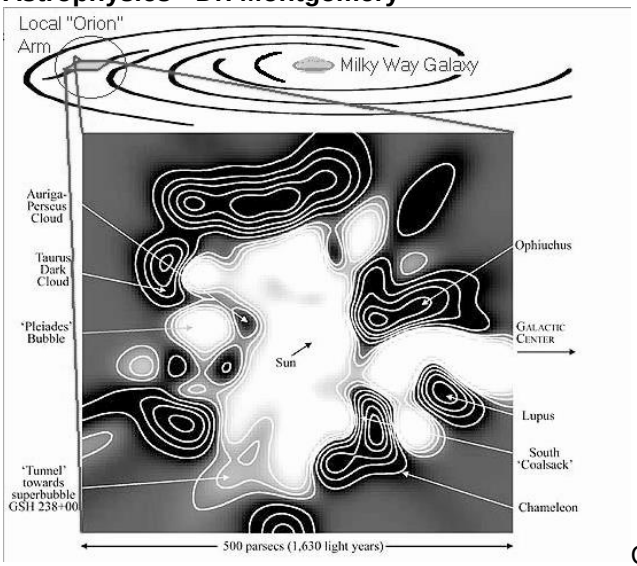
Research

Astrophysics - Dr. Montgomery

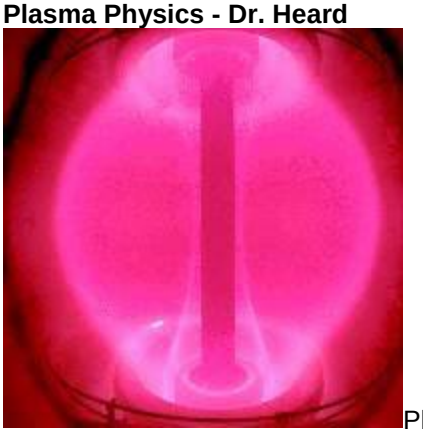


Our Solar System is surrounded by a Local Hot Bubble - a region of space with less neutral gas than usual - that is hundreds of light-years across. We detect interstellar gas by carefully measuring starlight that has come through it. Details of how the gas has absorbed light will tell us more about conditions within our region of the Galaxy. Dr. Montgomery analyzes data taken at McDonald Observatory in the Davis Mountains of Texas; a student doing Astronomy Research might accompany her to obtain more measurements.

Materials Physics - Dr. Pearce

Impurities within crystals greatly affect the electronic properties of the material. This is exploited in the fabrication of LEDs and transistors, and some photovoltaic (solar power) devices. Amorphous materials that lack long-range order, like glass, are much less expensive to make, but it is difficult to control and maintain their electronic properties. In particular, the efficiency of energy conversion in typical amorphous photovoltaics tends to decrease as they are used. Dr. Pearce is working to understand the cause of this efficiency dropoff so that better panels can be produced. He collaborates with the Center for Thin Film Devices at Penn State and with the Photovoltaics Group at the University of Toledo, concentrating on hydrogenated amorphous silicon. This research is closely tied to his interests in applied sustainability (both in the United States and in developing countries) and environmental stewardship.

Plasma Physics - Dr. Heard



Plasma is the fourth State of Matter, like a gas but electrically charged. The International Space Station and the Space Shuttle travel through the Low-Earth-Orbit plasma that

surrounds Earth. Dr. Heard is making a self-contained device designed to be taken into Low-Earth-Orbit, which will investigate low-frequency acoustic waves (sound) in this plasma. He also collaborates with the Space and Environmental Effects group at Marshall Space Flight Center, in Huntsville Ala., and with the magnetic confinement fusion research group at West Virginia University in Morgantown.

In Earth-based laboratories, we make plasma in a vacuum chamber by heating rarified gas to several thousand degrees. Plasma is usually confined (kept away from the "cold" chamber walls!) in a "bottle" made of Magnetic Fields. Hot plasmas are used in the electronics industry to fabricate nanotech chips.