

Advanced Undergraduate or Graduate Textbook

Classical Electromagnetic Radiation.

Jerry B. Marion. Academic Press, New York, 1965. xvi + 479 pp. Illus. \$10.75.

The stated objectives of this book are to provide a text for a one-semester, three- or four-hour course for physics students at the advanced undergraduate or beginning graduate level and to provide a modern and reasonably sophisticated mathematical treatment of classical electrodynamics at the undergraduate level with emphasis on radiation problems and the wave aspects of the electromagnetic field. The author assumes "that the reader has a recent acquaintanceship with the basic principles of electromagnetism." An unrationalized Gaussian cgs system of equations and units is employed throughout.

The book is well written. It is not absolutely clear whether the author considers a course in general physics (with the usual chapters on electricity and magnetism) as the only prerequisite or assumes that the students have had some prior course in field theory. In the first eventuality, he is probably an optimist (but no more so than most authors) if he thinks students will really master a book of this size in the time suggested. In the second eventuality, they probably will—or they should.

The contents of the text are best described by chapter headings: "Fundamentals of electromagnetics" (27 pp.); "Multipole fields" (19 pp.); "The equations of Laplace and Poisson" (31 pp.); "The electromagnetic field equations" (22 pp.); "Electromagnetic waves" (25 pp.); "Reflection and refraction" (34 pp.); "The Liénard-Wichert potentials and radiation" (24 pp.); "Radiating systems" (48 pp.); "Classical electron theory" (30 pp.); "Spherical scalar waves" (21 pp.); "Interference phenomena" (34 pp.); "Scalar diffraction theory" (36 pp.); "Relativistic electrodynamics" (42 pp.); and some appendices on vector and tensor analysis, Fourier series and integrals, and units, for example.

The treatment of multipoles (chapter 2) could be strengthened by starting with, and expanding, the definitions illustrated by diagrams in Section 2.6, expressing the multipole potentials as appropriate directional derivatives, dispensing with Taylor series, and applying instead the series of spherical har-

monics (which are introduced in chapter 3). This approach would be more in keeping with the author's expressed desire to link static multipoles with radiating multipoles and would provide another application of spherical harmonics in addition to that given in chapter 10.

Radiating systems (chapter 8), interference phenomena (chapter 11), and diffraction theory have much in common. For pedagogic reasons this should have been stressed. If this were done, the "remarkable fact . . . that scalar diffraction theory yields a quite satisfactory description of diffraction [of electromagnetic waves] . . ." would have ceased to be remarkable. In fact, it is very easy to include polarization effects without impairing the theory.

In chapter 6, on reflection and refraction, it is assumed that, even when one medium is metallic, the permeabilities are equal. Of course, this is the most important case. Unfortunately, the final formulas, although correct, are misleading. They imply that reflection is caused by the difference in propagation constants (or velocities, if the media are nondissipative)—and this is wrong. However, this faulty treatment is not confined to this book; it may be found in many other books. I have known a number of physicists who hold this erroneous belief.

The author's apology for the use of Gaussian units is not very convincing. Of course, there is a matter of personal preference. To the author "it is very comforting to see a factor of 4π explicitly appear when an integration over the entire solid angle is performed." On the other hand, this factor appears in Maxwell's equations where the integrations are performed over portions of the solid angle, and, furthermore, only in one term and not the other two. There is also a pesky factor of 2 in the expression for the magnetic intensity around an infinite current filament.

There is a curious inconsistency which should be explained or, at least, commented on. An accelerating charge radiates. Hence, its field must exert a force on it, which must be balanced by an external force (which does work). For an electric charge in bulk it is easy to calculate this force. It turns out to be proportional to the time rate of change of the acceleration. The author obtains the same force for a particle from the principle of conservation of

energy (p. 300). But the field of an accelerated particle, although apparently exact (p. 209, equation 7.60a), does not indicate such a force.

An errata sheet lists about a dozen and a half of errors. I noted two others: the quadrupole potentials, equations 4 and 5 (pp. 44 and 45), should be multiplied by $3/2$. These are minor errors unless the book is used for reference to specific results. Students should be able to find such errors—it is good for them. On the whole, the book is probably as free from errors as one could hope.

One error, however, is serious. On page 242, figure 8-8 shows a linear antenna driven by a coaxial cable. On page 243 it is stated that "since the system is symmetric," the current distribution is symmetric. The system is *not* symmetric electrically, and the current distribution is not symmetric. The voltage is applied not only between the two arms of the antenna but also between *one* of these arms and the outer surface of the coaxial cable. I have seen the same error in some other intermediate and advanced books.

In the matter of adoption of this book, instructors should be guided primarily by the first three paragraphs of this review. The few weak spots that I have mentioned can be easily strengthened by the instructors themselves.

S. A. SCHELKUNOFF

Department of Electrical Engineering,
Columbia University

Population Genetics

The Effects of Inbreeding on Japanese Children. William J. Schull and James V. Neel. Harper and Row, New York, 1965. xii + 419 pp. Illus. \$15.

Within a year of the time when the atomic bombs were dropped on Hiroshima and Nagasaki, plans were being made to evaluate the short- and the long-range biological effects of what is now elliptically and dispassionately known as "the Japanese experience." The work of the Atomic Bomb Casualty Commission, a joint effort of the bombers and the bombed, has included an intensive effort to get at the genetic effects of what we hope will remain a unique pair of mass radiation exposures. In 1956, J. V. Neel and W. J. Schull published an extreme-

ly thorough and well-planned study of what the first 10 years of postbomb pregnancies could show about genetic effects. The result of that study was that, although everyone agrees that radiations cause mutations, it was not possible to demonstrate any effect on the offspring of survivors of the unfortunate "experience."

Schull and Neel have had the perspicacity to realize that the immense effort put into the Hiroshima and Nagasaki studies could be put to uses other than the original attempt to assess radiation damage. In this second book to come out of their work with the Casualty Commission, they have attempted to deal with the effect of consanguineous marriages on human populations. Having collected a uniquely complete and large set of data on marriage patterns, schooling, measurements of physical and psychological traits, and mortality and morbidity statistics, they have analyzed the data with great care and intelligence. Again they have come up with an encouragingly negative report. At the levels of inbreeding now occurring in the world's populations, or likely ever to occur, the deleterious effects are quite small, though detectable. Whatever is wrong with mankind, it cannot be pinned on first cousins.

There is a great danger in the field of human population genetics of being led to lurid or extreme conclusions by the very import of the questions. Schull and Neel have avoided this trap with great skill. Moreover, in their last chapter, they have embarked on an enterprise of great danger. This last section is a general review and discussion of the hottest issue in population genetics today: What does inbreeding data tell us about the genetical structure of populations and about the kind and intensity of natural selection presently operating in populations? Although they are unable to resist some polemical forays (the temptation to do battle in this field is too great even for very well-adjusted gentlemen), they succeed in giving a well-balanced view of the messy and contradictory evidence and theory on this question.

This book, and especially its last chapter, can be taken as a cautionary tale. Two highly competent and conscientious scientists, working with a team of highly trained colleagues for more than 15 years, using the most sophisticated statistical techniques in a highly sophisticated field, with a very large set of human population and in-

dividual data, have asked a number of basic questions about the genetical structure of human populations. And the answers are—ambiguous. Can it be that the statistical methodologies of population genetics are inadequate for the problems of measuring heterozygosity and estimating the intensities and kinds of natural selection? *Ça vous donne à penser.*

R. C. LEWONTIN

*Department of Zoology,
University of Chicago*

Prehistory of the Old World

Atlas de Préhistoire. vol. 1. Henriette Alimen. Boubée, Paris, 1965. 185 pp. Illus. Paper, F. 31.50.

Volume 1 of the *Atlas de Préhistoire*, by Henriette Alimen, is a slightly revised, new edition of the book that was published in 1950. It is an indispensable textbook for the student of prehistory in that it is a sound and particularly well-illustrated manual on the French Paleolithic, Mesolithic, and Neolithic. It has been extended only briefly to the prehistory of the rest of Europe. This new edition has all of the virtues of the first and has been made even more attractive by increasing the size of the pages and using glossy paper.

The new edition follows the same plan as its predecessor. The first part begins with a concise discussion of the various types of archeological sites, including, notably, a clear description of the geomorphological aspects of the Paleolithic open-air and cave sites. This is followed by a short presentation of the rudiments of archeological field and laboratory work, including the auxiliary sciences of archeology, notably petrography. The last chapter (of the first part) is a succinct review of the various methods of dating used in archeology.

The second part of the book begins with a short discussion of prehistoric stone working techniques and is, essentially, a useful summary of the French Paleolithic. This part is particularly well illustrated and provides the student with the basic rudiments of an introductory course. The chapters on the Mousterian and Aurignacian have been revised to take into account the work by Bordes and Peyrony.

The book ends with a short discussion of the subsistence techniques of

prehistoric man, his burial customs, and the art of the Upper Paleolithic.

The large format and attractive presentation of the material in this second edition have made it an extremely pleasing book. Its outstanding qualities are the extremely logical presentation of the material, the balanced and detailed presentation of the French Paleolithic, the inclusion of the historical development of archeological research in France, and the unusually large number of illustrations, including some color plates. On the other hand, most of the recent developments have only been entered in terse paragraphs, appended at the end of the various chapters. Most of the text and captions have not been revised. This leads to some confusion and tends to de-emphasize current research. Unfortunately for the student, the names of many scholars who are mentioned in the text are not included in the bibliography, which has been restricted to 57 titles.

It is very regrettable that a comprehensive, detailed, and up-to-date text on Paleolithic archeology has yet to appear in English. Henriette Alimen's *Atlas de Préhistoire* (vol. 1) stresses the French Paleolithic in the traditional manner, but it needs to be complemented with Denise de Sonneville-Bordes's *L'Age de la Pierre* (1961) and Kenneth P. Oakley's *Man the Tool-Maker* (ed. 5, 1961). These two short texts will provide the student with additional material emphasizing more recent research and covering the rest of the Old World.

JACQUES BORDAZ

*Department of Sociology and
Anthropology, New York University*

Perspective on Genetics

The Evolution of Genetics. Arnold W. Ravin. Academic Press, New York, 1965. x + 216 pp. Illus. Paper, \$2.95; cloth, \$6.

One begins to scan this paperback and soon finds himself engrossed with the text despite a familiarity with the contents. The author's intent is to unfold for the nongeneticist the development of the central concepts of the exploding field of genetics. As stated by Ravin, the book is written for a "broad audience . . . undergraduates considering a career of teaching and research in biology, students who are embarking on graduate studies in biology, profes-