J. J. Thomson; and finally his papers on Radioactivity published from the McGill University, Montreal, where Rutherford occupied the Chair of McDonald Professor of Physics from 1898 to 1907

The reader naturally begins to study the first few papers of Rutherford with a sense of curiosity to find out how far the youthful experimenter displays in them signs of originality and independent thinking which are to become the outstanding characteristics of his later work. He finds that he is not disappointed. The very first paper on "Magnetization of Iron by High Frequency Discharges" shows evidence of the directness of the author's approach to the subject and his ability to go to the heart of the matter. His second paper "On Magnetic Viscosity" is noteworthy as it contains the description of an ingenious mechanical device which Rutherford called a "time apparatus", by which one could measure small intervals of time down to less than 10^{-5} sec. Rutherford's first paper on radioactivity "Uranium Radiation and the Electrical Conduction Produced by it" shows the directness and simplicity that he brings to his experiments leading to unequivocal inferences. "These experiments show" he records "that the uranium radiation is complex, and that there are present at least two types of radiation—one that is very readily absorbed, which will be termed the α-radiation, and the other of a more penetrative character, which will be termed the β-radiation." α-radiation became Rutherford's pet subject.

The papers appear in the chronological order of publication. While most of the papers are in English a few have been chosen from German or French versions as they contain additional material. To the present volume Sir Edward Appleton has written an introduction to Rutherford's early work in New Zealand and Cambridge, and Professors H. L. Bronson and Otto Hahn have contributed some delightful reminescences of Rutherford's Montreal period. The photographs of Rutherford and his collaborators and of some original apparatus of historic interest add value to the publication.

A UNIFYING THEORY OF HIGH-LATITUDE GEOPHYSICAL PHENOMENA

THROUGHOUT the whole of the earth's exosphere, and through much of the underlying ionospheric region, the geomagnetic field exerts a strong control on the motion of ionized matter (the plasma). 'Magnetosphere' is the term used to describe the plasma surrounding the earth to several earth radii, and dominated by the earth's magnetic field. It is common to think of the greater part of the magnetosphere in static terms, as a relatively calm expanse of quiescent plasma. However, there is no reason for adopting such a view, and indeed convective motions of the ionization can be established without difficulty. Convection of the whole magnetosphere is in fact implicit in a variety of circumstances (for example, the tidal dynamo theory) in which driving forces are exerted on the ionization at relatively low levels. The complementary case of convection generated at extreme altitudes has not been paid much attention as yet, but its consequences may be important in many phenomena.

In an article contributed to the *Canadian Journal of Physics*, 1961, 39, 1433, Axford and Hines deal with the occurrence at high latitudes of a large number of geophysical phenomena, including geomagnetic agitation and bay disturbances, auroræ, and various irregular distributions of ionospheric electrons. The authors show that these may all be related in a simple way to a single causal agency, namely, a certain convection system in the outer portion of the earth's magnetosphere. The source of this convection is taken to be a viscous-like interaction between the magnetosphere and an assumed solar wind which produces motion of the interplanetary gas in a direction outward from the sun. The strength and extent of this convection will naturally be dependent on the solar activity. The effect of this convection is that while the geomagnetic lines in the lower latitudes are of a roughly dipole shape, the high-latitude field lines are swept into the lee of the earth to form a geomagnetic 'tail'.

The proposed model is capable of accounting for many aspects of the phenomena concerned, including the morphology of auroral forms and the occurrence of 'spiral' patterns in the loci of maximum intensities of several features. It also bears directly on the steady state of the magnetosphere, and in particular on the production of trapped particles in the outer Van Allen belt.
