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.

LOUIS P. HAMMETT

Columbia University

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 ma-