Book Reviews

Archeology and Science

Scientific Methods in Medieval Archaeology. Proceedings of a conference, Los Angeles, Oct. 1967. RAINER BERGER, Ed. University of California Press, Berkeley, 1970. xx, 460 pp., illus. $20. UCLA Center for Medieval and Renaissance Studies Contribution No. 4.

Science and Archaeology. Papers from a symposium, Atlantic City, N.J., Sept. 1968. ROBERT H. BRILL, Ed. M.I.T. Press, Cambridge, Mass., 1971. xvi, 288 pp., illus. $30.

The Impact of the Natural Sciences on Archaeology. A symposium, London, June 1968. T. E. ALLIBONE, chairman. Published for the British Academy by Oxford University Press, New York, 1970. viii, 186 pp. + plates. $24. Also published as Vol. 269, No. 1193, of Philosophical Transactions of the Royal Society, Series A.

Rarely has a minor development in one field of study had such repercussions on another as the development of radiocarbon dating slightly over 20 years ago has had on the study of archeology. The problem of chronology which had kept archeology firmly immured in the humanities was at last soluble, and archeologists, free to act like scientists, rapidly did so, choosing at will to act like natural scientists or like social scientists or like both if they were versatile. The technology at the disposal of archeology proliferated, and the 1960's saw the establishment of a special journal, *Archaeometry*, and the appearance of a summary volume, *Science in Archaeology*, edited by Don Brothwell and Eric Higgs. This volume has gone through several printings and a major revision and enlargement only six years after the first edition appeared.

The physicists and chemists who might have been skeptical about wasting their substance on archeological problems got their comeuppance when Willard Libby won a Nobel prize for the development of radiocarbon dating. In the late 1960's, in addition to the 12th Nobel symposium (the proceedings of which were published as *Radiocarbon Variations and Absolute Chronology*, I. U. Olsson, Ed., Wiley, 1971; reviewed in *Science* 13 Aug. 1971), a number of meetings were held to celebrate the union of science and archeology, and a good time was had by all as specialists invited each other to their special meetings. The proceedings of three such meetings are under review here, and I welcome the opportunity to comment on them since their cost prohibits their purchase by all but the most affluent of libraries and individuals.

The first of the volumes, *Scientific Methods in Medieval Archaeology*, edited by Berger, consists of 20 papers presented at the University of California at Los Angeles (and an addendum). The second, *Science and Archaeology*, edited by Brill, contains 21 papers presented at the Fourth Symposium on Archaeological Chemistry in Atlantic City. The third, *The Impact of the Natural Sciences on Archaeology*, contains 17 papers from a symposium organized by the Royal Society and the British Academy under the chairmanship of T. E. Allibone. Most general in scope, with wide international participation, the last of these is the most useful of the three. It is also the most elegantly produced and a pleasure to read in a day of cramped typefaces and cheap paper.

Several things are apparent from these proceedings. It is clear that radiocarbon dating not only is the granddaddy of scientific archeology but is still its greatest single preoccupation. More space is devoted to it than any other analytical technique; neutron activation runs a distant second. It is also clear that if chronological problems are soluble by this method they are still far from being solved.

It becomes clear also that this is still a small field in spite of the appearance of so many volumes in such rapid order. Nine individuals or research teams account for almost one-third of the 62 articles and introductions. Robert Brill is the only person who contributed to all three volumes, although M. J. Aitken has four separate contributions with three in one volume (Berger's). It would appear that there is a hard core of "archeometrists" with a drifting satellite of scientists dabbling in archeology and archeologists dabbling in science.

One result of this is the duplication of papers; in some cases the same illustrations appear in several volumes. What is worse, almost all of the research on which these articles are based has appeared in journals, so these are reruns of reruns. Another result is that several busy participants did not have time to recheck their own sources. Aitken, to use an example from an area with which I am familiar, mentions magnetic prospecting by the Ohio Archaeological Society at Angel Rock (Berger, p. 424) when he must be referring to the Indiana Historical Society project at the Angel Mounds, a major excavation lasting more than two decades.

All three volumes are billed as a meeting of the sciences and humanities. Their contents give many indications that this is a most uneasy meeting. It takes no more than a few paragraphs to tell whether the author is a scientist or a humanist. Almost a quarter of the volume edited by Berger is devoted to two papers on the same series of radiocarbon dates, one by a humanist and one by a scientist. It is difficult to believe that these papers deal with the same samples.

Robert Brill in the volume he edited warns of the danger of the laboratory scientist's withdrawing so deeply into his numbers that he might "lose some contact with his newly won friends in the humanities." In the same volume, Cyril Smith calls for scientists to "ask and answer their own historical questions." In a chapter (in the Allibone volume) on dating in Mesopotamia, A. Sachs rejects the few radiocarbon dates from that area out of hand and concludes, "Assuming that we can rely on the accuracy of the archaeologists' ascription of stratigraphy to the samples submitted for carbon-14 analysis, we must await with patience, further investigations by physicists."

The best-written paper in all three volumes is Lynn White's introduction to the volume on medieval archeology. It is perhaps more readable than most because it was prepared as an after-dinner speech rather than a scientific paper and the author had some responsibility for keeping his audience awake. Whatever its origin, it is written both to praise science for being scientific and to warn humanists that the simple "scientific" solution to a problem can never replace reflective thought. This

reflects the major dilemma of the archeologists. They have been traveling with physicists and chemists for two decades now, and many have adopted the computers, the equations, and the jargon of their comrades—in fact, several of the most jargonesque papers in these volumes were prepared by archeologists who have forsaken archeology to become scientists and now write with the faith of the true believer.

The computers, equations, and jargon have their place in archeology. They lead to the objective study of objects. Archeologists always have counted and measured things they do not understand and will continue to do so, and these are just additional ways of carrying out this task. But if the end purpose of archeology is the study of subjects rather than objects, then does the objective study of subjectivity come any closer to reality than the subjective study of subjectivity? Being scientific is very popular in archeology at the moment, but I would doubt that any amount of doing science, or even publishing in a journal of that name, will ever completely remove archeology from the humanities.

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A Real Predicament

Environment, Resources, Pollution and Society. WILLIAM W. MURDOCH, Ed. Sinauer, Stamford, Conn., 1971. viii, 440 pp., illus. Paper, $5.95.

Within the past four years there have appeared probably more books treating man and his environment from the holistic and ecological viewpoint than appeared during the three decades prior to 1968. The sudden demand seems to reflect man's awakening to a real predicament which may have resulted in part from the previous dearth of such material. This collection of papers by 20 authors plus its editor, ecologist William W. Murdoch, covers the topic in greater depth, breadth, and objectivity than do the majority of similar books today.

Murdoch recommends *Environment: Resources, Pollution and Society* for "undergraduates taking courses that deal with the interaction between man and the environment, particularly interdisciplinary courses." As a source of information and ideas, the book will serve well, but as a text it does not, in my judgment, suffice. There is lacking the consistency of exposition, analysis, and interpretation which the uninitiated student requires for organizing his or her own approach to such a mass of facts and concepts. Consistency, of course, is not to be expected from among 21 authors representing the wide diversity of disciplines these do. A number of the authors do provide detailed basic expositions of their branches of science. While a number of them proceed from ecological concepts, others do not. Murdoch attempts to identify his unifying theme in the introductory chapter, "Ecological systems," reviewing the state and direction of ecology as a science, and in the summarizing final chapter, "Environment and the equilibrium population," which is a stimulating and innovative essay that extends well beyond summarization.

Murdoch's *Environment* provides a wealth of facts and ideas on man's environmental interactions: contributors include experts in economics, the law, political science, and urban sociology as well as in the biological and earth sciences. Generally, most of the major potential crises (such as pollution) or major ecological limits (depleted resources) are covered. Because the intended scope is so broad, however, most readers doubtless will identify some aspect that is either omitted or underemphasized. I find that terrestrial-ecosystem productivity and diversity are not treated adequately. Brown and Finsterbusch cover the man-food relationship in an excellent, thought-provoking statement, but choose to treat economic aspects in more detail than agronomic ones. There is no single overview of the factors that affect the capacity of land to produce food and fiber, or of the bases for diversity in this capacity, or of how man alters and can destroy this productivity. This deficiency may in part reflect the fact that the contribution (by M. Clawson) on land resources, the one disappointing paper in the volume, fails to identify productivity and diversity as primary criteria for assessing land. An excellent model of how ecosystem productivity and economics can be integrated is given by G. J. Paulik in his lucid analysis of marine fisheries. Issues in epidemiology and public health are not included. The crucial matter of human behavior as it relates to environment is not given the deserved distinction of a separate chapter. Many papers are slanted toward analysis of Western or "developed-country" situations; yet our environmental dilemmas are basically global.

Material is organized in a sequence starting with ecological concepts, then moving to the current state of things, to specific problems, and, finally, to how we put things right; but individual authors generally chose to venture beyond these boundaries. Thus Nathan Keyfitz (demographer) compares trends in population growth and birth-control efforts around the world, diagnosing these in ways more sophisticated and probably more realistic than have certain ecologists of late. Then he cleverly discusses alternative strategies for achieving a stable population, though at the last minute blenching from the consequences of not achieving this goal. Biogeologist Preston Cloud, in predicting trends in world mineral supplies, dissects the supposedly objective rationale of many economic and political spokesmen whose conclusions are considerably more optimistic than his.

Current environmental insults and hazards are well catalogued in the chapters on pollution: air (R. J. Hickey), fresh water (W. T. Edmondson), marine (F. MacIntyre and R. W. Holmes), ionizing radiation (E. Cook), and pesticides (R. L. Rudd). As with most compendia of pollution these days, the sum picture ought to alarm any thinking person. However, just how dangerous each effect is and what is the probability of occurrence for each possible degradation or catastrophe are not always clear. Although such evaluation will generally be inexact and requires considerable quantitative analysis, it is crucial to the advocates and managers who are fighting environmental battles in today's arena, where partial successes and compromises are the usual outcome.

In the final section there are several essays of notable depth and innovation. K. E. Boulding (economist) provides a novel analysis of relationships between types of human interaction (his classification) and environmental deterioration. It is refreshing to see an economist identify "bads" as negative equivalents of "goods" and treat future stability as a major economic responsibility. R. B. Smock (sociologist), in arguing that the prime function of human aggregations such as cities is enhancement of learning and cooperation, suggests that cities may be the best foci for solving environmental ills. And V. J. Yannacone (lawyer) argues that only