Physics

Community of Physics
Michigan Technological University

Goal:
To create a community of young physicists at MTU that spur one another on to excellence in their studies, camaraderie and mentoring in their relationships, and creativity in their visions for the future.

Means:
The community of physics would involve the following elements:

- Dedicated faculty mentor who is focused on education
- Inviting space where students spontaneously and continually meet and interact outside of the classroom.
- Range of special incentives and rewards for students throughout their undergraduate career.

1. Chaired professorship in physics: Serve as faculty mentor for the Community

2. Inviting Space:

Short Term: Computers for current SPS room

Long Term: As part of the Fisher Hall renovation: A place to call "home" on campus.

(Creation of the Undergraduate Physics Community Center- a place for students to "convene" for projects, meetings with faculty and visiting physicists, SPS meetings, lunches, rest, all-night work sessions, etc.)

3. Incentives:

a. Freshman Scholarship- to recruit top new applicants to the department.

We almost always have some very exceptional applicants who choose to go elsewhere.

b. Society of Physics Students membership for all freshman students.

c. Outstanding Sophomore Award (one award for academics, one for leadership)

d. Undergraduate Summer Research Award for Juniors (having finished typical 3rd year curriculum) majoring in physics/applied physics.

e. Outstanding Mentor Award (for seniors)

g. Annual entrepreneurship lecture by physicist or scientist in related field

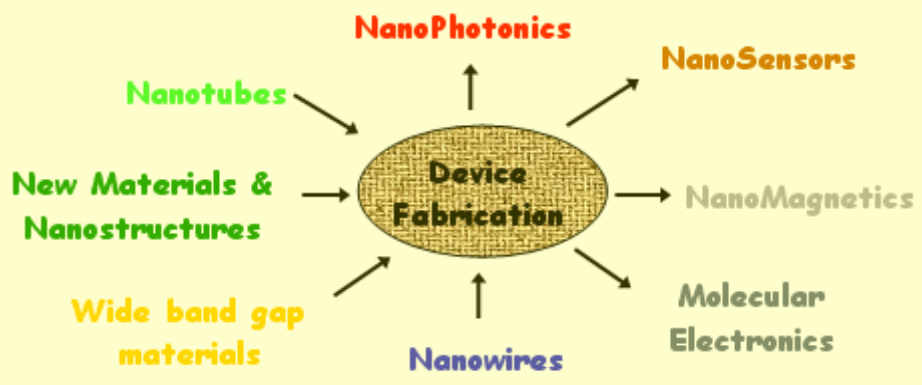
Adam DeConinck majoring in physics is a recipient of the Provost's Award for Scholarship. Adam is considered excellent not only by academic standards, but also for participation in research scholarship activity, levels of intellectual curiosity, creativity and communication skills.
Not content to simply absorb material in class, he has actively pursued learning by getting involved with research projects. In 2004, he received an award from the Michigan Space Consortium for his proposal "Synthesis of Carbon Nanotubes for uses in Advanced Space Propulsion." That work with Dr. Yoke Khin Yap has resulted in a publication "Stability of field emission current from various types of carbon nanotube films."

Jacob Fugal was awarded a National Science Foundation Graduate Research Fellowship**.** Jacob works with Prof. Raymond Shaw in the Cloud Physics Laboratory at MTU. Prof. Shaw's group study the physics and chemistry of clouds by holding single aerosol particles in a quadrupole trap, where its environment can be controlled and its properties determined through light-scattering studies. His group recently participated in the **IDEAS 3** (Instrument Development and Education in Airborne Science, phase 3) field project, held at the Research Aviation Facility of the National Center for Atmospheric Research, Colorado. The digital holographic instrument developed at MTU successfully recorded hundreds of gigabytes of cloud-particle holograms.

Prof. Robert S. Weidman is recipient of the Frederick D. Williams Instructional Innovation Award which is made in recognition of his spearheading the research, development, implementation, and sharing of new pedagogy, structure, and content for the calculus-based introductory physics courses PH2100 and PH2200 at Michigan Technological University, and setting the stage for positive long-term learning and teaching experiences for both students and faculty. His efforts has helped, and continues to help, the physics department work toward and accomplish what other institutions have spent significantly more resources and time to accomplish:
1. Improved student learning — deeper conceptual understanding and better problem solving skills
2. Improved student satisfaction (as evidenced through the Student Rating of Instruction forms)

Profs. Nitz and Fick research interest focus on understanding the origin of the highest energy cosmic rays. Cosmic rays are energetic charged particles of interstellar origin. Ultra High Energy Cosmic Rays (UHECRs) are the highest energy cosmic rays, and they are not well understood. They can have energies as great as a major league fastball, but yet are the size of an atomic nucleus. His research group is carefully studying the composition of UHECRs by analyzing the extensive air showers they create in earth's atmosphere using data from the Pierre Auger Cosmic Ray Observatory in Argentina. This knowledge will help scientists learn more about the environments where UHECRs are accelerated, the extra galactic environment between the UHECR source and earth, and particle physics in energy regimes well past those available in modern accelerators.

In the research area of Nanoscience, **Professor Yoke Khin Yap** received the NSF Career Award recognizing him to be one of the outstanding scientists and engineers who, early in their careers, show exceptional potential for leadership at the frontiers of knowledge. Prof. Yap's project focuses on novel solid compounds composed of elements of boron (B), carbon (C), and nitrogen (N), a class of compounds commonly referred to as frontier carbon materials. The goal is to create new thin films and nanostructures of boron nitride, carbon nitride and boron-carbon-nitride with desired physical properties with applications as protective coatings, high-power electronics, and nanoscale devices.



Computers have become a prominent device in the tool box of scientists extending the range of phenomena that can be studied within the framework of physics. An important example is biological molecules and other nanoscale systems. Research in **Prof. Hansmann**'s group focuses on the physics of proteins, "nanomachines" that are responsible for transporting molecules, catalyzing and regulating biochemical reactions in the cell, or as antibodies for fighting infections. As proteins are only functional if they assume specific shapes, it is important to explore how these structures emerge from a protein's chemical composition (the sequence of amino acids as specified in the genome). Such knowledge could not only lead to the rational design of novel drugs, but also to a deeper understanding of various diseases that are caused by misfolding of proteins.

A $100,000 grant from the National Science Foundation is helping Michigan Tech undergraduates explore nanotechnology. **Prof. Jaszczak** together with researchers from the other departments are working together on Nanotechnology Undergraduate Education to provide classes, seminars and research experience. The grant will fund a new one-credit special topics course, "Fundamentals of Nanoscience and Engineering," which will be offered next spring. The class, geared toward first- and second-year students, will hear presentations by faculty who are researching nanotechnology. An additional five lectures will be given by researchers from outside the university and will cover topics as diverse as biotechnology, ethics and medicine. The grant will also support several full-time undergraduate research positions in summer.