

A Note from the Chair

By Dr. Ravindra Pandey
Professor and Chair

We are proud to report recognitions of our efforts towards maintaining excellence in teaching and research—the State of Michigan has named **Dr. Cantrell** a 2013 Michigan Distinguished Professor of the Year for his outstanding contributions to the education of students. Prof. Cantrell believes in showing students the beauty, power and elegance of the ideas at the core of physical science.

The structure and properties of soot produced by biomass burning was a topic of a recent article in *Nature Communications* co-authored by graduate student **Swarup China** and **Dr. Claudio Mazzoleni** (DOI: 10.1038/ncomms3122). Biomass burning is one of the largest sources of aerosols in the atmosphere, and a complete characterization of soot is likely to improve our understanding of atmospheric processing of aerosols and their effects on Earth's climate.

This past summer, graduating seniors **Darcy Jacobson** and **Mike Adler** received scholarships from the German Academic Exchange Service. Darcy worked at the Max Planck Institute for Dynamics and Self-Organization, and Mike was an intern at the Technical University of Munich.

Our physics alum **Vithal Tilvi '06** co-authored a paper in *Nature* (Vol. 502, pp 524) reporting the most distant galaxy created within 700 million years after the Big Bang. Another alum, **Nathan Hinkley '09** was involved in the development and operation of atomic clocks with 10^{-18} instability. Such atomic clocks have applications in Earth and space based navigation (*Science*, Vol. 341, pp 1215).

Ramy El-Ganainy recently joined the department to initiate research activities in the area of Photonics. Some well-deserved promotions took place this year—congratulations to **Ranjit Pati** for becoming a Professor, and **Claudio Mazzoleni** an Associate Professor.

Many of these achievements have been possible only with your encouragement and support of the department. As you decide on end-of-the-year donations, please consider a contribution to the department's endowment. Your continued support is deeply appreciated.

Best wishes for a joyous holiday season and a happy and prosperous New Year.

Current Research

Ramy El-Ganainy



Ramy El-Ganainy is the newest member of the physics department at Michigan Tech. Prior to joining the department in Fall 2013, he was a guest scientist at the Max Planck Institute for the Physics of Complex Systems in Dresden, Germany. He was also a postdoctoral fellow at Toronto University, Canada. Having obtained his PhD from the College of

Optics and Photonics (CREOL) in Florida, his research interests encompass a wide spectrum of topics in the fields of optics and photonics.

Photonics technology plays an ever increasing role in our everyday life, from medical and industrial applications to optical communications. A considerable amount of recent research activity in the field is dedicated to building compact photonic circuits using currently available fabrication facilities. While significant progress towards this goal has been attained, building on-chip optical diodes (optical devices that allow light to propagate only in one direction while blocking reverse propagation) still remains a hurdle.

Recently, El-Ganainy has proposed a novel optical diode structure based on quantum inspired waveguide arrays. Initial analysis based on coupled mode theory predicts high performance and a small footprint. Even more importantly, this new design is compatible with silicon platforms. Other functionalities of the proposed device, such as a polarization splitter, have been postulated.

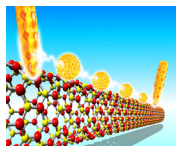
Lately El-Ganainy has begun to explore the possibility of using the interplay between the linear properties of the proposed structure and nonlinear Kerr effects in order to design soliton (nonlinear eigenmodes) assisted on-chip optical limiters. An optical limiter is a device that would allow only low intensity light through while blocking higher intensities.

In addition, El-Ganainy's research interests concern linear and nonlinear effects in optical nanowires as well as parity-time symmetry in optics.

Visit us online at:
www.mtu.edu/physics/

Research with Impact

Physics research is not so much about finding new answers, but about asking new questions. During 2012-13 investigators asked new and unconventional questions about the nature of devices, minerals, atmospheric science, and astrophysics.



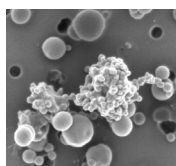
Transistors: Since it was published online in *Advanced Materials*, the article “Room-Temperature Tunneling Behavior of Boron Nitride Nanotubes Functionalized with Gold Quantum Dots,” authored by Yoke Khin Yap,

John Jaszczak and others, has received exceptional attention. The related news release, “Beyond Silicon: Transistors without Semiconductors,” appeared in numerous websites and blogs. The Altmetric system, which measures the social impact of a scholarly literature, gave it a score of 86.



Grand Slam: John Jaszczak co-authored three articles in the March/April edition of *Rocks & Minerals*: “Raman Spectroscopy in the Identification of Minerals,” “Miracle at Merelani: A Remarkable Occurrence of Graphite, Diopside and Associated Minerals

from the Karo Pit, Block D, Merelani Hills, Arusha Region, Tanzania,” and “Fluorapatite from a Remarkable Occurrence of Graphite and Associated Minerals from the Karo Pit, Block D, Merelani Hills, Arusha Region, Tanzania.”



Climate Change: Claudio Mazzoleni examines field emission scanning electron microscope images of soot particles from wildfire smoke. He hopes to understand the effect of these particles on Earth warming, cloud formation, and other aspects of climate

change. Mazzoleni operates the Environmental Optics Laboratory at Michigan Tech.



Gamma Rays: Petra Hüntemeyer is leading the team which is designing the High-Altitude Water Cherenkov (HAWC) Gamma-Ray Observatory laser calibration system. These highest energy gamma rays hold clues to the nature of space and time. HAWC comprises

100 Cherenkov detectors for studying gamma rays in the range of 100 GeV to 100 TeV. This is a bi-national project between Mexico and the United States.

ATM Degree

Matt Beals is the first recipient of a PhD in Atmospheric Sciences at Michigan Tech. His dissertation is entitled “Investigations of Cloud Microphysical Response to Mixing Using Digital Holography.” Beals’ advisor was Raymond Shaw. The interdisciplinary Atmospheric Sciences program at Michigan Tech stresses societal relevance.

Alumni Achievement

Dr. Debasis Datta was inducted into Michigan Technological University’s Academy of Sciences and Arts on September 13, 2013. Datta graduated with a PhD in Physics from Michigan Tech in 1994. His research work at Tech resulted in ten publications in *American Physical Review*. Following the completion of his postdoctoral work, he started his career in Information Technology in 1996 as a software engineer in the IT services industry. During his 16 year IT career, Debasis worked at DaimlerChrysler, PeopleSoft, Oracle and General Motors Corporation where he is currently employed.

Physics alum Nathan Hinkley '09 is the first author in a *Science Express* publication entitled “An Atomic Clock with 10^{-18} Instability.” The National Institute of Standards and Technology scientists reported that a pair of experimental atomic clocks based on ytterbium atoms have set a new record for stability.

Vithal Tilvi, who graduated in 2006 with an MS in Physics from Michigan Tech, co-discovered the most distant galaxy in the Universe. The observation was made at Keck Observatory on the Mauna Kea volcano in Hawaii.

2007 physics alum Carly Robinson has been selected as the 2013-2014 Arthur H. Guenther Congressional Fellow by SPIE, the international society for optics and photonics, and the Optical Society (OSA).



Ravi Pandey, Devashree Datta, Debasis Datta, and Donald Beck attended the induction ceremony of the Academy of Sciences and Arts on September 13, 2013.

I hope this recognition of fundamental science will help raise awareness of the value of blue-sky research. —Peter Higgs

Recent Funding

The department received more than \$540,000 in funding from NSF, NASA, US DOE, MSGC, and the University of Michigan—Michigan Initiative for Innovation and Entrepreneurship.

Awards and Achievements

Last spring Will Cantrell was named a 2013 Michigan Distinguished Professor of the Year by the President's Council, State Universities of Michigan. Provost Max Seel praised Cantrell for using "a mix of classic and modern teaching methods in his classes, combining traditional derivations with modern approaches like Just-in-Time-Teaching."

Engineering Physics graduate student **Ran Duan** is a recipient of the Outstanding Teaching Award in fall 2013. Atmospheric Sciences graduate student **Matt Beals** is a recipient of the Outstanding Scholarship Award. Dual physics and math major **Michael Adler** is a 2013 recipient of the Provost Award for Scholarship.

The departmental poster session was held on April 18, 2013. **Renee Batzloff** and **Jie Li** were recognized for presenting the best posters. **Marwa Abdalamoneam** and **Hugo Ayala Solares** gave the best talks on their research.



Tyler Plamondon is the 2013 **Ian W. Shepherd Award** recipient for outstanding graduating senior in physics. The most promising of seniors are presented with a check and have their names engraved on a plaque, which is displayed in the physics department.

The Michigan Tech chapter of the **Society of Physics Students (SPS)** was selected as one of the Outstanding SPS Chapters for the third year in a row.



The **Physics Graduate Poster Session** was held on April 18, 2013, in the Fisher Atrium. Ten grad students and three undergrads presented research posters.

Potnis Endowed Fellowship

Kusum Potnis established the **Vasant R. Potnis Endowed Fellowship** fund in memory of her late husband and physics professor emeritus. Dr. Potnis was a faculty member from 1968 until his retirement in 1996; he passed away in 2012. The Fellowship will provide financial support for graduate students pursuing a Master's or PhD in physics.

Recent Degree Recipients

2013

Matt Beals, PhD
Nick Black, MS
Neluka Dissanayake, PhD
Abhilash Kantamneni, MS
Pradeep Kumar, PhD
Xiaoliang Zhong, PhD

Mac Brennan, BS
Kathryn Cox, BS
Jonathan Curtis, BS
Abigail Dillon, BS
Jeremy Dobbs, BS
Eric Kaphengst, BS
Ethan Miltenberger, BS
Tyler Plamondon, BS
Jacob W. Smock, BS
Katelyn Sutton, BS
Derek Van Damme, BS

2012

Kristopher Bunker, MS
Nathan Kelley-Hoskins, MS
Saikat Mukhopadhyay, PhD
Haiqing Zhao, MS

Destination

MIT Lincoln Lab
Michigan Tech
Univ. of Illinois, Chicago
Michigan Tech
Univ. of Wisc., Madison
Virginia Tech

Pro Bike Tour

Michigan Tech
Univ. of Wisc., Madison
Michigan Tech
Computer Industry
Univ. of Minn., Duluth
Univ. of Wisc., Milwaukee

Secondary School
University of Illinois

Finlandia, Michigan Tech
Humboldt U/DESY
Cornell University
U of Maryland, Coll. Park

Department Updates

Ranjit Pati was promoted to professor. **Claudio Mazzoleni** was promoted to associate professor with tenure. **Kim Fook Lee** is now an adjunct assistant professor with the department.

David Ciochetto, Ashok Kumar, Jarvis Loh, and Dustin Winslow are new research scientists. **Nicholas Black** and **Kristopher Bunker** are new instructors.

Petra Hüntemeyer organized a meeting of the **HAWC (High-Altitude Water Cherenkov Gamma-Ray Observatory)** members on the campus of Michigan Tech.

William Slough was hired as lab coordinator.

John Jaszczak mentors the **Nanotech Innovations Enterprise** group at Michigan Tech. He co-authored a paper in the *Journal of Nano Education* on the group's entrepreneurial and outreach activities over the last five years. The special issue commemorated ten years of National Science Foundation funding of Nanotechnology Undergraduate Education programs.

Physics major **Adam Riederer** founded the **Smithing Guild** at Michigan Tech. He wished to do blacksmithing and to use the shaping of iron in promoting education on the properties of materials.

Dean's List

Spring 2013 4.00

Adler, Michael C.	SR
Nicklas, Brent C	SR
Rocheleau, Kevin B	JR
Small, Angela J	JR
Sutton, Katelyn P	SR

Spring 2013 3.50-3.99

Dobbs, Jeremy S	SR
Flood, Andrew E	SO
Furlich, Greg D	SR
Hallfrisch, Joshua D	JR
LaLonde, John E	FR
Plamondon, Tyler J	SR
Salmon, Cody J	SR
Small, Mick D	JR
Zhuravlyov, Vitaliy	FR

Physics freshmen had a composite ACT score of 28.2 this fall. The strategic goal for the college is 26.

Graduate Spotlight

Swarup China



Swarup China is a PhD student in the Atmospheric Sciences Program through the physics department, working under the supervision of Dr. Claudio Mazzoleni. He joined Michigan Tech in fall 2009 after finishing his Master's Degree in Civil and Environmental Engineering at the University of Nevada Las Vegas. His research interests lie in aerosol physics, including aerosol morphology and optical properties, and heterogeneous ice nucleation. He uses electron microscopy to understand morphology and mixing states of aerosol particles collected in different environments from various geographical locations. Recently Swarup and Dr. Mazzoleni investigated individual carbonaceous aerosol particles emitted from wildfire. He is developing an optical technique to detect the interaction between aerosol particles and water droplets, which is a fundamental aspect of contact ice nucleation. This project is led by Dr. Will Cantrell and Dr. Mazzoleni in collaboration with the Karlsruhe Institute of Technology, Germany.

Swarup expresses his sincere gratitude to his academic advisor, Dr. Claudio Mazzoleni, for his tremendous support and encouragement. He greatly acknowledges financial support from a NASA Earth and Space Science Graduate Fellowship, as well as the Department of Physics. Swarup's long-term goal is to pursue a career in research, either in a research institute or in academia.

Entrepreneurship

Last fall physics PhD student Abhi Kantamneni won first prize in the Fourth Annual Bob Mark Elevator Pitch on campus. Abhi's winning idea was for an Indian-based matchmaking website, which he named MyPaar (My Love). "Would you want your mother to pick your dates for you?" he asked. "I didn't think so." He also won the Audience Favorite Award.

Yoke Khin Yap is the first Michigan Tech professor to be part of the NSF I-Corps Team, whose goal is to turn scientific innovation into a business solution. Since then a new entrepreneurial training program called Michigan I-Corps has been launched by University of Michigan. Participants will not require previous NSF support for eligibility.

Thanks! We extend our deepest appreciation to friends and alumni who have made recent gifts or pledges to Michigan Tech. Did we miss your contribution? If so, contact physics@mtu.edu. As always, we appreciate your continued interest in the Department of Physics at Michigan Technological University.

Gary P. Agin
Alice Allen
Edward Augustyniak '94 & Monika Sujczynska
Keith & Wilma Baldwin
Stephen '02 & Jaime Beranek
Robert P. Brammer
David '64 & Mary Carlson
Michael C. Coleman '69
Pamela '66 & Floyd Croy
Matthew '06 & Cassandra Davenport
John '50 & Eugenia Evans
Walter '48 & Edith Gabriel
Kenneth '79 & Lynn Genutis
Thomas '63 & Dona Gould
Joel Graber '87 & Lindsay Shopland
Frank '58 & Shirley Hastedt

Stanley '70 & Christine Jefferson
Joe A. Jenney '60
Philip Kaldon '88 & Deborah Morrow
James '59 & Carole Kauppila
Walter '64 & Margaret Kauppila
Wayne '97 & Regina Keranen
Peter A. Kiefer '02
Ryan C. King '08
James '66 & Kathleen Kortge
Joyce & Arne '52 (dec) Koskela
Thomas '84 & Renee Kugler
Jack '62 & Kaethe Labo
Samuel C. Lambert '62
Edward M. Leonard '12
Miguel & Anita Levy
Charles J. McEwan '74
Thomas '76 & Margaret Mohr
Jeffrey '84 & Suzanne Morris

Dale & Lauren Mukavetz
Edward & Nina Nadgorny
Robert & Holly Nemiroff
Samuel '63 & Brenda Ochodnick
Joseph Roti Roti '65 & Stephanie Pagano (dec)
Raman Pfaff '87
Kusum & V.R. (dec) Potnis
Suresh K. Sampath '98
Maximilian & Mary Ann Seel
Thomas & Sharon Silvis
James '63 & Janice Strahl
James '74 & Karen Strobel
C. John '64 & Kathryn Umbarger
SriramaSwaminat Venkataraman '98 & Kalpana Chandrasekharan
William '78 & Kathleen '77 Wilson
David E. Woon '84
Charles '66 & Mary Zeigler

Senior Spotlight

Michael Adler



Michael Adler is a fourth year physics and mathematics dual major. He received the 2013 Provost's Award for Scholarship and was named the 2013 Dept. of Mathematics Departmental Scholar. His research experience began with a Summer Undergraduate Research Fellowship at Michigan Tech in 2011 to study thermoelectric materials with Dr. Peter Moran. Recently he has been working with Dr. Raymond Shaw to simulate atmospheric convection. This past summer he had the opportunity to study abroad with a research internship at the Technical University of Munich, in which he simulated combustion in supersonic flow. Michael is a teaching assistant in the *mathlab* and the *advanced physics lab* and was inducted into Sigma Pi Sigma in the spring of 2012. He is also a member of the Keweenaw Symphony Orchestra, Michigan Tech Concert Choir, and Mu Beta Psi music service fraternity at Michigan Tech. His future plans include graduate study in aerospace engineering, and he is confident that his solid background in the fundamentals has prepared him well for whatever career may lie ahead. Michael is very thankful for all of his friends and mentors, both students and faculty, in the physics department and in the community. He would not be where he is without their support and guidance.



Music, Art, Cuisine

Clockwise, from upper left: Jacek Borysow's students practice food preparation in the class "What's Cooking? A Physicist in the Kitchen;" Bob Nemiroff pours a glass of "Spacetime Brew" in Calumet's historic Shute's Bar; the portrait "Free Gaza!" by artist Miguel Levy was part of his exhibit *The People Respond*, displayed at the Rozsa Center for the Performing Arts; Michael Adler is one of many musically gifted physics majors in the department; Bryan Suits teaches the course "The Physics Behind Music."

Paul R. Hinzmann

Paul Revere Hinzmann, professor emeritus of physics, died on Nov. 30, 2012, in Grand Rapids, Mich. He was 99 years old.

He was born in Tipton, Mich., and lived in Ohio before attending the Case Institute of Technology (now Case Western Reserve). He attended his 70th reunion there in 2005.

Hinzmann received a Master's degree in education from the University of Michigan before beginning his teaching career at Michigan Tech in 1946. He taught until 1977 and was also the University photographer during his tenure at Tech. He was recalled as a patient, caring teacher who loved the enthusiasm of students. After retirement, he was active in the local Boy Scouts chapter, Isle Royale Natural History Association, and Golden Kiwanis.

Senior Spotlight

Darcy Jacobson



Darcy Jacobson is a fifth year undergraduate physics major. She has been on the dean's list numerous semesters and was inducted into Sigma Pi Sigma in spring 2013. Darcy is an active member of several organizations on campus, including the Society of Physics Students, Blue Key Honor Society, and the Ski and Snowboard Club. After only her second year she began atmospheric research with Dr. Will Cantrell, investigating ice nucleation in the immersion mode using Arizona test dust. The following summer she completed an internship at NASA Ames Research Center in California under Dr. Laura Iraci doing similar research in a pressurized cloud chamber. Most recently she was awarded a scholarship to conduct a research project at the Max Planck Institute for Dynamics and Self-Organization by the German Academic Exchange Service. She spent the summer in Germany participating in Jürgen Vollmer's research group, examining the time between turbidity events in a rain test tube experiment. Darcy has also been a physics teaching assistant since her third year, receiving the Students Helping Students award from the Michigan Tech Student Foundation. She plans to attend graduate school to obtain her PhD, but currently has no specific field in mind. Darcy would not be where she is today without the support from her friends and family, her wonderful mentors, and of course her peers and faculty in the physics department, all of which she is extremely thankful for.

We inspire the tenacity required to make the ethical choice and to persevere through all obstacles.

from the Michigan Tech Strategic Plan

MichiganTech

Physics News

Michigan Technological University
1400 Townsend Drive
Houghton, Michigan 49931-1295

Non-Profit Organization
U.S. POSTAGE PAID
Permit No. 11
Houghton, Michigan
49931



HAWC Meeting 2013

Members of the High Altitude Water Cherenkov (HAWC) Gamma-Ray Observatory met at Michigan Tech on September 23-25, 2013. Coordinated by Assistant Professor of Physics Petra H. Hüntemeyer, the meeting was attended by about 60 international members. The observatory began operation last August at the Sierra Negra Volcano in the state of Puebla, Mexico.