Preface

This book represents the implementation of a decision adopted by the Council of the National Academy of Sciences relating to the celebration of the 500th anniversary of the birth of Nicholas Copernicus. From the outset it was intended that this Copernican volume would describe a number of Copernican-type intellectual revolutions that have taken place in recent centuries. Such revolutions are characterized by the abandonment of widely held concepts and replacement by dramatically new conceptualizations that resulted in deepened understanding of natural processes.

It was the original intention of the Academy's Council that the essays would be addressed to the general educated public, including teaching staffs of colleges and high schools and college students. The combination of the intended broad coverage and the contemplated readership presented considerable difficulties and affected the choice of incidents in the history of modern science which could be discussed. As it has turned out, the material presented is quite rich and, while there is an unavoidable variation in the amount of specialized knowledge expected from the reader, we hope that the summaries preceding particular chapters are sufficient to create a broad perspective and make the whole understandable. To the extent that our goals have been approached, the help of numerous scientists is gratefully acknowledged.

The introductory chapter describes the circumstances and the essence of the initial intellectual revolution due to Copernicus himself. The subsequent six parts present in turn: (1) several revolutions in astronomy–cosmology, all in the twentieth century and one of them still in progress; (2) a number of deep revolutionary changes in the biological sciences, one of them made twenty years ago by an inspired contribution of a graduate student; (3) several revolutionary changes in the physical sciences; (4) revolutions in the thinking of mathematicians; (5) the emergence of a "pluralistic" point of view in scientific research; and (6) revolutions in technology.

The epoch when it was possible for individuals to acquire a reasonably detailed view of practically all of science is now far behind us. It was followed by a prolonged period of compartmentalization of research, with specialists in one domain becoming increasingly ignorant of developments in another. In the present epoch the pendulum appears to be moving in the opposite direction. The many problems faced by modern society depend for their solution on interdisciplinary studies and on participation of in-

dividuals with wide horizons. It is hoped that the publication of the present volume will serve not only to commemorate the achievements of Nicholas Copernicus but also to stimulate and accelerate this trend.

This volume was originally proposed by Professor Jerzy Neyman of the Department of Statistics at the University of California at Berkeley while serving as Vice Chairman of our Academy's Special Committee for the Celebration of the Copernicus Quinquecentennial. In view of his unbounded enthusiasm, he was appointed by Committee Chairman Antoni Zygmund of the University of Chicago as head of the Editorial Board for the Copernican volume. In that capacity he was assisted by fellow Board members Melvin Calvin and Emilio Segrè of the University of California at Berkeley, Nicholas U. Mayall of the Kitt Peak National Observatory, C. R. O'Dell of Yerkes Observatory and NASA's G. C. Marshall Space Flight Center, S. M. Ulam of the University of Colorado, and Antoni Zygmund, *ex officio*. In meeting his responsibilities as principal editor, Professor Neyman also received advice from many other academic colleagues to whom the Academy's warm appreciation is also extended. As is inevitable in such an enterprise, the hard editorial decisions and close attention to text rested with Professor Neyman, without whose remarkable vitality and inspiration this volume would never have appeared.

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