PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Preface

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PREFACE

Soon after the first artificial satellites were launched in 1957, it became clear that their orbits were being recognizably altered by air drag and the non-spherical components of the Earth's gravitational field. By analysing these changes in satellite orbits it has been possible to measure the Earth's gravitational field and the density and temperature of the upper atmosphere in far greater detail and much more accurately than was ever possible before.

At the end of 1965 the British National Committee for Space Research, under the chairmanship of Sir Harrie Massey, F.R.S., decided that a two-day international meeting should be held to discuss the techniques of orbital analysis. The meeting took place in the rooms of the Royal Society at Burlington House, London, on 17 and 18 October 1966, and was attended by over 100 participants from several countries. The papers presented at the meeting are collected in this volume.

Orbital analysis cuts across the boundaries of several scientific disciplines, and the meeting was particularly useful in bringing together scientists who, although their work had similar aims, were using methods derived from different branches of science. The programme of the meeting was divided into four sessions, corresponding to the four sections of this volume. Each session began with a review paper, to set the scene for those who were not specialists in the subject, and then continued with a number of short specialized papers, recording recent advances in the various subjects.

The papers in the first section cover the tracking of satellites, and here the diversity of disciplines is most obvious: both radio and radar techniques are important, as well as optical methods, which range from large cameras and kinetheodolites to visual observations made with binoculars and stopwatch. Once good observations are available in adequate numbers, the next step is the computation of the best possible orbits. This is the subject of the second section, in which there is discussion of the problems arising in determining orbits from Doppler tracking, from radio interferometers and from optical observations. When orbits have been computed they are examined to see what information they may yield about the Earth's gravitational field and upper atmosphere. The third section is devoted to gravitational fields: various new results on the Earth's field are presented and the first studies of the lunar gravitational field are reviewed. The fourth section is concerned with the Earth's upper atmosphere. Orbital analysis has shown the variations in air density and temperature at heights of 200 to 1200 km in great detail: the behaviour of the upper atmosphere has proved to be extremely complicated, and the papers recorded here bring out several new facets of its ever-varying activity.

In conclusion I should like to thank the speakers at the meeting for producing the texts of their papers so promptly, and, on behalf of all the participants, I should like to express our gratitude to the staff of the Royal Society, and particularly Mr P. Wigley, for making such excellent arrangements for the smooth running of the meeting.

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