earth sciences

GEOPHYSICS

Origin of Atlantic fracture zones

The Mid-Atlantic Ridge is sliced into segments by a number of crosswise fractures. Dr. J. Tuzo Wilson of the University of Toronto proposed in 1965 that the locations of these faults were determined by lines of weakness on the continent before rifting.

A. O. Fuller of Michigan Technological University has examined the geological structure of the western half of southern Africa for evidence of lines of weakness that might correspond to transform faults in the mid-Atlantic. The pre-drift locations of selected faults—and therefore potential sites of weakness on the continent—were determined by reconstructing the path of Africa's drift.

In the May 24 NATURE PHYSICAL SCIENCE he reports that the suspected sites do indeed fall on lines of weakness. One line lies just south of a system of parallel faults. Another marks the boundary between crustal blocks. These lines of weakness, Fuller concludes, may extend across the continent.

GEOPHYSICS

Variations in earth's rotation rate

It has been known for some time that the axis of rotation of the earth moves with respect to the earth's surface. But the rate of rotation also varies. These variations have been divided into three types: seasonal, irregular and long-term.

R. A. Challinor of the University of Toronto has calculated the average time of rotation for each month of a 14-year period from 1956 to 1969. The days are about a millisecond longer in spring and fall than in summer. The average length of day for the 14-year period is about 1.75 milliseconds longer than 24 hours, and the average annual length of day shows a slight increase during the period of study.

Irregular fluctuations that have been noted in the length of day, Challinor writes in the June 4 SCIENCE, are probably related to the seasonal variations, but appeared to be separate phenomena because of the mathematical procedures used to analyze the data.

Challinor also found slight correlations between solar activity and accelerations in the rate of the earth's rotation, and between general earthquake activity and length of day.

GEOPHYSICS

Islands all in a row

The islands of the Pacific tend to fall into chains arranged along a WNW-ESE line. At the northwestern end are atolls; farther east along the chain, the atolls have a highly eroded central volcano; still farther east the central volcanoes are less eroded and there is a fringing reef. Toward the southeastern extreme are active volcanoes. This pattern suggests different stages in the volcanic formation of islands, and Dr. J. Tuzo Wilson has proposed that one such chain, the Hawaiian Islands, was produced by the northwestward drift of the sea floor over a single deep-seated magma source.

The Austral Islands, east of Australia, fit this pattern rather uncertainly. Recently, however, an active volcano was discovered at the southeastern end of the chain.

In the May 10 JOURNAL OF GEOPHYSICAL RESEARCH, Rockne H. Johnson and Dr. Alexander Malahoff of the University of Hawaii report results of studies of this volcano. They believe that the Austral chain, like the Hawaiian Islands, was formed by drift of crust over a magma source. The smaller size and wider spacing of the Austral volcanic cones indicate either that each cone accumulated more slowly or that there were extended intervals of inactivity.

GEOPHYSICS

Origin of the Mediterranean

The Mediterranean Sea is a complex of small ocean basins. The origin of such basins is disputed (SN: 3/6/71, p. 169). There are two basic schools of thought on the origin of the western Mediterranean: that it was created by sea-floor spreading, or that land areas foundered.

If the floor of the Mediterranean was once continental crust, the magnetic anomaly pattern in the basins should reflect trends on land. This, report Dr. Peter R. Vogt, R. H. Higgs and G. L. Johnson of the U.S. Naval Oceanographic Office, is not the case. On the other hand, ocean crust created by sea-floor spreading displays parallel bands of normal and reversely magnetized crust, but the Navy survey failed to reveal this pattern, either.

The absence of conspicuous magnetic lineations, though, does not rule out the sea-floor spreading theory, they conclude. There are a number of factors such as later volcanism, that may have obscured any pattern. Or inundation of the rift by sediments may have inhibited development of highly magnetized crust.

PALEONTOLOGY

Tree dweller or not?

Hypsilophodon, a small, two-legged herbivorous dinosaur, is generally thought to have been a tree dweller, much like the tree kangaroo, and is often cited as the best example of an arboreal dinosaur.

Its skeletal structure, say proponents of this view, was ideally suited to a life in the trees. Its upper arm had a wider range of movement than that of other dinosaurs, and the toes of the hind feet were long and flexible. The clincher, however, is that in a well-known reconstruction of the paw, the first digit appears to be opposable, like a thumb, so that the foot would be capable of grasping.

But, says Peter M. Galton of Bridgeport University, the scientists who class *Hypsilophodon* as a tree dweller have really gone out on a limb. A more critical examination of the upper arm, he writes in the May 21 NATURE, shows no wider range of movement than in other dinosaurs of the same suborder. Further, the forepaw was very small and would have had limited usefulness in climbing. Finally, he says, in the reconstruction in which the thumb appears opposable, the thumb was on backward.

Hypsilophodon, Galton concludes, was admirably suited to rapid running and would not have needed to take to the trees to escape his enemies.