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Studying Astrophysics and Particle Physics with Gamma Rays: what we may learn with the upcoming GLAST mission

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The gamma-ray sky, for energies above 30 MeV, has been relatively poorly studied. Most of our current knowledge comes from observations made by the EGRET detector on CGRO, which produced many discoveries, opening up a new field of astronomy. It found that the luminosities of many objects peak in this energy band, that the spectra of gamma-ray bursts extends to at least GeV energies, and that intense gamma-ray flares are a common feature of many gamma-ray sources. This talk will focus on the three periods in the life of a gamma ray: How is it produced, which requires extreme environments in astrophysicsal objects, or new physics like WIMP dark matter annihilation; what can be learned as the photon propagates to us, absorption or dispersion; and how we detect it, with a discussion of the design of the successor to EGRET, GLAST. GLAST, for Gamma-ray Large Area Space Telescope, is a DOE/NASA mission to be launched in to low Earth orbit in 2007. It will have significantly improved capability over EGRET, satellite-based experiment to measure the cosmic gamma-ray flux in the energy range 20 MeV to >300 GeV. With a sensitivity that is more than a factor 30 greater than that of the EGRET.