earth sciences

PLATE TECTONICS

New Gondwana reconstruction

Almost all reconstructions of Gondwanaland have followed A. L. du Toit's match of the Atlantic margins of Africa and South America, and most have accepted his placement of southern Australia against the Wilkes Land part of east Antarctica. The areas of disagreement seem to be how these two composite pieces fit together and where India comes in.

J. J. Veevers, J. G. Jones and J. A. Talent of Macquarie University in Sydney present a new connection between Australia and India in the Feb. 5 NATURE that differs from earlier reconstructions in placing only southwest Australia against eastern peninsular India.

The researchers infer from the parallel nonmarine to marine trends in the stratigraphy of western Australia and India that before the breakup of Gondwanaland, southwest Australia and peninsular India lay within the interior and northwest Australia and Himalayan India lay along its margin. They point out that their reconstruction also provides space for Madagascar and the microcontinents of the Indian Ocean.

GEOPHYSICS

The expanding earth

The contraction, expansion or stability of the earth through geologic time is a question still sometimes disputed among geophysicists, although most believe the size of the earth is not changing.

The main support for the minority hypothesis that the earth has expanded is a discovery in 1956 that the continental areas covered by seawater had decreased. Assuming that the volume of seawater has remained constant, this decrease in areas was taken by some to mean that the earth's radius had increased.

But, says Jan Veizer of the Australian National University, there may be another explanation.

Because the geological time scale is based on the fossil and sedimentation record, the scale is more refined for recent periods simply because the record is better, he reasons in the Feb. 12 NATURE.

Different continental blocks may have been covered by seawater at slightly different times. As the time interval considered increases, Veizer says, the chance that these events will be lumped together also increases. The decreasing accuracy of a geological time scale with age may account for the apparent decrease in water-covered areas, he concludes.

GLACIOLOGY

Surging glaciers

Certain glaciers, known as surging glaciers, periodically discharge an ice reservoir by means of sudden, large-scale movements. Various mechanisms have been proposed to explain surging, many involving changes in geothermal heat flow in the glacier.

D. F. Classen and Dr. G. K. C. Clarke of the University of British Columbia in Vancouver studied the Yukon's Fox Glacier to see if it has the unusual thermal regime that would result if the mechanism were thermal.

They report in the Feb. 12 NATURE that drilling of the glacier revealed a layer of ice at the pressure melting point. The researchers estimated the geothermal heat flow in one of the holes to be about twice the worldwide average.

The surge behavior of the Fox Glacier must be related to its thermal regime, but whether the observed hot spot is the cause of the glacier's surging or a consequence of its latest surge is still open to question, the researchers conclude.

GEOPHYSICS

The Aleutians: Sink or source?

The concepts of plate tectonics and sea-floor spreading predict that ocean crust will be progressively older from the source of its generation at ocean ridges to the point where it is consumed in a trench. It was expected, therefore, that magnetic anomalies from the Pacific Rise to the Aleutian trench would display this pattern. But the age of oceanic crust appears not to increase but to decrease toward the trench.

This enigma, says J. G. Jones of Macquarie University, calls for a review of the assumption that the character of plate boundaries never changes. In the Feb. 5 NATURE, he discusses the possibility that plate sources may become sinks.

Jones suggests that at the time of the oldest magnetic anomaly, the eastern and northern edges of the Pacific plate were accreting along a rectangular boundary. Eventually, the northern perimeter ceased to accrete, became a zone of plate convergence, and the Pacific plate was overidden by the plate to its north.

Studies of the continental shelf of Alaska, he says, give evidence of tectonic events that may record this transformation.

SEISMOLOGY

Shallow earthquakes and rock composition

The nature of the worldwide distribution of shallow earthquakes on the midocean ridges or island arcs led C. H. Scholz of Columbia University's Lamont-Doherty Geological Observatory to suggest in 1969 that necessary conditions for earthquakes are acidic rock in the presence of high differential motion.

Dr. T. Hatherton of DSIR Geophysics Division in Wellington, New Zealand, tested the theory that seismicity may depend on rock type by comparing two types of island arc, one having continental rocks on both sides and the other with oceanic crust on one side and quasicontinental rock on the other. Dr. Hatherton reports in the Jan. 25 NATURE PHYSICAL SCIENCE that of all recorded earthquakes along the second arc type between 1964 and 1965, most shallow earthquakes occurred on the side with continental crust. As soon as the axis of the arc swings into New Zealand, where both sides are continental, shallow quakes occur on both sides with equal frequency.

If the stresses on both sides of the arc are equal, as is predicted by tectonic theory, this assymetry of earthquake occurrence, he concludes, can be attributed to differences in the mechanical properties of rocks on opposite sides of the arc.