Diatom spermatozoid cells have been known with certainty to have a single flagellum since von Stosch's research in 1951. Patrick and Reimer, however, state that there are two flagella on microspores, although on another page they state that spermatozoid cells have one flagellum.

Unfortunately, similar errors also extend into other sections of the introduction. In the ecology section, epiphytic diatoms are explained as those living on "rocks and rooted vegetation"; aerial habitats include species that are "in the soil." One wonders what sort of environment *Navicula contenta var. biceps,* described as a "truly atomspheric species, lives in. The extensive and important publications of F. E. Round on freshwater diatom ecology are not cited. Africa is not mentioned in the discussion on geographical distribution of diatoms, a surprising omission because some of the most recent and thorough studies of diatoms have been made in Africa by Cholnoky. Also, the important publications of Cassie, Wood, and Crosby on New Zealand and Australian diatoms are not mentioned in the section on ecology of marine diatoms.

Although this book is to be welcomed as a manual for diatom determination, the errors in the introduction make it unsatisfactory as a general reference.

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Early Culture in Mexico

The state of Oaxaca, situated on the Isthmus of Tehuantepec in southern Mexico, has long been a focus of interest for anthropologists because of the many colorful Indian tribes who still live there, retaining their native languages and many of their aboriginal customs, and because of the numerous archeological sites scattered over the area. Perhaps the most spectacular of these sites are Monte Albán, the ancient headquarters of the Zapotecs and their ancestors, and Mitla, the chief burial place of the Mixtec rulers.

The first scientific work in the region was done on these two sites around the turn of the century by William Holmes, Leopoldo Batres, and Marshall Saville. These investigations, while excellent for their time, took place before the days of dirt archeology and were primarily studies of architecture and decorative design. It was not until 1930 that Alfonso Caso began his epochal work at Monte Albán. With several prominent Mexican archeologists participating, these investigations continued until 1945. The result was the establishment of a chronology for the region beginning well before the start of the Christian era, and revealing the fact that the Zapotec and the wandering Mixtec were two of the most important factors in the complicated development of Mesoamerican civilization.

For more than 20 years this pioneer work stood as an isolated island of information in the midst of a veritable sea of archeological sites of only slightly lesser importance. During the past decade, however, a great deal has been done to fill out the picture of Oaxacan prehistory and history by such men as Ignacio Bernal, John Paddock, Roberto Gallegos, and Charles Wicke, in the field of historical research, and by archeological excavations at sites such as Yagul, Zaachila, and Cuilapan. Meanwhile Caso has continued his studies of Zapotec inscriptions and Mixtec native documents. As a result of all this work we now have a satisfactory framework for the prehistory of the area.

Olmec influences are evident in the earliest periods at Monte Albán. Writing and the calendar were developed by the Zapotec and possibly diffused by them to the Maya and others. Because of the abundance of early Mixtec documents here, history merges into archeology possibly to a greater degree than in any other part of Mesoamerica.

In **Ancient Oaxaca: Discoveries in Mexican Archeology and History**, edited by John Paddock (Stanford University Press, Stanford, Calif., 1966. 432 pp., illus. $18.50), an attempt has been made to synthesize this complex body of information for the student and lay reader.

In a sense the material is not new. The book is divided into three parts. Part 1, "Mesoamerica before the Toltecs," by Jiménez Moreno, is a translation into English of an article published in 1959 in *Esplendor del México Antiguo*. This serves as a general background for the early development of the civilizations of southern Mexico and gives perspective to the total picture. It is significant that the Aztecs and Maya are scarcely mentioned.

Part 2, "Oaxaca in Ancient Mesoamerica," by Paddock, deals with the complexities and chronology of movements beginning with preceramic people in the Oaxaca area, and serves as an introduction to part 3, which consists of eight papers on specific subjects, such as native documents, genealogies, and interpretations of tomb burials. These eight papers, originally presented at a symposium on Oaxaca, were first published in 1962 in the *Acta* of the 35th Congress of Americanists. Those originally published in Spanish have been translated into English. There have been some modifications, many illustrations have been added, and the bibliography is up-to-date. The book contains 15 maps and plans, five chronological charts, and numerous plates.

Oaxaca is a key area in Mesoamerican archeology. For the first time the student may now find adequate coverage in a single book.

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History of Atomic Theory

The World of the Atom (Henry A. Boorse and Lloyd Motz, Eds.; foreword by I. I. Rabi. Basic Books, New York, 1966. Vol. 1, 885 pp.; vol. 2, 1033 pp., illus. $35) is a collection of original papers significant for the development of ideas concerning atoms. The range is fairly wide, for papers on subjects which are not directly concerned with atoms but which are necessary for the understanding of our present ideas on atoms are included—for example, Huygens' "A wave theory of light," Maxwell's "Dynamical theory of electromagnetism," an article by Michelson and Morley on their experiments, and short articles by Einstein on the special and general theory of relativity.

There are 90 sections, starting with Lucretius, including Descartes' theory of vortices, and ending with a good exposition by the editors on the role of symmetry considerations in elementary particle theory. It is very valuable to have these original sources collected in one place and all in English.

Concerning such an extensive work, differences of opinion necessarily arise as to who should be included. In general I find the selection excellent but would have included Gassendi, who reintroduced the atomic theory to science, and Boltzmann.

Each of the reprinted papers is preceded by a lengthy introduction by the editors, giving the scientific background, an overview of the paper, and a bio-

graphical sketch of the author. The latter are particularly valuable, although I noted some inaccuracies. One of the objections I have to the introductions is that they sometimes repeat each other unnecessarily. It is obviously impossible always to express matters as difficult as those treated here precisely and briefly in everyday language; in most cases the editors have succeeded remarkably well, but in others a little elaboration could have avoided the lack of precision.

There are two cases where, in my opinion, the editor's exposition has missed the point:

In the case of Perrin's determination of the Avogadro number by the distribution of particles in the field of gravity, the editors say that the barometric formula cannot successfully be applied to the atmosphere because it is not isothermal. This is true, but not the essential point. The exponent is mgh/kT (m, mass of molecule), but multiplication of numerator and denominator by the unknown Avogadro number gives Mgh/RT (M, mass of mole), which contains macroscopic quantities only. The point is that for suspensions m is determined directly, and then the Avogadro number follows from M, determined by the barometric formula (pp. 626–7).

In the discussion of Bohr's atomic theory, the statement "No one else had applied Planck's quantum concept to anything but to the behavior of radiation" (p. 742) is wrong. In 1911 Hasenöhrl tried to find conditions under which an atom would emit the Balmer lines. Bohr's genius brought great advance and success because of three points: He used the correct quantum conditions; he used them twice, once on the structure of the atom, and a second time for the radiation; he used the Rutherford model.

I think this book should be in every physics library.

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Surface Science

Surface science is, as A. Many, Y. Goldstein, and N. B. Grover, the authors of **Semiconductor Surfaces** [North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 512 pp., illus. $17.50] say, a very difficult field both experimentally and theoretically, but it is important for practical purposes. One might therefore fear an avalanche of undigested, uncritically repeated facts on every semiconductor surface that has ever been looked at. This book, however, turns out to be quite the opposite. The wealth of information is there, with over 400 references in one chapter alone, but the important pieces of work are picked out for discussion with enough detail that one can understand them. The chapter on surface states, for example, shows that the authors have not only read the references but also understood them; a crisper, more readable account would be difficult to find, and a tight binding calculation of Tamm and Shockley states is outlined in sufficient detail to give one the feeling of how it all works.

Most of the volume is devoted to the experimental methods, and to the results insofar as reasonable agreement between different workers exists. There is plenty of useful advice on how to etch and how not to etch, as well as a comment on where a useful gadget for lining up the spots is available commercially. The brief introduction is followed by a chapter reviewing the bulk properties of semiconductors and one covering lattice structure and the chemical reactivity of the surface. Subsequent chapters cover the surface space charge region, surface states, the field effect, other experimental methods, and transport processes; and there is a discussion of what has been found out with these methods about the electronic structure of the surface. The last chapter covers real germanium and silicon surfaces—that is, surfaces as normally prepared and chemically cleaned—as well as the atomically clean surfaces prepared in ultrahigh vacuum. The emphasis of the book is distinctly more on the electrical than on the chemical properties of the surface.

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A Small, Autonomous Community

In **Lamotrek Atoll and Inter-Island Socioeconomic Ties** (University of Illinois Press, Urbana, 1965. 191 pp., illus. Paper, $4), William Alkire presents some of the results of 15 months of field research among the 200 inhabitants of Lamotrek Atoll in the western Carolines and its satellite islands of Elato and Satawal. During the period of the author's residence (1962–63) Lamotrek was being visited by a trading ship only four times a year and, as a result, was still relatively unacculturated.

Alkire first discusses land tenure, economic activities, and political organization on Lamotrek in detail. As in Truk and other matrilineal societies in Micronesia, land is the joint property of a small lineage and is normally cultivated by the women of a matrilocal extended family and their husbands. People connected with a lineage by patrilateral ties frequently exercise provisional rights to cultivate part of its estate, in return for which they periodically bring gifts to the residual owners. The social organization of Lamotrek and its dependencies is pervaded by the stratification typical of much of Micronesia, with ranked lineages, subclans, clans, and islands. Each of the three districts of Lamotrek is administered by the chief of an aristocratic clan, under a paramount chief who was reigning over both Lamotrek and Elato at the time of the field work. Many people thus have obligations to both a district chief and to their clan chief residing elsewhere. The smallness of the island allows all of the inhabitants, regardless of descent-group affiliation, to attend funerals, assist in such projects as the purchase of a large canoe, and participate in communal fishing expeditions.

Alkire demonstrates that the economics of Lamotrek and its neighbors can be understood only in the context of a multi-island system traditionally centered on the high island of Yap. Since the same clans and subclans occur in several communities, and inter-island marriages and adoptions are common, all sorts of agricultural produce, artifacts, and imported goods are exchanged between islands as gifts to real or putative kinsmen. In addition Elato regularly used to send turtles, and Satawal coconuts and preserved breadfruit, to Lamotrek, which in turn paid tribute to Ulithi and Yap, its own superiors in the network. The islands receiving tribute permitted their subordinates to utilize unihabited atolls and islets as coconut plantations and