perimental Relativity is a printed version of the author's lectures at the 1963 Les Houches summer school, supplemented by reprints of a dozen articles by the author and his collaborators. Several ideas link the notes and appendices, and reveal the extent of the author's preoccupation with gravitation during the past several years. He (i) follows Mach and postulates gravitational fields accounting for inertial forces in a less passive way than does general relativity; (ii) investigates other covariant theories satisfying (i); (iii) advocates accurate null experiments to reject some of the many candidates admitted by (ii); (iv) believes that among cosmic "experiments" being performed, astronomers may see some which he would like to be attempting in his own laboratory; (v) stresses the importance of additional clues that are lying about the Earth and solar system; (vi) criticizes the three tests of general relativity. Red-shift experiments do not test Einstein's field equations. Many distrust the measurements of light deflection by the Sun. Now the author makes the alarming suggestion that we cannot exclude effects like solar oblateness on Mercury's perihelion motion. He has impressive experiments in train to test some of his suggestions, most notably a refined Eötvös experiment.

The very form of this group of writings precludes much organization. Neither is the layout very clear nor the typography free from error. Nevertheless, this is a most welcome provisional collection of provocative ideas.

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Geological Society of America Charts

Physiographic Diagram of the Indian Ocean: The Red Sea, the South China Sea, the Sulu Sea, and the Celebes Sea. Bruce C. Heezen and Marie Tharp. Geological Society of America, New York, 1964. $2.

This large (4 by 5 feet) and excellent physiographic diagram of the entire Indian Ocean is the third in a series of charts prepared by Heezen and Tharp. (The two previously published diagrams deal with the North Atlantic and South Atlantic areas.) The diagram is accompanied by a brief descriptive text and figures that show (i) sounding lines of bathymetric data used in compilation of physiography; (ii) physiographic provinces, including continental margins, ocean-basin floors, plateaus and aseismic ridges, midoceanic ridges, and fracture zones; and (iii) a generalized bathymetric sketch based on 500 meter isobaths.

Of necessity considerable subjective interpretation is incorporated in such a hachured diagram, compared to a contoured bathymetric chart, but happily this is the work of professional marine geologists. Most of the sounding data were collected in connection with the International Indian Ocean Expedition, so the chart has been made possible by broad international cooperation, including the soundings of the U.S.S.R.'s ships *Vitiaz* and *Ob.* Agencies from participating countries have been given due credit for contributed sounding data. The authors promise the eventual preparation of a full scientific text in the form of a monograph to accompany the physiographic diagram.

The diagram opens to view, for the first time, the general geomorphology of a region almost as extensive as the combined area of the North and South Atlantic Oceans. The midocean ridge, so prominent in the Atlantic Ocean, continues through the Indian Ocean where it takes the form of an inverted Y, but it is no longer a geometrically median ridge. Numerous fracture zones are delineated, often generating transcurrent offsets of the topography.

Large, isolated blocks of presumed sialic rock are delineated and have been termed "microcontinents" by Heezen and Tharp. Remarkably straight north-south lineaments are perhaps the most striking feature of the diagram and should precipitate great speculation or, hopefully, working hypotheses for the interpretation of the geologic history of this little-known area. Advocates of continental drift will find comfort in the strong geomorphic suggestion that the Indian subcontinent moved northward as much as 50 degrees, as had been suggested previously by paleomagnetic data.

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The Tropical Atmosphere

Cloud Structure and Distributions over the Tropical Pacific Ocean. Joanne S. Malkus and Herbert Riehl. University of California Press, Berkeley, 1964. x + 229 pp. Illus. $7.50.

The tropical atmosphere is a region of great importance to the understanding of our weather. Half the atmosphere is situated between 30°N and 30°S latitude, and within this region large transformations of energy (for example, absorption of radiation, evaporation, and vertical convection) occur which are certain to influence the large-scale behavior of the whole atmosphere in important ways. The tropical atmosphere also exhibits fascinating and unique phenomena of more specific scientific interest—the hurricane, the equatorial convergence zone, and the 26-month cycle of equatorial stratospheric winds. Yet the tropical atmosphere remains a *terra incognita* from which travelers return with tales that are fragmentary and sometimes conflicting.

We owe our limited knowledge of the tropical atmosphere, to a considerable degree, to the analyses and interpretations of tropical observations which Joanne S. Malkus (Simpson) and Herbert Riehl have made during the past two decades. Malkus has specialized in tropical cloud phenomena of mesoscale (~ 10 km) while Riehl has specialized in synoptic-scale (~ 1000 km) phenomena; they are therefore uniquely equipped by experience and interest to collaborate in a descriptive investigation of the relations between meso- and synoptic-scale phenomena. *Cloud Structure and Distributions over the Tropical Pacific Ocean* describes the results of three aircraft flights over the tropical Pacific, made in July and August 1957, on which cloud photographs were taken at 1-second intervals at heights of 7000 to 9000 feet. The flights covered a total period of about 80 hours. These data are supplemented by surface observations from ships and meteorological stations and by a very few upper-air observations. The bulk of the book is devoted to a systematic analysis of each flight: included are synoptic charts of streamlines, wind shear, pressure, and precipitable moisture, soundings of temperature and wind velocity in the upper air, a few pictures, and flight cross sections showing prevailing cloud distributions.