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Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology

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Vassiliki Betty Smocovitis, *Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology* (Princeton: Princeton University Press, 1996), xxiv + 230 pp., \$29.95.

Unifying Biology offers an important new interpretation of the evolutionary synthesis from the perspective of cultural studies of science. Based on an article of the same name, which appeared in the *Journal of the History of Biology* (25 [1992]: 1–65), *Unifying Biology* recasts the evolutionary synthesis as a unifying narrative. Where other scholars have tried to understand the synthesis in terms of the articulation of a neo-Darwinian evolutionary theory, the creation of a new field, or the negotiation of the interests of groups of geneticists, systematists, and paleontologists, Smocovitis argues that the evolutionary synthesis and science in general should be understood as “narrative-constituted practice” (p. 206). The narrative of *Unifying Biology* is meant to provide an interpretive framework for the synthesis that sheds light on “the history and organization of the discipline of evolutionary biology” and on “the growing belief that evolution unified the modern biological sciences” (p. xviii).

Unifying Biology is divided into three sections; the narrative interpretation of the synthesis is framed by an extended discussion of the historical, philosophical, and scientific contexts at the beginning and a discussion of the implications of the narrative at the end. Because it was written for a variety of readers ranging from scientists to scholars engaged in cultural studies, the introduction to *Unifying Biology* may seem to cover familiar ground for readers of the *Journal of the History of Biology*. While most historians probably do not need a lesson on how to closely read the narrative (pp. 10–16), the

detailed review of the historiography of the synthesis presented in chapters 2 and 3 offers a clear and insightful overview of the variety of different perspectives that have been brought to bear on this “moving target.” Smocovitis’s discussion in chapter 3 of different approaches to the question of what pulled biologists together during the synthesis is especially valuable for understanding why she privileges narrative over more traditional internalist or externalist approaches to the history of science. For instance, Smocovitis argues that the fact that evolutionary biology as a discipline was never administratively legitimated as a university department in the United States cannot be explained by an externalist “interest” model of science (p. 68). Yet by turning to narrative, she does not want to reduce the synthesis to its rhetoric and discourse (pp. 71–72). Smocovitis’s goal is to create a coherent narrative that takes the practices of individual scientists seriously and combines their personal narratives with social, political, philosophical, and disciplinary narratives (pp. 74, 92).

Any account of the evolutionary synthesis has to take into account the role of its “architects”: Theodosius Dobzhansky, Ernst Mayr, and G. G. Simpson. The “architects” are at the core of Smocovitis’s narrative, but the way they are contextualized is crucial. Smocovitis places the “architects” in a positivist tradition concerning the unity of science. Accepting the drive to unify science raised questions for biologists such as J. H. Woodger and H. S. Jennings about the status of biology: How could it be unified and yet remain autonomous from physics and chemistry? The process of articulating that evolution was what unified biology was grounded on Dobzhansky’s evolutionary genetics, published in 1937 as *Genetics and the Origin of Species*. The response to Dobzhansky’s book in Mayr’s *Systematics and the Origin of Species* (1942), Simpson’s *Tempo and Mode in Evolution* (1944), and G. Ledyard Stebbin’s *Variation and Evolution in Plants* (1950) is interpreted as amending, reinterpreting, and legitimating Dobzhansky’s evolutionary genetics framework. While Dobzhansky’s evolutionary genetics is taken to have bound “together the heterogeneous practices of the biological sciences,” Smocovitis argues that the significance of evolution as a unifier in biology was brought to a wider audience by Julian Huxley’s *Evolution: The Modern Synthesis*. Huxley’s advocacy of progressive evolution and his willingness to draw out its implications for the unity and autonomy of biology, as well as for liberal ideology and humanism, allow Smocovitis to significantly broaden her narrative beyond Dobzhansky’s evolutionary genetic framework. Even as the new discipline of evolutionary biology was institutionalized, Huxley and later Dobzhansky extended evolution to human society and politics. For Smocovitis, this evolutionary humanism is indicative of the commitment to a unifying narrative that will literally explain the meaning of life (pp. 152–153, 215). Framing the evolutionary synthesis with Dobzhansky’s *Genetics and the Origin of Species*

at the beginning and his *Mankind Evolving* near its end persuasively refigures the cultural meaning of the evolutionary synthesis.

As a polemic for understanding biology as “narrative-constituted practice,” *Unifying Biology* is going to be controversial. Smocovitis argues that “not all narratives will do,” yet the grounds for discriminating among different possibilities are not clearly articulated (pp. 206–207). Moreover, Smocovitis’s emphasis on constructing a “meaningful story on the discipline level” allows her to disengage from the “causal” influences between individuals doing evolutionary biology (p. 204). I agree that the trajectory of the “collective enterprise” of seeking a unified biology and unified knowledge need not map onto the “specific positions” of all of the individuals involved, but Smocovitis’s account raises serious questions about the relationship between the cultural history presented in her narrative and the history of the “causal” interactions among individual scientists. If judging the history of “causal” interactions among individuals is sometimes difficult, judging among different narratives appears much more problematic.

As a framework for understanding the synthesis, Smocovitis’s narrative brings order to a very complex process. Although presented as narrative, the account does not preclude more traditional approaches to the synthesis. The narrative framework of *Unifying Biology* raises a wealth of questions to be explored further, such as, in what sense were disciplines such as embryology, ecology, and microbiology part of the synthesis? Or, put another way, why were these disciplines written out of the narrative? Understanding the synthesis as a unifying process also raises questions about how belief in a unified science might have influenced the interactions of individual scientists. These kinds of considerations are especially significant in evaluating the status of “outsiders” such as Richard Goldschmidt or Otto Schindewolf, the way in which the Society for the Study of Evolution was run, and the way in which *Evolution* was edited.

Unifying Biology is a provocative reinterpretation of a centrally important episode in the history of biology. While written to stimulate discussion among a wide audience, the work is a challenge to historians of biology to rethink both the evolutionary synthesis itself and how the history of the synthesis should be written in the future. As such, *Unifying Biology* deserves careful consideration by anyone interested in the history of evolutionary biology.

Michael R. Dietrich

Diane B. Paul, *Controlling Human Heredity: 1865 to the Present* (Atlantic Highlands, N.J.: Humanities Press International, 1995), xii + 158 pp., illus., \$39.95, \$12.50 paper.

Marouf A. Hasian, Jr., *The Rhetoric of Eugenics in Anglo-American Thought* (Athens: University of Georgia Press, 1996), x + 265 pp., \$40.00.

What was “eugenics” and why does it matter? Two new books address these questions by examining the scientific movement christened by Francis Galton from a Greek root meaning “wellborn.” Both explicate the multiple meanings and diverse political arguments that came to be associated with this movement. Both also consider the significance of this history for the field now called medical genetics.

Diane B. Paul’s text, *Controlling Human Heredity*, surveys the intertwining of scientific theories and political philosophies that shaped the study of heredity from Darwin’s day to the present. Part of a series exploring the “control of nature” written for general readers, its goal is to “bridge the gap between expert and lay understandings” (p. 21) by presenting contemporary historical scholarship in a concise and accessible manner. The result is a clearly written study rich in scientific and moral complexity that not only summarizes recent literature but also adds to it.

Paul challenges several still-popular oversimplifications, such as that “eugenicists were all political reactionaries who held scientific views that were obviously preposterous” (p. 18), or that this movement’s demise was largely due to the progress of science and the emergence of “real” genetics. Instead, she documents a diverse movement that appealed to revolutionaries as well as reactionaries, and that captured the imagination of feminists, Fabians, progressives, national socialists, social democrats, and countless others. Some episodes recounted here will be familiar, such as the efforts of American eugenicists to restrict immigration; others are far less known, such as leftist geneticist H. J. Muller’s efforts to convince Stalin that a program of artificial insemination could help the Soviet Union produce men of genius. Particularly suggestive is Paul’s comparison of eugenics in Germany and Denmark. By the 1930s, both countries had passed strict sterilization laws. Yet in Germany, these laws were ultimately linked to broader Nazi policies promoting euthanasia, racial hatred, and genocide, while in Denmark they were largely associated with a markedly different sort of collectivist enterprise – the liberal welfare state.

Even more significant than these diverse political uses are the convergences Paul identifies in explicating the “commonsense” beliefs guiding much eugenic science – beliefs that frequently persisted even when genetic

findings contradicted them. Among these, for example, was the belief that sterilization could dramatically reduce the incidence of hereditary conditions such as “feeble-mindedness” in one or two generations – perhaps by as much as 50 percent. As early as 1917, Paul notes, geneticists had seen the flaw in such arguments, for if feeble-mindedness were truly a recessive trait, sterilizing the afflicted would hardly reduce the far larger number of carriers. Applying the Hardy-Weinberg formula, geneticist R. C. Punnett concluded that even if none of the feeble-minded reproduced, it would take 8,000 years to reduce the incidence of this condition to one in 100,000. Yet such findings did not lead these scientists to oppose sterilization; instead, they simply defended this practice for its social utility. The same logic is evident in writings on “miscegenation.” While most Americans believed that “race-mixing” led to degeneration, genetic research often suggested the opposite, for Charles Davenport, Edward East, and William Castle all thought that “outbreeding” might actually increase “vigor” and the chances of heritable variations. Yet such findings did not lead these geneticists to challenge popular prejudices. To the contrary, Davenport wrote that a “group of white people will always be led by its instincts to segregate itself from Negroes, Chinese, and other groups,” East believed that blacks and whites constituted too wide a racial cross, and Castle argued that such crossing “interferes with social inheritance” and was therefore best avoided (pp. 111–113). It would take the widespread public revulsion at Nazi atrocities, and not the findings of geneticists, Paul concludes, to begin to undermine these “commonsense” assumptions.

Equally significant in undermining eugenic arguments would be another political development – the modern women’s movement. In defending birth control in the 1960s and abortion rights in the 1970s, women’s groups insisted that reproductive decision making constituted private behavior. In the process, Paul argues, they also undercut one of the premises most deeply held by many eugenicists – that the state should play a central role in guarding the nation’s germplasm, and thus in regulating reproduction. “Until then,” Paul writes, “it was taken for granted that society had a legitimate interest in who reproduced. By the mid-1970s, it was equally taken for granted that society had no interest in the matter” (p. 129). It was this sea change in political thinking, she shows, that sounded the death knell for the use of the term “eugenics” – a term that had survived, albeit in a redefined form, into the 1960s. In elucidating such changes, Paul has produced a subtle history of eugenics that also raises provocative questions about the broader relationship between scientific developments and political culture.

The multiple meanings of eugenics is equally central to Marouf A. Hasian, Jr.’s study, *The Rhetoric of Eugenics in Anglo-American Thought*. A professor

of rhetoric and communications, Hasian offers a postmodern analysis of eugenics discourse. Occasionally, the terminology used to introduce this analysis seems to obscure rather than to clarify his presentation. Clearly valuable, however, are Hasian's careful efforts to trace the wide range of English and American arguments both for and against eugenics. The "most popular forms of eugenics," he concludes, "were not always the hard-line tales constructed by people like Francis Galton, Karl Pearson, Harry Laughlin, and Charles Davenport" (p. 141). To prove this, his chapters closely analyze the arguments produced by African Americans, women, Catholics, and liberals and socialists. Such a strategy proves more successful in some chapters than others, for at times the author seems to struggle with the task of organizing so much diverse data into cogent arguments. Still, the very rich material analyzed by Hasian adds several new dimensions to our understanding of the multiplicity of responses to eugenic science.

Hasian's chapter on Catholic responses is particularly insightful. Eugenicists and Catholics are usually portrayed as enemies, largely because of the church's intense opposition to sterilization. Hasian too sees much eugenics rhetoric as anti-Catholic. Yet his analysis is far more nuanced, for he shows how Catholic intellectuals often challenged, co-opted, or redefined the very meaning of "eugenics." According to some, it was the Catholic commitment to social welfare and its opposition to "antieugenic acts of gluttony, drunkenness, intemperance, idleness, bad company and neglect of prayer" (p. 97) that would truly improve the race. Others contrasted "the eugenics of the Galton school and the eugenics of the Catholic Church" or advocated a "supernatural eugenics" (p. 96). "To pass over war and social injustice in the hope of eradicating human ills by sterilization may be good propaganda," one Catholic critic argued, but "certainly it is bad eugenics" (p. 111).

Equally intriguing is Hasian's summary of African-American responses. While the role played by black intellectuals in battling scientific racism has been widely documented, Hasian's arguments go further, for he suggests that in the decades that witnessed the emergence of the "New Negro" and the "talented tenth," a science promising "race betterment" could appeal to black as well as white reformers. Thus, a 1924 article on "Applied Eugenics" in the NAACP journal *The Crisis* saw this science as "interested in breeding for tomorrow a better negro. One more anxious, more capable, and more courageous to assume a larger share of our economic, political and social responsibilities" (p. 64). Black responses too could divide along class lines. Even more complex were reactions to birth control. To some, a rising black birthrate was a welcome sign of survival despite intense discrimination (and a refutation of racist predictions that their race was doomed); to others, it meant that large black families were more likely to remain poor. In sum, for

black leaders attempting to fight white racism while elevating their own race, eugenics could prove a double-edged sword. By incorporating these stories into the larger narrative of eugenics history, Hasian's text significantly expands our understanding of both the appeal and the dangers inherent in this movement.

Both Hasian and Paul conclude by exploring the relevance of this past for contemporary medical genetics. In new screening procedures, both see a potential for covert social coercion, notwithstanding the modern lexicon of "choice," particularly in an era of state and medical cost cutting. Hasian fears the Human Genome Project could lead to "a return visit by a revised form of eugenics that is just beginning to be critiqued" (p. 137). Paul elaborates an even more subtle relationship between past and present, for the very word "eugenics" now "carries ominous connotations" and "packs a powerful emotional punch" (p. 4). As a result, history itself has become "a weapon in a war over social policy" (p. 134). If she is correct, then the task of explicating just what this history means takes on an added importance. Both of these texts contribute significantly to that task.

Leila Zenderland

Henry Harris, *The Cells of the Body: A History of Somatic Cell Genetics* (Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory Press, 1995), ix + 263 pp., illus., \$59.00, \$29.00 (paper).

Henry Harris, a major figure in somatic cell genetics and one of its current elder statesmen, has written an account of his field that is encyclopedic in scope and balanced in its viewpoint. The genetic behavior of somatic cells, first studied in laboratory cultures and more recently in whole organisms, is a relatively recent affair. The nongerm cells of the body have long been recognized as having fundamental genetic behaviors, that is, like begets like (more or less). But in contrast to the overt sexual behavior of the germ cells, the genetic functions and potentials of the somatic cells of multicellular organisms were not recognized and understood until rather complex and sophisticated laboratory manipulations were applied to their study.

Sir Henry Harris, Regius Professor of Medicine, Emeritus, at Oxford, describes the various strands of research that have contributed to our current views of the genetic behavior of somatic cells. Harris casts his net widely and brings together genetic, embryological, and biochemical traditions to show their roles in the development of somatic cell genetics. His review of the early literature, "Somatic Cells as Genetic Units" (chapter 1), is especially

useful to remind modern readers of the long history of this problem. In contrast to the carefully explained and documented early history of this field, the descriptions of some of the more recent science are too sketchy to do more than signal to the reader that Harris recognizes the interdisciplinary nature of his field. These topics – collected in chapter 6, “Somatic Cell Genetics and Molecular Biology Come Together” – such as nucleic acid renaturation, RNA sequence analysis, and the discovery of restriction endonucleases, for example, are too brief and cryptic to be of much use, except to someone who already knows the field quite well.

This book should please scientists, who will find Harris’s synthesis a comforting validation of their favorite research work as important to somatic cell genetics. Cell biology, bacterial genetics, radiation biology, carcinogenesis . . . all are important in this story. Historians, however, will find the work useful mainly as a compendium of “findings.” Analysis of controversy, motivation for specific research problems, reasons for changes in direction . . . all are absent or only briefly mentioned. Sadly, *The Cells of the Body* succumbs to the “annual review” syndrome and frequently reads like a list of conclusions: “scientist A showed fact B and then scientist X showed fact Y.” Anticipation and priority are important issues in Harris’s account of his field. But *The Cells of the Body* is important precisely because it represents the perspectives and judgments of one of its major participants. With rare exception, it is only the insiders who know the literature so well. Indeed, accounts such as this may be the only way for the more detached and analytical historian to obtain a truly “insider” viewpoint.

William C. Summers

Anne Harrington, *Reenchanted Science: Holism in German Culture from Wilhelm II to Hitler* (Princeton: Princeton University Press, 1996), xxiv + 309 pp., ill., \$39.50.

There has been a tendency in science over the past two decades to obviate the question of the internal and the external by approaching the subject of science and culture as just that, a single subject. Without reducing science to culture or ignoring the context of science altogether, a handful of histories of science have detailed the circular patterns of causation, in which culture influences, and is influenced by, science. *Reenchanted Science* accordingly makes a valuable contribution to this effort and to the history of biology, specifically the history of the life sciences in Germany, with its examination of holism in German biology and culture during the Wilhelmine and Weimar eras.

Drawing its title from a 1918 speech given by the sociologist Max Weber at the University of Munich, *Reenchanted Science* turns on the differing conceptions of the ends and means of the natural sciences in German culture. Particularly after World War I, Germans looked to science to make sense of an increasingly disturbing modern world. According to Weber, however, science actually worked “to undermine all transcendent principles, systematically stripping the world of all spiritual mystery, emotional color, and ethical significance and turning it into a mere ‘causal mechanism’ ” (p. xvi). Mechanistic Newtonian science, in the eyes of its critics, stripped the world of enchantment, of qualities like art and beauty that made life worth living. *Reenchanted Science* thus tells the story of a group of German-speaking life scientists who, although they agreed with Weber that science had dis-enchanted the world, nonetheless argued that science could present an existentially meaningful picture of the world if epistemological and methodological changes were made. Under the banner of holism, these biologists and psychologists – scientists of life and the spirit – tried to restore a nurturing role to the sciences and, in so doing, to reenchanted the world. Harrington convincingly demonstrates that biology and psychology, when interpreted holistically, also wielded a unique authority within the discussion of holism because these subjects studied phenomena that served as special symbols of hope and regeneration to German culture.

This holistic approach, which saw the natural order and the cultural order as essentially the same, opposed itself explicitly to the mechanistic epistemology embodied by the metaphor of the Machine. The Machine represented the threat that industrialization, urbanization, and modernization was thought to pose to all facets of German culture. According to Harrington, the Machine was best understood as an emotionally charged image that nonetheless possessed a certain reality. Mechanism had become associated with a number of high-stakes issues as German culture modernized, and both “holism” and “mechanism” had become the center of whole clusters of images and feelings.

Drawing from a wealth of primary printed and archival sources, Harrington teases out the dynamic interaction between holism and biology by paying attention not only to *what* biologists said, but *how* they said it through a careful attention to language. Metaphors allow Harrington to argue that German holistic science played an integral role in German cultural history, and to demonstrate “how the conceptual ‘content’ of holistic life . . . science was also its cultural ‘context’ ” (p. xxiii) without reducing one to the other. Illuminating metaphors, such as that of the Machine, allowed these biologists to “leapfrog in a range of ways across the epistemological divisions that an earlier generation of science had declared must separate” (p. xix) the natural and cultural orders. Harrington makes the astute observation that the adoption

of such culturally laden metaphors constituted a means for science to ignore a distinction its practitioners vigorously defended in their self-representation: nature versus culture, fact versus value.

This metaphor-mediated porousness to the identity of culture and nature, however, contributed to the co-optation of holistic biological discourse by the Nazis. Harrington does an excellent job of detailing this process and emphasizing that although holism was not synonymous with Nazified nature, metaphoric translations contributed to it through two tragic identifications. Both Jews and the sick were represented as part of the Machine and, as such, were held antithetical to life. Yet Harrington raises an important point, specifically that holism was not synonymous to National Socialism: the holistic and vitalistic embryologist Hans Driesch was emphatic in his opposition to the Nazis, and attempted to harness holism to the service of pacifism and humanism.

One concern with the book is the role of the thought of Kant in the holism-mechanism debate. While holists, drawing on Kant, claimed that mechanistic causality could not explain nature, mechanists, also drawing on Kant, claimed that mechanistic causality, as it originated in living minds, was adequate. This tension does not appear to be adequately resolved because only the Kantian influences on holism are addressed. While Harrington's analysis of the Kantian elements of holism is strong in the beginning, it appears to diminish toward the end. This Kantianism appears to be replaced by Goethean antirationalism, although the transition is unclear. Perhaps Kant's thought provided a fund of metaphors deep enough to accommodate whatever was sought for.

Throughout her book, Harrington skillfully interweaves cultural and biological concerns, and demonstrates that they were, in effect, the same. *Reenchanted Science* represents a valuable resource for students of the history of biology and psychology, German science, and early-twentieth-century German culture.

Christopher S. W. Koehler

Jacques Roger, *Buffon: A Life in Natural History*, trans. Sarah Lucille Bonnefoi, ed. L. Pearce Williams (Ithaca: Cornell University Press, 1997), xviii + 492 pp., illus., \$49.95.

At the time of his death in 1990, Jacques Roger was the leading authority on Buffon. For almost forty years he had published works on Buffon, and, more than anyone else, he was responsible for renewing interest in this leading

naturalist of the Enlightenment and major figure in the history of biology. Roger's publications on Buffon include a coedited scholarly bibliography (in Jean Piveteau's *Oeuvres Philosophiques de Buffon*, 1954), a critical edition of *Les Époques de la nature* (in the *Mémoires du Muséum National d'Histoire Naturelle*, 1962), and fifty-seven pages on Buffon's theory of generation in his magisterial study of eighteenth-century ideas on animal generation (*Les sciences de la vie dans la pensée française du XVIIIe siècle*, 1963. This work has just been translated and is, at last, available to a wider audience). Fortunately for the scholarly world, Roger published his biography in the year before he died, or, as has been the case with some scholars who have devoted decades of study to mastering the life's work of a major scientific figure but never published their long-awaited final word, his mature overview might have been lost.

Roger's task was not easy. Relatively few of Buffon's letters survive, and he destroyed most of his manuscripts, preferring to leave his polished publications for future generations to judge. His family life was private, his daughter died in childhood, and his only son was executed during the Revolution. Even the location of the portrait of his wife is unknown. No Darwin industry is possible with such scant manuscript resources. But Buffon was a prolific writer, and his thirty-six-volume *Histoire naturelle, générale et particulière* (1749–1789) contains a wide range of subjects from essays on methodology to speculations on the formation of the earth. Roger had to concentrate on Buffon's writings, and this biography, therefore, is an intellectual biography. All the known facts of Buffon's life are in the book, as is the little we know about his relationships. But even there, much has had to be reconstructed from bits and pieces of evidence.

Roger has compensated for the incomplete record by carefully reading Buffon's work and providing insightful analyses that are placed in the context of the major themes of eighteenth-century science and philosophy. He provides background sketches on the growth of the mechanical philosophy in the seventeenth century and the theological interpretations given to it. Buffon's secular philosophy of nature is then contrasted with the natural theology of his contemporaries and immediate predecessors. The overwhelming bulk of Buffon's work consists of individual articles on specific animals. Roger focuses attention on the more philosophical essays that are found primarily in the opening volumes of Buffon's natural history and selects from the individual articles on animals sections that contain reflective or theoretical passages.

Separate chapters examine Buffon's ideas on method, his theory of the earth, theory on generation, natural history of man, classification, the order of nature, and definitions of basic terms like "species." Roger is at his best

at explicating the complex ideas that inform Buffon's natural history. Buffon may have been one of the members of the Académie Française, but he was not a systematic philosopher. Some of his ideas were sketchy, and Roger provides the reader with consistent and intelligent interpretations.

Roger's biography sticks closely to the text. Buffon's writings are placed in the context of eighteenth-century science and philosophy, but there is little of the wider context, his influence, or his ideas as a reflection of his time. But that is for other scholars to fill in. Roger has given the reader a rich survey of Buffon's major ideas. Sarah Bonnefoi's translation is accurate and faithful to the original, and the editor, L. Pearce Williams, provides helpful notes for the reader. The biography is a valuable addition to the secondary literature in the history of the life sciences, and it should help expand the reputation of a major figure who is still relatively little known in the English-speaking world.

Paul Lawrence Farber

Keir B. Sterling, Richard P. Harmond, George A. Cevalasco, and Lorne F. Hammond, eds., *Biographical Dictionary of American and Canadian Naturalists and Environmentalists* (Westport, Conn., and London: Greenwood Press, 1997), xix + 937 pp. \$175.00.

Robert L. Burgess, "American Ecologists: A Biographical Bibliography," *Huntia: A Journal of Botanical History* 10, no. 1 (1996): 5–116. \$60.00.

I might as well admit it up front: I have long been a fan of well-constructed reference works. Most of us discover early on how useful the right bibliography, biographical dictionary, index, or encyclopedia can be. And although we all depend on various reference materials to conduct our research, rarely do we grant the scholars who create them the recognition they deserve. Historians of biology – especially those whose interests center on developments in North American natural history, ecology, conservation, and/or environmentalism – clearly owe a debt of gratitude to the authors of these two excellent compilations.

The larger of the two works, a biographical dictionary of "American and Canadian naturalists and environmentalists," provides personal and professional information on some 445 "representative" figures who were active from the colonial period to 1996. In making selections about coverage, the editors have widely chosen to cast their net broadly. Included are biographical sketches not only of explorers, artists, writers, and conservationists but also of naturalists, ecologists, biogeographers, and others who have collected,

described, mapped, cataloged, or worked to protect various components of the North American landscape. Commercial natural history is the only activity not adequately represented in this expansive and generally well-chosen sample, although in fairness to the editors it should be mentioned that this occupation has only begun to gain the scholarly attention it deserves. During the late nineteenth century, dealers in specimens and supplies – entrepreneurs like Henry A. Ward and Frank B. Webster – played a crucial role in the American natural history community, serving as conduits of information and specimens, providing encouragement to budding young naturalists, and offering employment opportunities at a time when jobs in natural history were few and far between. Yet neither Ward nor Webster receives an entry in this otherwise comprehensive dictionary. (Ward is briefly mentioned in the sketches of William T. Hornaday and William Morton Wheeler, two of the many naturalists who went on to distinguished careers in museums, zoological parks, academic institutions, and private businesses after serving apprenticeships at Ward's Natural Science Establishment in Rochester, N.Y.)

The entries are concise and follow an easy-to-use format. Chronicled for each individual covered in the dictionary are the date and location of birth and death, family and educational background, an overview of career and major contributions, and a list of bibliographical sources. Many entries also include an indication of relevant manuscript collections, although the authors and editors have not always been consistent in supplying this information (e.g., the entry for William Brewster fails to mention his voluminous collection of papers preserved in the Museum of Comparative Zoology Special Collections at Harvard). Also missing are specific page numbers for many of the articles cited in the bibliographical sources. These problems are minor, though, when compared to the amount of useful information packed into this exceptionally handy volume.

Robert Burgess's "biographical bibliography" of American ecologists is much more modest in scope but also quite useful. First published in a much shorter version in 1981, Burgess has now expanded his bibliography to cover about 575 ecologists and more than 2,400 citations. The primary criterion for inclusion is affiliation with the Ecological Society of America, founded in 1915, although the compiler does provide references for "a few foreign scientists" who had obituaries or other biographical information published in ESA journals. He also includes a handful of figures who exerted an important "early influence on the development of American ecology" (p. 6) before the establishment of the ESA (e.g., he cites C. Hart Merriam and Charles E. Bessey, but not George Perkins Marsh). The bibliography is rendered more useful by the occasional addition of brief annotations (most often indicating the location of published portraits or photographs) and by the decision to

include entries on living ecologists (although the information available on these scientists is often quite sketchy). The references cited range from short notices of awards and deaths to book-length biographies.

The two works complement each other nicely, even though many entries appear in both. When there is overlap, Burgess invariably cites more bibliographical references. Yet, because the Sterling, Harmond, Cevasco, and Hammond volume provides self-contained biographical sketches for each of its entries, it is generally more convenient than Burgess's bibliography. While the price of these volumes will undoubtedly dissuade some historians from purchasing them for their own private use, both should be included in every major research library. They represent valuable additions to the tool kit available to historians of ecology and natural history, environmental historians, and anyone else interested in the development of scientific accounts of the North American landscape.

Mark V. Barrow, Jr.