

Physics Colloquium

Michigan Technological University

Monday, December 12, 2011 at 3:00 pm

Room 139 Fisher Hall



**45 Years of Space Research, The Highlights
(A Reprise of the 2011 AGU Nicolet Lecture)**

Prof. Michael C. Kelley

James A. Friend Family Distinguished Professor of Engineering

**Dept. of Electrical & Computer Eng
Cornell University**

Abstract: After 47 years of immersion in space physics, I have many stories to tell, some of which are not suitable for all audiences and will remain untold today. But after a few such tales, I will recount the most satisfying research I have done and then outline a new book I am working on entitled “The Earth’s Electric Field”. I also will outline five sources of electric fields: thunderstorms, motions of the atmosphere, the solar wind, the magnetosphere, and wave phenomena.

The most satisfying work I have published involves proof that the Earth was hit by a comet in 1908, studies of the long-lasting meteor trail during Leonids 1998/9, and results of barium/TMA releases. On the human side, the most satisfying work has been with Cornell students, both undergraduate and graduate. Although many books have been written on the Earth’s magnetic field, to my knowledge, none have been written on the electric field. This is not surprising since Gauss first noted that the Earth is a giant magnet hundreds of years ago. The first evidence of an electric field in the atmosphere was provided by Ben Franklin with his kite/thunderstorm experiments. We began considering the possibility of an electric field in space about 50 years ago, using the motion of auroral patches. Then, in the 1960s, Forrest Mozer and Ulf Fahlson showed that the electric field could be measured using rockets and, eventually, satellites. Luckily, I was Forrest’s second student and Ulf was in Berkeley for a year, so I was in the perfect place for a graduate student. Thus began the quest for knowledge of the Earth’s electric field, which continues today.