

A Note from the Chair

By Dr. Ravindra Pandey
Professor and Chair

The year 2007 has truly been a year of success! We are extremely proud of our students and faculty for receiving numerous recognitions and awards this year. First and foremost, **Dr. Ranjit Pati** is the recipient of the prestigious NSF career award for his project, "Theory and Modeling of a Mono-Molecular Field Effect Organic Transistor." The NSF CAREER award is highly competitive and is selectively awarded to researchers for their dual commitment to scholarship and education. As we continually strive to strengthen the research and education in the department, this recognition is encouraging.

Senior **Robert Niffenegger** was elected president of the Michigan Tech Undergraduate Student Government. Over the summer he had studied binary stars at NASA, while in winter he had helped organize the world's largest snowball fight and the world's largest man-made snowball. Bob's success is indicative of the high quality of our program that prepares students to excel at all levels of activities, including leadership both in the class and outside of the classroom.

Our faculty have received three major awards from the University this year. **Prof. Miguel Levy** has won the Michigan Tech Research Award, **Prof. Bryan Suits** is winner of the Distinguished Teaching Award and **Prof. John Jaszczak** has received the Distinguished Service Award. An accompanying article gives the details of their successes.

Senior **Stephanie Irish** was named a Goldwater Scholar. This is the most competitive award an American undergraduate in science and engineering can receive. Stephanie has been performing experimental research on ozonolysis of high molecular weight organic compounds applied to ice nucleation with **Prof. Cantrell**. This research will help climate scientists improve their models by providing a more detailed understanding of the impact of biomass burning on cirrus clouds in the upper troposphere.

You will certainly agree that many of the successes achieved have been possible only because of 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 for undergraduate and graduate students. Your continued support is deeply appreciated.

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

Current Research

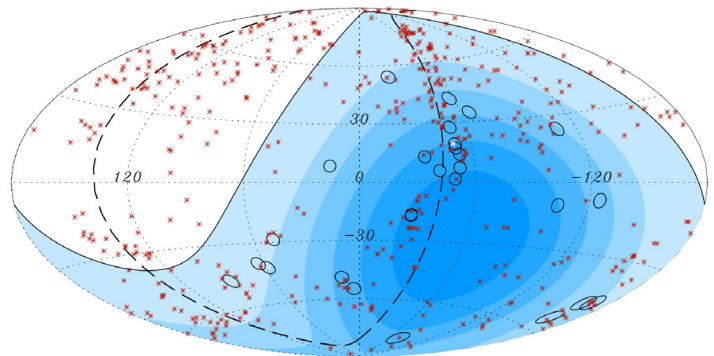
*Auger at Michigan Tech
Team Breaches Cosmic Mystery*

In a report published in the November 9th, 2007, issue of *Science*, the Pierre Auger Collaboration announced evidence for a correlation between the directions of the highest energy cosmic rays and nearby active galactic nuclei (AGNs). The Pierre Auger Cosmic Ray Observatory, which is just now nearing completion in the Mendoza province of Argentina, collected the data used in the analysis over the past 3.7 years, while the active area of the detector was growing. The observatory will have a detection area of 3000 km² when complete. This large area, the size of the Keweenaw Peninsula, is required because the highest energy cosmic rays are extremely rare. The high energy events reported in the *Science* article occur only once per square kilometer per century.

Michigan Tech physics faculty **David Nitz** and **Brian Fick** are founding members of the Auger Collaboration, and have seen the project through from conception, design, funding, construction, and now first major science results. MTU has been involved in the project for nine years, producing three PhD and four MS degrees. The MTU team now also includes postdoc **Johana Chirinos Diaz** and EECE faculty **Roger Kieckhafer**.

In addition to performing scientific analysis of the data from the Observatory, the Auger team at Michigan Tech developed

See **Research** inside



High Energy Cosmic Ray sky as seen by the observatory. The map is in galactic coordinates. Circles indicate the 27 highest energy cosmic ray events in the study, and the red dots are the locations of the nearby AGNs used in comparing the data.



Ranjit Pati

NSF CAREER Award

Assistant Professor of Physics **Ranjit Pati** has received the prestigious NSF Faculty Early Career Development Award. His project, entitled “CAREER: Theory and modeling of a mono-molecular field effect organic transistor (MOLFET)”, promises to identify an innovative transistor architecture for applications in molecular computing far beyond the Technology Roadmap for the year 2015. The research involves undergraduates through research and reaches a broad audience through visual animation.



Bryan Suits

Distinguished Teaching Award

Professor of Physics **Bryan Suits** was honored in the associate professor/professor category for 2007. The winning vote was facilitated by students taking the challenging but interesting Electronics for Scientists course with Suits. They found his methods exciting, fun, inspirational, and accessible. Suits has been instrumental in improving the physics curriculum and in student retention.



Miguel Levy

Michigan Tech Research Award

Professor of Physics **Miguel Levy** won the 2007 Research Award for his investigations into photonics and its applications. His work on magneto-photonic crystal technology has garnered international attention, attracted millions of dollars in funding, and led to many patents and publications. Levy has further advanced this field by mentoring graduate and undergraduate students in research.



John Jaszczak

Distinguished Service Award

Professor of Physics **John Jaszczak** received the Faculty Distinguished Service Award in 2007 for his diverse and prolonged efforts on behalf of the A. E. Seaman Mineral Museum. Jaszczak, Adjunct Curator of the museum, promoted the visibility and quality of the facility by organizing fundraiser events, instituting educational exhibits and talks, and involving the public in the topics of mineralogy and geology.

Research, *continued from front page*

electronic concepts, coding, and hardware used to detect the cosmic rays. In addition, they developed hardware and analysis techniques needed to monitor the clarity of the atmosphere, which is important for the energy calibration of the cosmic ray events. They tested hardware, some 1200 circuit boards, in environmental chambers at Michigan Tech to ensure they were robust enough to withstand the rigorous Argentinian climate where the detectors are located.

From the data sample used in this analysis, the 27 highest energy events showed a strong correlation with the location of nearby AGNs. AGNs have super-massive black holes at their core that consume matter from their host galaxies, which are now believed to be expelling by some unknown mechanism the highest energy cosmic rays in return. The close correlation between the directions of the cosmic rays and the locations of nearby AGNs provides strong evidence that these cosmic rays are protons. Heavier nuclei would be deflected by the intervening galactic and extra-galactic magnetic fields from their original direction by more than the observed few degrees.

“We are starting to map the universe in a new regime, using charged particles rather than photons. Exploiting this new

type of astronomy may lead us to amazing discoveries, as has been the case whenever the cosmos has been observed in a new part of the electromagnetic spectrum,” commented Chirinos.

“The most intriguing implication of this discovery is that nature has apparently given us a free beam of ultra-high-energy protons to play with. If we are clever, we can use this beam to do particle physics experiments, as we do in ground-based collider facilities. This opens up previously hidden regions in which to search for new and exotic particle physics phenomenon,” said Fick.

The cosmic ray events used in the analysis had energies above 5.7×10^{19} eV. It is not understood how nature can accelerate particles to these energies. Fermilab’s Tevatron accelerates protons and anti-protons up to energies of 10^{12} eV. The Large Hadron Collider (LHC) at CERN, which has not yet begun operation, will accelerate protons to 7×10^{12} eV. “One would have to expand the ring at LHC to the size of the orbit of Mercury in order to achieve the energies of the cosmic rays seen by the Auger Observatory,” commented Nitz. “The only way to probe hadronic interactions at that energy scale in the foreseeable future is by using these cosmic rays.”

Department Updates

John Jaszczak, Miguel Levy, and Jacek Borysow were promoted from associate professor with tenure to professor with tenure. Will Cantrell and Yoke Khin Yap were promoted from assistant professor without tenure to associate professor with tenure. Mike Meyer was promoted to lecturer.

Caroline Taylor and Dongyan Zhang have joined the department as adjunct faculty.

Professor Alex Kostinski recently returned from London, England, where he attended an annual meeting of the Editorial Board for a review journal entitled "Reports on Progress in Physics." Kostinski is one of two editors in the geosciences. The editors spend two days discussing exciting developments in their fields each year.

Professor Ulrich H. E. Hansmann is continuing his research collaboration with Jülich, Germany.

Associate Professor Raymond Shaw is visiting Leipzig, Germany, having received a Humboldt Fellowship.

Assistant Professor Ranjit Pati spent two weeks at Wright-Patterson Air Force Base in Dayton, Ohio, last summer. Pati was a USAF Summer Faculty Fellow, a program executed by the American Society for Engineering Education. Dr. Pati's work focused on computational materials within the Materials and Manufacturing Directorate.

Alexei Podtelezhnikov is with us as a visiting assistant professor. Vijaya Kumar Kayastha and Jiesheng Wang have received their PhDs at Michigan Tech and joined the department as postdocs.

Elizabeth Pollins has left the department to join Student Affairs. Physics welcomes Andrea Lappi as a new and returning Department Coordinator.

Yoke Khin Yap and Ravi Pandey attended the Indo-US Shared Vision Workshop on Soft, Quantum & Nano Computing (SQUAN-2007) in Agra, India.

Visit phy.mtu.edu to learn more about the many recent and past activities within the Physics Department. You will find an extensive News and Awards section under Features.

New Courses

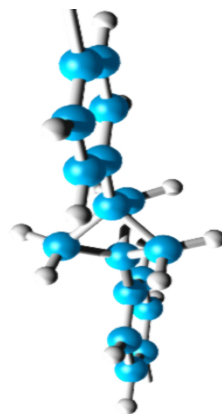
The Physics Behind Music (Bryan Suits)
Molecular Biology for Physicists (Dongyan Zhang)
Introductory Astronomy Online (Robert Nemiroff)
College Physics Online (Mike Meyer)

Recent Degree Recipients

	Destination
2007	
James Chye, PhD	Hawaii Pacific University
Jacob Fugal, PhD	NCAR, Boulder
Xiaoyue Huang, PhD	Seagate, Minneapolis
Vijaya Kumar Kayastha, PhD	Michigan Tech
Kah Chun Lau, PhD	NRL, Washington DC
Jiesheng Wang, PhD	Michigan Tech
Patrick Younk, PhD	University of Utah
Gouri Shankar Giri, MS	Univ of Groningen, Neth.
Benjamin Ulmen, MS	UIUC
Adam DeConinck, BS	UIUC
Joe Grochowski, BS	University of Maryland
Carly Robinson, BS	Univ of Colorado, Boulder
Katie E. Schalk, BS	Michigan Tech
B. Justin Scholfield, BS	
2006	
Himanshu Verma, MS	Univ of South Florida

Research Sponsorship

Research funding reached the \$2 million mark in 2006-07. Physics holds the largest research funding/expenditure totals for the College of Science & Arts. Recent sponsors include NSF, Department of Energy, Argonne National Lab, Michigan Tech Biotechnology Research Center, Office of Naval Research, USDA, and NASA.



NSF NUE

The NSF-sponsored Nanotechnology Undergraduate Education (NUE) in Engineering initiative has been granted to Michigan Tech again for two years. The project, entitled "NUE: Michigan Technological University (Michigan Tech) Nanotechnology Enterprise," is under the direction of John A. Jaszczak, Abdunnasser Alaraje, Mary B. Raber, Michael G. Bennett, and Paul L. Bergstrom. The first NUE grant in 2003 introduced undergraduate nanotechnology education at Michigan Tech, and in 2005 resulted in the offering of an interdisciplinary minor in "Nanoscale Science and Engineering (Nanotechnology)". The new cross-campus NUE program will focus on developing a new Nanotechnology Enterprise. The enterprise team is expected to develop a sustainable business model involving nanoscale science and engineering projects that they will subsequently carry out. In addition, the enterprise team will develop and deliver a variety of educational and outreach projects. Grant activity begins in January 2008.

Awards and Achievements

Adam DeConinck and Joe Grochowski received the 2007 Ian W. Shepherd Award for most outstanding physics graduates.

Physics graduate student Yanjie Wei will receive a \$2000 Finishing Award from the Michigan Tech Graduate School. Last year Lin Pan received that award. Ashley Shackelford will receive a \$1000 Recruiting Award.

Physics Department Graduate Student Presentations: Best Oral Presentation Award went to Wil Slough (\$100) and Best Poster Presentation Awards went to Shun Wu and Zhuoyuan Wu (\$60, each).

Undergraduate physics major Stephanie Irish has been named a 2007 Goldwater Scholar. The scholarship provides \$7,500 for tuition, fees, books and room and board. According to Assistant Provost Mary Durfee, "This is the most competitive award an American undergraduate in the bio-physical sciences, technology, engineering or math can receive."

Raymond Shaw was nominated for the Distinguished Teaching Award in the assistant professor or lecturer category.

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.

Alumni

Carl & Marlene Adams '62
John L. Baxandall '63
John & Louise Bretney '69
Leonard & Anne Buckman '60
Donald & Sharon Bullock '57
Ziyong & Ping Cai '88
James F. Capizzo '76
Michael C. Coleman '69
Kim & Barbara Crozier '68
Donald & Charlotte Daavettila '56
Peter DeGroot & Myrl Bishop '62
Yi Fu & Chunguang Zheng '98
Don & Norma Gendzwill '57
James & Dianna Gibson '63
Thomas & Dona Gould '63
Joel Graber & Lindsay Shopland '87
Roger & Carole Grates '60
Timothy & Carol Gump '72
Frank & Shirley Hastedt '58
Louis & Diane Hein '66
Stanley & Christine Jefferson '70
John & Elaine Johnson '64
Philip Kaldon & Deborah Morrow '88

Walter & Margaret Kauppila '64
Bruce & Peggy Knivila '63
Thomas & Renee Kugler '84
William & Joan Kure '50
Jack & Kaethe Labo '62
Samuel & Carol Lambert '62
Jerry & Ellen Lutz '84
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Robert & JoAnn Matheson '49
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Gerald & Patricia Schroeder '71
Gilbert & Sonia Sloan '48
Donald & Nora Sowers '59
Anthony & Sharon Suppelsa '63
Amin & Lily Sutjianto '95
Srirama Swaminathan & Kalpana Chandrasekharan '98
Michael & Mary Ellen Teneyck '64
John P. Thyren '94
Edmund & Christina Tisko '88
C. John & Kathryn Umbarger '64
Michael & Cynthia Vogel '76
Larry & Patricia Wittenbach '61
Dr. David E. Woon '84
Charles & Mary Zeigler '66

Friends

Keith & Wilma Baldwin
Winifred L. Blackford
Ronald & Rosanne Kruse
Mary Marchaterre & David Nitz

Senior Spotlight

Robert Niffenegger is one of the most active students on campus. As a Physics major and Astrophysics and Math minor, Robert has pursued his field interests with NASA Goddard and Ames internships each summer of his undergraduate career. On campus, he is involved with numerous organizations, such as Rock the Vote, residence hall activities, and Sigma Phi Epsilon fraternity. Niffenegger is president of the Michigan Tech Undergraduate Student Government, working with a half-million dollar budget to promote student organizations and create new student services.

Bob was one of the conceivers and organizers behind the World Record for the Largest Snowball Fight on February 10, 2006. The event involved nearly 4000 students and alumni of Michigan Tech. In addition to the largest snowball fight and most snow angels, the biggest snowball (6.77 ft diameter) was generated. Robert says "It was an exercise in determination, in sheer will." Certificates from Guinness now hanging in the Memorial Union attest to the enormity of the event.

Niffenegger has been professionally inspired by several people on campus, including physics professors and fellow students. Modern Physics Lab, Math Methods, and Electronics are among his favorite classes. Robert's future includes graduate school.

Staff Spotlight

Marg Rohrer

"My name is Marg Rohrer and I am a secretary in the Physics office, I have been in Physics since December of 2001. I have enjoyed working in this department since it gives me the opportunity to interface with students and Faculty alike.



"I live in Houghton with my three sons. Chip, my oldest (25) is a student in the Fine Arts Department and wants to be a Costume designer. Andy, (21) is working right now and I hope to get him back to Tech in the Spring, John, my youngest just finished up with Home schooling and took the last of his GED, and is a certified gunsmith.

"I am an avid rock collector and belong to the local Copper Country Rock and Mineral Club, I have held many offices in the past and am still very active. I am also involved with the Seaman Mineral Museum Society Board and help plan and run the annual ball fundraiser for the museum.

"Last but not least I am very involved on campus as I advise 5 student organizations. I have been the advisor to Alpha-xi-Zeta sorority for 10 years, I have been the advisor for Praise in Effect Gospel Choir for 6 years, I have been with Keweenaw Pride (GLBTA) Organization for 2.5 years and Delta Upsilon Fraternity for a year and half and the Social Dance Club for about a year. I enjoy working with all my groups and hope that I can bring something special to each one. I am also an avid sports fan and go to GSC softball, MTU Basketball, Hockey, Volleyball and football. If I can't make it I try to encourage the athletes when I see them on campus. I also make cookies for the Men and Women Basketball teams when they travel." -mr

Undergraduate Research

- ◇ Dow Corning Internship: **Tony Hegg**
- ◇ NASA Internship: **Robert Niffenegger**
- ◇ Research Experiences for Undergraduates: **Katie Thorne (MSU), Matthew Dunkman (Fermi Lab)**
- ◇ Michigan Space Grant Consortium: **Stephanie Irish**
- ◇ MTU Summer Undergraduate Research Fellowship: **Ben Coupland**

**A physicist is an atom's way
of knowing about atoms.**
—George Wald

Graduate Spotlight

Eli Ochshorn

"I came to Houghton in 2003 with the intent to work within the atmospheric physics group at Michigan Tech. This line of study allowed [me] to enroll in the typical selection of graduate level physics courses as well as a selection of atmospheric science courses. Hence, I feel as though I was able to acquire the more fundamental and rigorous training of an education in physics, as well as gain an understanding of how these skills could be applied to problems of the atmospheric sciences.



"The research that I have performed has centered around studying the molecular level properties of water at solid interfaces. The research is relevant to answering, for instance, why water beads up on some surfaces or why fog

forms on some spectacles more than others. The research also serves as a basis for understanding water that has condensed upon dust particles in the atmosphere, which we see as clouds. Whether or not a particular spec of dust will attract water to condense upon it, and whether or not the dust might trigger the water to freeze, are uncertainties that can be better understood through knowledge of the molecular level properties at the water/dust interface.

"In addition to gaining research skills during my stay here, I have had opportunities to gain teaching experience through the University. I have instructed for undergraduate laboratory courses, youth workshops, and undergraduate physics courses. I consider the experience that I have gained from teaching here to be very valuable, partly because I am considering potential career paths with teaching components.

"During my stay in Houghton, I have also been able to live a well balanced life by taking advantage of life outside of the university. I have enjoyed many days of bicycling, skiing, and hiking in many of the local forests and along the coasts of Lake Superior. I have also had the fortune of forging strong friendships with many of my fellow graduate students and residents within the local community. In general, I feel as though what I have gained from my experiences here will be valuable in guiding me after graduating this upcoming year." -eo

Eli won first prize in the annual Sigma Xi Colloquium Competition in 2005, sponsored by the Graduate Student Council. He works with Dr. Cantrell.



Physics News

Michigan Technological University

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Houghton, Michigan 49931

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Michigan Tech Physics Alumni - Get Listed On Our Website

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Any other information you may submit by logging in to MTU Huskylink at huskylink.mtu.edu.

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Current Position/Employer _____

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Other Information _____

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