the volume has written a chapter attempting to cover his own field. Since this averages out to 13 pages for each contributor, most techniques can only be treated superficially. Nevertheless, enough references are cited so that anyone undertaking to make a measurement in solid state physics will find this volume a good starting point. Although there is no other book like it in the field, I cannot recommend it for individual purchase since only a small fraction of the volume is devoted to the average experimentalist's problems. However, any library utilized by about four or more experimental solid state physicists can favorably consider its purchase.

Because of the brevity of each chapter, this volume will be of limited use to the researcher who must decide what experimental technique can best be applied to his problem, but having chosen a technique, he can well begin his literature survey here. While the foreword to the volume states that "Indications of limitations of both applicability and accuracy are an important part of this presentation," this intention is fulfilled only in the outstanding chapters, for many chapters fall far short of yielding any such indications. In addition, a newcomer to a field will glean little information concerning the accuracy generally obtainable by various experimental methods.

The book appears to be well edited and fairly complete in broaching experimental solid-state measurements. It is an important contribution in its field.

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The Lost Cities of Africa. Basil Davidson. Little, Brown, Boston, 1959. xvi + 366 pp. Illus. $6.50.

Africa. Its peoples and their culture history. George Peter Murdock. McGraw-Hill, New York, 1959. xiii + 456 pp. Illus. $11.75.

Both George Murdock and Basil Davidson write about the pre-European periods of Africa, but their books are quite different. Since the latter's book is of the more familiar genre, perhaps it would be best to discuss it first. Basil Davidson, a journalist with a long time interest in African archeology, attended both conferences on African history and archeology at the School of Oriental and African Studies (1953, 1957), and he gives us a useful popular survey of archeological research on the entire continent. This is very welcome, especially since, aside from the reports of the above conferences, rather more dryly written, and a slight book in French by de Pedrals, there is nothing of this sort on a continental scale, and even regional surveys, where they exist, are apt to be out of date.

Archeological reports are difficult for the layman to read, and since no archeologist has seen fit to provide a summary of African excavations for the general reader, Davidson is to be congratulated for undertaking a task that many must have shrunk from because of its magnitude and because interpreting a field in which the material is still scanty presents many pitfalls. So far as I can judge, he has come through well, and for areas where I am familiar with the original reports, he has adhered scrupulously to the data. I am afraid that some readers may have doubts on this because of the style of the book. The author's earlier books are mostly of a polemic and political nature, and archeology does not lend itself so well to polemics. Davidson wishes to demonstrate that the African has produced some cultural accomplishments, and even though there are many benighted readers who do not understand this, it is not as radical a statement as the author seems to think. If it is not yet "old hat," at least it does not bear repeating so often in a book of this kind. The effect may be to make the archeology seem to be the appendage of the argument rather than the other way around and, thereby, to raise doubt concerning the veracity of the actual data. This would be unfortunate.

The literature on the kingdoms of the western Sudan is quite extensive, and A. J. Arkell's writings provide an adequate account of the eastern Sudan, but Davidson adds an interesting chapter on the middle region in between. The "Azanians," still very much of a problem even as to identity, are discussed. Zimbabwe is reviewed, and other well-known and many less-known ruins pass before the kaleidoscope. Davidson has made his book indispensable to students of the general history of Africa.

Africa is based in large part on a method that has been relatively little employed for historical reconstruction, and never, to my knowledge, on such an extensive scale. Murdock has attempted to trace the spread of domesticated plants from known places of origin to their present distribution. Since agriculture is the basis of the Neolithic culture on which all subsequent civilization is built, there is a good rationale for this approach.

Other kinds of data, particularly linguistic data are used for historical inference, but these data seem to come in unevenly. It could, in fact, be argued that the book would have been more effective, or that it would at least have had a clearer line of argument, if it had been restricted to a consideration of plant "cultigens." The present state of knowledge makes it well-nigh impossible to bring together the various types of materials that might be useful in historical study of the African peoples; therefore, we need laudable onslaughts on a particular kind of material, such as Murdock has made on the botanical data, until we have a series that can be compared and cross-checked and, finally, interwoven. When one method is used extensively and another scantily, the impression is created, erroneously perhaps, that the minor thread is used only when a crutch or a sign-post is needed, or when a bit of evidence is too well known to be ignored.

This is the feeling that arises when we are told that the spread of the Bantu-speaking peoples was made possible by plants of Indonesian origin that came onto the continent on the Indian Ocean coast and then moved across the continent on the northern fringe of the forest before being used as a means of penetrating the forest *from the west*. Greenberg's classification of African languages leads to the conclusion that the people of Bantu speech originated in the Cross River-Benue region (Nigeria). Therefore, the plants *had* to go westward north of the forest; otherwise the speech of the forest peoples would have a different affiliation. Was this the reasoning? We would like to know whether the interpretation came strictly on botanical grounds or on linguistic, but it is impossible here to disentangle them. Had Greenberg delayed his classification until after this study had been made, and considering Harry Johnston's dictum that the Bantu originated in the area of the East African lakes, would we have been told that the Indonesian complex of plants began its penetration of the forest in the east? As an explanation of plant distribution, it is the simpler one, but it is not now compatable with the necessary explanation of language distribution. One would like to have a clearer

statement of the process by which the conclusion was reached.

Not the least contribution of these books is stimulating discussion in a field too often neglected by scholars in this country. That much more research needs to be done on many levels is evident; this is indicated, for example, by the surprisingly few points of contact in these two presentations or, for that matter, between either of them and D. Westermann's *Geschichte Afrikas.*

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Principles of Optics. Electromagnetic theory of propagation, interference and diffraction of light. Max Born, Emil Wolf *et al.* Pergamon Press, New York, 1959. xxvi + 803 pp. Illus. $17.50.

It is gratifying to have Max Born's *Optik* now translated and revised. *Optik* and its successor, by Born and Wolf differ enough, with some topics enlarged and others restricted or omitted, that the authors can claim they have written "a substantially new book." It is not my intention to repeat the table of contents here, but to give some reasons why I think the new book will become a great book. In addition to Born and Wolf, A. B. Bhatia, P. C. Clemmow, D. Gabor (holograms), A. R. Stokes, A. M. Taylor, P. A. Wayman, and W. L. Wilcock contributed to the volume. Their contributions may be identified by reading the preface.

The sections on dispersion, the geometrical theory of image formation and aberrations, the physical theory of diffraction and aberrations, and the treatments of interference and diffraction with monochromatic and partially coherent light are all excellent.

The treatment of periodic film structures (to which F. Abeles and B. H. Billings contributed) will be helpful to the inventors who have yet to create the new applications of stratified media that the future holds (such as reflection filters for use in the far infrared).

The coverage of topics of current interest, such as diffraction and partially coherent light, will please the reader interested in theory; the chapters on image-forming instruments and on interference and interferometers will be approved by those who apply optics.

And yet there are, inevitably, some disappointments, such as the inadequate treatment of Savart's plate and the absence of a discussion of apodizing. I missed items such as the Lyot polarization filter. Topics in which the atomic and molecular nature of matter play a decisive role are treated in the "new book" in terms of Maxwell's phenomenological theory. Thus, much of the original text, especially spectroscopy, is omitted in this volume. Planck's celebrated formula appears only as $K(\nu,T)$.

The writing, generally good, is sometimes incomplete—on page 24 the authors do not explicitly define the problem they solve so beautifully. The book has a good balance between examples and word pictures, on the one hand, and esoteric analysis, on the other. It is embellished by two dozen handsome halftones and an abundance of conventional line drawings. In the areas covered, the book treats the right subjects at the right level (for reference use).

Finally, the authors have retained the flavor and inherent stimulation of the original sources in their treatment of many topics, and the citations to those sources will afford an excellent bibliography for the scholar who is expanding his knowledge.

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Nicholas Biddle. Nationalist and public banker, 1786–1844. Thomas Payne Govan. University of Chicago Press, Chicago, Ill., 1959. xii + 429 pp. $7.50.

As its author points out, this is not a full biography of Nicholas Biddle: "It is in biographical form, but it is not a full story of Biddle's life. I have written of him as nationalist and public banker, for it is here, in my opinion, that his significance lies. I could not write of him as son, husband, parent, private citizen, or even as a man without having these remarks appear as irrelevant intrusions into the already too complex narrative" (page ix). There are brief discussions of other aspects of Biddle's life: his boyhood; his brilliant record as a student at Princeton; his literary interests and activities, including his editing of the Lewis and Clark journals; his experience as secretary to the American ambassador to France and as a traveler in Europe and the Near East; his courtship and happy marriage; his brief career as a lawyer; and his term as a member of the Pennsylvania legislature. But the central interest of the book is in Biddle's role as head of the great Second Bank of the United States, the political controversies centering on the bank and its policies, and the dramatic conflict between Biddle and Andrew Jackson.

In preparing this volume, Govan has drawn not only on published materials but also on masses of official papers and Biddle's copious correspondence. The result is an interesting and important book which sheds much new light on Biddle, the Bank, and the controversies surrounding them. It now becomes even clearer than it was before that Biddle recognized fully the powers of the Bank and was highly sophisticated in his use of those powers. He was, of course, interested in the commercial activities of the Bank and in promoting its profitability. But his deeper interest was in the Bank as an instrument of national policy, and he deliberately used its central banking powers to promote the national interests as he, and many others, saw them. Some of the actions that he took deliberately to influence the state of the credit markets, the behavior of business activity, and the nation's balance of international payments evidenced both boldness and an understanding of central banking principles quite rare in his time.

This book is destined to be highly controversial, for its verdict is almost completely favorable to Biddle and wholly adverse to Jackson. Those who seek to reverse this verdict, and they will probably be numerous, will face formidable evidence.

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Soviet Research in Crystallography, 1956. English translation. Consultants Bureau, New York, 1959. 77 pp. Illus. $10.

This is the third volume in a series that was inaugurated two years ago [reviewed in *Science* **129**, 324 (1959)]. We are told in the preface that the volume contains English translations of papers selected from six Russian chemistry journals; evidently the contents of the previous volumes were also restricted to the same sources. These