portant items: Henry's 1826 Inaugural Address as Professor of Mathematics and Natural Philosophy at the Albany Academy; an 1831 letter to a Mr. Rogers (one of the very few unidentifiable individuals to appear in this volume) on his understanding of the patent laws; and the Introductory Lecture to a course on chemistry he taught at the Academy early in 1832. Throughout these documents, Henry shows his "deep-rooted belief [in the words of the editors] that the useful arts should and actually do depend wholly on discoveries in pure science," and, as the editors note, such "intense but naive beliefs were embraced by a number of [Henry's] contemporaries," including apparently the trustees of the Academy. These beliefs led Henry to a state of confusion and a total misunderstanding of the patent laws. In his letter to Mr. Rogers, he argued that if a scientist publishes the results of his investigations such results immediately become public knowledge, and any application of them therefore is not patentable. Henry apparently was led to this view because he felt that inventions should be, and in general were, totally dependent upon and derived from what is today called pure research. The nature of the relationships between science and technology, as the editors note, "promises to become a major historical issue," and their annotations cite the work of A. E. Musson and Eric Robinson, Charles C. Gillispie, Robert P. Multhauf, Kendall Birr, and Edwin Layton. At the 1971 meetings of the History of Science Society, Reingold and Arthur P. Molella, his assistant editor at that time presented a major paper on this topic, giving Henry's views in detail, and their talk was followed by comments by Layton and Robinson. With the publication of this volume, including the substance of this paper, interest among historians in this question should continue to grow.

An aspect of the project missing in this volume is a discussion of the problems Reingold and his associates must have faced in collecting the documents and in identifying the many individuals referred to in them. Much of the manuscript material included is now part of the Joseph Henry papers at the Smithsonian Institution, but some items probably required much archival skill to locate. One letter from Henry to Benjamin Silliman, Sr., for example, was found in two parts, the first page among the Daniel Coit Gilman papers at the Johns Hopkins University and the second—cut into three pieces!—with the Silliman papers at the Historical Society of Pennsylvania. It is possible to speculate how the pages of this letter were separated—perhaps Gilman, who was librarian of Yale College for a number of years, acquired part of it from Silliman there—but how one of the editors, or another individual, brought them back together is unknown. Perhaps the final volume of the letterpress edition will contain a discussion of such archival problems.

The book concludes with a complete and well-organized index, and the Smithsonian Institution Press is to be congratulated for producing a beautiful and well-made book at a relatively low price. The illustrations, too, are excellent, well chosen and well reproduced. For example—though it would have been even better had a yardstick been positioned next to the apparatus—the photograph of the electromagnet (now at the Smithsonian) which Henry constructed in 1831 for Benjamin Silliman, Sr., contributes greatly to an understanding of how Henry made his equipment. In all, this volume shows that the editing of the Joseph Henry papers is in good hands, and it fulfills all the high hopes many historians of science have expressed for this edition. The future volumes of the series now have a high standard to live up to, and there is every reason to believe that they will do so.

MICHAEL M. SOKAL
Department of History,
Worcester Polytechnic Institute,
Worcester, Massachusetts

Socialist Resource Control

The Spoils of Progress. Environmental Pollution in the Soviet Union. MARSHALL I. GOLDMAN. M.I.T. Press, Cambridge, Mass., 1972. xii, 372 pp., illus. $7.95.

Conservation in the Soviet Union. PHILIP R. PRYDE. Cambridge University Press, New York, 1972. xvi, 302 pp., illus. $12.50.

Despite the fundamental differences between the Soviet Union and the United States in social organization and political structure, the two giants appear to reflect disconcertingly similar attitudes toward nature and their respective resource endowments. With allowances for variations in policy emphasis, timing, and funding, this conclusion is perhaps the first that an American may derive from reading two new, eminently scholarly publications on the consequences of economic progress in the Soviet Union. *The Spoils of Progress* by Goldman, an economist, and *Conservation in the Soviet Union* by Pryde, a geographer, effectively complement each other and make a substantial contribution to our understanding of the nature of the problems that have arisen in the Soviet Union relative to the "natural" environment.

The Western attitude toward nature and the manner in which Western man has exercised his environmentally destructive powers have been attributed by Ian McHarg, Lynn White, and several other Western writers to a consciousness of "supremacy over nature" derived from his Judeo-Christian heritage. Whether or not the Soviet notion that "Communism elevates man to a tremendous level of supremacy over nature" (as stated in the new program of the Communist Party of the Soviet Union in 1961) may be associated with the same—or an aberration of the same—heritage is for philosophers and polemicists to argue. In any case, whatever the origins of the man-apart-from-nature syllogism, the net result measured in terms of resource despoliation, waste, pollution, and environmental degradation is the same.

In the United States no less than in the Soviet Union, industrialization and the accompanying transformation of the landscape—the rise of cities, the migrations of people, the pushing back of the frontier, and so forth—have been regarded generally as good. The process has been called modernization. Science, which has made possible the most far-reaching revolutions in the lives of men, has been enthroned, tolerating no authority other than the authority of proof. Whatever has succeeded in the immediate context has been desirable and for the good of all; failure is not to be accepted and, like death, is pushed out of the collective consciousness. As John Dewey wrote in *Experience and Nature*, the validity of ideas "is measured by their capacity to effect the transformations which they propose. There is no *a priori* test as to their validity. They originate in human action and must be tested and improved in the course of that action." Marxist-Leninists, not to mention the present members of the Soviet regime, would in all likelihood agree.

Nevertheless, there is an unease abroad in the lands of the earth. In the United States that unease has prompted the enactment of some significant legislation designed to impose controls and alleviate some of the more

glaring and intolerable environmental ills resulting from industrialization and growth. Oddly enough, the same is true, though with variations, in the Soviet Union, a political system that has always touted the virtues of a rationally planned economy yet in which a dozen years ago the word conservation was scarcely considered appropriate to the official lexicon. As Goldman points out, there are now plenty of laws on the books in the Soviet Union dealing with the environment but the existence of these laws has tended to delude Soviet policy makers. (We must assume, for want of first-hand information, that U.S. policy makers do not so delude themselves.) Some Soviet authorities, he believes, have been lulled into thinking that the mere passage of highly desirable laws is all that is necessary to induce compliance and bring the difficulties under control. There are, indeed, violations in the Soviet Union and the laws are only weakly enforced. Since the laws have not worked, the Soviet regime has simply passed more laws. Goldman concludes—and this conclusion may come as a shocker to those Americans who insist that the solution lies in an exercise of power at the center—that the very concentration of power in the hands of the Moscow regime has been a major factor in the development of Soviet environmental problems. Not only does this reviewer agree, but he would go further and suggest that the tempos of Soviet industrialization, which were established with the five- and seven-year plans, together with the expansionist agricultural policies have compounded the difficulties. In any case, it is hard to say flatly whether the Soviet Union is better off or worse off than the United States in its attempts to resolve the environmental problems that have arisen.

Goldman's study is a first-class synthesis. Pryde's is more classic in organization and more detailed. After a survey of the conservation movement in Russia from Tsarist times to the revolution, Pryde provides in a systematic way a well-documented account of the problems that have arisen in the use of soil resources, fisheries and wildlife, timber and mineral resources, and water. His discussion of the *zapovedniki* (nature preserves) is useful. His concluding chapters, dealing with environmental quality, the question of population growth, and prospects for the future, raise questions that need to be treated at greater length. His conclusion that the Soviet experience provides no panaceas for the universally encountered problems related to natural resource development and conservation will come as no surprise to the Soviet Russia watcher.

W. A. DOUGLAS JACKSON
Department of Geography,
University of Washington, Seattle

Actuopaleontology

Ecology and Palaeoecology of Marine Environments. WILHELM SCHÄFER. Translated from the German edition (1962) by Irmgard Oertel. G. Y. Craig, Ed. University of Chicago Press, Chicago, 1972. xiv, 568 pp. + plates. $25.

This book, easily the best of its kind, is a real contribution to shallow-water marine paleontology and biology. The book was originally published as *Aktuo-Paläontologie nach Studien in der Nordsee,* and the English title is something of a misnomer. But the contents of the book are nonetheless striking and valuable, and this English version brings to the forefront a classic work that heretofore could be appreciated properly only by readers fluent in German. The breadth and significance of its coverage had been sadly overlooked by hosts of American students, teachers, and researchers.

The present version is not only a translation but also a new edition; the original text and illustrations have been revised slightly, and several references have been added. Focus remains mainly upon the North Sea, but a wealth of examples and conclusions given here apply equally to other seas and to the fossil record. The writing is clear and credible, and the illustrations are tremendous.

In essence, the book is a practitioner's synthesis of 45 years of work by numerous marine biologists and geologists at Wilhelmshaven, Germany. The marine institute there, a part of Senckenbergische Naturforschende Gesellschaft, is a venerable pioneer in many aspects of marine science, as illustrated aptly by this volume.

Schäfer has written more for geologists than for biologists, but marine biologists will benefit substantially from the abundant data on animal distributions, habitat adaptations, functional morphology, behavior, and various other aspects of autecology. Sections on synecology are more conspicuously paleontologic in application but are nonetheless valuable.

The ecology of present-day organisms is of fundamental importance in paleoecological interpretations, of course, but equally valuable is this book's unusually broad coverage of taphonomy—the study of the death, disintegration, burial, and potential preservation of organisms as fossils. This aspect of marine research has in general been sorely neglected, but the evaluation of taphonomic processes is in fact prerequisite to the unraveling of ancient animal-habitat relationships represented in the fossil record.

Also unique is the book's extensive treatment of ichnology—the study of tracks, trails, burrows, borings, and other signs of activity by animals. Such traces were once considered mostly as academic curiosities; but more recent work—notably the present volume—shows that both biologists and paleontologists may learn a great deal about animal adaptations through studying these traces. In addition, such traces may constitute the only fossil record of numerous soft-bodied invertebrates, and the requisite animal activities are important as sedimentologic agents.

In short, I highly commend this book to anyone interested in shallow-water benthic ecology, paleoecology, and sedimentology, or in the reconstruction of ancient depositional environments. Indeed, one now wonders how we ever did without it.

ROBERT W. FREY
Department of Geology,
University of Georgia, Athens

Induction of Immune Response

Immunogenicity. FELIX BOREK, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1972. xxii, 584 pp., illus. $37.50. Frontiers of Biology, vol. 25.

This book is intended to discuss the various factors that can determine and affect immunogenicity. The function of antigen is broadly conceived, and the book not only enumerates the chemicophysical requirements for immunogenicity but also deals with the role of the dose, route of administration, and adjuvants in the initiation of and the determination of the type of immune response. With respect to the host, the immunocompetent system is discussed in terms of the effect on its functioning of such factors as the genetic makeup