Department of Physics

Annual Report AY 2008-09

College of Arts and Sciences – Drexel University



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Mission Statement:

To expand our understanding of the physical universe through basic and applied research and prepare students of all disciplines for technical excellence and thoughtful citizenship through innovative instruction and engagement in the process of discovery.

PHYSICS AT A GLANCE

Personnel

Professors: 15 Associate Professors: 4 Assistant Professors: 3 Teaching Faculty: 1 Research Staff: 7 Professional and Technical Staff: 4

Enrollment

Students Enrolled in Physics Courses in 2008: 5,305 Student Credit Hours: 19,182 Undergraduate Enrollment: 61 Graduate Enrollment: 38 SAT Average (students enrolled): 1301 GRE Quant. Average (students enrolled): 703

Degrees Conferred

BS Degrees Awarded: 6 MS Degrees Awarded: 8 PhD Degrees Awarded: 2

Research

External Research Grants Awards (FY): \$2,122,660 Research Expenditures (FY): \$2,280,093 Refereed Publications: 40 Conferences and Other Presentations: 94

LEADING THE WAY



I am pleased to provide this overview of activities within the Department of Physics. In this year of great financial uncertainties, it is my pleasure to report that students, staff, and faculty had a year of vast accomplishments.

We are particularly proud to have had Drs. Brigita Urbanc and Luis Cruz Cruz join our faculty as associate professors in our already very strong Biophysics group. We also welcomed Dr. Joseph Trout as a Teaching Assistant Professor. Unfortunately this year also saw the passing of Professor Emeritus Paul Kaczmarczik. It was a bitter-sweet occasion to host the 14th Annual Kaczmarczik Lecture without his physical presence. On that occasion Dr. Geoffrey Marcy, Professor of Astronomy, University of California, Berkeley, presented a thought provoking talk on "Searching for other Earths and Life in the Universe".

This year we saw great accomplishments by our students. The Department was host to five

STAR undergraduate students. Students completed Co-Op cycles abroad, in particular in Cambridge University and Trinity College in Dublin. A large number of our undergraduates engaged in research that lead to conference presentations and papers. Our graduate program thrive under the direction of Dr. Michael Vogeley. Our graduate students form a very dynamic group with activities ranging from lunch seminars to great research.

The Department was very productive in research. Our researchers were awarded a total of \$2,122,661 in new grants, published 40 peer-review articles and gave 94 talks and poster presentations. Dr. Jelena Maricic received an Outstanding Junior Investigator Award from the U.S. Department of Energy. We joined the collaboration building the Large Synoptic Survey Telescope (LSST), the next world's most powerful survey telescope, poised to revolutionize our understanding of the universe.

Our members were very active in our teaching and outreach missions as well. The new calculus-based Physics sequence continues with resounding success. Professor McMillan co-authored "Astronomy: A Beginner Guide to the Universe" 6th edition. Our Society of Physics Students (SPS) continued to receive national recognition and was recognized for its outstanding outreach activities. In particular, it hosted a Rube Goldberg competition as the culmination of the Physics Mentorship Program at the Independence Charter School (ICS).

I invite you to peruse this report to learn more about our vibrant Department. Information is also available on-line at www.physics.drexel.edu.

Sincerely, Michel Vallines

Michel Vallières, Head Department of Physics

NEW FACULTY & STAFF



Brigita Urbanc, PhD, associate professor. Urbanc's current research interests are the development and application of statistical physics methods to neuroscience of Alzheimer's disease and normal aging; and the application of discrete molecular dynamics simulations to study folding and aggregation of proteins associated with disorders, such as Alzheimer's amyloid beta protein and Parkinson's alpha-synuclein, as well as other proteins, such as mucin.



Luis Cruz, PhD, associate professor. His research interests are the study of the loss of spatial organization of neurons in the aged brain using density maps; the folding of the Alzheimer amyloid beta protein using all atom molecular dynamics; growth of plaques in Alzheimer's disease using cellular automata models; and fluid flow through porous media using lattice models.



Joseph Trout, PhD, teaching assistant professor. Trout is responsible for developing, managing, and maintaining physics demonstrations for use with the lecture components of the department's lowerdivision courses. In addition, he is responsible for the development and administration of introductory physics laboratories for physics and engineering majors.

Undergraduate Achievements

- Alyssa Wilson was named a 2009 Gates Cambridge Scholar. The fellowship supports students in graduate study at the University of Cambridge in the United Kingdom. Wilson was selected as one of 37 Gates scholars from a pool of 752 applicants nationwide. Wilson is pursuing a PhD in physics with the Atomic, Mesoscopic and Optical Physics Group at Cambridge.
- Jerome Mlack, Vice-President of the Drexel Chapter of the Society of Physics Students, received the SPS Leadership Award from the American Institute of Physics. The award in the amount of \$2000 is based on high academic performance and active participation in SPS programs.
- For a third year in a row, the Drexel University chapter of the *Society of Physics Students* received the Marsh W. White Outreach Award for the proposal submitted by *Amanda White* and *Alyssa Wilson*. These awards are designed "to support projects designed to promote interest in physics among students and the general public." The Drexel University Society of Physics chapter proposed a mentorship program with a local middle school. The purpose of the program was to expose students to new issues in physics and the sciences in general as well as principles of physics that the students would not normally encounter until much later in their academic careers.
- The Society of Physics Students chapter was selected as one of the recipients of the 2009 Sigma Pi Sigma Chapter Project Awards. These annual awards recognize chapter efforts to raise public awareness of the honor society, build Sigma Pi Sigma's student/alumni community, and promote interchapter activities.
- Amanda White, Jerome Mlack, Alyssa Wilson, Sajjan Mehta and Andrew Eshelman, members of the SPS, received a \$500 Chapter Reporter Award to cover expenses to attend the 2008 Quadrennial Congress of Sigma Pi Sigma, the National Honor Society of Physics, held at Fermilab in Batavia, Illinois on November 6-8, 2008.
- *Robert C. Ferrier, Jr.* and *Alyssa M. Wilson*, won First Prize in Research in Physical Science and Engineering – Undergraduate division, Drexel Research Day.
- *Robert Ferrier* won First Prize in the Undergraduate Natural Sciences, Research Day, presented by the College of Arts and Sciences, Drexel University.
- Amanda White, won Third Prize in the Undergraduate Natural Sciences, Research Day, presented by the College of Arts and Sciences, Drexel University.

CoAS Honors Day

- *Kaleb Politis* received The Lambros G. Johnson Memorial Scholarship Fund.
- *Alyssa Wilson* received the Henry S.C. Chen Memorial Award.
- Alyssa Wilson and Ryan Wasson received the Walter R. Coley Award.
- Pubudu Galwaduge, Vede Ramdass, Jerome Mlack, Carlos Bahamondes, Mary K Chessey, Mark Kondria Jr, Amanda White, and Rory McGurty, received the M. Russell Wehr Award.
- Andrew Enshelman received the Lorenzo M. Narducci Endowed Scholarship Award.
- *Charles Marine* received the Susan and Donald Larson Endowed Scholarship Award.

"The department here has first class professors and interesting courses, but it is the opportunities to get involved in research that set Drexel apart."

Graduate Students Awards

- The Department of Physics honored graduate students with the following awards: *Alfred Whitehead*, Outstanding First Year Graduate Student; *Erica Caden*, Department Service; *John Schreck*, Research Award Junior Division; and *William T. King*, Research Award Senior Division.
- *William T. King*, was the recipient of the Teaching Excellence Award given by the Graduate Studies Office, Drexel University, 2009.
- *Marisa Roman*, won First Prize in the Graduate Natural Sciences, Research Day, presented by the College of Arts and Sciences, Drexel University.
- *Timothy Jones* and *Travis Hoppe* were awarded first prize in the Science Graduate Student category from the Drexel Publishing Group Writing Contest for their essays "Science and Art in a Time of War" and "The Wall" respectively.
- Donna Yosmanovich won First Prize in Biological and Biomedical Research – Graduate division, Drexel Research Day. She also received the 2009 Robert Davies Student Travel Award from the Philadelphia chapter of American Women in Science to attend the 2009 Biophysical meeting in Boston, MA, February 28
 March 4, 2009.



Faculty Awards

- **Dr. Jelena Maricic** received the Outstanding Junior Investigator Award in High Energy Physics. This award, given by the US Department of Energy's Office of High Energy Physics, is designed to identify exceptionally talented new high-energy physicists early in their careers, and to assist and facilitate the development of their research programs. Maricic was recognized for her work, "Enhancing the Precision of Low Energy Neutrino Experiments with a Novel Calibration System".
- **Dr. Gordon T. Richards** was the 2008-09 recipient of the Antelo Devereux Award for Young Faculty for his research in the field of Astrophysics, in particular Quasars Physics.
- **Dr. Michael S. Vogeley** was the 2009 recipient of the Faculty Mentor of the Year Award presented by the Graduate Studies Office, Drexel University.

Sigma Pi Sigma Inductees

Joseph Angelo, Jr., Edward Damon, Thilanka Galwaduge, Joseph Lambert, Zenghui Liu, Jerome Mlack, Vede Ramdass, Donna Yosmanovich, and Alyssa Wilson, were inducted to Sigma Pi Sigma National Physics Honor Society.

Degrees Awarded

B.S. Degrees

M.S. Degrees

Aspetti, Carlos O. Ferrier, Robert C. LaPoint, David R. Meiselman, Seth Tyler, Anthony Wilson, Alyssa M.

Ph.D. Degrees

Miletic, Tatjana S. Zakharov, Mikhail

Damon, Edward A. Hubartt, Bradley C. Kratzer, Rachael M. Lambert, Joseph G. Lynch, Sean M. Pan, Danny Chia-Yu Parejko, John K. Zhou, Di

UNDERGRADUATE RESEARCH

The Department of Physics offers opportunities for students to engage in a wide range of research. Students undertake research projects or senior thesis under the supervision of a faculty member. The following paragraphs show undergraduates involvement in research.

- Carlos Bahamondes, senior project, worked on "Densely-Aligned Carbon Nanotube Monolayered Films: Synthesis, Architecture, and Applications" with **Dr. Roberto Ramos**.
- Alex Bolesta worked with **Dr. Jelena Maricic**. He collected material for a website dedicated to neutrino physics at Double Chooz experiment, created interactive web tours of neutrinos and Double Chooz and wrote a java applet to show neutrino oscillations graphically.
- Mary Chessey, STAR scholar, worked with Dr. David Goldberg, on measurement of flux anomalies in lensed quasars.
- Robert C. Ferrier, senior project, worked on asymmetrical functionalization of magnetic nanoparticles primarily carried out in Materials Sciences Department and co-advised by Dr. Guoliang Yang.
- *Rory McGurty,* senior project, worked on "A Computational model of Bohmian Mechanics" with **Dr. Robert Gilmore.**
- *Thilanka Galwaduge* developed a Labview code to support **Dr. Roberto Ramos**' group in collecting and processing data from junction switching events, and worked on studies associated with disorder in graphene.
- *Wendy Harris,* STAR scholar, worked with **Dr. David Goldberg** on the measurement of flux anomalies in lensed quasars.
- *Nicholas Kruczek,* STAR scholar, worked with **Dr. Gordon Richards** on the problem of disk winds.
- *Warren Kushner,* worked with **Dr. Jelena Maricic**. He evaluated characteristics of 10 inch Hammatsu PMTs and applied two different methods for gain determination.
- David Lapoint, senior project, worked with Dr. Stephen McMillan on "N-Body Simulations and Segregated Globular Clusters".
- Sajjan Mehta worked as a co-op with **Dr. Gordon Richards**. Richards sent him to work with collaborators at Cambridge University on identifying quasars by combining SDSS optical data with near-IR data from UKIDSS.
- Nathan Scott, STAR scholar, worked with Dr. Gordon Richards. Nate has been looking at ways of improving photometric redshift algorithms. Nate has specifically been looking into whether the colors of quasars as a function of redshift, can be

more accurately classified using the same sort of "kernel functions" applied in the selection process.

- *Max Soloff,* senior thesis, worked with **Drs. David Goldberg** and **Stephen McMillan** on BASIN integration with the forthcoming LSST, and the calculation of the galaxy luminosity function.
- *Williams Stephenson* worked with **Dr. Som Tyagi** on a surface enhanced Raman scattering technique. He presented two posters at local research conferences and is a co-author on a paper.
- Anthony Tyler, senior thesis, worked with Dr. Roberto Ramos on Berry's phase in the Josephson phase Qubit. Anthony presented his results at the Workshop on Topology and Physics; the Sigma Xi Research Society Annual Symposium, Washington, DC; the Undergraduate Research Session of the AAPT Conference, Chicago, IL; and the Quantum Computing Session of the APS March Meeting, Pittsburg, PA.
- *Ryan Wasson*, STAR scholar, worked with **Dr**. **Jelena Maricic**. He developed a simulation of artificial backgrounds for Hanohano and did light concentrator study for DUSEL.
- Amanda White worked as a research assistant, supported by Dr. Michael Vogeley, studying properties of interacting void galaxies. She travelled to Kitt Peak National Observatory to observe and is co-author on a paper.
- Alyssa Wilson, senior thesis, worked with **Dr. Roberto Ramos** on lasing in Josephson phase Qubits and presented her results at the APS Meeting, Pittsburgh, PA.

Rising Stars

The STAR program is a special program for academically talented students that matches Drexel University undergraduates with research faculty. *Mary Cheesey* and *Wendy Harris* worked with Dr. David Goldberg, *Nicholas Kruczek* and *Nathan Scott* with Dr. Gordon Richards, and *Ryan Wasson* with Dr. Jelena Maricic. The students presented their research during Drexel's STAR Scholars Day, August 19, 2008.

Drexel Co-op

Physics students benefit from Drexel University's nationally recognized cooperative education program (co-op) which combines periods of full-time professional employment with periods of academic study. Physics students with laboratory experience can take advantage of research opportunities both nationally and internationally.

Students in the Department of Physics have recently completed co-ops with Cambridge University, Trinity College Dublin, Lockheed Martin, Army Research Laboratory, Thomas Jefferson University Hospital, Exelon Corporation, Penn State University, and some have done their co-ops within our Department.



Sajjan Mehta

"I am a pre-junior majoring in physics and mathematics, and am in the BS/MS program working toward a master's degree in mathematics. This year, I am also the vice-president of Drexel University's chapter of the Society of Physics Students.

My research thus far has been guided by Dr. Gordon Richards, and has been focused on the photometric and astrometric properties of quasars. I have contributed to a novel technique of redshift determination for absorption line objects, including quasars, and to quasar target selection for the SDSS-III BOSS survey.

In addition to an Anthony J. Drexel scholarship, I was awarded a Walter R. Coley Award and a Harry E.

STUDENT PROFILES

Muchnic Scholarship at the past two College of Arts and Science Honors Days. Through the Society of Physics Students, I was on the proposal committee that was awarded a 2008 Sigma Pi Sigma Undergraduate Research Award for our Variable Star Observation and Search project.

Through the Society of Physics Students, I was able to attend the 2008 Sigma Pi Sigma Quadrennial Congress at Fermilab, where I presented the results of our Society of Physics Students chapter's Variable Star Observation and Search project. I also had a co-op abroad in Cambridge, England in the Spring/Summer 2009.

My first co-op was at the Institute of Astronomy at Cambridge University, under the supervision of Dr. Richard McMahon. This co-op was funded and supervised by Dr. Gordon Richards. I worked on identifying methods of accurate photometric selection of mid to high redshift quasars utilizing near-infrared data from the UKIDSS survey in addition to optical data from the Sloan Digital Sky Survey.

The co-op experience is definitely one of the more unique aspects of Drexel; not only has it allowed me to

gain valuable work and research experience, but it has also exposed me to fields of my own interest. The openness of the physics department has also made my experience at Drexel so far a positive one. The accessibility and receptive attitude of the professors toward undergraduates was indeed one of the reasons I came to Drexel."



Jerome Mlack

"I am from a small town in Ohio called Ashtabula and am currently a Senior majoring in Physics with a minor in Mathematics. I came to Drexel to experience both the opportunity to do research as an undergraduate and also to move from the slow small town atmosphere to the more bustling big city. When I am not working on physics in the lab or the classroom I like to hang out with friends and go the occasional Jazz concert.

My current project is on Classical Behavior of Magnesium Diboride (MgB2) Josephson junctions which I am doing in Dr. Ramos' Low Temperature and Quantum Device Laboratory. MgB2 was discovered to be superconducting in 2001, and has a higher critical temperature than most conventional metal based superconductors. MgB2 is currently being used in MRI machines, SQUID sensors, and other low temperature technologies. However, its use in Josephson junctions, which exhibit the Josephson effect, or current flow across weakly coupled superconductors, has not been explored below 4 Kelvin until measurements our laboratory made recently. My senior project entails analyzing the recent measurements and performing more measurements of the MgB2 junctions to try and learn more about their characteristics. The long-term goal being to analyze the possibility of using MgB2 in a superconductor based quantum computer.

Awards:

- Society of Physics Students Leadership Scholarship, 2009.
- Sigma Pi Sigma Physics Honor Society inductee, 2009.
- M. Russel Wehr Award, 2009.
- Henry S.C. Chen Memorial Award for Physics, 2007.
- Students Tackling Advanced Research Scholar, 2006.
- Dean's List, 2006-Present.
- Anthony J. Drexel Scholar, 2005-Present.

I have had the chance to travel during co-op, working at the Army Research Laboratory in Adelphi, MD and also at Trinity College in Dublin, Ireland. Through SPS, I attended the Sigma Pi Sigma Quadrennial Congress in Batavia, Illinois near Fermilab, the APS/AAPT meeting in Washington D.C., and pending funding the APS March Meeting in Portland Oregon coming up in March 2010. Also, during my time in Ireland I was able to travel on vacation to Spain and the UK.

Co-op has been great. I learned a lot from my time at the Army Research Lab about Nuclear Physics. I was given my own project for which I organized and performed the experiments and data analysis, resulting in authorship of an Army Technical Report. Working at Penn State it was interesting to be involved on writing algorithms for a navigation system prototype, it was more coding heavy than my first co-op but I got to try and solve some interesting problems with magnetic navigation. This past co-op at Trinity College in Dublin was probably the best though. I worked daily on projects to create and characterize magnetic semiconductors. I fabricated and measured my own samples with the help of the graduate students and post docs of the lab. I worked with SQUID AFM microscopes, magnetometers, thermal evaporators, and other instruments. One of my projects though was more involved in reviewing, compiling, and analyzing all the magnetic semiconductor data the lab had acquired over the last six years. That work has been written into a paper and submitted for publication in the IEEE Transactions on Magnetics and I am the second author. Co-op has given me the chance to do what I enjoy most, to actively play and practice with the physics I have learned.

One thing that has obviously made my time at Drexel unique is the amount and breadth of research I have had the chance to do. I have worked for about four years now in Dr. Ramos' lab playing with and studying low temperature physics, and also done interesting work in various other fields while on co-op. This is not an opportunity I think I would have had if I had gone to a different university. A less obvious thing that has made at least my time at Drexel special, is the people I have met. Over my time at Drexel and on co-op I have met people from all over the world and all walks of life. My friends have made my time at Drexel interesting and fun.

I would recommend Drexel mostly because of the co-op program and the faculty's willingness to allow undergraduates to get involved in research. The department here has first class professors and interesting courses, but it is the opportunities to get involved in research that set Drexel apart. Students can go on co-op and do research or as a Freshman they can apply for the Students Tackling Advanced Research (STAR) program and work in a lab during the summer after their first year. In some cases, if students show enough initiative, professors will allow them to do research as a work-study student, or even on a volunteer basis. It is hard to know if a major, or even research field is really the right path without sitting in the laboratory and doing the work. Drexel offers the opportunity to get involved and actually explore your degree."

ENGAGEMENT – OUTREACH



Events Organization

- The Kaczmarczik Lecture Series, hosted by the Department of Physics, continues to be a popular and significant event on Drexel campus. This year, guest speaker Dr. Geoffrey W. Marcy, Professor of Astronomy at the University of California, Berkeley, presented "Searching for Other Earths and Life in the Universe". Dr. Marcy delivered an extraordinary lecture about some of today's most exciting science: the hunt for Earth-like planets. Drexel had the privilege of receiving first-hand information from one of the key team members of the NASA Kepler mission. Over four hundred high school students attended the lecture as well as a few hundreds of Drexel community members. As part of the activities, the Department conducted an Open House for High School students. During this Open House, physics researchers gave brief presentations to the students on topics such as biophysics, astrophysics, computational physics, condensed matter and chaos theory, along with a tour of the Department of Physics facilities. Over the years, this annual event has exposed thousands of local high school students to recent discoveries in physics and has given them the opportunity to meet with some of the country's leading scientists.
- The Drexel Chapter of the Society of Physics Students (SPS) hosted a Rube Goldberg competition on Tuesday, May 26, 2009. The competition was the culmination of the Physics Mentorship Program at the Independence Charter School (ICS). During the course of the program, Drexel SPS members taught middle school students various topics in physics including angular momentum and thermodynamics. Students from the charter school used what they learned to design and build Rube Goldberg machines which were displayed at Drexel. Students from both Drexel and ICS competed for the title of "Rube Goldberg Champion." Winners of the competition were 7th grade ICS students Sarah and Nora and Drexel undergraduate physics students Vede Ramdass, Kenneth Mui, and Nick Walker.

- The Joseph R. Lynch Observatory Open Houses, hosted by the Department of Physics, were successfully held throughout the year. These observing sessions are free and open the public. Alfred Whitehead runs this program under the supervision of **Dr. Gordon Richards**, Director of the Observatory.
- **Dr. Jelena Maricic**, on behalf of Sigma Xi, organized a public lecture "Science of Chocolate" that attracted around 100 students and members of the community, November 2008.
- Dr. Stephen S.L.W. McMillan, co-organized MODEST-9: "Formation and Evolution of Globular Clusters", Kavli Institute for Theoretical Physics, UC Santa Barbara, CA, January 16–17, 2009.
- **Dr. Gordon T. Richards**, organized the AstroPhilly 2009 meeting at the Franklin Institute, Philadelphia, PA, March 21, 2009.
- **Drs. Gordon Richards** and **David Goldberg** are participants in the Project Astro. This program links professional astronomers and local educators. The astronomers committed to visit the educator's students at least four times during the school year.
- **Dr. Enrico Vesperini**, co-organized an international conference on "Formation and Evolution of Globular Clusters" held at the Kavli Institute for Theoretical Physics, UCSB, January 12-16 2009. The conference was attended by about 140 participants.
- **Dr. Enrico Vesperini**, co-organized a three-month Research Program "Formation and Evolution of Globular Clusters." Kavli Institute for Theoretical Physics, UCSB, January 17-April 10, 2009. Researchers working on the formation and dynamical evolution of globular clusters had the opportunity to spend a period ranging from a few weeks to the entire three months. Participants were provided office space, meeting and computing facilities. About 70 researchers

attended the program. This program provided an excellent opportunity to start a large number of new projects and collaborations as well as making significant progress on existing projects.

- Stephen S.L.W. McMillan, was a member of the scientific organizing committee, IAU Symposium 266 "Star Clusters—Basic Galactic Building Blocks throughout Time and Space", IAU General Assembly, Rio de Janeiro, Brazil, August 10–14, 2009.
- **Michael S. Vogeley**, was a member of the science organizing committee, 3rd KIAS Workshop on Cosmology and Structure Formation, Seoul, Korea, October 27-28, 2008.

Editorial Boards

- **Dr. Shyamalendu Bose**, was primary Editor of the Proceedings of the International Workshop on the Mesoscopic, Nanoscopic and Macroscopic Materials published by the American Institute of Physics, October 2008.
- **Dr. Frank Ferrone**, Associate Editor of online journal PMC Biophysics.
- **Dr. Roberto Ramos**, Technical Editor, IEEE Transactions of Applied Superconductivity, 2008 ASC Proceedings, August 2008 – January 2009.
- **Dr. Brigita Urbanc**, Scientific Advisory Board 2008-2009 of Alzheimer Research Forum.
- **Dr. Brigita Urbanc**, Editorial Board Member of the Open Biochemistry Journal.

Proposal & Journal Reviewers

- **Dr. Shyamalendu Bose**, reviewer of Physical Review Letters and Physical Review B.
- **Dr. Frank Ferrone**, proposal reviewer for the NIH and Research Corporation. Reviewer of the Journal of Molecular Biology, British Journal of Hematology, Biophysical Chemistry, Biochimica and Biophysica Acta, Proceedings of the National Academy of Sciences, PLOS One.
- **Dr. Robert Gilmore**, proposal reviewer for the National Science Foundation. Reviewer of Physical Review Letters, Physical Review A, D, E, J. Phys. A, Applied Math Letters, IET, and Systems Biology.
- **Dr. David Goldberg**, reviewer of Astrophysical Journal Letters, Monthly Notices of the Royal Astronomical Society and Physical Review.
- **Dr. Jelena Maricic**, proposal reviewer for the National Science Foundation.
- **Dr. Stephen McMillan**, reviewer of the Monthly Notices of the Royal Astronomical Society and Astrophysical Journal.
- **Dr. Roberto Ramos**, proposal reviewer for the National Science Foundation.
- **Dr. Gordon Richards**, panel reviewer on GALEX Telescope Allocation Committee. Reviewer of the Monthly Notices of the Royal Astronomical Society and Astrophysical Journal.
- **Dr. Som Tyagi**, reviewer of the Applied Physics Letters, Solid Thin Films, Superconducting Science and Technology, Journal of Magnetism and Magnetic Materials.



- Dr. Brigita Urbanc, reviewer of the Journal of Molecular Biology, Proteins: Structure, Function & Bioinformatics, Biopolymers, Biochimica et Biophysica Acta – Proteins and Proteomics, New Journal of Chemistry.
- **Dr. Michael Vogeley**, reviewer of the Astrophysical Journal, Astrophysical Journal Letters, Monthly Notices of the Royal Astronomical Society, Astronomy and Astrophysics, Advances in Astronomy.
- **Dr. Guoliang Yang**, proposal reviewer for the NIH. Reviewer of several journals, including PNAS and Journal of Molecular Biology.
- **Dr. Jian-Min Yuan**, proposal reviewer on Petroleum Research Funds - American Chemical Society, Research Corporation, Outstanding Scholarship Award, Foundation for the Advancement of Outstanding, Scholarship, Taiwan. Reviewer of the European Physics Letters, Biophysical Journal, J. Chem. Phys., J. Phys. Chem., Physical Review E.

Colloquia

- Dr. Jolie Cizewski, Rutgers University, "Probing Reactions in Stars with Beams of Radioactive Nuclei", September 4, 2008.
- Dr. Ephraim Fischbach, Purdue University, "Evidence for a Correlation Between Nuclear Decay Rates and Solar Activity", September 25, 2008.
- Dr. Evelyn Thomson, University of Pennsylvania, "Particle Physics Puzzles for the Large Hadron Collider", October 23, 2008.
- Dr. Naomi Halas, Rice University, "Plasmonics: Merging Nanoparticles with Light", October 30, 2008.
- Dr. Tom Knutson, NOAA, "Have Humans Affected Atlantic Hurricane Climate?" November 6, 2008.
- Dr. Cameron Abrams, Department of Chemical and Biological Engineering, Drexel University,

"Biophysics of Insulin", November 13, 2008.

- Dr. Zeljko Ivezic, University of Washington, "Reaching for the sky with SDSS and LSST", December 4, 2008.
- Dr. Zelimir Djurcic, Columbia University, "Results of MiniBooNE Neutrino Oscillation Experiment", January 8, 2009.
- Dr. Jorge Golowasch, Rutgers/NJIT, "Rhythmic Patterns of Activity in Purely Electrically-coupled Neuronal Networks. Role of Dendrite Diameter", January 15, 2009.
- Dr. Jerry Sellwood, Rutgers University, "Regularities in Galaxy Rotation Curves", January 29, 2009.
- Dr. John Nagle, Carnegie Mellon University, "Structure and Interactions of Biomembranes: Results Obtained from X-ray Scattering Using a Non-crystallographic Method", February 5, 2009.
- Dr. Sonya Bahar, University of Missouri, "Imaging Pathological Synchronization in the Brain", February 19, 2009.
- Dr. Kevin Osborn, Laboratory for Physical Sciences, "Dielectric Studies for Superconducting Qubit circuits", February 26, 2009.
- Dr. Alex Gray, Georgia Tech, "Algorithms for Machine Learning on Astronomically-Large Datasets", March 5, 2009.
- Dr. Mark Wolverton, Freelance Science Writer, "Science Writers: Ink-Stained Wretches or Descendants of Prometheus?" April 2, 2009.
- Dr. Joanna Dunkley, Oxford University, "Cosmology from the Cosmic Microwave Background", April 9, 2009.
- Dr. William Oliver, MIT Lincoln Labs, "Interferometry, Cooling, and Amplitude Spectroscopy with a Superconducting Artificial Atom", April 16, 2009.
- Dr. Jens Koch, Yale University, "Quantum Computation and Quantum Optics with Circuit QED", May 14, 2009.



Conference Presentations

- Allred, J.C. "An Open Source MHD Code for the Study of Magnetic Structures in the Solar Wind", poster presentation, American Geophysical Union Meeting, San Francisco, CA, December 15-19, 2008.
- Allred, J.C. "MHD Simulations of Breakout Coronal Mass Ejections", poster presentation, 2009 SHINE Workshop, Wolfville, Nova Scotia, August 3-7, 2009.
- Al-Rawi, A.N., Urbanc, B., Ganguly, D., Rahman, T.S., Chen, J., Tomich, J. "Molecular Dynamics Simulations of a Single 11-Residue Beta-Sheet Adhesive and its Assembly", poster presentation, Biophysical Society Meeting, Boston, MA, February 23 – March 4, 2009.
- Aprelev, A., Zakharov, M., Liu, Z., Turner, M.S., Ferrone, F.A. "Sickle Hemoglobin Fiber Growth Rates Deduced Using Optical Channels", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 -March 4, 2009.
- Betnel, M., **Cruz, L**. Wolozin, B., and **Urbanc, B**. "Computational study of a-synuclein protein folding and assembly in Parkinson's disease", poster presentation, Protein Society Meeting, Boston, July 25-29, 2009.
- Betnel, M., **Cruz, L.** Wolozin, B., and **Urbanc, B**. "Computational studies of protein folding and aggregation in Parkinson's disease", poster presentation, American Chemical Society Meeting, Washington DC, August 16-20, 2009.
- Bitan, G., Li, H., Sinha, S., Attar, A., Bakshi, R., Schrader, T., Talbiersky, Polkowska, J. Gersthagen, T., Benedek, G., Lomakin, A., Xie, C.-W., Tan, M., Urbanc, B., Cruz, L., Frautschy, S., Yang, F., Hu, S., Gant, D., Bowers, M., Murray, M., Shea, J.-E., Wu, C. "Rationally designed inhibitors of amyloid bprotein assembly and toxicity", poster presentation, 9th International Conference - AD/PD, Prague, Czech Republic, March 11-15, 2009.
- Bose, S. "Collective Excitations in Concentric Metallic Nanoshells", invited talk, Inaugural Function of Releasing the Proceedings of the International Workshop on Mesoscopic, Nanoscopic and Macroscopic Materials, Bhubaneswar, Orissa, India, January 17, 2009.
- **Bose, S.** "Collective Excitations in Nanomaterials and their Applications", invited talk, Indian National Seminar, Berhampur, Orissa, India, February 6-7, 2009.
- Chen, C., Zhang, J., and **Vogeley, M.S.** "Reflections on the Interdisciplinary Collaborative Design of Mapping the Universe", HCI International, San Diego, CA, July 19-24, 2009.

- Chen, C., Zhang, J., and Vogeley, M.S. "Visual Analysis of Scientific Discoveries and Knowledge Diffusion", oral presentation, 12th International Conference on Scientometrics and Infometrics (ISSI 2009), Rio de Janeiro, Brazil. July 14-17, 2009.
- **Cruz, L.** "Geometry and Organization in the Brain: Possible Connections to Cognition", invited Colloquium, Department of Physics, Yeshiva University, NY, February 17, 2009.
- **Cruz, L.** "Geometry in the Brain: Is Order in Neuron Locations Necessary for Cognition?" College of Arts and Sciences Dean's Seminar Series, Drexel University, May 20, 2009.
- Deb, S., Goldberg, D.M., and Wilson, A. "What More Can We Learn from Galaxy Cluster Lensing? Bull. American Astron. Soc., 41, 377, oral presentation by S. Deb, 213th Meeting of the American Astronomical Society Meeting, Long Beach, CA, January 4-8, 2009.
- Ferrone, F.A., "Hard Spheres, Fuzzy Spheres and Long Rods: Insights into Sickle Hemoglobin Polymerization", invited talk, Conference on Macromolecular Crowding, Telluride, CO, July 6-10, 2009.
- Ferrone, F.A., Wang, Y., Liu, Z., Emanuele, A., Vittorelli-Palma, M.B., Palma, M.U. "A Unified Theory of Liquid-Liquid Demixing and Polymer Formation Kinetics", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 - March 4, 2009.
- Figueroa, M., Stephenson, W., Pourrezaei, K., Tyagi
 S. "Tunable Nanoparticle Fractal Clusters for Surface Enhanced Raman Scattering (SERS)", poster presentation, Drexel Engineering Research Symposium, March 20, 2009.
- Figueroa, M., Stephenson, W., Pourrezaei, K., Tyagi
 S. "Tunable Surface-enhanced Raman Scattering(SERS) Substrates", poster presentation, Drexel Engineering Research Symposium, March 20, 2009.
- Finegold, L. "How are static magnetic fields detected biologically?" poster presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- **Gilmore, R.** "Representation Theory for Strange Attractors" oral presentation, ICCSA 2009, 3rd International Conference on Complex Systems & Applications, Le Havre, France, June 30, 2009.
- **Gilmore, R.** "The Topology of Chaos", invited colloquium, University of Georgia, Athens, GA, October 9, 2008.
- **Gilmore, R.** "The Topology of Chaos", invited colloquium, University of Florida, Gainesville, FL, October 23, 2008.
- **Gilmore, R.** "Topology of Chaos", invited lecture, Summer School – From Nonlinear Dynamics to

Biomedicine, Universite de Rouen, France, September 1-4, 2009.

- **Goldberg, D. M.** "Telescopes from Galileo to the LSST", invited talk, CoAS Alumni Event, Franklin Institute, August 26, 2009.
- **Goldberg, D.M.** "The Mysteries of Dark Matter", invited talk, Franklin Institute, May, 2009.
- Hoppe, T., Yuan, J-M. "Lattice Model Studies of Designability and Alpha-helix to Beta-sheet Transitions of Short Peptide Chains", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 -March 4, 2009.
- King, W.T., Yang, G. "Effects of Cantilever Stiffness on Unfolding Force in AFM Protein Unfolding", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 · March 4, 2009.
- Lambert, J., Carabello, S., Thrailkill, Z., Ramos, R.C. "Quantum Metastable States in Graphene-based Josephsons" poster presentation, QFS2009 International Symposium on Quantum Fluids and Solids, Northwestern University, Evanston, IL, August 6-11, 2009.
- Lambert, J., Thrailkill, Z., Ramos, R.C. "Investigating the quantum behavior of a graphene-based Josephson Junction", oral presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- *Lin, H.,* **Yuan, J-M**. "Free Energy Landscape For Biological Systems", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 · March 4, 2009.
- Lin, H., Yuan, J-M. "Pre-unfolding oscillations of green fluorescence proteins", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 - March 4, 2009.
- Liu, Y.C., Li, X.H., Shao, C.L., Chu, X.Y., Wang, C.H., Yang G. "Photoluminescence Properties of Highly Dispersed ZnO Quantum Dots in Polyvinylpyrrolidone Nanotubes Prepared by a Single Capillary Electrospinning", Electronic Materials Conference, Pennsylvania State University, June 24-26, 2009.
- Maricic, J. "Hanohano: Deep underwater Neutrino Observatory", poster presentation, TAUP 2009, Rome, Italy, July 1.5, 2009.
- **Maricic, J.** "HanoHano: Mobile Neutrino Detectors for Mixing, Masses, Geology, and Remote Reactor Monitoring", invited lecture, Argonne National Laboratory, IL, October 22, 2008.
- **Maricic, J.** "Light Concentrators for Long Baseline Neutrino Experiment at DUSEL", invited talk at ANT workshop, Honolulu, HI, August 13, 2009.
- Maricic, J. "Long Baseline Neutrino Oscillation Experiment at DUSEL", oral presentation, TAUP

2009, Rome, Italy, July 1-5, 2009

- **Maricic, J.** "Neutrinos and why do we care?" invited talk, Adolf Reichwein Schule, Langen, Germany, June 2009
- Maricic, J. "Overview of Neutrino Oscillations and Future Prospects", invited talk, Louisiana State University, Baton Rouge, February 19, 2009
- **Maricic, J.** "Precision Measurement of Theta13 with Double Chooz", poster presentation, TAUP 2009, Rome, Italy, July 1-5, 2009.
- Maricic, J. "Small Neutrinos for Big Discoveries", invited talk at Kansas State University, January 22, 2009
- Maricic, J. "The Double Chooz Experiment the Precision Reactor Neutrino Experiment in the Quest for Theta_13", oral presentation, APS meeting, Denver, May 2-5, 2009
- McMillan, S. "Effects of Primordial Mass Segregation on the Dynamical Evolution of Star Clusters", invited talk, Formation and Evolution of Globular Clusters, Institute for Theoretical Physics, UC Santa Barbara, CA, January 12, 2009
- **McMillan, S.** "Overview of MODEST and MUSE", invited talk, MODEST-9, Kavli Institute for Theoretical Physics, UC Santa Barbara, CA, January 16, 2009.
- McMillan, S., Djorgovski, S., Hut, P., *Vesperini, E.*, Knop, R., Portegies Zwart, S. MICA: The Meta-Institute for Computational Astrophysics", poster presentation, 214th meeting of the American Astronomical Society, Pasadena, CA, June 7-11, 2009.
- Measey, T.J., Bendon, M., Schweitzer-Stenner, R., Yang, G., Kornev, K. "Conformational Instability, Aggregation, and Hydrogel formation of a 16-Residue Alanine-Based Peptide in Aqueous Media", platform presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 - March 4, 2009.
- Mehta, S., White, A., Ramos, R.C. "Variable Star Observation and Search", poster presentation, Sigma Pi Sigma Quadrennial Physics Congress, Fermilab, Batavia, IL, November 6-8, 2008.
- Mehta, S.S., White, A. "Variable Star Observation and Search", poster presentation, 2008 Quadrennial Congress of Sigma Pi Sigma, the National Honor Society of Physics, at Fermilab in Batavia, IL, November 6-8, 2008.
- Mlack, J.T., Teitelbaum, E., Thrailkill, Z., Ramos, R.C. "Optimization of Microwave Powder Filters for Microwave Attenuation", poster presentation, Sigma Pi Sigma Quadrennial Physics Congress, Fermilab, Batavia, IL, November 6-8, 2008.
- **Olson, K.** "Paramesh: A parallel, Adaptive Grid Tool for the Space Sciences", oral presentation, NASA

AISR Meeting, University of Maryland, MA, May 5-7, 2008.

- *Pan, D.,* Hoyle, F., and **Vogeley, M.S.** "Shapes of Voids in the SDSS" poster presentation, 213th Meeting of the American Astronomical Society Meeting, Long Beach, CA, January 4-8, 2009.
- *Pan, D.,* Platen, E., **Vogeley, M.S**., Hoyle, F., van de Weygaert, R. "Cosmic Voids in SDSS and 6dF", poster presentation, Isolated Galaxies conference, Granada, Spain, March 12-15, 2009.
- Parejko, J.K., Pan, D., White, A., and Vogeley, M.S. "Interacting Void Galaxies in the SDSS", poster, The Monster's Fiery Breath: Feedback in Galaxies and Groups, Madison, WI, June 1-5, 2009.
- Parejko, J.K., Vogeley, M.S., Hyde, J.B., Constantin, A., Thornton, R.J., and Hoyle, F. "Hunting for Low Luminosity AGN Using Optical and X-ray Emission", oral presentation, 213th Meeting of the American Astronomical Society Meeting, Long Beach, CA, January 4-8, 2009.
- **Ramos, R.C** "Quantum States in Graphene-based Josephson Junctions" invited talk, 2009 International Quantum Fluids and Symposium Conference at Northwestern University, Evanston, IL, August 5-11, 2009.
- Ramos, R.C. "Superconducting Approaches to Quantum Computing", invited colloquium, Department of Physics, University of Sciences in Philadelphia, Philadelphia, PA, November 11, 2008.
- Ramos, R.C. "Teaching How Things Work Using Clickers, Demonstrations and Videos" poster presentation, AAPT Winter Meeting, American Association of Physics Teachers, Chicago, IL, February 12-16, 2009.
- Ramos, R.C., Lambert, J., Carabello, S., Thrailkill, Z. "Quantum Metastable States in Graphene Josephson Junction Devices", poster presentation, 2009 ISEC Int'l Superconductive Electronics Conference, Fukuoka, Japan, June 16-19, 2009.
- S., Vallieres, Μ. Ramos, **R.C.**, Tyagi, "Contemporary Physics Experiments for а Physics poster Redesigned Curriculum", presentation, AAPT Winter Meeting, American Association of Physics Teachers, Chicago, IL, Feb 12.16, 2009.
- Ramos, R.C., *Tyler, A.* Sigma Xi National Student Research Conference, "Berry's Phase in a Superconducting Qubit", Washington, D.C., November 20-23, 2008.
- **Richards, G.T.** "Detection of QSOs and the Problems of Defining the QSO Luminosity Function", invited speaker, Classification and Discovery in Large Astronomical Surveys, Ringberg Castle, Germany, October 14-17, 2008.
- Richards, G.T. "QSO Built up", invited talk,

Harvesting the Desert: The Universe Between Redshifts 1 and 3, Marseille, France, June 29- July 3, 2009.

- **Richards, G.T.** "Quasars and the Sloan Digital Sky Survey", invited colloquium, Department of Physics and Astronomy, University of Western Ontario, April 28, 2009.
- Roman, M., Yang, G. "Macromolecular Crowding Affects Stability Properties: A Comparison Study for Titin and Ubiquitin" poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28-March 4, 2009.
- *Deb, S.* "Reconstruction of Cluster Masses using Particle Based Lensing (PBL)" oral presentation, Ozlenz 2008: Dark Matter, Dark Energy, and Dark Ages with Gravitational Lensing, Sidney, Australia, September 29-October 3, 2008.
- Thrailkill, Z., Lambert, J., Kennerly, S., Ramos, R.C. "Three and Four Coupled Josephson Junction Phase Qubits", oral presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16.20, 2009.
- *Thrailkill, Z., Lambert, J.*, **Ramos, R.C.** "Higher Energy Levels in Qubit Networks", poster presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- *Thrailkill, Z.*, **Ramos, R.C.** "Multiple Resonators Coupling Josephson Junction Qubits as a Multi-Channel Bus", 2009 ISEC International Superconductive Electronics Conference, Fukuoka, Japan, June 16-19, 2009.
- **Tyagi, S.** "Eighty Years of Raman Spectroscopy- an Amazing Journey from Physics to Bio-Pharmaceuticals: A Tribute to C. V. Raman", invited talk, 60th Indian Pharmaceutical Congress 2008, Dwarka, New Delhi, December 12-14, 2008.
- *Tyler, A.,* **Ramos, R.C.** "Berry's Phase in a Superconducting Josephson Phase Qubit", AAPT Winter Meeting, American Association of Physics Teachers, Undergraduate Research Session, Chicago, IL, February 12·16, 2009.
- *Tyler, A.,* **Ramos, R.C.** "Berry's Phase in the Josephson Phase Qubit", poster presentation, 2009 ISEC Int'l Superconductive Electronics Conference, Fukuoka, Japan, June 16-19, 2009.
- *Tyler, A.,* **Ramos, R.C.** "Berry's Phase of a Current-Biased Josephson Junction", oral presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- Urbanc, B. "Protein structure-toxicity relationship relevant to Alzheimer's disease: Discrete molecular dynamics study", invited talk, 2009 American Chemical Society Meeting, Washington DC, August 16-20, 2009.
- Urbanc, B. "The Role of Discrete Molecular

Dynamics Simulations in Therapeutic Approaches to Alzheimer's Disease", invited colloquium, Yeshiva University, New York, May 12, 2009.

- Urbanc, B., Bitan, G., Cruz, L., Lam, A., Teplow, D. "Computational Study of Assembly and Toxicity Inhibition of Amyloid β-Protein and Its Arctic Mutant", oral presentation, Urbanc, co-chaired the session entitled "Amyloids from Multiple Perspectives", Biophysical Society Meeting, Boston, MA, February 23 – March 4, 2009.
- **Vesperini, E.** "Formation and Dynamical Evolution of Multiple Populations", oral presentation, KITP Formation and Evolution of Globular Clusters Conference, Kavli Institute for Theoretical Physics, Santa Barbara, CA, January 12-16, 2009.
- Vesperini, E., McMillan, S., Portegies Zwart, S. "Mass Segregation in Young Star Clusters", oral presentation, Globular Clusters—Guides to Galaxies, ESO Astrophysics Symposia, Springer Berlin Heidelberg, 2009, p. 429 (2009).
- Vesperini, E., D'Ercole, A., D'Antona, F., McMillan, S. "Formation and Dynamical Evolution of Multiple Stellar Generations in Globular Clusters", oral presentation, 213th Meeting of the American Astronomical Society Meeting, Long Beach, CA, January 4-8, 2009.
- Vogeley, M.S. "Cosmic Voids and Void Galaxies", invited review, 3rd KIAS Workshop on Cosmology and Structure Formation, Korea Institute for Advanced Study, Seoul, Korea, October 27, 2008.
- Vogeley, M.S. "Cosmology Results from the Sloan Digital Sky Survey", invited review, CosPA2008: International Symposium on Cosmology and Particle Astrophysics, Asia Pacific Center for Theoretical Physics, Korea, October 29, 2008.
- Wang, J.C., Ferrone, F.A., Kwong, S., Turner, M.S., Briehl, R.W.. "Sickle Hemoglobin Fiber Depolymerization, a Potential Modifier of Pathology: Fracture, Fragments, Vanishing Times and Stochastics", platform talk, Sickle Cell Disease Association of America, New Orleans, LA, September 24-27, 2008.
- Wang, J-C., Kwong, S., **Ferrone, F.A.**, Turner, M.S., Briehl, R.W. "Fiber Depolymerization: Fracture, Fragments, Vanishing Times and Stochastics in Sickle Hemoglobin", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 - March 4, 2009.
- White, A, Mehta, S.S. "Physics in Philly: Engaging and Enlightening Experiments for High School Students", poster presentation, 2008 Quadrennial Congress of Sigma Pi Sigma, the National Honor Society of Physics, at Fermilab in Batavia, IL, November 6-8, 2008.
- White, A., Ramos, R.C. "Physics in Philadelphia", poster presentation, Sigma Pi Sigma Quadrennial Physics Congress, Fermilab, Batavia, IL, November 6-8, 2008.

- *Wilson, A.* "Self-Rotating DC Atmospheric Pressure Discharge over a Water-Surface Electrode: Regimes of Operation", poster presentation, 2008 Quadrennial Congress of Sigma Pi Sigma, the National Honor Society of Physics, at Fermilab in Batavia, IL, November 6-8, 2008.
- Wilson, A., Mlack, J.T., Tyler, A., Thrailkill, Z., Lambert, J., Ramos, R.C. "Undergraduate Research with Josephson Qubits: From Fabrication to Spectroscopy" oral presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- *Wilson, A.,* **Ramos, R.C.** "Lasing in Superconducting Qubits", poster presentation, 2009 March meeting of the American Physical Society, Pittsburgh, PA, March 16-20, 2009.
- Yang, G. "The effects of macromolecular crowding on the mechanical stability of proteins", invited talk, Conference on Macromolecular Crowding, Telluride, CO, July 6-10, 2009.
- Yang, G. "Measurement of the Energy Landscape Roughness of Protein Molecules", Single Molecule Biophysics World Networking Workshop, Drexel University, February 16-17, 2009.
- Yang, G., *Liu*, *R*. "Viscosity Effect On The AFM Force Measurement", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 · March 4, 2009.
- Yosmanovich, D., Rotter, M., Aprelev, A., Ferrone, F.A. "Ligand Binding and Sickle Hemoglobin Polymerization Kinetics: Implication for Therapies", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 · March 4, 2009.
- Yuan, J-M. "Effects of Macromolecular Crowding on Protein Stability, Dynamics, and Aggregation", invited talk, Conference Dynamics and Spectroscopy of Small Molecules and Biomolecule, Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan, November 9-12, 2008.
- **Zbiri, K.** "Muon induced production of neutrons and radioactive isotopes in scintillation detectors", oral presentation, Double Chooz Collaboration Analysis Meeting at MIT, Boston, MA, June 4, 2009.
- Zhang, J., Chen, C., Pan, D., and Vogeley, M.S. "Quantifying the Impact of the Sloan Digital Sky Survey: Evolving Patterns of Research Topics and Collaboration", poster presentation, 213th Meeting of the American Astronomical Society Meeting, Long Beach, CA, January 4.8, 2009.
- **Zhao, L., Yang, G.**, Jun Xi, J. Exploring the Dynamic Actions of Cellulolytic Enzymes in a Heterogeneous System with Micro-cantilever Technology", poster presentation, 53rd Biophysical Society Annual Meeting, Boston, Massachusetts, February 28 -March 4, 2009.

Textbooks

- Astronomy: A Beginner's Guide to the Universe, 6th edition, E. Chaisson and **S. McMillan**, © 2009, Addison Wesley: San Francisco.
- Physics Lab Manual, **R. Ramos** and **S. Tyagi**, © 2009, Pearson/Addison Wesley: New York.

Books and Books Chapters

Mesoscopic, Nanoscopic and Macroscopic Materials Proceedings of the International Workshop on Mesoscopic, Nanoscopic and Macroscopic Materials, Bhubaneswar, India. **S. Bose**, S.N. Behera, B.K. Roul, (Eds.) November 2008, Springer/Verlag: New York.

Journal Articles

- Abazajian, K. N., Adelman-McCarthy, J. K., Agueros, M. A., (Richards, G. T., Vogeley, M. S.) et al. (2009) "The Seventh Data Release of the Sloan Digital Sky Survey", Astrophysical Journal Supplement Series, 182(2), 543-558.
- Berger, B. E., Busenitz, J., Classen, (Lane, C. E., Maricic, J., Miletic, T.) et al. (2009) "The KamLAND Full-volume Calibration System", *Journal* of Instrumentation, 4.
- Bose, S. M., Behera, S.N., and Gayen, S. (2008) "Theory of Raman Spectra of Unfilled and Filled Carbon Nanotubes", Proceedings of the International Workshop on Mesoscopic, Nanoscopic and Macroscopic Materials (IWMNMM-2008). AIP Conference Proceedings, (1063), 72-83.
- Chen, C. M., Zhang, J. and **Vogeley, M. S.** (2009) "Mapping the Sloan Digital Sky Survey's Global Impact", *IEEE Intelligent Systems*, 24(4), 74-77.
- Chen, C. M., Zhang, J. and **Vogeley, M. S.** (2009) "Reflections on the Interdisciplinary Collaborative Design of Mapping the Universe", *Proceedings of the* 13th International Conference on Human-Computer Interaction. Part IV: Interacting in Various Application Domains, 693-702.
- Chen, C. M., Zhang, J. and Vogeley, M. S. (2009) "Visual Analysis of Scientific Discoveries and Knowledge Diffusion". Proceedings of the 12th International Conference on Scientometrics and Informetrics (ISSI 2009). 874-885
- Chen, Y. W., Qiao, Q., Liu, Y. C. and Yang, G. L. (2009) "Size-Controlled Synthesis and Optical Properties of Small-Sized ZnO Nanorods", *Journal of Physical Chemistry C*, 113(18), 7497-7502.

Patents Filled

- Methods of Quantitatively Assessing Inflammation with Biosensing Nanoparticles, Papazoglou, E., Pourrezaei, K., **Tyagi, S.**, Karwa, S., and Murthy, S.
- Methods and Systems for Applying Metallic Nanoparticle-Based Inks to Create an Analytical Substrate, Jablonsky, G., Mastropietro, M., and Tyagi, S.
- Method for the Formation of SERS Substrates, **Tyagi, S**. and Pourrezaei, K.
- AFM-Nanopore Based DNA Sequencing and Single Molecule Analysis, Kim, M. and **Yang, G.**

- Croom, S. M., **Richards, G. T.**, Shanks, et al. (2009) "The 2dF·SDSS LRG and QSO Survey: the Spectroscopic QSO Catalogue", *Monthly Notices of the Royal Astronomical Society*, 392(1), 19-44.
- Cruz, L., Roe, D. L., Urbanc, B., Inglis, A., Stanley, H. E. and Rosene, D. L. (2009) "Age-Related Reduction In Microcolumnar Structure Correlates with Cognitive Decline in Ventral but not Dorsal Area 46 of the Rhesus Monkey", *Neuroscience*, 158(4), 1509-1520.
- D'Ercole, A., Vesperini, E., D'Antona, F., McMillan, S. L. W. and Recchi, S. (2008) "Formation and Dynamical Evolution of Multiple Stellar Generations in Globular Clusters", *Monthly Notices of the Royal Astronomical Society*, 391(2), 825-843.
- Deb, S., Goldberg, D. M. and Ramdass, V. J. (2008) "Reconstruction Of Cluster Masses Using Particle Based Lensing. I. Application to Weak Lensing", Astrophysical Journal, 687(1), 39-49.
- Diamond-Stanic, A. M., Fan, X. H., Brandt, W. N., Shemmer, O., Strauss, M. A., Anderson, S. F., Carilli, C. L., Gibson, R. R., Jiang, L. H., Kim, J. S., **Richards, G. T**., et al. (2009) "High-Redshift SDSS Quasars with Weak Emission Lines", *Astrophysical Journal*, 699(1), 782-799.
- Dikmen, E., Ozturk, O. and **Vallieres, M.** (2009) "Shell Model Structure of Mid-heavy Even-even Sn Isotopes", *Journal of Physics G-Nuclear and Particle Physics*, **36**(4).
- Fradinger, E. A., Monien, B. H., Urbanc, B., Lomakin, A., Tan, M., Li, H., Spring, S. M., Condron, M. M., Cruz, L., Xie, C. W., Benedek, G. B. and Bitan, G. (2008) "C-terminal Peptides Coassemble

into A beta 42 Oligomers and Protect Neurons Against A beta 42-Induced Neurotoxicity", *Proceedings of the National Academy of Sciences of the United States of America*, 105(37), 14175-14180.

- Freeman, S. H., Kandel, R., Cruz, L., Rozkalne, A., Newell, K., Frosch, M. P., Hedley-Whyte, E. T., Locascio, J. J., Lipsitz, L. A. and Hyman, B. T. (2008) "Preservation of Neuronal Number Despite Age-Related Cortical Brain Atrophy in Elderly Subjects without Alzheimer Disease", *Journal of Neuropathology and Experimental Neurology*, 67(12), 1205-1212.
- Green, P. J., Aldcroft, T. L., Richards, G. T., et al. (2009) "A Full Year Chandra Exposure on Sloan Digital Sky Survey Quasars From the Chandra Multiwavelength Project", Astrophysical Journal, 690(1), 644-669.
- Harfst, S., Zwart, S. P. and **McMillan, S.** (2008) "Status and Future of MUSE", *Astronomische Nachrichten*, 329(9-10), 885-891.
- *Hoppe, T.* and **Yuan, J. M.** (2009) "Entropic Flows, Crowding Effects, and Stability of Asymmetric Proteins", *Physical Review E*, 80(1).
- Jang, S., Yuan, J. M., Shin, J., Measey, T. J., Schweitzer-Stenner, R. and Li, F. Y. (2009) "Energy Landscapes Associated with the Self-Aggregation of an Alanine-Based Oligopeptide (AAKA)(4)", *Journal* of Physical Chemistry B, 113(17), 6054-6061.
- Jiang, L. H., Fan, X. H., Bian, F. Y., Annis, J., Chiu, K. L., Jester, S., Lin, H., Lupton, R. H., **Richards, G. T.**, Strauss, M. A., Malanushenko, V., Malanushenko, E. and Schneider, D. P. (2009) "A Survey of Z Similar To 6 Quasars In The Sloan Digital Sky Survey Deep Stripe. Ii. Discovery Of Six Quasars At Z(Ab) > 21", Astronomical Journal, 138(1), 305-311.
- *Kaczmarczik, M. C.*, **Richards, G. T.**, *Mehta, S. S.* and Schlegel, D. J. (2009) "Astrometric Redshifts For Quasars", Astronomical Journal, 138(1), 19-27.
- Lam, A. R., Teplow, D. B., Stanley, H. E. and Urbanc, B. (2008) "Effects of the Arctic (E-22 -> G) Mutation on Amyloid beta-Protein Folding: Discrete Molecular Dynamics Study", *Journal of the American Chemical Society*, 130(51), 17413-17422.
- Letellier, C. and **Gilmore, R.** (2009) "Poincare Sections for a New Three-dimensional Toroidal Attractor", *Journal of Physics a-Mathematical and Theoretical*, 42(1).
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J., Krolik, J.H., Shen, Y., **Richards, G. T.**, Anderson, S. F. and Schneider, D. P. (2008) "Space Density Of Optically Selected Type 2 Quasars", *Astronomical Journal*, 136(6), 2373-2390.

- Richards, G. T., Deo, R. P., Lacy, M., Myers, A. D., Nichol, R. C., Zakamska, N. L., Brunner, R. J., Brandt, W. N., Gray, A. G., *Parejko, J. K.*, Ptak, A., Schneider, D. P., Storrie-Lombardi, L. J. and Szalay, A. S. (2009) "Eight-Dimensional Mid-Infrared/Optical Bayesian Quasar Selection", *Astronomical Journal*, 137(4), 3884-3899.
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- Shan, G. Y., Wang, S., Fei, X. F., Liu, Y. C. and Yang, G. L. (2009) "Heterostructured ZnO/Au Nanoparticles-Based Resonant Raman Scattering for Protein Detection", *Journal of Physical Chemistry B*, 113(5), 1468-1472.
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New Collaborations

Drexel University joined the collaboration building the Large Synoptic Survey Telescope (LSST) and is now among the 29 universities, national laboratories and corporations involved in constructing the next world's most powerful survey telescope, a project that will revolutionize our understanding of the universe. Drexel scientists, **Dr. Gordon Richards** and **Dr. Michael Vogeley**, are working with researchers around the world on this project.

The 8.4-meter LSST, scheduled to see first light in 2014, will survey the entire visible sky deeply in multiple colors each week with a 3 Giga-pixel digital camera. Drexel is currently involved in the previous generation experiment, the Sloan Digital Sky Survey (SDSS), which took 8 years to make a digital map of the sky. By comparison, the LSST telescope will take snapshots every 15 seconds and will cover the entire SDSS area every ~3 days -- opening a movie-like window on objects that change or move on rapid timescales, such as exploding supernovae and potentially hazardous near-Earth asteroids as small as 100 meters in size. The \$400-millon LSST will be constructed on Cerro Pachón, Chile.

The LSST will provide unprecedented 3D maps of the mass distribution in the Universe, in addition to the traditional images of luminous stars and galaxies. These maps can be used to better understand the nature of the yet to be discovered and utterly mysterious Dark Energy that is driving the accelerating expansion of the Universe. The LSST will also provide a comprehensive census of our solar system. Finally, LSST's rapid scans of the sky will open the "time window", searching for faint bursts of light.

Plans for sharing the data from LSST with the public are as ambitious as the telescope itself. Anyone with a

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Image credit: Todd Mason, Mason Productions Inc./LSST Corporation

computer will be able to fly through the Universe, zooming past objects a hundred million times fainter than can be observed with the unaided eye. The LSST project will provide analysis tools to enable both students and the public to participate in the process of scientific discovery.

LSST is a public-private partnership. Funding for design and development activity comes from the National Science Foundation, private donations, grants to universities, and in-kind support at Department of Energy laboratories and LSST-consortium Institutional Members. Drexel has been included as Institutional Member thanks to the support of the College of Arts and Sciences.

International Collaborations

Collaborator/ Collaboration	Institution	Description	Faculty Involved
S. Portegies Zwart	Leiden University, The Netherlands	Starlab and the MUSE project. Computational astrophysics, using high-performance computing to address the evolution of young star clusters.	S. McMillan
F. D'Antona	National Institute for Astrophysics, INAF, Italy	Theoretical studies of the formation of multiple stellar populations in globular clusters using dynamical simulations and detailed models of stellar evolution.	S. McMillan, E. Vesperini
A. D'Ercole	National Institute for Astrophysics, INAF, Italy	Theoretical studies of the formation of multiple stellar populations in globular clusters using dynamical simulations and detailed models of stellar evolution	S. McMillan, E. Vesperini
Sloan Digital Sky Survey Collaboration	Korea, Japan, Germany, China, England	A project to map the universe with digital images and spectra of millions of galaxies, stars, and quasars.	G. Richards, M. Vogeley, and students
R. van de Weygaert	Kapteyn Institute for Astronomy, University of Groningen, The Netherlands	Investigations of the formation and evolution of cosmic voids and void galaxies.	M. Vogeley
Changbom Park	Korea Institute for Advanced Study, Korea	Studies of the topology of large-scale structure in the universe and investigations of the properties of galaxies and their environment.	M. Vogeley
M. Lefranc	Universite des Sciences et Technologies de Lille, France	Topological understanding of strange attractors b eyond thee dimensions.	R. Gilmore
C. Letellier	CORIA, Universite de Rouen, France	Invariant sets of chaotic attractors.	R. Gilmore
JM. Ginoux	Institut de Mathematiques de Jussieu, Universite Pierre et Marie Curie, France	Chaotic dynamics.	R. Gilmore
Sheng H. Lin	Institute of Atomic & Molecular Sciences, Academia Sinica, Taiwan	Protein folding, statistical mechanical approaches to secondary structural transformation of proteins.	JM. Yuan
Chin-Kun Hu	Institute of Physics, Academia Sinica, Taiwan	Systems behavior of p53 signaling pathways and cancers.	JM. Yuan
Feng-Yin Li	National Chung Hsing University, Taiwan	Self-aggregation of peptides and proteins, such as (AAKA)4.	JM. Yuan
Soonmin Jang	Sejong University, Korea	Self-aggregation of peptides and proteins, such as (AAKA)4.	JM. Yuan
S. Gallagher	University of Western Ontario, Canada	Study of winds in active galaxies.	G. Richards
P. Hewett and R. McMahon	Institute for Astronomy, University of Cambridge, UK	Active galaxies with the SDSS data.	G. Richards
J. Hennawi	Max Planck Institute for Astronomy, Germany	Study of galaxy mergers by looking at pairs of objects.	G. Richards
S. Croom	University of Sydney, Australia	AUS (AAOmega-UKIDSS-SDSS survey). Formation and evolution of active galaxies	G. Richards
Double Chooz Neutrino Experiment Collaboration	France, Germany, Spain, Russia, Great Britain, Japan, Brasil, UK, USA	Experiment searching for the last non-measured neutrino mixing angle Theta 13.	C. Lane, J. Maricic, and K. Zbiri
Kamioka Liquid Scintillator Antineutrino Detector Collaboration	Japan, China, USA	KamLAND, ongoing reactor neutrino experiment in Japan, made the first ever measurement of antineutrinos of geological origin confirming the validity of the existing Earth composition model.	C. Lane, J. Maricic, and K. Zbiri
The Hawaiian Anti- neutrino Observatory Project	France, Germany, USA	Deep-ocean large 10 kton scintillator detector set to study geoneutrinos coming from the Earth's mantle off-shore Big Island, Hawaii.	J. Maricic
S.N. Behera	Institute of Material Science, Bhubaneswar, India	Raman scattering from nanocarbon.	S. Bose

RESEARCH





Condensee Mater Nonlinear Dynamics



Faculty

David Goldberg Stephen McMillan Gordon Richards Michael Vogeley

Research Faculty Joel Allred Kevin Olson Daniel Spicer Enrico Vesperini

Post-Doc Fellows Rajesh Deo Otonyo Mangete

Graduate Students

Sanghamitra Deb Vishal Kasliwal Rachael Kratzer Coleman Krawczyk Sean Lynch E. Mamikonyan Danny Pan John Parejko Alfred Whitehead

Research Areas

Large-scale structure and cosmology, galactic astronomy, galaxy surveys, active galactic nuclei/quasars, black holes, dynamics of star clusters and galactic nuclei, numerical simulation of dense stellar systems, highperformance computing. Faculty Luis Cruz Cruz Frank Ferrone Brigita Urbanc Guoliang Yang Jian-Min Yuan

Research Faculty Alexey Aprelev

Graduate Students

Travis Hoppe William King Hanbing Lin Runcong Liu Zenghui Liu Derya Meral Marisa Roman John Schrek Yihua Wang Donna Yosmanovich

Research Areas

Phase transitions in biology, force transduction in muscle, dynamics of biomolecules, protein folding and selfassembly, neurodegenerative diseases, systems biology and bionetworks. **Faculty** Shyamalendu Bose Roberto Ramos Somdev Tyagi

Graduate Students Steven Carabello Joseph Lambert Zechariah Thrailkill

Research Areas Theoretical research on electronic and optical properties of nanoshells, graphene, carbon nanotubes and high-Tc superconductors. Experimental research includes ultra-low temperature studies, simulations of entanglement, coherence in superconducting qubits, enhanced Raman scattering and use of nanoparticles for biomedical applications.



Faculty Robert Gilmore

Graduate Students Benjamin Coy Daniel Cross Steven Jenks Timothy Jones Samuel Kennerly Ryan Michaluk Nicola Romanazzi

Research Areas

Topological analysis of nonlinear systems, driven molecular systems, chaotic scattering and quantum- classical correspondence. **Faculty** Charles Lane Jelena Maricic

Post-Doc Fellows Karim Zbiri

Graduate Students Erica Caden Edward Damon

Research Areas

Experimental neutrino properties and oscillation, solar neutrinos, geoneutrinos and neutrino applications to nuclear nonproliferation.









NEW GRANTS

(FY 2008-09: July 1, 2008 – June 30, 2009)

PI	Co-Pl	Project Title	Sponsor	FY Awards (New)
Cruz, L.	Urbanc, B.	Quantitative Analysis of Cerebra Cortex in Aging Monkeys	Boston University (NIH)	\$811,311
Gilmore, R.		Strange Attractors: Description and Visualization	National Science Foundation	\$207,000
McMillan, S.		Construction of a GPU cluster for simulations of stellar systems (hardware only)	Nvidia	\$30,000
Olson, K.	Spicer, D.	Parallel Adaptive Meshing for Magnetohydrodynamics Simulation Models	Naval Research Lab	\$45,000
Ramos, R.		Reviving the Sigma Pi Sigma Honor Society at Drexel (ceremony only)	AIP	\$500
Richards, G.		Deconstructing the Accretion Disk Wind in Quasars	Smithsonian Astrophysical Observatory	\$68,387
Richards, G.		Seeing the Unseen: IR Spectroscopic Constraints on Quasar Big Blue Bumps	Spitzer (NASA/JPL)	\$61,590
Richards, G.		Is the Structure of the Dusty Torus Related to the Physics of the Accretion Disk?	NASA	\$82,245
Richards, G.		SERVS: The Spitzer Extragalactic	Jet Propulsion Laboratory	\$20,000
Richards, G.		Leveraging Spitzers Legacy: Quasars and Feedback at High Redshift	Spitzer Space Telescope (NASA/JPL)	\$56,450
Tyagi, S.		Fabrication of SERS substrates using Nanoparticle inks	NTI/PChem	\$40,000
Urbanc, B.	Cruz, Luis	Ab Initio Molecular Dynamics of AB Folding and Assembly	Boston University (NIH)	\$583,034
Vesperini, E.	McMillan, S; Mac Low, M; Zepf, S	Dynamical Evolution of Young Clusters in Merging Galaxies	Space Telescope Science Institute	\$67,144
Jun Xi	Yang, G.	Investigation of Dynamic Actions of Cellulolytic Enzymes with Micro-Cantilever Sensors	National Science Foundation	\$50,000
Total:				\$2,122,661

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