Book Reviews

Earth Dynamics

Rotation of the Earth. Proceedings of a symposium, Morioka, Japan, May 1971. PAUL MELCHIOR and SHIGERU YUMI, Eds. Reidel, Boston, 1972. xxii, 244 pp., illus. $19.50. International Astronomical Union Symposium No. 48.

The publication of the proceedings of the International Astronomical Union symposium on the rotation of the earth once again emphasizes the pervasiveness of the subject of the earth's rotation in geophysics, geodesy, and astronomy. Papers dealing with creep in the earth and planets (invited lecture by Sir Harold Jeffreys), spectral analysis (Pedersen and Rochester), separation of secular polar motion and continental drift (Mueller and Schwarz), determination of polar motion by laser ranging to satellites (Smith, Dunn, and Kolenkiewicz), motion of the equator and ecliptic (Fricke), changes in the geomagnetic dipole moment and the spin rate (Yukutake), and the evolution of the earth's core (Jacobs) illustrate the range of topics encompassed. In all, there are 54 contributions.

The symposium took place at a time of very rapid development in earth dynamics. The emergence of plate tectonics had finally given a kinematical explanation of continental drift, and the techniques of latitude and longitude determination used in the study of the earth's rotation seemed to be the only methods of providing real time measurements of the plate motions. Theoretical and observational evidence had been presented that earthquakes might excite the Chandler wobble or free polar motion, and indeed some evidence of premonition had been found. The realization that classical measurement methods were probably incapable of providing the needed accuracy to adequately check these geophysical theories had led to experimentation with new techniques, ranging to lunar laser retroreflectors, very long baseline radio interferometry, and satellite tracking. Finally, the International Geodynamics Project sponsored by the International Council of Scientific Unions promised renewed interest and cooperation in geodynamics.

Because the symposium took place at a time of such rapid development, very few conclusive answers are given, but many theories, suggestions, and intriguing bits of evidence are presented. The material ranges from exhaustive analysis to raw speculation. Nearly all the great questions in the earth's rotation are dealt with: What is the source of the excitation of the Chandler wobble and the nature of its damping? Is there more than one Chandler period? Is the diurnal wobble due to the presence of the earth's liquid core detectable? What is the history of the spin rate? Are polar wandering and mantle convection connected? Shimazaki and Takeuchi give results which they conclude are in agreement with the hypothesis that large earthquakes excite the Chandler wobble; Chinnery and Wells are more skeptical. Jeffreys takes the damping of the Chandler wobble as a key piece of data on the inelastic behavior of the mantle, but the observed damping time depends drastically on the resolution of the question of whether the Chandler peak is split. Gaposchkin concludes that it is, Rochester and Pedersen that it isn't. In any case, the seat of the damping mechanism is still unsettled. Both Débarbat and Yatskiv find evidence for the diurnal wobble in latitude and time observations. Newton reports on his exhaustive study of ancient astronomical observations, which has resulted in a more reliable measure of the earth's rotational deceleration. The lack of measurements for long time scales is reflected in speculative papers on polar wandering and mantle convection.

Indeed, in considering the whole of the proceedings, it is evident that few conclusive answers will be found until the new generation of measurement techniques now being developed takes hold and provides some critical tests of the many theories that abound in this field.

Meanwhile, any reader interested in geophysics, geodesy, or astronomy will find a gold mine of intriguing questions and speculations in this book. Attempting to resolve them would provide a nearly complete education in all three sciences, but would surely take more than one lifetime.

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Essays by a Physicist

Physics in the Twentieth Century. Selected Essays. VICTOR F. WEISSKOPF. M.I.T. Press, Cambridge, Mass., 1972. xvi, 368 pp., illus. $7.95.

"A gentleman," it used to be said, "is never unintentionally rude." On the same principle: "A scientist is never unintentionally obscure." After reading a collection of articles so notable for their lucidity, one begins to ask: how is this achieved?

There are some elementary principles, such as the use of simple words and short sentences. Despite his upbringing in German, and half a lifetime in America, Weisskopf's vocabulary is direct and unpretentious. Every word is bare and robustly unqualified. Each sentence is a precise logical statement carrying the argument one firm step forward. As we read, we move forward in understanding, knowing that we are with an experienced and confident guide.

Some scholars, indeed, abuse this style. By a succession of bold and apparently simple assertions they thoroughly lead us up the creek of their own fantasies. The shock of realizing that one is actually lost is then more devastating than with a more obscure author. On this point Weisskopf records Bohr's remark on the complementarity between clarity and truth and the charming story of the young man listening to the rabbi. To be really convincing, it is rather necessary to know what one is talking about; but the attempt to express the inexpressible is not always vain!

The main theme of these essays is quantum theory, to which Weisskopf has made such notable contributions, especially in quantum electrodynamics and nuclear structure. Having himself climbed what he calls the "quantum ladder," from crystal structure through chemical bonds and nuclear matter to the exotic behavior of elementary particles, he can tell us how it all fits to-