Fall 2009, Vol. 4 Issue 1

APAM NEWS

THE DEPARTMENT OF APPLIED PHYSICS & APPLIED MATHEMATICS

THE FU FOUNDATION SCHOOL OF ENGINEERING & APPLIED SCIENCE, COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

Dear Alumni and Other Friends of APAM:

This term has seen many major developments that bode well for the present and future.

The Department is very proud to announce that SEAS has a new dean, Feniosky Peña-Mora, and the University a new provost, Claude M. Steele. We look forward to working closely with both of them in helping our Department and School excel even more.

This issue details the awards and honors bestowed upon our faculty and research scientists, including Michael Weinstein, David Keyes, Philip Kim, Adam Sobel, Simon Billinge, Latha Venkataraman, and Darren Garnier. We profile visits from old friends, including emeritus faculty and alumni. We also highlight the inspiring interdepartmental research performed by Cev Noyan, in which he used his expertise in neutron scattering to explore cables in suspension bridges, along with the challenges our applied mathematics undergraduates faced in the modeling contest they entered.

Our major department renovation is now complete!

Once again, APAM is very pleased to extend a hearty hello to our alumni and other friends of the department. Please stay in touch!

Best,

Irving P. Herman
Chair, APAM

Photo: *(left to right)* Prof. David Keyes, Prof. Gerald Navratil, Prof. Irving Herman, Prof. Chris Marianetti, Prof. Michael Mauel, and Mr. & Mrs. Robert Hartman at the 2009 APAM Department Alumni Luncheon. See page 3 for more information.

In This Issue

APAM COMAP Team Members: Adrian Haimovich, Boris Grinshpun, & Pradeep Bandaru

2009 COMAP: For Undergraduates Who Want to Model

Boris Grinshpun, B.S. 2010, Applied Mathematics

The Consortium for Mathematics and its Applications (COMAP), is an award-winning non-profit organization whose mission is to improve mathematics education for students of all ages. Since 1980, COMAP has worked with teachers, students, and business people to create learning environments where mathematics is used to investigate and model real issues in our world.

Six Columbia students participated this past spring in the Mathematical Contest in Modeling (MCM) which challenges teams of students to clarify, analyze, and propose solutions to open-ended problems. The contest attracts diverse students and faculty advisors from over 500 institutions around the world.

Columbia participants included: Adrian Haimovich (APAM), Stephen Cox (DEES), Dan Amrhein (Physics), Boris Grinshpun (APAM), Pradeep Bandaru (APAM), & Jiang Yio (Biological sciences)

People develop mathematical models as tools to solve various problems. Predictive models are used to determine the effects of climate change, the path of a subatomic particle, the future of the economy, the winner of American Idol, and the next music track you'll want to listen to. Optimization models are used to route information over the World Wide Web, determine optimal departure times for an airline, time traffic lights, and even create Sudoku puzzles and crosswords for the morning paper. In summary, mathematical models are important in numerous aspects of our everyday lives, many of which we take for granted.

This past February, I learned firsthand the process of developing a mathematical model when I took part in the Mathematical Contest in Modeling (MCM), an annual four-day team competition for undergraduate students. The MCM is run by the Consortium for Mathematics and its Applications (COMAP). It is highly publicized by many professional organizations, including the Society for Industrial and Applied Mathematics (SIAM), and teams from all over the globe participate. This year two teams from Columbia were organized and funded by the Columbia University chapter of SIAM.

The MCM consists of two real-world problems, a continuous problem and a discrete one. A team of three students has four days to develop a solution to one of these problems in the form of a mathematical model and to summarize the results in a paper. The paper includes a restatement of problem, the rationale behind the proposed model, the development and testing of the model, error analysis, and a discussion of the strengths and weaknesses of the model. This year, the continuous problem asked for a model to optimally control traffic in, around, and out of a traffic circle. The discrete problem asked for a model to predict the energy consequences of the cell phone revolution over the next fifty years.

For undergraduates who are interested in participating in the MCM, here is a brief day-by-day description of my team's experience.

Day 1: We read both questions carefully and brainstormed points that needed to be addressed and preliminary ideas for effective models. We attempted to restate both problems in such a way that the main task ahead of us was clear. We used Google extensively and searched for information on traffic circles and cell phone use. We watched YouTube videos of cars driving along traffic circles. We laughed at unfortunate drivers trying to get through the traffic circles. We drew a rudimentary traffic circle and it felt good.

Day 2: We worked on mathematizing our traffic circle word problem. We added detail to our traffic circle – more lanes, more signs, serious consideration of flow rates and traffic light timing. We worked with NetLogo (a programmable modeling environment) to create an interactive traffic circle model. We had dinner and played with Shazam, the iPhone app. After dinner we linearized the traffic circle and created a second NetLogo simulation.

Day 3: We made elaborate flow-charts and schematics using Inkscape, a vector graphics editor. We had another heated debate on how to correctly time traffic lights. We produced plots in MATLAB to describe the timing. We made an outline for our paper and proceeded to write different parts in a Google document. Before we left for the night we practiced throwing our MetroCards.

Day 4: We did last minute research while working diligently on our paper. We basked in the warm glow of our windowless room with many hours remaining until the 8 p.m. deadline. We ran short on time and wrote frantically to make the deadline. All hope seemed lost, but we just barely finished on time. The adrenalin rush wore off and we found ourselves relieved and exhausted. We celebrated with pizza.

The MCM competition is a great experience for those interested in learning to develop mathematical models to use in real-world problems. However, this competition is not only a learning experience; it is also a bonding experience. After spending four days as part of team, struggling and rejoicing as we progressed through the competition, eating meals together, exchanging stories and learning about one another's mathematical and technical skills I felt much closer to my team members. I highly recommend this competition to people who enjoy problem solving, mathematics and team work.

If you are an undergraduate and interested in participating in the MCM competition, please contact Prof. Chris Wiggins (chris.wiggins@columbia.edu) or Braxton Osting (bro2103@columbia.edu).

www.comap.com/undergraduate/contests/mcm

APAM Alumni Reunion Luncheon

SEAS Alumni from all class years were invited to visit the Columbia University campus for the 2009 Alumni Reunion Weekend and Dean's Days Weekend from Wednesday, June 3, through Sunday, June 7, 2009.

The Alumni Office staff planned various campus activities including tours, discussions and panels, cultural outings, cocktail parties, and class dinners. From the Young Alumni Casino Night to the Golden Lions Dinner at the Russian Tea Room, to the Camp Columbia for Kids to interactive adult learning opportunities, the SEAS Alumni Reunion Weekend had something for the whole family. As part of the festivities, the SEAS Dean also sponsored alumni luncheons for each department.

Undergraduate alumni, **Michael Koltonyuk** (B.S. '95, Applied Physics and winner of the 1995 Applied Physics Faculty Award) and **Robert Hartman** (B.S. '59, Applied Physics), attended the APAM Department luncheon. Prof. Gerald Navratil, Prof. Irving Herman, Prof. David Keyes, Prof. Chris Marianetti, and Prof. Mike Mauel were on hand to give an update on the Department and a tour of the facilities.

Mr. Hartman and his wife also attended a special reception for the graduating class of 1959 and members of the administration at the Kellogg Center, SIPA, on Wednesday, June 3, 2009. Mr. Hartmath is currently the Vice President of Device Development at CyOptics Inc. in Pennsylvania.

Michael Koltonyuk B.S. '95 and Irving Herman

Irving Herman with Mr. & Mrs. Robert Hartman B.S. '59,

Alumni Updates

James Coromilas (B.S. '69, Applied Physics) is an Associate Professor of Clinical Medicine in the Cardiology Department at Columbia University's College of Physicians and Surgeons

Kenneth Kin (M.S., D.E.S. '75, Nuclear Engineering) has been elected to the Board of Directors of SMSC, subject to reelection at the 2009 Annual Meeting of stockholders. Dr. Kin recently retired from his role as Senior Vice President, Taiwan Semiconductor Manufacturing Company, Ltd. (TSMC), where he had responsibility for global sales, services and marketing. He was formerly Vice President, Worldside Sales and Services at IBM Microlectronics, Vice President and Director of Operations for the Computer Group at Motorla Inc. and served in various sales and marketing roles for several other Asia Pacific companies in the computing and telecommunications markets. Dr. Kin received a B.S. degree from National Tsing Hua University in Taiwan and worked with Prof. Herbert Goldstein to earned his M.S. and D.E.S. in Nuclear Engineering at Columbia.

Aaron Wininger (B.S., '94 Applied Physics) writes "2009 marks my third year in Shanghai. I have a beautiful 3-year old daughter who is now fluent in bolth children's English and Mandarin. She has recently started attending Dulwich, a British school out here, and is developing a British accent. I have recently joined the law firm Nixon Peabody LLP as partner, where I do intellectual property and corporate finance law including private investments in public equity (PIPEs) for Chinese companies listeing overseas. In my spare time, I love to go to KTV (karaoke) with my friends here."

Matthew Witten (Ph.D. '04, Applied Physics, concentration in Medical Physics) has been appointed as an Adjunct Assistant Professor in the APAM Department. He will be overseeing a graduate student this year.

Stop by the new Columbia Alumni Center at 622 W. 113th Street (between Broadway and Riverside Drive) to catch up on the latest University news, check e-mail, explore alumni benefits, peruse a yearbook, or just have a cup of coffee.

APAM Welcome Party Photos (Student News, continued)

Faculty, staff, and students gathered on September 15 in the APAM Department for the annual Welcome Party to celebrate the start of a new school year. More photos are available on page 8 and online at: www.apam.columbia.edu/directory/announcements

(left-right) **Christopher Lease, Dario Leone, Eric Haviland, Nadia Whittington, & Bonnie Chinsky**

(left-right) **Simon Billinge & Ildar Salakhutdinov**

(left-right) **Dory Kramer, Teresa Fazio, Paul Brenner, Michael Frei & Sean Polvino**

Pierre Gentine

New Faculty Member: Pierre Gentine

Dr. Pierre Gentine has been appointed as the new Chu Assistant Professor of Applied Mathematics at Columbia University, a non-tenure two-year position in the Applied Physics and Applied Mathematics Department. Prof. Gentine obtained his B.Sc. at SupAéro (French Aeronautical School), with a major in applied mathematics. After his graduation in 2002, he became a civil servant for a French-Moroccan collaboration project, whose objective was to study the impact of agriculture on water resources and to determine "good practices" that reduce the human footprint on the water resources in the region of Marrakech, Morocco. Prof. Gentine then decided to develop his education in the field of hydrology and water resources, and obtained a M.Sc. at the Massachusetts Institute of Technology in 2006. He obtained a Shoettler fellowship in 2004. After graduation, he worked as a consultant in the industry in Paris, France from 2006 to 2007. Prof. Gentine then decided to go back to the academia and was a Ph.D. student at the Massachusetts Institute of Technology from 2007 to 2009 under the supervision of Prof. Dara Entekhabi, Director of Parsons Laboratory, in the Department of Civil and Environmental Engineering. He graduated recently on September 22, 2009.

Prof. Gentine's research focuses on land and atmosphere interactions and the inherent feedback between the two systems. The overall motivation of his work is to improve the estimation of evaporation over land, which in turn improves water resources management, weather and climatic forecasts.

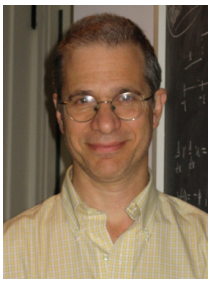
The first part of his research is related to the understanding of the role of solar radiation on the land-surface heat fluxes and scalars (temperature, humidity). Indeed, land-surface temperatures are now commonly used along with data assimilation (filtering) techniques to estimate evaporation over the entire globe. A better understanding of the daily cycle of the land-surface temperature leads to more accurate estimates of evaporation over land, in particular in developing countries, which have limited networks of meteorological sensors.

The second part of his research involves comprehending soil moisture and precipitation feedback. In most regions and weather conditions, an increase in soil moisture leads to an increase in precipitation, yet there are situations where more soil moisture leads to less rain. Prof. Gentine is investigating the underlying physical mechanisms controlling these behaviors over West Africa, the U.S. and Europe.

The third part of Prof. Gentine's work is dedicated to the use of remote sensing and data assimilation (filtering) to determine soil moisture globally. In particular, he is trying to develop new filtering techniques to better use the available remote sensing information for soil moisture inferring.

Finally, he is investigating the response of soil moisture to stochastic rainfall forcing, and the corresponding effect of time scales. He is collaborating with researchers in the U.S., Switzerland and France.

Prof. Gentine is currently teaching the undergraduate Applied Mathematics course APMA E3101 Linear Algebra.



Michael Weinstein

Weinistein Delivered Distinguished Lecture

Prof. Michael Weinstein delivered the annual Distinguished Lecture in Applied Mathematics in the Department of Mathematics and Statistics at the University of Massachusetts - Amherst on October 15, 2009.

In his lecture, "Mathematics of Nonlinear Dispersive Waves: From Fundamental Results to Applications", he discussed recent progress in the theory and application of nonlinear dispersive Hamiltonian wave equations.

Visit from Robert Gross, Professor Emeritus

Prof. Robert Gross, *emeritus*, was on campus on April 8, 2009 to have lunch with Mikhail Klassen, (B.S. '09, Applied Physics), the Robert Gross Named Scholar from 2005 to 2009.

While Mikhail and Prof. Gross kept in contact with each other over those four years, they were never able to meet face to face. The Fu Foundation's Stewardship Officer, Timothy Greene, set up a special luncheon on their behalf during which they had a wonderful time discussing Mikhail's plans for after graduation. Mikhail is currently studying astrophysics at McMaster University in Ontario, Canada.

Prof. Gross then stopped by the APAM Department to visit his former colleagues and the staff. Prof. Thomas Marshall, *emeritus*, and Prof. C.K. Chu, *emeritus*, also made a special appearance.

Prof. Gross was a member of the faculty of Engineering and Applied Science from 1960 to 1994 and was dean from 1982 to 1989. The Robert Gross Scholarship was established in 1999 by friends of Prof. Gross and recognizes exceptional students in applied physics.

Photo: *(left to right)* Prof. Thomas Marshall (*emeritus*), Prof. Robert Gross (*emeritus*), Prof. Michael Mauel, and Prof. C.K. Chu (*emeritus*)

The lastest faculty news can be found at:
www.apam.columbia.edu/directory/announcements

David Keyes

Keyes wins 2009 Kim Award for Faculty Involvement

Prof. David Keyes won the 2009 Kim Award for Faculty Involvement. This award recognizes a faculty member who has been exceptionally involved in the academic and co-curricular life of students in SEAS.

The award, which included a $2,000 honorarium and a commemorative plaque, was presented at the Class Day ceremony on May 18, 2009.

Prof. Keyes, who also received the 2008 "Great Teacher Award", is currently spending his leave as the inaugural Chair of the Division of Mathematical and Computer Sciences, one of four academic divisions at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. He oversees KAUST's research and educational activities in applied and computational mathematics and computer science, while forging collaborations with the other science and engineering divisions in large-scale computational simulation.

Philip Kim

Kim receives 2009 IBM Faculty Award

The Department is pleased to announce that Prof. Philip Kim has been awarded a 2009 IBM Faculty Award.

The IBM Faculty Award Program is a competitive worldwide program intended to foster collaboration between researchers at leading universities worldwide and those in IBM research, development and services organizations; and to promote courseware and curriculum innovation to stimulate growth in disciplines and geographies that are strategic to IBM.

Faculty Awards are cash awards granted annually. To qualify for this award, the nominee must be a full-time professor at an accredited university which has a Ph.D. or MBA program in the nominee's field. Candidates must have an outstanding reputation for contributions in their field or, in the case of junior faculty, show unusual promise.

Prof. Kim, who holds a joint appointment in the Physics Department and the APAM Department, joined Columbia University in 2001 after having worked for two years at the University of California at Berkeley as a Miller Research Fellow. He received a Ph.D. in Applied Physics from Harvard University in 1999.

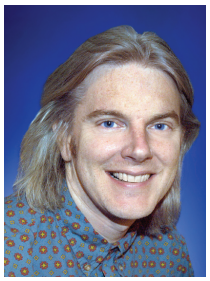
Prof. Kim's research focuses on experimental condensed matter physics, physical properties and applications of nanoscale low-dimensional materials, quantum thermal transport phenomena in one-dimensional nanoscaled materials, mesoscopic thermoelectricity and thermoelectric applications of nanoscale materials, quantum transport in novel two-dimensional materials, mesoscopic electron transport and thermodynamic processes for sensors and electronic devices.

Adam Sobel

Sobel Receives 2010 AMS Meisinger Award

Prof. Adam Sobel has been awarded the 2010 Meisinger Award by the American Meteorological Society Council, with the citation: "For outstanding contributions to the understanding of the tropical atmosphere, through observational studies and analyses of idealized dynamical models."

The Clarence Leroy Meisinger Award is given to an individual in recognition of research achievement that is, at least in part, aerological in character and concerns the observation, theory, and modeling of atmospheric motions on all scales. The award is given to young, promising atmospheric scientists who have recently shown outstanding ability and are under forty years of age when nominated.



Simon Billinge

Billinge & Farrow Paper Highlighted in IUCr Newsletter

The paper "Relationship between the atomic pair distribution function and small-angle scattering: implications for modeling of nanoparticles" by Christopher L. Farrow and Prof. Simon Billinge, which recently appeared in *Acta Crystallographica Section A: Foundations of Crystallography*,was selected as a highlight article for the summer newsletter of the International Union of Crystallography (IUCr). **http://journals.iucr.org**

The paper states "One of the great challenges in nanoscience is to solve the structure, or internal atomic arrangement, of nanoparticles. One promising approach is atomic pair distribution function (PDF) analysis which gives the internal arrangements of atoms from ensembles of identical particles. Another widely used approach is to study the small-angle x-ray or neutron scattering (SAS) from nanoparticles, which gives information about the size and shape of the nanoparticle but not the internal arrangement".

In this paper, Farrow and Billinge formally rederived the PDF equations and related them explicitly to the equations from small angle scattering. This will allow SAS and PDF data from the same samples to be explicitly compared.

Latha Venkataraman

Venkataraman Appointed Associate Director of Nanocenter

Prof. Latha Venkataraman has agreed to serve as the new Associate Director for Columbia's Nanocenter. In this role Venkataraman will work closely with the Directors in defining the Center's research program and direction. For more information, please see: **www.cise.columbia.edu/nsec**

Stress/Strain Transfer in Suspension Bridge Cables

I. C. Noyan (APAM) Adrian Brügger, Raimondo Betti (Civil Eng./Eng. Mechanics), Bjørn Clausen (LANSCE-LC, Los Alamos National Laboratory)

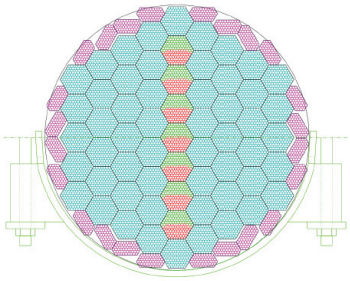


Figure 1: Cross-section of real bridge cable

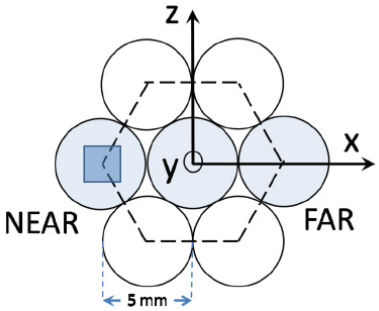
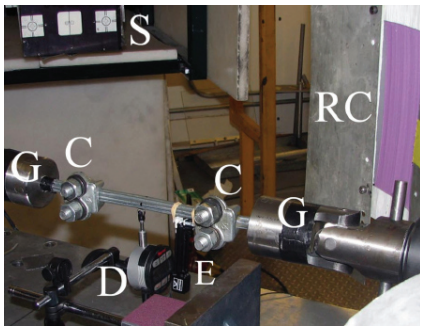


Figure 2: Cross-section of test cable strand



Main cables of suspension bridges are the most critical elements in these structures. Such cables are made of many thousands of parallel high-strength steel wires, whose diameter is about 5 mm. The core of the cable consists of closely-packed galvanized steel wire bundles (strands) (Fig. 1). Each bundle consists of many parallel steel wires whose number depends on the type of cable spinning process used. Inner strands usually have hexagonal cross-sections to optimize the compaction operation. The core is wrapped by a continuous, pre-tensioned wire layer, and it is radially clamped at regular intervals along its entire length to ensure geometrical integrity and tightness, and to enhance strain transfer to any broken wires. Some of the clamping action is also provided by the cable bands that serve as attachment points for the vertical suspenders that connect the bridge deck to the main cable. A mid-sized bridge cable, such as the one used in the Manhattan Bridge in New York, can be about 50 cm (20″) in diameter, with about 8,500 – 9,000 wires while larger cables, approximately 0.9 m – 1 m in diameter (e.g. the Golden Gate Bridge, Verrazano Narrows Bridge and the George Washington Bridge), contain about 26,000 – 28,000 wires. Suspension-bridge cables are loaded in tension: they transfer the entire weight of the bridge deck and any traffic that might be on it, more than several hundred thousand tons, to the suspension towers, and to anchor points at each end of the bridge.

Analysis of load partitioning within such cables is a non-trivial problem and poses theoretical and experimental challenges. The cable can be considered as a massive fiber composite structure that is loaded in the far field. At a location remote from the ends the local stress state within any wire depends on the far-field stress and the local boundary conditions. These local stress/strain states within the cable at the wire level are very hard to calculate since the boundary conditions such as the friction coefficient at the points of contact, local wire flattening, and local contact areas cannot be easily measured or estimated. In addition, because of deterioration or local manufacturing defects, there may be broken wires within the cable, which modify the local stress state in such wires.

We used neutron diffraction at Los Alamos National Laboratory to measure the elastic strains induced in the constituent wires of parallel wire test sample (Figures 2 & 3) under tensile loading; these were the first measurements of their kind. We observed that the elastic strains carried by the individual wires depended very strongly on the boundary conditions at the grips and on radial clamping forces. The friction forces between the wires were quite significant and could not be neglected (which had been the usual procedure).

These results will be published in the *Journal of Experimental Mechanics* (accepted, in press).

Figure 3: Test Sample mounted in the load tester of the SMARTS Diffractometer at the Los Alamos National Laboratory. The neutron beam from the incident slit (S) impinges on the sample directly above the tip of the dial indicator (D), at the black mark. The extensometer (E) is secured with rubber bands against a bottom wire. The cable clips, C, at each end, exert clamping forces on the entire wire cross-section, including the center wire. The center wire ends approximately 10 mm before entering the conical grips (G). The aperture of one of the radial collimators (RC) is also seen. There are beam-shields on both sides of the RC aperture to minimize stray radiation and background.

SEAS Colloquium in Climate Science (SCiCS)

Under the leadership of Prof. Lorenzo Polvani, a group of SEAS faculty members have initiated a new seminar series this term under the title of the "SEAS Colloquium in Climate Science" (SCiCS). While hosted in APAM, this new series is a school-wide seminar also involving the Departments of Earth and Environmental Engineering, Chemical Engineering, and Earth and Environmental Sciences, as well as the Lamont Doherty Earth Observatory and the NASA Goddard Institute of Space Studies.

This new school-wide series will host, on a weekly basis, nationally prominent speakers in all fields of climate science. Unlike many other climate related activities at Columbia which are concerned with economic, social and political impacts of climate change, this series will focus on the fundamental science underlying climate change.

For the inaugural term of the new series, in Fall 2009, speakers include Rob Korty from Texas A&M University, Isla Simpson from the University of Toronto, Eric Maloney from Colorado State University, Clara Deser from the National Center for Atmospheric Research, Nir Krakauer from CUNY, Sandra Yuter from North Carolina State University, Daniel Klocke from the Max Planck Institute for Meteorology (Hamburg), Daniel Knopf from SUNY Stony Brook, Paul Dirmeyer from the Center for Ocean-Land-Atmosphere Studies at the Institute of Global Environment and Society, and Dan Jacob from Harvard University.

Financial and logistic support for the new colloquium series comes from the SEAS Dean's office, and the faculty group composed of Prof. Upmanu Lall and Prof. Gavin Gong from the Earth and Environmental Engineering Department, Prof. Vivian Faye McNeill from the Chemical Engineering Department, as well as Profs. Adam Sobel and Lorenzo Polvani from the APAM Department.

Garnier Receives the 2009 Excellence in Fusion Engineering Award

Dr. Darren Garnier, APAM Research Scientist, was named the recipient of the 2009 Excellence in Fusion Engineering Award.

In selecting Dr. Garnier, the Fusion Power Associates (FPA) Board noted the contributions and leadership he has provided for the design, fabrication and operation of the Levitated Dipole Experiment (a joint Columbia-M.I.T. project located at M.I.T.) and his contributions to the diagnostics and control systems for that experiment.

This award was established in 1987 in memory of M.I.T. Prof. David J. Rose to recognize persons in the relatively early part of their careers who have shown both technical accomplishment and potential to become exceptionally influential leaders in the fusion field.

The FBA Board of Directors will present the award at the Fusion Power Associates Thirty-year Anniversary Meeting and Symposium, December 2-3, in Washington, DC.

Amin & Rivera Join the Columbia Twenty-Five Year Club

(left to right)
Dina Amin & Nick Rivera

The 55th Annual Dinner honoring the newest members of the Columbia University Twenty-Five Year Club took place in Roone Arledge Auditorium, in Alfred Lerner Hall, on Friday, May 22, 2009.

APAM's Departmental Administrator, Dina Amin, and Plasma Physics Laboratory Staff Associate, Nicholas Rivera, were inducted into the club this year. They join fellow APAM staff members Marlene Arbo, Assistant to the Chair and former APAM Departmental Administrator, and Jimmy Florakis, former Applied Physics and Medical Physics Laboratory Supervisor, in this distinction.

APAM Renovations

APAM recently renovated offices and lab space in Mudd and Engineering Terrace.

The project, overseen by Prof. Irving Herman (Chair), Dina Amin (Departmental Administrator), and Columbia Facilities, involved the removal and reconstruction of several walls to create new faculty offices. Other offices in Engineering Terrace, housing faculty, postdocs, research scientists, and visitors, were repainted and stocked with new furniture and graduate student offices were upgraded. Storage space and closets were reconfigured to house the Department's photocopier, office supplies, and files. New doors were installed in Engineering Terrace to join these rooms and offices to the main APAM office space in Mudd and the entire APAM office was recarpeted.

The renovation also included the rededication of the Herbert Goldstein Library. Herbert Goldstein, professor emeritus of nuclear science and engineering, passed away on Jan. 12, 2005. Goldstein had been a professor at SEAS since 1961 and he received the Great Teacher Award, given by the Society of Columbia Graduates, in 1976. In 1984, Goldstein was the first to hold the Thomas Alva Edison Professorship at the University. He presented the first Con Edison Lecture in 1985 titled "Nuclear Waste Disposal in Prehistoric Times." The Goldstein Library houses alumni dissertations and the room is regularly used as a meeting space for oral examinations, thesis defenses, small classes, office hours, and faculty and student conferences.

Current plans are underway to construct a Medical Physics lab in the area immediately outside of the entrance of APAM office.

DEPARTMENT OF APPLIED PHYSICS & APPLIED MATHEMATICS FUND

Yes, I want to support the APAM Department with my gift of:

☐ $1,000 ☐ $500 ☐ $250 ☐ $100 ☐ Other: _____

I have enclosed my check in the above amount made payable to Columbia University. Please direct my gift to:

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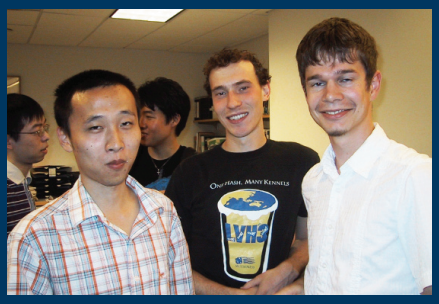
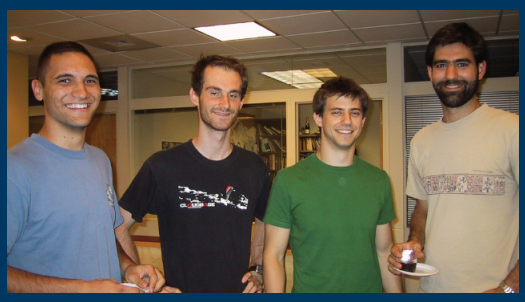
This gift is tax deductible as allowed by law. Please return this form and your check to:

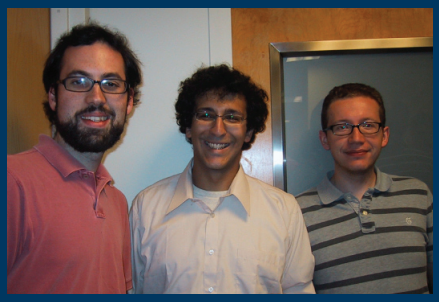
Prof. Irving P. Herman, Chair
Department of Applied Physics & Applied Mathematics at Columbia University
500 W. 120th Street, 200 Mudd, Mail Code 4701, New York, NY 10027

2009 APAM WELCOME PARTY





The Applied Physics & Applied Mathematics Department
The Fu Foundation School of Engineering & Applied Science
Columbia University in the City of New York
500 W. 120th Street, Room 200 Mudd, MC 4701
New York, NY 10027
Phone: 212-854-4457
Fax: 212-854-8257
www.apam.columbia.edu

Editors: Irving Herman, Dina Amin, Christina Rohm

Contributing Authors: Simon Billinge, Pierre Gentine, Boris Grinshpun, Irving Herman, I.C. Noyan, Christina Rohm

Photos/Images: Barbara Alper, Marlene Arbo, James Florakis, & Christina Rohm

Design: Christina Rohm

We welcome submissions for our next newsletter. Please contact us at the mailing address listed above or at:

seasinfo.apam@columbia.edu