

DIMENSIONS

NORTHWESTERN UNIVERSITY DEPARTMENT OF PHYSICS AND ASTRONOMY

Spring 2004



"The first requisite for success is the ability to apply your physical and mental energies to one problem incessantly without growing weary."

-Thomas A. Edison

The department would like to extend its congratulations to the following students who have earned their degrees. Academic success is the reward of work well-applied in not only what tasks are laid before us, but what endeavors we may follow during the course of our education. These students represent the leaders in a difficult field that may offer many challenges but also yield great rewards.

2004 Graduates

Bachelor's Degree

Janet Elaine Colucci
Dennis Matthew Flowers
Jeffrey Adam Kasten
Henry Shih

Igor V. Dubinsky
Ross D. Hays
Kyle Patrick Moyer

Matvey Farber
John William Hewitt
Mengkai Shieh
Michael Seth Turner

Master's Degree

Timothy Andeen Jr.
Hyounghoon Choi
John Stuart Halpine
Genya Takeda
Zingeng Yin

Carol Ann Braun
Anne Evelyn Dabrowski
Weiqiang Mu
Wanling Xu
Lan Luan

Paul Byshe Cadden-Zimansky
John Patrick Davis
Derek Axel Strom
Sahal Yacoob
Sung-Woong Yoon



Recognition, Appointments, & Awards...



CONGRATULATIONS...

In September, Professor **Melville Ulmer** will take on the challenging and exciting role of becoming the new department chairman. **Venkat Chandrasekhar** has been promoted, becoming a full Professor within the department. Also celebrating a promotion, **Michael Schmitt** has become an Associate Professor with tenure.

Two faculty members have recently received prominent awards, including the *Bessel Research Award* received by Prof. **Hui Cao**. The award is given by the Alexander von Humboldt Foundation, which grants approximately 10 Friedrich Wilhelm Bessel Research Awards annually. Each award goes to a young, top-flight scientist or scholar from abroad who is already recognized as an outstanding researcher in their field. Also, Prof. **Vicky Kalogera** has been awarded a *Cottrell Scholar Award* by the Research Corporation. The Cottrell Awards are given to outstanding young faculty members in PhD-granting astronomy, chemistry and physics departments in the U.S. and Canada. Prof. Kalogera was selected as one of only 11 who received the prestigious award this year.

Northwestern alum **Linda Spentzouris** has earned a National Science Foundation CAREER award in particle physics while working in her new position as Associate Professor at the Illinois Institute of Technology.

The **2004 Robot Design Competition** brought more than two dozen teams of robot-builders together at the Patton gym on May 22nd. This year, the Society of Physics Students received the prize for the “sexiest” looking robot in this year's event. They built

their robot from scratch using stepper motors, half a disco ball and a micro-processor chip, which was programmed to control the robot. The course was designed so that three robots competed at once while tethered together by a bungee cord. All three performed with the objective of popping a number of balloons placed on the course.



The team had been designing and building the robot since the Fall quarter of last year. This is the third time the club has fielded a robot in the Design Competition.

In the news...

Muge Karagoz Unel appeared in an article titled “*CDF Searches for the Unknown in High-mass Dileptons*” in the February 5th edition of FERMINEWS. The article is available on-line on the Fermilab National Accelerator Laboratory web site at: http://www.fnal.gov/pub/today/archive_2004/today04-02-05.html.

A new book, titled “*The Physics of Superconductors - Vol. II Superconductivity in Nanostructures, High- T_c and Novel Superconductors, Organic Superconductors*” is now in print from Springer publishing. The book is co-edited by the department's own Prof. **John Ketterson**. Copies can be purchased either through Amazon.com, or directly through Springer Science Online at: <http://www.springeronline.com>.

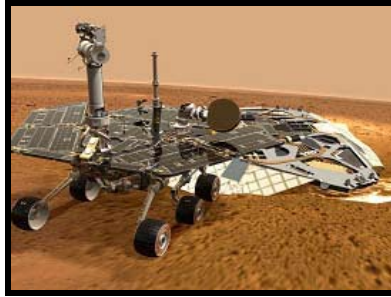


EDUCATION & ANNOUNCEMENTS



Public Lecture Series

Prof. **Farhad Yusef-Zadeh** hosted a public lecture presented by Dr. **Doug Roberts** on May 5th. The title of the lecture was *“The Changing Face of Mars”* and it attracted a number of interested visitors. Prof. Zadeh will be posting the contents of the lecture on-line in the near future and faculty members will be invited to use details of the material in their teaching.



Research Highlights

The work of Prof. **Arthur Freeman** and postdoc **Julia Medvedeva** will soon appear in the Physical Review Letters in an article titled *“Light induced paths for persistent conductivity”*. The piece will explain how two seemingly contradictory properties, optical transparency (as in glasses, which are not conducting) and electrical conductivity (as in metals, which are not transparent) can be combined in “mayenite”, or calcium aluminate (a very common inexpensive material whose constituents are found in concrete sidewalks) when subjected to hydrogen doping and ultraviolet radiation. The first-principle quantum simulations demonstrate that the light activates narrow conducting channels in nanoporous (around 0.6 nm in diameter) cages of transparent mayenite and produces persistent conductivity. Understanding how the electrical carriers behave while moving along these channels allows researchers to predict a way to control the conductivity over many orders of magnitude by targeting particular atoms and their spatial arrangement and/or by creating additional paths for the charge transport. The team is enthusiastic, stemming from their belief that mayenite represents the first of a new class of transparent conductors. The new conductors

have the potential to combine 100% optical transparency with useful electrical conductivity, which can be employed in a number of advanced technologies. The applications could include flat-panel displays, solar cells and invisible circuits.

Travel Services Update

For those that remember the inconvenience and expense of the old NU Travel Services, there are now four different travel booking options with direct billing to CUFS accounts. In addition, the partnering travel agents can usually meet or beat online airfares while providing the flexibility to make changes even after flights are purchased. The three partnering travel agencies are:

Tower Travel (866) 682-8785

Four Corners (847) 869-3366

Intraworld (847) 491-6930

(Service fees apply: \$19.50 domestic and \$25.00 international)



Faculty and staff may also book flights online using the Compass booking system. This



system offers 24-hour access and has a low transaction fee

of just \$5. Compass can accept CUFS accounts as well as personal credit cards. Please visit <http://www.univsvcs.northwestern.edu/travel/compass.htm> to access Compass and to view instructions for first-time users. University NetIDs and employee IDs are necessary to access this site.

Faster service with Tower Travel can be set up by going to the Compass site above to set up a profile that specifies traveler personal information, travel preferences and frequent traveler numbers.

For information on travel policies and discounts for airfare, car rentals and hotels, please take a moment to visit: <http://www.univsvcs.northwestern.edu/travel/>.



Research Awards

January 2004 - May 2004



David A. Buchholz & Heidi M. Schellman

High Energy Experimental Physics Program
Task C
Department of Energy
December 2003 – November 2004
\$385,000

David A. Buchholz & Jerome L. Rosen

High Energy Experimental Physics Program
Task D
Department of Energy
December 2003 – November 2004
\$124,000

Hui Cao

“CAREER: Microscopic Study of Photon Localization”
National Science Foundation
June 2004 – May 2005
\$89,999

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$36,905

Venkat Chandrasekhar

“Local Spectroscopy of Ferromagnetic/Superconductor
Nanostructures”
National Science Foundation
June 2004 – May 2005
\$65,000

“Proximity-Coupled Normal Metals and Ferromagnets”
National Science Foundation
May 2004 – April 2005
\$100,000

Pulak Dutta

“X-Ray Studies of Liquids Near Interfaces and in Thin
Films”
National Science Foundation
June 2004 – May 2005
\$110,000

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$36,905

Donald E. Ellis

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$36,905

Arthur J. Freeman

“Predicting Aspects of Mechanical Behavior via
Fundamental Electronic Structure
Characteristics of Homogenous Phases and
Intrinsic Surfaces”
Air Force Office of Scientific Research
December 2003 – February 2004
\$33,761

“Energetics, Bonding Mechanism and Electronic
Structure of Ceramic/Ceramic and
Metal/Ceramic Interfaces”
Department of Energy
April 2004 – March 2005
\$75,000

“Fundamental Electronic Structure Characteristics
and the Mechanical Behavior of Materials for
Aerospace Applications”
Air Force Office of Scientific Research
March 2004 – September 2004
\$72,917

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$44,301

Bruno Gobbi

High Energy Experimental Physics Program
Task H
Department of Energy
December 2003 – November 2004
\$223,000

William P. Halperin

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$36,905

Vassiliki Kalogera

“Genetic Algorithms in Gravitational Wave
Astrophysics”
Research Corporation
May 2004 – May 2006
\$75,000

“An Ultra-Deep Study of M101”
NASA
January 2004 – January 2005
\$27,331

“Discrete X-Ray Source Populations and Star Formation History in Nearby Galaxies”
NASA
Subcontract: Smithsonian Astrophysical Observatory
October 2003 – March 2004
\$16,123

John B. Ketterson

“Chalcopyrite and Orientation-Patterned Semiconductors of Mid-IR Sources: Modeling, Growth and Characterization (MURI)”

Department of Defense
Subcontract: Stanford University
January 2004 – May 2004
\$49,999

NSF/MRSEC Research Allocation
National Science Foundation
Materials Research Center
March 2004 – August 2004
\$36,905

John B. Ketterson & Arthur J. Freeman

“Chalcopyrites for Spintronics Application”
Defense Advanced Research Projects Agency
August 2003 – July 2004
\$78,270

James T. Lauroesch & David M. Meyer

“The Physical Character of the Smallest-Scale Interstellar Structures”

NASA
Subcontract: Space Telescope Science Institute
March 2004 – October 2004
\$30,408

David M. Meyer

“Small-Scale Structure in the Diffuse Interstellar Medium”

NASA Goddard Space Flight Center
March 2004 – March 2005
\$99,734

David M. Meyer & James T. Lauroesch

“AU-Scale Interstellar H₂ Structure Toward HD 37903?”

NASA
March 2004 – March 2005
\$22,500

“An H₂ Survey of the Complex Interstellar Structure Toward η and χ Persei”

NASA
February 2004 – February 2005
\$16,572

Robert J. Oakes

High Energy Experimental Physics Program
Task F
Department of Energy
December 2003 – November 2004
\$73,000

Frederic A. Rasio

“Stellar Collisions in Dense Star Clusters and Galactic Nuclei”

NASA
May 2004 – May 2005
\$102,107

“Binary Stars and Globular Cluster Dynamics”

NASA
April 2004 – April 2005
\$21,199

Jerome L. Rosen

High Energy Experimental Physics Program
Task A

Department of Energy
December 2003 – November 2004
\$40,000

Michael H. Schmitt

High Energy Experimental Physics Program
Task B

Department of Energy
December 2003 – November 2004
\$140,000

Ralph E. Segel

“Physics with Rare Isotope Beams”

Department of Energy
January 2004 – December 2004
\$60,000

Melville P. Ulmer & George C. Shatz

“Self-Assembly of Optical Structures in Space”

NASA
Subcontract: NASA Institute for Advanced Concepts
October 2003 – March 2004
\$62,000

Melville P. Ulmer & Bruce W. Wessels

“The Development and Testing of GaN Based EBCCDs for Visible-Blind UV Imaging”

NASA
January 2004-December 2004
\$105,000

“GaN Photo-Cathode Structures for Detection and Imaging in the UV”

NASA
January 2004 – December 2004
\$100,000

Mayda M. Velasco

High Energy Experimental Physics Program
Task C

Department of Energy
December 2003 – November 2004
\$75,000

Farhad Yusef-Zadeh

“SGR A*”
NASA
May 2004 – April 2005
\$13,600