history in Europe has been pollen analysis and related plant-macrofossil work. Although the methodology was devised in order to explain postglacial vegetational and climatic changes in Scandinavia, reviewed in volume 1 of *The Quaternary* (1965), it has been adapted to elucidate interglacial, interstadial, and even full-glacial conditions for the rest of the Quaternary through detailed analyses of buried organic sediments in controlled stratigraphic position. Particularly in the Netherlands and the British Isles have these studies been carried to perfection, so that several preglacial but post-Pliocene climatic fluctuations have been identified and confirmed at several sites. Because the vegetational sequences during the several interglacial intervals differed from one another in major features, a skeleton pollen diagram that shows the major trends can be used to establish the stratigraphic correlation of an unknown organic unit—thus serving the role of index fossils in pre-Quaternary stratigraphy.

The coverage in all of the four chapters in the book is comprehensive and broadly similar, for all treat the geologic, biogeographic, and archeologic aspects both topically and regionally—each even ends with a paragraph or two about economic applications. Archeology figures strongly throughout the treatment of France, which has relatively few Quaternary sediments. The chapter on Germany is condensed by Woldstedt from pertinent parts of his great three-volume treatise *Das Eiszeitalter,* and thus makes available in English a broad summary of much of his volume 2.

As a basic reference this book should be essential for all American Quaternary scientists who wish to understand the kind of record that glaciers and climate have left in another now-temperate region, or to obtain ideas they might use in their own investigations. Being condensed and highly documented, the book is more for reference than for light reading. But as a reference work it is well furnished with several hundred bibliographic titles for each chapter, a comprehensive subject index 40 pages long, and an author index. Illustrations and tables are generally good, but too many of them preserve the European tradition of burying in the caption the explanations for numbered map patterns, when the explanations could just as simply have been placed beside the map boxes themselves.

All the papers were written in 1962; in view of the pace and diversity of research in this field, some of the book must be considered out of date already. It is unfortunate that the publisher, when he commissioned the reviews, could not assure publication in less than five years. Although the editor makes apology for the delay, it must not go unmentioned in this review, which is otherwise intended to be highly favorable.

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Tracking Birds

Radar Ornithology. ERIC EASTWOOD. Methuen, London, 1967 (distributed in the U.S. by Barnes and Noble, New York). xii + 278 pp., illus. $12.

As director of research of the English Electric Group and chief scientist to the Marconi Company, Eric Eastwood had an unusual opportunity to use high-powered radar to study the movement of birds. He took advantage of this opportunity by making photographs of bird targets as they appeared on the radarscope as he was investigating ways of removing unwanted targets by developmental work on valves and other components of L-band radar.

About half of Eastwood's book is devoted to a discussion of radar and its techniques for monitoring bird passage. The remainder of the book reviews the findings of the author and others on bird movements.

An interesting history is given of the development of radar in Great Britain to meet the threat of the Luftwaffe. Although there are insufficient details for the radar engineer, there is an extremely readable account of the principles of radar and of the display and interpretation of radar targets. The author should convince any remaining skeptics once and for all that radar records the movements of birds in the airspace. Indeed, published reports by Eastwood and others indicate that a great deal of the unwanted "angel" display on radarscopes is made up of bird targets. Eastwood concludes that radar ornithology is becoming so advanced that a "signature analysis" of the radar echo can identify single bird targets. In fact, the wingbeat patterns of some birds have been identified as to species. Eastwood presents a thorough analysis of the ingenious ways in which several types of radar can be used to investigate the numbers and position of migrating birds in the airspace.

Most of the material on bird migration has been presented by Eastwood and other investigators in earlier papers, which are ably abstracted in the book. The treatment of bird movements is largely descriptive rather than analytical. The author uses many maps to demonstrate the passage of birds in relation to geography and weather. The influence of weather on bird migration is treated only superficially; no parameters are given which would provide a means of evaluating the degree of influence of various weather factors. A point of controversy raised by the author centers about the influence of wind on the flight path. Does the bird select a fixed heading from its point of departure, to be drifted from its goal by a wind with a beam component? Does the bird compensate for a beam wind, and so change its heading? Eastwood agrees with David Lack of Oxford that birds are drifted by the wind. This is at variance with the findings of radar ornithologists in the United States and of one of Lack's students in England. Eastwood analyzes his findings and those of others on the influence of radio waves on bird flight behavior. After careful study he concludes that "any interaction between alternating electro-magnetic fields and the bird's sensory organs can be second order only, if it exists at all" (p. 254).

This book is a valuable contribution to the ornithologist interested in radar and to the radar engineer interested in angel echoes.

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Sedimentology

Cyclic Sedimentation. P. MCL. D. DUFF, A. HALLAM, and E. K. WALTON. Elsevier, New York, 1967. xii + 280 pp., illus. $23.50. Developments in Sedimentology, No. 10.

In 11 chapters, chapters that draw upon more than 450 references, *Cyclic Sedimentation* attempts to organize, digest, and evaluate the ins and outs of the study of cyclic sedimentation since the early 1830's. After a brief and thoughtful introduction that touches upon terminology and methods of analysis, the subject is presented as follows: