The offshelf facies of the Pethei contains shale with abundant stromatolitelike digitate growth structures of poorly laminated limestone. They are rhythmically interbedded with graywacke turbidites, thin evenly bedded calcareous mudstone with shale partings (rhythmite) and beds of cherty limestone submarine-slide breccia. The growth structures certainly formed below surf-base and probably below the photic zone of muddy water. They may be bacteriagenic.

The mere presence of stromatolites in Proterozoic carbonates cannot be used to infer a specific depositional environment, but by mapping different types of stromatolites and their associated sediments, paleogeographic facies can be established as in any Phanerozoic succession.

HOFFMAN, P., Inst. Sed. and Petroleum Geol., Calgary, Alta., B. W. LOGAN, Dept. Geol., Univ. of W. Australia, Nedlands, W. Australia, and C. D. GEBELEIN, Dept. Earth and Space Sci., State Univ. New York, Stony Brook, N.Y.

ALGAL MATS, CRYPTALGAL FABRICS, AND STRUCTURES, HAMELIN POOL, WESTERN AUSTRALIA

Stromatolitic sediments and structures in Hamelin pool, Western Australia, are formed by interactions between blue-green algae (which trap and bind sediment particles) and a variety of mechanical and diagenetic processes. The algae form a cohesive mat that tends to cover intertidal, supratidal, and some shallow subtidal surfaces. The mat is differentiated into 7 intergradational types as an expression of variations in algal species present, ratio of filamentous to unicellular forms, quantity of mucilaginous matrix, life habits, and quantity and nature of the host sediment. The distribution of mat types is controlled by environmental factors such as elevation of substrate, drainage, depth and nature of interstitial groundwater, and sediment influx. In tidal flats with gentle gradients there is a broad zonation of mat types, whereas on headlands and locations with irregular topography the mat is highly differentiated with a condensed, patchy development of types.

The sediments trapped and/or bound by the algal-mat communities commonly are imprinted with distinctive fabrics. These fabrics, which can be related to specific mat types, reflect a complex interaction between the algae, and processes of sedimentation and diagenesis. Important factors in the development of fabric are surface texture and internal structure of the mat, rate and frequency of sediment influx, and processes such as oxidation, cementation, and lithification. Changes in mat type with changes in environmental conditions (*e.g.*, shoaling and sediment influx) lead to the development of successions of fabrics in the sediment pile.

The mat-sediment complex is shaped by physical factors into a variety of structures ranging from extensive flat-lying sheets through linked ellipsoids and columns to discrete ellipsoids and columns. The size range of structures is variable from a few centimeters to several meters; confluent and branched structures are also common. The gross morphology of the structures is largely independent of the mat type (or types) involved in the primary trapping and/or binding processes. Major environmental factors involved in shaping of structures are waves, currents, substrate gradient, and long-term sea-level change; minor factors include burial, exhumation, growth of epiphytes, activity of browsing organisms, gas evolution, corrosion, precipitation, desiccation, and variation in sediment type. These factors also influence the external surface texture of structures.

HOFMANN, H. J., Dept. Geol., Univ. Montreal, Montreal, Que.

STROMATOLITES: CHARACTERISTICS AND UTILITY

Stromatolites are laminated biosedimentary structures usually attributed to the trapping and binding action of nonskeletal algae in shallow-water environments. They have a geologic record dating back from the Holocene to the Archean, with an acmic development during the Proterozoic. The structures are generated by successive stacking of laminae, whose particular shapes are more or less uniformly maintained during the accretion process that yields the final gross morphologies. The laminae and their synoptic morphologies represent not only the microbathymetries at past instants in time, but also the preserved record of successive surfaces of equilibrium between interacting physical, chemical, and biologic factors in the environment. Analysis of the geometric, material, dimensional, and positional attributes of these active interfaces, as well as the final morphology of the stromatolite, provides information useful in classification of stromatolites and in the interpretation of environmental conditions during their formation. Changes in their morphology and microstructure through geologic time reflect evolutionary changes in stromatolite-building biotas and their environments, and are the basis for the correlation of stromatolitic Precambrian sequences. Stromatolites also have been used to determine paleolatitudes, to gauge ancient tidal ranges, to shed light on past rates of rotation of the Earth, and to date the apparent capture or closest approach of the Moon, but conclusions reached in these respects are not yet sufficiently firmly based.

HOLMES, M., A. J. ELOY, and D. J. VER STEEG, Marathon Oil Co., Littleton, Colo.

GEOLOGIC RESERVOIR ANALYSIS OF KIRKWOOD SANDSTONE, ILLINOIS

The Mississippian Kirkwood reservoir is a 30-ft thick alluvial or deltaic crossbedded sandstone, overlain and underlain by shale. Measurements of grain diameter and sorting, clay content, porosity, permeability, and capillary pressures were made on cores from 5 wells in the reservoir.

The lower part of the reservoir is coarser grained and more permeable than the upper part. Also, feldspar grains in it have been partially altered to kaolin. The upper part is finer grained and less permeable. In contrast to the lower part, it contains illite and minor amounts of kaolinite and generally exhibits calcite cementation and quartz overgrowths.

Measurements of absolute pore size and average pore entry radius disclose larger values of these parameters in the lower part of the sandstone than in the upper. However, surface area and irreducible water saturation have smaller values in the lower part of the sandstone than in the upper. Pore entry size distribution data are in qualitative agreement with Kozeny's analysis and show that pore tortuosity is apparently reflected in the shape of the pore entry distribution curve. Those rocks which have platykurtic pore entry distributions have a more tortuous pore network than those with skewed distributions. A theoretical 2-dimensional model of the pore network involving cubic packing of spherical grains closely describes rock/fluid behavior.