Book Reviews

Lamarck in His Milieu

The Spirit of System. Lamarck and Evolutionary Biology. RICHARD W. BURKHARDT, JR. Harvard University Press, Cambridge, Mass., 1977. xii, 286 pp., illus. $16.50.

It is mainly for wrong reasons that Lamarck is remembered today. His fame comes from his alleged framing of the conception of the inheritance of acquired characteristics, from his putative ancestorship of neo-Lamarckism, and, in pious historiography, from his characterization as a martyr of science, persecuted by state power (Napoleon) and the scientific establishment of his time (Cuvier). More generally, he has often been depicted as the biologist who, long before Darwin, tried, though unsuccessfully, to tackle the problems of adaptation and the origin of species.

Fortunately recent research is dissipating some of those ideas, making possible a new understanding of Lamarck's historical identity.

As Burkhardt points out, the idea of the inheritance of acquired characteristics had a long history before Lamarck's time and moreover never was central in his thought. As for neo-Lamarckism (in contrast to neo-Darwinism in relation to Darwin), be it American or French, it bore no continuity in tradition with Lamarck. Indeed, there is a considerable body of evidence to show that the so-called neo-Lamarckian conceptions initially emerged in reaction against Darwin's theory and some of its 19th-century reshapings and not as the product of a research program under development from Lamarck's time on. As a matter of fact, early neo-Lamarckian leaders, for instance Cope in the United States or Giard in France, had at first little knowledge of Lamarck's writings. The neo-Lamarckian conceptions were attempts to answer better than Darwin had the questions of the origin of species and of adaptation. It was not so in Lamarck's works: these questions he never raised as such, his main concern being to explain the advent through time of ever more complex patterns of organization, from Infusoria to man, and, at first, to accommodate such an explanation to the idea of a single chain of beings. In short, since his answers were directed to a different set of questions, Lamarck cannot be understood as providing wrong answers to questions better dealt with by Darwin.

Lamarck is therefore best studied not in the light of Darwin's achievement but in the context of his own age. This task Burkhardt sets for himself when he writes: "Reconstructing the intellectual milieu in which Lamarck operated as a means of evaluating the guiding features of Lamarck's evolutionary thought is one of the major tasks of this work." In that reconstruction Burkhardt is often strikingly successful. For instance, his description of the 18th-century natural history background is rich and precise and his depiction of Lamarck's immediate environment, that of the naturalists working at the Jardin du Roi (which in 1793 became the Muséum d'Histoire Naturelle), is as pleasurable to read as it is informative and illuminating. The crucial intellectual issues of the second half of the 18th century are carefully reviewed: that of the nature of life and the relationships between inorganic and organic bodies, a matter on which Burkhardt argues Lamarck underwent a dramatic shift from a vitalist to a monist-materialist position; that of the chain of being, a conception which was more and more heavily criticized by naturalists late in the century but to which Lamarck in many ways remained committed; and the idea of the mutability of species, which Burkhardt reviews, analyzing the works of major naturalists such as Adanson, Linnaeus, and Buffon and also, very usefully, those of lesser ones such as Duchesne, Tschoudi, and Delamétherie.

In addition to these intellectual issues Burkhardt stresses the importance of a structural transformation in the scientific life of late-18th-century France. As a result of rapid institutionalization, which provided a considerable number of positions for practicing and teaching science full time, scientific activity was clearly moving toward a disciplinary pattern, involving specialization and narrowing of the scope of problems one person might generally claim to speak legitimately and authoritatively about. In Lamarck's case, it is particularly important to understand that social process, for he never stopped fancying himself as the universalist naturalist-philosopher, setting basic principles for all fields included in the scope of a truly cosmological project. Lamarck's career is not just that of a biologist with interests shifting from botany to invertebrate zoology; it also involves extensive writings in an anti-Lavoisierian brand of chemistry, in some anti-Laplacian physics and meteorology, in geology, and even in psychology and philosophy. Indeed, since serious attention has been given to Lamarck's "physico-chemical logic"—an expression of his—many scholars have attempted to find in it the roots of his evolutionary pronouncements of the early 1800's.

Burkhardt's claim is that these roots of Lamarckian evolutionism are to be found elsewhere, namely in Lamarck's work in conchology, a field he was expected to cultivate as one of the responsibilities of his chair at the Muséum d'Histoire Naturelle. This Burkhardt thinks put Lamarck in a situation where he could not escape critical examination of the idea of the extinction of species, an issue to which the relationships between living and fossil shells had in the 1790's become central. Unable to imagine any natural mechanism to account for the extinction of entire species, Lamarck, according to Burkhardt, would have had to conclude that extinction was impossible and that fossil species, no longer found among the living, simply had been transformed. Lamarck nowhere says what prompted him to change his mind and become an evolutionist, and Burkhardt has had, with much virtuosity, to base his case on indirect evidence. Well argued as it is, Burkhardt's solution remains in some respects perplexing. There is no doubt about Lamarck's commitment to the Linnean idea of an economy of nature, well regulated and intangible, in which the war of species rages only to maintain a permanent balance between the populations of living species. However, if for Lamarck the impossibility of extinction was based on his acceptance—the wicked human species being a special case—of that conception, it is strange that he nowhere raises the problem of accommodating the evolution of organisms to the notion of the economy of nature. Indeed, it would seem that this concept not only would imply the impossibility of extinction but also, at face value, would preclude the notion of the transformation of species. It seems that further research and clarification are needed here.

In explaining the Lamarckian mechanisms for evolution, Burkhardt has done a very detailed job, emphasizing the centrality of Lamarck's early commitment

to the notion of a single series of progressively more complex organizations, in animals as well as in plants. Lamarck's is a two-factor theory. First there is a sort of drive of life to produce ever more complex forms, in such a way that all animal and all plant forms should arise in linear succession. Since, as classification testifies, that does not occur, relationships between taxa instead showing repeated branching, some interfering process must have been acting, distorting the serial arrangement without, however, being able to eradicate it completely. That interference is ascribed to the action of circumstances, to the changing environment twisting the organism in a way that makes it an "anomaly" when considered in relation to serial succession. In this context, the problem of adaptation per se never arises; adaptive characters are so to speak explained away by focusing on the primary factor of evolution and the deflection of its effects.

From 1800 to the 1820's the Lamarckian evolutionary explanation showed some modifications, which Burkhardt carefully and usefully documents. Though these did not alter the fundamental principles of the theory, they consistently led to a more and more nuanced appraisal of linearity in the development of the diverse animal classes.

As one progresses through the book one is led by the author to oscillate in one's perception and assessment of Lamarckism. In places Burkhardt makes us feel that Lamarck's ideas should have had a better reception in his time, though elsewhere it is made clear that his solution could not be seen as correct and convincing by his contemporaries, that there was little or no factual evidence supporting it, and that moreover Lamarck's approach to science, as reflected in his writings as well as in his behavior, ran counter to the ethos and standards of the institutionalized French science of the time.

Indeed, it would seem that the author is equivocal in his very perception of Lamarck himself, a most complex character. Burkhardt concludes saying that "one cannot help but feel sympathy" toward Lamarck; this shows consistently throughout the book. But whereas at the beginning of the book Lamarck is described as "a skillful lobbyist on his own behalf," with "a sense of what was politically prudent," he is later characterized as "an inept strategist." In more than one place his paranoia is stressed, though at other times one is made to feel that it is unjustly that his ideas were attacked or brushed away. No doubt this reflects the fact that an equitable assessment of Lamarck's significance in his own environment is a difficult task, the more so because we still lack information on the workings, commitments, and vested interests of the French scientific community in the early decades of the 19th century. All in all Burkhardt has given us an important and reliable study, no doubt the major source now on the topic.

CAMILLE LIMOGES
Institut d'histoire et de sociopolitique des sciences, Université de Montréal, Montreal H3C 3JN, Canada

Phylogenetic Reconstruction

Major Patterns in Vertebrate Evolution. Papers from a NATO Advanced Study Institute, Surrey, England, July 1976. MAX K. HECHT, PETER C. GOODY, and BESSIE M. HECHT, Eds. Plenum, New York, 1977. x, 908 pp., illus. $64.50. NATO Advanced Study Institutes Series A, vol. 14.

The volume under review consists of 22 major papers and seven extended comments arranged in three groups: Approaches to the Analysis of Macroevolutionary Trends (312 pp.), Macroevolutionary Trends among Vertebrate Taxa (426 pp.), and Phylogeny and Classification of Vertebrate Taxa (156 pp.). The type is large and space on the pages is poorly used, presumably as a result of efforts to reduce labor costs. The papers themselves are variable in quality and significance. Some are loosely written summaries, but there are also some important papers that present new data, offer new perspectives, or both.

The overwhelming preoccupation of the contributors is the reconstruction of phylogenetic histories. Most of the papers deal with this issue philosophically or empirically. Major differences in philosophy and practice are apparent among the offerings. There is disagreement on some fundamental issues, such as the contribution, if any, made by the fossil record to phylogenetic interpretation. Even seemingly uncomplicated words produce controversy. Thus Bonde states, "The whole theory of phylogenetic systematics could be looked upon as a semantic analysis of the word 'related' with a precise and unique biological meaning, and the consequences of this analysis for bio-classifications."

There are no defenders of phenetic taxonomies in this book. Farris, who treats the subject, concludes that phylogenetic methods can best be used to attain the goals of pheneticists.

In contrast there are numerous proponents of so-called phylogenetic systematic (à la Hennig) approaches. Some of their attempts to justify their views are emotional, some are restatements of old arguments, and some are simply assertive. Perhaps the most comprehensive paper is Patterson's treatment of teleost phylogeny. Following a concise historical summary, Patterson presents an empirical example of his phylogenetic method as applied to "halecostome" fishes. He argues that cladist approaches give direction and purpose to paleontology. At the same time his phylogenetic taxonomic philosophy leads him to conclude that paleontology must always be subservient to neontology and has no fully independent role in phylogenetic work.

Traditional or evolutionary systematic approaches (in the tradition of Simpson and Mayr) find their strong proponents in Bock (two papers) and Gutmann. Bock argues that clarity of reasoning is more important than methodological detail and that the distinction between opposing approaches often breaks down when it comes to precedural details. Gutmann advocates a rather imprecise adaptational interpretation of phylogenetic transformations. The basis for his analysis is the production of a "Bauplan" for particular systems of groups based on admittedly somewhat simplistic biomechanical, physiological, and ecological relations. Continuous models of change apparently based on optimization ideas are proposed, but I fail to understand how they can be put into practice.

Some workers are skeptical that any single method has been invented that will provide a robust classification. Hecht and Edwards analyze a case history in detail, using their recently formulated cladistic method to examine salamander classification. Despite relatively good data, they are unable to find any scheme that does not require multiple parallelism and reversal. They observe that the mere multiplication of poorly analyzed morphoclines will not lead to correct phylogenies and urge that the desire to find an answer not be allowed to lead to the acceptance of suspect relationships. Their methods at least identify ambiguity.

A pair of papers by Fitch on the phyletic interpretation of macromolecular data and a brief comment by Beintema are the only contributions that deal with problems at the molecular level. The first of Fitch's papers addresses simple meth-