seaward barrier (Africa?), but the very area involved has to be ignored in order to bring about a good "pre-drifting" fit. Mantle movements in both continental and oceanic segments having magnitude and velocity enough to justify the drift theory seem well established. So, too, is the decoupling of continental and oceanic crust in the circum-Pacific region. The probability of drift seems fairly high, but many of the arguments, both geological and geophysical, involve too much special pleading for comfort. Both geologist and geophysicist must go considerably farther before the theory can be considered either firmly established or disproved.

Enrico Fermi's Papers, 1939 to 1954

Volume 2 of **The Collected Papers of Enrico Fermi** (University of Chicago Press, Chicago, 1965. 701 pp., $22.50), edited by Edoardo Amaldi, Herbert L. Anderson, Enrico Persico, Emilio Segrè, and Albert Wattenberg, is divided into two distinct parts.

Beginning with item Number 129 (the first paper in volume 2), we have almost 100 papers that deal in one way or another with interactions of neutrons with matter, and with other problems that are relevant to the chain reaction in uranium.

The first paper, item Number 129, was published in 1939, shortly after Fermi arrived in the United States from Stockholm with his family and his newly acquired Nobel prize. (The Fermis used the trip to Stockholm as a way of escaping from Fascist Italy.) We can trace the course of events of those historic days in the transition from the publication of Fermi's papers in the *Physical Review* to the secret reports that he made to various agencies of the United States Government as the grave and fateful meaning of the subject became apparent to the Roosevelt administration. Almost all of the latter material is now declassified but not easily available. They present a story of the development of the ideas of the nuclear chain reaction—the discoveries, measurements, and calculations that it was necessary to make, or to invent, before the first chain reactor could be realized.

Paper 228, again in the *Physical Review*, marks the end of the war period and the resumption of more normal research and publication. In the intervening years, Fermi had moved from Columbia to the Metallurgy Laboratory in Chicago to Los Alamos and then back to Chicago as a professor. His subsequent papers were chiefly concerned with researches in meson physics and with cosmic radiation. For Fermi, this was another period of great contributions, both in research and as a teacher and a source of inspiration to graduate students. His enormous talents as a teacher are demonstrated by the quality of the physicists who did their doctoral dissertations under his supervision, for the roll of Fermi's students reads like a "Who's Who" of the leaders of contemporary physics.

The postwar papers, about 40 in number, were all done in the space of less than 9 years, and they represent an important section of the most brilliant and fruitful contributions to experimental and theoretical physics of the period. The chief subjects to which Fermi turned his attention were as usual those fields that were most promising for future knowledge. First of all, there were papers on meson physics (now called particle physics), cosmic rays, and the interaction of slow neutrons with matter. In meson physics he was chiefly concerned with problems of the production and scattering of pions from nuclei, notably hydrogen. His papers show not only his theoretical and experimental ingenuity but also his instinct for the important questions of physics. In cosmic rays, he presented his very fruitful theory of the origin of cosmic rays through the collision of charged particles with cosmic magnetic fields. In neutron physics, he pressed the development of the beautiful methods of neutron interference, reflection, and diffraction which have been so useful in studying both the solid state and nuclear properties, including the interaction of electrons and neutrons.

Fermi was active up to the time of his untimely death on 28 November 1954, and his last papers are dated 1954. He left his distinctive mark on the physics, and on the physicist, of two worlds.

None of these papers speak to the larger public, outside of physics and technology, on the great issues that were raised by Fermi's contributions to the release of nuclear energy. Fermi was not unaware of these issues. He knew them, he understood them, and he felt very keenly about the political and cultural implications of his great contributions.

He served on the General Advisory Committee to the United States Atomic Energy Commission where not only his scientific gifts but also his wisdom and insight had a large influence on fateful decisions. These contributions are an important part of his complete works, but unfortunately they are not included in his published works.

Fermi died the noble Roman that he was.

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Earth Science

Peter C. Badgley's **Structural and Tectonic Principles** (Harper and Row, New York, 1965. 538 pp., $13.95) covers rock deformation from single fractures to the evolution of entire mountain ranges. The book should be interesting reading for professional geologists and probably also for scientists interested in summaries of structural features and syntheses of new data on worldwide mountain building and tectonic patterns. Extensive bibliographies are appended to each chapter and suggest that the writing of the text was completed early in 1963.

This book results from the Herculean and well-done task of summarizing modern structural and tectonic concepts (no attempt has been made to discuss the subject from a historical point of view). Beginning with a discussion of modes of rock failure, mechanics of deformation, and laboratory data pertinent to the behavior of rock materials, the author launches into fold structures by discussing them from the point of view of the various classifications that are currently in use. Succinct definitions lead the reader rapidly past a swarm of terms into brief discussions of the mechanics of growth of folds and competency of materials involved, kinematic classifications (vertical uplift, gravity gliding, and the like), and on to a discussion of fold types based on their position in the tectonic framework.

In successive chapters Badgley bypasses the trees of terminology and observes the forest as a whole: jointing and fracture analysis; description, classification, and recognition of faults;