

cations for registration. Deadline for indicating interest in filing for registration was November 13, 1969, and closing date for submitting final completed application form is April 30, 1970. The date after which it will be unlawful to practice or offer to practice geology in California, except as specifically exempted in the Act, has been extended to June 30, 1970. This was done to enable the Board to complete registration of the unexpectedly large number of geologists who have applied.

Individuals missing the "grandfathering" period may still register without examination under certain provisions of the Act. They also may apply to take the next examination, for registration in geology and/or certification in engineering geology, at any time. This test will be given between August and October 1970.

Provisions of the Act require that the "specialty" of engineering geology be established and defined by the Board, and that qualified individuals be certified as engineering geologists upon proper application. Groups of geologists desiring to have similar "specialty" certifications established in other disciplines may bring their requests before the Board, which has the authority to regulate these into existence on the basis of public need.

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#### GEOPHYSICS AND FUTURE OIL POTENTIAL

(No abstract submitted)

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#### COMPUTER SIMULATION OF MARINE SEDIMENTATION

Geology has lacked an effective experimental approach to many problems. Although some kinds of experiments can be carried out, such as sediment transport on a stream table, most geologic processes cannot be re-created in the laboratory. A mountain range can be observed in the field, but neither the mountain range nor the mountain-building processes can be duplicated in the laboratory. These are shortcomings of which geologists are fully aware.

There is, however, another shortcoming in the geologist's kit of tools—namely, his difficulty in dealing with many interdependent variables or processes that mutually and simultaneously affect each other. However, computers can be used, in conjunction with appropriate mathematical geologic models, to perform kinds of experiments which otherwise could be performed only with difficulty, or not at all. Furthermore, these computer models are ideally suited for "exploring" the effects of interdependent geologic processes that are linked together to form dynamic systems.

The processes of marine sedimentation are highly interdependent. All too commonly, geologists who study stratigraphic sequences attempt to interpret the depositional environments of the strata in terms of only one or two variables—such as water depth or wave energy. Clearly, methods of analyzing the effects of multiple interdependent geologic variables are needed.

Computerized, dynamic mathematical models which represent geologic processes and products in two- or three-dimensional space provide one method of attack. These models are philosophically identical to dynamic oil-reservoir simulation models, and they also share many of their constructional details. Most dynamic geologic simulation models can be constructed from relatively few mathematical "building blocks," which may be grouped into the following categories: (1)

materials-balance accounting systems; (2) sources of random variables; (3) Markov chains; (4) flow and transport mechanisms using finite-difference methods of representing diffusion and fluid-flow processes; (5) feedback control; (6) optimization; and (7) graphic display. Virtually all models employ methods in which both space and time are compartmented into small increments.

Experiments with relatively simple sedimentation models suggest that feed-back control exerts much influence on sedimentary sequences. A lag in the isostatic adjustment of the crust in response to the load imposed by deposition of sediment may be responsible for some of the large-scale rhythms in cyclic sedimentation. Simulation models can be used effectively to explore the results of different assumed lag factors in sedimentation/isostatic-adjustment feedback loops.

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#### STRATIGRAPHY AND SEDIMENTATION OF JOIDES HOLES OFF CALIFORNIA COAST

Five holes were drilled several hundred kilometers offshore near the Mendocino and Pioneer fracture zones. Situated in 3,200–4,200-m water depths, these holes penetrate most or all of the stratigraphic column present at each site. They provide pertinent geologic data concerning the age of the oceanic crust and demonstrate 200–1,200-km offset across the fracture zones in that region. The deposits range in age from Pleistocene through late Oligocene. Their rates of deposition range from 0.1 to 56.0 + cm/1,000 years. Most are of terrigenous origin, although thin pelagic intervals are present in two holes. Such sedimentation agents as biogenous productivity, tropospheric transport, bottom currents, grain-by-grain settling, and turbidity currents have contributed to the sediment accumulations. Two of the holes that are only 20 km apart are lithologically similar. Each of the other holes has distinctive lithologic characteristics and thereby reflects variations in the contributions made by the different sedimentation agents. Several holes contain intervals of porous sand as well as organic-rich mud.

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#### DIAPIRS AND DIAPIRLIKE STRUCTURES, SOUTHEASTERN BERING SEA<sup>1</sup>

Four diapiric folds and two folds that are probably diapiric have been located by seismic-reflection profiling beneath the edges of Umnak Plateau, a broad platform at a depth of about 1,860 m in the southeastern corner of the Bering Sea. The plateau is underlain by 2,000–3,000 m of generally flat-lying strata thought to be of Neogene age. These strata overlie an "acoustic basement" that probably consists of lithified rocks of Paleogene age or older.

The piercement cores appear to rise from, or through, the acoustic basement, or possibly from the basal beds of the strata that form the plateau. The cores rise as much as 1,500 m above the acoustic basement and to within 700 m of the sea floor. Folding above the cores decreases upward, but the plateau is gently domed in places. Intrusion of the diapiric cores probably formed these folds in late Tertiary time; how-

<sup>1</sup> Publication authorized by the Director, U.S. Geological Survey.