Bowler identifies five basic kinds of evolutionary theory: selectionist, theistic, Lamarckian, orthogenetic, and mutationist. He surveys the basic elements of late-19th-century Darwinism, charts the decline in this period of theistic evolution (the idea that the course of evolution was designed by the Creator), and then dwells at length on Lamarckian, orthogenetic, and mutationist alternatives to Darwinian natural selection. Though his emphasis is more on general trends in evolutionary theory than on the particular kinds of evidence that individual theorists cited on their behalf, he does show for at least the American neo-Lamarckians that the different kinds of evidence available to paleontologists on the one hand and field naturalists on the other were reflected in the different ways these groups exploited Lamarckian theory.

Bowler sees the "eclipse of Darwinism" at the turn of the century as the result of two different factors operating simultaneously: a "backward-looking" return to "an earlier, largely teleological view of development in which the evolution of life was modeled on the goal-directed process of individual growth," and a "forward-looking" "more rigorous attempt to reform biology," which involved promoting the laboratory study of heredity and variation. With respect to the first of these factors, he explains that many anti-Darwinian theorists wanted very much to see evolution as an ordered process. Not only the Lamarckians (who preserved a place for purpose in nature by believing that the adaptive responses of organisms to their environments produced heritable organic change) and the orthogenesists (who believed that factors internal to organisms provided direction to the evolutionary process) but also the early mutationists—William Bateson, Hugo de Vries, T. H. Morgan, and others—were uncomfortable with the "randomness" of Darwinian natural selection. In making this point, Bowler is careful to note, however, that the philosophical and social implications of Lamarckism and orthogenesis had their own drawbacks. Lamarckism, though commonly associated with progressive notions regarding the possibilities of human improvement, was in its own day readily enlisted in support of ideas of racial inequality and separate social roles for the sexes. Orthogenesis, with its pessimistic notion of evolutionary lines running predetermined courses to extinction, offered a view of the cosmic process too chilling for many scientists to embrace.

The major weakness in Bowler's treatment of his subject is his failure to relate the various evolutionary theories he examines to the particular institutional contexts in which they were elaborated. He focuses almost exclusively on the internal logic of the theoretical alternatives in question. He writes of evolutionary theory being gradually (and inevitably) purged of its more conservative elements. Representative of his interpretative framework is the statement: "Had the experimental movement not been contaminated by extreme anti-Darwinian sentiments derived from [the] more traditionally oriented philosophy, the emergence of modern genetics might have been accompanied by a far less obvious repudiation of selection" (p. 219). This approach neglects the disciplinary stakes that were involved in the disagreements over the kinds of evidence and methodologies that were most vital to understanding how evolution works. Bowler expresses an inkling that the institutional structure of French science may have had something to do with the peculiar shape of anti-Darwinism in France, but he does not explore the possibility that the course of the evolutionary debates in England, Germany, or the United States may have reflected the organization (and ongoing restructuring) of science in those countries too. Neither what Bowler calls the "overenthusiastic" claims of the experimentalists, nor the competition between the biometricians and the Mendelians in England, nor the way the Lamarckians were forced into the experimental arena despite the fact that the main foundations of their claims lay elsewhere, can be fully understood by looking just at the logic of the theories involved. Future investigators of this subject will have to explore the extent to which being able to pronounce authoritatively on the issue of how evolution works played a role in the competition between disciplines for crucial resources: university positions, research funds, talented students, and so forth. In this regard it is certainly worth remarking that the United States, the home of the most distinctive school of Neo-Lamarckians in the late 19th century, was in the early 20th century the country in which opportunities to pursue academic biology changed most dramatically and at the same time the country where Lamarckism died fastest and genetics developed most quickly.

Bowler's book provides a much-needed overview of a rich and fascinating period in the history of evolutionary theory. The author is to be commended not only for tackling a subject that had been unduly neglected by historians of science but also for providing an account that is bound to attract more scholars to the small but growing number of historians of biology concerned with post-Darwinian issues. Biologists too should find Bowler's well-written account of interest. It is certainly worth knowing that disagreements among evolutionary biologists concerning how evolution works are not just a novelty of the 1970's and 1980's.

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Distributional Patterns

Biogeography. JAMES H. BROWN and ARTHUR C. GIBSON. Mosby, St. Louis, Mo., 1983. xii, 644 pp., illus. $32.95.

Biogeographers study the distributions of organisms. Historical biogeographers try to reconstruct the past positions and movements of plants and animals and decipher their causes. Neo-biogeographers tend to focus on either descriptions of biotic units or the ecological determinants of species boundaries. In its entirety, biogeography thus requires a knowledge of systematics, evolutionary biology, ecology, physiology, geology, and meteorology. Given the diversity of information that must be mastered in order to understand completely the various facets of the subject, it is not surprising that there have been few attempts to produce a modern, integrated biogeography textbook. In fact, since the 1960's there has not been a truly comprehensive book on either plant or animal geography. Brown and Gibson have now corrected this situation by providing a systematically balanced and almost encyclopedic treatment of the elements involved in biogeographical research. They include discussions of topics ranging from continental drift to community ecology and climatology to cladistics. Their discussions are replete with examples drawn from a wide array of terrestrial and aquatic plants and animals. Particular works are cited and the bibliography is extensive. There is, however, a decided bias toward studies centered in the American southwest.

The book is organized into four units dealing with the ecological determinants of plant and animal distributions, the past geological events that shaped species distributions, the modern geographi-

cal patterns of aquatic and terrestrial organisms, and, finally, ecological biogeography. There are, however, some inconsistencies within this outline. Quaternary phenomena are not discussed with other historical events but are included in the section on modern distributions. The unit on ecological biogeography, which contains some of the most interesting discussions, seems artificially separated from the unit on the ecological setting. The separation of the topics discussed in this last section (for example, island biogeography) undoubtedly reflects the influence of MacArthur on the authors. Obvious as well are Whittaker's ideas about plant community ecology. The notion of a climax community rates one line. The concept of plant formations, the basis of our biome and ecosystem nomenclature, is never clearly discussed even though formation names are used throughout.

In content the book is unquestionably unrivaled, although I think that many students will have difficulty in obtaining from it a feeling for how biogeographical studies are really done. The only detailed section that explains the processes involved in a historical biogeographical reconstruction is one dealing with phylogenetic systematics and vicariance biogeography. Within this short section, the authors do not make it clear that one can be a cladist and not a vicariance biogeographer or that, these days, one can be a cladist without an evolutionary premise. The authors also do not stress the importance of endemism in vicariance biogeography. After drawing a distinction between evolutionary and phylogenetic systematics, Brown and Gibson proceed to call many of the classical evolutionary studies they cite "phylogenetic treatments," which would certainly be interpreted by the naive reader to mean a cladistic treatment. More important perhaps, since this is supposed to be a textbook for undergraduates, is the absence of a feeling for the dynamism that makes biogeography appealing to many people. The abundance of works mentioned precludes detailed discussion of any of them. As a result, readers are left without a sense of the excitement of the original studies. Gone is the thrill of marching geofloras or the vivid imagery of organisms being swept up in the current of colonization from North to South America or being strained from the flow by a series of filters between the two continents. For advanced students and scientists familiar with the subject, this presents no problem because they will have read the original articles. For others, biogeography will probably appear to be a rather flat discipline. Nevertheless, the wealth of information presented and its accumulation into a coherent framework clearly outweigh the book's shortcomings.

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