zation and viewed the provisional theory of pangenesis as Darwin's explanation for the tendency of some offspring to revert to ancestral types. In this new history Olby points to Darwin's difficulty in accounting for unusual phenomena, such as pseudogamy, "bud sports," and fusion of graft hybrids, and reminds the reader that even in 1859 Darwin insisted that the environmental condition rather than the effects of cross-breeding created new somatic variations. This double emphasis, Olby argues, led Darwin to deny the uniqueness of sexual reproduction and forced him to develop his theory of pangenesis. Here is a thoughtful interpretation which is further supported by a manuscript version of the theory of pangenesis which Darwin wrote in 1865 and a portion of which the author has included in an appendix. Whether this was a prevailing attitude only future historical research can tell; however, as presented by Olby it offers an interesting way to view the irksome question concerning the lack of contemporary appreciation of Mendel. In fact, using Darwin's correspondence with Galton as a test case, Olby forcefully argues that in light of his indifference toward the special nature of sexual reproduction Darwin would not have understood Mendel's achievements even if he had known of them.

In a second fascinating section Olby contends that de Vries knew of Mendel's work as early as 1896 but did not announce the fact until his hand was forced in 1900. The evidence for this is conjectural, but Olby's interpretation of the events has the advantage of explaining how on separate occasions de Vries could claim that he learned of Mendel's work from different sources.

There are other provoking sections in this book which demonstrate that Olby has gone far beyond Roberts' history of the same events. One serious drawback, however, arises from the fact that Olby has followed Roberts' outline so closely that he does not break away to analyze other issues. Most notably, Olby skips from Mendel's experiments of 1865 to the rediscovery of Mendel's laws in 1900. This "saltation" dodges a thorough investigation of the cytological work of Weismann, Van Beneden, Nägeli, Roux, and many others. It was this cytological understanding, as Olby himself briefly notes, which permitted de Vries to have the insights he did by 1900. Only after historians have fully investigated these developments can we claim to have an understanding of the "origins of Mendelism."

I highly recommend this work. It will stimulate investigation into many corners of 19th-century biology, and its many thoughtful and unique interpretations demand a hearing at history's forum. The book is reasonably priced and contains some valuable source material in the appendices.

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Biology of Marine Caves

Biologie der Meereshöhlen. Topographie, Faunistik und Ökologie eines unterseeischen Lebensraumes. RUPERT RIEDL. Parey, Hamburg, 1966. 636 pp., illus. DM 186.

Until about 20 years ago submarine caves were virtually unexplored and almost no information concerning their configurations, biota, and environmental conditions was available. This situation was due primarily to man's inability to solve technological problems involved in first-hand exploration of these recesses. With accelerated development of skin- and SCUBA-diving instrumentation and techniques, this barrier was successfully overcome, and concomitantly, interest in the investigation of submersed caves increased rapidly. Centered along the edge of the Mediterranean Sea, French, Italian, Croatian, and Austrian scientists actively engaged in probing this remote habitat. One of the most successful of these endeavors was the Austrian Tyrrhenia Expedition of 1952, the results of which form the basis for the present book. Riedl's integration of geological, geomorphological, climatological, hydrographical, and biological data and conclusions has resulted in a monograph which will certainly be a directing influence for the orderly investigation of other marine environments. One is impressed by the book's excellent illustrations, both graphical and photographical, and the exemplary organization of the text.

A discussion of the problems and methods of littoral research, with special emphasis on marine caves, introduces the book, and the reader is confronted with the program, execution, and investigations undertaken during the Tyrrhenia Expedition. Riedl then discusses the occurrence and limits of the rocky littoral and the roles played by geological, geomorphological, and hydrographical factors. A preliminary division of the littoral, based upon water movement and light exposure and their biological effects, follows. The distribution, origin, and age of caves in the rocky littoral occupy the greatest portion of the second chapter, wherein the morphological and climatological significance of different cave types is also treated. This treatment leads to a topographic definition of marine caves, which is supplemented in later chapters by faunistic, ecological, functional, and biocenotic definitions.

About 900 species of organisms are known from sea caves, and they are dealt with systematically and biologically in chapter 3. It is interesting to learn that none of these species is a troglobiont, although many species are speleophilic, especially sedentary animals which show a preference for caves to evade competition with plants in the open littoral. Troglobiontic marine species are known to occur only in "border caves" (*Randhöhlen*). Riedl's discussion of this type of cave, which was originally open to the sea but is now only poorly connected and may in the future become completely isolated from the marine environment, bridges the gap between marine and terrestrial speleology. Furthermore, Riedl shows that the "border cave" and its successive integration into the limnetic domain provide a possible route for the immigration of certain marine faunal elements into the subterranean freshwater habitat.

The zonation of organisms in sea caves is considered in chapter 4. Using one cave, the "Grotta tuffo-tuffo" in the Gulf of Naples, as an example, Riedl portrays the qualitative and quantitative distribution of the biota. He then compares faunal zonation in caves of different forms and depths, considering also chronological and geographical faunal changes. At the beginning of chapter 5 Riedl points out that knowledge of faunal zonation would be of little value without determination of the factors governing it. Consequently, he analyzes the complex influences of light and water movement, in addition to such factors as competition for space, benthonic and pelagic food supply, and the significance of sedentary animals as substrates for other

sedentaria and the vagile fauna. Behavioral patterns and their relations to the close affinities of animals (mainly fishes) to marine caves are a further subject of discussion.

After a prefatory account of methods and concepts in autecology and synecology, Riedl elucidates the biocenotic relations of marine caves in chapter 6. Faunal associations are characterized (by statistical material and Riedl's "method of homogenity determination," explained in chapter 1), and the trophic structure of caves and their biological connections with neighboring biotopes is demonstrated. Further, climatic conditions, as well as interspecific relations and their effect on associations, are treated. The concluding chapter is concerned with the origin of the marine cave fauna and the question of what part of the littoral system it occupies. By comparison with the fauna of other marine environments and by the tracing of rows of correlations of species and biotope characters, it is shown that the marine cave fauna is a special and comparatively young branch of the littoral hard-bottom fauna. The incorporation of sea caves and their fauna into the "littoral system" as an extreme form of a secondary production area follows, as a consequence, the author's presentation of the division of the littoral.

Biologie der Meereshöhlen, with its wealth of information, is a highly significant contribution to the literature on marine biology. Riedl has produced a unique volume which will prove to be a must for workers in the field of marine science.

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Optical Processes in Metals

Optical Properties and Electronic Structure of Metals and Alloys. Proceedings of an international colloquium held in Paris, September 1965. F. ABELÈS, Ed. North-Holland, Amsterdam; Wiley (Interscience), New York, 1966. 655 pp., illus. $18.50.

The understanding of simple metals and alloys has advanced in the last decade. The increasingly accurate Fermi surface and optical experiments have armed band theorists with the information necessary for adjusting and testing their calculations. Yet these band-structure calculations are unable to predict quantitatively the strength, and often the shape, of the observed inter-band optical spectra. This colloquium was held just as the participants were realizing that optical processes in simple metals are not yet quantitatively understood. Are many-body effects important for interpreting optical experiments? Are optical intensities determined primarily by transitions which are vertical in wave vector space, or by indirect processes? Is the "optical" mass in the Drude term the same as the "polaron" mass? This conference asked more questions than it answered. The major progress has been logged by the experimentalists, who have advanced their art enormously.

The volume is a compendium of the major problems in the optical and electronic properties of metals. This seems to be its main virtue to prospective purchasers. The experimental articles are especially good in surveying a subject rather than dwelling on a recent result. The theoretical articles, although fewer in number, have a greater variation in quality and general interest. Those of W. Kohn, J. C. Phillips, and P. Nozières are excellent in sketching ideas rather than details.

This is also a lively book to read. The general discussions following each presentation provide drama, controversy, and much entertainment. They also provide the reader with an accurate index to what the conference participants considered interesting. This makes these proceedings especially useful to anyone wanting to read up on the field.

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Solid State Physics over 13 Years

Introduction to Solid State Physics. CHARLES KITTEL. Wiley, New York, ed. 3, 1966. 662 pp., illus. $12.50.

It is a truism that physics is progressing at a rapid rate. Most of us, of course, are not aware of this on a day-to-day basis, since we are immersed in our own particular lacunae of research. But on occasion something happens to jolt us into an awareness of just how rapid the pace has become. I received such a jolt when I read the third edition of *Introduction to Solid State Physics*.

Only 13 years have elapsed since the first edition and 10 years since the second, but the tables of contents tell the story. There were 23 pages on superconductivity in the first edition and 26 in the second, but there are 40 in the third edition. Whereas the second edition had a 10-line note added in its third printing to tell the reader that the Bardeen-Cooper-Schrieffer theory of superconductivity existed, the third edition makes full use of the theory and goes on to include tunneling phenomena. Magnetic resonance now merits a chapter of its own, which is written in a very economical style indeed. The use of inelastic neutron scattering for determination of phonon dispersion curves is now covered, and a brief introduction to localized phonons is provided. The discussion of ferromagnetism and antiferromagnetism now includes magnons and reduces magnetostriction to a homework problem. The list of such changes is endless.

In most respects the third edition needs to be considered as a brand new book, although the author's point of view is unchanged. He still treats in depth the elementary excitations in solids (phonons, electrons, magnons, plasmons, polarons, excitons), outlines and gives references to experimental techniques (deHaas-van Alphen effect, ultrasonic attenuation, and so on), and briefly considers a host of important, but not quite as fundamental, applications (Van Hove singularities, the Fermi surface of copper, type II superconductors, iron garnets, hydrogen bonding in DNA, and others). Not every topic in solid state physics is covered, and the treatment is somewhat uneven, as it must be in an introductory book. But Kittel's style has become more compact, and the third edition reads more slowly because it is meatier and more sophisticated.

Beginning graduate students and advanced undergraduates will find the book very worthwhile as an introduction to the solid state. Their research supervisors can also profitably look through it to appreciate the depth and breadth of the mainstream. Kittel's book sets the standard for introductory works on solid state physics.

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