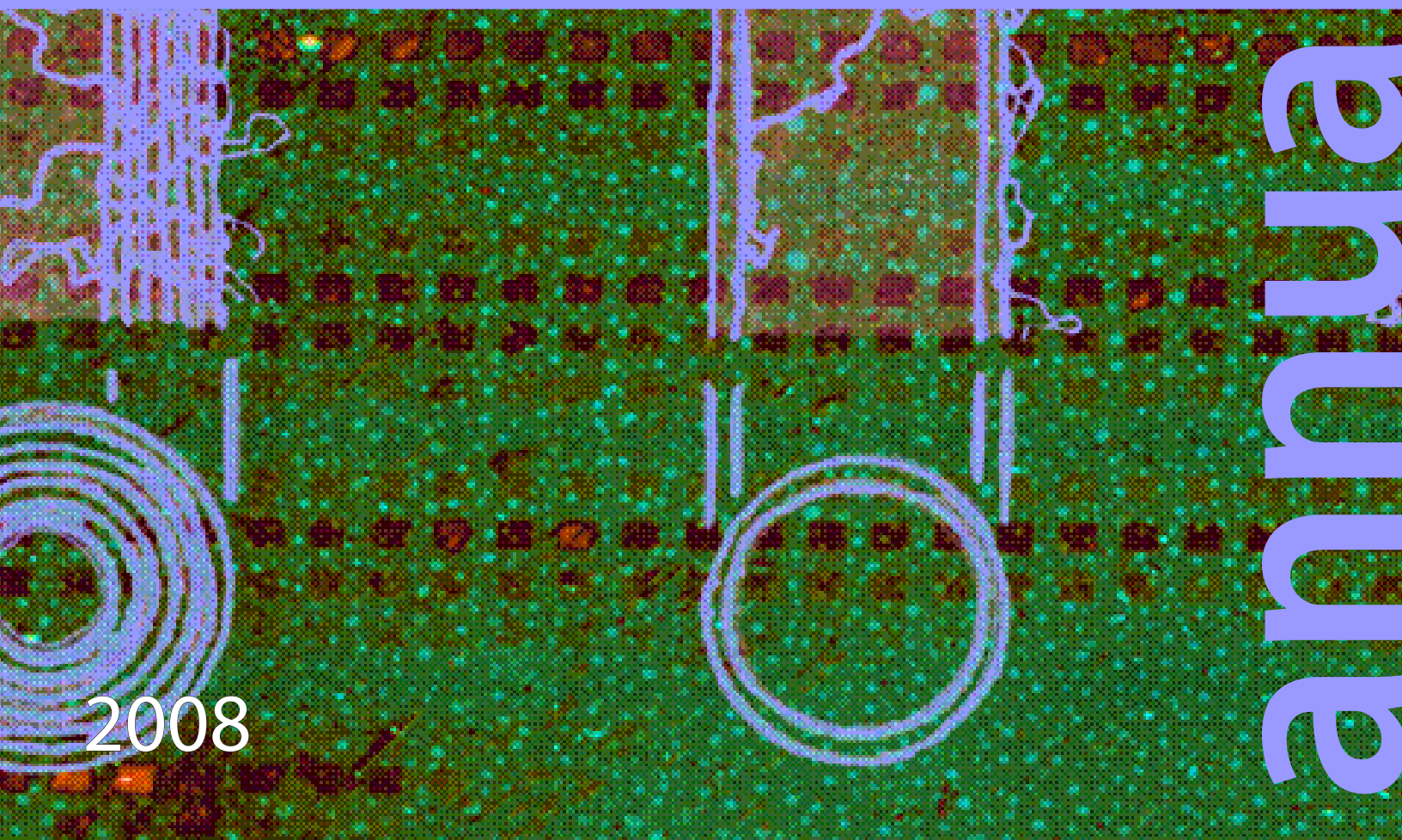
Physics

Boston University
College of Arts and Sciences

annual report



2008

Mission

The mission of the Physics Department at Boston University is to provide excellence in teaching physics and advancement of knowledge through research and scholarship in service to the University and to society at large.

In teaching, we seek to attain a level and quality of physics course offerings at the undergraduate and graduate level that supports the breadth and depth of modern physics curricula and fosters growth in new interdisciplinary areas. The current educational mission is fulfilled through: (1) introductory courses for science and engineering majors; (2) upper-level undergraduate courses (and opportunities for undergraduate research participation) for majors in physics and related fields; (3) core and advanced-level courses as well as challenging research opportunities for physics graduate students; (4) distinctive courses for non-scientists both through the Core Curriculum and several departmental and interdepartmental offerings; and (5) outreach programs such as the pairing of physics graduate students with physics teachers and their classes in local high schools, as well as teaching MET and SED courses that enable local teachers to qualify to teach physics at the challenging, conceptual "physics first" level, about the 9th grade.

In research, our mission is to advance fundamental scientific explorations as well as applications of the related technologies. We seek both external prominence and internal cohesiveness of departmental research clusters in key areas of physics that have been identified as important and challenging, while gaining the flexibility to exploit unforeseen breakthroughs that will open new fields.

Our program has been steadily growing over the past 15 years and we now have a faculty of 38 within the department, 18 faculty from affiliated departments with joint appointments in Physics, plus about 30 visiting researchers and postdoctoral fellows in residence. Physics at Boston University provides a stimulating environment for our approximately 100 undergraduate and 120 graduate students. Our research productivity is high, as we rank in the top 10 in private universities in statistical measures of the number of refereed papers, the number of citations per year, and critically, impact, the number of citations per paper. External research funding totaled $10.9M ($288K per FTE) in the 2008 fiscal year.

Our program has strengths in experimental and theoretical condensed matter physics, elementary particle physics and biological physics. We are also heavily involved in interdisciplinary programs of research with many joint projects within the Electrical and Computer Engineering and Biomedical Engineering Departments, as well as the Photonics Center in quantum optics and hard and soft materials research. In elementary particle experiment, we host major experimental efforts with the DØ experiment at Fermilab, the Super-K neutrino experiment in Kamioka, Japan, two major detector efforts at the LHC at CERN, and the MuLan experiment at the Paul Scherrer Institute in Switzerland. In elementary particle theory, our students are engaged in understanding the origin of the masses of the elementary particles and the signatures of physics beyond the Standard Model.

The Physics Department hosts state-of-the-art infrastructure for the University, including a variety of supercomputers in the Center for Computational Science, the Electronics Design Facility, and the very well-equipped Scientific Instrument Facility.

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Overview

Major Accomplishments

The Physics Department has continued to grow its educational mission, expanding offerings with a new Freshman Seminar in Physics, significant growth in our main service courses as well as in the non-science majors' *Cinema Physica*, and new summer immersion and evening classes for in-service teachers. In research, our faculty published 342 papers in 2007, with 244 articles in refereed journals plus 4 books. The faculty were also highly sought after, being invited to give 154 lectures at peer institutions in the US and around the world. Physics faculty were very successful in grant funding, acquiring nearly $11 million in external funding for research during the 2008 fiscal year, up from just under $10 million in 2007.

Faculty garnered many national and international awards and accolades, including Stanley winning the APS Lilienfeld Prize, Kearns and Sandvik honored as Fellows of the American Physical Society, El-Batanouny winning a Jefferson Fellowship to the State Department, and Averitt being awarded a DARPA Young Faculty Award. Faculty served in numerous leadership positions in national and international professional organizations, including Cohen as president of the Aspen Center for Physics, Averitt on the executive user committee of the DOE Center for Integrated Nanotechnologies, Redner as chair of the Topical Group on Statistical and Nonlinear Physics of the American Physical Society, and Stanley as chair of the National Academy of Sciences' Keck Futures Initiative.

We awarded 15 PhDs, 16 MAs, and 27 BAs, our largest total in the history of the department. Four undergraduates were named to Phi Beta Kappa, Dalit Engelhardt won the Alumni Student Award, and Michele Kotiuga won the College Prize for Excellence in Physics.

Our graduate recruitment season was extremely successful as we made 25% fewer offers yet more than filled our incoming class. This continuing increase in our acceptance rate is a clear measure of success, reflecting our growing national and international stature. In the latest US News and World Report rankings, Physics ranked 36th, among the highest of all science and engineering departments at BU.

Research highlights of the department were numerous, and include major reports on the adiabaticity of quantum systems, the statistical mechanics of voting, the final installation of the muon chambers on ATLAS at the LHC, the discovery of semiconducting tunability in graphene, the demonstration of a radio frequency scanning tunneling microscope, the discovery of a new subatomic particle by the D Zero group, a nanoscale sensor for glucose and breast cancer antigens, the solvation thermodynamics of water, and the demonstration of optical analogues to steering, refracting and focusing biomolecules and biomaterials.

Last year, the department led a successful, University-wide effort to renew the commitment to our key enabling resources of the Scientific Instrument Facility and the Electronics Design Facility. This year, we met the new budget projections in both facilities, and we began an SIF Student Training Center that developed a 6 week curriculum and has already taught two cohorts of graduate students in physics, astronomy and engineering.

The CAS-funded visitors programs in elementary particle theory and condensed matter theory continue to bring many leading researchers to our department, providing both valuable collaborative interactions and positive exposure for our department.

The Physics Department has been very active with outreach and educational activities in the local Boston community. Graduates and undergraduates assisted in Science Fair posters and went every Thursday for 6 weeks to English High to help with high school physics MCAS exam preparation; Physics Day attracted 200 urban high school students for a morning of demonstrations and lectures by faculty and graduate students; Photon developed and taught a unit on sun spots to local middle schools; Math Science Upward Bound brought 50 first generation, college-bound, at-risk students to BU for a 6 week residency program; the Improving the Teaching of Physics program entered its 5th year, and we spearheaded a new Teacher Immersion in Science program with two week workshops on Optics and Green Energy.

Following the recent success of a graduate alumni reunion, the department held its first Undergraduate Alumni Reunion in April, which attracted 60 current and former undergraduate

students, and combined research talks with career panels and social networking events.

Goals

The central concern that has emerged in our self-study, external review and strategic planning over the past several years is that the department, though excellent in several areas, is too small and too narrowly based to simply wait for its growing reputation to automatically propel it to "the next level". Rather, we need to aggressively build enhanced strength in additional areas that are of intrinsic interest within physics, and that also couple effectively to other developments at Boston University.

The best defined of these is the area of biological physics. The department is requesting that it be authorized to begin searching during FY09 for the first two of several faculty appointments in this area. We argue that such an expansion would accomplish two key strategic goals: (1) strengthening the Physics Department's future impact and overall standing in biological physics, a rapidly rising subfield of the discipline; and (2) strengthening the Physics Department's interdisciplinary links with a variety of related programs and centers at the University, including (but not limited to) the new University-wide initiative in Quantitative/Systems Biology, the Photonics Center, which has recently launched a 5-year growth plan in biophotonics, the training program in Quantitative Biology and Physiology, the Bioinformatics program, the Center for Adaptive Systems, the cross-campus Cellular Biophysics training program, and the Department of Physiology and Biophysics at the Medical School.

A somewhat larger faculty would also allow the Physics Department to broaden its outreach and impact in the area of undergraduate teaching. In addition to anticipating enrichment of the physics undergraduate electives in biological physics, we have begun to teach a joint, junior-level seminar course with the Quantitative Biology program. There is also an opportunity for broader offerings by the Physics Department that serve both CAS and ENG. Our calculus-based introductory courses are being reinvigorated with more biologically relevant content for SMED students, and particularly in light of the fact that nearly half of all ENG students now go into Biomedical Engineering. We also teach a very successful writing seminar on cosmology and a new freshman seminar experience course.

Specific undergraduate program needs within our majors program are to improve the sophomore year course, infuse computing into the freshman and sophomore curriculum, offer a new interdisciplinary course in biological physics and continue the expansion of undergraduate research opportunities. We will also focus effort on expanding the connections between Physics and departments in CAS and ENG. Our goals are to continue our strong support for the Core program, increase our new, interdisciplinary course offerings for non-science majors, develop a second freshman writing course, couple our service courses to subsequent classes in other majors, and design a specialized physics class for the new neuroscience program. Finally, we will follow up the first ever Undergraduate Alumni Reunion with related events and development activities.

In the graduate program, the department will focus on several areas of development that are internal, as well as expand our connection to materials science, quantitative/systems biology and interdisciplinary centers and programs in CAS and ENG. We will examine the number of required courses, seeking to allow students greater flexibility to take classes outside of Physics while maintaining core educational breadth and depth; develop and implement a long-term teaching plan for the frequency of offering 500-, 600-, and 700-level courses that would provide both graduate students and faculty greater ability to plan and a more predictable curriculum; help the graduate student organizations, specifically the community and the teaching methods groups, plan and run events with speakers, faculty, and the broader community; and design and implement a new approach to training our teaching fellows, with a new, integrated 699 curriculum that includes coupling to the ERC STEM efforts, and focuses on science pedagogy within a workshop model.

To extend our already strong relationships across the University, we will examine the Physics Department's role within the new Materials Science and Engineering program, and consider whether a new effort in Materials Physics and Materials Chemistry would make sense for CAS and the University. We will also expand existing efforts with the Photonics, Nanoscience, and Computational Science centers that already support a large number of physics graduate students. With these centers we are helping to develop new educational and research initiatives.

People

Organization

The Physics Department houses **38 faculty members**. Two hold full-time, administrative posts: Andrei Ruckenstein is the Associate Provost and Vice President for Research, and Scott Whitaker is the Associate Dean of the Graduate School in the College of Arts and Sciences. In addition, 35 faculty are active in funded research programs. The department has strong research programs in high energy theory and experiment, condensed matter theory and experiment, and biological and polymer physics. The faculty teach graduate and undergraduate courses in the major, service courses for CAS, ENG, SAR and SMED students, interdisciplinary courses for non-majors, and courses for K-12 teachers. In fall 2008, two faculty were active in the Core Curriculum.

We also have **12 emeritus faculty**, 5 of whom are still very active in research and continue to contribute to the department. **Nineteen faculty are joint with the Physics Department**, with contributors and collaborators from 8 different departments and 4 colleges. In particular, joint faculty from ECE and BME are very active in supporting our graduate students through to PhDs, as well as serving on admissions committees and faculty search committees. The Physics Department supports **6 research faculty** (4 associate and 2 assistant) and **25 research associates** (post doctoral fellows) in our funded research programs, as well as **6 lecturers** in the teaching program. The Physics Department has two permanent visitor programs in high energy and condensed matter theory, currently hosting 9 visiting scholars.

The department supported **115 graduate students** this past year, with 78 on external research grants and external research or teaching fellowships, 3 on Dean's fellowships and 31 on teaching fellow support. We typically have an incoming class of 17-20 students and graduate about 16 PhDs per year. The graduate students have several internal organizations, including a physics graduate student committee that meets regularly with the chair and organizes events, an ad hoc graduate student teaching group that meets to discuss physics teaching, pedagogy and novel active learning, and a women in physics graduate student group that organizes and hosts events for female physicists.

The Physics Department had **103 declared, undergraduate majors** this past year. We typically graduate about 20 students per year, ranking us as one of the top 25 departments in the nation in terms of physics baccalaureates. We support an undergraduate student organization, Photon, that meets weekly and plans and holds a variety of educational, outreach and social activities.

Chairmanship is currently held by Bennett Goldberg, and will transition to Claudio Rebbi in September. Two faculty are appointed to lead the teaching program, the **Director of Graduate Studies** (James Stone) and the **Director of Undergraduate Studies** (Ulrich Heintz). A fourth administrative post is the **Faculty Director** (William Skocpol), who supports a wide range of administrative and teaching tasks. Supporting staff include 9 in the front office, a **business manager** (Rachel Meisel), a **financial accounts administrator** (Anita Gupta), a **facilities and purchasing administrator** (Lawrence Cicatelli), a **program coordinator** (Solomon Posner), a **graduate administrator** (Mirtha Cabello), an **undergraduate administrator** (open), an **executive administrative assistant** (open), a **senior administrative secretary** (Winna Somers) and a **senior accounts technician** (Nancy Kostowski).

In support of the laboratory and lecture teaching mission, we have 3 staff: a **laboratory manager** (Erich Burton), a **laboratory technical coordinator** (Mark Badway) and a **lecture demonstration coordinator** (Valentin Vorosholov). In support of computing we have 2 staff, a **computer resource manager** (Guoan Hu) and a **systems analyst** (Richard Laskey). Several additional administrators support the Polymer Center, the Center for Computational Science and the Learning Resource Network.

The Physics Department operates two major cost units for the University. The Scientific Instrument Facility, which serves 30 BU departments, is run by a **manager/machinist** (Heitor Mourato) and a **coordinator/welder/machinist** (Robert Kingsland), with support from **4 experimental machinists** (Sam Ma, Umberto Fazio, Robert Snee and Jose Velho). The Electronics Design Facility serves several departments, and is run by a **director** (Eric Hazen), with support from **2 senior electronics engineers** (Shouxiang Wu and William Earle),

a **production engineer** (Paul Bohn) and an **administrative coordinator** (Chris Lawlor).

Leadership

The department recently transitioned to a rotating chair model, with Bennett Goldberg selected as the first rotating chair. This past year we developed and instituted a process for choosing a new chair. In this process, two faculty were appointed to engage in both private and open discussions with all the faculty and report back to the Dean. Two candidates were identified, and a faculty meeting was held where the candidates shared their plans for the department. An additional faculty meeting concluded the discussions and a vote was taken, which resulted in a tie between the two candidates. Each met with the Dean, who decided that Claudio Rebbi would be the next chair; he will assume those duties on September 1.

In addition, two faculty are appointed to lead the teaching program: Jim Stone, the Director of Graduate Studies and Ulrich Heintz, the Director of Undergraduate Studies. A fourth administrative post is our Faculty Director, Bill Skocpol, who supports a wide range of administrative and teaching activities. These three faculty frequently advise the chair on a range of issues and form an ad hoc executive committee. The department organizes two major committees around the undergraduate and graduate teaching and research programs, as well as additional major committees consisting of graduate admissions and conversion, comprehensive exam, merit review and facilities (SIF, EDF and computing). Committees are periodically formed for pre-tenure mentoring, faculty searches, and tenure and promotion review.

Committees report to both the chair and the faculty at open faculty meetings, which are held the second Wednesday of each month, with additional meetings scheduled as needed. Nearly all decisions are made at faculty meetings.

Professional Development

Faculty mentoring

The Physics Department at Boston University actively mentors new faculty to support and develop their full career in research, teaching, and leadership. We assign mentors who have demonstrated excellence in both teaching and research, who have successfully mentored junior faculty in the past, and who are familiar with the new faculty's research area. We facilitate frequent meetings of the committee and the junior faculty member, with the chair acting ex officio. These committee members visit lectures, and share their evaluations with both the new faculty member and the chair. The mentoring committees meet for discussions of current research and planning for future directions, and in particular help with prioritization, a notoriously difficult task for young faculty. The chair has provided funding for mentoring dinners, as well as websites and information on mentoring programs at other institutions. There is some struggle, however, getting the senior faculty to meet frequently enough, and we will try to provide additional incentives and encouragement.

Faculty teaching development

The department supports activities that train young faculty in teaching and science pedagogy in general. Professor Rick Averitt attended last years' American Institute of Physics / American Association of Physics Teachers two day workshop on the teaching of physics. There, he learned about active learning approaches and techniques for engaging large classes. Professor Averitt returned with numerous excellent resources. Together with the outgoing chair, who will provide background on current physics education research, Averitt will be giving a department seminar covering what he has learned and how we can use it to improve our teaching.

Staff professional development

The department also instituted a new approach to staff professional development two years ago. At the end of each academic year, each member of staff is asked to self-reflect and assess their job in three distinct ways, and to provide specific personal goals. These are then reviewed together with the business manager and chair. The three areas are:
(1) Improving the staff member's job: This occurs through definition of the job, identification of key elements, methods that they could use to measure their own performance, and how they go about setting goals for themselves. They are asked to identify barriers to improvement, and come up with short term and long term job-related goals. They are then asked how they see their job interacting with others.
(2) Improving the operations of the department: Staff are asked to take a look beyond their specific jobs and examining the broader interaction and work flow of the department, whether in academic programs, finances, or research operations. They are asked to address organizational issues

that include improving the flow of information, whether they have clear paths for answering questions and getting assistance, whether staff meetings or structural procedures would improve collective efforts, how to best utilize human and other resources, and how the physical layout could be used to improve the efficiency of the work environment. (3) Finally, staff are asked to examine and suggest improvements for the behavior of their constituents. Certain staff support certain constituents – students, faculty, researchers, etc. They are asked how they would modify their constituents' behavior to best improve the job, and how they would alter student or faculty interactions to best deliver services. These responses and the meetings that follow provide many opportunities for staff development.

Faculty

NAME	POSITION	EDUCATION
Steve Ahlen	Professor	University of California, Berkeley; 1976
Richard Averitt	Assistant Professor	Rice University; 1998
Rama Bansil	Professor	University of Rochester; 1975
John Butler	Professor	Stanford University; 1986
Rob Carey	Associate Professor	Harvard University; 1989
Antonio Castro Neto	Professor	University of Illinois, Urbana-Champaign; 1994
Claudio Chamon	Professor	Massachusetts Institute of Technology; 1996
Andrew Cohen	Professor	Harvard University; 1986
Andrew Duffy	Assistant Professor	Queen's University, Canada; 1995
Michael El-Batanouny	Professor	University of California, Davis; 1978
Shyam Erramilli	Professor	University of Illinois, Urbana-Champaign; 1986
Sheldon Glashow	Professor	Harvard University; 1959
Bennett Goldberg	Professor, Chair	Brown University; 1987
Ulrich Heintz	Associate Professor	State University of New York, Stony Brook; 1991
Emanuel Katz	Assistant Professor	Massachusetts Institute of Technology; 2001
Ed Kearns	Professor	Harvard University; 1990
Bill Klein	Professor	Temple University; 1972
Ken Lane	Professor	Johns Hopkins University; 1970
Karl Ludwig	Professor	Stanford University; 1986
Jim Miller	Professor	Carnegie-Mellon University; 1975
Raj Mohanty	Associate Professor	University of Maryland; 1998
So-Young Pi	Professor	State University of New York, Stony Brook; 1974
Anatoli Polkovnikov	Assistant Professor	Yale University; 2003
Claudio Rebbi	Professor, Chair-Elect	University of Turin; 1967
Sid Redner	Professor	Massachusetts Institute of Technology; 1977
Lee Roberts	Professor	College of William and Mary; 1974
Jim Rohlf	Professor	California Institute of Technology; 1980
Ken Rothschild	Professor	Massachusetts Institute of Technology; 1974
Andrei Ruckenstein	Professor, Associate Provost and VP for Research	Cornell University; 1984
Anders Sandvik	Associate Professor	University of California, Santa Barbara; 1993

Martin Schmaltz	Associate Professor	University of California, San Diego; 1995
Bill Skocpol	Professor	Harvard University; 1974
Kevin Smith	Professor	Yale University; 1988
Gene Stanley	Professor	Harvard University; 1967
Jim Stone	Professor	University of Michigan; 1977
Larry Sulak	Professor	Princeton University; 1970
Ophelia Tsui	Associate Professor	Princeton University; 1996
Scott Whitaker	Professor, Associate Dean of the Graduate School (CAS)	University of California, Berkeley; 1976

New Hires

Andrei Ruckenstein
PhD in Physics, Cornell University, 1984

Dr. Ruckenstein was appointed in September as a Professor of Physics, shortly before becoming the new Associate Provost and Vice President for Research.

Tulika Bose
PhD in Experimental Particle Physics,
Columbia University, 2006

Dr. Bose was hired as an Assistant Professor of Physics in May, and is set to begin employment at BU in September 2008. Her hire was the result of a faculty search in experimental particle physics that saw about 60 applications and 8 interviews.

Promotions and Tenuring

In September, Professors **Claudio Chamon** and **Ed Kearns** were promoted to full Professors. **Martin Schmaltz** was promoted to an Associate Professor.

Leaves and Sabbaticals

Professor **Rama Bansil** spent her leave of absence at the NSF under an Intergovernmental Personnel Act assignment. She worked as a Program Director in the Division of Materials Research (DMR) of the Mathematical and Physical Sciences Directorate. Her primary responsibility was to manage the Materials Research Science and Engineering Centers (MRSEC) program. That involved running the 2008 MRSEC competition, managing existing MRSECs and Nano Science and Education Centers (NSEC), and participating in activities relating to funding decisions and future directions of research in DMR and MPS.

Professor **Claudio Chamon** was on sabbatical for fall 2007 at MIT, and initiated a number of collaborations with faculty there, involving graduate students at both BU and MIT.

Professor **Shyam Erramilli** took a sabbatical for the academic year. He served as a visiting professor at Cambridge University in the Department of Applied Mathematics and Theoretical Physics, working on nanohydrodynamics of algae and microbial systems.

Professor **Ed Kearns** was on calendar year 2007 sabbatical, where he maintained his ongoing program in neutrino physics and astrophysics with the Super-K experiment in Japan, as well as initiated research in the search for dark matter using cryogenic noble liquids.

Professor **Ken Lane** took a sabbatical for the academic year in Europe. He spent most of his time in Annecy, France, and at Rutherford Lab in England, talking to experimentalists on the LHC experiments ATLAS and CMS. In a number of his talks, he introduced audiences to the phenomenology of "low-scale technicolor" and persuaded several groups to search for its signatures.

Professor **Raj Mohanty** was on sabbatical for the academic year, where he focused on socially responsible solutions to the global health care problem, particularly in the underdeveloped world.

Professor **Claudio Rebbi** took a sabbatical for spring 2008, and used his leave to organize and expand extensive lecture notes and software he developed for his courses on computational physics, in view of combining them into a possible textbook. He also continued his investigations in particle theory, including a two-week visit to CERN, where he gave an invited seminar on current research results and collaborated with theorists.

Professor **Sid Redner** was on sabbatical for spring 2008. While in Germany, he gave talks at the University of Bonn, an international conference, and a theory seminar at the IFF, a major research lab in Julich. While working as a visiting professor at Universite Paul Sabatier in Toulouse, France, he completed a project about baseball statistics, and gave both a seminar and a colloquium. He also traveled to Los Alamos National Lab, the Santa Fe Institute, and the University of Colorado (Boulder) and gave four talks. He then spent two months in France as a Visiting Professor at Universite Pierre et Marie Curie.

Professor **Anders Sandvik** took a sabbatical for the academic year. He spent the fall as a visiting scientist at National Taiwan University in Taipei, and the spring as a visiting professor at the Institute of Solid State Physics at the University of Tokyo.

Awards and Honors

Professor **Michael El-Batanouny** was chosen as a 2008-09 Jefferson Science Fellow at the U.S. State Department. This select fellowship program was established in 2003 as an initiative of the Science and Technology Advisor to the Secretary of State to expand on scientific expertise within the Department.

Professor **Gene Stanley** won the American Physical Society's Julius Edgar Lilienfeld Prize. Stanley won the award for his research in understanding the 64 anomalies of liquid water in a coherent "physical" fashion via the new concept of a liquid-liquid (as opposed to a liquid-gas) critical point. The work was performed by Stanley, colleagues, visitors and graduate students in the Physics Department.

Professors **Ed Kearns** and **Anders Sandvik** and Adjunct Associate Professor **Meenakshi Narain** were honored as Fellows of the American Physical Society. Kearns was recognized for contributions in neutrino physics and particle astrophysics. Sandvik was recognized for contributions to the development of quantum Monte Carlo methods and their applications. Narain was chosen for her work in the measurement of the properties of the top quark.

Professor **Kevin Smith** was named a 2007 fellow of the American Vacuum Society. The honor recognizes members who have made scientific and technical contributions to areas of interest to AVS.

Professor **Sid Redner** was named an Outstanding Referee of the American Physical Society. The APS award program is in its first year, aiming to applaud the efforts of a small number of their 42,000 referees annually.

Professor **Richard Averitt** received a DARPA Young Faculty Award for his proposal "Metamaterial Enhanced MEMS for Terahertz Technology." The Young Faculty Award program is designed to seek out ideas from non-tenured faculty with an emphasis on ideas that are innovative, speculative, and high-risk.

Professor **Sheldon Glashow** was awarded an Honorary Professorship from Beihang University (China).

Election to Professional Organizations and Societies

Professor **Sheldon Glashow** was elected Foreign Member of the Accademia Nazionali dei Lincei (Italy).

Professor **Kevin Smith** was elected to the Surface Science Division Executive Committee of the American Vacuum Society.

Professor **Sid Redner** served as chair of the Topical Group on Statistical and Nonlinear Physics of the American Physical Society.

Professor **Richard Averitt** was elected to the DOE Center for Integrated Nanotechnologies User Executive Committee.

Professor **Andrew Cohen** was elected president of the Aspen Center for Physics.

Professor **Gene Stanley** was chosen to chair the National Academy of Sciences' Keck Futures Initiative. He was also elected a member of the National Academy of Sciences committees related to "science at the interface of physical

and life sciences" and "ways to protect against terrorist attacks from the sea."

Stanley was also a member of BU President Robert Brown's Strategic Planning Committee, which was charged with writing a 10-year plan for the future of BU.

Professor Antonio Castro Neto became Divisional Associate Editor for Physical Review Letters.

Research Faculty

NAME	POSITION	EDUCATION
Luis Cruz Cruz	Research Associate Professor	PhD, Massachusetts Institute of Technology; 1994
Mi Kyung Hong	Research Professor	PhD, University of Illinois, Urbana-Champaign; 1988
Plamen Ivanov	Research Associate Professor	PhD, Boston University; 1998
Paul Krapivsky	Research Associate Professor	PhD, Moscow Institute of Physics and Technology (Russia); 1991
Jim Shank	Research Professor	PhD, University of California, Berkeley; 1988
Brigita Urbanc	Research Associate Professor	PhD, Jozef Stefan Institute (Slovenia); 1994

Promotions

Drs. Urbanc, Cruz Cruz and Ivanov were promoted from Research Associates in the Center for Polymer Studies to Research Associate Professors in the Physics Department, effective September 2007 for Drs. Urbanc and Cruz Cruz, and February 2008 for Dr. Ivanov.

Awards and Honors

Research Associate Professor Plamen Ivanov has been selected as Co-Editor of Europhysics Letters, one of the leading European journals.

Research Associates

NAME	FIELD	EDUCATION
Roman Barankov	Condensed Matter Theory	PhD, Massachusetts Institute of Technology; 2005
Vladislav Bergo	Biological Physics	PhD, Boston University; 2003
Nathalie Bouet	Condensed Matter Experiment	PhD, University of Orleans (France); 2006

Dookee Cho	Particle Experiment	PhD, University of Rochester; 2004
Sang Wan Cho	Condensed Matter Experiment	PhD, Yonsei University (Korea); 2008
Brian Feldstein	Particle Theory	PhD, University of California, Berkeley; 2007
Yoshihisa Fujii	Condensed Matter Experiment	PhD, Kyushu University (Japan); 2008
Zhiguo Ge (Left in May)	Condensed Matter Experiment	PhD, University of Notre Dame; 2007
Rob Harrington	Particle Experiment	PhD, Northeastern University; 2006
Arno Heister	Particle Experiment	PhD, Physikalisches Institut (Switzerland); 2005
Shabnam Jabeen	Particle Experiment	PhD, Kansas University; 2005
Ameya Kolarkar	Particle Experiment	PhD, University of Kentucky; 2008
Fuk Kay Lee (Left in August)	Condensed Matter Experiment	PhD, Hong Kong University of Science and Technology (Hong Kong); 2005
Ivan Logashenko	Particle Experiment	PhD, Budker Institute of Nuclear Physics (Russia); 1999
Kevin Lynch	Particle Experiment	PhD, Boston University; 2002
Sergey Mamaev	Biological Physics	PhD, Novosibirsk Institute of Bioorganic Chemistry (Russia); 1987
Constanze Metzger	Condensed Matter Experiment	PhD, Ludwig-Maximilian-Universität Munich (Germany); 2007
Gozde Ince-Ozaydin (Left in December)	Aerospace & Mechanical Engineering	PhD, Boston University; 2007
Louis Piper	Condensed Matter Experiment	PhD, University of Warwick (UK); 2006
Jennifer Raaf	Particle Experiment	PhD, University of Cincinnati; 2005
Veronica Sanz	Particle Theory	PhD, Universitat de Valencia (Spain); 2002
Vasisht Tadigotla	Condensed Matter Experiment	PhD, Rutgers University; 2006
Mithat Unsal (Left in August)	Particle Theory	PhD, University of Washington; 2004
Zhaohui Yang	Condensed Matter Experiment	PhD, Peking University (China); 2005
Yan Zhen	Particle Experiment	PhD, Shandong University (China); 2006

New Hires

Zhaohui Yang began work with Professor Ophelia Tsui in July 2007, and is the lead researcher on an NSF-funded project.

Constanze Metzger joined the Physics Department in September, and has been working on properties of graphene under Professor Bennett Goldberg.

Roman Barankov started work with Professor Anatoli Polkovnikov in September, studying strongly interacting cold atoms.

Brian Feldstein joined the department in September, working with Professor Martin Schmaltz on physics beyond the Standard Model and on cosmology.

Vasisht Tadigotla began work under Professor Andrei Ruckenstein in September, focusing on gene transcription.

Gozde Ozaydin-Ince joined the department in September, working with Professor Karl Ludwig.

Zhiguo Ge joined BU in November, working under Professor Kevin Smith to probe the electronic structure of solids.

Ameya Kolarkar began work for Professor Lee Roberts in November, focusing on the neutron electric dipole moment search.

Sang Wan Cho joined the department in June 2008, working under Professor Kevin Smith to run experiments on new organic metals.

Yoshihisa Fujii will begin working for Professor Ophelia Tsui this summer, studying the surface dynamics of polymer thin films.

Awards and Honors

Veronica Sanz recently received an LHC Theory Initiative Postdoctoral Travel and Computing Award, funded by the NSF. The award supports LHC-related travel and research. Dr. Sanz will be studying new strong interactions at the LHC using a holographic approach to organize the model parameter space.

Lecturers

NAME	COURSE	SEMESTER
Ahlam Al-Rawi	General Physics I and II	Summer 2007 and 2008
Elena Gubankova	Elementary Physics I	Summer 2007
Manher Jariwala	General Physics	Fall 2007 and Spring 2008
Brigita Urbanc	Elementary Modern Physics	Spring 2008
Val Voroshilov	Elementary Physics	Fall 2007, Spring 2008 and Summer 2008
Joel Weinstein	Electronics for Scientists	Spring 2008

New Hires

Our teaching faculty was joined by six excellent lecturers this year. **Ahlam Al-Rawi** taught General Physics for the 2007 and 2008 summer sessions. **Elena Gubankova** taught Elementary Physics I during the summer of 2007. **Manher Jariwala**, who had previously done research with Professor Raj Mohanty, taught General Physics in both the fall and spring. **Val Voroshilov**, our Teaching Demonstrations Coordinator, taught Elementary Physics in the fall and spring, and will again teach in the summer of 2008. **Brigita Urbanc**, who taught in the summer of 2006, taught Elementary Modern Physics this spring. And **Joel Weinstein**, who has taught Electronics for Scientists at BU since 2003, once again lectured for us in the spring.

Emeriti

NAME
Ed Booth
Bernard Chasan
Robert Cohen
Ernesto Corinaldesi
Dean Edmonds
Wolfgang Franzen
Bill Hellman
Frank Krienen
Abner Shimony
John Stachel
Chuck Willis
George Zimmerman

Affiliated Faculty

NAME	POSITION	FIELD
Irving Bigio	Joint Professor	Biomedical Engineering
Kenneth Brecher	Joint Professor	Astronomy
Richard Brower	Joint Professor	Electrical and Computer Engineering
David Campbell	Joint Professor and Provost	Condensed Matter Theory
Charles DeLisi	Joint Professor	Biomedical Engineering
Alvaro Derujula	Joint Professor	Particle Theory
Evan Evans	Joint Professor	Biomedical Engineering
Jonathan Gershoni	Adjunct Professor	Biological Physics
Roscoe Giles	Joint Professor	Electrical and Computer Engineering
Dirk Kreimer	Joint Professor	Mathematics
Anne Matsuura	Adjunct Assistant Professor	Condensed Matter Experiment
Amit Meller	Joint Associate Professor	Biomedical Engineering
Jerome Mertz	Joint Associate Professor	Biomedical Engineering
Theodore Moustakas	Joint Professor	Electrical and Computer Engineering
Meenakshi Narain	Adjunct Associate Professor	Particle Experiment
Alexander Sergienko	Joint Professor	Electrical and Computer Engineering
Anna Swan	Joint Associate Professor	Electrical and Computer Engineering
Malvin Teich	Joint Professor	Electrical and Computer Engineering
Selim Unlu	Joint Professor	Electrical and Computer Engineering

Visiting Scholars

NAME	EDUCATION
Joan Adler (Left in May)	PhD, University of New South Wales (Australia); 1980
Liliana Arrachea (Left in August)	PhD, Universidad Nacional de la Plata (Argentina); 1995
Bruno Barboza	PhD, State University of Campinas (Brazil); 2004
Daniel Charrier (Left in June)	MS, École Normale Supérieure de Lyon (France); 2006
Pascal Degiovanni (Left in September)	PhD, Université Pierre et Marie Curie (France); 2005
Anton Fernandez (Left in September)	MS, University of Oviedo (Spain); 2005
Harvey Gould	PhD, University of California, Berkeley; 1966
Manher Jariwala	PhD, University of Maryland, College Park; 2004
Vitor Pereira	PhD, Universidade do Porto (Portugal); 2006

Administrative Staff

NAME	POSITION
Eliza Berkon (Left in June)	Administrative Assistant
Cynthia Brossman	Administrative Director, LERNet
Cora Carey	Educational Outreach Coordinator, LERNet
Larry Cicatelli	Facilities and Purchasing Specialist
Julia Elder	Undergraduate Coordinator
Anita Gupta	Grants Administrator
Nancy Kostowski	Accounts Technician
Anthony Lux (Left in April)	PROSTARS/STEM Administrator
Rachel Meisel	Business Manager
Solomon Posner	Program Coordinator
Mirtha Salcedo-Cabello	Graduate Coordinator
Winna Somers	Senior Administrative Secretary

Technical Staff

NAME	POSITION
Mark Badway	Teaching Laboratories Technical Coordinator
Paul Bohn	Production Engineer, Electronics Design Facility
Russell Boudreau (Left in April)	Senior Experimental Machinist, Scientific Instrument Facility
Erich Burton	Undergraduate Teaching Laboratories Manager
William Earle	Electronics Engineer, Electronics Design Facility
Umberto Fazio	Senior Experimental Machinist, Scientific Instrument Facility
Eric Hazen	Director, Electronics Design Facility
Guoan Hu	Computer Resource Manager
Robert Kingsland	Coordinator/Welder, Scientific Instrument Facility
Richard Laskey III	Systems Analyst
Chris Lawlor	Administrative Coordinator, Electronics Design Facility
Sai-Ho Ma	Senior Experimental Machinist, Scientific Instrument Facility
Heitor Mourato	Manager/Machinist, Scientific Instrument Facility
Robert Snee	Senior Experimental Machinist, Scientific Instrument Facility
Jose Velho	Senior Experimental Machinist, Scientific Instrument Facility
Val Voroshilov	Teaching Demonstrations Coordinator
Shouxiang Wu	Electronics Engineer, Electronics Design Facility

New Hires

In September, **Eliza Berkon** began work as Administrative Assistant, and **Solomon Posner** began as the department's Program Coordinator.

Anthony Lux began in November as the PROSTARS/STEM Administrator.

Cora Carey began in December as the Educational Outreach Coordinator for LERNet.

Mark Badway began in May as the Teaching Laboratories Technical Coordinator.

Undergraduate Program

Our undergraduate physics program gives students a foundation of knowledge and problem-solving ability on which to build a variety of careers. Reflecting the diversity of careers available to our students, the department offers two options for the concentration in physics, as well as joint concentrations with astronomy, philosophy, and other College of Arts and Sciences fields. In addition, the department offers two BA/MA programs: one in physics and one in astrophysics and space physics. Finally, we offer a minor concentration in physics, which is an excellent complement to degrees in engineering, mathematics or other sciences.

Although many of our graduates continue their careers in physics or astronomy, a BA in physics also offers preparation for careers in such areas as industrial research and development, engineering, environmental sciences, medical physics, geophysics, oceanography, computer science, and energy-resource management. It is also ideal preparation for professional schools such as medicine, law, teaching, engineering, or business management.

The department prides itself on the quality of its teaching while also maintaining a vigorous research program. The diverse faculty assures an opportunity for close interaction with teachers and mentors. Students are encouraged to participate in ongoing research projects, and many get involved as early as their sophomore year. Qualified students enroll as seniors in independent work projects leading to a degree with distinction.

Teaching Highlights

Cooperative Curricular Efforts

Professor Scott Whitaker was one of eight faculty who taught **Core Curriculum Natural Science I: Evolution of the Physical Universe and the Earth (CC105)** in the fall.

Professor Sheldon Glashow taught **Physics of the 20th Century and Beyond (PY100/UNI NS100)** in the fall.

Professor Andrew Duffy taught the honors sections of **Elementary Physics I and II (PY105 and 106)** for the Honors Program in the fall and spring.

Professor Larry Sulak taught **Writing and Research Seminar (WR150 LA)** for the College of Arts and Sciences in the spring, developing a successful new offering in Cosmology.

Curricular Changes

The Physics Department did not propose any new degrees or change any degree programs this year. However, two new courses were instituted, while the development of a third is still underway:

1. A new general education course, **Cinema Physica (PY103)**, was designed by Professor Andrew Cohen in Fall 2006. It teaches basic ideas in introductory physics, and students use them to quantitatively evaluate the accuracy of statements and depictions in familiar movies. The course was offered without advertising on a pilot basis to 9 students in spring 2007. This year, it hit its stride, being offered both semesters; there were 41 students in the fall and 44 in the spring. The fall term alone was twice the typical size of PY132 (Physics of Motion: How Big, How Fast, How Far), the general education course that it replaced. In addition, PY132 was offered only one semester per year.

2. A new one-credit **Freshman Seminar in Physics (PY195)** was designed and taught by Professor Bennett Goldberg with 18 students signing up on a voluntary basis. For the first several weeks, this course provided information useful to students new to BU. It then offered an introduction to the modern fields of physics research, as well as gave examples of a variety of career paths that physics students can pursue after graduation.

3. For several years, we have considered broadening our one-semester Modern Physics course (PY354) into a two-semester sequence that allows more coverage of current applications. As a placeholder, we refer to the new approach as PY351 and PY352. This course planning did not make as much progress as we would have liked during 2007-08, but will remain one of our priorities.

New Developments in Pedagogy

Teaching laboratories in the courses for physics and physics-related majors have been a key focus of our efforts this year. The Physics Department has completely revamped its first-year teaching laboratories over the years, with much more reliance on computer-based instrumentation and analysis. The PY351-352 course proposal would create a wider variety of lab experiences for our sophomores, including work with vacuum systems, instrumentation interfacing and other useful subjects.

This year for the first time, the fall-term junior lab met in the same classroom as the spring-term electronics course. Professor Bill Skocpol has been modifying the experiments to take advantage of the data-processing capabilities of the digital oscilloscopes available in that room. Also, our Advanced Lab for seniors has several new experiments under development. An experienced physics teacher was hired in an upgraded teaching lab position. He is taking a major role in working with Professor Larry Sulak and a graduate student to improve the Advanced Lab experience for undergraduates.

Course Enrollments

Non-majors dominate enrollments in the large service classes offered by the department:

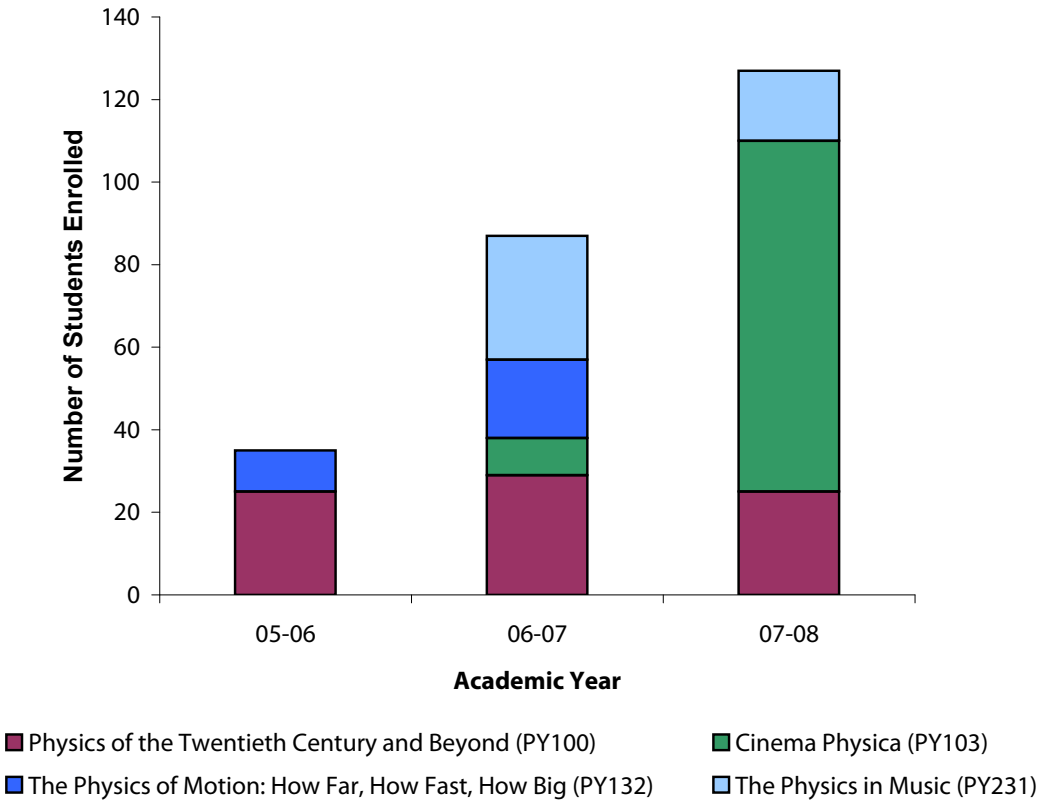
PY105/106: 731 students (Summer: 167 students)
Sargent College Health Science and Biology students, or premedical students in other majors, take the algebra-based Elementary Physics sequence PY105 and PY106.

Table 1. Large Service Course Enrollments

COURSE SEQUENCE	COURSE TITLE	COURSE AUDIENCE	SUM 06	AY 07	SUM 07	AY 08	SUM 08
105/106	Elementary Physics	Premed, Sargent	176	712*	198*	731	168
211/212	General Physics	Engineering, Chemistry	81	764	95	752	103
241/242	Principles of General Physics	SMED majors	n/a	49	n/a	77	n/a
251/252	Principles of Physics	First year Physics majors	n/a	65	n/a	83	n/a
313	Elementary Modern Physics	Non-Physics majors	6	102	n/a	124	n/a
354/355	Modern Physics	Second year Physics majors	n/a	47	n/a	71	n/a

All figures include MET and Honors sections; *Off-cycle PY105 offered for the first time.

Graph 1. **One Semester General Education Course Enrollments**



PY211/ 212: 752 students (Summer: 103 students)
PY313: 124 students
Large numbers of Engineering majors and some CAS science majors take the calculus-based General Physics sequence, PY211 and PY212, and Elementary Modern Physics PY313. These three courses are each taught in both spring and fall semesters in order to meet student demand, and to accommodate various student schedules.

PY241/242: 77 students
Seven Year Medical Program (SMED) students and a small but growing number of non-SMED students take the calculus-based Principles of General Physics sequence PY241 and PY242.

Table 1, previous, details enrollments in both the large service courses and the freshman and sophomore majors sequences for the last three years. The trends are an increase in the number of Biology, Applied Health, and Chemistry majors enrolling in Physics, and a decrease in the number of Engineering students. The latter trend is due partially to the changing requirements for engineering students, who in 2005 were no longer required to take three semesters of physics. We are working with the College of Engineering to update and make more relevant the third semester of engineering physics.

Graph 1, above, shows the course enrollments for our one semester general education courses.

Advising and Mentoring

Physics majors and minors meet with the Director of Undergraduate Studies and are assigned a faculty advisor as soon as they express the intent to study in the department. Students are strongly encouraged to join one of our research groups during the school term or the summer, as a junior or senior thesis student, or for independent study. Before they complete their apprenticeship with the department, most undergraduates have had hands-on training with a research group, and many have co-authored a research paper.

Educational research has shown that students who work in research laboratories as undergraduates are more likely to succeed in graduate school. Considerable care is paid to advising students on post-graduate training and obtaining jobs. We continued our training seminars for the GRE exam, and will be hosting career seminars this coming year. Because students majoring in Astronomy and Physics take the majority of their courses in Physics, those students are assigned an advisor in our department as well as one in their home Astronomy department.

For a complete list of undergraduates and their advisors, please refer to Appendix 1.

Co-Curricular Programs

Events

The department hosted its third annual **Pumpkin Drop** last Halloween. See inset (below) for details.

The Physics Department also held its first **Undergraduate Alumni Reunion** on Saturday, April 12. Eighty alumni, faculty, and current undergraduates discussed contemporary physics, caught up on years passed, and discussed careers inside and outside of physics. See "Community" for the full story.

Student Organization: Photon

Photon is the Boston University chapter of the Society of Physics Students (SPS). It serves as a social organization for undergraduates involved in physics at BU. Every semester, Photon organizes social events for physics majors, tutoring by upperclassmen and lectures by faculty on subjects of current interest.

This year, Photon became a more active chapter of SPS. They began the year with a Demo show, which was held outside the Metcalf Science building on the first weekend of school. Members utilized large, play-pin balls to demonstrate Bernoulli's principle, and touched on the principles of fluid dynamics by using a smoke machine and a trash can to make smoke rings. The show was successful in attracting many new members, and current members had a great time planning the event.

Pumpkin Drop

On October 31, the department hosted its third annual Pumpkin Drop at the Metcalf Science Center. The tradition, which involves dropping pumpkins filled with substances from popcorn to paint onto Metcalf Plaza — 70 feet below — was continued as both a promotional and an educational tool. This year, we dropped several paint-filled pumpkins onto a canvas to document the splatter patterns. The largest pumpkin dropped weighed in at 373 pounds.

During meetings, members performed demonstrations, discussed concepts that they found difficult and watched NOVA videos. Discussion topics ranged from angular momentum to Eddy currents, and members had hands-on access to equipment like polarizers and a Van der Graaf generator. In addition, Professor Claudio Rebbi, the group's faculty advisor, gave a lecture about modeling wavefunctions, and members put together a Liquid nitrogen ice cream day. As Photon grew, they decided to focus more of their time on projects.

In January, Photon began development of an outreach program for local middle schools in conjunction with Dr. Nick Gross, Co-Director of Education at BU's Center for Space Physics. They created a presentation about solar physics, which covers topics from fusion reactions to sunspots, and developed a hands-on activity related to coronal mass ejections, which aims to help students develop important science skills. In April, they gave their first presentation to a local Boston middle school and were met with great success. They hope to maintain an active outreach program, and to present their work as a model for other SPS outreach curricula.

In addition, the group will begin building a small indoor zeppelin in the Fall to practice planning and construction, explore radio control and, most importantly, to have fun.

Members also attended two undergraduate conferences this year:

In January, six members attended the Conference for Undergraduate Women in Physics at Yale. Two seniors gave research presentations: Michele Kotiuga talked about the "Vibrational Properties of Carbon Nanotubes," and Lela Todorova described her work on the "Physical State of Polymer Nanometer Films above the Glass Temperature of the Polymer in Bulk." Claire Thomas gave a poster presentation on her Graphene research.

In March, seven members attended an SPS Zone meeting at the University of Connecticut. Two members gave research presentations: Brian Henning talked about "Neutrino Oscillations and Upward-Going Muons at the Super-Kamiokande Detector," while Katie Jameson discussed "NIR Spectroscopy and Imaging of the Massive Star Cluster Mercer 23." Participation in the meeting afforded them the opportunity to not only present research, but also connect with other SPS chapters, as they hope to host a Zone meeting within the next year.

The group also plans to attend the next April meeting of the American Physical Society.

In the Spring, a small group of sophomore members began meeting for 2 hours each week to teach themselves basic nuclear physics. The group, called Physics Undergrads for New Knowledge, or PhUNK, spent 1 hour each week lecturing to each other on chapters in *Nonclassical Physics*, and a second hour doing labs with the assistance of Professor Rob Carey. The lectures not only provided an opportunity to learn, but helped familiarize students with giving presentations, an important skill to develop for graduate school. The group hopes to make PhUNK an official 2-credit course in the future.

Research

The department continues to take pride in the large number of undergraduate majors who work in our research laboratories. This year, one-third of our upperclassmen were involved in research projects. Upper-level students are strongly encouraged to become involved with a research group and gain exposure to experimental and theoretical research projects. That experience offers essential, practical training for students who wish to pursue technical careers after their undergraduate education, and broadens the background of those planning graduate study in physics. This past year, we held a research open house, where members of the Physics faculty described their research to a packed house of undergraduates. A half-dozen students found research positions as a result of the meeting.

Many of our undergraduate research assistants work under

their advisors' research grants, including some funded from NSF Research Experiences for Undergraduates grants. Several students join research groups through exchange programs or via UROP research awards.

The following paragraphs showcase most of the research being done by our undergraduates.

Peter Ashton (2008) spent two years at the Center for Integrated Space Weather Modeling (CISM), developing software for analyzing ionospheric data from the DMSP satellites with Jeffrey Hughes and Viacheslav Merkin. In the summer of 2007, he had a Solar and Space Physics REU in Boulder, Colorado, determining whether the magnetic kink instability could be a trigger for solar flares and other energetic solar events.

Deborah Avery (2010) is working with Professor Steve Ahlen on his dark matter project. She has helped with the construction of a dark matter detection chamber and with data analysis.

Carla Benatti (2008) worked with the Low-Energy Beam and Ion Trap (LEBIT) group at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University, where she performed a systematic study of the Penning Trap to study phase space transitions through computer simulations. She is currently performing beam simulations and imaging diagnostics with the accelerator group at MSU.

Ian Cohen (2010) is attempting to find spectral similarities between galactic cosmic ray fluxes and properties of the solar wind with Astronomy Professor Harlan Spence. He also spent last summer at Rutgers University working under the direction of John Hughes. His task was to process and analyze Chandra x-ray observations of supernova remnants to determine their expansion rates.

Amy Colgan (2008) worked with Professor Michael El-Batanouny doing Computer Analysis of Crystal Surface Structures.

Jessica Donaldson (2008) searched for long-term temperature trends in the upper atmosphere with Engineering Professor William Oliver.

In the summer of 2007, **Dalit Engelhardt** (2008) did an REU at the University of California, Davis, in particle theory on the phenomenology of sypersymmetry – missing particle topologies motivated by supersymmetric models. The paper has been submitted for publication. Earlier this year, she also did Technicolor research with Professors Steve Ahlen and Ken Lane. Her focus was on the identification of long-lived, anomalously-charged massive particles at the ATLAS experiments at the LHC. Based on preliminary studies, the muon system at ATLAS may have good capability as a standalone detection system for these particles, but full simulation studies and much more analysis is needed.

Hugh Enxing (2009) worked with Professor Rob Carey on the Muon Lifetime Analysis (MuLan) project at the Paul Scherrer Institute in Villigen, Switzerland. His work involved measuring the muon's lifetime by aiming a beam of muons at a target and detecting the electron created during the muon's decay.

Ryan Eriksen (2010) is performing research in the Engineering Department under Professer Srikanth Gopalan, where he focuses on producing pure hydrogen from stem and methane. Another project that he is working on is making a set up that can test the diffusion rate of carbon-dioxide through a porous sample.

Brian Henning (2009) is working with Professor Ed Kearns on the Super-Kamiokande neutrino detection experiment. His work has dealt mainly with reduction of background events. To accomplish this, Brian has implemented a clustering algorithm using information from the Outer Detector. Though the algorithm is tuned to optimize background rejection, Brian continues to look at alternative strategies including means to automate the rejection process.

Amir Hevroni (2008) did research at the Technion-Israel Institute of Technology with Professor Moti Segev in the summer. He helped develop an apparatus that would probe toxin emissions from the Haifa petrochemical factories through Fourier transform spectroscopy. Hevroni has been a physics and chemistry peer tutor at the BU Educational Resource Center for the past 2.5 years as well as a volunteer chemistry tutor for Chemia (an ACS affiliated student group at BU) during his sophomore year.

William Hubbard (2008) has spent the past year and a half working under Bennett Goldberg studying graphene, a single-atom thick sheet of carbon. Hubbard designed and fabricated graphene-based nanoscale devices, which are used to measure the properties of graphene. His research was

funded by UROP research grants.

Katie Jameson (2009) is working on the Galactic Plane Infrared Polarization Survey, headed by Professor Dan Clemens of BU's Institute for Astrophysical research. Katie is doing data reduction and writing and modifying IDL code for data processing. She is currently working on side projects in spectroscopy, such as analyzing the optical and near infrared spectra of stars in a newly discovered cluster, Mercer 23.

Michele Kotiuga (2008) worked on modeling various properties of carbon nanotubes with Professors Anna Swan and Michael El-Batanouny. Nanotubes are small tubes of carbon that can be thought of as single layers of graphite rolled into tubes and capped with buckyball-like ends. She began her research by writing a program to model the electronic properties during her sophomore and junior years. From the end of her junior year until now, she studied the vibrational properties of carbon nanotubes – the subject of her senior thesis.

Alexander Krause (2009) is working with Engineering Professor Anna Swan to build a microscope to test predictions for using fiber as a phase sensitive detector.

Chad Madsen (2009) is spending his summer at the Paul Scherrer Institute in Villigen, Switzerland to join a collaboration of Boston University, University of Illinois and James Madison University researchers on the MuLAn experiment (Muon Lifetime Analysis), a 1 ppm measurement of the positive muon lifetime. His most important contribution thus far has been his analysis of the muon beam profile, which uncovered the rate of "errant muons", or the rate of muons that stop in the beam pipe but still send their decay positron into the detector. Chad works with Professor Rob Carey.

Kristopher Maynard (2010) is working on the IBEX (Interstellar Boundary Explorer) project with the Center for Space Physics. IBEX is a satellite that will launch in June of next year and will detect particles coming from the heliosphere. This will achieve one of the project's goals of generating a global map of the heliosphere. Under the guidance of Professor Nathan Schwadron, Maynard is working on visualization tools for the satellite's orbit and detected particles.

Julie Moreau (2011) also studies star clusters with the Galactic Plane Infrared Polarization Survey (GPIPS), which seeks to characterize the galactic magnetic field. Julie looks at the photometry, or electromagnetic intensity, of stars in specific clusters and tries to identify them. Once she can say with certainty that a particular star is part of a cluster, she measures the polarization of that star's light. Polarization of the interstellar medium is directly tied to magnetic fields.

During his senior year, **Eric O'Dea** (2008) worked as the thermal engineer on the CRaTER instrument under Astronomy Professor Harlan Spence. That project is set to launch to the moon in December.

Brian Pardo (2008) worked on a thesis with Professor Richard Averitt on building and using a far-infrared spectrometer. The purpose of his work is to look at the responses of novel materials to intense excitation with light, such as terahertz radiation emission from semiconductor surfaces and photo-induced phase transitions.

Amanda Robison (2008) has worked with Professor Harlan Spence in the Astronomy Department for the past four years on multiple research projects, including ice-core analysis and magnetic reconnection. For two summers, she worked with Dr. Stephen Fuselier at the Lockheed Martin Advanced Technology Center studying auroral phenomena. Her latest research with Spence, which she presented in her work for her distinction thesis, is on the dynamics of Earth's electric fields that connect the Earth's magnetic field to regions of the upper atmosphere.

Ted Stinson (2009) is developing a near-field scanning optical microscope capable of high resolution imaging on the nanoscale with Professor Bennett Goldberg.

Claire Thomas (2010) works on Professor Bennett Goldberg's graphene project. Graphene is a two-dimensional carbon structure with a unique crystal lattice structure. The periodic potential caused by the lattice gives rise to relativistic pseudoparticles that carry charge in the material. These charge carriers mimic relativistic particles and are described by the Dirac equation rather than Schrodinger's equation. This means that relativistic phenomena can be simulated using graphene in a table-top experiment. Also, since the charge carriers have such high mobility, there is hope that graphene will play a leading role in nanotechnology in the future. They are currently building a circuit in which they hope to tune graphene's fermi level, changing the charge carriers from electrons to holes. They expect that

the conductivity will be symmetric over the Dirac point, but at no point will it be zero (graphene will not become an insulator- it will remain metallic even at the neutrality point). This preliminary testing will lead into study of graphene's interesting "half integer quantum hall effect," which has a quantized level at E=0 (where both electrons and holes carry charge).

Lela Todorova (2008) worked under the guidance of Professor Ophelia Tsui on examining the behavior of polymers in nanoscale settings. Specifically, Todorova researched whether molten polymers may become solid-like when confined in nanometer films. The answer to that question would significantly affect the way we use polymers in nanoscale applications. Todorova also worked for two summers at Columbia University Medical School, on tracing and analyzing human brain neurons. The project's goal was to better understand the origins and development of schizophrenia in humans. She received UROP funding for two semesters.

Program Completion

The Physics Department had 103 majors this academic year, with 60 concentrating in Physics, 40 in Astronomy and Physics, and 3 in Philosophy and Physics. We graduated 27 majors; 20 earned degrees in Physics and 7 in Astronomy and Physics.

Bachelor's recipients from the Physics Department have been successful in recent years in being accepted to the most prestigious graduate programs in the United States. They have also entered a diverse range of disciplines, reflecting the broad value of an undergraduate degree in physics.

Below are some of the plans of this year's graduating students:

Peter Ashton will be working as an assistant teacher at the MIT Kavli Institute for a program teaching high school students, and plans to pursue a PhD in astronomy the following year.

Carla Benatti will attend Michigan State University for nuclear physics.

Nicholas Brady is taking time off before medical school.

Amy Colgan plans to work in the public sector.

Dalit Engelhardt will pursue a master's degree in mathematics in the UK, either at Imperial College London or Durham University.

Hugh Enxing will attend UMASS Amherst for an MS in Applied Mathematics.

Amir Hevroni will return to Israel to attend graduate school at either Tel-Aviv University or the Technion-Israel Institute of Technology.

Jonathan Hoffman will pursue physics at the graduate level at the University of Maryland, College Park.

William Hubbard will continue research started as an undergraduate and eventually pursue a graduate degree in Physics.

Gregory Jones will work for a company that manufactures industrial cleaners and cleaning chemicals.

Michele Kotiuga will attend graduate school at the University of California, Berkeley to study condensed matter physics.

Matthew Molinario will continue research in Professor Richard Averitt's lab and take a year off before going to

graduate school.

Eric O'Dea will work at Agganis Arena while pursuing jobs in astronomy or physics, and plans to later return to school for his PhD.

Caitlin O'Nan will work in Boston while she applies for graduate schools in astronomy for Fall 2009.

Brian Pardo will continue research in Professor Richard Averitt's lab and plans to travel to Spain.

Matthew Preble will work and plans to begin graduate school in Fall 2009.

Genelle Pugliese will work and plans to attend graduate school in the future.

Megan Riley will work and plans to pursue a graduate degree.

Amanda Robison will attend graduate school at the University of Washington for a PhD in Space Physics.

Lela Todorova will work at Boston University.

David Tooley plans to apply to graduate school.

Dan Tran plans to pursue graduate school after taking one year off.

Awards and Honors

Phi Beta Kappa:
Lisa Baubock, Dalit Engelhardt, Jonathan Hoffman, Michele Kotiuga

Alumni Student Award:
Dalit Engelhardt

College Prize for Excellence in Physics:
Michele Kotiuga

Teaching Facilities and Infrastructure

The Metcalf Science Center and the Physics Research Building are equipped with laboratories in atomic, nuclear, low temperature, high energy, surface and biological physics, and Laser Raman spectroscopy. Major condensed matter physics and biological physics research laboratories are also located in the Center for Photonics.

Research is aided by a precision instrumentation shop, an Electronics Design Facility, and a Computer Research Facility, all of which may be used by graduate students. Research is also carried out at the Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Stanford Linear Accelerator Center, CERN, National Synchrotron Light Source, the Advanced Light Source, Super Kamiokande (Japan), and the Stanford Synchrotron Radiation Laboratory.

An extensive network of computational facilities supports the research activities of the department. There are networked multiprocessor DELL and SGI servers and centralized Sun workstations available to departmental faculty, staff and students. Additional Unix and Linux servers and workstations, as well as many Windows PCs, are available to research groups.

For computationally intensive applications, students have access to supercomputing resources supported through the Center for Computational Science and the Office of Information Technology. In addition, the Departmental Computer Facility supports a wide range of software applications for physics data collection, analysis, simulation, and visualization. See "Research: Facilities and Infrastructure" for more information.

Undergraduate Teaching Laboratories

The undergraduate teaching laboratories comprise four general-purpose rooms and five specialized computer labs. The teaching laboratories staff provides equipment and facilities for the laboratory component of PY103, 105, 106, 211, 212, 241, 242, 251, 252, 313, 354, 371, 408, and 681, as well as several School of Education/College of Arts and Sciences courses for high school physics teachers. Each of these courses has up to eight labs per semester. The laboratory rooms are set up to accommodate as many as 24

students in groups of two, and labs typically run from two to three hours.

After more than a year with only two full-time staff members splitting their attention among the teaching labs, the advanced lab and lecture demonstrations, the department has hired a new lab coordinator to get the staff back to full capacity.

Microcomputer Based Labs (MBLs) make up three quarters of the experiments done in the Intro I courses, and approximately two thirds of the Intro II courses. In the past year, the oldest of the computers in these labs have been replaced, and the rest have been upgraded. The oldest computers have been reserved for use during the summer, when the laboratory rooms will be inaccessible due to ongoing construction, and temporary laboratories will have to be organized. This obviates the need to disassemble current computer networks between the summer terms and reassemble them days before the fall term begins.

Undergraduate Lecture Demonstrations Facility

This academic year, the primary project has been the continued reorganization of the demonstration facility. Through rearranging and reorganizing the most used equipment, the accessibility of the demonstration collection continues to improve, despite limitations of the existing storage structures. The online database continues to be modified to more accurately match our existing collection and to provide background information about the demonstrations. The development of the database is an ongoing process. A detailed list of the most popular demonstrations has proved effective and helpful for new faculty when preparing lectures.

Our most significant recent equipment acquisitions are a new solid-state Tesla coil and a tablet PC display that faculty can use during lectures for real-time incorporation of hand-written notes into presentations. The DVD collection "Physics Demonstrations" was recently purchased to help faculty with incorporating video clips of elaborate demonstrations into their presentations. Many demonstrations were modified, repaired or newly acquired, and the descriptions are being added to the demo database. A laserdisc player and a document camera were also obtained to replace older equipment.

The demonstration and laboratory staff has worked closely with Media Services and faculty to coordinate needed improvements in the lecture rooms to allow for the incorporation of more audio, video and student personal response systems in lectures. Most of the requests for adjustment or replacement of equipment were resolved quickly and internally by the Physics Department staff.

Throughout the year, our demonstration and laboratory staff has lent equipment and expertise to a series of courses taught by Physics and School of Education faculty outside the department, primarily for Boston Public Schools. Requests from outside the department for equipment are gradually increasing from year to year. As part of BU's Freshman Fridays, the demonstration staff – together with faculty and graduate students – participated in developing and providing demonstrations. The demonstration and laboratory staff also assisted the Chemistry, Biology and Astronomy Departments, Core Courses, Boston University Academy, numerous local elementary and high schools through the LERNet program, as well as many individuals in the greater university community.

Looking Forward

In the coming year, we will focus on several interrelated areas of our undergraduate program. We will work with our majors' program to improve the sophomore year course, infuse computing into the freshman and sophomore curriculum, offer a new interdisciplinary course in biological physics and continue the expansion of undergraduate research opportunities. We will also focus effort to expand the connections between physics and departments in CAS and ENG. Our intent is to continue our strong support for the Core program, increase our new, interdisciplinary course offerings for non-science majors, develop a second freshman writing course, couple our service courses to subsequent classes in other majors, and design a specialized physics class for the new neuroscience program. Finally, we will follow up the first ever Undergraduate Alumni Reunion with related events and development activities. Here are the details:

1. We plan to complete the redesign of our curriculum for undergraduate physics majors. We want to **redesign the sophomore sequence of courses such that it provides an up to date introduction to modern physics topics** with the required mathematical sophistication. Our plan includes turning Modern Physics (PY354) into a

two semester class (PY351/352) with greatly expanded modern topics, and coupling that better to Mathematical Methods of Physics (PY355). The new expanded modern physics will blend well with the new freshman seminar experience course, which introduced first year students to the top ten unanswered questions in physics.

2. This fall we will begin a new, multi-year effort to **infuse computing and computational approaches into the first two years of the majors curriculum**. Computing is a critical component to solving modern physics problems, and has been effectively used as a tool for visualization and teaching of physics concepts. Professor Anders Sandvik will be spearheading a program to develop new laboratories for PY251, PY252, PY354 and the new sequence PY351/352 over the next several years. The goal is to train all majors in sufficient depth that computing becomes a ready tool, part of the lexicon of every student, to be used in situations from coursework to laboratory research. Two laboratories will initially be developed in the first semester course to introduce students to computational concepts as well as techniques. In later courses, visualization and computational problem solving will be developed.

3. We plan to complete the design of a **new undergraduate course in biological physics** to be accessible to juniors in physics and other departments. As we build up in biological physics, and work with the University's program in Integrated/Quantitative/Systems Biology, as well as the Biology Department's new Quantitative Biology program, it is important to offer a solid introduction to biological physics at the junior level.

4. We are also concerned about the large number of students who apply for **transfer credits for introductory physics courses** taken at other institutions and whether those courses really give students a basic foundation in physics that corresponds in quality to the courses that we teach. We will evaluate how we can more efficiently ensure they are receiving an equivalent education. We met with Associate Deans Jackson and Snyder to discuss this last year, and received a promise to alter the forms, which has not yet occurred. We will investigate the possibility of an on-line post-transfer credit exam, as well as work to inform advisors, especially those in Biology and Sargent.

5. **Undergraduate research is a cornerstone of our program.** Data demonstrate that students that have a year of intensive research are far more likely to get into top graduate schools and have an accelerated career path than those who don't. Currently, more than half of all physics majors have at least one year of undergraduate research experience. We hope to increase this number to two-thirds of all majors. We are aggressively pursuing REU programs, and are funding eight additional women and underrepresented minorities in summer research from an NSF STEP grant. We are also planning to help support UROP applications that receive only partial funding.

6. On the infrastructure side, we intend to normalize the delivery and support of our **large service courses**. We have a server and database system dedicated to storing and making available all past syllabi, class notes, homeworks, exams and conceptual exercises. We are developing more active learning techniques in the classroom, and supporting the demonstrations and radio controlled response systems from the educational staff. Physics will work closely with CAS and minor construction on the renovation of the SCI lecture space. We are also enhancing the training of teaching fellows, adding pedagogical workshops, and encouraging our graduate student informal teaching seminar series - all to be better focused on support of students.

7. We are **redeveloping our relationship with the ERC**, with the help of their director. This coming year we will institute a new ERC tutoring fellow, who will be the liaison between the ERC and the department. Further, we will likely utilize ERC training for our teaching fellows.

8. We intend to plan several follow-up elements to our very successful **Undergraduate Alumni Reunion**, which was held for the first time this past spring. These include a career panel, since the junior and senior undergraduates found that session in the Alumni Reunion extremely valuable, as well as follow-up events to further develop our relationship with alumni interested in supporting departmental activities.

Graduate Program

Our department offers multiple programs leading to degrees of Master of Arts and Doctor of Philosophy in Physics. A PhD in Cellular Biophysics is also offered in conjunction with the Department of Physiology and the Biophysics Institute of the Medical School. Although our graduate students are admitted exclusively for the PhD programs, many students opt to obtain the optional master's degree along the way. In some cases, although relatively few, the master's degree serves as a terminal degree, usually when a student's performance on the written comprehensive examination is below the high pass level. Research opportunities are offered in experimental high energy particle physics and intermediate energy physics, particle astrophysics, theoretical particle physics and cosmology, molecular biophysics, experimental biophysics, biological physics, experimental and theoretical condensed matter physics, polymer physics, econophysics and statistical physics. During their first year in the Graduate School of Arts and Sciences, students are encouraged to explore the various research areas and facilities available in the department. They are not obliged to commit themselves firmly to a specific area of research until they have passed their comprehensive examination.

Student Recruitment

The Graduate Admissions and Recruiting Committee aggressively recruited the best graduate applicants this year. Each admittee was contacted several times by email and invited to visit the department. We held two open houses, one at the home of Provost David Campbell, with 12 prospective students attending. We also offered sessions for academic presentations, meetings with faculty, and lunch with current graduate students. Of the 17 total students who visited our department in the spring, 10 eventually chose to enroll in our graduate program, including some recruits with the best undergraduate records. These results demonstrate the importance of campus visits in the recruitment process.

The Dean's Fellowships continue to be an important recruiting tool. This year, we awarded two fellowships to outstanding applicants who accepted our admission offer and the fellowship. In addition, we awarded a Junior Photonics Fellowship to a new graduate student entering in the fall of 2008. The possibility of offering an apartment to these fellowship recipients in the graduate student residences at 580 Commonwealth Avenue also appears to be helpful in our recruiting efforts.

In February, the Physics Department also sent a graduate student to the Joint Annual Conference of the National Society of Black Physicists and National Society of Hispanic Physicists in Washington, D.C., to represent the science departments at BU. We set up a recruitment booth, where we promoted our graduate program and our research. Five of the 14 students who explicitly expressed interest in attending BU were interested in the physics PhD program, and many other students picked up our materials.

Of the 328 applications submitted, 67 admission letters were sent out. Sixteen students accepted our offer. Table 2, opposite, provides detailed statistics of applicants for the past 3 years, as well as a breakdown of incoming students by field of interest.

Table 2. Applicants and Admissions

	2006	2007	2008
TOTAL APPLICANTS	**312**	**372**	**328**
Domestic	112	156	148
Foreign	200	216	180
Male	252	295	264
Female	60	77	64
TOTAL ADMITTED	**50**	**65**	**67**
Domestic	36	32	32
Foreign	14	33	35
Male	43	49	60
Female	7	16	7
Prospective Visits	24	24	17
Conversions	12	8	10
TOTAL ENROLLED	**19**	**21**	**16**
Domestic	7	7	9
Foreign	10	14	7
Male	17	19	14
Female	2	2	2
Yield (admitted/enrolled)	2.63	3.10	4.19

2008 ENROLLED STUDENTS BY FIELD	#
Biological physics	2
Condensed matter experiment	8
Condensed matter theory	2
Particle experiment	1
Condensed matter experiment/Condensed matter theory	2
Condensed matter theory/Particle theory	1

Advising and Mentoring

Members of the Graduate Curriculum Committee advise incoming graduate students and graduate students who have not committed to a research field. The advisors meet both before and after initial discussions with students to develop standard guidelines and to resolve open issues. An academic review of entering students occurs at the end of the first semester to identify potential problems early. If a student has trouble with our graduate program for two consecutive semesters, the student is encouraged to seek alternative opportunities. This early intervention helps avoid expending Teaching-Fellow resources on students who have little chance of successfully completing the PhD degree requirements.

The Chair also hosts two informal lunches with graduate students every year to discuss student concerns. This year, students discussed the proposed changes to comprehensive exams and course requirements, how to enhance alumni events, and how to improve the graduate community. Students were especially interested in reviving the graduate-student physics organization, which was resurrected shortly after the lunches.

For a complete list of current graduate students and their advisors, please refer to Appendix 2.1.

Fellowships and Aid

Photonics Fellowships for AY 2007-08:
Nicolas DiFiori, Joel Kralj and Andy Walsh

GK12 Fellowships for AY 2007-08:
Marc Betnel, E. Rachele Dominguez and Mikkel Jensen

UNCF/Merck Graduate Research Fellowship:
Aaron Santos

Awards and Honors

The Gertrude and Maurice Goldhaber Award in Physics:
Alvaro Roccaro

Teaching Fellow of the Year in Physics:
Minghai Li and Mikkel Jensen

Chair's Book Award:
David Schaich and Adam Avakian

Photonics Travel Grant:
Jason Amsden

Travel Grant Award to attend XXIII IUPAC International Conference on Statistical Physics:
Alfonso Lam Ng

Travel award to the Biophysical Society meeting:
Joel Kralj

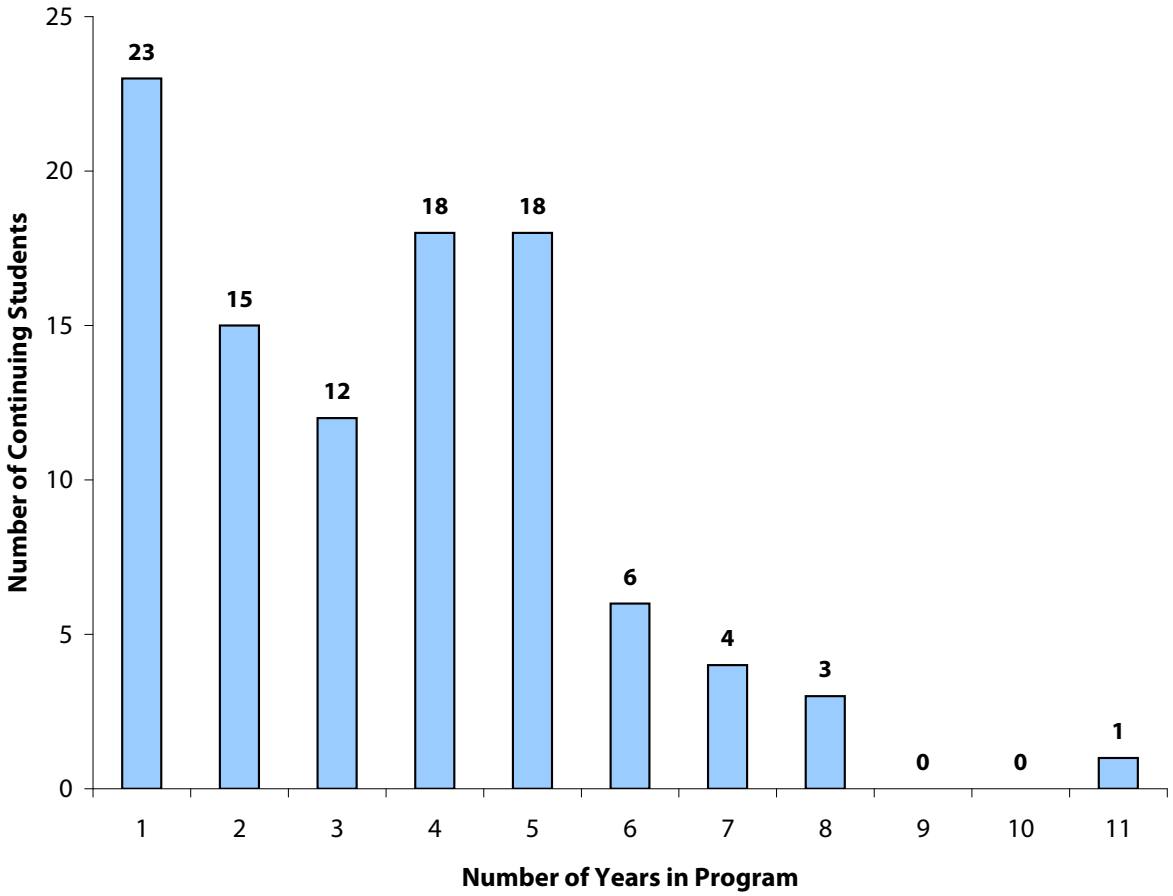
IEEE LEOS Student Travel Grant:
Mehmet Dogan

Graduate student **Utku Kemiktarak** won a travel grant from the APS Topical Group on Instrument and Measurement Science. GIMS awarded travel grants of up to $800 each to students who are the first author of contributed papers in sessions sponsored by GIMS at the March Meeting.

Kemiktarak was also first author of a paper in Nature, entitled *Radio-frequency scanning tunnelling microscopy*. He performed his research in the basement physics lab with a group of investigators led by BU Aerospace and Mechanical Engineering Assistant Professor Kamil Ekinci. The research demonstrates utilizing radio frequencies to speed up data collection and improve resolution in scanning tunnelling microscopy. Their method will find application in quantum-limited position measurements.

Graduate students **Jie Lou** and **Ling Wang**, who work with Professor Anders Sandvik, recently won International Junior Scientist Travel Awards from the Institute for Complex Adaptive Matter (ICAM). They will be visiting the Institute of Solid State Physics in Tokyo, and will work with two ISSP professors, Naoki Kawashima and Masaki Oshikawa, to perform numerical studies of deconfined criticality and new quantum Monte Carlo algorithms for strongly correlated systems implemented by Matrix Product State.

Graph 2. **Time Spent in Graduate Program**



Program Completion

The Physics Department graduate program served 115 students this academic year. Graph 2 (above) depicts the distribution of our current graduate students based on the number of years they have been in the program.

We awarded 16 MAs and 15 PhDs.

2007-08 Master of Arts in Physics:
Eitan Anzenberg, Claudio Felipe Busco, Jacob Nathan Davis, Tzong-Ru Han, Jeremy Robert Love, Jianyuan Luo, James McNerney, Alexander Petersen, Le Qiu, Armin Rahmanisisan, David Alexander Schaich, Kevin C. Stokely, Wei Sun, Joel Nathan Tenenbaum, Xuetao Zhu and Guiti Zolfagharkhani

2007-08 Doctor of Philosophy in Physics:
Jason Amsden, Amitabha Das, Dongfeng Fu, Xiaobo Huang, Pradeep Kumar, Alfonso Ramon Lam Ng, Timothy Learmonth, Minghai Li, Yongsheng Liu, Zhonghua Ma, Ka Ming Tam, Zhenhua Wu, Limei Xu, Yufeng Zhang and Guiti Zolfagharkhani

For a list of PhD dissertation titles, please refer to Appendix 2.2.

Table 3 (following page) provides initial or current career paths for PhD recipients from the past 3 years.

Table 3. Career Paths of Recent PhD Recipients

NAME	GRADUATION YEAR	POSITION	INSTITUTION
Jason Amsden	2008	Postdoctoral Fellow	Tufts University
Amitabha Das	2008	Research Associate	University of Arizona
Dongfeng Fu	2008	Finance Administrator	Freddie Mac
Pradeep Kumar	2008	Postdoctoral Fellow	
Alfonso Ramon Lam Ng	2008	Postdoctoral Fellow	Rockefeller University
Timothy Learmonth	2008		University of California, Riverside
Minghai Li	2008	Postdoctoral Fellow	
Yongsheng Liu	2008	Postdoctoral Fellow	Boston University, College of Engineering
Zhonghua Ma	2008	Postdoctoral Fellow	University of Missouri
Ka Ming Tam	2008	Postdoctoral Fellow	Boston University, Chemistry Department
Zhenhua Wu	2008	Postdoctoral Fellow	University of Waterloo
Limei Xu	2008	Postdoctoral Fellow	Harvard University
Yufeng Zhang	2008	Postdoctoral Fellow	University of Utah
Guiti Zolfagharkhani	2008	MEMS Engineer	University of Nevada, Chemistry Dept.
Jonathan Celli	2007	Postdoctoral Fellow	Boston University, Sand9
Scott Clark	2007	Software Data Adm.	Massachusetts General Hospital
Adam Martin	2007	Postdoctoral Fellow	Ab Initio Software Coorporation
Johan Nilsson	2007	Postdoctoral Fellow	Yale University
Ariel Ribeiro	2007	Postdoctoral Fellow	Leiden University (Netherlands)
Aaron Santos	2007	Postdoctoral Fellow	National Institute of Health
Aaron Schweiger	2007	Researcher	University of Michigan-Sharon Glotzer group
Vishal Sood	2007	Postdoctoral Fellow	ITG, Investment Technology Group
Sameet Sreenivasan	2007	Postdoctoral Fellow	University of Calgary
Federico Vasquez	2007	Postdoctoral Fellow	University of Notre Dame
Wei Wang	2007	Postdoctoral Fellow	University de las Islas Baleares, Spain
Yiyi Wang	2007		University of Wisconsin, Madison
Daoxin Yao	2007	Postdoctoral Fellow	Taking time off
Sijung Yun	2007	Postdoctoral Fellow	Purdue University
Claudio Castelnovo	2006	Postdoctoral Fellow	National Institute of Health
Zhi Chen	2006	Postdoctoral Fellow	Oxford University
Maryam Farzaneh	2006	Postdoctoral Fellow	University of California, Irvine
Lorenzo Feligioni	2006	Postdoctoral Fellow	Mount Holyoke
Kaushik Matia	2006	Assistant Vice President	Center for Particle Physics, Marseille, France
Shouyong Peng	2006	Postdoctoral Fellow	Bank of America, Charlotte, North Carolina
Joseph Howard	2006	Systems Engineer	Brigham and Women's Hospital
Yan Yin	2006	Postdoctoral Fellow	Raytheon

Looking Forward

In the upcoming academic year, we will focus on several areas of development in our graduate program. These include (1) an examination of the number of required courses, with the aim of allowing students greater flexibility to take classes outside of Physics while maintaining core educational breadth and depth; (2) organizing a long-term teaching plan for the frequency of offering 500-, 600-, and 700-level courses that provides both graduate students and faculty greater ability to plan and a more predictable program of advanced study; (3) helping the graduate student organizations, specifically the community and the teaching methods groups, to plan and run events with speakers, faculty and the broader community; (4) examining the Physics Department's role in the new Materials Science and Engineering program, and consider whether a new effort in Materials Physics and Materials Chemistry would make sense for CAS and the University; (5) and taking a new approach to training our teaching fellows by way of a new, integrated 699 curriculum, which includes coupling to the ERC STEM efforts, and focusing on science pedagogy within a workshop model. Here are a few details:

We will re-examine the graduate curriculum, specifically the number of required core courses. In the context of other graduate school programs in physics that are considered competitive with ours, the BU program is somewhat anomalous in requiring 10 lecture courses that are basically predetermined. There is some sentiment that fewer core requirements would allow students to take additional elective courses more closely related to the area of their PhD research. In some cases, these courses may be outside of the Physics Department. The graduate committee will assemble a list of acceptable non-physics courses and generally evaluate the core requirements. A recommendation to the faculty for their full consideration will take place before any change in the formal requirements is enacted.

The graduate students organize three effective groups. The general physics graduate student organization oversees community interactions and addresses graduate student concerns like health care, common space and educational issues. Women in Physics is a group of female graduate students who work to bring speakers, go to conferences, create awareness and develop supportive ties with similar organizations in Biology and Chemistry, as well as in neighboring institutions. A group devoted to the teaching of physics meets periodically as a discussion group and journal club, examining current pedagogy, articles of interest and new techniques to improve the teaching of physics. Our goal in the coming year is to help these organizations in their endeavors, supply funding for activities and encourage them to meet regularly and expand and strengthen the physics graduate student community.

Highlights

Our teaching faculty and research faculty have been exceptionally productive in terms of research this year, producing dozens of publications and making headlines in the larger physics community. Below are highlights of the year.

Research in the News

In thermodynamics, it is generally believed that a system will behave adiabatically – that is, no heat will be produced – if the parameters of the system are changed sufficiently slowly. This is often justified using the adiabatic theorem of quantum mechanics, which states that the transitions between different energy levels in a quantum system are suppressed if the system changes sufficiently slowly. Though these two ideas have long been connected, their exact relationship has remained elusive. In a recent paper published in Nature, Professor **Anatoli Polkovnikov** and his colleague have elucidated this relationship. They have identified three response regimes for slowly changing thermodynamic systems, and as a result, have shown that adiabaticity can break down for low-dimensional, gapless systems.

Professor **Sid Redner** was interviewed on Physicsworld.com regarding his research on the relationship between air particles and voters. As a statistical physicist, Redner applies the same physical principles used to study interacting particles to social situations, and in turn hopes to model large-scale social phenomena, such as voting behavior.

The last big piece of the ATLAS experiment at CERN's Large Hadron Collider near Geneva, Switzerland was recently installed. Most of the detectors on the "A Side Small Wheel" were built by the Boston Muon Consortium under the direction of BU personnel. The BU contingent of ATLAS includes Professors **Steve Ahlen**, **John Butler**, **Ulrich Heintz** and **Scott Whitaker**, as well as several other researchers and graduate students.

For the past several years, the one-atom-thick carbon material known as graphene has intrigued physicists. Its size, strength and conductivity make it a possible semiconductor alternative to silicon in modern technology. An important property of a semiconductor is its energy gap, which can turn electrical currents on and off when receiving external voltage. Were this gap "tuneable," the resulting semiconductor could bring with it new electronic devices. Professor **Antonio Castro Neto**, as part of an international team, has created the first semiconductor with "tuneability." In other words, the energy gap between the valence and conduction bands of the semiconductor's graphene bilayer can be altered with external voltage. This development has possible applications in a variety of fields including laser technology, and was featured on Physicsworld.com.

The search for signatures of magnetic monopoles in the cosmos has been a subject of intense work within the Physics community. **Claudio Castelnovo**, a recent BU Physics graduate and now a postdoc at Oxford, has proposed an alternative strategy to finding magnetic monopoles in nature: They can be realized not as elementary but rather as emergent particles, i.e. as manifestations of the correlations present in a strongly interacting, many-body system. His results appeared in the January 3, 2008 issue of Nature, and were highlighted on the cover of the journal.

The work of Professor **Ulrich Heintz** and his research group at the Tevatron made the American Institute of Physics' *Top 10 Physics Stories of 2007*. Heintz is currently leading the top physics analysis group at the DØ (D-Zero) experiment, and the BU group has worked directly on the evidence for single top quark production (**Shabnam Jabeen**), top-antitop production (**Dookee Cho**) and on the measurement of the top quark mass (graduate students **Dan Boline** and **Vivek Parihar**).

Physics Graduate Student **Utku Kemiktarak** was first author of a paper in Nature, "Radio-frequency scanning tunnelling microscopy." Utku performed this research in the basement physics lab with a group of investigators led by BU Aerospace and Mechanical Engineering Assistant Professor **Kamil Ekinci**. The research demonstrates utilizing radio frequencies to speed up data collection and improve resolution in scanning tunnelling microscopy. Their method will find application in quantum-limited position measurements.

The DØ group posted findings of a new subatomic particle, the "triple-scoop" baryon. Professor **John Butler** built part

of the muon trigger system and Professor **Ulrich Heintz** was part of the team who designed and constructed the silicon microstrip tracker that allowed detection of the particle.

Featured Publications

Our faculty put forth a total of 342 publications in 2007, with 244 articles in refereed journals. Here are a few samples:

D. Dujmic et al., "Observation of the 'Head-Tail' Effect in Nuclear Recoils of Low-Energy Neutrons," in *Nuclear Instruments and Methods in Physics Research*, A584, 327, 2008. – **Steve Ahlen**

M. Li, H. Ni, Y. Liu, M. Steinhart, **R. Bansil**, "Kinetics of HEX-BCC Transition of Cylinders to Spheres: Comparison of Time-Resolved SAXS data with a Model of Coupled Anisotropic Fluctuations," in *Macromolecules*, 40, 9491-9502, 2007.

V. M. Abazov et al., "Search for a Higgs Boson Produced in Association with a Z Boson," in *Physical Review Letters B*, 655, 209, 2007. – **John Butler**

J. Nilsson and **A.H. Castro Neto**, "Impurities in a Biased Graphene Bilayer," in *Physical Review Letters*, 98, 126801, 2007.

C. Castelnovo and **C. Chamon**, "Topological Order and Topological Entropy in Classical Systems," in *Physical Review B*, 76, 174416, 2007.

A. Cohen, T. Roy and **M. Schmaltz**, "Hidden Sector Renormalization of MSSM Scalar Masses," in *Journal of High Energy Physics*, 027, 2007.

A. Inglis, **L. Cruz**, D. L. Roe, **H. E. Stanley**, D. L. Rosene, and **B. Urbanc**, "Automated Identification of Neurons and their Locations," in *Journal of Microscopy*, 230(3), 339-347, 2008.

A. Duffy, *Essential Physics Workbook*, Wiley Press, 2007.

M. El-Batanouny and F. Wooten, *Symmetry and Condensed-Matter Physics: A Computational Approach*, Cambridge University Press, 2008.

X. Wang, Y. Chen, K.A. Gibney, **S. Erramilli**, **P. Mohanty**, "Silicon-Based Nanochannel Glucose Sensor," in *Applied Physics Letters*, 93, 013903-013905, 2008.

E. Özkumur, J. W. Needham, D. A. Bergstein, R. Gonzalez, M.Cabodi, J. M. Gershoni, **B. B. Goldberg**, and M. Selim Ünlü, "Label-free and dynamic detection of biomolecular interactions for high-throughput microarray applications," *Proceedings of the National Academy of Science*, Vol 105, 7988, 2008.

E. Katz and M.D. Schwartz, "An ETA Primer: Solving the U(1) Problem with ADS/CFT," in *Journal of High Energy Physics*, 0705.0534, 2007.

H. Wang, K. Barros, H. Gould and **W. Klein**, "Approaching Metastable Equilibrium," in *Physical Review E*, 76, 041116, 2007.

S. N. Dorogovtsev, **P. L. Krapivsky**, and J. F. F. Mendes, "Transition from Small to Large World in Growing Networks," in *Europhysics Letters*, 81, 30004, 2008.

G. Brooijmans et al., "New Physics at the LHC: A Les Houches Report. Physics at TeV Colliders – New Physics Working Group," arXiv:0802.3715, 2008. – **Ken Lane**

C. Chamon, C.-Y. Hou, R. Jackiw, C. Murdry, **S.-Y. Pi**, and A. Schnyder, "Irrational vs. Rational Charge and Statistics in Two-Dimensional Quantum Systems," in *Physical Review Letters*, 100, 110405, 2008.

C. Rebbi, "A Project-Oriented Course in Computational Physics: Algorithms, Parallel Computing, and Graphics," in *American Journal of Physics*, 76, 314, 2008.

Aron Walsh, Juarez L. F. Da Silva, Su-Huai Wei, Christoph Körber, Andreas Klein, L. F. J. Piper, Alex DeMasi, **K.E. Smith**, G. Panaccione, P. Torelli, D. J. Payne, A. Bourlange and R. G. Egdell, "The Nature of the Bandgap in In2O3 Revealed by First-Principles Calculations and X-Ray Spectroscopy," in *Physical Review Letters*, 100, 167402, 2008.

S. V. Buldyrev, P. Kumar, P. G. Debenedetti, P. Rossky, and **H. E. Stanley**, "Water-Like Solvation Thermodynamics in a Spherically-Symmetric Solvent Model with Two Characteristic Lengths" in *Proceedings of the National Academy of Sciences*, 104: 20177-20182, 2007.

K. J. Morton, K. Loutherback, D. Inglis, **O. K. Tsui**, J. C. Sturm, S. Y. Chou, R. H. Austin, "Hydrodynamic Metamaterials: Nanofabricated Arrays to Steer, Refract and Focus Streams of Biomaterials," in *Proceedings of the National Academy of Sciences*, 105: 7434-7438, 2008.

Visitors Program

The **Quantum Condensed Matter Visitors Program**, directed by Professor Antonio Castro Neto, was established by then College of Arts and Sciences Dean Jeffrey Henderson in 2004 and made permanent by Provost David Campbell in 2008, in order to bring prominent condensed matter theorists from around the world to collaborate with scientists in the Physics Department at Boston University. The program, with a budget of $60,000 for FY09, supports travel, lodging and local expenses for visitors, and has recruited more than 50 distinguished scientists from the most important research institutions in the United States, Europe, South America, Australia and Asia.

These visits have allowed the quantum condensed matter theory group to establish research collaborations with scientists in other institutions and publish papers in the most distinguished journals in the world, in addition to benefiting the experimentalists in the department. The visitors have also delivered seminars to the department, and have interacted closely with faculty and students during their stay in Boston.

Facilities and Infrastructure

The Physics Department administers two major university-wide facilities for the Boston University community: the **Electronics Design Facility** and the **Scientific Instruments Facility**.

The **Electronics Design Facility** **(EDF)** has been serving the electronics needs of the BU community for over 20 years. They provide custom instrumentation for science, big and small, and are located in the Physics Research Building. Their work includes: instrument design and construction, computer interfacing, data acquisition and analysis, analog and RF systems, consulting on any electronics-related topic, and training in CAD software use and PCB design.

The **Scientific Instruments Facility** **(SIF)**, operating since 1987, specializes in the highly accurate machining and fabrication of all types of experimental hardware required by any University department (e.g., vacuum chambers, telescopes, positioning tables, electron guns, manipulators and cryostats). SIF works with materials such as stainless steel, titanium, aluminum, nickel, copper, ceramic and a wide variety of plastics. The facility has the ability to "turn your ideas into tangible items."

Source: BU Today

SIF employs a staff of senior experimental machinists with many years of experience in C/N/C as well as manual machining, CAD/CAM programming and all types of welding and fabrication. Services are available to anyone from within or outside the university who may be in need of custom-machined parts. SIF was recently featured in BU Today, in an article titled "Machine Dreams."

The **Physics Research Computation Facility**, directed by Guoan Hu, provides systems support for departmental servers and assistance with workstations and personal computers to our extensive group of faculty, staff, and student users. The Systems Analyst, Richard Laskey, is a graduate of the Mathematics Department and worked for four years in the Astronomy Department, where he was extensively involved in systems administration, database and website development. This year, he successfully created and implemented a graduate admissions database and has continued to help us expand our web-accessible database interfaces for administration and teaching use. In addition, he has helped the department build on the new departmental website launched in the final quarter of last year.

The **Center for Computational Science**, under the direction of Professor Claudio Rebbi and working jointly with the Scientific Computing and Visualization Group of the Office of Information Technology, provides advanced computational facilities to all members of the Boston University research community. At the high end, these currently consist of an IBM BlueGene supercomputer with a peak capacity of 5.7 Tflops, a cluster of IBM pSeries parallel, shared-memory computers with a combined peak performance of nearly 1 Tflops, an IBM BladeCenter and an Intel based Linux cluster. These resources

are integrated in a well-endowed distributed computing and visualization environment, which includes a high resolution, stereographic display wall, a laboratory for immersive virtual environments, an Access Grid Conference Facility, the Computer Graphics Laboratory, Myrinet, Gigabit Ethernet, and Fast Ethernet networks. A vast and diverse array of optical fiber connections to the NoX, Metro Ring and commercial ISPs provide multiple Gb/s of bandwidth and connectivity to the Internet, Internet2, and international research networks.

With support from an NSF IGERT grant, the center runs an interdisciplinary graduate training program called ACES (Advanced Computing in Engineering and Science), offering a Certificate in Computational Science, and NSF-funded traineeships for students pursuing the PhD in any of nine participating departments, including Physics.

Grant Activity

Our faculty continue to conduct active research programs, despite an unfavorable funding climate caused by the decline in non-defense, federal research funding since 2004, and the shift of federal Research & Development resources to biomedical research beginning around 2000. We were awarded $10,947,100 this past fiscal year, which includes funding by PIs within our department that were counted solely through another unit.

Appendix 3.1 reflects data compiled by the Office of Sponsored Programs on the number and amount of applications and awards in the Physics Department and the Center for Polymer Studies between 2004 and 2008. Appendix 3.2 provides a detailed summary of award information for the same period. The discrepancy between the totals in these tables arises primarily from awards established in units or departments other than Physics. These are primarily Departments in the College of Engineering, the Department of Cognitive and Neural Systems, and the Science, Mathematics and Education Center.

Uses of Indirect Cost Recoveries

The Physics Department received $168,815.56 in indirect cost (IDC) return from the College of Arts and Sciences during FY2008. Since FY2006, the department has directed 50% of IDC return back to the researchers responsible for generating it.

Funds returned to principal investigators this year provided crucial financial support for ongoing projects not covered by research awards or other departmental resources. Other uses included lab supplies and equipment, computing equipment and research travel.

The remaining 50% of IDC return ($84,408) was retained by the Physics Department for broader departmental initiatives. As in the past, these funds helped to offset necessary expenditures for which other support was not available. As mentioned previously in recent annual reports, the fraction of departmentally-held overhead return that must be directed toward staff support has declined since FY2004 from about 75% to about 9%. Consequently, we have been able to direct this important resource toward the unfunded needs we deem most pressing, instead of using most of it just to remain afloat operationally.

Approximately $35,000 of the department's portion of the IDC return was used for student support (including tuition support) for which other resources were not available. Another $12,000 was used to purchase furniture associated with this year's remodeling of the Quantum Condensed Matter Theory office and conference spaces in the Science Center. About $22,000 funded the purchase, construction or repair of supplies and equipment for research and education projects not covered by other sources. Approximately $7,500 was used for catering expenses for departmental events.

Events

Physics Teaching Assistantship Forum

As part of the national conference "American Association of Physics Teachers," held at BU this year, and hosted by chairman and Professor Karl Ludwig, BU Physics organized a forum for physics teaching assistants. Fifty physics TAs attended from Boston University, Harvard, MIT, Northeastern, Tufts, and Brandeis, and the forum was adopted as a feature of future national conferences. After the conference, our Physics Teaching Fellows organized a weekly journal club on teaching methods, where students share papers and ideas on active learning, peer mentoring, *No Child Left Behind*, and many other issues.

Women in Physics Seminars

Through a series of biographical seminars held this spring, BU's Women in Physics showcased the accomplishments of female scientists and educated the physics community on relevant issues. Though the talks were given by women about women, they attracted and engaged both genders. In an environment where only 8 percent of faculty and 13 percent of graduate students are female, WIP turned up the volume on a voice that had been relatively quiet.

Each seminar offered a rare glimpse at the experiences of women in science. In that sense, WIP member and graduate student Rachele Dominguez said they differed from the typical physics talk, centering on research. Featured speakers included Professors Ophelia Tsui and Anna Swan and Research Associate Professor Brigita Urbanc.

Dean Edmonds Colloquium

This year's Dean Edmonds Colloquium series speaker was Robert Aymar, the Director-General of CERN. Aymar discussed the challenges and opportunities at the new Large Hadron Collider, and later spoke at a banquet held in the School of Management.

For a complete list of this year's colloquia and seminars, please refer to Appendix 4.

Educational Outreach

Boston University Upward Bound

As part of the GK-12 initiative, BU Physics graduate students taught in the BU Upward Bound program for Boston area youth struggling to complete high school and matriculate to college.

GK12 Boston Urban Fellows

Physics graduate students Rachele Dominguez and Mark Betnel received GK12 fellowships and were placed respectively in physics classrooms at Boston Latin Academy and The Engineering School, where they helped develop new curricula for physics classes.

LERNet

Throughout the school year, the teaching laboratories have worked in coordination with LERNet, BU's Learning Resource Network, to conduct educational and enrichment activities for local middle-school and high-school students, including BU Academy, Bedford High School, The Engineering School, and Quincy High School. LERNet, run by Cynthia Brossman, also hosted a Physics Day for high school students in May (see below), and was the prime organizer of the 2008 Department Of Energy ScienceBowl. At the event, 27 teams vied for the opportunity to compete in the National Bowl in Washington, D.C.

Physics Day at Boston University

The department participated in the third annual Physics Day at BU, which attracted 250 high school students and teachers from around the city. Andrew Duffy and Val Voroshilov performed a physics demo show titled "Under Pressure," and Professor Bennett Goldberg introduced students to nanotechnology. In addition, graduate students Rachele Dominguez and Mark Betnel developed and presented a session called "Experience the Sound."

Improving the Teaching of Physics

Improving the Teaching of Physics (ITOP) is a joint effort between the Physics Department and the School of Education. ITOP is funded by the Massachusetts Board of Higher Education, and is designed to train in-service high-school teachers in physics and the teaching of physics. In 2007-08, our teaching labs provided space and laboratory equipment for several of the ITOP courses, including:

NS540 Concepts in Physics I: Force and Motion (Fall 2007)
NS541 Concepts in Physics II: Rotation and Gravitation (Fall 2007)
NS549 Everyday Applications of Physics (Fall 2007)
NS542 Concepts in Physics III: Fluids, Heat, and Thermodynamics (Spring 2007)
NS543 Concepts in Physics IV: Electrostatics and Magnetostatics (Spring 2007)
NS544 Concepts in Physics V: Harmonic Motion, Waves, and Geometrical Optics (Summer 2008)

The involvement of the Physics Department in Project ITOP has been a major outreach effort. Project ITOP is a rigorous two-year 20-credit program, in which high school teachers come to BU to learn about physics, physics pedagogy and education research, and the conceptual history of physics. The target audience consists of teachers who are teaching physics in the high schools without having the qualifications or the background to teach the subject. There are roughly 40 such teachers in the Boston Public Schools, and more such teachers in towns close to Boston.

The ITOP program began in May 2004 as a joint effort between the Physics Department, the School of Education, and the Boston Public Schools. Since then, the program has been funded through a three-year $450,000 grant through the Massachusetts Board of Higher Education (PI: Professor Peter Garik (School of Education); co-PI: Professor Andrew Duffy (Physics)) that has allowed an expansion of the collaboration to include the University of Massachusetts at Boston and the Revere Public Schools.

Courses from Project ITOP have now been taken by approximately 35 Boston-area teachers, most from the Boston Public Schools, but with several from Revere and others from Holliston, Franklin, Brookline, Manchester-Essex and Quincy. Two cohorts of teachers are currently enrolled in the program. Cohort II, with 11 teachers, meets on Monday and Friday evenings, while cohort III, with 4-6 teachers, meets on Tuesday and Friday evenings. The lead instructors are Andrew Duffy and Val Voroshilov (Physics), who share the physics instruction, and Peter Garik and philosophy graduate student Luciana Garbayo, who share the instruction pertaining to the history and philosophy of science, and to education research. Voroshilov, the Director of the Lecture Demonstration Facility in Physics, was a key addition to the ITOP team this year, allowing the two cohorts to be taught simultaneously.

Until this year, the ITOP courses had been offered through the School of Education. This year, however, the sequence of 10 courses won approval from CAS to be cross-listed as NS (Natural Science) course at the 500 level. These NS 500 level courses will address the content of STEM disciplines, the educational research conducted in the field, and the conceptual history of the discipline. They are intended to further the understanding of the students within the liberal arts and science tradition by focusing on research based content and analytical reasoning. The new CAS designation formally acknowledges the value brought by PhD faculty in the disciplines for in-service instruction for the first time, more appropriately identifies the content covered, and provides the participants with the credentials they have earned. Math has a similar structure based on the Focus on Math program.

This will be an important benefit for participating teachers as they work toward their professional license. This year, three of our participating teachers passed the Massachusetts Test for Educator Licensure (MTEL) in Physics, giving them the qualifications they need to be licensed to teach physics. Several of our other teachers have either taken the MTEL and are awaiting the results, or plan to take the MTEL in July 2007. We expect even more of the teachers to also become licensed physics teachers, meeting one of the primary goals of the ITOP program.

Immersion for Elementary Teachers

In the summer of 2007, the undergraduate labs hosted an intensive two-week workshop for elementary teachers, covering light and optics. This workshop, called Immersion in Geometrical Optics, was privately funded by a three-year grant from Stephen Bechtel. In July 2007, 15 elementary teachers attended the workshop (enrolling in a two-credit graduate-level School of Education course, SED SC531), which ran from 9 am to 4 pm Monday through Friday for two weeks.

In the summer of 2008, two such workshops will be offered. Each starts with five three-hour pre-workshop sessions in May and June (hosted by the undergraduate physics labs), and then continues with an intensive two-week session in July. Each is now associated with a four-credit graduate-level School of Education course. These courses are SED SC532 (Immersion in Geometrical Optics, one section of 15 teachers) and SED SC533 (Immersion in Green Energy, two sections of 15 teachers each). The Optics workshop is covered by the Bechtel grant, while the Green Energy workshop is funded by a new grant from the Massachusetts Board of Higher Education.

Quarknet

In 1999, Associate Professor Ulrich Heintz started one of the first quarknet centers in the country in collaboration with colleagues from Northeastern University. Quarknet is an initiative to involve high-school teachers and their students in state-of-the-art research that seeks to resolve some of the mysteries about the structure of matter and the fundamental forces of nature. It is supported by the National Science Foundation and the U. S. Department of Energy. The program has included research internships for teachers, a three-week workshop for teachers in 2000 in which many faculty members from BU participated, and annual one-week workshops since then.

Research Internship Program

The BU Research Internship Program in Science and Engineering, co-founded by Professor Emeritus George Zimmerman, entered its 30th year of immersing high school students in the world of scientific research. Featured in the BU Metropolitan College winter newsletter, the program enlists faculty mentors to help students explore their scientific interests and prepare for the rigor of college-level research.

Alumni Initiatives

The department held its first Undergraduate Alumni Reunion in April. See the following page for details.

Community Service

Walk for Hunger

This year, a team of Physics Department staff raised $900 in donations from the Physics staff and faculty for the 40th Annual Walk for Hunger. More than 40,000 people participated in the walk, despite the soggy weather, and raised about $3.8 million total for programs statewide.

Media Strategy

Both print and online media are vital avenues for our department's communication with the greater physics community. Our media is comprised of our Website, Undergraduate Folder, Graduate Folder, Research Brochure, Alumni Newsletter and Annual Report. This year, we took a step back to assess how well that media was meeting the needs of our myriad constituencies.

We set out to develop a cohesive media policy, as we decided existing publications of the department failed to address all the needs of our constituencies and lacked uniformity. The department therefore aimed to 1) Identify the needs of each constituency and develop/revise content to meet those needs, 2) Collect and share information efficiently among different media, and 3) Revise the presentation of publications so they would achieve a common look and feel.

That process has been exceedingly successful. In the past several months alone, we have revamped our Website, Undergraduate Folder, Alumni Newsletter and Annual Report – with the revision of our Research Brochure and Graduate Folder in progress.

Because information can be instantly updated and has a large audience, our **Website** is our most critical medium and is justly our media focus. The Physics website has undergone several changes this year. Our homepage now includes modules for displaying news and events, and our "Student Spotlight," which has been an effective way of portraying the lives of BU Physics students. For a highlight of our Student Spotlights, please refer to Appendix 5.

In terms of our internal online capabilities, we have also made progress. The department has continued to update

Undergraduate Alumni Reunion

The Physics Department held its first Undergraduate Alumni Reunion on Saturday, April 12. Eighty alumni, faculty, and current undergraduates discussed contemporary physics, caught up on years passed, and discussed careers inside and outside of physics. We hope to make this an annual event as the feedback from both alumni and undergraduates was extremely positive.

The day began with lunch in the Metcalf Science Center, where about 40 alumni and 20 undergraduates mingled over sandwiches and sodas. From there, the group proceeded to the Life Science and Engineering building for a session with alumni speakers Alexia Schulz ('98), Mark Spitzer ('75), John Cummings ('97) and Terry Russell ('91). Many attendees praised the talks – which touched on current research and "life as a physicist." Russell, who is a Cambridge local biotechnology entrepreneur and who inspired several undergraduates with his speech, recommended the department hold reunions more often.

Attendees also took advantage of a question-and-answer session with the panel, joined by Zach Hartwig ('05) and Molly Oliver ('93). There, undergraduates asked alumni about life after a bachelor's degree in physics. Undergraduate Coordinator Julia Elder, who organized the event, said many current undergraduates had been skeptical about the prospect of enjoying an "alumni" reunion. But after informative events like the career panel, she said they quickly changed their minds.

The majority of alumni in attendance hailed from Massachusetts, but others traveled from New Hampshire, Wisconsin and beyond. And while many attendees were recent graduates, one was not so recent: David Wellinger graduated in 1945, a time when much of BU was located in the Back Bay.

our admissions database with new functionality, as well as improve usability in our existing database interfaces. We now also have an availabilities application for scheduling group appointments, a preprint database, the ability to store and manage website documents via the Web, and a tag-based teaching resources database. In addition, work has begun on a new graduate database and a forms archive, and we have created an improved printable directory which is automatically updated on a daily basis.

We streamlined the content of our **Undergraduate Folder**, a resource for our prospective and current undergraduates. Our folder now covers several areas of interest for the prospective student, and leaves out all unnecessary information. The document is short, succinct and features a cohesive design, crafted in-house using Adobe InDesign.

Our **Alumni Newsletter** and **Annual Report** utilize a similar design, as part of our effort to create a common look and feel among all our documents. We also chose to combine our two newsletters – once discrete documents geared for undergraduate and graduate alumni – into one. That process will save time and allow us to send out the newsletter on a semiannual basis rather than once every one or two years.

In the coming year, we hope to improve on our existing media, and ensure that it reflects the growth of our department in a timely and savvy way.

Fundraising, Gifts and Grants

The Physics Department has several projects and initiatives in fund raising, briefly mentioned here.

We held the first graduate alumni reunion in the spring of 2007 and the first undergraduate alumni reunion in the spring of 2008. Both events were a great success, and we are in the process of continuing our relationships with alumni to develop fund raising opportunities.

The Physics Department received two anonymous gifts this past year: one for $3000 which will become part of the Marin Memorial Scholarship to support a graduate student in high energy physics, and the other for $10,000 to help graduate students travel to international conferences. We continue to seek funds to build the Marin Scholarship to a level sufficient for endowment; we expect to reach that level this year.

We continue on our major fundraising initiative to raise money to build a common space. Initially, we had a commitment of $40k for the 'Sulak Common Room' but lost that commitment late last year. We have received approval to work with several past and present members of the board, and will try to raise new funds for the common room

Major Challenges and Areas for Improvement

The goals of the Physics Department in the areas of faculty, research, and education are described in detail in the section titled Strategic vision and short and long term goals. The major needs in these areas are (1) to increase the breadth of research and education into two new areas, the first identified as biological physics; and (2) to continue the growth in interdisciplinary education with new courses and research programs at the undergraduate and graduate level, especially those that connect to departments, centers and programs in CAS and ENG.

Infrastructure

In terms of additional departmental needs, staffing is two positions down from several years ago, and we seek to upgrade one position, that of program coordinator of the graduate program, to overall graduate and undergraduate program coordinator, in charge of the undergraduate coordinator. The purpose is to advance the career of an excellent staff member who has been in the Department for 13 years, and who has significantly increased their portfolio to include many minor projects and personnel management. We also seek appropriate compensation for several staff positions that we feel are currently inadequate.

Teaching, research and administrative space is a major concern of the Department. The graduate student's and faculty's chief concern this year is the continued absence of a common room. We still are seeking funds to support a common room construction, and have already programmed sufficient space for it on the second floor (700 sq ft).

We have committed in a retention letter to a physics faculty member and in an offer letter to a new faculty member that the University will plan and construct sufficient space for large computer clusters that are required for both computational and large data analysis tasks. We are working with Michael Krugman in IT, but the process has been very slow, and no plan has yet emerged. The lack of data server space will soon become a critical issue in Physics.

We are pleased to work with CAS and Biology and Chemistry to develop a new renovation plan for SCI teaching space. But it is also clear that after the renovation, we will still have too few classrooms within reasonable access of our demonstration facility, no new active learning space designed specifically for studio-type teaching, and real needs for central facility upgrades the nanoscale research facility, and a new molecular biophysics facility.

The front office is in desperate need of renovation and reorganization, similar to what was done in Biology several years ago. We are also developing a plan for future research laboratory space, and the consolidation of undergraduate teaching space into greater dual use. These changes will require the support of CAS and the central administration.

1. Undergraduate Students and their Advisors

NAME	ADVISOR(S)
Shawn Devin **Akridge**	Castro Neto
Bryan Conley **Anderson**	Sulak
Peter Campbell **Ashton**	Rothschild
Deborah Ruth **Avery**	Ahlen
Amanda Marie **Bair**	Castro Neto
Jonathan Jun **Bao**	Ahlen
Elizabeth Marie **Barris**	Skocpol
Michi Christopher **Baubock**	Ahlen
Carla Frances **Benatti**	Roberts
Gavin Michael **Berkowitz**	Castro Neto
Luis **Blanco**	Ahlen
Nicholas Alexander **Boitnott**	Butler
Alexander Justin **Boyd**	Klein
Nicholas James **Brady**	Carey
Sean Michael **Byrnes**	Skocpol
Zenas **Chan**	Duffy
Emily Maeve **Cody**	Tsui
Ian James **Cohen**	Tsui, Erramilli
Amy Marie **Colgan**	Duffy
Benjamin **Cooper**	Castro Neto
Jack William **Degroot**	Pi
Aaron Matthew **Demay**	Castro Neto
Scott Andrew **Dietrich**	Heintz
Michael Steven **Dimitriyev**	Duffy
Jessica Kate **Donaldson**	Rothschild
Dalit **Engelhardt**	Ahlen
Hugh **Enxing**	Klein
Ryan Steven **Eriksen**	Heintz
Luke **Fellin**	Duffy
Daniel **Fernandez**	Redner
Andrew Mark **Fraine**	Klein
Nathan Leslie **Gardner**	Pi
Chance **Gautney**	Ludwig
Peter **Glynn**	Redner
Cody **Hayden**	Sandvik
Brian Quinn **Henning**	Cohen
Amir **Hevroni**	Carey
Jonathan Evan **Hoffman**	El-Batanouny
William Arthur **Hubbard**	El-Batanouny
Michael Thomas **Jacobs**	Carey
Katherine E **Jameson**	Stone
Gregory Alan **Jones**	Roberts
Alexander Grey **Krause**	Pi
Michele **Kotiuga**	Glashow
Jessica Kathryn **Leach**	Ludwig
Neil Matthew **Lender**	Heintz
David **Li**	Butler
Edward Jonathan **Lipchus**	Mohanty
Michael **Lloyd**	Katz
Anthony **Lollo** Jr.	El-Batanouny
Chad Allen **Madsen**	Sandvik
Vikas Venket **Mangipudi**	Pi
Emily Rachel **Manne-Nicholas**	Castro Neto
Kristofor-ryan Michael **Maynard**	Rebbi
Kaitlyn **Mcardle**	Schmaltz
Joseph James **Megnia**	Sandvik

Andrew Maico **Menz**	Roberts
Gregory **Meyer**	Katz
Yuliya **Miretskaya**	Kearns
Matthew Joseph **Molinario**	Carey
Julia **Moreau**	Polkovnikov
Rebecca **Norklun**	Polkovnikov
Eric Robert **O'Dea**	Butler
Alice Rose **Olmstead**	Pi
Caitlin Elizabeth **O'Nan**	Kearns
Daniel **Pade**	Polkovnikov
Brian Alan **Pardo**	Rebbi
Adam **Patch**	Polkovnikov
Adam Jeffrey **Pettit**	Roberts
David Alan **Pickholtz**	Carey, Redner
Daniel Victor **Pilon**	Sulak
Robert **Pratt**	Tsui
Matthew Brandon **Preble**	Duffy, Heintz
Genelle Louise **Pugliese**	Ludwig
Zachary Mark **Raines**	Roberts
Megan Elizabeth **Riley**	Rebbi
Amanda Nichole **Robison**	Ludwig
Adam Christian **Romines**	Cohen
Scott Michael **Sandler**	Roberts
Scott Emerson **Sayce**	Rothschild
William **Shain**	Castro Neto
John **Sheets**	Cohen
Nicholas **Slowey**	Duffy
Timothy **Smith**	El-Batanouny
Scott **Stackley**	Klein
Troy **Stedman**	Pi
Harry Theodore **Stinson** III	Rebbi
Hally Bissell **Stone**	Schmaltz
Glenn Flinn **Sugar**	Sulak
Catherine Marie **Summerhayes**	Katz
Ashton Alexander **Szabo**	El-Batanouny
Lela **Todorova**	Rohlf
David Paul **Tooley**	Rohlf
Dan Lam **Tran**	Katz, Eramilli
Emma Marie **Tupay**	Schmaltz
Julian **Vasilkoski**	Rohlf
Brooke Catherine **Vaydik**	Schmaltz
Daniel Thomas **Walkup**	Butler
Nora **Watson**	Redner
Andrea Jayne **Welsh**	Schmaltz
Ryan **Wilks**	Rohlf
Lauren **Wizon**	Skocpol
Sun Young **Yang**	Skocpol

2. Graduate Students

2.1 Graduate Students and their Advisors

NAME	ACADEMIC ADVISOR(S)	RESEARCH ADVISOR(S)
Elsa **Abreu***	*	
Jason **Amsden**	Ludwig	Rothschild
Kevin **Ann**	Ahlen	Jaeger (CGS)
Eitan **Anzenberg**	Kearns	Ludwig
Adam **Avakian**	Ahlen	
Ronald **Babich**	Rebbi	Rebbi
Kipton **Barros**	Chamon	Klein
Mark **Betnel**	Erramilli	Jaeger (CGS)
Daniel **Boline**	Schmaltz	Heintz
Kaca **Bradonjic**	Ahlen/Schmaltz	
Claudio **Busko**	Kearns	
Bo **Chen***	*	
Pu **Chen**	Ludwig	Redner
Yu **Chen**	Mohanty	Mohanty
Yiping **Chen**	Erramilli	Stanley
Andrew **Clough**	Kearns	Rohlf
Leyla **Colakerol**	Erramilli	Smith
Eva **Cornell***	*	
Luca **D'Alesio**	Klein	
Jacob **Davis**	Schmaltz	
Claudia **De Grandi**	Chamon	Polkovnikov
Nima **Dehmamy***	*	
Alexander **Demasi**	Chamon	Smith
Mark **Dickison**	Erramilli	Stanley
Nicolas **Di Fiori**	Erramilli	Meller (ENG)
Mehmet **Dogan**	Goldberg	Goldberg

Elizabeth Rachele **Dominguez**	Schmaltz	Klein
Adam **Donovan**	Schmaltz	
Fanny **Dufour**	Chamon	Kearns
Tyler **Dunn**	Erramilli	Mohanty
Cory **Fantasia***	*	
Dongfeng **Fu**	Heintz	Stanley
Alan **Gabel***	*	
Daniel **Gastler**	Schmaltz	Kearns
Diego **Guerra**	Chamon	
Sungho **Han**	Chamon	Stanley
Rafael **Hipolito**	Sandvik	Polkovnikov
Chang-Yu **Hou**	Chamon	Chamon
Xiaobo **Huang**	Miller	Miller
Xuqing **Huang**	El-Batanouny	
Luis Ibanez **Herrera**	Redner	
Matthias **Imboden**	Schmaltz	Mohanty
Andrew **Inglis**	Ahlen	Stanley
Mikkel **Jensen**	Erramilli	Rothschild
Songbo **Jin**	El-Batanouny	
Utku **Kemiktarak**	Skocpol	Ekinci (ENG)
Maxim **Kitsak**	Erramilli	Stanley
Alexander **Kitt***	*	
Joel M. **Kralj**	Redner	Rothschild
Pradeep **Kumar**	Stanley	Stanley
Alfonso **Lam Ng**	Stanley	Stanley
Joseph **Larkin**	Erramilli/Stone	Meller (ENG)
Erik **Lascaris**	Schmaltz	
Philip **Lawson**	Sulak	Sulak
Timothy **Learmonth**	Ludwig	Smith
Joao Ricardo **Lemos Rodrigues Dos Santos**	Castro Neto	Castro Neto
Guanliang **Li**	Erramilli	Stanley
Qian **Li**	Averitt	
Minghai **Li**	Bansil	Bansil
Wei **Li**	Ahlen	

Jianxun **Lin**	Erramilli	Meller (ENG)
Michael **Litos**	Kearns	Kearns
Chen **Liu**	Klein	
Kang **Liu***	*	
Mengkun **Liu**	Erramilli	Averitt
Yongsheng **Liu**	Ahlen	Bansil
Jie **Lou**	Chamon	Sandvik
Jeremy **Love**	Ahlen	Butler
Jiayuan **Luo**	Erramilli	Stanley
Zhonghua **Ma**	Chamon	Coker (Chemistry)
Mohammad **Mahmoudzadeh Vazifeh***	*	
Arnab **Majumdar**	Stanley	Stanley/Suki (ENG)
Roberto **Mastrangelo**	Smith	
Marco **Mazza**	Stanley	Stanley
Marc **McGuigan**	Chamon	Goldberg
James **McNerny**	Chamon	Redner
James **McNulty***	*	
Will **Morrison**	Ahlen	
Nigel **Nation**	Redner	Ahlen/Whitaker
David **Newby***	*	
John **Ogren***	*	
Jason **Olejarz***	*	
Keith **Otis**	Ahlen	
Vivek **Parihar**	Heintz	Heintz
Dongdong **Peng***	*	
Qinzeng **Peng**	Chamon	Miller
Alex **Petersen**	Chamon	Stanley
Justin **Phillips**	Schmaltz	Carey
Eric **Pinnick**	Erramilli	Erramilli
Le **Qiu**	Erramilli	Perelman (BIDMC)
Erica **Raber**	Erramilli	Rothschild
Armin **Rahmanisisan**	Erramilli	Chamon
Sebastian **Remi**	Goldberg	Goldberg
Alvaro **Roccaro**	Chamon	Ahlen

John **Roush***	*	
Christopher **Sanborn**	Ahlen	Ludwig
David Alexander **Schaich**	Katz	Rebbi
Christopher **Serino**	Schmaltz	
Jia **Shao**	Erramilli	Stanley
Julian **Spring**	Katz	
Jason **St. John**	Schmaltz	Rohlf
Kevin **Stokely**	Schmaltz	Stanley
Elena **Strekalova**	Chamon	Stanley
Andrew **Strikwerda**	Katz	Averitt
Zhiqiang **Su**	El-Batanouny	
Wei **Sun**	Erramilli	deBoer/Mertz (ENG)
Jason **Sutin**	Erramilli	Meller (ENG)
Ka Ming **Tam**	Chamon	Campbell (ENG)
Ying **Tang**	El-Batanouny	
Joel **Tenenbaum**	Katz	
Hidefumi **Tomita**	Schmaltz	Ahlen
Andrea **Velenich**	Chamon	Kreimer (Mathematics)
Silvia **Viola**	Chamon	Castro Neto
Daniel **Volovik**	Katz	
Andrew **Walsh**	Redner	Goldberg
Duan **Wang**	Erramilli/Stone	
Ling **Wang**	Sandvik	Sandvik
Fengzhong **Wang**	Ahlen	Stanley
Xihua **Wang**	Erramilli	Erramilli
Joseph-Stefan **Wenzler**	Ahlen	Mohanty
Zhenhua **Wu**	Stanley	Stanley
Limei **Xu**	Ludwig	Stanley
Zhenyu Yan	Stanley	Stanley
Guang **Yang***	*	
Yangyang **Yao**	Chamon	El-Batanouny
Jingdi **Zhang**	Erramilli/Stone	
Wei **Zhang**	Erramilli/Stone	
Yufeng **Zhang**	Smith	Smith

Jun **Zhou**	Redner	Campbell (ENG)
Xuetao **Zhu**	Ahlen	El-Batanouny
Guiti **Zolfagharkhani**	Mohanty	Mohanty

* Incoming Fall 2008

2.2 Recent PhD Recipients with Dissertation Titles

NAME	DATE	DISSERTATION TITLE
Amitabha Das	May 21, 2007	*Search for Randall-Sundrum Gravitons in Dilepton and Diphoton Final States with 1FB-1 of Data*
Yongsheng Liu	August 13, 2007	*Phase Behavior of Block Copolymers in Selective Solvents*
Limei Xu	August 23, 2007	*Can One Understand Water Anomalies with a Simple Potential*
Pradeep Kumar	August 30, 2007	*Anomalies of Bulk, Nanoconfined and Protein-Hydration Water*
Dongfeng Fu	September 14, 2007	*Statistical Physics Approaches to Understanding the Firm Growth Problem*
Yufeng Zhang	October 3, 2007	*Soft X-Ray Spectroscopic Studies of the Electronic Structure of Organic Semiconductors*
Zhonghua Ma	November 28, 2007	*Simulation of Quantum Decoherence in Condensed Phases*
Zhenhua Wu	December 4, 2007	*Physics of Flow in Weighted Complex Networks*
Timothy Learmonth	December 5, 2007	*Soft X-Ray Spectroscopic Studies of Quasi-Low Dimensional and Strongly Correlated Materials*
Jason Amsden	December 10, 2007	*A Study of the Proteorhodopsin Primary Photoreaction by Low-Temperature FTIR Difference and Ultrafast Transient Infrared Spectroscopy*
Xiaobo Huang	December 17, 2007	*CPT and Lorentz Violation Test in the BNL Muon g-2 Data*
Ka Ming Tam	January 24, 2008	*Renormalization Group Studies of Strongly Correlated Systems*
Guiti Zolfagharkhani	March 25, 2008	*Nanomechanical Detection of Electron Spin Flip*
Minghai Li	March 28, 2008	*Phase Behavior and Kinetics of Cylinder To Sphere Transition in Block Copolymers in Selective Solvents*
Alfonso Lam Ng	April 18, 2008	*In-Silico Study of Amyloid Beta-Protein Folding Relevant to Alzheimer's Disease*

3. Research Grants, Contracts and Awards

3.1 OSP Summary of Grant and Contract Activity

PHYSICS DEPARTMENT										
	FY04		FY05		FY06		FY07		FY08	
	#	Amount	#	Amount	#	Amount	#	Amount	#	Amount
Applications	46	32,123,637	55	29,295,990	43	14,328,486	56	19,005,657	63	19,188,967
Awards	45	8,715,547	37	5,132,353	35	5,107,638	48	6,495,851	54	7,504,564

CENTER FOR POLYMER STUDIES										
	FY04		FY05		FY06		FY07		FY08	
	#	Amount	#	Amount	#	Amount	#	Amount	#	Amount
Applications	27	27,298,703	12	2,680,011	7	4,210,806	7	811,460	3	1,069,703
Awards	14	1,972,897	10	729,468	9	1,207,604	15	1,713,826	9	1,283,621

Total amount awarded during FY08	8,788,185

3.2 Detailed Summary of Research Awards*

	FY04	FY05	FY06	FY07	FY08
TOTAL PENDING REQUESTS	0.0	0.0	0.0	0.0	0.0
TOTAL GUARANTEED AWARDS	12,421.6	15,592.1	10,242.4	9,839.7	10,947.1
TOTAL DEPARTMENTAL GRANT ACTIVITY	12,421.6	15,592.1	10,242.4	9,839.7	10,947.1

Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
AFFLECK, IAN									
	9619-5	NSF	90.0	2.0					
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
AHLEN, STEVE									
	2074-5	NSF	97.0	1.0					97.0
	9055-5	DOE	65.0	1.0			65.0		
see Whitaker	8522-5	DOE/CB	*	13.0	*	*			
see Butler	8532-5	DOE	*	5.0	*	*	*	*	*
	9340-5	NSF	115.0	1.0			115.0		
	9942-5		280.0	2.0				140.0	140.0
		TOTAL:			**0.0**	**0.0**	**180.0**	**140.0**	**237.0**
AVERITT, RICHARD									
	2335-5	DARPA	147.7	2.0					147.7
	9914-5	DOE via LANL	134.4	3.0				67.5	66.9
		TOTAL:			**0.0**	**0.0**	**0.0**	**67.5**	**214.6**
BANSIL, RAMA									
	6515-7	NSF	182.9	1.0					182.9
Polymer Studies	4778-5	American Chemical Society	60.0	1.0					
Polymer Studies	8509-5	NSF	300.0	3.0		100.0	100.0	100.0	
		TOTAL:			**0.0**	**100.0**	**100.0**	**100.0**	**182.9**
BRESNAHAN, GLENN (IT)									
see Rebbi	6004-7	NSF		5.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
BROWER, RICHARD (ECE)									
see Rebbi	8526-5	DOE		15.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
BUTLER, JOHN									
	2297-5	DOE/Oregon	51.0	1.0					51.0
see Whitaker	8522-5	DOE/CB		13.0	*	*			
	8530-5	DOE/RS	568.4	13.0					
w/ Heintz	8532-5	DOE	1507.0	5.0	263.0	266.0	245.0	380.0	353.0
w/ Heintz, Narain	8533-5	DOE	1684.0	5.0	390.0	429.0	430.0	220.0	215.0
	8637-5	FNAL	12.0	1.0		12.0			
	9564-5	DOE/ANL	40.0	1.0				40.0	
		TOTAL:			**653.0**	**707.0**	**430.0**	**640.0**	**619.0**
CAREY, ROB									
see Miller	2344-5	NSF		3.0					*
see Miller	4589-5	NSF		3.0	*	*	*		
see Duffy	7105-6	NSF		3.0	*	*			
see Miller	8237-5	NSF		1.0					
see Sulak	8527-5	DOE/G-2		12.0					
see Miller	8550-5	NSF		5.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
CASTRO NETO, ANTONIO									
	4736-5	IBM	239.4	4.0	64.3	66.9			
	8389-5	NSF	270.0	3.0	90.0	90.0	90.0		
see Affleck	9619-5	NSF		2.0	*				
	9643-5	IBM	24.0	3.0	6.0	6.0			
		TOTAL:			**160.3**	**162.9**	**90.0**	**0.0**	**0.0**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

CHAMON, CLAUDIO									
	3923-5	NSF	220.0	4.0					
	4864-5	NSF	15.3	4.0					
	8176-5	NSF	270.0	3.0	90.0	90.0	90.0		
	8730-5	Brandeis Univ.	223.4	4.0		88.5	45.0	45.0	44.9
	9317-5	DOE	211.0	3.0				211.0	
		TOTAL:			**90.0**	**178.5**	**135.0**	**256.0**	**44.9**
CHIVUKULA, SEKHAR (TO MSU)									
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
see Butler	8530-5	DOE/RS		13.0	*	*	*		
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
COHEN, ANDREW									
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
DUFFY, ANDREW									
w/ Carey, Goldberg	7105-6	NSF	71.0	3.0	71.0				0.0
		TOTAL:			**71.0**	**0.0**	**0.0**	**0.0**	**0.0**
EL-BATANOUNY, MICHAEL									
	8164-5	DOE	2,646.5	23.0	170.0	178.9	182.1	185.4	185.6
		TOTAL:			**170.0**	**178.9**	**182.1**	**185.4**	**185.6**
ERRAMILLI, SHYAM									
	2389-5	Ninth Sense, Inc.	84.5	1.0					84.5
w/ Hong	4287-5	NSF	596.0	3.0					
	8278-5	NSF	597.6	3.0	222.1	184.0	191.5		
	8613-5	Army	484.5	4.0		484.5			
	9121-5	NIH	111.4	3.0			64.5	34.9	12.0
		TOTAL:			**222.1**	**668.5**	**256.0**	**34.9**	**96.5**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
GLASHOW, SHELDON (ALSO UNI)									
	4629-5	NSF	330.0	4.0	110.0				0.0
		TOTAL:			**110.0**	**0.0**	**0.0**	**0.0**	**0.0**
GOLDBERG, BENNETT									
ENG w/ Swan, Unlu, Karl, Cantor	4902-5		497.7	3.0	186.7				
SMEC w/Garik	7087-6	NSF	309.3	3.0	106.2	101.8	101.3		
SMEC w/DeRosa	7088-6	NSF	1,360.0	4.0	423.9	446.4	446.4		43.2
see Duffy	7105-6	NSF		3.0	*	*	*		
	7453-6	Bechtel	225.0	2.0				125.0	100.0
	7454-6	NSF	194.8	3.0				97.2	97.6
	7455-6	NSF	460.2	3.0				220.8	239.4
	8281-5	Air Force/U. Rochester	436.1	5.0	39.5	160.0	78.9	72.9	84.9
ENG w/ Swan	8539-5	NSF	20.0	2.0		20.0			
	8683-5	Air Force	13.0	1.0		13.0			
ENG w/ Clapperich, Desai, Unlu	9081-5	NSF	168.7	3.0			168.7		
	9792-5	NIH	1776.4	5.0	399.6	342.2	348.4	340.2	
ENG w/Unlu et al.	9693-5	NSF	1300.0	3.0	37.5	37.5			
ENG w/Unlu et al.	9764-5	NSF	34.6	3.0					
		TOTAL:			**1193.4**	**1120.9**	**1143.7**	**856.1**	**565.1**
HEINTZ, ULRICH									
	2136-5	Fermilab	89.3	1.0					89.3
	4796-5	DOE/OJI	195.0	4.0					
	6307-7	NSF	8.0	1.0		8.0			
	8137-5	FNAL	33.7	1.0					
	8371-5	FNAL	34.1	1.0	34.1				
see Narain	8452-5	Fermilab		2.0	*	*			
see Whitaker	8522-5	DOE		13.0	*	*			
see Butler	8533-5	DOE		5.0	*	*	*	*	*

Heintz continued on next page

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

Heintz, continued									
	8795-5	Fermilab	5.5	1.0		5.5			
see Narain	9635-5	NSF		3.0	*	*			
	9885-5	NSF/Columbia U.	184.8	2.0				13.0	171.8
		TOTAL:			**34.1**	**21.0**	**0.0**	**13.0**	**261.1**
HONG, MI									
see Erramilli	4287-5	NSF		3.0	*	*			
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
KATZ. EMANUEL									
	2075-5	Sloan	45.0	1.0					45.0
	9572-5	NSF	160.0	2.0					160.0
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**205.0**
KEARNS, ED									
	2097-5	DOE	57.0	1.0					57.0
w/ Sulak, Stone	8695-5	U. of Calif.	322.0	16.0	0.0	50.0	84.6		
w/ Sulak, Stone	9533-5	DOE		13.0	*	*	*	*	*
		TOTAL:			**0.0**	**50.0**	**84.6**	**0.0**	**57.0**
KLEIN, BILL									
	4626-5	Los Alamos	217.2	2.0					
	4893-5	Los Alamos	40.0	1.0					
	8447-5	Los Alamos	170.0	2.0	170.0				
	8970-5	Los Alamos	30.0			30.0			
		TOTAL:			**170.0**	**30.0**	**0.0**	**0.0**	**0.0**
KRAPIVSKY, PAUL									
	9076-5	NSF	106.6	3.0			71.1		35.5
		TOTAL:			**0.0**	**0.0**	**71.1**	**0.0**	**35.5**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
LANE, KEN									
	2223-5	CNRS / IN2P3							31.5
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
	9938-5	IN2P3	25.0	1.0				25.0	
		TOTAL:			**0.0**	**0.0**	**0.0**	**25.0**	**31.5**
LUDWIG, KARL									
	4993-5	NSF	321.9	3.0	107.2	110.5			
	8103-5	DOE	662.9	6.0	109.0	112.2	107.6		228.3
	8983-5	NSF	300.0	3.0		100.0	100.0	100.0	
	8984-5	NSF	330.0	3.0		110.0	110.0	110.0	
	9789-5	NSF	6.2	3.0					
		TOTAL:			**216.2**	**432.7**	**317.6**	**210.0**	**228.3**
MILLER, JIM									
w/ Roberts, Carey	2344-5	NSF	420.0	3.0					420.0
w/ Roberts, Carey	4589-5	NSF	1560.0	4.0					
w/ Roberts, Carey	8237-5	NSF	8.2	2.0					
w/ Roberts, Carey	8550-5	NSF	1868.0	4.0	455.0	455.0	455.0	503.0	
	8686-5	NYU via NSF	108.1	2.0		68.1	40.0		
	8893-5	UCI via NSF	99.9	2.0		91.9	8.0		
		TOTAL:			**455.0**	**615.0**	**503.0**	**503.0**	**420.0**
MOHANTY, RAJ									
	8196-5	Sloan	40.0	2.0	40.0				
	8467-5	NSF	300.0	3.0	113.9	118.2	67.8		
	8628-5	NSF	98.6	1.0		98.6			
	8631-5	NSF	255.0	3.0		75.0	130.0	50.0	
	8636-5	ACS/PRF	80.0	2.0		80.0			
	8803-5	NSF/Career	340.0	4.0		85.0	85.0	85.0	85.0
	9511-5	NIH	160.2	2.0				81.3	78.9
		TOTAL:			**153.9**	**456.8**	**282.8**	**216.3**	**163.9**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

NARAIN, MEENAKSHI (TO BROWN)									
w/ Heintz	4298-5	DOE/OJI	375.0	6.0	75.0	75.0			
	4435-5	NSF/Career	150.0	4.0					
	7059-6	Mass/DoEd	17.0	1.0					
w/ Heintz	8452-5	Fermilab	137.7	2.0					
see Whitaker	8522-5	DOE		13.0	*	*			
see Butler	8533-5	DOE		5.0	*	*	*	*	*
	8816-5	Fermilab	353.6	1.0		353.6			
	8817-5	Fermilab	23.9	1.0		23.9			
	9195-5	DOE	50.0	1.0			50.0		
w/ Heintz	9635-5	NSF	455.8	3.0					
		TOTAL:			**75.0**	**452.5**	**50.0**	**0.0**	**0.0**
PI, SO YOUNG									
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
POLKOVNIKOV, ANATOLI									
	9556-5	ARMY	409.7	3.0				138.3	133.8
		TOTAL:			**0.0**	**0.0**	**0.0**	**138.3**	**133.8**
REBBI, CLAUDIO									
Computational Science	4423-5	CRDF	5.0	1.5	0.0	0.0	0.0	0.0	0.0
Computational Science	4720-5	DOE	773.1	5.0	115.0	204.9	168.9	0.0	0.0
Computational Science	4767-5	NSF	938.3	3.0	0.0	0	0.0	0.0	0.0
Computational Science	4983-5	CRDF	5.0	1.0	0.0	0	0.0	0.0	0.0
Computational Science	6004-7	NSF	793.0	5.0	0.0	0	0.0	0.0	0.0
Computational Science	6247-7	NSF	525.0	2.0	240.0	0	0.0	0.0	0.0
Computational Science	7069-6	NSF	574.4	5.0	119.4	143.2	118.3	146.7	0.0
Computational Science	7070-6	NSF	1851.4	5.0	480.2	522.1	524.0	603.7	0.0

Rebbi continued on next page

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
Rebbi, continued									
w/ Brower, Cohen, Lane, Pi	8526-5	DOE	9149.9	17.0	457.0	500.0	490.0	550.0	805.0
Computational Science	9483-5	DOE	271.5	4.5	0.0	0.0	0.0	271.5	189.0
Co-PI: Delisi		IBM/ SUR	1200.0	2.0	0.0	0.0		0.0	743.1
		TOTAL:			**1459.6**	**2270.2**	**1401.2**	**1671.9**	**1737.1**
REDNER, SID									
Polymer Studies	8044-5	NSF	100.0	1.0					
	8644-5	Los Alamos	233.2	1.0		233.2			
	8883-5	Los Alamos	5.0	1.0		5.0			
		TOTAL:			**0.0**	**238.2**	**0.0**	**0.0**	**0.0**
ROBERTS, LEE									
	2185-5	Los Alamos							10.0
see Miller	2344-5	NSF		3.0					*
see Miller	4589-5	NSF		4.0	*				
see Miller	8237-5	NSF		2.0					
see Miller	8550-5	NSF		4.0	*	*	*	*	
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**10.0**
ROHLF, JIM									
	4599-5	FNAL	67.3	2.0					
	4987-5	Northeastern/NSF	1756.0	2.0					
	8828-5	Fermilab	50.3	1.0		50.3			
	8892-5	NSF via UCLA	217.4	1.0		217.4			
	9218-5	NSF via UCLA	144.5	1.0			144.5		
see Sulak	9265-5	DOE		13.0	*	*	*		
	9903-5	NSF via UCLA	488.3	4.0				91.3	397.0
		TOTAL:			**0.0**	**267.7**	**144.5**	**91.3**	**397.0**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

ROTHSCHILD, KEN									
	4386-5	NIH	690.7	3.0					
	8802-5	NIH/PHS/NIGMS	1013.0	4.0		292.3	261.0	189.2	270.2
		TOTAL:			**0.0**	**292.3**	**261.0**	**189.2**	**270.2**
SANDVIK, ANDERS									
	9015-5	NSF	246.0	3.0		164.0	82.0	82.0	0.0
		TOTAL:			**0.0**	**164.0**	**82.0**	**82.0**	**0.0**
SCHMALTZ, MARTIN									
	4985-5	DOE	330.0	6.0	55.0	55.0	55.0	55.0	0.0
	8195-5	Sloan	40.0	2.0	40.0				
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
		TOTAL:			**95.0**	**55.0**	**55.0**	**55.0**	**0.0**
SHANK, JIM									
	4895-5	U. Florida/NSF	1190.0	5.0	275.0	224.0	228.0	-5.0	
	9114-5	Columbia/NSF	850.0	2.0		450.0	400.0		
	9872-5	Wisconsin/NSF	85.0	1.0				85.0	
	9886-5		1200.0	2.0				300.0	900.0
		TOTAL:			**275.0**	**674.0**	**628.0**	**380.0**	**900.0**
SIMMONS, ELIZABETH (TO MSU)									
see Rebbi	8526-5	DOE		17.0	*	*	*	*	*
		TOTAL:			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
SMITH, KEVIN									
	2072-5	ACS	90.0	2.0					90.0
	2145-5	NSF	86.9	1.0					86.9
	4374-5	NSF	300.0	3.0					
	4496-5	DOE	885.0	12.0	100.0	100.0	100.0	148.9	120.0
	4692-5	NSF	25.3	4.0					
	8180-5	Amer. Chem. Soc.	80.0	2.0	80.0				
	8215-5	NSF	360.0	3.0	101.7	162.2	96.1		

Smith continued on next page

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
Smith, continued									
	9477-5	Army	53.0	1.0				53.0	
	9818-5	DOE	30.0	1.0				30.0	
	9819-5	Jefferson Labs	34.2	2.0				24.0	10.2
		TOTAL:			**432.4**	**359.8**	**337.7**	**295.9**	**307.1**
STANLEY, GENE									
w/ Goldberger, Mark (Harvard, BI)		NIH/ NatResourceCent.	5100.0	5.0	1020.0	1020.0			
PI: Grossberg (20.1 M total)		NSF/ CELEST	5000.0	6.0		1000.0	697.0	798.0	871.0
		NSF/ Collab Chem	3000.0	6.0	600.0	600.0	600.0	620.0	625.0
		Anonymous Foundation	1801.0	9.0	200.0	200.0	30.0		
		BP/ King	349.0	3.0					
		BP/ water	381.5	6.0					
		BP/ polymer	331.5	5.0	81.5				
		BP/ econophysics	100.0						
w/ DeLisi (ENG) and Rebbi		IBM/ SUR	1000.0	1.0					
		INTEVEP	60.0						
		Merck Foundation	195.0	5.0	40.0	45.0	40.0	40.0	40.0
		Mitsubishi Corp.	146.0	3.0					
		NIH/ AG / R01	1917.3	5.0					
		NIH/ AG / R03	132.4	2.0	66.2	66.2			
		NIH/ AG / R21	448.0	3.0	148.0	150.0	150.0		
		NIH/ HG / R21	328.2	3.0					
		NIH/ HL / R01	323.0	3.0	100.0	123.0	125.0	125.0	125.0
w/ Suki (BME) (Stanley share)		NSF/ BE98	529.9	3.0					
w/ Suki (BME) (Stanley share)		NSF/ BE01	587.6	3.0					
w/ Suki (BME) (Stanley share)		NSF/ BE04	300.0	4.0	50.0	50.0	50.0	50.0	
		NSF/ Chem99	285.0	3.0					

Stanley continued on next page

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

Stanley, continued									
		NSF/ Creativity05	420.0	3.0	160.0	160.0	100.0		
		NSF/ CRLT	858.5	3.0					
		NSF/ DMR	30.0	1.0		30.0			
		NSF/ DMR	20.0	1.0					
		NSF/ DUE	450.0	3.0					
		NSF/ DUE [DTS Prize]	304.9	5.0	60.0	64.9			
		NSF/ DUE2	499.3	3.0	166.4	166.4			
w/ Campbell (ENG)		NSF/ GK12	1380.0	3.0	460.0	460.0			
w/ Campbell (ENG)		NSF/ GK12 (Suppl)	404.0		236.0	168.0			
see Rebbi		NSF/ IGERT	2677.1	5.0	*	*	*		
		NSF/ IMD	1399.7	5.0					
		NSF/ IMD2	1200.0	5.0					
		NSF/ INT	30.0						
		NSF/INT	12.0	3.0					
w/ Salinger (SMG)		NSF/ SES	50.0	1.0					
		NSF/ SES / Hill	198.1	3.0	66.0	66.1			
		NSF/ SRS / Newlon	299.1	3.0	100.0	100.0			
		NSF-TPE	1481.0	3.0	500.0	481.0			
		ONR	1037.9	5.0	240.0	240.0	240.0	205.0	200.0
		ONR/ DURIP	71.8	1.0		71.8			
		Petroleum Res Fund	60.0						
		Zenith Award	240.0				120.0	120.0	120.0
		NIH/AG/PPG	342.0				342.0	342.0	342.0
		NIH/172/RO1	202.0				202.0	202.0	310.0
		NSF/HSD	114.0				114.0	114.0	114.0
								150.0	
		TOTAL:			**4294.1**	**5262.4**	**2810.0**	**2766.0**	**2747.0**

STONE, JIM									
see Kearns	8695-5	U. of Calif.		16.0	*	*			
w/ Kearns, Sulak	9533-5	DOE	7276.4	13.0	530.0	500.0	490.0	445.0	596.0
	`	**TOTAL:**			**530.0**	**500.0**	**490.0**	**445.0**	**596.0**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

PRINCIPAL INVESTIGATOR(S)	SOURCE #	AGENCY	TOTAL	# OF YEARS	FY04	FY05	FY06	FY07	FY08
SULAK, LARRY									
	3708-5	FNAL/DOE	1102.0	8.0	813.0				
w/ Carey	8527-5	DOE/G-2	1518.0	13.0					
see Kearns	8695-5	U. of Calif.		16.0	*	*	*		
w/ Rohlf	9265-5	DOE	1242.5	13.0	164.0	165.0	156.0	213.0	201.0
see Stone	9533-5	DOE		13.0	*	*	*	*	*
		TOTAL:			**977.0**	**165.0**	**156.0**	**213.0**	**201.0**
TSUI, OPHELIA									
	9941-5	NSF	200.0	3.0				100.0	100.0
		TOTAL:			**0.0**	**0.0**	**0.0**	**100.0**	**100.0**
WHITAKER, SCOTT									
	8453-5	BNL	15.0	2.0	15.0				
	8522-5	DOE/CB	4072.0	13.0	569.5				
	8826-5	DOE/BNL	228.8	4.0		168.8		60.0	
	9163-5	NSF/Columbia U.	169.0	2.0			51.1	117.9	
	9687-5	NSF/Columbia U.	624.5	2.0	0.0	0.0			
		TOTAL:			**584.5**	**168.8**	**51.1**	**177.9**	**0.0**

** see name in italic for award amount.*
Award amounts given in thousands of dollars.

4. Colloquia and Seminars

4.1 Biological Physics Seminars

DATE	SPEAKER	TITLE
April 18, 2008	Mark C. Williams (Northeastern University)	*Force-induced single molecule DNA interactions: From small molecule binding to HIV replication*
April 16, 2008	Marcia Barbosa (Institute of Physics, Rio Grande University, Brazil)	*Which type of potentials exhibit the anomalous behaviour of water?*
April 11, 2008	Debra Auguste (Harvard University)	*Embryoid Body Shell Formation Reduces Diffusive Transport: new strategies for stem cell differentiation*
April 4, 2008	M. Carter Cornwall (Boston University School of Medicine)	*Early Steps of the Visual Cycle: Production and Clearance of Retinol in Vertebrate Rod and Cone Photorecetors*
March 21, 2008	Adam E. Cohen (Harvard University)	*Controlling Complex Molecules with Light*
March 5, 2008	Sebastian Doniach (Stanford University)	*The forces which stabilize small functional RNAs*
January 18, 2008	Plamen Ivanov (Boston University)	*Statistical Physics in Physiology and Medicine*
December 7, 2007	Dušanka Janežič (National Institute of Chemistry, Ljubljana, Slovenia)	*Molecular Modeling - A New Approach*
December 4, 2007	Uli Rant (Walter Schottky Institut, Technische Universität München)	*Shaking biomolecules with oscillating DNA layers*
November 27, 2007	Nozomi Ando (Cornell University)	*The pressure stability of biomacromolecules*
November 16, 2007	Brigita Urbanc (Boston University)	*Ab Initio Discrete Molecular Dynamics Approach to Studies of Alzheimer's Amyloid β-Protein Folding and Assembly*
October 19, 2007	Wokyung Sung (Pohang University of Science and Technology, S. Korea)	*Biological Dynamics of Crossing over Barriers*
October 18, 2007	Yariv Kafri (Technion, Israel)	*Steady-State Chemotactic Response in E. coli*
September 13, 2007	Janusz Holyst (Warsaw University of Technology)	*Phase Transitions in Social Systems*

4.2 Colloquia

DATE	SPEAKER	TITLE
April 22, 2008	Ned Wingreen (Princeton University)	*E. coli's division decision: modeling Min-protein oscillations*
April 17, 2008*	Robert Aymar (Director General, CERN)	*The Future of Physics: challenges and opportunities at the Large Hadron Collider*
April 15, 2008	Carlos Sa de Melo (Georgia Tech and Joint Quantum Institute University of Maryland/ NIST)	*The Evolution from BCS to Bose-Einstein Condensation: Superfluidity in Metals, Neutron Stars, Nuclei, and Ultra-Cold Atoms*

April 8, 2008	Robert H. Austin (Princeton University)	*Of Bugs and Men: Game Playing, Evolution and Adaptation for Physicists*
April 1, 2008	Mikhail A. Anisimov (University of Maryland)	*Soft Matter: Finding Simplicity in Complexity*
March 18, 2008	Don Eigler (IBM Fellow, IBM Almaden Research Center, Harvard University)	*The Quest for Spin Cascade Logic Circuits*
February 14, 2008	Christopher Llewellyn-Smith (Oxford University, UK)	*The Path to Fusion Power*
January 29, 2008	Joan Adler (Technion - Israel Institute of Technology)	*Atomistic simulation and visualization: modeling in the world of condensed matter*
January 22, 2008	S. Julio Friedmann (Lawrence Livermore National Laboratory)	*Thinking Big: Carbon Capture and Sequestration as a Greenhouse Gas Mitigation Strategy*
December 4, 2007	Pier Oddone (Director, Fermilab)	*The Future of Particle Physics*
November 13, 2007	Eric Adelberger (University of Washington)	*Recent Gravitational Experiments and their Implications for Particle Physics*
October 30, 2007	Gerson Goldhaber (LBNL)	*The discovery of Dark Energy*
October 23, 2007	Robert Grober (Yale University)	*When Obsessions Gollide: Golf and Physics*
October 16, 2007	David Huse (Princeton University)	*Paired-Fermion superfluids with ultracold atoms*
September 25, 2007	Phuan Ong (Princeton University)	*The pseudogap and the phase diagram of the cuprate superconductors*
September 18, 2007	Gyan Bhanot (Rutgers University)	*What PCA and clustering reveal about human migration, longevity and breast cancer*

* Dean Edmonds Colloquium

4.3 Condensed Matter Seminars

DATE	SPEAKER	TITLE
April 25, 2008	Ray Ashoori (Massachusetts Institute of Technology)	*Precise Measurement of Electronic States Above and Below the FermiLevel*
April 18, 2008	Simon Trebst (Microsoft Station Q)	*Collective states of interacting anyons: Things golden*
April 11, 2008	Leonid Glazman (Yale University)	*1D Fermions and Bosons beyond the Luttinger Liquid Picture*
April 4, 2008	Royce Zia (Virginia Polytechnic Institute)	*Modeling Protein synthesis by Totally Asymmetric Simple Exclusion Processes (TASEP)*
April 2, 2008	Dr. Andrea C. Ferrari (University of Cambridge, UK)	*Raman Spectroscopy and Optical Phonons of Graphene and Nanotubes*
March 28, 2008	Adrian Parsegian (NIH)	*Measuring DNA interactions in vitro and in viruses*
March 21, 2008	Raefael Garcia (Worcester Polytechnic Institute)	*Wetting transitions and forces in adsorbed films: new phenomena and surprising results*
March 7, 2008	Andre Geim (University of Manchester)	*Graphene: Exploring Carbon Flatland*

March 7, 2008	Eric Chason (Brown University)	*Influence of non-equilibrium conditions on thin film stress and surface morphology evolution*
February 22, 2008	Mohit Randeria (The Ohio State University)	*Superconductivity in Doped Mott Insulators*
February 15, 2008	Bruce Normand (ETH Zurich, Switzerland)	*Quantum Magnets under Pressure*
February 12, 2008	Mikito Koshino (Columbia University, Tokyo Inst. Of Technology)	*Electronic properties of graphene multilayers*
February 8, 2008	Piers Coleman (Rutgers University)	*Heavy Fermion Superconductors: the little spin that could*
February 1, 2008	Karyn Le Hur (Yale University)	*Charge Fractionalization and Transport in low dimensions*
December 7, 2007	Mike Aziz (Harvard University)	*Nanoscale morphology control using ion beams*
November 16, 2007	Antonio Castro Neto (Boston University)	*Drawing conclusions from graphene*
November 9, 2007	Natali Gulbahce (Northeastern University/ Harvard Medical School)	*Tailoring the metabolism against mutations*
November 2, 2007	Laurent Saminadayar (CNRS, Grenoble)	*Quantum Coherence in Networks*
October 26, 2007	Peter Silvestrov (ruhr-Universitat Bochum, Germany)	*Electrostatics of Graphene Strips*
October 23, 2007	Felix von Oppen (Fachbereich Physik, Freie Universität Berlin)	*Two-electron resonance in the Coulomg blockade*
October 19, 2007	Giulio Biroli (CEA-Saclay)	*Glass transition: a new kind of critical phenomenon?*
October 12, 2007	Ophelia Tsui (Boston University)	*Equilibrium Pathway of Spin-Coated Polymer Films*
September 28, 2007	Sri Sastry (Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore)	*Length Scales in Glass Forming Liquids*
September 21, 2007	Constanze Metzger (Boston University)	*Opto-Mechanics of deformable Fabry-Perot Cavities*
September 14, 2007	Ganpathy Murthy (University of Kentucky)	*Disorder, Interactions, and Crossovers in Quantum Dots*

4.4 Particles and Fields Seminars

DATE	SPEAKER	TITLE
May 22, 2008	Jay Wacker (SLAC)	*Searches for gluinos at TeVatron*
April 18, 2008	Erich Poppitz (University of Toronto)	*Lattice chirality and the decoupling of mirror fermions*
April 14, 2008	Maxim Perelstein (Cornell University)	*Colliders to the Cosmos: Dark Matter and Electroweak Phase Transition*
March 31, 2008	Tim Tait (Argonne National Laboratory)	*Fun with Top Compositeness at the Tevatron and LHC*
March 27, 2008	Matt Strassler (Rutgers University)	*The Hidden Valley Scenario: A Panoply of Novel Signals for LHC Searches*
March 17, 2008	David Shih (Institute for Advanced Study)	*General Gauge Mediation*
March 3, 2008	Josh Erlich (College of William and Mary)	*Un-hidden local symmetry and electroweak symmetry breaking*

February 28, 2008	Alberto Nicolis (Columbia University)	*On super-Planckian Fields at sub-Planckian Energies*
February 21, 2008	Mark Wise (Caltech)	*The Lee Wick Standard Model*
February 19, 2008	Michael Salem (Tufts University)	*Quark and Lepton Masses and Misings from Gaussian Landscapes*
January 28, 2008	Sergei Dubovsky (Harvard University)	*Phase Transition to Eternal Inflation*
December 10, 2007	Paddy Fox (Fermilab)	*LHC and Dark Matter Signals of Improved Naturalness*
December 6, 2007	Csaba Csaki (Cornell University)	*GIM or shinning in warped space*
December 3, 2007	Antonio Delgado (Notre Dame du Lac)	*Dynamical mu term in gauge mediation*
November 29, 2007	Seung J. Lee (Stony Brook)	*Radion Phenomenology in Realistic Warped Spacetime Models*
November 26, 2007	Tomer Volansky (IAS)	*MFV@LHC: Constraining Flavor at the TeV Scale*
November 15, 2007	Devin Walker (Berkeley)	*Mass Scales and Unparticle Physics at the LHC*
November 14, 2007	Adam Falkowski (CERN)	*Pseudo-Goldstone Higgs*
November 8, 2007	Yuval Grossman (Cornell University)	*D-Dbar mixing*
November 5, 2007	Ian Low (Argonne/Northwestern)	*KK Parity in Warped Extra Dimension*
October 29, 2007	Lawrence Hall (Berkeley)	*The LHC: More Symmetries or More Universes?*
October 22, 2007	Nathan Seiberg (IAS)	*Two topics beyond the MSSM*
October 15, 2007	Aaron Pierce (University of Michigan)	*Natural Dark Matter in Unnatural Theories*
September 24, 2007	Matt Reece (Cornell University)	*Constraints on the S parameter*
September 17, 2007	Juan Maldacena (IAS)	*Gluons scattering at strong coupling from AdS*
September 5, 2007	Gudrun Hiller (Universitat Dortmund)	*Minimal Flavor Violation and LHC*

4.5 Other Seminars

DATE	SPEAKER	TITLE
May 28, 2008	Brigita Urbanc (Boston University)+	*A curiosity-driven ride through uncertainties of my physics career pathway*
May 22, 2008	Victor Galitski (University of Maryland)	*Quantum Fluctuations in two-dimensional superconductors*
May 15, 2008	Kris Helmerson (NIST)	*Persistent currents and vortices: The physics of "two-dimensional" Bose-Einstein condensates*
May 13, 2008	Claudia De Grandi*	*Adiabatic Nonlinear Probes of One-dimensional Bose Gases*
May 8, 2008	Sandro Stringari (University of Trento)	*Effects of polarization, rotation and tunneling in the unitary Fermi gas*
May 1, 2008	Cenke Xu (Harvard University)	*Novel quantum magnetism in Sp(4) and SU(4) spin systems*
April 30, 2008	Victor Gurarie (University of Colorado)	*A many particle generalization of the Landau-Zener problem*
April 25, 2008	Gerard 't Hooft (University of Utrecht)	*Can there be a discrete theory of gravity?*
April 24, 2008	Giulia Pancheri (INFN, Italy)+	*EU gender policy and other stories*

April 23, 2008	Anna Swan (Boston University)+	*My life in science: a biased random walk approach*
April 17, 2008	Vitor M. Pereira (Boston University)	*The Coulomb problem in graphene and its connections with QED in strong fields*
April 3, 2008	Jerome Dorignac (Boston University)	*Vibration spectrum of a multi-element nanomechanical structure*
March 20, 2008	Zenyu Yan*	*Anomalies of Water and Simple Liquids*
March 20, 2008	Claudio Castelnovo (University of Oxford, UK)	*Magnetic monopolies in spin ice*
March 4, 2008	Ayana Holloway Arce (Lawrence Berkeley National Laboratory)	*Starting from the top: plans & prospects for early ATLAS results*
February 28, 2008	Ophelia Tsui (Boston University)+	*A career transition: Hong Kong to the US*
February 14, 2008	Anton Anastassov (Northwestern University)	*Searching for Supersymmetric Higgs Bosons at CDF: Why, how and what does the future hold?*
February 11, 2008	Florencia Canelli (Fermilab)	*Towards an Understanding of Electroweak Symmetry Breaking*
February 4, 2008	Hai-Jun Yang (University of Michigan)	*Search for New Physics at Present and Near Future*
January 31, 2008	Kevin Black (Harvard University)	*Unearthing New Physics in Early LHC Data*
January 31, 2008	Wilhelm Zwerger (Technical University of Munich)	*BCS and beyond: new insights into fermionic superfluids from ultracold gases*
January 24, 2008	Tulika Bose (Brown University)	*Hunting for the Exotic: A journey from the Tevatron to the LHC*
January 24, 2008	Ka-Ming Tam*	*Renormalization Group Studies of Strongly Correlated Systems*
December 21, 2007	E. Rachele Dominguez*	*Structure in the Long-range Antiferromagnetic Ising Model*
December 13, 2007	Fengzhong Wang*	*Statistical Physics Approaches to Financial Fluctuations*
December 12, 2007	Yu Chen*	*Silicon Nanowire Field Effect Transistor for Biosensing*
December 11, 2007	Matthias Imboden*	*Diamond Nano-Electromechanical Resonators: Dissipation, Elasticity and Superconductivity in Polycrystalline Diamond*
December 11, 2007	Josef Stefan Wenzler*	*Measurement of Aharonov-Bohm Oscillations in Mesoscopic Metallic Rings in the Presence of High-Frequency Electromagnetic Fields*
December 10, 2007	Jason J. Amsden*	*A Study of the Proteorhodopsin Primary Photoreaction by Low-Temperature FTIR Difference and Ultrafast Transient Infrared Spectroscopy*
December 5, 2007	Timothy Learmonth*	*Soft X-Ray Spectroscopic Studies of Quasi-Low Dimensional and Strongly Correlated Materials*
December 4, 2007	Zhenhua Wu*	*Physics of Flow in Weighted Complex Networks*
November 28, 2007	Zhonghua Ma*	*Simulation of Quantum Decoherence in Condensed Phases*
November 1, 2007	Kevin Stokely*	*Probing the Phase Diagram of Supercooled Water using a Lattice Model*
October 17, 2007	David Huse (Princeton University)	*Many-body localization*
October 5, 2007	Silvia Viola*	*Electronic Compressibility of the Graphene Bilayer*
October 3, 2007	Nicholas Gross (Center for Space Physics, Boston University)	*The Research Educator*
October 3, 2007	Yufeng Zhang*	*Soft-X-Ray Spectroscopic of the Electronic Structure of Organic Semiconductors*

October 2, 2007	Eric Pinnick*	*Computational Studies of Nitrous Oxide Interactions with Biomolecular Systems*
September 19, 2007	Zhenhua Wu*	*Transport in Weighted Networks: Partition into Superhighways and Roads*
September 18, 2007	Sungho Han*	*Dynamical Properties of Confined Water Molecules*
September 14, 2007	Dongfeng Fu*	*Statistical Physics Approaches to Understanding the Firm Growth Problem*

* Graduate Seminar
+ Women in Physics Seminar

5. Student Profiles

Ian Cohen

Full-time physicist. Part-time troubadour.

The Physics and Astronomy sophomore works in the BU Center for Space Physics where he studies cosmic rays and their interaction with Earth's magnetic field and their correlations with coronal mass ejections (CMEs) from the Sun. The goal of Ian's work, under Professor Harlan Spence, is to identify similarities between cosmic rays and the solar particles that shoot at Earth.

Cosmic rays are strong sources of radiation believed to originate during supernovas and are constantly bombarding Earth. By comparing the effects of impact of energized particles from solar storms like CMEs on the magnetosphere to the impact by cosmic rays, Ian hopes to learn more about the nature of cosmic rays. He is also working with the CRaTER instrument, which will measure cosmic ray data on the Lunar Reconnaissance Orbiter. That instrument could tell us more about how cosmic rays might affect humans in space.

Perhaps what inspires Ian's love of space physics is his longtime fandom of "Star Wars." In fact, he spends a good deal of time doing things space-related: He is well-acquainted with his own telescope and he works at the Charles Hayden Planetarium at the Museum of Science.

He also has great adoration for the arts. He draws, sculpts, sings, dances, acts and is a very active member of the BU Stage Troupe. You may have spotted him in such shows as "The Graduate," "Rumors" and "The Real Inspector Hound." He has also appeared on a public-access TV show in New Jersey. And when it comes to film, he says nothing beats "Forrest Gump."

Though he's artistic, he's also athletic. Ian lettered in football in high school, and watches a lot of college football. And Ian has a sports secret he might be advised to keep to himself in these parts – he's a Yankees fan.

Rachele Dominguez

To graduate student Rachele Dominguez, a physics education goes both ways.

A recent recipient of the Chairman's Book Prize for Excellence in Teaching, she not only studies statistical physics at BU but she also tutors physics students at an area high school.

Rachele's research with Professor Bill Klein takes a look at the kinetics of phase transitions. She works closely with a "clump model" that tests the dynamics of a long-range interacting system. As illustration, imagine a white box with some small black dots randomly distributed inside. As the temperature in the box is lowered below a critical point, the black dots organize themselves into clumps to lower their energy. When more black dots are introduced, the clumps reorganize into "stripes." The results of such analysis have applications varying from nanolithography to the stability of large structures.

In another area of her graduate-student life, Rachele is founder and president of the BU Physics Educational Community , a group

of astronomy and physics graduate students interested in teaching. The organization meets to discuss teaching strategies and current issues in physics education research, and organizes programs that provide new teaching fellows with resources and connect them with teaching mentors. She is also an active member of BU Women in Physics , the physics branch of Women in Science and Engineering at BU. Yet the university is not her only educational arena; she spends two days a week at the Boston Latin Academy as an NSF GK-12 fellow. Her work with computer simulations in the classroom enhances the physics component of the high school's science curriculum.

If Rachele had not chosen to pursue physics, she might have become an ethnomusicologist. She says she doesn't know how to play any instrument well, but she has been known to strum a few chords on her banjo. She was also once a member of a gamelan, an Indonesian musical ensemble consisting primarily of percussion instruments. In addition to her intermittent performance enterprises, Rachele loves to listen to a wide variety of music, including Middle Eastern and early jazz.

In what little spare time she has, Rachele also likes to hit the yoga mat and to travel. She has spent time in Seattle, Morocco, Spain, Scotland and always tries to go for a hike when she is near the mountains. When at home, you won't find her in front of the TV – she doesn't have one. But you might find her knitting a scarf. She says it's a great way to unwind.

Dalit Engelhardt

Undergraduates usually aren't involved in research on the most fundamental properties of matter at the highest energy scales, but alum Dalit Engelhardt was.

Dalit studied how exotic, long-lived particles can be detected at the Large Hadron Collider (LHC) at CERN. Physicists have a working model of elementary particles, called the Standard Model, that has been tested and re-tested over the past three decades – each time with new, more precise measurements or at higher energy scales. The problem is that the Standard Model doesn't explain many basic things, such as the origin of mass, the unification of all forces, or the way the forces we now observe at low energy were created out of unified forces at high energy. For these reasons, particle physicists have developed a variety of new models beyond the Standard Model.

Under the guidance of Professors Steve Ahlen and Kenneth Lane, Dalit examined ways to detect some of the stranger new particles that these models predict, like particles that are not only very massive and long-lived but are also doubly-charged. Some models of technicolor and supersymmetry predict these exotic particles. They can also be part of a composite, dark matter particle: Instead of having one elementary particle as the mysterious dark matter that is abundant in the universe, it is possible to have a composite neutral state of two oppositely-charged particles. In a collider, we might observe the separate elementary components.

Dalit's research examined the possible signatures of these particles at the LHC. Because they are long-lived, they can reach the outmost layers of the detectors just like muons. But unlike muons, they are much heavier and move more slowly. They also lose a lot of energy in the detector. As a result, they are much trickier to trigger on and to reconstruct correctly; because they have small production rates in the first place, they can easily be missed altogether. Understanding these signatures is therefore a key step toward identifying, rejecting or placing bounds on theories beyond the Standard Model and, consequently, gaining insight into physics at very high energy scales.

Occasionally, Dalit finds herself pursuing interests not involving unusual speeding particles. For as long as she can remember, she

has enjoyed writing historical fiction and has taken an interest in folklore and mythology. She used to spend many hours perusing anthologies of legends from all over the world, and they still serve as her inspiration for writing and traveling.

Dalit is also an avid traveler, having hiked in over 25 national parks in the U.S. and Canada and journeyed abroad to many locations, including Ireland, France, Israel, Mexico, England, Austria and Spain. And this year, she's headed for the UK again to pursue graduate studies. She enjoys outdoor activities and nature, especially hiking, biking, kayaking and skiing. That means no season is an indoor season for her – even in New England.

Billy Hubbard

Alum Billy Hubbard studies nanomaterials at BU, and one day, he just might pop up on your iPod Nano.

Over the past year, Billy has developed methods for producing and attaching electrical contacts to graphene, a single atom-thick hexagonal lattice of carbon atoms. He begins with a block of graphite, and ends with simple graphene-based electronic devices. Along with the rest of his research group in the Optical Characterization and Nanophotonics Laboratory, of Prof. Bennett Goldberg, he uses these devices to test various properties of graphene, including optical and transport properties.

Graphene is a hot topic in physics, with more abstracts at the March Meeting of APS this year than any other single subject, an astonishing 7% out of 5,000. The great interest is due to novel physics as well as potential applications in nanoscale electronics and optoelectronics. Billy anticipates discovering some fascinating things about graphene from their experiments, such as how the material's properties change at low temperatures and in the presence of a large magnetic field. The methods developed are also applicable to other nanomaterials, such as carbon nanotubes, which is something he plans to study soon.

Outside the lab, Billy is very passionate about music and tries not to let his books and pencils keep him from it for too long. He sings and plays guitar, and also writes a great deal of music, often scratching down one-liners in the back of his notebook.

Billy grew up outside of Boston and is still playing with the band he started in high school: Forest Henderson. Playing shows is probably the most fun one can have outside of Disney World, Billy says. And now that Forest Henderson is building some clout as a band, it has a foot in the door at nearly every local club in the city.

An officially licensed MBTA musical performer, Billy is known to hop on the subway with a guitar, pick a train station and start playing whenever he has a chance. It's great practice, he meets the most interesting people, and he makes a few bucks as well. He says he's kind of a "big deal" on the Blue Line.

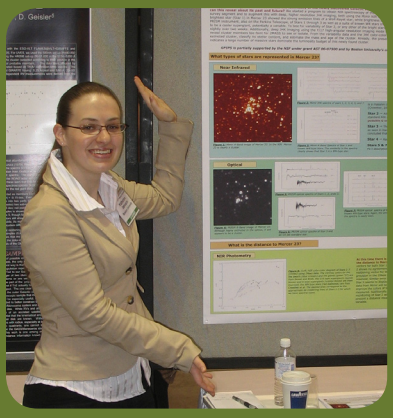
Katie Jameson

Junior Katie Jameson approaches physics with an eye to the cosmos.

Katie reduces and actively analyzes stellar spectra of a newly discovered galactic cluster, which has allowed her to identify the three brightest stars within the cluster as "massive stars." That implies that the cluster is a "massive cluster," and adds to the short list of known massive galactic clusters. Her research is in collaboration with Professor Dan Clemens of the Institute for Astrophysical Research at BU as part of the Galactic Plane Infrared Polarization Survey (GPIPS) team.

She notes that understanding our galaxy helps us understand the universe as a whole, though she adds that "due to the difficulty in observing our own galaxy, there is much left to be discovered." Katie's work will ultimately lead to a more detailed picture of the most local part of the universe and contribute to our understanding of how the universe we observe has evolved.

When she is not in the office busy with data and programming, she does occasionally do things unrelated to physics. She has captained an intramural co-ed soccer team, and she has been "coerced" into playing intramural softball with The Cosmic Voids from the Astronomy Department. (She has one RBI and one home run hit in the home run derby.)



Although not particularly musically inclined, she does pick up a guitar from time to time – she has two – and rock out. She also loves art and artistic expression a great deal, particularly painting and slam poetry, but she says that fractals are also "pretty nifty." Most importantly, she tries to devote as much time as possible to de-stressing, mainly by meditating and doing yoga.

The thing that keeps her waking up every morning and drives her involvement in science is the "immaculate beauty that exists in this world." She is happiest just looking up at the sky and trying to imagine the immensity of the universe. What gets to her the most is that, despite that immensity, such fantastic patterns seem to underlie everything, which brings an unanticipated elegance to our existence.

Michele Kotiuga

Michele Kotiuga travels the world, takes to the rink and still finds time for the lab.

In the fall of her sophomore year, alum Michele began work in the Optical Characterization and Nanophotonics Laboratory under the direction of Professor Anna Swan, a joint faculty member in Physics and ECE, and a BU Physics alum. As a senior, Michele focused her studies on vibrational properties of carbon nanotubes.

Carbon nanotubes have a variety of practical applications, including field-effect transistors for nanoscale electronics, optical emission devices for plasma displays and electron microscopes and ultra-sensitive detectors for molecules. The tiny devices are hollow cylinders of a single sheet of graphite with diameters on the order of a nanometer and lengths that can extend to a centimeter. Nanotubes have the aspect ratio of a human hair extending across a room. Because nanotubes are extremely strong and can assume the properties of either a metal or a semiconductor, they can be used as metallic wires or semiconductors in the Lilliputian world of nanotechnology.

The results of Michele's research will be analyzed to fine-tune the technology used to create and classify single-walled carbon nanotubes (SWNTs). The growth of SWNTs creates nanotubes of a variety of different helicities (wrapping), leading to both metallic and semiconducting properties. Michele worked toward an efficient classification method, overcoming some of the growth limitations associated with SWNTs. And as a graduate student at the University of California, Berkeley, she plans to continue her studies in condensed matter physics.

When Michele pulls off the lab coat, she often pulls on her ice skates. As a member of the Boston University Figure Skating Club, she continues to pursue an interest she has held since age 9. She sees skating as a great way to relax, have fun, and do things she says she could never accomplish on dry ground.
She also adores traveling; she has traversed the terrain of several European countries, as well as American states from coast to

coast. She especially enjoys devoting some of her summer to the Cape and to Maine. New adventures and old friends are two of her favorite things.

Chad Madsen

You might say life for Chad Madsen is about muons, matter and motets.

The junior spent last summer in Switzerland working on the MuLan experiment, where he performed a measurement of the muon beam profile. The experiment aims to take precision measurements of the positive-muon lifetime on the order of 1 part per million.

Such precise measurements seek to test the Fermi constant, used to calculate the strength of the Weak Nuclear Force. That force is responsible for nuclear decay and radioactivity. The measurements Chad is working on, under the guidance of Professor Rob Carey, could help verify or disprove the Standard Model of particle physics.

Because Chad's interest in science doesn't stop at physics, he is also president of the BU Astronomical Society, an organization open to anyone excited by astronomy. He's specifically intrigued by cosmology and high energy astrophysics. During his freshman year, he worked with astronomy Professor Elizabeth Blanton on X-ray observations of the Perseus Cluster. They analyzed how the cluster's supermassive black hole affects the cluster.

He now works with Professor Tereasa G. Brainerd on the dark matter problem, using his physics and math skills to analyze dark matter's effect on the large-scale structure of the universe. Chad says his interests in experimental particle physics and dark matter are not coincidental; he hopes to one day help find the particle responsible for dark matter.

Chad also harbors an affection for the arts. He plays the cello, the piano and writes his own classical music. He ventures out to museums and the symphony. He fiddles with acting and comedy routines. And he adores listening to Beethoven, Brahms, and Shostakovich. Chad also knows the importance of physical activity; he enjoys playing frisbee and hitting the boxing ring. And though he hails from Idaho, he reports that never in his life has he seen a potato farm.

Claire Thomas

Not too many BU sophomores climb bona fide mountains or analyze super-small substances. Claire Thomas does both.

Claire works in experimental solid-state physics, where she examines graphene, a two-dimensional layer of carbon that is only a single atom thick. Thanks to its specific properties, graphene has great potential for applications in nanotechnology. Its unique carbon lattice structure allows charge carriers to move through it at relativistic speeds, approximately 1/300th the speed of light.

Because of this, graphene is looked at as a potentially smaller and speedier alternative to the silicon chips currently used in computers, since those have size and speed constraints that graphene does not. In her research with Professor Bennett Goldberg, Claire subjects small portions of graphene to a changing electric field, and in turn gathers transport and optical data to understand the physics of the substance.

Claire also serves as president of BU's undergraduate physics organization, Photon. The club is working to create a huge Zeppelin, which is similar to a blimp, and plans to do outreach with a local middle school this semester. In addition, Claire lends her time to the college classroom, as a peer mentor for the physics department's freshman physics seminar.

When she isn't writing up lab reports, Claire is composing poetry. Each week, in fact, you can find her reading her material at an open mic in Cambridge. You can also find her at area rock-climbing gyms or scaling the crags of New Hampshire. She rock-climbs twice a week and ventures out on excursions with the BU Outing Club. She says it helps clear the mind.

Lela Todorova

A polyglot who analyzes polymers.

Lela, a Physics alum, examined as an undergraduate the behavior of polymers in nanoscale settings, which differs when in bulk. A polymer is a long chain of recurring molecular units called monomers, and Lela's research zeroed in on polystyrene, a standard polymer for academic research.

To study this polymer, Lela placed the polymer on pure silicon and then uses atomic force microscopy to obtain an accurate topography of its surface. Her research, under the guidance of Professor Ophelia Tsui, examined whether molten polymers may become solid-like when confined in nanometer films. The answer to that question would significantly affect the way we use polymers in nanoscale applications. For example, polymers that are good lubricants in the macroscopic world may lose their niche if they became a solid in the nanoworld. On the other hand, the solid-like property could greatly improve the stability of a polymer film, from a rupturing time of one day to years.

Lela was born and raised in Macedonia. She moved to New York at the age of 14, which was perhaps when the seed of her long-held interest in traveling was planted. She says she's proud of her Macedonian heritage, but she's also fond of the European lifestyle in general. Lela finds the social climate relaxing and the people open-minded.

When in the States, Lela trades the historic monuments and lazy cafes for the rink and the pool. She spends a good deal of time cheering on the BU hockey team, but she's also an athlete herself. She used to be a competitive swimmer and still jumps into the pool for fun at FitRec.

Another area Lela dives into is literature. She reads vociferously, with National Geographic and books by Oscar Wilde and Paulo Coelho among her favorites. She also enjoys seeing stories take to the screen, often relishing in foreign and independent cinema.

Boston University Physics Department
2007-2008 Annual Report

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