Evolutionary Thinking Observed

Dimensions of Darwinism. Themes and Counterthemes in Twentieth-Century Evolutionary Theory. MARJORIE GRENE, Ed. Cambridge University Press, New York, and Editions de la Maison des Sciences de l'Homme, Paris, 1983. x, 336 pp. $29.95. From a conference, Bad Homburg, Germany, Aug. 1981.

Science is supposed to be international, but, as the historical papers in this anthology show, the development of evolutionary biology in English- and in German-speaking countries was radically different. The story in England and the United States is familiar. After suffering an eclipse at the turn of the century, Darwinism was reshaped into the Synthetic Theory, first by Fisher, Haldane, and Wright and then by Dobzhansky, Mayr, and Simpson. Several authors argue that this story as it is usually told is not quite accurate. For example, both William Provine and William Kimler challenge the exemplary role of systematists claimed by Ernst Mayr in the forging of the new synthesis. Rather than promoting the role of adaptation in evolution, systematists were instrumental in convincing other biologists that the characters that distinguish taxa at lower taxonomic levels are nonadaptive. Kimler argues that ecologists were the ones who emphasized adaptation. Provine, however, supports Stephen Gould's view of the new synthesis as abandoning its early pluralism as it hardened into its current gradualistic, selectionist form.

All this interest shown by practicing biologists in the history of their discipline can be explained in part by the recent turmoil concerning the foundations of evolutionary biology. Several evolutionary biologists, most notably Gould and Niles Eldredge, are promoting new versions of evolutionary theory. According to the model proposed by Eldredge and Gould, evolutionary development is a good deal more "punctuational" than advocates of the synthetic theory have been willing to admit and contains an important nonadaptive phase. Instead of occurring by means of hopeful monsters, evolution proceeds by the differential success of "hopeful populations." According to the recent literature in philosophy and sociology of science, no sooner do scientists come up with a "new" view than they begin to search for unappreciated precursors who held similar views and were treated unfairly in their own day. Interest in Richard Goldschmidt is a case in point. Gould is as familiar with this literature as the next person. He must feel a bit uncomfortable behaving in such a predictable manner.

As Bernhard Rensch, Wolf-Ernst Reif, and Rupert Riedl show, the development of evolutionary biology during the early part of the 20th century was quite different in German-speaking countries. Even though Weismann, a German, was the impetus for neo-Darwinism in Great Britain, German biologists were not especially inclined to join in the new synthesis. (Rensch was the major exception.) Instead, morphology and reconstruction of phylogeny have predominated. Riedl decries the identification of morphology with German idealistic philosophy encouraged by such expatriates as Ernst Mayr. The major gap in the new synthesis according to Riedl is lack of proper attention to form. "All human understanding or comprehension of complex objects and events in this world is connected with our perception of form (*Gestalt*)" (p. 205). It was not the few proponents of the new synthesis that dominated the German scene but the paleontologist O. H. Schindewolf. Granted, Schindewolf did maintain that the first bird hatched from an egg laid by a reptile, but he did not reject evolution or advocate any sort of vitalism. Hence he could never understand why other authors seemed to consider him a Platonist. Although Riedl is likely to be no less dismayed, English-speaking readers are liable to view him in the same light. Marjorie Grene, who translated Riedl's paper, has tried vainly for many years to get English-speaking scientists to give proper attention to the German literature. Her only success occurred a quarter of a century ago when she compared the views of Schindewolf and Simpson and found Schindewolf's ideas epistemologically superior. Even so, in reading Riedl's essay, Grene finds herself entering a different and strange world. Other readers, even less receptive than she, are likely to feel the same way.

A second theme of this anthology is the important role that society at large plays in scientific development. Externalist commentators on science have emphasized that the general character of the society in which scientists live informs their science. The usual example is Darwin's theory of evolution. Riedl attributes the "instant success" of Darwin's theory to Victorian industrialization. "The reading public of England, which, with Victorian industrialization, had demonstrated its (often ruthless) efficiency, could now see the rights it arrogated to itself on the ground of that efficiency legitimized as a law of nature" (p. 210). The main message of Bernard Norton's paper is that Fisher's interest in population genetics and the peculiarly gradualist and selectionist character of his theory were due in large measure to his intense commitment to eugenics. "Eugenics was the dog that wagged the tail of population genetics and evolutionary theory, not the other way about" (p. 21).

Several evolutionary biologists agree that nonscientific factors (narrowly conceived) are important in scientific change. Among them are Gould and Richard Lewontin. These biologists have also frequently denigrated evolutionary scenarios as Kiplingesque just-so stories. The problem with explaining the structure of organisms in terms of past adaptations is that neither available evidence nor current theories of evolutionary mechanisms constrain such explanations very much. Indefinitely many alternative stories seem equally plausible. But similar observations hold for the explanations that commentators on science give for episodes in science. Often as the connection between the competitive character of Darwin's theory and Victorian society has been alleged, little in the way of evidence has been provided for it. First off, Darwin's theory was hardly an "instant success," and the part that was least successful was natural selection. Other scientists living in the same competitive society as Darwin somehow remained impervious to its influences. On a larger scale, no correlation seems to exist between the reception of Darwin's theory around the world and the larger characteristics of these societies; at least none has been demonstrated.

Relevant to this question is Kimler's and John Turner's argument that so much attention has been paid to mimicry because it is the clearest example of natural selection at work. How influential was the competitive nature of Victorian society in contrast to studies of mimicry in leading biologists to accept Darwin's theory? Strong convictions notwithstanding, no one has carried out

the sorts of investigation necessary for anyone to venture a guess. But one thing is certain, if evolutionary scenarios are just-so stories then the causal claims made about the course of science warrant no greater credence.

Grene's anthology is primarily historical in intent, but several papers deal with the status of present-day evolutionary biology. Turner, Antoni Hoffman, and John Maynard Smith evaluate recent controversies in paleontology and evolutionary biology. In this connection, Eldredge and Gould's model comes in for some harsh and at times sarcastic treatment. For example, Turner terms the version of evolutionary theory proposed by Eldredge and Gould the "theory of evolution by jerks." I am afraid that the double entendre was intended. As Turner sees it, "The theory of evolution by jerks is being largely created by juggling with definitions and using a diagram whose vertical axis, time, is clear enough, but whose horizontal axes conflate, in a most confusing way, phenotypic change and geographical separation. . . . These diagrams, and the theory they represent, undo eighty years of progress in population genetics" (p. 155).

Richard Burian and D. S. Peters conclude the volume with careful discussions of the notions of adaptation and fitness. Proper attention to Burian's classification of various senses of these important terms would go a long way in eliminating the conceptual confusion that continues to plague evolutionary biology.

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A Boreal Biota

Biogeography and Ecology of the Island of Newfoundland. G. ROBIN SOUTH, Ed. Junk, The Hague, 1983 (U.S. distributor, Kluwer Boston, Hingham, Mass.). xii, 724 pp., illus. $130. Monographiae Biologicae, vol. 48.

The Island of Newfoundland, lying between 46° and 52°N, is the easternmost extension of the North American continent. Its climate is boreal-maritime, chilled but yet moderated by the Labrador current from the north; it has been extensively glaciated, and agricultural land occupies only 1 percent of the area. Discovered by Leif Eriksson about the year 1000, and rediscovered by John Cabot in 1497, it remained for centuries a distant colony, valued mainly as a base for fishing. Later an important forestry developed, but modern cultural and scientific progress belongs to the postwar period only.

This multiauthor book on the biota of Newfoundland, written mainly from Memorial University, considers successively the geological origins, climate, soils, ecological regions, peatlands, heathlands, lichens, mosses, marine algae, marine ecology, seabirds, land mammals, introduced insects, aquatic insects, and amphipods. Work is in progress on all these subjects, and the chapters have been chosen largely on this basis. Some earlier work, such as the biogeographic results of the Scandinavian entomological expeditions of 1949–1951, is not reviewed, and other important themes, such as the boreal forest (which occupies nearly one-half of the land area), are also missing.

The editor provides an informative synoptic introduction, and there follows the chapter on geological origins. The island is the northeasternmost section of the Appalachian system in North America and preserves in its structure the history of the North Atlantic area, from the proto-Atlantic Ocean of early times to the collision of continents that generated the Appalachian orogen and the later rifting that led to the Atlantic of today. But the Pleistocene glaciations eliminated most or all the preceding fauna, flora, and soils. The significance of foreland or offshore refugial areas remains uncertain—a problem that returns in several later chapters.

There are good discussions of the climate and the soils and a chapter on peatlands with an interesting series of aerial photographs and profiles. The flora of lichens and mosses, the first of the individual groups to be dealt with, is large and diverse; they have achieved a nearly complete recolonization in the 10,000 years since deglaciation. The case of the mammals is different. There are only 14 native species, as against 34 in Labrador, and the fauna is evidently disharmonic. Most species probably came in by the narrow Strait of Belle Isle, but recolonization has been very incomplete owing to the insularity of Newfoundland or simply to its great distance from areas of Pleistocene survival. Finally, a chapter on aquatic insects discusses the different modalities of aquatic life in the several orders and leads to interesting views on habitat selection and the determination of present-day ranges. In the event, the dragonflies, caddisflies, and water beetles are now represented by an almost full eastern boreal zone fauna, whereas the stoneflies, like the mammals, are very sparse.

Overall, this is a significant contribution to the ongoing study of the biology of Newfoundland and of the boreal life zone at large.

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Protists

Radiolaria. O. ROGER ANDERSON. Springer-Verlag, New York, 1983. x, 355 pp., illus. $59.

The stated purpose of this book is to encourage interdisciplinary research on a "remarkable group of aesthetically pleasing mineral-secreting protists." The author has contributed much to the understanding of the biology of radiolaria through his own research, and his book emphasizes the biological aspects of radiolarian studies over paleontologic and stratigraphic themes. It provides an extremely broad view of studies that have addressed the morphology, systematics, cellular structure, physiology, ecology, and evolution of the radiolaria. The discussions of symbiosis, bioluminescence, parasitism, and skeletal structure and morphogenesis are particularly enlightening.

Anderson is acutely aware of the great gaps in our knowledge of the radiolaria. Many of these gaps derive from our inability to follow them through a complete reproductive cycle in a laboratory setting—let alone maintain a long-term culture suitable for ecologic studies. Although fission and the production of "swarmers" have been observed, a full cycle of sexual reproduction has not. "There is . . . no convincing evidence that the flagellated swarmers are gametes." Yet sexual reproduction and even hybridization have been inferred by many authors. The lack of long-term laboratory studies, combined with the very complex nature of the pelagic realm inhabited by the radiolaria, has limited investigations to the techniques of careful observation and strong inference.

The first major strong point of this book is the completeness of its treatment of the literature. The second is that the author never fails to point out where further research is needed and often suggests how some of the remaining problems might be addressed. A weakness (if it is to be considered such) is that the