functioning can only arise from a false metaphorical comparison of human creativity with irrelevant systems based on fixed and filled containers—pennies in a piggy bank or cookies in a jar.

Many of the most brilliant and revolutionary theoreticians in the history of science have also been meticulous compilers of detailed evidence. Darwin developed his theory of natural selection in 1838, but prevailed because, when he finally published in 1859, he had also amassed the first credible factual compendium (overwhelming in thoroughness and diversity) for the evolutionary basis of life's history. (All previous evolutionary systems, including Lamarck's, had been based on speculation, however cogent and complex the theoretical basis.) Many key discoveries emerged and prevailed because great theoreticians respected empirical details ignored by others. In the most familiar example, Kepler established the ellipticity of planetary orbits when he realized that Tycho Brahe's data yielded tiny discrepancies from circularity that most astronomers would have disregarded as "close enough"—whereas Kepler knew that he could trust the accuracy of Tycho's observations.

I do not deny that some scientists see trees but not forests, thereby functioning as trustworthy experts of meticulous detail, but showing little interest or skill in handling more general, theoretical questions. I also do not deny that Nabokov's work on butterfly systematics falls under this rubric. But I strenuously reject the argument that Nabokov's attention to descriptive particulars, or his cherishing of intricate factuality, precluded strength in theory on principle. I do not understand Nabokov's psyche or his ontogeny well enough to speculate about his conservative approach to theoretical questions, or his disinclination to grapple with general issues in evolutionary biology. We can only, I

suspect, intone some clichés about the world's breadth (including the domain of science), and about the legitimate places contained therein for people with widely divergent sets of skills.

I therefore strongly reject any attempt to characterize Nabokov as a laboratory drudge for his love of detail and his lack of attention to theoretical issues. The science of taxonomy has always honored, without condescension, professionals who develop Nabokov's dedication to the details of a particular group, and who establish the skills and "good eye" to forge order from nature's mire of confusing particulars. Yes, to be frank, if Nabokov had pursued only butterfly taxonomy as a complete career, he would now be highly respected in very limited professional circles, but not at all renowned in the world at large. But do we not honor the dedicated professional who achieves maximal excellence in an admittedly restricted domain of notoriety or power? After all, if Macbeth had been content to remain Thane of Cawdor—a perfectly respectable job—think of the lives and grief that would thus have been spared. But, of course, we would then have to lament a lost play. So let us celebrate Nabokov's excellence in natural history, and let us also rejoice that he could use the same mental skills and inclinations to follow another form of bliss.

An Epilogue on Science and Literature

Most intellectuals favor a dialogue between professionals in science and the arts. But we also assume that these two subjects stand as polar opposites in the domain of learning, and that diplomatic contact for understanding between adversaries sets the basic context for such a dialogue. At best, we hope to dissipate stereotypes and to become friends (or at least neutrals), able to put aside our genuine differences for temporary bonding in the practical service of a few broader issues demanding joint action by all educated folk.

A set of stereotypes still rules perceptions of "otherness" in these two domains—images based on little more than ignorance and parochial fear, but powerful nonetheless. Scientists are soulless dial-twirlers; artists are arrogant, illogical, self-absorbed blowhards. Dialogue remains a good idea, but the two fields, and the personalities attracted to them, remain truly and deeply different.

I do not wish to forge a false union in an artificial love feast. The two domains differ, truly and distinctly, in their chosen subject matter and established modes of validation. The magisterium (teaching authority) of science extends over the factual status of the natural world, and to the development of theories proposed to explain why these facts, and not others, characterize our universe. The magisteria of the arts and humanities treat ethical and aesthetic

questions about morality, style, and beauty. Since the facts of nature cannot, in logic or principle, yield ethical or aesthetic conclusions, the domains must remain formally distinct on these criteria.

But many of us who labor in both domains (if only as an amateur in one) strongly feel that an overarching mental unity builds a deeper similarity than disparate subject matter can divide. Human creativity seems to work much as a coordinated and complex piece, whatever the different emphases demanded by disparate subjects—and we will miss the underlying commonality if we only stress the distinctions of external subjects and ignore the unities of internal procedure. If we do not recognize the common concerns and characteristics of all creative human activity, we will fail to grasp several important aspects of intellectual excellence—including the necessary interplay of imagination and observation (theory and empirics) as an intellectual theme, and the confluence of beauty and factuality as a psychological theme—because one field or the other traditionally downplays one side of a requisite duality.

Moreover, we must use the method of "replication with difference" if we wish to study and understand the human quintessence behind our varying activities. I cannot imagine a better test case for extracting the universals of human creativity than the study of deep similarities in intellectual procedure between the arts and sciences.

No one grasped the extent of this underlying unity better than Vladimir Nabokov, who worked with different excellences as a complete professional in both domains. Nabokov often insisted that his literary and entomological pursuits shared a common mental and psychological ground. In *Ada*, while invoking a common anagram for "insect," one of Nabokov's characters beautifully expresses the oneness of creative impulse and the pervasive beauty of chosen subject matter: "If I could write," mused Demon, "I would describe, in too many words no doubt, how passionately, how incandescently, how incestuously—*c'est le mot*—art and science meet in an insect."

Returning to his central theme of aesthetic beauty in both the external existence and our internal knowledge of scientific detail, Nabokov wrote in 1959 (quoted in Zimmer, page 33): "I cannot separate the aesthetic pleasure of seeing a butterfly and the scientific pleasure of knowing what it is." When Nabokov spoke of "the precision of poetry in taxonomic description"—no doubt with conscious intent to dissipate a paradox that leads most people to regard art and science as inexorably distinct and opposed—he used his literary skills in the service of generosity (a high, if underappreciated, virtue underlying all attempts to unify warring camps). He thus sought to explicate the common ground of his two professional worlds, and to illustrate the inevitably paired components

of any integrated view that could merit the label of our oldest and fondest dream of fulfillment—the biblical ideal of “wisdom.” Thus, in a 1966 interview, Nabokov broke the boundaries of art and science by stating that the most precious desideratum of each domain must also characterize any excellence in the other—for, after all, truth is beauty, and beauty truth. I could not devise a more fitting title for this essay, and I can imagine no better ending for this text:

The tactile delights of precise delineation, the silent paradise of the camera lucida, and the precision of poetry in taxonomic description represent the artistic side of the thrill which accumulation of new knowledge, absolutely useless to the layman, gives its first begetter. . . . There is no science without fancy, and no art without facts.

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5

Art Meets Science in
The Heart of the Andes:
 Church Paints, Humboldt Dies,
 Darwin Writes, and
 Nature Blinks in the Fateful Year
 of 1859

THE INTENSE EXCITEMENT AND FASCINATION THAT Frederic Edwin Church's *Heart of the Andes* solicited when first exhibited in New York in 1859 may be attributed to the odd mixture of apparent opposites so characteristic of our distinctive American style of showmanship—commercialism and excellence, hoopla and incisive analysis. The large canvas, more than ten by five feet, and set in a massive frame, stood alone in a darkened room, with carefully controlled lighting and the walls draped in black.

Dried plants and other souvenirs that Church had collected in South America probably graced the room as well. Visitors marveled at the magisterial composition, with a background of the high Andes, blanketed in snow, and a foreground of detail so intricate and microscopically correct that Church might well be regarded as the Van Eyck of botany.

But public interest also veered from the sublime to the merely quantitative, as rumors circulated that an unprecedented sum of twenty thousand dollars had been paid for the painting (the actual figure of ten thousand dollars was impressive enough for the time). This tension of reasons for interest in Church's great canvases has never ceased. A catalog written to accompany a museum show of his great Arctic landscape, *The Icebergs*, contains, in order, as its first three pictures, a reproduction of the painting, a portrait of Church, and a photo of the auctioneer at Sotheby's gaveling the sale at \$2.5 million as "the audience cheered at what is [or was in 1980, at the time of this sale] the highest figure ever registered at an art auction in the United States."

A far more important, but basically ill-founded, tension—the supposed conflict between art and science—dominates our current scholarly discussion of Church and his views about nature and painting. This tension, however, can only be deemed retrospective, a product of divisions that have appeared in our society since Church painted his most famous canvases. Church did not doubt that his concern with scientific accuracy proceeded hand in hand with his drive to depict beauty and meaning in nature. His faith in this fruitful union stemmed from the views of his intellectual mentor Alexander von Humboldt, a great scientist who had ranked landscape painting among the three highest expressions of our love of nature.

Church sent *The Heart of the Andes* to Europe after its great American success in 1859. He wanted, above all, to show the painting to Humboldt, then ninety years old, and who, sixty years before, had begun the great South American journey that would become the source of his renown. Church wrote to Bayard Taylor on May 9, 1859:

The "Andes" will probably be on its way to Europe before your return to the City. . . . [The] principal motive in taking the picture to Berlin is to have the satisfaction of placing before Humboldt a transcript of the scenery which delighted his eyes sixty years ago—and which he had pronounced to be the finest in the world.

But Humboldt died before the painting arrived, and Church's act of homage never bore fruit. Later in 1859, as *The Heart of the Andes* enjoyed another tri-



Frederic Edwin Church's great landscape painting, *The Heart of the Andes*.

umph of display in the British Isles, Charles Darwin published his epochal book, *The Origin of Species*, in London. These three events, linked by their combined occurrence in 1859—the first exhibition of *The Heart of the Andes*, the death of Alexander von Humboldt, and the publication of *The Origin of Species*—set the core of this essay. They present, in my view, a basis for understanding the central role of science in Church's career and for considering the larger issue of relationships between art and the natural world.

As a professional scientist, I hold no credentials for judging or interpreting Church's paintings. I can only say that I have been powerfully intrigued (stunned would not be too strong a word) by his major canvases throughout my life, beginning with childhood visits to the Metropolitan Museum of Art in my native New York City, when *The Heart of the Andes*, medieval armor, and Egyptian mummies grabbed my awe and attention in that order.*

But if I have no license to discourse on Church, at least I inhabit the world of Humboldt and Darwin, and I can perhaps clarify why Humboldt became such a powerful intellectual guru for Church and an entire generation of artists and scholars, and why Darwin pulled this vision of nature up from its roots, substituting another that could and should have been read as equally ennobling, but that plunged many votaries of the old order into permanent despair.

When Church began to paint his great canvases, Alexander von Humboldt may well have been the world's most famous and influential intellectual. If his name has faded from such prominence today, this slippage only records a curiosity and basic unfairness of historical judgment. The history of ideas emphasizes innovation and downgrades popularization. The great teachers of any time exert enormous influence over the lives and thoughts of entire generations, but their legacy fades as the hagiographic tradition exalts novel thoughts and discards context. No one did more to change and enhance science in the first half of the nineteenth century than Alexander von Humboldt, the cardinal inspiration for men as diverse as Charles Darwin, Alfred Russel Wallace, Louis Agassiz (whom Humboldt financed at a crucial time), and Frederic Edwin Church.

Humboldt (1769–1859) studied geology in his native Germany with another

*I greatly amused my Hungarian grandmother (see essay 1) on my first visit at about age five—when I asked her if she had worn such armor as a girl in that far-off land. My mother, after all, had told me that my grandmother was “middle aged.”



The Icebergs, by Frederic Edwin Church.

great teacher, A. G. Werner. Following Werner's interest in mining, Humboldt invented a new form of safety lamp and a device for rescuing trapped miners. Early in his career, Humboldt developed a deep friendship with Goethe, a more uncertain relationship with Schiller, and a passion to combine personal adventure with the precise measurements and observations necessary to develop a science of global physical geography. Consequently, recognizing that the greatest diversity of life and terrain would be found in mountainous and tropical regions, he embarked on a five-year journey to South America in 1799, accompanied by the French botanist Aimé Bonpland. During this greatest of scientific adventures, Humboldt collected sixty thousand plant specimens, drew countless maps of great accuracy, wrote some of the most moving passages ever penned against the slave trade, proved the connection between the Orinoco and Amazon rivers, and established a mountaineering record (at least among westerners inclined to measure such things) by climbing to nineteen thousand feet (though not reaching the summit) on Chimborazo. On his way home in 1804, Humboldt visited the United States and had several long meetings with Thomas Jefferson. Back in Europe, he met and befriended Simon Bolívar, becoming a lifelong adviser to the great liberator.

Humboldt's professional life continued to revolve around his voyage and the meticulous records and diaries that he had kept. Over the next twenty-five years he published thirty-four volumes of his travel journal illustrated with 1,200 copper plates, but never finished the project. His large and beautiful maps became the envy of the cartographic world. Most important (in influencing Church and Humboldt's other disciples), Humboldt conceived, in 1827–28, a plan for a multivolume popular work on, to put the matter succinctly, everything. The first two volumes of *Kosmos* appeared in 1845 and 1847, the last three in the 1850s. *Kosmos*, immediately translated into all major Western languages, might well be ranked as the most important work of popular science ever published.

Humboldt's primary influence on Church can scarcely be doubted. Church owned, read, and reread both Humboldt's travel narratives and *Kosmos*. In an age when most painters aspired to a European grand tour to set the course of their work and inspiration, Church followed a reverse route, taking his cue from Humboldt. After his apprenticeship with Thomas Cole, Church first traveled, at Humboldt's direct inspiration, to the high tropics of South America, in 1853 and 1857. In Quito, he sought out and occupied the house that Humboldt had inhabited nearly sixty years before. He painted the great can-

vases of his most fruitful decade (1855–65) as embodiments of Humboldt's aesthetic philosophy and convictions about the unity of art and science. Even subjects maximally distant from the tropics bear Humboldt's mark of influence. *The Icebergs* and Church's general fascination with polar regions closely parallel Humboldt's second major expedition, his Siberian sojourn of 1829. Church did not visit Europe until 1867, and this cradle of most Western painting did not provoke a new flood of great creativity.

We can best grasp Humboldt's vision by examining the plan of *Kosmos*. On the first page of his preface, Humboldt states the grand aim of his entire work:

The principal impulse by which I was directed was the earnest endeavor to comprehend the phenomena of physical objects in their general connection, and to represent nature as one great whole, moved and animated by internal forces.

"Nature," he adds later, "is a unity in diversity of phenomena; a harmony, blending together all created things, however dissimilar in form and attributes; one great whole animated by the breath of life." This twofold idea of natural unity forged by a harmony of internal laws and forces represented no mere rhapsodizing on Humboldt's part; for this vision expressed his view of natural causation. This view of life and geology also embodied the guiding principles that animated Church and that Darwin would tear down with a theory of conflict and balance between internal and external (largely random) forces.

Volume one of *Kosmos* covers, on the grandest possible scale, the science that we would call physical geography today. Humboldt ranges from the most distant stars to minor differences in soil and climate that govern the distribution of vegetation. (*Kosmos* is fundamentally a work in geography, a treatise about the natural forms and places of things. Thus, Humboldt includes little conventional biology in his treatise and discusses organisms primarily in terms of their geographic distribution and appropriate fit to environments.)

Kosmos takes seriously, and to the fullest possible extent, Humboldt's motivating theme of unity. If volume one presents a physical description of the universe, then volume two—an astounding tour de force that reads with as much beauty and relevance today as in Church's era—treats the history and forms of human sensibility toward nature. (The last three volumes of *Kosmos*, published many years later, present case studies of the physical world; these volumes never became as popular as the first two.) Humboldt wrote of his overall design:

I have considered Nature in a two-fold point of view. In the first place, I have endeavored to present her in the pure objectiveness of external phenomena; and secondly, as the reflection of the image impressed by the senses upon the inner man, that is, upon his ideas and feelings.

Humboldt begins volume two with a discussion of the three principal modes (in his view) for expressing our love of nature—poetic description, landscape painting (need I say more for the influence upon Church?), and cultivation of exotic plants (Church made a large collection of dried and pressed tropical plants). The rest of the volume treats, with stunning erudition and encyclopedic footnotes, the history of human attitudes toward the natural world.

Humboldt embodied the ideals of the Enlightenment as well and as forcefully as any great intellectual—as Voltaire, or Goya, or Condorcet. If he lived so long, and past the hour of maximal flourishing for this philosophy, he remained firm in his convictions, a beacon of hope in a disillusioned world. Humboldt conveyed the Enlightenment's faith that human history moved toward progress and harmony based on the increasing spread of intellect. People may differ in current accomplishments, but all races are equally subject to similar improvement. In the most famous nineteenth-century statement of equality made by a scientist (see also essay 27), Humboldt wrote:

While we maintain the unity of the human species, we at the same time repel the depressing assumption of superior and inferior races of men. There are nations more susceptible of cultivation, more highly civilized, more ennobled by mental cultivation than others, but none in themselves nobler than others. All are in like degree designed for freedom.

In expressing his liberal belief in progress, Humboldt contrasts his perception of unity with the standard views, based on division and separation, of such social conservatives as Edmund Burke. For Burke and other leaders of the reaction against liberalism, feeling and intellect must be treated as separate domains; emotion, the chief mode of the masses, leads to danger and destruction. The masses must therefore be restrained and ruled by an elite capable of mastering the constructive and empowering force of intellect.

Humboldt's vision, in direct contrast, emphasizes the union and positive interaction between feeling and analysis, sentiment and observation. Sentiment,

properly channeled, will not operate as a dangerous force of ignorance, but as a prerequisite to any deep appreciation of nature:

The vault of heaven, studded with nebulae and stars, and the rich vegetable mantle that covers the soil in the climate of palms, cannot surely fail to produce on the minds of these laborious observers of nature an impression more imposing and more worthy of the majesty of creation than on those who are unaccustomed to investigate the great mutual relations of phenomena. I cannot, therefore, agree with Burke when he says, "it is our ignorance of natural things that causes all our admiration, and chiefly excites our passions."

Romantic nonsense might proclaim a superiority of untrammelled feeling over the dryness of accurate observation and measurement, but the Enlightenment's faith in rationality located highest truth in the mutual reinforcement of feeling and intellect:

It is almost with reluctance that I am about to speak of a sentiment, which appears to arise from narrow-minded views, or from a certain weak and morbid sentimentality—I allude to the fear entertained by some persons, that nature may by degrees lose a portion of the charm and magic of her power, as we learn more and more how to unveil her secrets, comprehend the mechanism of the movements of the heavenly bodies, and estimate numerically the intensity of natural forces. . . . Those who still cherish such erroneous views in the present age, and amid the progress of public opinion, and the advancement of all branches of knowledge, fail in duly appreciating the value of every enlargement of the sphere of intellect, and the importance of the detail of isolated facts in leading us on to general results.

Humboldt viewed the interaction of feeling and intellect as an upwardly spiraling system, moving progressively toward deep understanding. Feeling excites our interest and leads us to a passionate desire for scientific knowledge of details and causes. This knowledge in turn enhances our appreciation of natural beauty. Feeling and intellect become complementary sources of understanding; knowing the causes of natural phenomena leads us to even greater awe and wonder.

Thus do the spontaneous impressions of the untutored mind lead, like the laborious deductions of cultivated intellect, to the same intimate persuasion, that one sole and indissoluble chain binds together all nature. . . . Every imposing scene in nature depends so materially upon the mutual relation of the ideas and sentiments simultaneously excited in the mind of the observer.

Humboldt rooted his theory of aesthetics in this idea of mutual reinforcement. A great painter must also be a scientist, or at least committed to the detailed and accurate observation, and to the knowledge of causes, that motivate a professional scientist. For the visual arts, landscape painting becomes the principal mode of expressing the unity of knowledge (as poetry serves the literary arts and cultivation of exotic plants the practical arts). A great landscape painter is the highest servant of both nature and the human mind.

Church accepted Humboldt's aesthetic theory as his own guide (and why not, for I think that no one has ever improved upon this primary statement of humanism). Church achieved primary recognition and respect as the most scientific of painters (when such a designation implied admiration, not belittlement). Critics and connoisseurs viewed his penchant for accuracy in observation and rendering, both for intricate botanical details in his foregrounds and for geological forms in his backgrounds, as a primary source of quality in his art and as a key to his success in awakening feelings of awe and sublimity in his viewers.

I do not, of course, say that Church attempted, or that Humboldt advocated, a slavish rendering of particular places with snapshot accuracy. Humboldt did stress the value of colored sketches from nature, even of photographs (though he felt, in the nascent years of this art, that photography could only capture the basic forms of a landscape, not the important details). But Humboldt realized that any fine canvas must be conceived and executed as an imaginative reconstruction, accurate in all details of geology and vegetation, but not a re-creation of a particular spot:

A distinction must be made in landscape painting, as in every other branch of art, between the elements generated by the more limited field of contemplation and direct observation, and those which spring from the boundless depth and feeling and from the force of idealizing mental power.

None of Church's great tropical paintings represent particular places. He often constructed idealized vantage points so that he could encompass all life

zones, from the vegetation of lush lowlands to the snow-clad Andean peaks, in a single composition. (For example, although Church's most famous painting of Cotopaxi includes no lowland plants, most of his other canvases of this great volcano feature palm trees and other luxuriant plants that do not grow in such proximity to the mountain.) Moreover, though likely with no conscious intent, Church did not always depict his geological background accurately. Volcanologist Richard S. Fiske discovered that Church painted the symmetrical cone of Cotopaxi with steeper sides than the actual mountain possesses. We may, however, view this "license" as a veering toward accuracy, for Humboldt himself had drawn Cotopaxi with even steeper slopes!

Humboldt's influence over Church extended well beyond general aesthetic philosophy and the value of science and accurate observation. One may identify landscape painting as the principal mode of glorifying nature in the visual arts, but which among the infinitude of earthly landscapes best captures the essence of wonder? Humboldt replied with the aesthetic conviction that still motivates such modern ecological movements as the battle to save the rain forests of the Amazon. Maximal diversity of life and landscape defines the *sum-mum bonum* of aesthetic joy and intellectual wonder. This maximal diversity thrives in two circumstances that enjoy their greatest confluence in the High Andes of South America. First, the vastly greater diversity of vegetation in tropical regions marks the equatorial zone as immensely more varied than temperate areas inhabited by most Western peoples. Second, diversity will be greatly enhanced by a range of altitudes, for the sequence of lowland to mountaintop in a single district may span the entire panoply of lowland environments from equator to pole, with an equatorial mountaintop acting as a surrogate for the Arctic. Thus, the higher the mountains, the wider the range of diversity. The Himalayas might win our preference, but they lie too far north of the equator and do not include zones of tropical lowland vegetation. The Andes of South America became the premier spot on earth for landscape painting, for only here does the full luxuriance of the lowland jungle stand in the shadow of such a massive range of snow-clad peaks. Humboldt therefore chose South America, as did Darwin, Wallace, and Frederic Edwin Church, much to the benefit of art and history. Humboldt wrote:

Are we not justified in hoping that landscape painting will flourish with a new and hitherto unknown brilliancy when artists

One of Church's versions of Cotopaxi, showing the full range of environments from tropical lowland vegetation to the snow-clad volcanic peak.



of merit shall more frequently pass the narrow limits of the Mediterranean, and when they shall be enabled, far in the interior of continents, in the humid mountain valleys of the tropical world, to seize, with the genuine freshness of a pure and youthful spirit, on the true image of the varied forms of nature?

When Church was still a small boy, Humboldt's travel writings also played a major role in setting the life course of a young English graduate who planned to become a country parson (not from any particular zeal for religion, and probably to maximize time for avocational interests in natural history). But Charles Darwin veered down a different course to become one of history's most important intellectuals—and Humboldt served as his primary influence. Darwin read two books that focused his interests upon natural history in a more serious and professional way: J. F. W. Herschel's *Preliminary Discourse on the Study of Natural History* and Humboldt's *Personal Narrative of the South American Voyages* (1814–29). As an old man, Darwin reminisced in his autobiography:

[These books] stirred up in me a burning zeal to add even the most humble contribution to the noble structure of Natural Science. No one or a dozen other books influenced me nearly so much as these two.

Moreover, directly inspired by Humboldt's views on the importance of tropical travel, Darwin hatched a plot to visit the Canary Islands with some entomologist friends. Darwin involved his mentor, botanist J. S. Henslow, in the plan, and this decision led, clearly if indirectly, to Darwin's invitation to sail on the *Beagle*, the beginning and *sine qua non* of his rendezvous with history. Mathematician George Peacock asked Henslow to recommend a keen young naturalist to Captain FitzRoy, and Henslow, impressed with Darwin's general zeal and desire for tropical travel, suggested his young protégé for the job. The *Beagle* spent five years circumnavigating the globe, but the trip had been conceived primarily as a surveying voyage to South America, and Darwin spent the bulk of his time in and around Humboldt's favorite places. More than mere accident underlies the fact that the twin discoverers of natural selection, Darwin and Alfred Russel Wallace, both cited Humboldt as their inspiration, and both made their most extensive, youthful trips to South America. On April 28, 1831, as Darwin prepared for the *Beagle* voyage, he wrote to his sister Caroline:

My head is running about the tropics: in the morning I go and gaze at Palm trees in the hot-house and come home and read Humboldt; my enthusiasm is so great that I can hardly sit still on my chair.

Darwin's first view of the richness of tropical life led him to rhapsody, for the real objects even exceeded Humboldt's descriptions. In Brazil, Darwin wrote in his diary for February 28, 1832:

Humboldt's glorious descriptions are and will for ever be unparalleled; but even he with his dark blue skies and the rare union of poetry with science which he so strongly displays when writing on tropical scenery, with all this falls far short of the truth. The delight one experiences in such times bewilders the mind; if the eye attempts to follow the flights of a gaudy butterfly, it is arrested by some strange tree or fruit; if watching an insect one forgets it in the stranger flower it is crawling over; if turning to admire the splendor of the scenery, the individual character of the foreground fixes the attention. The mind is a chaos of delight, out of which a world of future and more quiet pleasure will arise. I am at present fit only to read Humboldt; he like another sun illuminates everything I behold.

And, more succinctly, in a letter to his mentor Henslow a few months later, on May 18: "I never experienced such intense delight. I formerly admired Humboldt, I now almost adore him."

Darwin did not read Humboldt only for visceral wonder; he evidently studied Humboldt's aesthetic theories with some care as well, as several entries in the *Beagle* diary testify. Consider this comment from Rio de Janeiro in 1832:

During the day I was particularly struck with a remark of Humboldt's who often alludes to "the thin vapor which without changing the transparency of the air, renders its tints more harmonious, softens its effects," etc. This is an appearance which I have never observed in the temperate zones. The atmosphere, seen through a short space of half or three-quarters of a mile, was perfectly lucid, but at a greater distance all colors were blended into a most beautiful haze.

Or this passage, from his summary comments upon returning in 1836:

I am strongly induced to believe that, as in Music, the person who understands every note, will, if he also has true taste, more thoroughly enjoy the whole; so he who examines each part of a fine view, may also thoroughly comprehend the full and combined effect. Hence a traveler should be a botanist, for in all views plants form the chief embellishment. Group masses of naked rocks, even in the wildest forms. For a time they may afford a sublime spectacle, but they will soon grow monotonous; paint them with bright and varied colors, they will become fantastick [sic]; clothe them with vegetation, and they must form at least a decent, if not a most beautiful picture.

Humboldt himself could not have written a better passage on the value of diversity and his favorite theme of aesthetic appreciation enhanced by detailed knowledge of individual parts—the union of artistic pleasure and scientific understanding.

So we reach the pivotal year of our drama, 1859. Humboldt lies dying in Berlin, while two powerful and influential men, half a world apart in geography and profession, reach an apex of fame founded on Humboldt's inspiration: Frederic Edwin Church displays *The Heart of the Andes*, and Charles Darwin publishes *The Origin of Species*.

And we encounter a precious irony, an almost painfully poignant outcome. Humboldt himself, in the preface to volume one of *Kosmos*, had noted the paradox that great works of science condemn themselves to oblivion as they open floodgates to reforming knowledge, while classics of literature can never lose relevance:

It has frequently been regarded as a subject of discouraging consideration, that while purely literary products of intellectual activity are rooted in the depths of feeling, and interwoven with the creative force of imagination, all works treating of empirical knowledge, and of the connection of natural phenomena and physical laws, are subject to the most marked modifications of form in the lapse of short periods of time. . . . Those scientific works which have, to use a common expression, become antiquated by the acquisition of new funds of knowledge, are thus continually being consigned to oblivion as unreadable.

By Darwin's hand, Humboldt's vision suffered this fate of superannuation in 1859. The exterminating angel cannot be equated with the fact of evolution itself, for some versions of evolution as necessarily progressive and internally driven fit quite well with Humboldt's notion of pervasive harmony. Rather, Darwin's particular theory, natural selection, and the radical philosophical context of its presentation, drove Humboldt's pleasant image to oblivion. Frederic Edwin Church, alas, felt even more committed than Humboldt to the philosophical comfort of their shared vision, for Church, unlike Humboldt, had rooted a good portion of his Christian faith—for him a most important source of inspiration and equanimity—in a view of nature as essential harmony in unity.

Consider just three aspects of the new Darwinian worldview, all confuting central aspects of Humboldt's vision.

1. Nature must be reconfigured as a scene of competition and struggle, not higher and ineffable harmony. Order and good design arise by natural selection, and only as a side consequence of struggle. Hobbes's "war of all against all" denotes the causal reality of most daily interactions in nature. The struggle should be viewed as metaphorical and need not involve bloody battle (a plant, Darwin tells us, may be said to struggle against an inclement environment at the edge of a desert). But, more often than not, competition proceeds by the sword, and some die that others may live. The struggle, moreover, operates for the reproductive success of individual organisms, not directly in the service of any higher harmony. Darwin, in one of his most trenchant metaphors, seems to tear right through Humboldt's faith and Church's canvases in depicting apparent harmony as dangerously misleading:

We behold the face of nature bright with gladness, we often see superabundance of food; we do not see, or we forget, that the birds which are idly singing round us mostly live on insects or seeds, and are thus constantly destroying life; or we forget how largely these songsters, or their eggs, or their nestlings, are destroyed by birds and beasts of prey.

2. Evolutionary lineages follow no intrinsic direction toward higher states or greater unification. Natural selection only yields local adaptation, as organisms alter in response to modifications in their environment. The geological and climatological causes of environmental change impose no inherent direction either. Evolution is opportunistic.

3. Evolutionary changes do not arise by an internal and harmonious force. Evolution expresses a balance between the internal characteristics of organisms and the external vector of environmental change. These internal and external forces both include strong random components, further obviating any notion of impulse toward union and harmony. The internal force of genetic mutation, the ultimate source of evolutionary variation, works randomly with respect to the direction of natural selection. The external force of environmental change alters capriciously with respect to the progress and complexity of organisms.

Many other humanists joined Frederic Edwin Church in feeling crushed by this new and apparently heartless view of nature. Few themes, in fact, reverberate more strongly through late nineteenth- and early twentieth-century literature than the distress and sadness provoked by losing the comfort of a world lovingly constructed with intrinsic harmony among all its constituent parts. Thomas Hardy, in a striking poem titled "Nature's Questioning," lets the natural objects and organisms of Darwin's new world express their despair through stunned silence:

When I look forth at dawning, pool,
Field, flock, and lonely tree,
All seem to gaze at me
Like chastened children sitting silent in a school.

Upon them stirs in lippings mere
(As if once clear in call,
But now scarce breathed at all)—
"We wonder, ever wonder, why we find us here!"

I am no devotee of psychobiography or psychohistory, and I will not indulge in speculative details about the impact of Darwin's revolution on Church's painting. But we cannot ignore the coincidences of 1859, and their impact upon the last thirty years of Church's life. When I began this project,* I was shocked to learn that Church had lived until 1900. His work and its meaning had been so firmly fixed, in my eyes, into the world just before Darwin's watershed, that I had trouble imagining his corporeal self peering into the twentieth century. (Church reminds me of Rossini, living into Wagner's era, but with all his work done thirty

*I originally wrote this article for the catalog of a retrospective exhibit of Church's paintings, displayed in Washington, D.C., at the National Gallery of Art in 1989.

years before in a different age of *bel canto*; or of Kerensky, deposed by Lenin, but then living for more than fifty years as an aging exile in New York.)

My impression of surprise arose in part from the facts of Church's output. He continued to produce some canvases into the 1890s, but he painted no more great landscapes after the 1860s. I know that several non-ideological reasons help to explain Church's withdrawal. For one, he became very wealthy from his painting (contrary to the stereotype of struggling artists) and spent much of his later life designing and furnishing his remarkable home, Olana, on the Hudson River in upstate New York. For another factor (and one could hardly state a better reason), he experienced severe health problems with inflammatory rheumatism and eventually lost the use of his painting arm. Still, I wonder if the collapse of his vision of nature, wrought by Darwin's revolution, also played a major role in destroying both his enthusiasm for painting such landscapes ever again. If an uplifting harmony turns into a scene of bloody battle, does not the joke become too bitter to bear?

Several scholars have claimed that the large number of books about science in Church's library at Olana prove his continuing concern for keeping up with the latest ideas in natural history. But this argument cannot be sustained, and the list, in my judgment as a historian of the sciences of natural history, actually implies an opposite conclusion. Yes, Church owned many books about science, but as Sherlock Holmes once recognized the *absence* of a bark as the crucial evidence for the nonexistence of a dog, the key to Church's collection lies in the books he did *not* own. Church maintained a good collection of Humboldt; he bought Wallace's books on the geographic distribution of animals and on tropical biology, Darwin on the *Beagle* voyage and the *Expression of the Emotions in Man and Animals* (1872). He purchased the major works by Christian evolutionists who continued to espouse the idea of necessary progress mediated by internal forces of vital matter—H. F. Osborn and N. S. Shaler, for example. But Church did not own either of Darwin's evolutionary treatises, *The Origin of Species* (1859) or *The Descent of Man* (1871). More important, he apparently collected not a single work of a mechanistic or materialist bent—not a word of E. H. Haeckel and only a text on religion by T. H. Huxley, though sales of their books far exceeded all others among late-nineteenth-century popularizations of evolution. I think that Frederic Edwin Church probably did undergo a crisis of confidence akin to the pain and bewilderment suffered by the organisms of Hardy's poem—and that he could not bear to face the consequences of Darwin's world.

I do not wish to end this article on a somber note—not only because I try to maintain a general cheerfulness of temperament, but also because such a termi-

nation would not provide a factually correct or aesthetically honorable end for my story. I want to finish by affirming an aspect of Humboldt's vision that I regard as more important than his falsified view of natural harmony and, therefore, as upholding the continuing power and beauty of Church's great paintings. I also want to suggest that Hardy's sadness and Church's silence may not represent the most fruitful or appropriate responses of humanists to Darwin's new world—an initial reaction of shock and dismay, perhaps, but not the considered conclusion of more reflection and understanding from both sides.

First of all, Humboldt correctly argued, as quoted earlier, that great works of science supersede themselves by sowing seeds for further advances. This, Humboldt adds, marks an aspect of science's joy, not its distress:

However discouraging such a prospect must be, no one who is animated by a genuine love of nature, and by a sense of the dignity attached to its study, can view with regret anything which promises future additions and a greater degree of perfection to general knowledge.

Second, and of far more importance for this essay, Humboldt rightly emphasized the interaction of art and science in any deep appreciation of nature. Therefore Church advanced a grand vision, as right and as relevant today as in his own time, in his fidelity to the principle and actuality of natural observation combined with the shaping genius of imagination. Indeed, I would go further and argue that this vision may now be even more important and relevant today than in the era of Humboldt and Church. For never before have we been surrounded with such confusion, such a drive to narrow specialization, and such indifference to the striving for connection and integration that defines the best in the humanist tradition. Artists dare not hold science in contempt, and scientists will work in a moral and aesthetic desert—a most dangerous place in our age of potentially instant destruction—without art. Yet integration becomes more difficult to achieve than ever before, as jargons divide us and anti-intellectual movements sap our strength. Can we not still find inspiration in the integrative visions of Humboldt and Church?

I will not deny that such integration becomes more difficult in Darwin's world—a bleaker place, no doubt, than Humboldt's. But in another sense, the very bleakness of Darwin's world points to the right solution, a viewpoint perceived with crystal clarity by Darwin himself. Nature simply is what she is; nature does not exist for our delectation, our moral instruction, or our pleasure. Therefore, nature will not always (or even preferentially) match our hopes.

Humboldt asked too much of nature, and pinned too much of his philosophy on a particular outcome. He therefore chose a dubious, even a dangerous, tactic—for indifferent nature may not supply the answers that our souls seek.

Darwin grasped the philosophical bleakness with his characteristic courage. He argued that hope and morality cannot, and should not, be passively read in the construction of nature. Aesthetic and moral truths, as *human* concepts, must be shaped in human terms, not “discovered” in nature. We must formulate these answers for ourselves and then approach nature as a partner who can answer other kinds of questions for us—questions about the factual state of the universe, not about the meaning of human life. If we grant nature the independence of her own domain—her answers unframed in human terms—then we can grasp her exquisite beauty in a free and humble way. For then we become liberated to approach nature without the burden of an inappropriate and impossible quest for moral messages to assuage our hopes and fears. We can pay our proper respect to nature's independence and read her own ways as beauty or inspiration in our different terms. I therefore give the last word to Darwin (diary entry of January 16, 1832), who could not deny the apparent truth of natural selection as a mechanism of change, but who never lost his sense of beauty or his childlike wonder. Darwin stood in the heart of the Andes as he wrote:

It has been for me a glorious day, like giving to a blind man eyes, he is overwhelmed by what he sees and cannot justly comprehend it. Such are my feelings, and such may they remain.