

GEOPHYSICS OF THE CORE AND CORE-MANTLE BOUNDARY:
INTRODUCTION TO THE SPECIAL ISSUE

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The inner core was discovered fifty years ago by Inge Lehmann (1936), by careful analysis of PKIKP phases. It is appropriate that a special issue commemorating this major advance in our knowledge of the Earth should appear in a year of exceptionally vigorous research on the structure, dynamics and composition of the core and core-mantle boundary. In the intervening years since 1936 there has been a tremendous increase in our understanding of the core, yet we are still far from a comprehensive knowledge of the core's dynamics and physical state. A variety of recent geophysical investigations, which can collectively be described as core spectroscopy, are shedding light upon the nature of the core at an unprecedented rate. This special issue represents a cross-section of the multi-disciplinary approaches that are leading to a more complete knowledge of the core.

The first generation of global three-dimensional models for the aspherical seismic velocity heterogeneity of the outer and inner cores and for the topographic relief on the core-mantle and outer core-inner core boundaries is presented in this special issue. As in Ms. Lehmann's original work, the PKP and PKIKP phases provide the principle travel time data base for these analyses. The development of these models

had to await the determination of corresponding models for the mantle which enable the effects of shallower structure to be stripped from the data sensitive to the core. Additional smaller scale, and higher resolution, analyses of specific seismic phases are also well-represented in this special issue. These seismic models, which are not yet in complete agreement, provide critical boundary conditions and velocity gradient constraints for thermal, compositional and dynamical investigations of the core and lowermost mantle, several of which are included in this issue. Analyses of the gravitational and geomagnetic fields are also unveiling the structure and convective motions of the core and deep mantle, with joint interpretation of the seismic results reducing the intrinsic non-uniqueness of the potential field investigations.

The papers in this issue are mostly from a special session in tribute to Ms. Lehmann's work held at the Spring 1986 AGU meeting in Baltimore. While definitive answers to many long-standing questions about the core are not yet in hand, this collection of papers defines the cutting edge of research on the deep Earth's interior from which future progress will be made.

Lehmann, I., P', Travaux Scientifiques, 14, 88, 1936.

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