

CONTRIBUTIONS TO IONOSPHERIC PHYSICS
AND RADIO ASTRONOMY

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A Thesis Submitted to the University of Tasmania
for the Degree of Doctor of Science.

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INTRODUCTION

The first chapter in the thesis is concerned with the propagation of electromagnetic waves in the ionosphere and in particular with the explanation of magneto-ionic effects observed by echo sounding. The papers on triple splitting, on gyro echoes and on the trapping of cosmic noise give, it is believed, the first satisfactory accounts of these phenomena.

In the second chapter the observation and theory of natural electromagnetic radiation propagated in the terrestrial magnetosphere is discussed. Included in this group of papers is one on whistling atmospherics in which the existence and the properties of nose whistlers were predicted. Another gives the first proposal that the natural very low frequency radiations may be caused by Cerenkov radiation from fast electrons in the magnetosphere. The remainder describe new techniques for observing the radiation and consequent studies of its geographical distribution radiation and relation to geomagnetic storms.

The papers in Chapter three all explore the properties of the cosmic radio emissions in the frequency band between one and ten megacycles /second. They derive from the first observations in this band which were made by the author in association with G. Reber. The observation and the theory of the intensity spectrum are discussed and new information on the brightness distribution of the southern sky is given. Pronounced effects caused by absorption of the radiation with the galaxy have been noted. It is expected that in the future these will lead to the detailed study of the distribution of tenuous ionised hydrogen in the galaxy.

The final Chapter describes observations of the decametric radio emissions of Jupiter made incidentally during the investigations discussed in Chapter three. These observations were at a lower wave frequency than any made previously and were simpler to interpret. They led to a detailed theory of the radiations which is given in this chapter.

All of these papers are original. Where the investigations they describe were made jointly with another person or persons the order of the authors indicates the relative contribution made by each.

None of this work has been submitted previously for the purposes of the Degree of Doctor of Science.



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