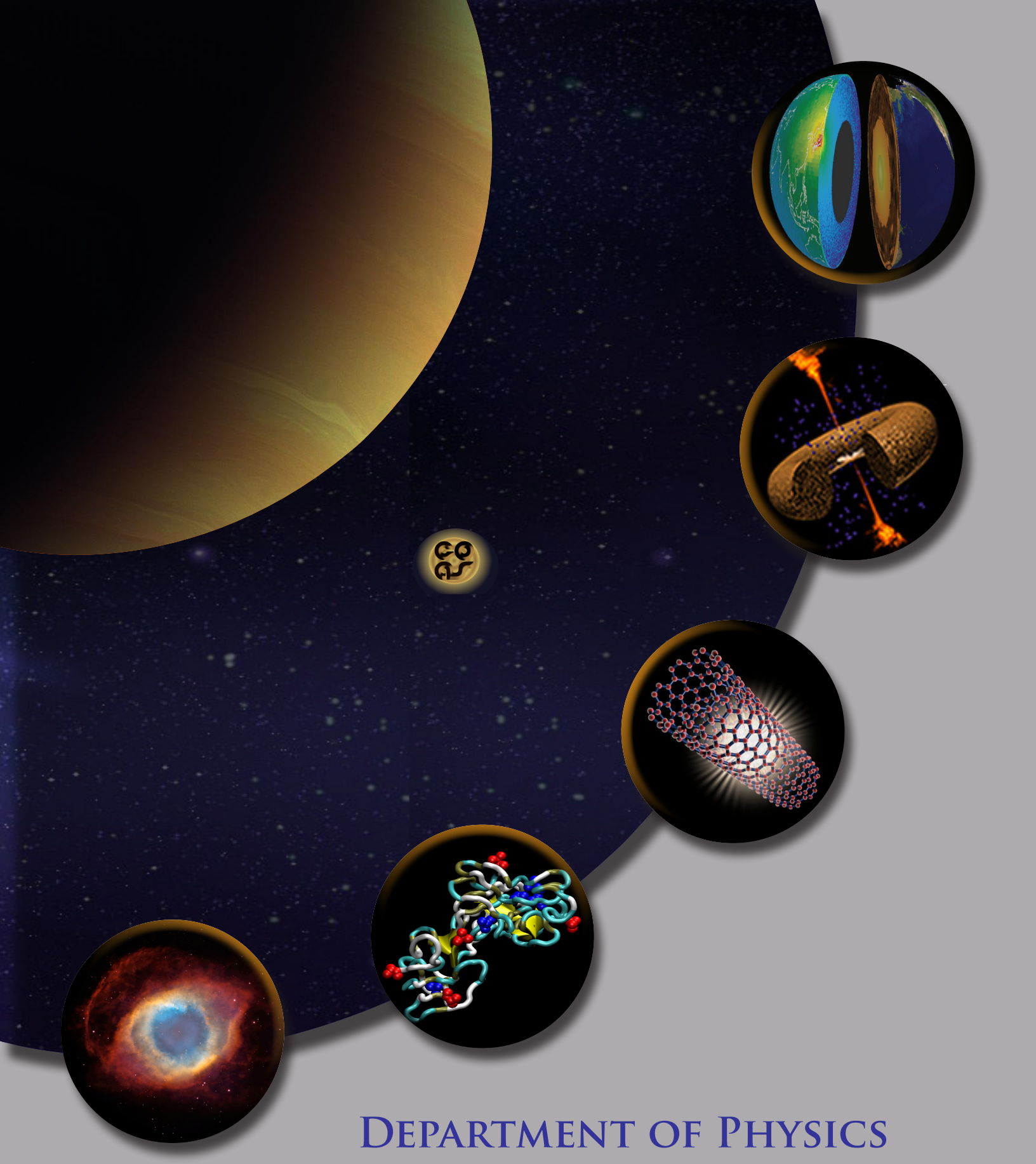

Department of Physics

Annual Report

2007-2008

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Message from the Department's Head

Welcome to the 2007-2008 edition of the Annual Report of the Department of Physics at Drexel University. I am pleased to report that the Department has had another very successful year of accomplishments.

We are particularly proud of having had the opportunity to hire two new exceptional faculty members who will conduct research in biophysics and form outstanding students. Drs. Brigita Urbanc and Luis Cruz Cruz are joining the Department as Associate Professors to conduct research in protein induced neurological disorders, like Alzheimer's, as well as in understanding the normal aging process. We also welcome Dr. Liming Zhao, Post-Doctoral Fellow in Biophysics. Unfortunately, our colleague Dr. Maria Rotter passed away in June. We have lost an esteemed member of the Department, and she is greatly missed.

This year saw great accomplishments by our students. Among others, undergraduate student Alyssa Wilson received the national Goldwater Scholarship and graduate student Erica Caden was selected to participate in the 58th Meeting of Nobel Laureates in Lindau, Germany. Undergraduate students Carlos Bahamondes and James W. Monahan did a Co-OP cycle at the University of Tubingen in Germany. The Department was host to five (5) STARs undergraduate students. The Society of Physics Students received two national awards.

The Department has seen real growth in research. Our faculty members were awarded a total of $6,060,000 in external funding, spent $1,836,000 in research expenditures, published 46 refereed articles and presented 51 talks. Our faculty co-organized five (5) international conferences. Dr. Gilmore received the 2008 "Outstanding Referee" from the APS. Dr. Maricic received the CoAS Devereux award. Dr. Gilmore published "Lie Groups, Physics, and Geometry".

Our faculty was very active in our teaching and outreach missions as well. The new calculus based Physics sequence met with great success. The new laboratories to accompany these courses are fully implemented. On the other hand, Dr. McMillan published the 6th edition of "Astronomy Today". Dr. Ramos received the 2008 Allen Rothwarf award and was PI on an awarded NSF S-STEM grant to support undergraduate students in Physics and Chemistry. The Kaczmarczik Lecture was given by Nobel Laureate Dr. William D. Phillips and met with considerable success. The SPS conducted many outreach activities with high schools.

I invite you to peruse this report to learn more about our Department. You can also visit us at www.physics.drexel.edu.

Sincerely,

Michel Vallieres

Michel Vallieres
Department Head and Professor

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
- Research Staff: 12
- Professional and Technical Staff: 4

Enrollment
- Students Enrolled in Physics Courses in 2007: 4,348
- Student Credit Hours: 16,441
- Undergraduate Enrollment: 60
- Graduate Enrollment: 39
- SAT Average: 1305
- GRE Quant. Average: 702

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

Research
- External Research Grants Awards (FY): $5,560,000
- Education Grant Award (FY): $460,000
- Research Expenditures FY: $1,836.000
- Refereed Publications: 46
- Conferences and Other Presentations: 51

Honors and Awards

Undergraduate Students Spotlight

Alyssa Wilson achieved national distinction as a recipient of the prestigious Barry M. Goldwater Scholarship. Alyssa was among 321 sophomores and juniors who were recognized for success in math and sciences, chosen from among 1,035 nominees. The Goldwater Scholarship is the premier undergraduate award of its type in the fields of mathematics, the natural sciences, and engineering.

The **Drexel University Society of Physics** has received national recognition for its projects designed to promote interest in physics among students and the general public. The National Society of Physics and Sigma Pi Sigma, the national physics honor society, honored our chapter with two awards:

- The 2007-08 Marsh W. White Outreach Award for the proposal submitted by **Vede Ramdass** and **William Stephenson**. The Drexel SPS received this award for two consecutive years.

- The 2007-08 Sigma Pi Sigma Undergraduate Research Award for their research proposal "Variable Star Observation and Search" submitted by **A. Bolesta, S.S. Mehta, J. Mlack, and A. Petrone.** This award provides grants to support local Chapter activities that are deemed imaginative and likely to contribute to the strengthening of the SPS program.

Ryan McKeown received a grant award from the Sigma Xi Committee on Grants-in-Aid of Research for his Senior Project on "Can muon spallation and a lead target be used to create a fast neutron source?" This program has a highly competitive application process and only approximately 20% of applicants receive any level of funding.

2008 CoAS Honors Day: Undergraduate Physics Awards

Henry S.C. Chen Memorial Award for Physics: **Vede Ramdas**

Walter R. Coley Award: **Ryan McKeown** and **Sajjan Mehta**

M. Russell Wehr Award: **Joseph Angelo, Andrew Eshelman, Daniel McGovern, Ana Petrone, Max Soloff**, and **Alyssa Wilson**

Lorenzo M. Narducci Memorial Endowed Scholarship: **Alyssa Wilson**

Senior Second Honor: **Matthew Washik**

Senior First Honor: **Max Soloff**

Senior Holding a 4.0 GPA: **Alyssa Wilson**

Faculty Awards

Dr. **Robert Gilmore** received the 2008 "Outstanding Referee" award as recognition for his exceptional work in reviewing articles for the American Physical Society journals.

Dr. **Jelena Maricic** received the 2008 Antelo Devereux Award for Young Faculty, from the College of Arts and Sciences, Drexel University, May 2008.

Dr. **Roberto Ramos** received the 2008 Allen Rothwarf Award for Teaching Excellence (Junior Faculty), Drexel University, June 2008.

Degrees Awarded

BS AS Degrees:

Kara R. Blaine
Max Polun
Ryan W. McKeown
William R. Gallagher
Christopher Lawrence
Geoffrey Lukas

MS Degrees:

Jeffrey A. Blomquist
Timothy D. Jones
Sam T. Kennerly
Hanbing Lin
Runcong Liu
Marisa B. Roman
Zechariah E. Thrailkill
Ryan M. Michaluk

PHD Degrees:

Dr. David J. Miller, "Time Adaptive Integration of Reaction-Diffusion Systems". Advisor: Dr. Avijit Ghosh, March 14, 2008.

Dr. Weijun Weng, "Universal Metastability of Sickle Hemoglobin Polymerization". Advisor: Dr. Frank Ferrone, May 29, 2008.

Graduate Student Awards

Junior Graduate Student Research Award: **Travis Hoppe**

First Year Graduate Student Award: **Edward Damon**

Graduate Student Research and Service Award: **Timothy Jones** and **John Parejko**

Erica Caden was selected to participate in the "58th Meeting of Nobel Laureates", Lindau Germany, June 29- July 4, 2008. More than 20,000 young researchers applied, and only about 2% were selected. These young researchers belong to the scientific elite of their respective countries, and have passed a multi-stage international selection procedure.

John Parejko received an Honorable Mention for best student poster at the American Astronomical Society meeting in Austin, Texas for his work in collaboration with Dr. Michael Vogeley on "Soft X-ray Properties of Ordinary SDSS Galaxies".

Employee Service Awards

35 Year Award: Dr. Somdev Tyagi

25 Year Award: Dr. Robert Gilmore

20 Year Award: Dr. Stephen McMillan

15 Year Award: Mrs. Laura D'Angelo

5 Year Award: Dr. David Goldberg

Undergraduate Program Highlights

- Dynamic freshmen physics sequence that exposes our students to Classical and Modern Physics right away.
- Scientific computing introduced to freshmen via Maple and Python.
- Weekly colloquia that enhance the coursework by providing our students with the opportunity to learn from and interact with leading scientists.
- Elective sequences for those preparing to enter biophysics or medicine, and advanced topics for those interested in atomic, nuclear, solid-state, or theoretical physics.
- High-Performance Computational Physics integrated in the curriculum to expose students to numerical techniques, parallel processing, electronic communication, basic computer languages and software relevant to advanced studies and research in Physics.
- Small classes, hands-on laboratories, and opportunities to engage in research under the guidance of faculty advisers.
- High quality, personalized learning environment
- An individual faculty advisor from day one
- An Undergraduate Physics Lounge where students meet, study and plan activities

New Introductory Physics Curriculum for Science & Engineering Majors

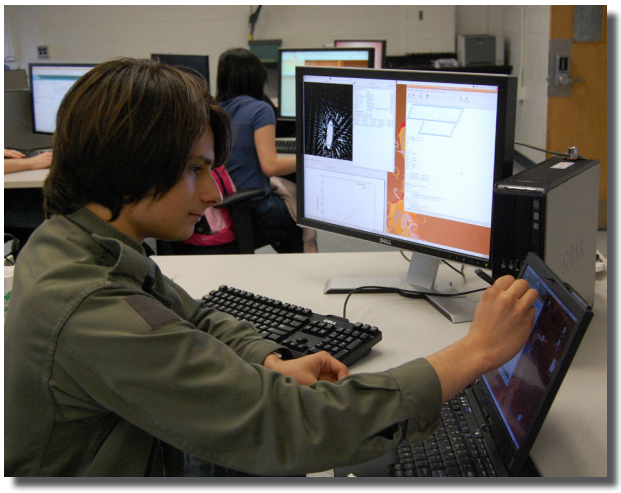
- 3-quarter series for 600 engineering majors

  Physics 101 (Mechanics),
  Physics 102 (Electricity & Magnetism)
  Physics 201 (Waves & Modern Physics)
- Optional Physics 202 (Techniques of Applied Physics)
- Infused with modern and contemporary physics
- Emphasis on conceptual learning and critical thinking
- Integration of clickers in Lectures
- Many physics demos
- Physics Help Center manned 4 days/week
- A Lab Component with a dedicated Lab Coordinator
- 16 New Physics Labs where none existed before
- Labs infused with modern physics and innovative classic experiments
- A “Just for the Fun of it” Laboratory component
- A Pre-lab Graded Exercise
- New Equipment in a newly renovated room
- Honors Lab

Laboratory for High-Performance Computational Physics

With our recent upgrade, we now have a computer lab built upon 15 powerful workstations-each with Intel Core 2 Duo processors at 3 Ghz, 4 Gb RAM, and an ultra fast DVD writer/burner. They are running Ubuntu 8.04 LTS using the server kernel (for high memory). Each workstation has a 24 inch screen monitor.

These world-class workstations are connected to our main file server via the highest quality gigabyte network connectors.



S-STEM Program

Six physics and four chemistry majors, all freshmen, have been awarded $40,000 scholarships each to study at Drexel University. This is made possible by a $460,000 NSF grant for the proposal “S-STEM Scholarships for Enhancing the 21st Century Scientific Workforce” awarded to Dr. **Roberto Ramos** (PI) and Dr. Lynn Penn (Co-PI). This Philadelphia’s first NSF S-STEM Scholarship Program, provides scholars with mentoring, career counseling, academic support services and other enrichment activities. Students were selected from over 50 academically-talented, financially-needy applicants, mostly from the Greater Philadelphia Area.

Drexel Co-op

Physics students benefit from Drexel University’s nationally recognized cooperative education program (Co-op) by combining 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.

Top Co-op Employers

NASA
Caltech
LIGO
The Anglo-Australian Observatory
University of Washington
Princeton University
University of Tuebingen, Germany
Lockheed Martin

Undergraduate Students Profile

Seth Meiselman worked on computational and theoretical research at Widener University. Seth collaborated on a project about a generalized four-level-lambda atomic system that exhibits electromagnetically induced transparency (EIT) phenomena. He visited the Navy Research Laboratory harboring an EIT experimental setup and a magnetic optical trap (MOT) used to make these phenomena possible to observe. This was a great opportunity to meet with other collaborators and discuss forefront research.

Carlos Bahamondes, worked in the Particle Physics group at the University of Tübingen, Germany, and was involved with the assembly and testing of Photo-Multiplier Tubes to be used in the Double-Chooz neutrino physics experiment. Double-Chooz is an international collaboration based at the Chooz nuclear reactor in France. Carlos also attended the collaboration conference at Chooz, where he presented a small talk about his work. During his stay at the University, Carlos was enrolled as a study abroad student and was able to take two advanced Physics courses, which counted towards his degree. He also completed an intensive German-language course. Travel expenses were paid by Dr. Jelena Maricic.

Rising STARs

The STAR program is a special program for academically talented students that match Drexel University undergraduates with research faculty. On August 14, 2008, Physics' STAR students **Andrew Eshelman**, **Sajjan Mehta**, **Jennifer Pillion, Anna Petrone**, and **Amanda White** presented posters summarizing their summer research.

Sajjan Mehta, worked on atmospheric dispersion photometric redshifts with Dr. Richards and grad student Kaczmarczik. Mehta will be an author on a paper on this subject.

Anna Petrone, worked on the selection of quasars from variability data with Dr. Richards. Petrone will likely be an author on 1 or 2 upcoming papers related to this work.

Amanda Whitehead worked on "Interacting Void Galaxies in the Sloan Digital Sky Survey" with Dr. Vogeley.

Jennifer Pillion worked on the research project "Investigation of Substrates for Surface Enhanced Raman Spectroscopy"with Dr. Tyagi and is in the process of writing a paper.

Graduate Program Highlights

Our Graduate Program offers M.S. and Ph.D. degrees, with the focus of course work on advanced training in core areas of physics and in topics of current research. Ph.D. students begin research early in the program, commencing thesis work in their second year of study. We offer opportunities for students to work with leading researchers in the areas of Astrophysics, Biophysics, Condensed Matter, Nonlinear Dynamics, and Particle Physics, and the possibility to participate in international collaborations. Assistantships include 12-month stipend support, full tuition remission, and free health insurance. In 2007, we had an increase in the total number of applicants, with most of the growth in domestic applicants.

Several changes were implemented to better follow our students' progress. We introduced an Annual Activities Report that helps students reflect on their accomplishments, establish new goals, and record milestones toward their degree. Faculty advisors were requested to provide written constructive feedback on these reports. We also implemented a database system to closely monitor the students' academic performance on a quarterly and annual basis.

The two week Physics Graduate Orientation Program for incoming graduate students continues to be a great success. The program has two components: computer seminars that introduce them to programming tools and talks by faculty members describing their research and inviting them to learn more about possible thesis topics. The program also includes team-building activities for the graduate students; this year the majority of students participated in a camping trip to one of Pennsylvania's state parks. This program has now proven to be effective in helping to prepare new students for rigorous course work, as well as fully engage them in the graduate program and welcome them to the department.

Following the success of our graduate student mentoring program that we first implemented last year, we again paired up new students with "mentors" among the more senior students, who could guide them through their first steps at Drexel and throughout their first year.

Throughout the year, semi-weekly graduate student seminars were organized by the students and funded by the department to encourage discussion of current topics in physics research.

A highlight of the Program was the graduate student award ceremony during our department welcome back party in September. Several thoughtful nominations were received for categories of Outstanding First Year Graduate Student, Research Achievement awards, and the Department Service award. The awardees are listed under the Honors and Awards section.

Outreach

Kaczmarczik Lecture

The Kaczmarczik Lecture Series is a significant event on campus, as numerous Nobel Laureates have been invited in recent years to address the audience. Dr. William D. Phillips, Nobel Laureate, was the honored speaker at the 13th Annual Kaczmarczik Lecture, February 7th, 2008. The Lecture "Time and Einstein in the 21st Century: The Coolest Stuff in the Universe" was attended by over 700 high school students from schools across the Philadelphia, New Jersey, and Delaware areas, as well as hundreds of Drexel students, faculty, and staff.

Dr. Phillips delighted the audience with a series of intriguing and explosive experiments meant to demonstrate Einstein's principles of cooling atoms to incredibly low temperatures.

Established in 1995 the lecture is an unparalleled example of Drexel's consistent efforts to expose students to the fascinating concepts at the forefront of modern scientific research.

Public Observation Nights

On the first Wednesday of every month, the Department of Physics invites the public to attend an observing session atop the Main Building at Drexel University. A variety of celestial objects can be viewed from planets, nebulae, star clusters to comets. This program is run by graduate student John Parejko under the supervision of Dr. Gordon Richards, Director of the observatory.

Astrophysics Outreach to Philadelphia School District

David Goldberg and graduate student John Parejko received a NASA OSS/EPO grant to help the Philadelphia School District with their 6th grade astronomy curriculum. This effort consists in two parts: Student observing nights bringing in 6th grade students from around the district to use our telescope for visual observing and imaging, and Teacher enrichment by offering a free astronomy series for ACT 48 credit to all teachers in the Philadelphia School District.

Giving Back to the Community

Under the initiative of Dr. Joseph Trout, our department donated used computers to Saint Francis Xavier School. The school profoundly appreciated the donation and its students have written emotive thank you letters expressing their gratitude.

Low-Temperature Physics in High Schools

Within the NSF Campaign for Absolute Zero, the Drexel University Society of Physics Students (under the supervision of Dr. Roberto Ramos) demonstrate low-temperature quantum devices in local high schools and other community events and explain superconductivity. This effort includes hands-on demonstrations engaging students in science and low-temperature physics. The Drexel SPS have been involved in several outreach activities to promote physics awareness.

Physics in Philly: Engaging and Enlightening Experiments for High School Students

Drexel University SPS undergraduate members Brian Cohen, Andrew Eshelman, and Sajjan Mehta together with graduate student Travis Hoppe performed demonstrations at a career fair at the Global Leadership Academy in West Philadelphia. The volunteers gave five presentations to a total of around 150 children from fourth to seventh grade. The presentations consisted of demonstrations of the properties and effects of liquid nitrogen, angular momentum, and the Doppler Effect.

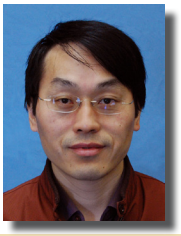
Focus on the Faculty

Faculty News

The Department of Physics is pleased to announce the addition of two faculty members and a post-doctoral fellow.

Dr. Brigita Urbanc completed her PhD at University in Ljubljana. Her 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.

Dr. Luis Cruz Cruz, received his PhD at MIT. 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.



Dr. Liming Zhao, appointed as Research Post-Doctoral Associate, received his Ph.D. from the University of Maryland. Dr. Zhao brings expertise in biomechanics and biomaterials characterization. Dr. Zhao participates in developing a novel cellulase assay with micro-cantilevers.

Memberships and Fellowships

L. Finegold, F. Ferrone, R. Gilmore, T. Lim, and J. Yuan, Fellows of the American Physical Society.

S. McMillan, Fellow of the Royal Astronomical Society (U.K.)

F. Ferrone, member of the Franklin Institute Committee on Science and the Arts.

J. Allred, D. Goldberg, G. Richards, S. McMillan, and M. Vogeley, members of the American Astronomical Society.

J. Allred and L. Finegold, members of the American Geophysical Union.

S. Bose, N.J. DiNardo, C. Lane, R. Ramos, R. Steinberg, M. Vallières, and G. Yang, members of the American Physical Society.

N.J. DiNardo and J. Yuan, members of the American Chemical Society.

L. Finegold, and S. McMillan, members of the American Association for the Advancement of Science.

L. Finegold, member of the Committee on Space Exploration and the Federation of American Scientists.

L. Finegold, F. Ferrone, G. Yang, and Jian-Min Yuan, members of the American Biophysical Society.

R. Gilmore, member of the American Institute of Physics.

J. Maricic, President, Drexel chapter of Sigma Xi, D. Goldberg, F. House, C. Lane Teck-Kah Lim, and M. Vallières, members.

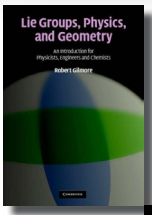
S. McMillan, and G. Richards, members of the Astronomical Society of the Pacific.

S. McMillan, member of the IEEE Computer Society.

R. Ramos, G. Richards, members American Association of Physics Teachers.

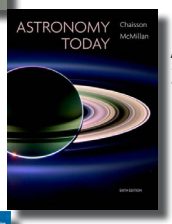
R. Ramos, member Philippine-American Academy of Scientists and Engineers.

Books



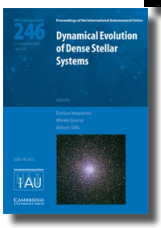
Lie Groups, Physics, and Geometry, R. Gilmore, 2008, Cambridge: University Press

ISBN-13: 978-0-521-88400-6



Astronomy Today, 6th edition © 2008, Addison Wesley: San Francisco, E. Chaisson and S. McMillan

ISBN-13: 9780321586971



IAU Symposium 246 proceedings: Dynamical Evolution of Dense Stellar Systems, 2008, Cambridge University Press, Eds. E. Vesperini (Chief Editor), M. Giersz & A. Sills

ISBN: 0-521-874688

Professional Activities

Most of our faculty members served as reviewers of renowned scientific journals (Phys. Rev. Lett., Phys. Rev. A, Phys. Rev. E, Phys. Rev. D, Am. J. of Phys., Biophys. J., J. Chem. Phys., J. Phys. Chem., Astrophys. J. Lett., Biochemistry J, Mol. Biol. J. Biophys. Chem., Physics B, Cell Biochemistry and Biophys., Microscopy Research and Technique, Ultrasonics, etc.)

Our faculty members also participated as proposal/panel reviewers for the NIH, NSF, NASA E/PO grant program, Petroleum Research Funds, American Chemical Society, Research Corporation, the U.S. Civilian Research and Development Foundation (CRDF) Cooperative Grant Applications.

Events Organization

Gilmore R., co-organized the Drexel Workshop on Topology and Physics, September 8-9, 2008.

Bose S., co-organized a three-day workshop on Nanoscopic, Mesoscopic and Macroscopic Materials at Bhubaneswar, India during January 2-4, 2008.

McMillan S., Scientific Organizing Committee, MODEST-8 meeting on Dense Stellar Systems, Bonn, Germany, December 2007.

Ramos R., organizing committee, and co-Chair Spectroscopy Session), 28th Annual Philippine-American Academy of Science and Engineering (PAASE) Meeting and Symposium (28th APAMS), Georgetown University, Washington DC, May 22-24, 2008.

Richards, G.T., Scientific Organizing Committee, SDSS Symposium: From Asteroids to Cosmology, Chicago, IL, August 15-18, 2008.

Conferences and other presentations

Allred, J.
"MHD Simulations of Helmet Streamer Eruptions", poster presentation at SHINE 2008, June 23-27, 2008, Midway, Utah.

Bose, S.
"Theory of Raman Spectra of Unfilled and Filled Carbon Nanotubes", invited talk, International Workshop on Mesoscopic, Nanoscopic and Macroscopic Materials, Jan 2-4, 2008, Bhubaneswar, India.
"Properties and Technology of Carbon Nanotubes", invited talk, Silver Jubilee Convention of Orissa Physical Society and National Conference on Recent Developments and Prospects of Physics Feb 2-3, 2008, Cuttack, India.

Chen, Y.
"The size controlled structural and optical properties of ZnO nanorods", Y. W. Chen, Q. Qiao, Y. C. Liu, and G. Yang, poster presentation at the 2008 APS March Meeting of the American Physical Society, March 10-14, 2008, New Orleans, LA.

Cross, D.
"Representation theory for strange attractors", D. Cross and R. Gilmore, poster presentation, Drexel Workshop on Topology and Physics, Aug 2008.

Ferrone, F.
"Stiffness of Sickle Hemoglobin Polymers Alone and in Domains", M. Zakharov, A. Aprelev, M. Rotter, F. A. Ferrone, poster presentation, Biophysical Society, Feb 2007, Long Beach, CA.
"Sickle Hemoglobin Fiber Depolymerization, a Potential Modifier of Pathology: Fracture, Fragments, Vanishing Times and Stochastics", J.C. Wang, F.A. Ferrone, S. Kwong, M.S. Turner and R.W. Briehl, platform talk, Annual Meeting of Sickle Cell Disease Association, Sept 2007, New Orleans, LA.

Goldberg, D.
"Where is the Information in Cluster Lenses?", invited seminar at the new Institute for the Physics and Math of the Universe (IPMU), University of Tokyo, and Tohoku University, Aug 2008, Sendai Japan.

Gilmore, R.
"The Structure of Chaos", Conference on Nonlinear Dynamics, 2007, Paris, France.
"The Topology of Chaos", Institut Nonlineaire de Nice, 2007, Nice, France.
"The Topology of Chaos", Drexel Workshop on Physics and Topology, 2008, Philadelphia, PA.

King, W.
"Experimental Estimation of the Free Energy Landscape Roughness of Protein Molecules", W. T. King and G. Yang, poster presentation at the 52nd Annual Meeting of the Biophysical Society, Feb. 2-6, 2008, Long beach, CA.

Liu, R.
"Viscosity Effects on the AFM Force Measurements", R. Liu and G. Yang, poster presentation at the 52nd Annual Meeting of the Biophysical Society, Feb 2-6, 2008, Long beach, CA.

Maricic, J.
"Surveying the Earth with Neutrinos", speaker Dean's Seminar Series, CoAS, Drexel University, Nov 2007, Philadelphia, PA.

McMillan S.
"A Dynamical Origin for Early Mass Segregation in Young Star Clusters", contributed talk at the IUA 246 on Dynamical Evolution of Dense Stellar Systems symposium, Sept 5-9, 2007, Capri, Italy.
"The MUSE Software Environment", invited talk presented at the MODEST-8 workshop, Dec 5-8, 2007, Bonn, Germany.
"Simulating Dense Stellar Systems with MUSE", invited talk presented at Frontiers in Computational Astrophysics: The Origin of Stars, Planets and Galaxies July 13-18, 2008, Ascona, Switzerland.
"Simulating Dense Stellar Systems with MUSE", invited talk presented at N-body 2008 conference, Aug 10-14, 2008, Turku, Finland.
"Dynamics of Multiple Stellar Populations in Globular Clusters", invited talk, Nbody 2008 conference, Aug 10-14, 2008, Turku, Finland.
"Introduction to MUSE", invited talk presented at the MODEST-8b workshop, Sept 15-19, 2008, Amsterdam, The Netherlands.

Miller, D.
"A Systems Approach for the Prediction of Wild Type MAPK Pathway Response to Targeted Drugs", poster presentation, 8th International Conference on Systems Biology in Long Beach, CA, Oct. 1-6, 2007.

Pan, D.
"Cosmic Void Ellipticity in SDSS", D. Pan, F. Hoyle, M.S. Vogeley, poster presentation at the international symposium "The Sloan Digital Sky Survey: From Asteroids to Cosmology", Aug 15-18, 2008, Chicago, IL.

Parejko, J.
"X-ray Emitting Galaxies in the SDSS", poster presentation at the international symposium "The Sloan Digital Sky Survey: From Asteroids to Cosmology", J.K. Parejko, M.S. Vogeley, A. Constantin and F. Hoyle, J.B. Hyde, Aug 15-18, 2008, Chicago, IL.

Ramos, R.
"Spectroscopy of Coupled Artificial Atoms", contributed talk at the 28th Annual Symposium of the Philippine-American Academy of Scientists and Engineers, Georgetown University, May 22-24, 2008, MA.
"Energies and Entanglement in Multiply-coupled Phase Qubit Systems", Z. Thrailkill, S. Kennerly, A. Tyler and R.C. Ramos, poster presentation, 25th International Low Temperature Conference, Aug 6 – 13, 2008 Amsterdam, The Netherlands.
Participated in the 2008 Quantum Computing & Quantum Algorithm Program Review, Atlanta, GA.

Richards, G.
"Quasar Surveys and the Quasar Luminosity Function", invited talk at the CCAPP AGN Workshop, Ohio State University, 1-3 Oct 2007, Columbus, OH.
"What to do with one million quasars", invited colloquium speaker, Harvard-Center for Astrophysics, March 5, 2008.
"Quasar Science from the Sloan Digital Sky Survey", invited Review talk on at the SDSS Symposium: From Asteroids to Cosmology; Aug 15, 2008, Chicago, IL.

Roman, M.
"Macromolecular c Crowding Increases the Mechanical Stability of Protein Molecules", M. Roman and G. Yang, poster presentation at the 52nd Annual Meeting of the Biophysical Society, Feb 2-6, 2008, Long beach, CA.

Shan, G.
"The Detection of Protein via ZnO Resonant Raman Scattering Signal", Guiye Shan, Shuang Wang, Yichun Liu and Guoliang Yang, poster presentation at the 2008 APS March Meeting of the American Physical Society, March 10-14, 2008, New Orleans, LA.

Thrailkill, Z and Kennerly, S.
"Modeling Three-and Four-Coupled Phase Qubits", Z. Thrailkill, S. Kennerly and R.C. Ramos, poster presentation, International Applied Superconductivity Conference, Aug 17-22, Chicago, IL.

Tyler, A.
"Detection of Berry's Phase in a Josephson Junction", A. Tyler and R.C. Ramos, poster presentation, Drexel Workshop on Topology and Physics, Aug 2008. Philadelphia, PA

Tyagi, S.
"Development of Surface Enhanced Raman Scattering (SERS) Substrates using Nano-particle Inks", M.A. Figueroa, S. Park, K. Pourrezaei, and S. Tyagi, presentation, 2008 Biophotonics West Conference, Jan 16-19, 2008, San Jose, CA.

Vesperini, E.
"Dynamics of Young Mass-segregated Star Clusters", oral presentation at Young Massive Star Clusters conference Sept 11-14, 2007, Granada Spain.
"Dynamical evolution of mass-segregated clusters", contributed talk at the IUA 246 on Dynamical Evolution of Dense Stellar Systems symposium, Sept 5-9, 2007, Capri, Italy.

Vogeley, M.
"The Structure of Cosmic Voids", D. Pan, M.S. Vogeley and F. Hoyle, presented at the 211th American Astronomical Society meeting, Jan 7-11, 2008, Austin, TX.
"The Soft X-ray Properties of Ordinary SDSS Galaxies", J.K. Parejko, M.S. Vogeley, A. Constantin and F. Hoyle, presented at the 211th American Astronomical Society meeting, Jan 7-11, 2008, Austin, TX.
"Neighborhoods of the Universe", invited speaker Dean's Seminar, CoAS, Drexel University, April 2008, Philadelphia, PA.

Yang, G.
"The effects of macromolecular crowding on the mechanical stability of proteins", colloquium speaker, Department of Chemistry, University of British Columbia, November 30, 2007, Canada.

Yuan, J.

"Unraveling design principles of signaling pathways and controlling output signals using non-equilibrium thermodynamics and sensitivity analysis: Cancers and diabetes", plenary talk, 3rd Cross-Strait Conference on Statistical Physics, Zhejiang Normal University, November 11–16, 2007, Jinhua, China.

"Effects of depletion force on protein stability, folding dynamics, and protein aggregation", invited talk, 4th International Workshop on Simulational Physics, Zhejiang University, November 10–11, 2007, Hangzhou, China.

"Sensitivity and dynamic studies on cancer- and diabetes-related signaling pathways", invited talk, 2008 NCTS Workshop on Critical Phenomena and Complex Systems, Chung-Yuan Christian University, July 5-7, 2008, Chungli, Taiwan.

"Effects of entropic depletion force on protein stability", invited talk, 9th International Symposium on Statistical Physics, Institute of Physics, Academia Sinica, Nankang, July 8-12, 2008, Taipei, Taiwan.

"Theoretical and experimental studies on peptide and protein aggregation", plenary talk at the 4th Cross-Strait Conference on Statistical Physics, National Kaohsiung Normal University, July 14–17, 2008, Kaohsiung, Taiwan.

"Theoretical and experimental studies on peptide and protein aggregation", seminar at the Institute of Physics, Academia Sinica, Nankang, July 29, 2008, Taipei, Taiwan.

"Sensitivity and dynamic studies on cancer- and diabetes-related signaling pathways", seminar at the Institute of Physics, Academia Sinica, Nankang, August 5, 2008, Taipei, Taiwan.

"Theoretical and experimental studies on peptide and protein aggregation", seminar, Institute of Atomic and Molecular Sciences, Academia Sinica, August 14, 2008, Taipei, Taiwan.

Zbiri, K.

"First results on R1408 PMTs mass testing", oral presentation at Double Chooz meeting collaboration, September 17-19, 2007, Oxford.

"Update on R1408 PMTs Testing", oral presentation at Double Chooz meeting collaboration, March 3-5, 2008, Kobe.

"New Results of R1408 PMTs Testing", oral presentation at Double Chooz meeting collaboration, June 26-28, 2008, Chooz.

Zhou, L.

"A novel cellulase assay with micro-cantilever", Liming Zhao, Jun Xi, and Guoliang Yang, poster presentation at 236th American Chemical Society National Meeting, August 2008, Philadelphia, PA

Colloquia

Dr. Dee Breger, Drexel University, Dept. of Materials Science, "Did a Comet Cause Noah's Flood?"

Dr. Steven Anlage, University of Maryland, "Is Quantum Mechanics Chaotic?"

Dr. Marshall Onellion, University of Wisconsin, Madison, "Ultrafast Optical Studies of Condensed Matter Systems"

Dr. Georgi Medvedev, Drexel University, Dept. of Mathematics, "Mixed-mode oscillations: from dopamine neurons to solid fuel combustion"

Dr. Shari Moskow, Drexel University, Dept. of Mathematics, "Convergence and Stability of the Inverse Scattering Series for Diffuse Waves"

Dr. John Jewett, California State Polytechnic University, Pomona, "A Drexel Graduate's Journey through Physics Professorship and Textbook Authoring"

Dr. Joel Allred, Drexel University, Dept. of Physics, "The Sun and Space Weather"

Dr. Heather Ray, University of Florida, "Oak Ridge and Neutrinos - eHarmony forms another perfect couple"

Dr. Heidi Newberg, RPI, "Your Textbook is wrong about the Milky Way"

Dr. Gabrijela Zaharijas, ANL, "Has dark matter already been discovered?"

Dr. Nily Dan, Department of Chemical and Biological Engineering, "Dynamic Disorder in Enzymatic Systems"

Dr. Sara Vaiana, NIH, "Dynamics of Intramolecular Contact Formation in Islet Amyloid Polypeptide"

Dr. Som Tyagi, Drexel University, Dept. of Physics, "The Giant Magneto-Resistive (GMR) Effect"

Dr. Bruce Elmegreen, IBM Watson Research Center, "Star Formation in High Redshift Galaxies"

Dr. Fred Strauch, Gettysburg College, "The Perfect Qantum State Transfer with Superconducting Phase Qubits"

Personnel

Faculty

Shyamalendu Bose
Luis Cruz Cruz
N. John DiNardo
Frank Ferrone
Leonard Finegold
Robert Gilmore
David Goldberg
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Tech Kah Lim
Jelena Maricic
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Enrico Vesperini

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Karim Zbiri
Liming Zhao

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Yihua Wang
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Alfred Whitehead
Donna Yosmanovich
Mikhail Zakharov
Di Zhou

Research

Astrophysics

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Stephen McMillan
Gordon Richards
Michael Vogeley

Research Faculty:
Joel Allred
Kevin Olson
Daniel Spicer
Enrico Vesperini

Post-Doctoral:
Rajesh Deo
Otonyo Mangete

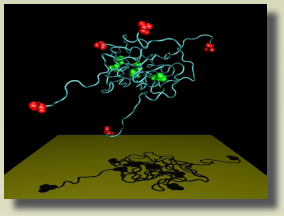
Visiting Research Faculty:
Fiona Hoyle
Peter MacNeice

Research Areas:
Large-scale structure and cosmology, galactic and astronomy, galaxy surveys (Sloan Digital Sky Survey), active galactic nuclei/ quasars, black holes, dynamics of star clusters and galactic nuclei, numerical simulation of dense stellar systems, high-performance computing.

Funding Agencies:
NASA, NSF, Sloan Foundation

Grants Awarded FY:
$4,865,961

Expenditures FY:
$1,280,551



Biophysics

Faculty:
Luis Cruz Cruz
Frank Ferrone
Brigita Urbanc
Guoliang Yang
Jian-Min Yuan

Research Faculty:
Alexey Aprelev

Post-Doctoral:
Liming Zhao

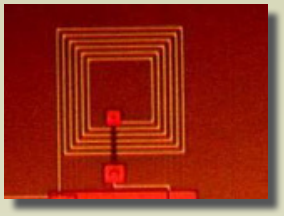
Visiting Research Associates:
Yanwei Chen
Guiye Shan

Research Areas:
Phase transitions in biology, force transduction in muscle, dynamics of biomolecules, protein folding and self-assembly, neurodegenerative diseases, systems biology and bio-networks.

Funding Agencies:
NIH, NSF

Grants Awarded FY:
$0

Expenditures FY:
$430,382



Condensed Matter

Faculty:
Shyamalendu Bose
Roberto Ramos
Somdev Tyagi

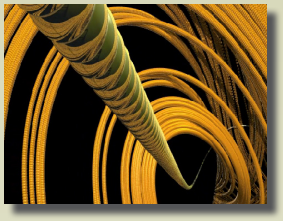
Visiting Research Faculty:
Gregory Jablonski

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 and simulations of entanglement and coherence in superconducting qubits, enhanced Raman scattering and use of nanoparticles for biomedical applications.

Funding Agencies:
NTI/PChem

Grants Awarded FY:
$0

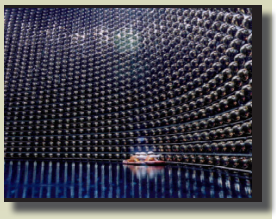
Expenditures FY:
$24,247



Nonlinear Dynamics

Faculty:
Robert Gilmore

Research Areas:
Topological analysis of non-linear systems, driven molecular systems, chaotic scattering and quantum- classical correspondence.



Particle Physics

Faculty:
Charles Lane
Jelena Maricic

Post-Doctoral:
Dr. Karim Zbiri

Research Areas:
Experimental neutrino properties and oscillation, solar neutrinos, geoneutrinos and neutrino applications to nuclear non-proliferation.

Funding Agencies:
DoE, NSF

Grants Awarded FY:
$693,954

Expenditures FY:
$99,829

Publications

Abe S, Ebihara T, Enomoto S, et al. (**Lane C, Maricic J, Miletic T**). 2008. "Precision Measurement of Neutrino Oscillation Parameters with KamLAND". Phys. Rev. Lett. 100: 221803

Adelman-McCarthy JK, Agueros MA, Allam SS, et al. (**Richards GT, Vogeley MS**). 2007, "The Fifth Data Release of the Sloan Digital Sky Survey". ApJS, 172: 634

Adelman-McCarthy JK, Agueros MA, Allam SS, et al. (**Richards GT, Vogeley MS**) 2008. "The Sixth Data Release of the Sloan Digital Sky Survey". ApJS, 175: 297

Chen C, Ibekwe-SanJuan F, Sanjuan E, **Vogeley MS**. 2008. "Identifying Thematic Variations in SDSS Research". 9th Int'l Conference on the Statistical Analysis of Textual Data (JADT2008): 319-330.

Colberg JM, Pearce F, Foster C, et al. (**Vogeley MS**) 2008. "The Aspen-Amsterdam Void Finder Comparison Project". Monthly Notices of the Royal Astronomical Society, 387: 933.

Constantin A, Hoyle F, **Vogeley MS**. 2008. "Active Galactic Nuclei in Void Regions". AJ., 673: 715

da Angela J, Shanks T, Croom SM, et al. (**Richards GT**) 2008, "The 2dF-SDSS LRG and QSO Survey: QSO Clustering and the L-z Degeneracy". MNRAS, 383: 565

Deo RP, Crenshaw DM, Kraemer SB, Dietrich M, Elitzur M, Teplitz H, Turner TJ. 2007. "Spitzer IRS Observations of Seyfert 1.8 and 1.9 Galaxies: A Comparison with Seyfert 1 and Seyfert 2". ApJ, 671: 124

Deo RP, Crenshaw DM, Kraemer SB. 2007 "Spitzer/IRS Observations of Seyfert 1.8 and 1.9 Galaxies: A View through the Torus Atmosphere?" The Central Engine of Active Galactic Nuclei, ASP Conference Series, Vol. 373, Edited by Luis C. Ho and Jian-Min Wang, p.483

Figueroa MA, Park S, Pourrezaei K, **Tyagi S.** 2008. "Development of Surface-Enhanced Raman Scattering (SERS) Substrates". Proc. SPIE, 6866: 668610-1-5

Finikova OS, Lebedev AY, **Aprelev A**, et al. 2008. "Oxygen Microscopy by Two-Photon-excited Phosphorescence". ChemPhysChem 9(12): 1673

Gayen S, Behera SN, **Bose SM**. 2007. "Raman Spectra of Unfilled and Filled Carbon Nanotubes: Theory". Phys. Rev. B76: 165433

Giannantonio T, Scranton R, Crittenden RG, Nichol RC, Boughn SP, Myers AD, **Richards GT**. 2008. "Combined Analysis of the Integrated Sachs-Wolfe Effect and Cosmological Implications". Phys. Rev. D, 77(12): 123520

Gilmore R, Letellier C, **Romanazzi N**. 2007. "Global Topology from an Embedding". J. of Phys. A40: 13291-13297

Gilmore R. 2008. "LeChatelier Dynamics". Mol. Phys. 106(8): 991-997

Gott JR, Hambrick DC, **Vogeley MS**, et al. 2008. "Genus Topology of Structure in the Sloan Digital Sky Survey: Model Testing". AJ, 675: 16.

Groen D, Zwart SP, **McMillan S**, et al. 2008. "Distributed N-body Simulation on the Grid using Dedicated Hardware". New Astronomy, 13: 348

Guo Y, Mylonakis A, Zhang ZT, **Yang GL**, Lelkes PI, Che, SN, Lu QH, Wei Y. 2008. "Templated Synthesis of Electroactive Periodic Mesoporous Organosilica Bridged with Oligoaniline". Chem. Eur. J. 14: 2909-2917

Inada N, Oguri M, Becker RH, Shin MS, **Richard GT**, et al. 2008, "The Sloan Digital Sky Survey Quasar Lens Search. II. Statistical Lens Sample from the Third Data Release". AJ, 135: 496

Jiang LH, Fan XH, Annis J, Becker RH, White RL, Chiu K, Lin H, Lupton RH, **Richards GT**, Strauss MA, Jester S, Schneider DP. 2008, "A Survey of z~ 6 Quasars in the Sloan Digital Sky Survey Deep Stripe. I. A Flux-Limited Sample at zAB". AJ, 135: 1057

Karwa A, Papazoglou E, Pourrezaei K, **Tyagi S**, Murthy S. 2007. "Imaging Biomarkers of Inflammation in Situ with Functionalized Quantum Dots in the Dextran Sodium Sulphate (DSS) Model". Inflammation Research. 56:502-510

Kayo I, Inada N, Oguri M, Hall PB, Kochanek CS, **Richards GT,** et al. 2007, "A New Quadruply Lensed Quasar: SDSS J125107.57+293540.5". AJ, 134: 1515

Lee I, Im M, Kim M, Kang E, Shim H, **Richards, GT**, et al. "Seoul National University Bright Quasar Survey in Optical (SNUQSO). I. First Phase Observations and Results". ApJS, 175: 116

Leonard A, **Goldberg DM**, Haaga JL, Massey R. 2007. "Gravitational Shear, Flexion, and Strong Lensing in Abell 1689", AJ., 666: 51

Letellier C, **Gilmore R, Jones T.** 2007. "Peeling Bifurcations of Toroidal Chaotic Attractors". Phys. Rev. E76: 066204

Letellier C, Messager V, **Gilmore R**. 2008. "From Quasiperiodicity to Toroidal Chaos: Analogy Between the Curry-Yorke Map and the van der Pol System". Phys. Rev. E77: 046203

Letellier C, Moroz IM, **Gilmore R**. 2008. "Comparison of Tests for Embeddings". Phys. Rev. E78: 026203

Liu YC, Zhong MY, Shan GY, Li YJ, Huang BQ, **Yang GL**. 2008. "Biocompatible ZnO/Au Nanocomposites for Ultrasensitive DNA Detection Using Resonance Raman Scattering". J. Phys. Chem. B, 112: 6484-6489

Liu Z, **Weng W,** Bookchin RM, Lew VL, **Ferrone FA**. 2008. "Free Energy of Sickle Hemoglobin Polymerization: A Scaled-Particle Treatment for Use with Dextran as a Crowding Agent". Biophys J. 94(9): 3629-34

Massey R, **Goldberg DM**. 2008. "Weak Lensing Ellipticities in a Strong Lensing Regime". Astrophys. J. Lett., 673: 111.

McMillan SLW. 2008. "Gravitational Dynamics of Large Stellar Systems". Classical and Quantum Gravity, 25: 114007

Medkour T, **Ferrone F**, Galacteros F, et al. 2008. "The Double Nucleation Model for Sickle Cell Hemoglobin Polymerization: Full Integration and Comparison with Experimental Data". Acta Biotheor. 56(1-2):103-22.

Melendez M, Kraemer SB, Armentrout BK, **Deo RP,** et al. 2008. "New indicators for agn power: The correlation between [O IV] 25.89 mu m and hard X-ray luminosity for nearby seyfert galaxies". AS, 682: 94.

Menard B, Nestor D, Turnshek D, Quider A, **Richards G**, Chelouche D, Rao S. 2008, "Lensing, Reddening and Extinction Effects of MgII Absorbers from z = 0.4 to 2". MNRAS, 385: 1053

Myers AD, **Richards GT**, Brunner RJ, Schneider, DP, Strand NE, Hall PB, **Blomquist JA,** York DG. 2008, "Quasar Clustering at 25 h−1 kpc from a Complete Sample of Binaries". ApJ, 678: 635

Oguri M, Inada N, Strauss MA, Kochanek CS, **Richards, GT**, et al. 2008, "The Sloan Digital Sky Survey Quasar Lens Search. III. Constraints on Dark Energy from the Third Data Release Quasar Lens Catalog". AJ, 135: 512

Oguri, M, Ofek EO, Inada N, Morokuma T, Falco EE, Kochanek CS, Kayo I, Broadhurst T, **Richards GT**. 2008, "The Third Image of the Large-Separation Lensed Quasar SDSS J1029+2623". ApJ, 676: L1

Paik H, Dutta SK, Lewis RM, Palomaki TA, Cooper BK, **Ramos RC**, et al. 2008. "Decoherence in dc SQUID phase qubits". Phys, Rev. B 77(21): 214510

Parejko JK, Constantin A, **Vogeley MS**, Hoyle F. 2008. "Source Matching in the SDSS and RASS: Which Galaxies are Really X-Ray Sources?". Astronomical Journal, 135: 10

Ratra B, **Vogeley MS.** 2008. "The Beginning and Evolution of the Universe". Publications of the Astronomical Society of the Pacific, 120, 235

Shen Y, Greene JE, Strauss MA, **Richards GT,** Schneider DP. 2008 Biases in Virial Black Hole Masses: An SDSS Perspective". ApJ, 680: 169–190

Trippe ML, Crenshaw DM, **Deo R**, et al. 2008. "Long-term variability in the optical spectrum of the Seyfert galaxy NGC 2992". AJ. 6: 602

Van den Berk DV, Khare P, York DG, **Richards GT,** et al. 2008, "Average Properties of a Large Sample of $z_{abs} \sim z_{em}$ Associated Mg II Absorption Line Systems". ApJ, 679: 239

Vestergaard M, Fan X, Tremonti CA, **Richards GT**. 2008, "Mass Functions of the Active Black Holes in Distant Quasars from the Sloan Digital Sky Survey Data Release 3". ApJ, 674: L1

Weng W, Aprelev A, Briehl RW, **Ferrone FA.** 2008, "Universal Metastability of Sickle Hemoglobin Polymerization". J Mol Biol. 377(4): 1228-35.

Zwart SP, **McMillan S**, Groen D, et al. 2008. "A Parallel Gravitational N-body Kernel". New Astronomy, 13: 285

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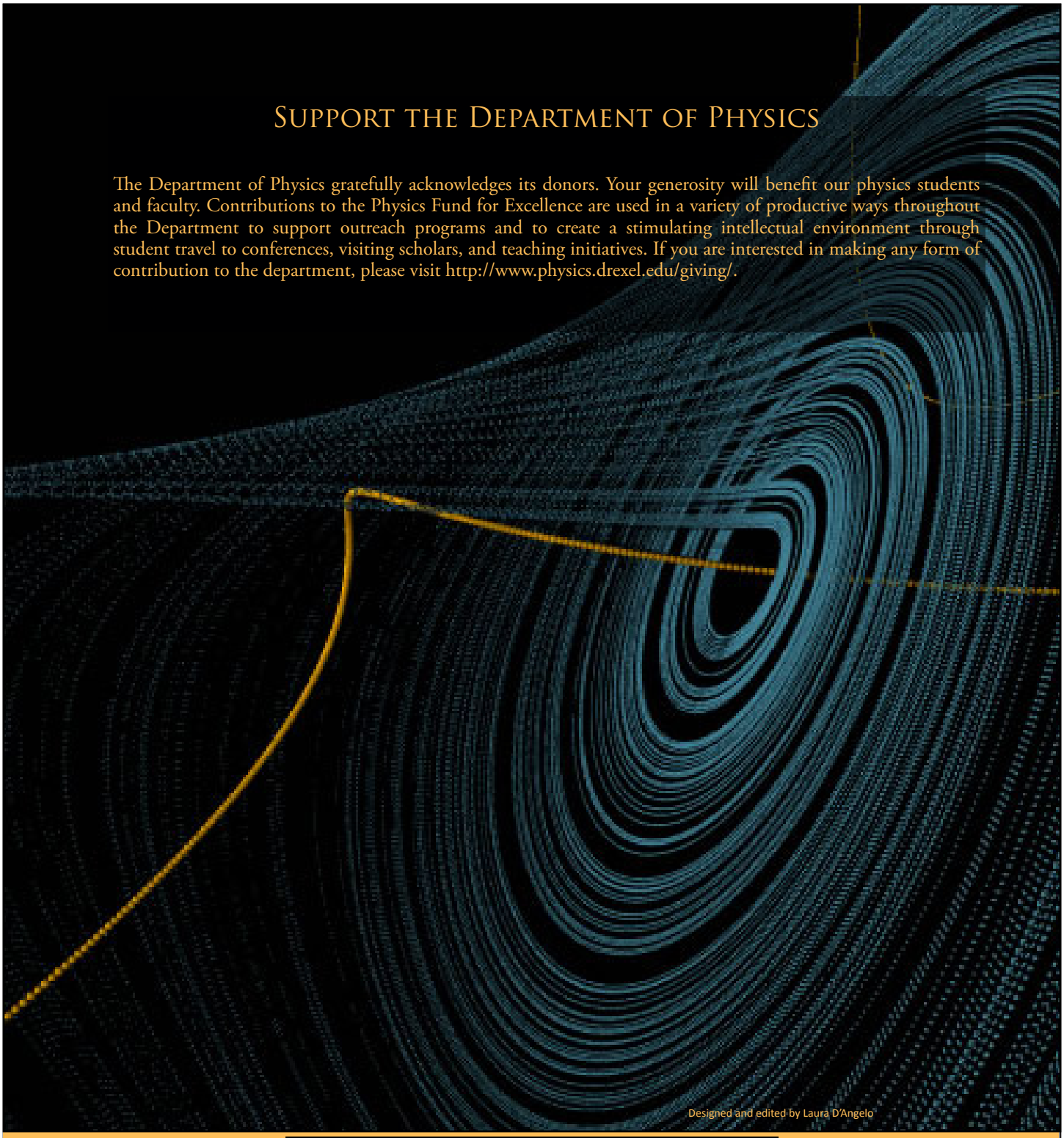

Designed and edited by Laura D'Angelo

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