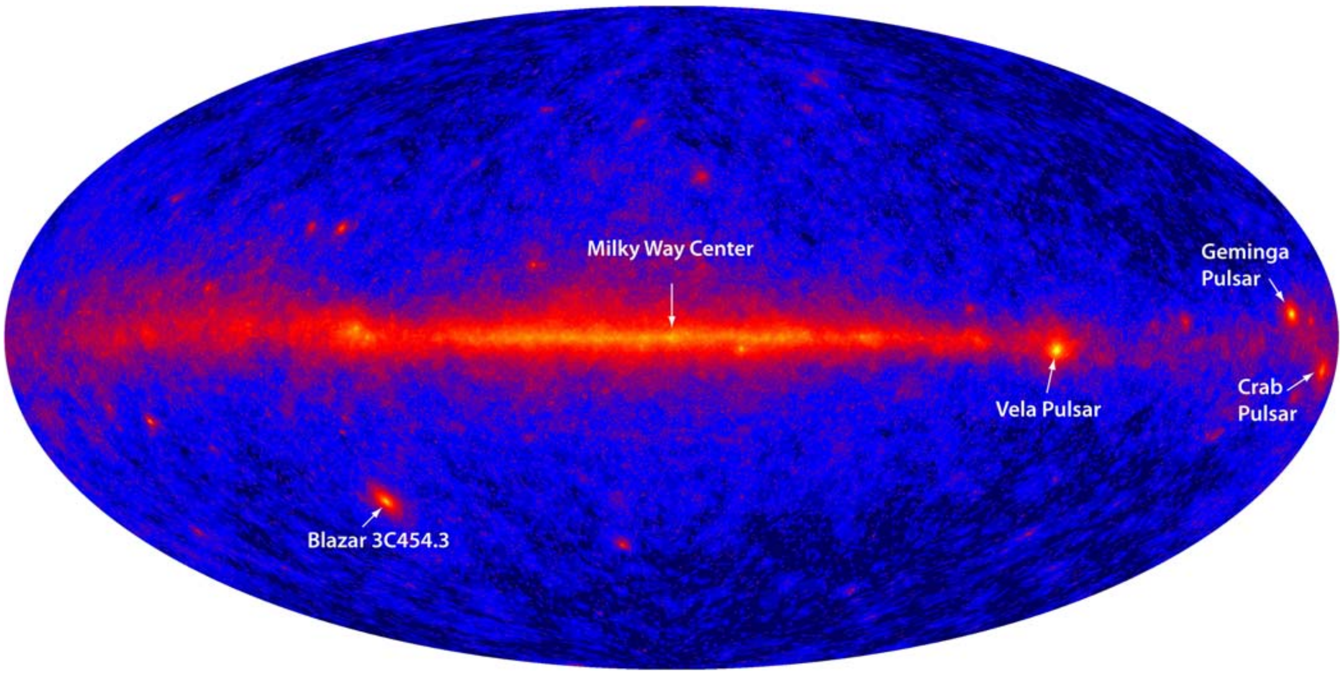
PHYC 581-002: High Energy Astrophysics
Spring 2012



This class is a 3-credit graduate course.

Instructor:

Rouzbeh Allahverdi, Physics and Astronomy Room 172, rouzbeh@unm.edu

Time and Location:

M W 15:30-16:45, Physics and Astronomy Room 184

Course Webpage:

http://panda.unm.edu/Courses/Allahverdi/Phys581Sp12/index.html

Book(s):

There are many books that may be useful as references. We will use the following book as the main text for this course:

Melia Fulvio, 2009, "High-Energy Astrophysics", Princeton Series in Astrophysics

This is a carefully written book that takes into account the field's explosion in breadth and impact. It provides good physical insight while covering an impressive range of topics like accreting black holes, gamma-ray bursts, pulsars, etc. Overall, this book is an excellent, self-contained resource for the classroom, which is written by an eminent researcher and teacher in the field.

Requisites:

A solid foundation of undergraduate E&M, Quantum Mechanics, Thermodynamics, and Mathematics.

Grading Policy:

The final grade will consist of equal contributions from the following two things:

a) Homework assignments 50% (there will be assignments every 2-3 weeks)
b) Final project 50% (a final project involving a term paper and a short talk on the paper topic)

Preliminary Outline:

High-energy astrophysics involves the study of exceedingly dynamics and energetic phenomena occurring near the most extreme celestial objects known to exist, such as black holes, neutron stars, white dwarfs and supernova remnants. This course is intended to provide a physics-based overview of these phenomena. We will begin by develoingp theoretical tools needed to study the objects uncovered by observations. Here is an approximate list of topics that I hope to cover:

- Introduction and motivation (astronomical wavebands, energies/luminosities/time scales, atmospheric absorption)
- Particle acceleration (gravitational field, electromagnetic field, Fermi acceleration)
- Interaction of high energy particles with matter (ionization, bremsstrahlung, Synchrotron radiation, Compton scattering)
- Accretion of plasma (hydrodynamics, disk formation, thin and thick accretion disks)
- Pulsars (radio pulsars, X-ray pulsars)
- Black holes (black hole binaries, supermassive black holes)
- Bursting stars (X-ray bursts, gamma-ray bursts)
- The high-energy background (cosmic rays, galaxy clusters, diffuse emission)