Book review

Introduction to the Physics of the Earth's Interior
Jean-Paul Poirier, *Cambridge University Press, Cambridge,* 2nd edn, 2000, 326 pp, ISBN 052166392X, Paperback, £21.95

The planet Earth is very much less massive and centrally condensed than an ordinary star, with a moment of inertia as much as 0.825 times that of a sphere of uniform density. Its internal energy sources are comparatively feeble, and, being a planet, its diameter would hardly change if its temperature were everywhere reduced to absolute zero. Based on a wide variety of geochemical and geophysical data, research on the Earth's structure, dynamics and evolution is still greatly handicapped by insufficiently detailed knowledge of energy sources, chemical composition and the thermal, mechanical and electrical properties of materials at pressures of up to several megabars and temperatures of up to several thousand degrees. However, painstaking observational and experimental work combined with improvements in theoretical ideas over the past century have made it possible to define more clearly many of the controversial issues that remain to be settled by future research.

Professor Poirier relegates the discussion of these issues to the seventh and final chapter, on earth models, of this new and expanded version of the earlier edition of his well-written and authoritative monograph published nearly a decade ago. The monograph starts with a chapter on the thermodynamics of solids, where extensive and intensive conjugate quantities, thermodynamic potentials, stiffnesses and compliances are succinctly but clearly explained. Elastic moduli, thermoelastic coupling and lattice vibrations are treated in the next two chapters, which are followed by three long chapters on equations of state, melting and transport processes. Only then does the author venture into the realm of ideas about convection in a mantle of uncertain rheology, temperature variations, phase transitions, the nature of the core–mantle boundary, the detailed composition of the outer liquid core and the solid inner core, and many other topics that fill the modern research literature.

Focused on the provision of a link between condensed matter physics and Earth Sciences, Professor Poirier's splendid book could be read with profit by anyone with a background in general physics and an interest in planets, including graduate students and advanced undergraduate students in geophysics and mineralogy, for whom the book is largely intended, and to whom it can be strongly recommended.

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