

Physics News

MICHIGAN TECH PHYSICS DEPARTMENT NEWSLETTER

Winter 1998-99

Volume 1, No. 2

A note from the Chair

By Dr. J. Bruce Rafert
Professor and Chair



Faculty, Students, and Alumni:

As you read this quarter's issue of Physics News, you'll notice that one of the primary features of the Physics Department at Michigan Tech is that we are making major contributions to both teaching and research. This conference of activities is one of the features that distinguishes our program and MTU. For example, we've just finished a complete redesign of all of the introductory physics labs, replacing the equipment and experiments that I'm sure many of you recall, with ultra-modern equipment and discovery-based laboratory exercises. Students have responded to the new approach with enthusiasm, and our assessment indicates our labs to be amongst the most effective in teaching physics to engineers in the nation.

At the same time, physics faculty continue to distinguish themselves (see "Department Update") at the national and international level. Dr. Alex Kostinski was invited to spend a sabbatical year working at the Goddard Space Flight Center, Dr. Raymond Shaw is spending a year at the National Center for Atmospheric Research, and the department has now grown to 19 tenure-track faculty, 7 professional staff, and 4 research professors.

In closing, let me reiterate our offer to share news of your recent activities or accomplishments with us in Physics News.

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Current Research: Dr. Bryan Suits

By Dr. Bryan Suits
Professor



Terrorism is an unfortunate part of our lives. Using physics to help fight terrorism and to make the world a safer place is just what Prof. Bryan Suits set out to do during his recent 6-month sabbatical leave at the Naval Research Laboratory in Washington, D.C. Suits worked with Dr. Alan Garroway's group, who has pioneered the use of nuclear quadruple resonance (NQR), a close cousin of nuclear magnetic resonance (NMR), for the detection of explosives.

Initial studies in Garroway's group centered on the detection of small amounts of explosive compounds in luggage. The group is now also looking into the use of NQR to detect buried land mines and other similar explosive hazards. However, the signals are relatively weak and often one finds extraneous signals present which can mask the presence of an explosive.

Using a detection coil, NQR measures the intensity of radio frequency signals from the nuclei of certain atoms. Since that frequency is determined entirely by the chemical structure of the material, specific chemical compounds can be targeted for detection. Unlike NMR, which relies on the presence of a strong magnetic field which could significantly disturb the contents within a suitcase, NQR does not require such a field.

Suits used basic electricity and magnetism theory along with experimental measurements to develop several improvements for the system. His work

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Current Research

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included theory and experiment to determine the limits of detectability using a “super-Q” detection system, where he showed that a signal-to-noise ratio improvement could be made using a detection bandwidth which is much smaller than the signal bandwidth. That work was based on previous work by others to design gravity wave detectors. He also developed a “noise-immune” detection coil which eliminates most external rf noise (necessary for land mine detection in the field). Along with others at NRL, he has also developed some very non-traditional coil geometries which take advantage of some of the unique features of NQR signals from polycrystalline materials.

Suits has continued this collaboration with the NRL group upon his return to MTU and is supported with funding made available by the NRL. So far, this work has directly resulted in three patent applications and three published papers with more “in the works.”

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Department Update

Susan Hill has joined the Physics Department as a Laboratory/Systems Associate. Dr. Hill earned her Ph.D. in Applied Physics from Michigan Technological University in 1991.

Cindee Molnar joined the Physics Department as a Secretary II. Cindee previously worked at MTU in the Forestry Department as a Secretary II.

Robert Nemiroff, Assistant Professor in the Physics Department, is an organizer of the “Great Debates” in Astronomy. The Nature of the Universe Debate was held as scheduled on October 4, 1998. The proceedings will appear in the Publications of the Astronomical Society of the Pacific in early 1999. The web site: <http://antwrp.gsfc.nasa.gov/debate/debate98.html> will include content from the debate, including pictures and comments from the audience.

Michael Renn, Assistant Professor in the Physics Department, has a patent pending “Direct-Writing of Materials by Laser Guidance.” Laser guidance technology provides non-contact manipulation of microscopic and nanometer scale particles and precision delivery over long distances.

Spring Quarter 1999 Course Offerings

PH010 Development of Physics skills
PH020 Team Approach Learning Physics
PH181 Introductory Physics Lab 1
PH182 Introductory Physics Lab 2
PH183 Introductory Physics Lab 3
PH202 Elements of Physics II
PH203 Elements of Physics III
PH204 General Physics I
PH205 General Physics II
PH206 General Physics III
PH310 General Physics IV
PH333 Theoretical Mechanics II
PH345 Thermodynamics and Statistical Mechanics
PH360 Geometrical and Physical Optics
PH413 Senior Laboratory/Project
PH422 Quantum Mechanics III
PH427 Electricity and Magnetism II
PH431 Nuclear Power Systems Design
PH444 Introduction to Nuclear Physics
PH453 Senior Physics Colloquium
PH482 Computers in Physics - Theory
PH490 Special Problems in Physics
PH500 Graduate Research
PH512 Electrodynamics I
PH532 Theory of Solids
PH535 Quantum Mechanics III
PH561 Special Topics in Physics
PH600 Doctoral Research

Spring arena registration occurs January 25-29, 1999. Instruction begins on March 8, 1999. For more information contact the Physics Department at (906) 487-2086 or checkout the course registration website at <http://www.sas.it.mtu.edu/em/coursereg.htm>

*Visit the Physics Department Homepage
located at
<http://www.phy.mtu.edu/>*

New Ph.D. Candidates

Fall 1998

Joe Darling
Huitian Jiang
Anil Kandalam
Vladimir Kovalenko
Kenneth Morgan
Abdenour Sabir
Weidong Yang



Society of Physics Students - MTU Chapter

Well it's a new year again and things are happening with SPS. Through the last few years our SPS chapter here at Michigan Tech has become more and more active. This winter SPS, in addition to our key activities of colloquium speaker generation, scoop sales, the ever popular SPS student/faculty lunches and mixers, we will build our own winter carnival snow statue. I can not yet tell you what it is because like most innovative, cutting edge inventions, a rigorous battery of tests must be completed before public unveiling. However, as you wonder through the usual assortment of snow creatures, racecars and people, look for the most intriguing and "physical" of them all. This will be the SPS innovation. It is tradition in the making. I hope that future generations of SPS continue these activities to create a stronger and more visible SPS Chapter here at MTU.

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The Physics Learning Center

As one of the "core" learning centers at Michigan Tech, the Physics Learning Center (PLC) plays an important role in providing quality learning experiences for students enrolled in demanding introductory physics courses. The learning centers have become increasingly popular with students, and demand for learning center services have been steadily increasing over the years.

Thanks to commitments by the University to increase support to the learning centers, this year we

have a record number of undergraduate student coaches working in the PLC—sixteen! Senior physics major Jeremy Rogers is the head coach, and coordinates all PLC schedules and leads the weekly coach-training meetings. Currently there are nearly 50 students receiving help through weekly appointments. Thirty-three students are participating on learning teams for PH204 or PH205 and meet weekly for three hours with their team and coach to discuss concepts, homework problems, and problem solving techniques. Coaches leading learning teams meet weekly for extra training in team learning.

Physics coaching is available on a walk-in basis during posted hours for the following courses: PH201, PH202, PH203, PH204, PH205, PH310. For more information stop by the PLC or visit our web site at www.phy.mtu.edu/phylcenter/phylcenter.html.

-jaszczak@mtu.edu

New Faculty Profiles

Ulrich Hansmann, Ph.D. in Physics at Freie Universitat, Berlin, Germany. Dr. Hansmann joined the Department in March, 1998, as an Assistant Professor. Dr. Hansmann's research includes biomolecular modeling.

Raymond Shaw, Ph.D. in Meteorology at Pennsylvania State University. Dr. Shaw joined the Department in August, 1998, as an Assistant Professor. Dr. Shaw's research includes atmospheric sciences.

Robert Pastel, Ph.D. in Physics at University of New Mexico. Dr. Pastel's appointment as a Visiting Assistant Professor has been extended for 1998-99 year. Dr. Pastel's research includes laser physics.

David Nitz, Ph.D. in Physics at University of Rochester. Dr. Nitz joined the Department in September, 1998, as a Research Professor. Dr. Nitz's research includes Remote Sensing/Astrophysics.

Larry Coke, Ph.D. in Applied Physics at Michigan Technological University. Dr. Coke joined the Department in August, 1998, as a Research Assistant Professor.

Kenneth J. Morgan, a Ph.D. candidate in the physics program at Michigan Tech, joined the Department in August, 1998, as a Visiting Instructor.

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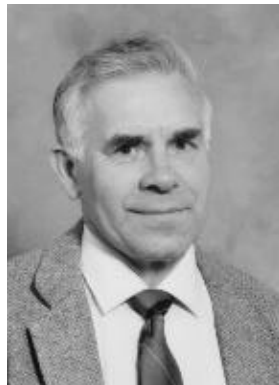
Did you know...

that the "Astronomy Picture of the Day", or APOD website which is jointly maintained by the Physics Department and NASA now has over 70,000 daily readers?
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

that the new Physics Department Brochure "Want to Change the World" is on-line at <http://www.mtu.edu/depts/physics/index.html>

Faculty Spotlight

Donald A. Daavettila
Associate Professor, MS,
Michigan Technological
University, 1958
Radiation Safety



A key aspect of the "learning phenomea" is the development of the ability to clearly display solutions to problems. Mastery of the basic text material and understanding of the problem is demonstrated by a neat, complete solution. Herein lies the advantage of the small recitation classes at MTU. There, I can aid and monitor the development of these skills in students.

-dond@mtu.edu

Distinguished Teacher Award, 1994

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