

Physics News

MICHIGAN TECH PHYSICS DEPARTMENT NEWSLETTER

Fall 2006

Volume 8

A note from the chair

By Dr. Ravindra Pandey
Professor and Chair

Twenty-five years ago when Dr. Donald Beck and Dr. Robert Weidman joined the department, a transformation towards developing a strong research program was initiated. Since then, we have made excellent progress towards achieving such a goal. The level of success is reflected in the publication of about seventy research papers in the peer-reviewed journals in the past twelve months by undergraduate and graduate students along with the faculty members. The Ph.D. program has grown to about forty students. The research funding from various governmental and industrial sources has reached about \$2M. This has facilitated the continuation of cutting-edge research in the department.

Dr. Beck has the unique distinction of receiving continuous support from the National Science Foundation since 1981 in the area of theoretical atomic physics. He has published well over one hundred research papers, and has mentored many undergraduate and graduate students in the last twenty-five years.

Dr. Weidman is the recipient of Michigan Tech's Fredrick D. Williams Instructional Innovation Award for 2006. Our department teaches high-impact courses in introductory physics to hundreds of students every semester in Fisher Hall. Prof. Weidman has successfully transformed the large physics lecture halls into arenas of interactivity, rapid feedback, and focused critical thought. The prestigious award was made in recognition of his spearheading the strategy that combines web-based homework assignments, animation, tutorials, and experimental demos. This award also affirms our commitment to undergraduate education for all MTU students.

You will certainly agree that many of the successes achieved have been possible only because of the donated funds. As you decide on end-of-the-year donations, please consider a contribution to the department's endowment for the Physics Alumni summer research fellowship for undergraduate students. Your continued support is deeply appreciated. *Best wishes for a joyous holiday season and a happy and prosperous New Year.*

Current Research: Donald Beck

By Donald Beck

Accurate Calculations of Transition Metal and Rare Earth Atoms and Ions

Professor of Physics, Dr. Donald Beck, has been at Michigan Technological University since December 1, 1980, has as his research focus the accurate and efficient calculation of wavefunctions and properties of transition metal and rare earth atoms and ions. This requires the careful inclusion of relativistic and correlation effects in the calculations, which are currently being done on 2 AMD 2.4GHz PCs. These atoms are quite difficult to deal with due to the complex nature of open d - and f -subshell electrons, and much still needs to be learned about them. For example, it is not yet possible to produce good wavefunctions for actinide containing molecules such as those occurring in nuclear wastes.

Properties of transition metal atoms are of considerable technological interest in plasma fusion devices (as impurities), astrophysical abundance and atmospheric studies, deep-level traps in semi-conductors (e.g. transitions within d bands), hydrogen storage devices, and atomic trap trace analysis.

Rare earths are technologically important in magnets, high temperature superconductors, lasers, advanced lighting sources, time standards, and nuclear waste.

Dr. Beck's work has been well supported by the National Science Foundation and the Department of Energy for 15 years or more, in addition to other federal and industrial agencies. He is about to graduate his 10th Ph.D. student and has a 6th student working on an M.S. He has published more than 125 refereed articles, the majority of them while at Michigan Technological University. In 1991, he was the co-recipient of Michigan Technological University's Research Award and in 2001 was made a fellow of the American Physical Society.



Student Leader Carly Robinson

Physics senior Carly Robinson has been active throughout her undergraduate studies at Michigan Tech. She is in her second term as president of the Society of Physics Students. Last year she was instrumental in organizing an SPS sponsored Family Physics Night in conjunction with the Western UP Center for Science, Mathematics, and Environmental Education. In 2006 she was among the honorees in the Woman of Promise program initiated by the Presidential Council of Alumnae. Carly has played tennis for three years and was nominated for Homecoming Queen this year.

Carly did research with Dr. Will Cantrell for two consecutive summers. In 2004 she presented work on freezing of solutions catalyzed by high molecular weight organic compounds at the American Geophysical Union meeting. In 2005 she received a Michigan Space Grant Consortium award for her research in atmospheric physics. Last summer she worked with Laura Iraci at NASA Ames Research Center and will be presenting those results at the upcoming AGU Meeting.



Carly was profiled in MTU Student Stories online.

New Teaching Innovation Award

Associate Professor of Physics Dr. Robert Weidman is the 2006 recipient of the Fredrick D. Williams Instructional Innovation Award. The award was made in recognition of his leadership in the research, development and implementation of new pedagogy, structure, and content for the calculus-

based introductory physics courses: PH2100 and PH2200. This is a culmination of 26 years of dedicated instruction for the Physics Department. Weidman earned a Distinguished Teaching Award from the university in 1987.



Awards and Achievements

Professor of Physics Donald R. Beck was recognized for 25 years of service in spring 2006.

Associate Professor of Physics Robert S. Weidman was recognized for his 25 years of service in spring 2005. Weidman is this year's recipient of the new Fredrick D. Williams Instructional Innovation Award.

Alumnus Walter E. Kauppila of Wayne State University was inducted into the MTU Academy of Sciences and Arts for outstanding leadership in his profession.

Professor Emeritus of Physics and '56 alumnus Donald A. Daavettila received the Outstanding Service Award from Michigan Tech.

Matthew Davenport received the 2006 Ian W. Shepherd Award for most outstanding physics graduate.

Physics senior Adam DeConinck is this year's recipient of the Provost's Award for Scholarship.

Physics graduate student Raghav Rao Vanga won second prize in the 2005-6 Grad Student Council Poster Session Competition. Jiesheng Wang received first place in the Technical category during the 2006-7 competition. S. Gowtham won second prize in the 2006 Sigma Xi Multi-Disciplinary Graduate Research Colloquium. See the *Graduate Spotlight* for mention of Vijaya Kumar Kayastha's numerous awards.

On 25 Years

Donald Beck

"The biggest changes I have seen in the Physics Department over the 25 years have been the amount of research being done in the Department. In addition to maintaining its good teaching performance, the Department has become nationally recognized in several research areas. Secondly, I would mention the improvement in computing facilities over this same period. Going from a single slow mainframe computer to a large number of distributed workstations, PCs, and clusters of PCs. MTU has been quite responsive in adapting itself to computational innovations which are both efficient and inexpensive." -db

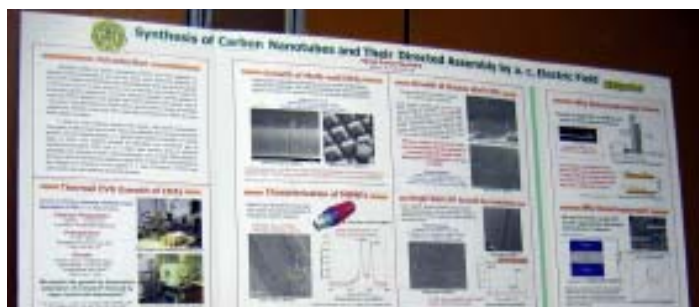
Senior Spotlight

Katie Schalk

“My favorite experience of Tech has come through the shifting and turbulent sea of characters that make up this university – friends, colleagues, and professors. My third passion is for the environment. (I’ve yet to identify my first two.) At Tech, I enjoy being a part of the Environmental Sustainability Committee and the Students for Environmental Sustainability. Through these organizations, I have met some of the most inspirational people, making me believe together we can change the world. My future is still unclear: Will I join the Peace Corps? Study atmospheric physics or cosmology in graduate school? My only hope is that one lifetime will be time enough for me to grasp all the things I wish to understand, to come to terms with all the things I will not be able to fathom.” -ks

Graduate Spotlight

Vijaya Kumar Kayastha is currently doing research on carbon nanotubes: synthesis, characterization and applications. He is part of Yoke Khin Yap’s research group. Vijaya’s work is solidly recognized in professional competitions organized by the Graduate Student Council (GSC). He took second place in the 2005 Sigma Xi Colloquium Competition and won an honorary mention in the 2006 competition. In the 2005-6 GSC Poster Session Competition Vijaya received Best Presentation Award for his poster “Synthesis of Carbon Nanotubes and Their Directed Assembly by a. c. Electric Field”. He received Third Place in the Visual category for his poster during the 2006-7 poster competition. Vijaya holds an MSc from Trivuwun University in Nepal.



Recent Degree Recipients

2006	Destination
Michael Larsen, Ph.D.	Army Research Lab
Samuel Mensah, M.S.	Oxford, England
Ankita Roy, M.S.	Clemson University
Vithal Shet Tilvi, M.S.	Arizona State University
Changgong Zhou, Ph.D.	Michigan Tech
Eric Carlson, B.S.	Japan
Daniel Cordell, B.S.	Microsoft
Matthew Davenport, B.S.	UC Irvine
Eric Domeier, B.S.	Michigan Tech
Adam Kaczynski, B.S.	Michigan Tech
Matthew Merlo, B.S.	
Matthew Mosher, B.S.	
Patrick Phelps, B.S.	Michigan Tech

2005	
Jitendra Menda, M.S.	Hyderabad, India

Senior Research

- Adam DeConinck is working with Dr. Yoke Khin Yap on the growth and characterization of boron nitride films.
- Joseph Grochowski has a project with Dr. Brad Sherril of Michigan State: Improving the S800’s Ionization Chamber Resolution.
- Carly Robinson and advisor Dr. Will Cantrell are looking at the waiting times for freezing of water droplets.
- Katie Schalk wonders if it is possible to detect climate change by looking for record highs/lows in a time series, as advised by Dr. Alexander Kostinski.
- B. Justin Scholfield and advisor Dr. Igor Kliakhandler of the Math Dept. are involved in visual investigations of the Marangoni effect and various instabilities.
- Paul Sneller and Dr. Will Cantrell are analyzing aerosol data from Kaashidhoo Climate Observatory.

Research Sponsorship

Research funding has reached about \$2M. External sponsors include the National Science Foundation, US Department of Energy, US Department of Army, Research Foundation of City University of New York, NASA, and Michigan Space Grant Consortium. Michigan Tech funding includes the Research Excellence Fund and Summer Undergraduate Research Fellowship.

Thanks!

We extend our deepest appreciation to friends and alumni who have made recent gifts or pledges directly to the department. The response has been OUTSTANDING again this year. We appreciate your continued interest in the Department of Physics at Michigan Technological University.

Alumni

Edward Augustyniak & Monika Sujczynska '94
Mitchell & Cynthia Austin '86
Kent & Patricia Barlow '57
Ramakrishnan Bashyam & Harini Sampathkumar '96
Alan & Kathy Boutilier '80
Donald & Sharon Bullock '57
Marvin & Dorothy Cox '64
Pamela & Floyd Croy '66
Carl & Phyllis Dahlman '53
Peter DeGroot & Myrl Bishop '62
Andrew R. Drews '84
Eric & Kari Duffin '83
John & Geraldine Eisenlord '52
John & Eugenia Evans '50
Peter & Carol Farm '60
Adam C. Figon '88
Rodney & Arlene Flancher '84
Niccolas L. Franz '66
Walter & Edith Gabriel '48
David & Yvonne Gay '81
Don & Norma Gendzwill '57
Kenneth & Lynn Genutis '79
James & Dianna Gibson '63

David & Jewel Grewe '59
Timothy & Carol Gump '72
David & Sharon Hansen '69
Roland & Joan Hanson '55
William G. Hart Jr '77
Frank & Shirley Hastedt '58
Louis & Diane Hein '66
Thomas & Ellen Herron '55
Thomas & Heidi Hintz '92
Marlin & Dawn Horseman '64
Raymond & Laura Humphrey '66
Loren & Kathleen Isley '60
Robert D. Jackson '93
Kenneth J. Javor '77
Philip Kaldon & Deborah Morrow '88
James J. Kaufman '67
Wayne & Regina Keranen '97
Lloyd & Deanna Klusendorf '67
Rodney & Marlene Kopish '61
Thomas & Renee Kugler '84
Jack & Kaethe Labo '62
Keith LaFleur & Diane Foglia-LaFleur '72
Norman & Sara-Jo Larsen '61
Joseph & Mary Leu '63
Ronald & Dorri Liikala '56

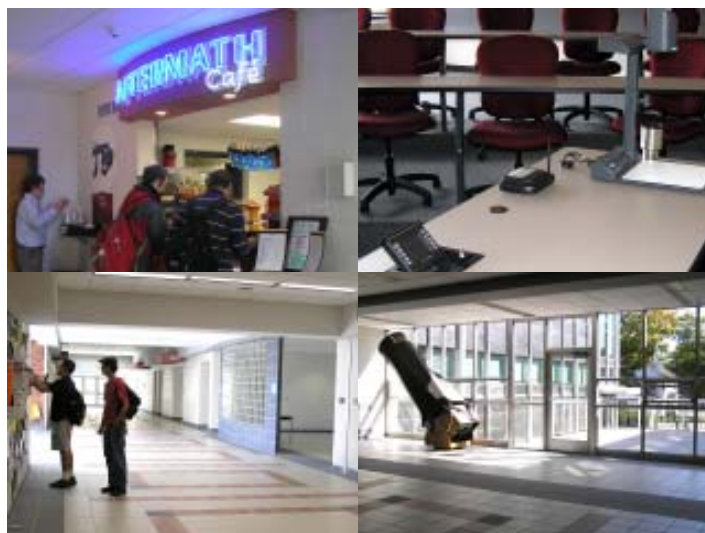
Eugenia & Robert Lind '61
Robert & JoAnn Matheson '49
Dennis & Jacqueline McCal '74
Robert & Judi McEachen '68
David & Terri McLaughlin '61
Ronald & Hermine Meyer '64
Thomas & Margaret Mohr '76
Jeffrey & Suzanne Morris '84
Marcus & Lisa Niessen '81
Gary & Charlotte Palmgren '76
Ann & Donald Parry '86, '84
Richard & Linda Petzke '71
Peter & Jill Pietila '63
Thomas & Sharon Plutchak '69
George & Judy Pokorny '65
Mary J. Repar '75
Gary E. Rhoney '65
Joseph Root & Anne Demers Root '76
Joseph Roti Roti & Stephanie Pagano '65
Joseph & Susan Rowe '70
William & Carla Siskaninetz '88
Burriss & Katherine Smith '64
Sanjay Sood '92
James & Karen Strobel '74
Timothy R. Symons '93

Donald & Carolyn Szenina '73
John & Carol Taylor '59
Michael & Mary Ellen Teneyck '64
Michael & Tami Thom '94
Alfred & Deborah Trapanese '69
Mark A. Turkal '81
C. John & Kathryn Umbarger '64
Roger & Linda Urbaniak '66
Bruce & Linda Webb '63
William & Kathleen Wilson '78
Larry & Patricia Wittenbach '61
David & Elizabeth Witteveen '88
James & Christine Wood '70
William E. Wuerthele '66
Yin Zhang & Jinghua Fu '90
Gary & L Lynn Zulauf '72

Friends

Thomas Blanchard & Eve Dziak-Blanchard
Michael & MaryAnn Davenport Paul & Elsie Hinzmann
John & Sherry Jaszczak
Mary Marchaterre & David Nitz
Edward & Nina Nadgorny
Roger & LeMae Ryba

Fisher Hall Makeover



Clockwise: Aftermath Cafe, across the hall from the Physics Department.; new technology in all the classrooms, including wireless; patio and telescope; Fisher Lobby.

The department has established several funds for greatly enhancing departmental activities:

Physics Alumni/Other Fund

Established in 1967, this fund is for the discretionary use of the Chair of the Department of Physics in support of departmental activities.

John Miles Fellowship Fund

This fund was established at Michigan Technological University through a charitable remainder trust from the estate of John A. Miles (BS 1935), who passed away in 1986, for the support of graduate students in materials physics.

Ian W. Shepherd Endowed Award Fund

Established in 1978 in memory of the late Dr. Ian W. Shepherd, former MTU Physics Department Chair, this award is presented to a physics senior or graduate student judged to be the most promising by a three-person committee appointed by the head of the Physics Department.

Sabbatical Enrichment

Presidential Professor Edward M. Nadgorny spent his 2005-06 sabbatical leave at two institutions. The first was the School of Engineering and Electronics, Institute for Materials and Processes, at the University of Edinburgh, Scotland, in the United Kingdom. The second was the Air Force Research Laboratory (AFRL), Wright-Patterson Air Force Base in Dayton, Ohio, where he was a Visiting Professor. During the 2005 Fall semester in Edinburgh, he focused on an emerging area of dislocation microplasticity, measuring the nanoscale surface roughness produced when deforming samples. The University of Edinburgh is the best in Scotland and quite large, having about 30,000 students.

During the 2006 Spring semester in AFRL, he studied plastic deformation processes of micron-scale samples using a novel technology developed at AFRL for preparing microsamples down to 1 micron diameter and deforming them in test a nanomachine. Nadgorny did research there also in 1991 and observed that it's almost impossible to recognize the old AFRL now. Facilities are much better and more people are doing research. Especially impressive is the available support from technical staff. The scientific results obtained at both research institutions corroborated each other and confirmed the universal nature of the observed effects. These results are believed to have both fundamental and practical interest. The results of the studies have been published in three papers and presented at the International Conference "Statistical Mechanics of Plasticity and Related Instabilities", Bangalore, India, 2005, and at the 12th International Symposium, "Plasticity 2006", Halifax, Canada. During his sabbatical, Dr. Nadgorny also gave six seminars in Scotland, Germany, and the USA, describing his previous research at MTU and the newly obtained scientific results. Due to the importance of the first results obtained by their joint efforts, scientists in both Edinburgh University and the Air Force Research Laboratory are interested in continuing their collaboration.

Look for the Houghton snowflake in the recently issued Holiday Snowflakes commemorative postage stamps.



Summer Internship

Adam DeConinck

"Instead of an academic research project, this summer I did a research internship at Dow Corning in Midland, MI. My project was to build a test station to measure the properties of the organic light-emitting diodes (OLEDs) which my group was developing to help determine which materials had the highest performance. This taught me a lot about measurement and experimental design, as well as the different opportunities available in industry than academia."

-ad

Right: Adam assists with physics demonstrations during the MTU Open House expo.



Department Update

Presidential Professor Edward Nadgorny returned from sabbatical leave. He spent the 2005-2006 year performing microplasticity experiments at the University of Edinburgh and the Air Force Research Laboratory, Dayton, OH.

In the past year, visiting faculty and researchers have included Dr. Mrinilani Deshpande, Dr. Johana Chirinos Diaz, Dr. Sigfried Hoefinger, Dr. Dennis Lamb, Dr. Walter Nadler, Dr. Mark North, Dr. Roberto Orlando, Dr. Amir Jalali Roudsar, Dr. Ralph Scheicher, and Dr. Michael Zaiser.

Professor of Physics Ulrich H. E. Hansmann is an organizer of the Workshop CBSB07, *From Computational Biophysics to Systems Biology 2007* to be held in Jülich, Germany, next spring. He was an organizer of the previous workshop CBSB06 and a co-editor of the proceedings for that event.

Department Chair Ravindra Pandey was an organizer for the *International Symposium on Frontiers in Nanoscale Science, Technology and Education* held in Cochin, India, last summer.

I like to think that the moon is there even if I am not looking at it.

-Albert Einstein

Physics News

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	Post on the Physics website?	Yes	No
Name _____		<input type="checkbox"/>	<input type="checkbox"/>
Current position/employer _____		<input type="checkbox"/>	<input type="checkbox"/>
Degree and year _____		<input type="checkbox"/>	<input type="checkbox"/>
Address _____		<input type="checkbox"/>	<input type="checkbox"/>
Phone _____		<input type="checkbox"/>	<input type="checkbox"/>
Email/website _____		<input type="checkbox"/>	<input type="checkbox"/>
Other information _____		<input type="checkbox"/>	<input type="checkbox"/>

Feel free to attach information. If you would like to make a donation to the Physics Department, please make checks payable to the Michigan Tech Fund - **Department of Physics**. You can return this form and your donation to:

Physics Department, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931
