Book Reviews

Physical methods of organic chemistry. (Vol. I.) Arnold Weissberger (Ed.). New York: Interscience Publishers, 1945. Pp. vii + 736. (Illustrated.) $8.50.

The emphasis in this first volume of a two-volume collection of monographs is heavily on the physical methods as opposed to the organic chemistry. It should be a valuable reference work for any chemist who wishes to make careful measurements of physical properties. The subjects of the 16 chapters are all determinations which are important in the characterization of organic compounds or for the elucidation of their structures and behavior. All are presented with the authority of genuine experts, and most of them with compassion for the nonexpert. The editing has been successful in eliminating duplication and overlapping. The topics range from measurements which are an everyday task in every laboratory to those which are pretty much a job for a specialist. With the former, the critical discussion of limitations and precision should have much value; with the latter, the reader may at least grasp the significance and the limitations of the technique. Sturtevant's article on calorimetry is a model treatment, covering the field from the refinements necessary for the utmost precision or under extreme conditions to an unprejudiced assay of the value of relatively crude and simple methods, and refraining admirably from an overemphasis of the author's own accomplishments and special fields of interest. The excellent articles on viscosity, osmotic pressure, and diffusivity reflect current interest in high polymers.

The subjects covered are melting, freezing, boiling, and condensation temperatures, density, solubility, viscosity, surface and interfacial tension, properties of monolayers and duplex films, osmotic pressure, diffusivity, calorimetry, microscopy, crystal form, X-ray and electron diffraction, and refractometry.

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Cambrian history of the Grand Canyon region. Pt. I: Stratigraphy and ecology of the Grand Canyon Cambrian. Edwin D. McKee; Pt. II: Cambrian fossils of the Grand Canyon. Charles E. Resser. Washington, D. C.: Carnegie Institution of Washington. 1945. Publication 563. Pp. viii + 232. (Illustrated.) $2.50 (paper); $3.00 (cloth).

Grand Canyon, with its over 100 miles of continuous outcrops, is an ideal region for the tracing of sedimentary rock types (facies) and time planes and the demonstration of their relationships.

Four major groups of facies make up the Cambrian section, each comprising a formation, the Tapeats Sandstone, Bright Angel Shale, Muav Limestone, and unnamed upper dolomites. The three lower formations record one major marine transgression from the west across northern Arizona. Each formation represents one dominant facies and several lesser, related ones, and is defined without regard to time planes. Formational boundaries are arbitrary and follow the contacts of interfingering tongues which express the actual relationship between the units. Oscillations of the shore produced two minor groups of facies (one transgressive, the other regressive) which show a definite sequence from the shore seaward. The sediments of each facies are pictured as built up to a considerable thickness in a staggered arrangement as the facies shifted back and forth.

Time planes are established by key beds (three fossil horizons and many beds of distinctive lithology) which are traced along the outcrop. A few extend across the region, others for from 30 to 80 miles. Altogether they form an overlapping series of planes which, superimposed on the lithologic pattern, show the time relations.

Fifteen facies are analyzed. Only the conglomerate facies represents beach or near-shore conditions, and the Tapeats coarse-grained sandstone is considered an offshore deposit (1 to 20 miles, in water depths of 20 to 60 feet). Transgressive facies are, in sequence from sea shoreward, the Muav mottled limestone (its shoreward margin 150 miles from the strand), a *Girvanella* limestone, and a tongue of rusty-brown dolomite passing into shale. This thin, but extensive, dolomite is considered an original facies precipitated in an area of slight deposition. Regressive facies are, from the shore-side seaward, shales, occasionally flat-pebble conglomerate, platy siltstones, and thin silty limestones. McKee argues for the deposition of flat-pebble conglomerate well below sea level and many miles distant from shore, but does not make clear the site of origin of the pebbles. Glauconite, abundant in both groups of facies, is considered indicative of many significant diastems.

Seven members of the Muav, and one member and seven dolomite tongues in the Bright Angel, are named. The members are rock units representing age subdivisions, and their boundaries are determined by the lithologic key beds. The steady eastward (shoreward) thinning of these rock units indicates that the slow, uninterrupted accumulation of limestone more than balanced the permanent sedimentation of detrital material because of frequent breaks of nondeposition or scour in the east.

The Cambrian sea encroached upon an Ep-Algonkian erosion surface which, in the west, was on granites and had a relief under 100 feet, but in the east, had faulted Algonkian ridges forming 800 foothills. The major transgression consisted of periods of rapid sinking of the basin and eastward spread of the transgressive facies, followed by cessation of sinking, filling of the basin, and westward spread of the regressive facies. The single member of the Muav in easternmost Grand Canyon marks the turning point of sedimentation. The uppermost Muav member indicates that the major Cambrian regression had started, but no further westward shift of facies is apparent as the section passes vertically into dolomites. The latter are interpreted as regressive marine deposits in a filled basin covered by very shallow, concentrated water.

In Part II all known fossils are reviewed and described. One cystoid, 1 gastropod, 14 brachiopods, and 36 trilobites merit specific description, and a number more are placed generically. The paucity and poor preservation of the material is amazing, and more intensive collecting should be done. An *Olenellus* and *Antagmus* horizon date the lower beds as late Lower Cambrian. Horizons of *Alokistocare althea* and *Glossopleura mckeei* and of *Solenopleurella porcata* date most of the Bright Angel and the Muav as early Middle Cambrian. The collections are too small to indicate distinct faunal zones or satisfactory zonal correlations.

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Physical chemistry of cells and tissues. **Rudolf Höber and collaborators. Philadelphia: Blakiston, 1945. Pp. 675. (Illustrated.) $9.00.**

This is the book which we had long been expecting as the American analogue of Dr. Höber's *Physikalische Chemie der Zelle und der Gewebe.* That went through six editions, and the last, in 1926, is encyclopedic and a classic for the cell physiologist. It probably would have been asking too much of the author to have maintained the same scheme of the original edition. Perhaps this may still be done.

The present book follows the current vogue of multiple authorship, the author having enlisted the services of four collaborators. David I. Hitchcock, of Yale, and J. B. Bateman, of the Mayo Clinic, are responsible for the first two sections, which are strictly on physical chemistry. The section by Hitchcock deals with selected principles of particular import for our knowledge of living matter, viz., diffusion in liquids, reaction velocity and enzyme action, thermodynamics, the energy concept, electromotive force, and properties of aqueous solutions. This section of 91 pages and 126 references is clear and concise, depending freely on the references for essential details—an admirable method of presenting fundamentals with lessened risk of becoming lost in too deep a forest of details.

The second section, by Bateman, is on the physicochemical properties of large molecules, with a discussion of their architectural and functional significance in living matter. This extremely valuable section of 121 pages with 534 references includes a discussion of fibers, films, and membranes so widespread as structural forms of living matter.

The sixth section, by David R. Goddard, of the University of Rochester, is an excellent discussion on the respiration of cells and tissues (74 pages and 199 references). The discussion is devoted to the mechanism of cellular respiration, the development of which has been so largely during the last two decades. Dr. Goddard deals with the energetics and kinetics of the process involving a series of graded steps with many distinct enzymes, the whole constituting an integrated reaction system. The writer presents a fascinating story of a general pattern of cellular respiration by emphasizing the physicochemical approach. Coupled reactions permit the storage of oxidative energy in the form of high-energy phosphate bonds which may be transferred, stored, or utilized, as needed. The mechanism of energy transfer is suggested by Engelhardt's discovery that myosin, the contractile protein of muscle may itself be the enzyme to induce the hydrolysis of adenosin triphosphate. This case of a catalyst accepting the energy liberated by its substrate would appear to be the first biochemical reaction discovered which directly converts the potential energy of a chemical compound into mechanical work.

Another well-developed section is by Wallace O. Fenn, on contractility (79 pages with 316 references). A very brief discussion of protoplasmic streaming, ameboid and ciliary movement as phenomena of contractility is followed by an excellent account of muscle contractility. Interesting experimental data are presented, and the section ends with a discussion of muscle contracture and a survey of theories of muscle contraction historically developed, ending with the significance given by the newer knowledge of the configuration of protein structure. The phosphate cycle provides the energy, and the change in configuration of the myosin from a partial to a more complete folding causes the shortening. The shortening may result from a phosphorylation of the myosin serving as an enzyme for the removal of PO_4 from adenylpyrophosphate.

The four remaining sections are by Dr. Höber and occupy somewhat less than half of the book. A brief section deals with introductory remarks on the architecture of protoplasm. He offers an interesting concept of a chemodynamic machine having a submicroscopic structure which is so spread as to form a very large area for adsorption catalysis.

The section on permeability follows somewhat the classic lines and deals with organic nonelectrolytes, weak bases and acids, dyestuffs and water. From this discussion is deduced the chemistry and physics of the plasma membrane for the structural basis of which he offers evidence. Regarding the permeability of nonelectrolytes, their passage is related to molecular volume and lipoid solubility. In an analysis of experiments dealing with pore size, consideration might have been taken of the fact that many nonelectrolytes exist as molecular aggregates varying in size according to the nature and pH of the medium. Moreover, the determining characteristics of the medium may change on approaching surfaces, such as those of cells. The chapters on permeability attest to the great variability encountered with different types of cells, a valuable feature to be pointed out in the face of those who may attempt too sweeping generalizations. Dr. Höber is to be commended for the carefulness of his survey. The only question which arises is whether the subject may have been more easily handled if, instead of grouping various cell types under headings of permeability to different substances, the different types of cells had been taken