

Professor W.I. Axford and Magnetospheric Physics

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The internal structure and dynamics of the magnetosphere are governed by convection of plasma and magnetic field lines which is driven by tangential stresses exerted by the solar wind. Together with Prof. C.O. Hines, Prof. W.I. Axford introduced convection into magnetospheric physics and demonstrated that it can explain a large variety of phenomena taking place in the magnetosphere. Then he adopted reconnection of IMF and geomagnetic field lines as the dominant process that causes the tangential stress, and developed a comprehensive theory to explain the dynamics of the magnetosphere, specifically on its nightside. His view of substorms as well as solar flares was that they are manifestations of global instabilities of evolving magnetic field and plasma configuration, with magnetic field reconnection allowing reconfiguration to take place. He also addressed the plasma flow along magnetic field lines and suggested that ions can flow away along open field lines with supersonic speeds through a mechanism similar to the solar wind acceleration. These contributions by Axford in the 1960s have become the foundation of magnetosphere research ever since.