3:30 pm • Friday September 14, 2012 • 2241 Chamberlin Hall • Coffee at 4:30 pm

Jan Egedal

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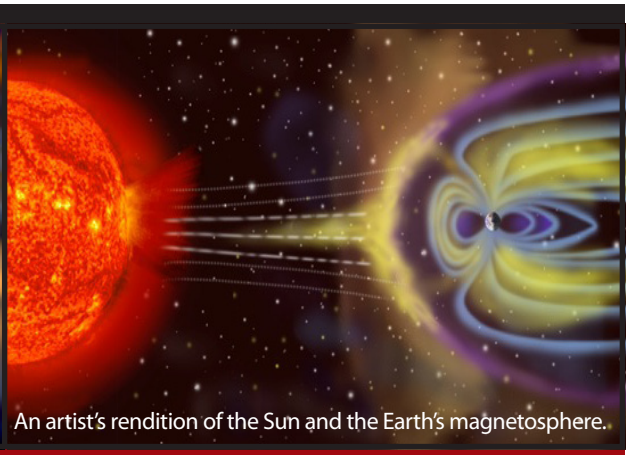

An artist's rendition of the Sun and the Earth's magnetosphere.

Magnetic Reconnection in Plasmas
A Celestial Phenomenon in the Laboratory

Department of Physics Colloquium

WISCONSIN

Coronal mass ejections from the sun are the most explosive events that occur in our solar system. Closer to home, on earth the aurora borealis is a spectacular, naturally occurring, light show. Both of these large scale events are driven by magnetic reconnection in plasmas. The spontaneous rearrangement of magnetic field topology provides the enormous energy needed for these celestially magnificent and diverse phenomena.

Magnetic reconnection has been a fascinating topic of research in plasma physics for over sixty years. While we still do not fully understand the process of reconnection, significant progress has been made in the past decade through detailed analysis of laboratory experiments and computer simulations. The Versatile Toroidal Facility (VTF) at MIT is an experiment dedicated to the study of magnetic reconnection.

In this talk I will describe experimental observations from VTF which have led to a new theoretical paradigm for magnetic reconnection. Large scale computer simulations support the experimental and theoretical results detailing the release of magnetic energy during reconnection. We are now able to explain the large scale electron heating observed during reconnection by spacecraft in the earth's magnetotail. Our model may also provide insight to magnetic reconnection on the sun and the associated heating in solar flares and coronal mass ejections.

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