

Space Science Seminar
Tuesday, 2015 April 28
10:30 a.m.
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**Gamma-ray Polarimetry as a Probe of the
Central Engine of Gamma-Ray Bursts**

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Host: Linda Sparke (sponsored by ZP12)

Discovered nearly forty years ago, gamma-ray bursts (GRBs) are brief, intense flashes of gamma-rays appearing randomly across the sky at a measurable rate of about once per day. Now known to originate at cosmological distances, they are the most luminous objects in the universe. It has been established that GRBs are emitted from outflows moving towards us at highly relativistic speeds. The outflow is thought to arise from either the collapse of a very massive star (also known as a hypernova) or the merger of two compact objects (involving neutron stars or black holes). Although the salient features of a GRB can be explained by the so-called fireball model of a rapidly expanding volume of hot material, several key aspects concerning the nature of the central engine (including the jet formation and jet structure) remain poorly understood. Some of these issues can best be addressed by studying the polarization of the prompt gamma-ray emission. Probing the nature of the central engine of GRBs is one of the long-term goals of the Gamma-Ray Polarimetry Experiment (GRAPE). GRAPE is a balloon-borne instrument designed for measuring the polarization of sources in the 50-500 keV energy range. GRAPE has flown twice from Ft. Sumner in an attempt to measure polarization from the Crab. The next step in our balloon program is to operate GRAPE in a wide FoV configuration on a long duration balloon for the study of gamma-ray bursts. We have also explored designs, based on our experience with GRAPE, for dedicated GRB polarimeters on orbit, both as a free-flyer (SMEX) and as an attached payload to the ISS. We describe all of these efforts and the science motivation for GRB polarimetry.

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