

The Physics of the Aurora

Professor Robert L. Lysak

University of Minnesota, USA

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ABSTRACT:

The auroral australis (and its northern cousin, the aurora borealis) have long fascinated mankind. The shimmering, twisting currents of light associated with an auroral display would seem to defy scientific explanation, and indeed have inspired many legends and myths among ancient peoples. Nevertheless, with the dawn of the space age, measurements from satellites and sounding rockets, as well as magnetic and optical measurements taken from ground level, have shown that the aurora is associated with energetic charged particles impacting the upper reaches of the Earth's atmosphere. Although many questions remained unanswered, a basic understanding of auroral acceleration processes has emerged. The aurora is associated with a system of electrical currents flowing in the ionized gas, or plasma, that permeates the region above the atmosphere called the magnetosphere where the Earth's magnetic field is dominant. The magnetosphere can be disturbed by large blobs of plasma that emanate from the Sun during high solar activity, shaking loose the plasma stored in the radiation belts and the plasma sheet, a region much like a comet's tail that extends away from the Earth. The magnetospheric storms and substorms that occur give a vivid example of the dynamic coupling of the Sun and interplanetary space to Earth and its space environment.

SPEAKER PROFILE:

Robert L. Lysak is a Professor of Physics at the University of Minnesota, where he has been on the faculty since 1982. He received his Ph.D. from the University of California, Berkeley in 1980, with a thesis about the acceleration of ions outward from the Earth's auroral zone. His interests are in the theory and modeling of auroral acceleration processes and the oscillations of the Earth's magnetic field. He has authored over 100 scientific papers, and serves as the Senior Editor of the Journal of Geophysical Research-Space Physics published by the American Geophysical Union. He is presently on leave at the University of Newcastle, NSW.

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