

DIMENSIONS

NORTHWESTERN UNIVERSITY DEPARTMENT OF PHYSICS AND ASTRONOMY

FALL 2005



Gideon Alon



Derek Barge



Jin-Yon Bryne Tan



Paul Dalach



Ketan Dandare



Nastaran Hadizadeh



Wei-Chih Huang



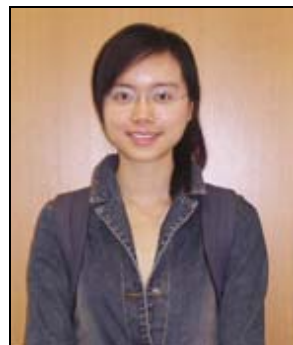
Zhe Li



Walter Maksym



Monika Patel



Xiao Wu

**Welcome
to our
new
graduate
students!**

Recognition, Appointments and Awards...

Congratulations to **Prof. Hui Cao** who was awarded the 2006 Maria Goeppert-Mayer award. The American Physical Society gives this award to recognize and enhance outstanding achievements by a woman physicist in the early years of her career, and to provide opportunities for her to present these achievements to others through public lectures in the spirit of Maria Goeppert-Mayer. Hui Cao's principal research interest is optical processes in nano-structures. A special thanks to Prof. Art Freeman, Prof. John Ketterson and Prof. Ron Taam of the awards committee who oversaw the nomination material.

Within the past year two of the department's former High Energy students, Paolo Rumerio and Teresa Fonseca, were awarded CERN Fellowships. This is one of the most prestigious and better paid European Fellowship in the field.

Paolo Rumerio received the CERN Fellowship in the selection that took place in November of 2004 and has already started to work on the LHC CMS experiment. He is focusing on the Electromagnetic Calorimeter, which is the main detector for the $H \rightarrow 2\gamma$'s discovery channel of the Higgs boson. He was a student of Jerry Rosen on the Charmonium experiment at FNAL.

Teresa Fonseca was awarded a CERN Fellowship in the most recent selection which took place in May 2005. She will

start in the next few months. Teresa earned her PhD this summer for work done at the NA48 CERN experiment, which is devoted to studying CP violation in rare Kaon decays. She was the first PhD student of Mayda M. Velasco.

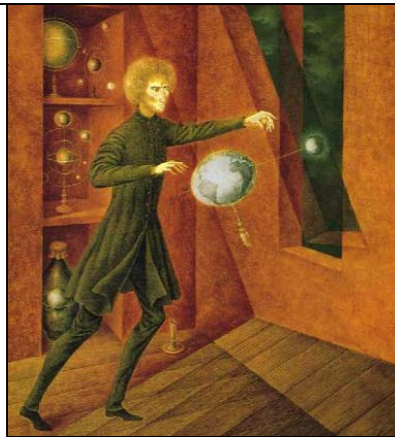
Professor Arthur J. Freeman was given a courtesy faculty appointment in the Department of Materials Science and Engineering. Professor Freeman's research interests lie in developing computational methods and programs for carrying out first-principles modeling/simulations of complex materials and phenomena. Prof. Freeman is a pioneer in computational physics and computational materials science. His first-principles approaches (i.e., without adjustable parameters) based on the local density approximation, have provided a universal method for treating all materials.

Congratulations to **Professor Mayda M. Velasco** on her promotion to Associate Professor. Prof. Velasco's research on high-energy particle physics is currently centered around three at the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland.

Prof. Vicky Kalogera received a Faculty Early Career Development (CAREER) award from the National Science Foundation (NSF). The program recognizes and supports the early-career development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century. Prof. Kalogera's CAREER project, "Theoretical Studies of Compact Objects in Binary Systems", will involve theoretical research related to the formation and evolution of binary systems with compact objects.

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"Physics" Remedios Varo



In June 2005, Physics and Astronomy graduate student **Megan M. Krejny** was awarded a three-year Graduate Student Researchers Program (GSRP) Fellowship by the National Aeronautics and Space Administration. Megan's GSRP award will support her research in the area of submillimeter spectropolarimetry that she is carrying out in collaboration with her adviser Prof. Giles Novak and with Dr. David Chuss at NASA-Goddard Space Flight Center. Megan will use Northwestern's new polarimeter, SHARP, that operates at the Caltech Submillimeter Observatory on Mauna Kea, Hawaii, to study the grain size distribution in protoplanetary disks. Her goal is to find evidence of grain size growth which may represent a first step toward planet formation.

Congratulations go out to **Hyungsoon Choi** and **Johannes Pollanen** who completed The LaSalle Bank Chicago Marathon on Sunday, October 9th. Choi finished with a time of 04:10:41 and Pollanen with 03:35:50.



Rachel Scheidegger and **Mia Ihm** won third place this year in the spring Design Competition run by the School of Engineering. Each student team designs and builds a robot, that can, without human intervention, negotiate a course and a series of tasks in the shortest time while also defending itself against another robot out to accomplish the same task. They were sponsored by the Physics Club which has sponsored a team for each of the last three years. This is the first time a Physics Club team has placed in the top three.



This past June the department awarded the very first top TA award to **Johannes Pollanen**. The award was created to acknowledge the outstanding performance of a graduate student TA. Johannes was the sole discussion TA for Professor Debbie Browns Physics 135-2 (190 students). Here are some of the comments received from students after nominating Johannes for the award:

"Johannes was the best TA I ever had at Northwestern. He is clear and articulate and has a real talent for teaching..."

"...He assumed complete responsibility in making sure that concepts were understood by all students..."

"...He had a way of explaining physics so that it was simple and understandable. He taught his section with enthusiasm and seemed to genuinely want to be there and to help the students..."

"...His enthusiasm and relaxed approach met us each week and made our weekly quizzes much more conquerable."

Prof. Mel Ulmer wrote the proposal that was submitted to the standard Hubble review process in requesting observations of the moon for mineral deposits that may contain oxygen. The *New York Times*, *MSNBC*, *The Christian Science Monitor*, and *Pravada* wrote articles concerning the Hubble program.

Congratulations to **Anastasios Fragkos**, graduate student of Prof. Vicky Kalogera, on receiving a tuition award from the Gerondelis Foundation. The foundation offers scholarships up to \$3,000 to first year college students of at least one fourth Greek lineage.

New Additions...

There have been new additions to Department families within the past semester. Introducing...

Stefan George Rasio
Born to proud parents
Fred Rasio and Vicky Kalogera



Born: Friday, September 23, 2005
Weight: 7 pounds 2 ounces
Height: 20.5 inches

Benjamin Ryan Knauth
Born proud parents David and
Sheri Knauth and big sister Charlotte



Born: Monday, September 12, 2005
Weight: 7 pounds 6 ounces
Height: 19.5 inches

On June 24, 2005 a retirement banquet was held in honor of **Professor Ralph Segel**, who retired in 2004. Colleagues, family and friends gathered to pay tribute to Prof. Segel and acknowledge his many contributions to the field.



Comings...

Please join us in welcoming the following additions to the department.

Sarah McVicar has joined our department as the new Dearborn Observatory Program Assistant. Sarah hails from Michigan where she attended Northern Michigan University.

With the departure of Sophia Myers, **Jasmine Kacar** has joined the department as a temp in the academic office.

...and Goings

We bid a fond farewell to the following people who have left the department for bigger and better things.

Julia E. Medvedeva and **Alexey Yamilov** have moved on to the University of Missouri Rolla. Julia was given a position as a tenure-track assistant professor. Alexey was given a position as a research professor, also with a tenure-track position.

Miyoung Kim PhD has moved back to Korea and has a Research Professorship at Seoul National University.

Sean Fleming PhD has accepted a tenure-track position in Nuclear Theory at the University of Arizona.

Sophia Myers has left our department to move on to Evanston Hospital and pursue a career in her field of study.

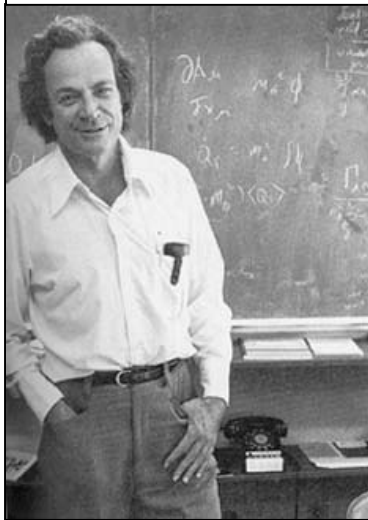


Publicatons...

Professor Arthur Schmidt, Aysha Chowdhry, and Ealine Tsao published an article, “Transverse Vibrating Modes of a Resonance Wire Loop”, in the May 2005 edition of the Northwestern Undergraduate Research Journal. Aysha and Elaine were students of Professor Schmidt’s who did an independent study with him. The Resonance Wire Loop is a popular lecture demonstration made by PASCO that has some very curious and up to now undocumented properties.

Professor Laurie M. Brown edited a book that was published in July 2005 called “FEYNMAN’S THESIS — A New Approach to Quantum Theory”. Richard Phillips Feynman (May 11, 1918 – February 15, 1988) was one of the most influential American physicists of the 20th century, expanding greatly the theory of quantum electrodynamics.

Richard Feynman



Conferences...



This years MODEST conference was organized by Craig Heinke, Natasha Ivanova and Fred Rasio. The conference commenced August 29-31 and was highly attended. MODEST is a loosely knit collaboration between various groups working in stellar dynamics, stellar evolution, and stellar hydrodynamics.



This year Prof. Mayda Velasco, Prof. Andre de Gouvea, and Prof. Robert J. Oakes helped to coordinate the Kaon International Workshop. The workshop was held June 13-17th. The purpose of the workshop is to bring together the latest experimental and theoretical developments on flavor physics with particular emphasis in the kaon system.

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2005



RESEARCH AWARDS

April 2005 – October 2005

Hui Cao

“Plasmonics and Molecular Based Electronics: Fundamentals and New Tools” (IRG #3)

NSF/MRSEC

September 2005 – August 2006

\$30,283

“CAREER: Microscopic Study of Photon Localization”

NSF

June 2005 – May 2006

\$89,999

Pulak Dutta

“X-Ray Studies of Liquids near Interfaces and in Thin Films”

NSF

June 2005 – May 2006

\$110,000

“In Situ X-Ray Studies of Adsorption, Nucleation and Self-Assembly at Soft-Hard Interfaces”

DOE

November 2004 – October 2005

\$159,951

Donald E. Ellis

“High Performance Nano-Crystalline Oxide Fuel Cell Materials: Defects, Structure, Interfaces, Transport and Electrochemistry”

DOE

September 2005 – August 2006

\$76,060

“Synergistic Linear and Nonlinear Phenomena in Multifunctional Oxide Ceramic Systems” (IRG #1)

NSF/MRSEC

September 2005 – August 2006

\$56,567

Institute for Environmental Catalysis

DOE

June 2004 – May 2005

\$10,917

Donald E. Ellis and John B.

Ketterson

“Inter-American Materials Collaboration: Surface Structure and Metal Uptake of Apatite Films and Particles”

NSF

August 2005 – July 2006

\$155,000

Arthur J. Freeman

“Advanced Tools for Computational Materials Engineering”

ONR

Subcontract: Questek Innovations

LLC

June 2005 – September 2006

\$316,558

“Synergistic Linear and Nonlinear Phenomena in Multifunctional Oxide Ceramic Systems” (IRG #1)

NSF/MRSEC

September 2005 – August 2006

\$77,531

“Energetics, Bonding Mechanism and Electronic Structure of Ceramic/Ceramic and Metal/Ceramic Interfaces”

DOE

April 2005 – March 2006

\$75,000

William P. Halperin

“Order Parameter Structure in Thin Films and Disordered Superfluid ³He”

NSF

August 2005 – July 2006

\$152,000

“Antiferromagnetism and Superconductivity”

DOE

September 2005 – June 2006

\$140,000

Vassiliki Kalogera

Fellowship in Science and Engineering

David & Lucile Packard Foundation

October 2005 – September 2006

\$125,000

“A Deep X-Ray Observation of the Fornax Dwarf Spheroidal Galaxy”

NASA Goddard Space Flight Center

October 2005 – September 2006

\$14,002

“Discrete X-Ray Source Populations and Star-Formation History in Nearby Galaxies”

NASA

Subcontract: Smithsonian

Astrophysical Observatory

September 2005 – August 2006

\$17,153

“Understanding the X-Ray Binary Populations of Nearby Galaxies

Revealed by the Chandra Observatory: Super Star Clusters and Starbursts” (Fellowship for J. Sepinsky)

NASA

September 2005 – August 2006

\$24,000

Vassiliki Kalogera and Frederic A.

Rasio

“Stellar Sources of Low-Frequency Gravitational Waves”

NASA

April 2005 – March 2006

\$45,348

John B. Ketterson

“Plasmonics and Molecular Based Electronics: Fundamentals and New Tools” (IRG #3)

NSF/MRSEC

September 2005 – August 2006

\$30,283

John B. Ketterson and Arthur J.

Freeman

“Chalcopyrites for Spintronics Application”

DARPA

August 2004 – July 2005

\$105,971

John B. Ketterson and David M.

Kelso

“SENSORS: Collaborative Research: Biochemical Sensors and Data Processing for Security Applications”

NSF

September 2005 – August 2006

\$120,000

James T. Lauroesch

“An Archival Survey of Instellar Abundances in the Magellanic Clouds”

NASA

Subcontract: Space Telescope Science Institute

August 2005 – July 2007

\$8,641

continued on next page...

James T. Lauroesch and David M. Meyer

“Digging for Interstellar Rare Elements in Archival UV Spectra”
NASA
Subcontract: Space Telescope Science Institute
August 2005 – July 2007
\$17,281

Giles A. Novak

“Collaborative Research: Submillimeter Polarimetry with SHARP”
NSF
September 2005 – August 2006
\$42,373

“From Dust to Planets—Multi-Wavelength Polarimetric Studies of Protostellar Disks” (Support for Megan Krejny)
NASA
July 2005 – June 2006
\$24,000

“A Novel Architecture for Multi-Wavelength Polarization Modulation for Far-Infrared through Millimeter Systems”
NASA Goddard Space Flight Center
April 2005 – March 2006
\$35,000

Frederic A. Rasio

“Dynamics of Extrasolar Planetary Systems”
NSF
August 2005 – July 2006
\$132,326

“Hydrodynamic Calculations of Coalescing Compact Binaries”
NSF
August 2005 – July 2006
\$40,000

“Stellar Collisions in Dense Star Clusters and Galactic Nuclei”
NASA
May 2005 – May 2006
\$49,918

“REU: Hydrodynamic Calculations of Coalescing Compact Binaries”
NSF
August 2004 – July 2005
\$6,000

Ralph E. Segel

“Research into the Measurement of the Proton Form Factor”
(Fellowship for Issam Qattan)
DOE
Subcontract: Argonne National Laboratory
September 2005 – December 2005
\$9,016

“Physics with Rare Isotope Beams”
NSF
January 2005 – December 2005
\$9,000

Melville P. Ulmer

“Plasma Sprayed Metal/Ceramic Composite for Light Weight X-Ray Mirrors”
NASA STTR
Subcontract: Powdermet, Inc.
September 2005 – August 2006
\$127,367

Illinois Space Grant Consortium
NASA
Subcontract: University of Illinois, Urbana-Champaign
March 2005 – February 2006
\$75,000

“Nickel-Syntactic Hybrid Mirrors”
NASA STTR
Subcontract: Cornerstone Research Group
January 2005 – January 2006
\$40,000

“Rediscovering the Unseen with Ultraviolet Light”
NASA
January 2004 – December 2005
\$14,950

“Replication Multilayer Optics Development, Phase I”
NASA
Subcontract: Osmic, Inc.
May 2005 – September 2005
\$25,106

“Development of High Performance laminated Electroformed Shape Memory Composite Materials for Lightweight and Deployable Optics”
NASA
March 2005 – July 2005
\$109,826

National Space Grant College and Fellowship Program
NASA
Subcontract: University of Illinois, Urbana-Champaign
February 2005 – April 2005
\$24,509

Mayda M. Velasco

“Development of Beam Instrumentation for CLIC at the CTF3 Facility at CERN”
DOE
September 2005 – August 2006
\$45,000

“Ground Motion Studies at NuMI”
DOE
September 2005 – August 2006
\$28,000

Farhad Yusef-Zadeh

“Supernova Remnants Interacting with Molecular Clouds”
NSF
June 2005 – May 2006
\$66,406

“X-Rays from the Super Star Cluster Westerlund 1”
NASA
Subcontract: Smithsonian Astrophysical Observatory
May 2005 – May 2006
\$25,672

“A Proper Motion Study of the Ionized Gas in the Vicinity of the Galactic Center Black Hole”
NASA
Subcontract: Space Telescope Science Institute
May 2005 – December 2005
\$11,568



CALENDAR OF EVENTS

October

- 24 High Energy Physics Seminar
“Off-the-wall Higgs in the Randall-Sundrum Model”
Prof. Ben Lillie
Univ. of Chicago Argonne
4:30 p.m. Tech F235
- 27 Condensed Matter Seminar
“Small-angle X-ray Scattering Measurements of 3He-4He Mixtures in Aerogel”
Prof. Laurence Lurio
Northern Illinois University
4:00 p.m. Tech F235
- 28 Nonlinear Science Seminar
“Towards a Digital Bacterium”
Prof. Thierry Emonet
Univ. of Chicago
2-3:00 p.m. Tech M416
- 28 Colloquium
“Massively Parallel Dip Pen Nanolithography: Towards Combinatorial Nanotechnology”
Prof. Chad Mirkin
Northwestern University
4:00 p.m. Tech Room L211
- 31 High Energy Physics Seminar
TBA
Prof. Puneet Batra
Argonne
4:30 p.m. Tech F235

November

- 1 Astrophysics Seminar
“Control of Star Formation by Supersonic Turbulence and Gravitational Instability”
Prof. Mordecai MacLow
American Museum of Natural History
4:00 p.m. Dearborn 23
- 4 Nonlinear Science Seminar
“How Fishes Swim: Experimental Hydrodynamics and the Mechanics of Flexible Propulsors”
Prof. George Lauder
Harvard University
2-3:00 p.m. Tech M416
- 4 Colloquium
“Neural Signaling in the Cerebellum”
Prof. Chad Mirkin
Northwestern University
4:00 p.m. Tech Room L211
- 7 High Energy Physics Seminar
TBA
Prof. Alessandro Cerri
LBNL
4:30 p.m. Tech F235
- 8 Astrophysics Seminar

“Cataclysmic Variables: Things that go bump in the night”
Prof. Knox Long
Telescope Science Institute
4:00 p.m. Dearborn 23

- 11 Colloquium
“Tests of Gravity at the Millimeter Scale and Below”
Prof. Joshua Long
Indiana University
4:00 p.m. Tech Room L211
- 14 High Energy Physics Seminar
TBA
Prof. Jennifer Klay
LLNL
4:30 p.m. Tech F235
- 15 Astrophysics Seminar
“Physical Conditions and Morphologies in the Diffuse ISM”
Prof. Carl Heiles
Univ. of California Berkeley
4:00 p.m. Dearborn 23
- 17 Condensed Matter Seminar
TBA
Prof. Dan Prober
Yale University
4:00 p.m. Tech F235
- 18 Nonlinear Science Seminar
“The Interior of Mushy Layers Revealed”
Prof. M. Grae Worster
Cambridge, UK
2-3:00 p.m. Tech M416
- 18 Colloquium
“Wrapping Light Around a Hair”
Prof. Eric Mazur
Harvard University
4:00 p.m. Tech Room L211
- 22 Astrophysics Seminar
“Diversity in Young Neutron Stars: The High-Magnetic-Field Puzzle”
Prof. Vicki Kaspi
McGill
4:00 p.m. Dearborn 23
- 29 Astrophysics Seminar
“Observation of Star Formation in the Galaxy”
Prof. Barbara Whitney
Wisconsin
4:00 p.m. Dearborn 23

December

- 2 Nonlinear Science Seminar
“An Articulated Fish Swimming with Point Vortices”
Dr. Eva Kanso
University of South California
2-3:00 p.m. Tech M416
- 5-9 **FINAL EXAMS**
- 8 Condensed Matter Seminar
“Ultrafast Optical Nonlinearities of Single Gold Nanorods”

Dr. Matthew Pelton
Univ. of Chicago
4:00 p.m. Tech F235

- 9 **DEPARTMENT HOLIDAY PARTY**
3:30 P.M. TECH F235

January

- 9 High Energy Physics Seminar
TBA
Prof. Jon Hayes
Northwestern University
4:30 p.m. Tech F235
- 13 Colloquium
TBA
Prof. Wayne Saslow
Texas A&M
4:00 p.m. Tech Room L211
- 27 Colloquium
“Low-Energy Tests of the Standard Model”
Prof. Guy Savard
Argonne
4:00 p.m. Tech Room L211

February

- 3 Colloquium
“The Top Quark Today”
Dr. Hugh Montgomery
Fermilab
4:00 p.m. Tech Room L211
- 10 Colloquium
TBA
Prof. Robijn Brinsma
UCLA
4:00 p.m. Tech Room L211
- 17 Colloquium
“Search for the Electric Dipole Moment of the Electron”
Prof. David DeMille
Yale University
4:00 p.m. Tech Room L211
- 24 Colloquium
“Thoughts on Dark Matter, Dark Energy, Inflation”
Prof. Rocky Kolb
Fermilab & Univ. of Chicago
4:00 p.m. Tech Room L211

March

- 3 Colloquium
“Inertial Confinement Fusion Research on the Z Pulsed Power Facility”
Dr. Keith Matzen
Sandia Labs
4:00 p.m. Tech Room L211