compares natural and laboratory-produced lignins and their structures. Chapters on ultraviolet, infrared, and paramagnetic resonance spectra follow in part 4. Lignin reactions, including solvolysis, halogenation/nitration, oxidation, reduction/hydrogenolysis, and high energy breakdown, are dealt with in the next six chapters. Lignin reactions in the technologically important sulfite and alkaline pulping processes are described next. The physical chemistry of the lignin macromolecule and its modified forms is then well covered. The two final parts deal with microbiological breakdown of lignin and utilization of lignins, first as a source of chemicals and then as unchanged polymers. Expectedly, the contributions vary widely in length and quality, but all provoke enthusiasm and thought. Only the section on biological deterioration of lignin is rather weak, perhaps reflecting inadequate input from or consultation with biologically oriented workers in the field.

Many may find $35 excessive for a book reproduced photomechanically from typescript, with unesthetic line-end irregularities and some minor typographical errors, but the formulas and figures are clean and generally understandable, and, on deliberation, the price seems reasonable recompense for the marathon effort invested in producing the first text on lignin that is suitable for educating newcomers to the field.

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Ostracoda

Colloque sur la Paléoécologie des Ostracodes. Colloquium on the Paleoecology of Ostracodes. Pau, France, July 1970. H. J. Oertli, Ed. Société Nationale des Pétroles d'Aquitaine, Pau, 1971. 954 pp., illus. 150 F. Bulletin du Centre de Recherches Pau-SNPA, supplement to vol. 5.

Compared to other microscopic organisms, Ostracoda have outstanding potential for providing information concerning salinity, temperature, currents, and other aqueous conditions in the past. These little crustaceans have some advantages over the one-celled Foraminifera, which already have been found valuable for interpreting paleoecology: ostracods thrive in fresh and brackish water where forams cannot survive, and they were abundant and diverse in the Paleozoic, at which time forams were represented mostly by irregular agglutinated types.

Each ostracod of the distant past is assumed to have lived in an environment much like that in which its descendants flourish. Interpretation involves two factors. First, the relationship of the fossil to the living ostracod must be firmly established by taxonomy. Second, the ecology of living ostracods must be known in detail. Extinct taxa pose a special challenge, but even they can be compared against morphologically (and presumably functionally) similar living forms.

Research on Ostracoda has accelerated in recent years. Over half the genera were founded in the last two decades. In the early 1960's the ostracod volumes in the American *Treatise on Invertebrate Paleontology* and the Russian *Osnovy Paleontologii* appeared in quick succession, contributing greatly to taxonomy. Colloquiums held in Naples (1963) and Hull (1967) emphasized the ecology of Recent ostracods. The time was right for an attack on the more difficult problem of ostracod paleoecology. At a colloquium called in Pau, France, in 1970, 84 ostracodologists met for formal presentation of papers and subsequent discussion. More than half were from France, the United States, and Britain, but others came from as far as Israel, Japan, Yugoslavia, and Gabon. The results are impressive.

The 53 published papers (in French or English) cover Ostracoda geologically from Devonian to Recent times and geographically from western Canada to the Kouznetsk Basin. Most either analyze in detail the fauna in a local area or report on geographic distributions of faunas of a particular age. As might have been expected, a few contributions fail to fit the theme of paleoecology: two about classification and one about morphology. Of the numerous new concepts in the interpretation and utility of fossil ostracod occurrences, a few of the highlights can be mentioned here. T. I. Kilenyi discusses various methods of distinguishing the biocoenosis, citing ambiguities arising from postmortem displacement. Vladimir Pokorný uses diversity of the fossil ostracod community to identify transgressive and regressive movements of the sea. H. J. Oertli interprets environments of deposition based solely upon the preservation of ostracods; this is an intriguing approach, independent of taxonomy. Kaesler and Taylor investigate the possibilities of cluster analysis, and Jacobzone and Carbonnel apply Jaccard's coefficient to correlation of Miocene faunas. Articles of more than local interest include K. G. McKenzie on the paleozoogeography of freshwater Ostracoda, D. Ter Keurs on assemblages in transgressive/regressive sequence, and F. Adamczak on ostracod assemblages in Middle Devonian rocks.

The progress made at the colloquium fulfilled all expectations, probed new insights, and suggested lines for future research. Although ostracod paleoecology is still in the exploratory stage, it promises to be a major means of understanding the geologic past.

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Respiration

Comparative Physiology of Respiratory Mechanisms. JOHAN B. STEEN. Academic Press, New York, 1971. x, 182 pp., illus. $10.

An objective of the comparative physiologist is to describe the means by which different organisms solve similar basic physiological problems. The solutions achieved by the animals depend on many factors, including their size and complexity and the nature of the habitat in which they live. In this book the problem at issue is respiratory gas exchange, and solutions to it are described and discussed for animals ranging from Protozoa to man.

The main themes of the book concern the diffusion of gases (oxygen and carbon dioxide) across the (respiratory) interface of the animal and its environment and the transport of these gases between this region and the tissues. For the general reader an introductory chapter is provided which discusses the basic principles of these processes. The largest part of the book is organized according to the respiratory medium involved—aquatic, aerial, or transitional. Later chapters provide brief discussions of specialized topics such as respiratory adaptations to altitude and diving, gas exchange of the placenta and the bird egg, and swimbladder function. Throughout the book, the author chooses examples of the phenomena he deals with and examines them quantitatively.

This book might be considered a

modern version of August Krogh's 1941 classic of the same title, which the author tried to emulate. The material covered and several of the figures are the same, as is nearly all of one paragraph. Steen's treatment is not always as clear as the older work, nor is he able to cover an area with equal authority, the available information having grown so in the interim. For example, 14 pages of Steen's book are devoted to the alveolar lung, a large representation in a book this small but microscopic in comparison to the available literature on the mammalian lung alone. Consequently, specialists will not find comprehensive reviews of their particular topics; but they should profit from the overview of the field. Students will find in addition insights of an investigator of broad experience into some of the exciting current problems in the field. Finally, the book is commended to general readers, who will find in it an introduction to a fascinating aspect of physiological adaptation.

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Mutagenic Agents

Chemical Mutagens. Principles and Methods for Their Detection. ALEXANDER HOLLAENDER, Ed., with the cooperation of Ernst Freese, Kurt Hirschhorn, and Marvin Legator. Plenum, New York, 1971. Vol. 1, xxviii pp. + pp. 1–310, illus., + index. Vol. 2, xxii pp. + pp. 311–610, illus., + index. $17.50 each.

Chemical Mutagenesis in Mammals and Man. F. VOGEL and G. RÖHRBORN, Eds. Springer-Verlag, New York, 1970. xiv, 520 pp., illus. $34.10.

The stated purpose of the two-volume work edited by Hollaender is to encourage the development and application of testing and monitoring procedures to avert significant human exposure to mutagenic agents. Certainly it succeeds brilliantly in providing a single source from which the details of a whole battery of mutational assay systems can be obtained. Despite the large number of contributors (the 23 chapters have 34 authors), it has a continuity seldom exemplified in contributed volumes. It begins with an excellent discussion of the molecular mechanisms of mutation and proceeds with chapters on the relationships between mutagenesis and teratogenesis and between mutagenesis and carcinogenesis. The rest of volume 1 deals with the utilization of simple prokaryotic organisms as mutational test systems. Volume 2 takes up the more complex biological systems. The final chapter, which is exceptionally fine, succinctly elucidates the approaches to and problems of monitoring human populations.

The volume edited by Vogel and Röhrborn contains the papers of the Symposium concerning Mutation Research held at Mainz in 1969 and several supplementary chapters. Three chapters deal with broad aspects of the problem of chemical mutagenesis in relation to man, 14 with research methods, and 10 with findings and applications, the latter including a valuable segment on results obtained to date with a number of characteristic chemical groups such as alkylating agents, antimetabolites, acridines, and caffeine. Special attention should be drawn to the tabular summary, compiled by A. Barthelmess, of mutagenic substances in the human environment, which gives 1017 references. Although valuable in the main, it would have been enhanced by a more specific referencing of the agents responsible for a mutagenic effect per se and by a clearer division of environmental source or use category. The appendix of the book consists of a most useful 40-page treatment of statistical methods in mutagen research. The overall treatment is notably cohesive for a symposium volume, and this work too is a worthwhile contribution to the field of chemical mutagenesis.

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Embryology

Lectures on Developmental Physiology. ALFRED KÜHN. Translated from the second German edition (1965) by Roger Milkman. Springer-Verlag, New York, 1971. xvi, 536 pp., illus. $19.60.

The first edition of *Lectures on Developmental Physiology* appeared in German in 1955. A second, expanded, edition followed in 1965; it is this which is translated into English here, seemingly without change.

Developmental physiology is broadly construed. There are 36 lectures, each of which not only presents facts but also raises problems and discusses concepts. The first five lectures discuss the structure of chromosomes, their distribution in mitosis and meiosis, and cytoplasmic division; examples are chosen from a wide variety of organisms. The next three lectures deal with developmental events in unicellular organisms, acellular organisms (including *Acetabularia*), and in simple multicellular systems (Volvocales, Acrasiales, and so on). Then several general topics are discussed in separate lectures: fertilization, polarity in spores and eggs, cleavage. A number of lectures are then devoted to the development of particular organisms: two to the echinoids, six to the amphibians, one to the ascidians, one to forms with spiral cleavage, four to insects, four to plants. Two lectures follow on regeneration, discussing primarily, but not exclusively, hydroids and planarians. A general discussion follows on spatial patterns in development, and the book then concludes with four lectures on developmental genetics, Kühn's own field. The bibliography includes over 750 items, and there are 620 illustrations, each of which is superb.

The lectures are tersely written, and assume some understanding of technical vocabulary. Kühn was unique by virtue of his breadth of biological knowledge and his depth of understanding of fundamental biological problems. He was intimately acquainted with a great variety of biological forms from the most varied phyla. There is therefore some question as to how deeply Kühn's presentation of a variety of developments can be appreciated by a generation of American students who know little of the adult organisms that are developing. Kühn's lectures were originally addressed to students who had been trained differently. The book will be most useful to advanced students fortunate enough to have professors who can attempt to provide for them some of the background that they lack. It will be indispensable to those who teach developmental biology; it has no counterpart in print in English or any other language. It is a great pity that Kühn died before preparing a new edition of the book for the 1970's; no living teacher or investigator of developmental genetics or developmental biology more generally can begin to equal his standards.

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