sphere would predominate. A challenge of the ASME's tax-exempt status by the Internal Revenue Service, litigation over the boiler code, and criticism of its role in advancing nuclear power were among the factors that led to a more defensive strategy by the society by the late 1970's.

Robert Stewart, a past president of the ASAE, has written a work of more limited interest to those outside his profession. The organization of the book is chronological, with a single chapter devoted to each of the seven decades of the ASAE. Unfortunately, Stewart chose not to use footnotes in order "to avoid distracting the reader" (p. 419). The writing style tends to be nominalistic, at times consisting of long lists of authors and paper titles. Most of the burden of interpretation is left to the reader, and the book does not reflect an awareness of the efforts of other historians of agricultural science and technology. Stewart's monograph contains much factual information, however, and is quite revealing of the attitudes and values of the ASAE leadership.

The first meeting of the ASAE was held at the University of Wisconsin in 1907 with 18 charter members. In contrast to the ASME with its New York City base, the ASAE has kept its headquarters in the Midwest. Stewart describes agriculture as "the world's most important industry" and agricultural engineering as a "joyful pursuit" (p. 408). He notes that "the technology developed by agricultural engineers and codified by ASAE has profoundly influenced the patterns of life in the United States and large areas of the world" (p. 409).

Stewart observes that the publications of ASAE contained little of lasting value in the early years but that members with industry affiliation "evidently found the meetings to be a congenial place to present papers on products and processes from their companies" (p. 17). The ASAE was generally a proponent of mechanization, although Stewart recites one instance in 1924 when a resolution that would have put the society on record as favoring tractors over animal power failed to pass because the "horse people had a lot of friends among the college members" (p. 44). He finds that research had become more sophisticated by the 1920's when E. G. McKibben contributed a "landmark series" of papers on "The Kinematics and Dynamics of the Wheel Type Farm Tractor" (p. 73).

The ASAE attempted with some success to influence government policy on agriculture. The establishment of a Bureau of Agricultural Engineering in the U.S. Department of Agriculture in 1931 is described by Stewart as a "major triumph" of the ASAE (p. 86). However, the hope expressed at the time by the Secretary of Agriculture, Arthur Hyde, that the new bureau would "serve the needs of the family farm, rather than the more spectacular mass-production farm" was not a goal shared by the ASAE (p. 86). The issue had been raised earlier in a list of policy recommendations presented to President Coolidge in 1927 by an ASAE delegation. Among their recommendations was that "surplus farm people should be transferred to industrial activities" (p. 83). This recommendation stimulates Stewart to comment, parenthetically, that "engineers sometimes use inhuman phrases when proposing solutions to human problems" (p. 83). The dilemma for the professional agricultural engineer was expressed in 1936 by Harry B. Walker, who told an ASAE audience that "we invite disaster to good professional service when we try to design social justice into production machinery" (p. 92).

The gloom of the Depression years was followed by a long period of optimism and growth for the ASAE when the benefits of increased productivity through mechanization and chemical methods were largely unquestioned. Many of the members contributed to "an internationalization of American agricultural engineering" (p. 177). The perception that America was falling behind in technology that followed the launching of the first Sputnik in 1957 did not include agriculture, in which the United States still seemed invincible. The "Sputnik" for agricultural engineering instead became the publication of Rachel Carson's *Silent Spring* in 1962. The public response to Carson's indictment of pesticides was a source of "puzzled bafflement" to the ASAE, which again was placed on the defensive (p. 243). By 1970 the harmful side effects of many of the innovations introduced by ASAE members were the subject of a speech by an ASAE president, who urged that future emphasis be on the quality of rural life rather than quantity. Despite such indications of doubt about the traditional professional goals, the ASAE bicentennial view of the future of agriculture depicted "an empty landscape peopled by monstrous mechanisms almost as intelligent as their creators and requiring little human guidance to accomplish enormous tasks" (p. 365). Stewart comments that some engineers who contemplated the social consequences of what they had wrought felt "something less than pride" and "something old-fashioned deep within them wondered at the loss to American values" (p. 360). He concludes that "it may be time for ASAE to stimulate significant thinking about alternative systems of food production" rather than to continue a single-minded advocacy of "farming large holdings with big machines" (p. 366).

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Old World Archeology

The Prehistory of Europe. PATRICIA PHILLIPS. Indiana University Press, Bloomington, 1980. 314 pp., illus., + plates. $17.50.

The prehistoric archeology of Europe stands as an important branch of anthropological archeology because it covers that part of the world where archeological research has been the most intensive and extensive, thus exemplifying most completely what results archeological research can give, and because it rests on the material remains of the technology that became the foundations of our industrially based technology and society. Alas, however, most European prehistoric research consists either of reports of particular finds and excavations, or of broad syntheses, often constructed wholly or partly by intuition. First-order systematic syntheses, such as Härke's *Settlement Types and Patterns in the West Hallstatt Province*, in which sites of whatever function are grouped according to some commonality, such as artifact similarity or parallel adaptive adjustment, are relatively rare. Thus any author attempting to make the much-needed precise summary of European prehistory has to face a vast body of relatively scattered and ill-integrated material.

Phillips's ingenious solution to this difficulty causes the appeal of her book to transcend the interests of those concerned only with Old World prehistory or even just archeological science. Her solution is to select a set of recent studies over the last decade that exemplify for her the best innovations in European prehistoric research. She intends to make available to the wider public the methodological advances, the new theories, and some new information. Thus a

more accurate, if drier, title for the book would have been "Trends in European Prehistoric Research."

Though this approach obviously provides a valuable guide to innovative research, it occasionally leads to quaint results, as sometimes older but more plausible or better-founded conclusions are passed over in silence. An extreme case occurs on p. 257 when information reported by Julius Caesar around 50 B.C. and commented on endlessly ever since reappears in a secondary quotation as a new understanding with a publication date of 1974. In all fairness, the author mitigates this eccentricity by adding how Szabo's 1971 study of chieftains' names on the Boii (in Bohemia) tribe's coins reflect in detail the same change in social structure Caesar observed. Another curious outcome is that sometimes contradictory results are presented several pages apart without any attempt to reconcile the differences. On p. 155 the early bronze-working Bell Beaker folk are obviously a new people, but on p. 187 they are simply local individuals, with deep roots among the previous inhabitants, who happen to have attained high status as symbolized by a bell-shaped drinking beaker in the grave.

In general, Phillips selects papers that exemplify quantitative methods or exchange networks and commercial relationships and their subsequent effects on the social structure. A specific trend recurrently touched upon in the book is the study of raw materials and their exploitation, manufacturing processes (briefly), and distribution of finished artifacts. In accordance with other modish archeological leaders, Phillips tends to emphasize "homebody" archeology, with the continuation of local groups in one place, but in contact, primarily for economic or commercial reasons, with their neighbors. This departs from older summaries, which tended to emphasize the adventurers, explorers, and migrants of European prehistory. Such formerly key cultures as Corded Ware, Bell Beaker, and the Scythic horse nomads receive little wordage and fewer illustrations here.

As in most such books, the lower Paleolithic before fully modern *Homo sapiens* evolved is underemphasized, partly no doubt because hominids did little trading or had little use for exotic materials before the Upper Paleolithic began around 35,000 years ago. Northern Europe and the western Mediterranean (the latter Phillips's own geographic specialty), which have been the subject of important recent studies, are also underemphasized. The Neolithic farmers' astronomical alignments, which are surely one set of the wonders of the prehistoric world and which must have helped prehistoric farmers by aiding in determining the favorable time of the year to plant crops, are only briefly referred to, without comment on how such ostensibly esoteric developments actually fit quite well with the "homebody" archeology stressing local ecology in vogue these days.

Here I give a representation, chosen by the use of random numbers for selecting pages and paragraphs from each chapter, of the papers noted in this book. These include Boskinki's 1976 analysis, based on the number of different kinds of flint utilized, of the variation in Neanderthal's different kinds of tool assemblages. The Kniegrotte evidence can be used to argue that late Pleistocene Magdalenians were very protective of their reindeer, with selective killing of deer in an age-sex ratio very similar to that for early domesticated animals in the Near East, implying that these reindeer were practically domesticated also.

For the Neolithic, here cited is Sielmann's well-thought-out prediction that greater use of sheep and goats would be found on the drier Bandkeramik Neolithic sites of 6000 years ago, whereas in areas with more water meadows cattle would be kept. For the Bronze Age there is Welinder's 1977 model of southwestern Sweden, where residually neighboring chiefs and handicraft specialists funneled metal and other finished products to farming villages, which in turn, of course, sent agricultural products to these worthies. A solid example of several similar recent studies stems from Wetwang Slack in Yorkshire, where clear differences in the amount and kind of grave artifacts and grave food must reflect differences in Iron Age socioeconomic status.

This emphasis on recent studies, and consequently on trading, precludes the emergence of a comprehensive understanding of European prehistory. The most secure substantive result is the antiquity of trading and exchange networks, a startling discovery in accord also with emerging evidence from the Near East and parts of the New World. The reader will gain a clear picture of the most significant new directions in Europeanist research. The author contributes a "postface" wherein she delineates what she regards as the important sectors remaining for development. Despite the predilection for latest fashions in the main text, she bucks the trend by calling for more precise chronologies, not as an end in themselves, to be sure, but to facilitate understanding of social organization and functional relationships by confirming strict contemporaneity of the interacting parts of supposed ancient systems. She warns that, though rescue or salvage archeological digs will provide surprises and draw off an even larger share of research funds in the future, these must ultimately be tied in with well-thought-out pure-research projects, based on theoretical considerations, sampling particular areas and periods. Only then can archeology continue to develop its scientific status, whatever ancillary scientific techniques it may use otherwise.

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Atomic Physics

Atomic Structure. E. U. CONDON and HALIS ODABAŞI. Cambridge University Press, New York, 1980. xviii, 658 pp., illus. Cloth, $49.95; paper, $18.95.

In 1935, in *The Theory of Atomic Spectra*, Edward Condon and George Shortley undertook "a survey of the present status of the problem of interpreting the line spectra due to atoms." The monograph soon became the definitive work on the application of quantum theory to atomic spectra, and such it has remained over the years. Remarkable for its clarity of thought and expression, it has been an indispensable reference work for generations of physicists, chemists, and astronomers.

Subsequent years have brought continuing advances in the field. In particular, two new mathematical techniques have become important, if not indispensable, theoretical tools for treating the structure of many-electron atoms. The first, generally referred to as Racah algebra in recognition of the seminal work of Giulio Racah in the 1940's, systematized techniques explained in *The Theory of Atomic Spectra* for the evaluation of operator matrix elements within a representation of collective (coupled) many-particle angular momentum states. During the 1960's powerful graphical techniques were developed by A. P. Jucys (or Yutsis) and his co-workers that further simplify this central practical problem. The second technique, group theory, was deliberately omitted from *The*