



# SPACE PHYSICS SEMINAR

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**“Taking the Measure of Mercury’s Magnetosphere:  
Energetic Electrons and MESSENGER Mission”**

**Thursday, November 8, 2012**

**Refreshments at 3:30pm in CAS 500**

**Talk begins at 4:00pm in CAS 502**

**Abstract:**

Twice in 1974 and a third time in 1975, the Mariner 10 spacecraft flew by the innermost planet of the solar system, providing our first close-up views of the planet Mercury. One of the greatest scientific surprises was the presence of an active magnetic dynamo of sufficient strength to provide a magnetosphere, at that time only the third such system known in the solar system. On the first flyby, Mariner also observed what were interpreted as significant particle acceleration events, but instrumental limitations left significant uncertainties as to their nature. Hence, when the MErcury Surface, Space ENvironment, GEOchemistry, and Ranging (MESSENGER) mission was first proposed to NASA’s Discovery program of planetary missions in the Fall of 1996, understanding the elusive energetic particle measurements was not a primary goal, as too little was known to frame a proper scientific question regarding their role in planetary science at Mercury. However, an energetic particle instrument was included in the payload to help understand any particle-induced corrections to the internal magnetic field, the measurement of which was a primary goal. For the same reasons, a small plasma instrument was added at the time of the second – and successful – MESSENGER proposal in 1998. In spite of extreme mass limitations, and with little to go on for sizing the instrument capabilities, these experiments were included in MESSENGER’s payload as the Energetic Particle and Plasma Spectrometer (EPPS). Following no detections of energetic particles on the three gravity-assist flybys of Mercury, MESSENGER’s year of orbital operations has shown energetic electrons to be a quasi-permanent feature of the magnetosphere, and their further investigation is a primary goal of the ongoing extended mission. Mercury’s magnetosphere has proven to be highly dynamic and its activity, coupled with the rise in solar activity toward solar maximum, continues to provide clues to the nature of these enigmatic particles first briefly glimpsed by Mariner 10 over 35 years ago.