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PHYSICS NEWSLETTER

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College of Natural Sciences and Mathematics

INSIDE

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LEARNING COMMONS

PHYSICS AND UMASS AMHERST IN THE INFORMATION AGE

Advances in information technology have drastically transformed UMass Amherst over the past few years. Almost all aspects of campus life have changed: the way courses are taught, how research is done, how students learn, and even how they socialize.

Here are typical scenes that you might see if you were to stroll across the campus today. Many students wearing backpacks are walking to their classes. Their hands are free so that they can hold cell phones, and perhaps look at pictures transmitted from other cell phones doubling as digital cameras. Other students with iPod[1] headphones may be listening to rock music or their latest lecture in economics.

In a classroom, an instructor quizzes his students using a wireless communication system. The students answer the instructor on their tablet PCs. In milliseconds the answers are summarized in graphical form and displayed on a screen. Discussion follows. In another classroom an instructor gives a PowerPoint[2] presentation using both sound and dramatic visual effects. Students waiting between classes use their cell phones to surf the Internet or send text messages.

In Hasbrouck, freshmen in a physics lab acquire data with computers. In the Lederle Graduate Research Tower, a graduate student reads the latest *Physical Review* on her computer while data arrives from a computer-controlled experiment in Europe. In a video/teleconference, physicists show a new detector to their collaborators in California.

Elsewhere, a student composes a paper on her laptop, making use of the on-line encyclopedia *Wikipedia*[3] and the multilingual *Wiktionary* for English translation of Latvian words. To solve

*See **Learning Commons**/ page 2*

Continued/ ***Learning Commons***

complicated integrals, she uses the software package *Mathematica*.[4]

The Learning Commons is busy even at 8:00 a.m.

Most surprising of all would be a visit to the **W.E.B. Du Bois Library**, one of the tallest libraries in the world. In former days it was a quiet place, open about half of the hours a week, and infrequently visited by students. Now buzzing with activity, it is open 24 hours a day, five days a week, soon to be extended to 24/7. The peak hours of Library use are in the afternoon, but even at 4:30 a.m., there are typically 350 students in the building. Indeed, for undergraduates, the Library is the heart of the campus, just as it was envisaged by former **President John W. Lederle** in the 1960s.

The big attraction is the new 23,000 square foot "**Learning Commons**" that integrates academic, resource, and social environments. The Learning Commons has small glassed-in rooms where students may study together, and, if they wish, use their cell phones and laptops. In large open areas there are 220 new computers for students to access electronically any of 12,000 journals or 15,700 other publications. Help with computer problems may be found at the **Technical Support Desk**, and guidance for other problems at the **Academic Advising and Career Counselling Centers**. Tutoring and supplemental instruction may be obtained in the **Learning Resource Center**. If the student's hunger extends beyond academics, the **Procrastination Station** serves food and refreshments.

Although our campus has been "wired" with optical fibers for sometime now, we are developing wireless networks, and currently have over 140 wireless access points in 36 buildings. No wires. No fuss. It is understandable that UMass Amherst was recently named the **first Microsoft Information Technology Showcase School**. Funding from this program will help keep the campus at the cutting edge of new technology.

The Internet is a powerful tool for disseminating the findings of science. It counters exclusivity in that anyone with access to a computer can obtain information formerly available to an elite few. It also undercuts compartmentalization of knowledge; whereas universities have schools, departments, and sub-groups, the natural world and the Internet know no such boundaries.

But are there downsides to all of this? If everybody stays glued to their computers and other devices, are we losing connectivity to one another and becoming more isolated? Are we becoming a faceless society? Has written culture taken a hit? (See the back page of this Newsletter.) Are physicists becoming too devoted to the computer and losing the hands-on approach to physics? If days are spent staring at a computer screen, instead of tinkering with equipment in the real world, observations and insight that lead to discovery may be missed.

It is child's play to use search engines, such as Google, to find arcane information, but does one merely get superficial snippets of the primary sources without all of their depth and nuances? Is the information from sources such as Wikipedia accurate? Will the analysis that goes into writing suffer when whole passages can be lifted and pasted into a paper?

Universities exist to preserve, transmit, and create knowledge. The Internet may make it easy to preserve information, and it is excellent at transmitting information, but is it aiding creativity? Questions need to be asked. The answers are not obvious.

1. A brand of portable digital media player marketed by Apple Computer.
2. Microsoft Corporation Presentation Software developed for Windows and Mac OS operating systems.
3. The free web-based encyclopedia that anyone may edit. (Wiki is a Hawaiian word meaning fast.)
4. A product of Wolfram Research Corporation.

Comments

Comments about the newsletter, or information about yourself for our alumni news section, may be e-mailed to us at newsletter@physics.umass.edu, or sent to:

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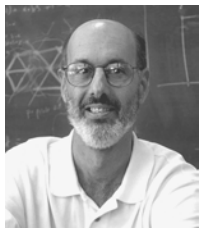
Our newsletter is sent to more than 1,250 of our alumni and alumnae who received degrees in physics from the 1930s to the present, and to present and former staff and faculty. For more information about our department, visit our website at **http://www.physics.umass.edu**.

Dear Friends and Alumni,



For a computational physicist, the theme of this year's newsletter, "Physics in the Information Age," is close to my heart. The computer and the Internet have revolutionized how we do, teach, and think about physics in the most fundamental ways. Our department has been a leader in bringing the Information Age to both pedagogy and research. We were among the first to offer an introductory course in computational physics and innovators in classroom information technology such as the On-line Web-based Learning (OWL) homework system and in class-feedback systems like Classtalk and Personal Response Systems (PRS). In research, our high energy group is renowned for its prowess in analyzing and extracting results from vast data sets emerging from particle experiments, and our condensed matter theory group is famous for revolutionary innovations in the computational methods for simulating quantum systems.

On campus, big changes are afoot. The College of Natural Sciences and Mathematics welcomes a new Dean, **George Langford**. **Chancellor Lombardi** has plans to increase the number of students—from my window on the 11th floor of the Graduate Research Center, I can see the foundations for new 1,000 undergraduate dormitory complex. Additionally, the legislature has approved the "Amherst 250 Plan," calling for 250 new faculty additions over the next three to five years. The breakdown by department has not been announced, but I have no doubt that Physics will get its share. We are currently searching to fill two 250 Plan positions.

Physics faculty and students have been honored with several major awards this year. **Prof. Krishna Kumar** has been made a Fellow of the American Physical Society in the Nuclear Physics Division. **Prof. John Donoghue** delivered a Distinguished Faculty Lecture and received the Chancellor's Medal. **Emeritus Prof. Robert Gluckstern** was granted an honorary degree at the 2005 Commencement to celebrate his lifetime contributions at UMass Amherst and the University of Maryland. Two of our undergraduate physics majors, **John DeBardeleben** and **Matthew Marzilli**, received the nationally competitive Goldwater scholarship, and senior **David Lawrence** is this year's student commencement speaker.

A **Center for Hierarchical Manufacturing** has received a $16 million NSF grant. The grant announcement was attended by Senator Kennedy and Governor Romney, who announced that he will request the additional $5 million from the state legislature. Professor **Mark Tuominen** will be the co-director of the new Center.

The department welcomes three new faculty: nuclear and particle experimentalist **David Kawall**, cosmologist and particle theorist **Lorenzo Sorbo**, and condensed matter experimentalist **Marc Achermann**. Marc has set up his lab in a newly renovated basement space in Hasbrouck, and 10 offices and Hasbrouck labs have also been renovated. In other transitions, **Prof. Francis Pichanick** retired after many years of distinguished service and **Profs. Jose Mestre** and **Alex Levine** left for other institutions. We wish Francis, Jose, and Alex well in their new endeavors.

If you are in the area, please stop by to say hello.

My warmest regards,

Jon Machta

Jon Machta, Department Head
machta@physics.umass.edu

New Faculty

DR. DAVID KAWALL

by Kevin Sheridan '06

Dr. David Kawall joined our experimental nuclear physics group as an assistant professor in the fall of 2005. He has broad experience in both nuclear and atomic and high-energy physics.

Born in Glasgow, Scotland, Dr. Kawall moved to Canada at an early age, where he attended the Lester B. Pearson United World College of the Pacific, a school of 200 students from 50 different countries, dedicated to fostering international understanding. He described his experiences there as "eye opening" and responsible for his broad international perspective. One of his teachers was Andrew Spray, a Rhodes scholar with the ability to "make physics come alive."

Dr. David Kawall

After getting his B.S. from the University of Toronto, Dr. Kawall earned his Ph.D. at Stanford University, where he found himself inspired by outstanding Nobel Prize physicists and access to the famous two-mile long Stanford Linear Accelerator. Dr. Kawall continued his research in particle and nuclear physics at Yale University, first working with Vernon Hughes, and then on an experiment with David DeMille to measure the electric dipole moment of the electron using a molecular lead-oxide system. Several theories beyond the Standard Model of particle physics predict new particles with time reversal violating phases that would give rise to greatly enhanced electric dipole moments. A year before moving to UMass Amherst, he began work as a RIKEN fellow at the Brookhaven National Laboratory on Long Island (for more about RIKEN, see the article on Steve Yamamoto, page 10).

Here at UMass Amherst, most of Dr. Kawall's work is with the PHENIX collaboration investigating high-energy polarized proton-proton collisions at the Relativistic Heavy Ion Collider at Brookhaven. This collaboration has more than 500 members from 62 institutions in 13 countries. Dr. Kawall is focused on finding the contribution that gluons make to the spin of the proton. "It's amazing that today we still really do not understand how a proton works," he explains. The motivation for his work rests in a decades-old mystery: since quarks contribute only twenty-five percent of a proton's spin, where does the rest come from? The other seventy-five percent could be generated from the gluons—or perhaps from the orbital angular momentum of the proton's constituents. Dr. Kawall looks forward to finding conclusive results in the near future.

For Dr. Kawall, "one of the biggest challenge at UMass Amherst will be teaching." His first teaching opportunity came this fall when he taught the laboratory component of Physics 289: Fluids, Waves, and Thermodynamics. This spring, he is teaching Physics 100, Conceptual Physics, and hopes to show non-physics majors the beauty and power of the science—and to remove the proverbial fear of physics.

Dr. Kawall, his wife Hilary, who teaches Russian literature at Yale, and his daughters Tessa (12 months) and Rachel (5 years) are settling in and have truly found a new home here at UMass Amherst. We wish him and his family the very best in all of their endeavors.

DR. LORENZO SORBO

by Lai Kuong '07, Jordan Samari '06, Roger Selsov '07

Dr. Sorbo's office is modestly furnished with a desk and a chalkboard and doubles as a research laboratory for this theoretical high energy physicist, who started here in 2005. Instead of using giant particle accelerators, Sorbo's work on cosmology is done with pencils, erasers, paper, and dedication. The study of cosmology, inextricably related to high energy theory, deals with the study of the universe as a whole, asking such questions as "what is the universe made of, and what was the universe like very shortly after its birth?"

Dr. Lorenzo Sorbo

Dr. Sorbo hadn't always intended to be a cosmologist. For his undergraduate work at L'Universitá di Bologna in Italy, he considered engineering or programming for their financial and employment stability. However, after taking a few physics courses, he found a mean between the "poetic ideas

of astronomy and the pragmatic ideas of engineering." As his studies of physics progressed, he was drawn more toward theory, and everything developed naturally from there.

Dr. Sorbo notes that European universities are notably different from American ones in part because there aren't campuses or college towns. "In Bologna, with its 375,000 people, the college students do not change the atmosphere that much," he says. "When I went to college, there was no culture shock, and no new sense of freedom as when American students are uprooted from the watchful eyes of parents."

Dr. Sorbo studied particle physics at the International School of Advanced Studies in Trieste. "In cosmology, you quickly start asking philosophical questions. This is part of the draw of cosmology, the mystery and awe of the universe are as captivating as it is expansive," he says. Observations made in the last 15 years tell us that only 5% of the material in the universe is baryons, the ordinary stuff we are made of. The rest is dark matter (25%) and dark energy (70%) – and we do not know what those energies are.

"Cosmology can not only look into the future but can rewind the clock as well. For example, in the early universe when protons and neutrons came together, nuclei were formed," Dr. Sorbo says. "We can calculate how many nuclei of various atoms should be out there. Then we can ask an astronomer how many atoms of this and that type there are. A truly phenomenal agreement is found, a testament to the capabilities of cosmology."

In the very early universe, energies were much higher than those achievable by particle accelerators, making the early universe a great testing ground for high energy physics. Conversely, one needs high energy physics to propel cosmology forward.

Dr. Sorbo rides the crest of this new research: "Today we have a good theory of particle physics, but we can't fit gravity into the picture. Here's where string theory comes in. In string theory particles act like points at low energies, but like "strings" (in many dimensions) at very high energies. Furthermore, string theory suggests the existence of particles so heavy that they are not seen in limited energy accelerator experiments. These should decay into high energy photons, and in fact such photons have actually been observed. Could they be due to strings? Cosmology has an enormous potential for advancing the concepts of physics."

DR. MARC ACHERMANN

Before joining us, Dr. Marc Achermann worked at the Los Alamos National Laboratory in New Mexico, where he investigated charge carrier relaxation and energy transfer dynamics in semiconductor nanocrystals (NCs), nanometer-scale particles synthesized in solution using wet chemistry techniques and usually made of direct bandgap semiconductors (such as cadmium selenide and zinc sulphide). NCs are very efficient light emitters whose emission wavelength and color can be controlled by tailoring their size. For example, the emission wavelength of cadmium selenide NCs can be tuned from 640 nm (red) to 510 nm (green) by changing the diameter from 7 nm to 2.5 nm, respectively.

Marc Achermann

Using ultrafast optical spectroscopy techniques, Dr. Achermann studied the fundamental interactions of NC multiple electron-hole pairs (excitons). Due to small volume, NCs represent strongly confined systems in which excitons play a much bigger role than in bulk systems. The results are ultrafast non-radiative multiexciton decay (so-called Auger recombination) and large multiexciton binding energies. These effects are significant, in part because they determine the possibility of using NCs as a gain material in lasers. In its traditional implementation, solid-state lighting involves a color-conversion step in which a high-energy photon emitted by a light-emitting diode (LED) is absorbed by a phosphor that then re-emits a lower-energy photon. Dr. Achermann investigated a novel approach to incorporate NCs into a light-emitting device based on energy transfer. Significant energy savings can be obtained if the light source activates the phosphor directly via nonradiative energy transfer. By eliminating several intermediate steps of the traditional color-conversion scheme, this mechanism can provide significant reduction of losses during the color-conversion process, and it can also produce improved efficiency compared to stand-alone LEDs.

At UMass Amherst Dr. Achermann will study interactions between different types of nanomaterials (dyes, semiconductor nanocrystals, metal nanostructures, etc.) using time-resolved optical spectroscopy techniques. Besides new phenomena

arising from the combination of different materials, the fundamental understanding of such interactions will allow the tailoring of specific optical properties of the hybrid nanomaterials toward increased absorption or directional emission, which can be used in light-harvesting (photovoltaics) or light-emitting (LED) devices or to enhance sensor sensitivities.

Growing up in the German-speaking part of Switzerland, only 20 miles from the nearest border, Dr. Achermann experienced other countries and cultures at a very early age. As a teenager, Dr. Achermann traveled throughout Europe as a contestant in worldwide vaulting competitions (gymnastics on horseback). Following international recognition in this sport, he switched his focus to physics at ETH Zurich, and his programs included study-related stints in Lausanne and Paris. Academic work was always balanced by outdoor activities, including bicycling and hiking trips in East Africa and Nepal. After finishing his Ph.D. in Zurich, Dr. Achermann moved to Los Alamos, New Mexico, where he fell in love with the beautiful scenery of the Southwest. He looks forward to exploring the Northeastern part of the United States by bike and foot.

Marc Achermann (center) flying high.

New Grants

MASSNANOTECH WINS BIG GRANTS

Already a national leader in nanotechnology, UMass Amherst will receive a $16 million grant from the National Science Foundation to establish a **Center for Hierarchical Manufacturing** (CHM). The five-year grant, along with $7 million in University and State funding, will be used to carry out CHM's mission to move nanotechnology from laboratory innovation to manufacturing, making an important contribution to the state's economic future. CHM's research focus is on tools and processes for engineering, fabricating, assembling, and integrating nanoscale material into larger-scale structures, devices, and systems. Researchers from eight departments at UMass Amherst and partner institutions will concentrate on nanoelectronics, biological nanotechnology, and new materials and processes. Director **James Watkins** of Polymer Science and Engineering and Co-Director, **Mark Tuominen** of the Department of Physics report that over a dozen industrial, government, and nonprofit partners will participate in research; provide fabrication, development, design and testing facilities; and support licensing and technology transfer activities.

UMass Amherst's MassNanoTech Institute also has a five-year $3.1 million grant from the NSF that greatly enhances opportunities for graduate students interested in uniting pure science with practical application. An **Integrative Graduate Education and Research Traineeship** (IGERT) improves science and engineering graduate student experience through interdisciplinary training. Students will learn how nanoscale devices, sometimes composed of just a few atoms, can be transformed into commercial products. The IGERT fellows both develop prototypes of nanoscale devices and work with students from the Isenberg School of Management to plan production and commercialization of their designs. **Mark Tuominen** notes that in the rapidly developing field of nanotechnology, a strong scientific background alone is not enough to guarantee success in the competitive world of industry. The real-world environment provided by the IGERT program helps to produce well-rounded graduates who are more than just scientifically trained. Five IGERT fellows were selected this year; five will be selected next year; and seven more for each of the remaining three years of the grant.

Graduate Students

OLD AND NEW

Graduated 1985

Dan Clemens *Richard Heinrichs* *Don Hinshilwood* *Robert Huffman* *Wayne Kinzel* *Ronald Kollgaard*

Suzanne Madden *Jose Marrero* *Steven Moore* *Brett Parker* *Michael Plum*

Domingo Prato *George Schmiedeshoff* *David Taylor* *Denise Taylor* *Mark Trainoff*

Entered 2005

Back Row: Luis Mercado, Phil Martel, Matthias Poetzl, Fabian Ruehle, Christian Reuschle, Stephen Dickert
Middle Row: Darcy Lambert, Andrew Meade, Yanzhen Wang, Yanbo Wang, Zekun Shi, Yikuan Wang
Front Row: Yiming Chen

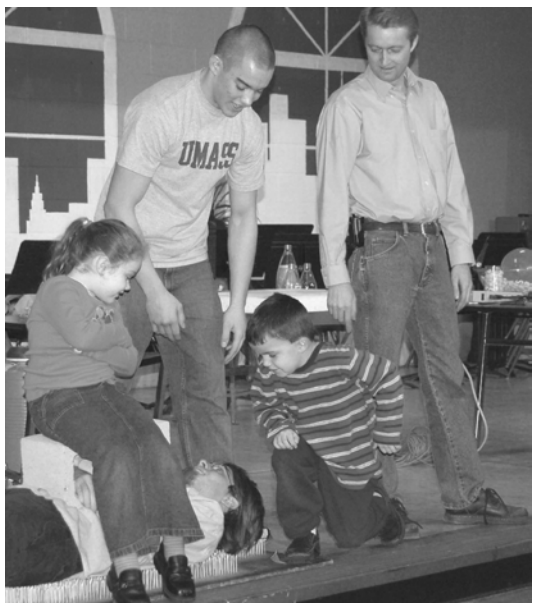
Outreach and Service

PHUN WITH PHYSICS

by David Chardo '07, Christine Harrington '07, and Huai-Ti Lin '07

You might not have heard of them, but that doesn't make them any less important to the future of science. These brave volunteers do something that most of us are terrified to do, and they have fun doing it. They give science demonstrations at elementary, middle, and high schools. They are members of the UMass Amherst Science Outreach Club.

The club was created about five years ago as an offshoot of the Society for Physics Students, whose goals centered on our physics students, whereas the Outreach Club aspired to introduce physics to the children of the surrounding communities.



Dan Brosnan lies comfortably on a bed of nails while Yitzi Calm and Heath Hatch (far right) watch. A child sits on a cinder block on Dan's stomach.

Among the founders of the club was **Jason Surprise '03**, who graduated with dual Bachelor's degrees in astronomy and physics. Currently, the club has four students who regularly visit neighboring schools: **Christine Harrington '07, Drew Von Maluski '08, Jennifer Hertzberg '07**, and **Coleman Krawczyk '08**. In addition, **Heath Hatch**, who runs our lecture demonstrations, takes an active interest. One of your editors (Bob Krotkov), who has two grandchildren in Granby (south of Amherst), recently went to a Parent Teacher Organization meeting to see his girls watch "Phun with Physics". It was a great success: the demonstrations of liquid nitrogen ice cream, jumping rings, bed of nails, astronomy, and magnets, held the attention of the 5- to 10-year olds and their parents.

One of the most dramatic demos (and there are quite a few of them!) is the breaking of a glass beaker with sound. A function generator produces a sound wave, which is amplified and pointed at the beaker. When the sound wave is tuned to the exact resonant frequency of the beaker, it causes the beaker to vibrate. When the intensity of the wave is dramatically increased, the beaker resonates so violently that it shatters. This impressive demo always gets calls for an encore, but the supply of beakers is limited. Another popular demonstration is the bed of nails, pictured here. After the picture was taken, Heath smashed the cinder block with a baseball bat! Anyone care to try?

According to feedback from children attending the events, the presentations are refreshing and entertaining. Many kids describe the demos as "impressive" and "cool." Although the kids may not remember the details of a demonstration, they remember its dramatic effects, and perhaps they'll realize that studying natural phenomena can be fun. Creating such an impression is the club's primary goal.

The children are not the only ones who benefit from the presentations. The members of the club get to learn physics by doing physics. According to a recent poll of members, the top three reasons they joined the club are that they love doing the demos, they like teaching, and they like to learn new physics.

The club's performances are not static. In order to improve them, the members often investigate the methodology of the existing demonstrations as well as invent new ones. For instance, an ad hoc "rocket team" was founded last year to improve the design of the water rocket and its launcher. Subsequently, a new double launcher was built with the help of the Hasbrouck machine shop. Scientific development really has two directions: one is exploring new things, and the other is demonstrating the validity of old concepts.

The UMass Amherst Science Outreach Club is still young, and the fact that it survived through its vulnerable infancy is promising. Its members continue to recruit new people who share their love of the sciences and want to inspire this love among kids. Local schools are starting to take notice and are booking shows. The future of science education, and of the Science Outreach Club seem bright and encouraging.

The club is always looking for new ideas, and Jason's words still hold true, "If you have an idea, and we have the equipment, then go for it!"

Energy Symposium

ENERGY IN CRISIS

Almost every day we hear about rising gas prices, the depletion of oil, polar ice cap melting, and global warming. Last April 9th, our Department held an Energy Symposium to examine these problems. It was open to the public, and in spite of beautiful weather on a spring Saturday, 152 people attended.

Joseph Gavin, former president of Grumman Aircraft Corp., who was in charge of the lunar landers that put men on the moon, led off with an overview of the energy crisis we face. He was followed by **Michael Mann**, now at the University of Pennsylvania and much in the news lately, who gave evidence of human causes of global warming. **Michael Klare** of Hampshire College, author of *Blood and Oil*, then spoke of our dependency on oil and its relation to war. Former Under Secretary of Energy **Ernest Moniz** of MIT discussed possible technological approaches that might ameliorate the situation, such as using oil shales. **Jon McGowan** of the Department of Mechanical Engineering, detailed one alternative source of energy, wind power. **Robert Pratt** of the Massachusetts Technology Collaborative pointed out the possible impact of conservation measures and alternative energy sources.

The symposium concluded with a panel discussion. A post-symposium survey decisively indicated that attendees are greatly concerned about and interested in the urgency of our energy problems, and desire political actions to solve them. In this information age, you may watch a video of the symposium at www.umass.edu/energy.

Undergraduate Research

FIVE-COLLEGE PHYSICS SYMPOSIUM

A Five-College Physics Symposium on undergraduate research, organized by **Professors Dinsmore and Wong**, was held on Saturday, October 1, 2005, in the Hasbrouck Laboratory. Below is a selection of papers presented by our undergraduates.

"Development of a Large Diameter Spiral Antenna Helicon Plasma Source for a Motional Stark Effect with Laser-Induced Fluorescence Diagnostics," **John DeBardeleben** (work done at the Princeton Plasma Physics Laboratory as a National Undergraduate Fellowship recipient, summer 2005).

"Encapsulation of Yeast Cells by Means of Self-Assembling Colloidal Particles," **Matt Gratale** and **Yutaka Maki** (Advisor: **Professor Tony Dinsmore**).

"Self Assembly of Dynamic Microcapsules at Liquid-Liquid Interfaces Using Temperature-Sensitive PNIPAm Particles," **David Lawrence** (Advisor: **Professor Tony Dinsmore**).

"Measuring the Force-Displacement Relation in Crumpling Cylindrical Sheets," **Robert Lychev** (Advisor: **Professor N. Menon**).

"Crumpling of Thin Polymer Films," **Megan Juzkiewicz** and **Matt Marzilli** (Advisor: **Professor N. Menon**).

"Diffusion-Limited Aggregation on Spherical Surfaces," **Eric Miller** (Advisor: Professor **Jon Machta**).

"Compton Scattering and Proton Polarizabilites," **John Barrett** (Advisor: **Professor Rory Miskimen**).

People

David Lawrence

The 2006 Undergraduate Commencement Speaker is senior physics undergraduate David Lawrence. For his undergraduate thesis, he carried out research with **Tony Dinsmore's** group making and characterizing small hollow particles that are selectively permeable to specific chemicals and change size in response to temperature (for possible application in drug delivery). David, a Burrillville, R. I. native, was a columnist for the Daily Collegian and worked at the Annual Fund. He plans to attend law school after graduation. We wish him the best!

Prof. Bill Gerace, Professor of Physics and Director of the Scientific Reasoning Research Institute, was awarded a Fulbright grant to teach and carry out research at the University of Fort Hare in Alice, South Africa from December 2005 to June 2006. Established in 1946 under legislation introduced by the late Senator J. William Fulbright, the grant program's purpose is to build mutual understanding between the people of the United States and other countries.

Robert L. Gluckstern received an honorary Doctor of Laws degree at the Graduate School Commencement ceremony on May 21, 2005. As Professor and Head of the Department of Physics and Astronomy, in the 1960s, he built up the department from 11 faculty and a modest research program to 45 faculty and an exceptionally strong physics research program. In 1969, he became Provost. In 1975 he became Chancellor at the University of Maryland, where he was influential in establishing scholarship programs that became state-wide models. He retired in 1997 to become Senior Scientist and Director of the Dynamical Systems and Accelerator Theory Lab at Maryland.

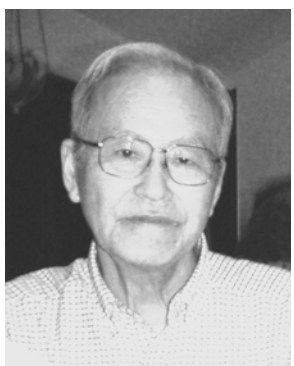
Professor Krishna S. Kumar (KK to us) was elected to Fellowship in the American Physical Society as a member of the Division of Nuclear Physics for "his leadership in parity-violating electron scattering experiments, especially those focused on low energy searches for physics beyond the standard model." This is a significant honor since no more than one-half of one percent of the APS membership is elected by their peers to Fellow status annually.

Letter from Steve Yamamoto, "Faculty Class of '65"

I was one of **Bob Gluckstern's** first recruits together with **Norm Ford, Stan Hertzbach, Dick Kofler, Claude Penchina, Mort Sternheim**, and the late **Roy Cook**, who came to UMass Amherst in 1965 to do great things. Stan, Dick, and I formed an experimental high-energy physics group from scratch; it became operational in a year. Those were exhilarating days which prepared me for my later career. **Janice Button-Shafer**, recruited at the same time, joined us a year later. [Editor's note: Seven faculty were added that year, a 50% increase of the 14 person department. In those days, the campus was expanding at a rate of one Amherst College per year in terms of faculty and students.]

I left UMass Amherst in 1970 to form a group at the University of Tokyo, a challenge hard to decline since I had never worked in Japan, and Tokyo was reputed to be the best university in Japan. Returning to Japan after 20 years in America, starting from my senior year at Andover, was more like going to a foreign country. Needless to say, the reentry culture shock was immense.

Unlike UMass Amherst, the University of Tokyo's Physics Department gave little support to get my group started. I had a research associate, an office, lab space, and an inadequate allotment of research money, but soon I was able to receive government and private funds to keep going. Since I stood out among fellow faculty members because of my educational and career background, I attracted very good students who were adventurous and curious. Since there was not yet a high-energy proton accelerator in Japan, I analyzed film from two of our UMass Amherst bubble chamber experiments at Brookhaven with machines that we designed and built in Japan. The quality and motivation of both the undergraduate and graduate students were of top level. The teaching load was fairly light, but teaching physics classes in Japanese was quite a chore. When a 12-GeV proton synchrotron and a 1-m bubble chamber were built at KEK, we did two experiments with them, and later we switched to counter experiments. I also served as the Director of the International Center for Particle Physics at the University, which was founded by Prof. M. Koshiba, who later won the Nobel Prize for his work in neutrino physics.



Steve Yamamoto

I retired from the University of Tokyo in 1992 at the compulsory retirement age of 60, and after one year at a second-tier private university, I went to Sophia University, a first-rate private university run by Jesuits. There I

concentrated mostly on undergraduate education, and particularly on laboratory courses, although I did some nuclear physics experiments at RIKEN (The Institute of Physical and Chemical Research) using its ring cyclotron. After serving for three years as Chair of the Physics Department, I resigned in 2000.

Since then I have been serving as part-time Director of the International House at RIKEN, an apartment complex for foreign scientists. My bilingual and bicultural background is very useful for this position. In April, I am expected to become a special adviser for international matters at RIKEN. (ssyammy@attglobal.net)

NEW DEAN

George Langford, the new Dean of the College of Natural Sciences and Mathematics, is a nationally known scientist, researcher and teacher. He was nominated by President Bill Clinton to the National Science Board and served a six-year term from 1998-2004, advising the president and Congress on national science policy.

"It is indeed an honor and a privilege to serve as dean of the College of Natural Sciences and Mathematics," Langford says. It is especially exciting to lead the college at a time of faculty growth. My goal is to work with the faculty to strengthen research and teaching, the core missions of the college."

Dean Langford

Previously, Langford served as the Ernest Everett Just Professor of Natural Sciences and professor of biological sciences at Dartmouth College in New Hampshire, and an adjunct professor of physiology at the Dartmouth Medical Center from 1991 until 2005.

He was a professor of physiology in the School of Medicine at the University of North Carolina at Chapel Hill from 1988-91 and associate professor from 1979-88; he was program director for the National Science Foundation's cell biology program from 1988-89; and assistant professor of anatomy at the Howard University College of Medicine from 1977-79. He was the Josiah Macy Scholar at the Marine Biological Laboratory at Woods Hole, Mass., in 1976 and was an assistant professor of biology at UMass Boston from 1973-76. Langford was an NIH postdoctoral fellow in the cell biology program at the University of Pennsylvania from 1971-73 and a graduate research fellow at the Argonne National Laboratory in Argonne, Ill., from 1969-71. He earned his bachelor's degree in biology from Fayetteville State University in Fayetteville, N.C., in 1966 and he earned a master's degree and a doctorate in cell biology from the Illinois Institute of Technology in 1969 and 1971, respectively.

STAFF

No modern physics department can be without someone like Mary Ann Ryan, our much appreciated and talented business manager. She manages department funds, space, and equipment. Mary Ann also assists Principal Investigators in managing government funds, an increasingly complicated effort as the department expands its operation in global-wide multinational multi-institutional collaborative research activities. She cites one example in which a British citizen was a postdoc on a UMass Amherst project at CERN in Switzerland who was supported by a UMass Amherst account at Brookhaven National Laboratory with money from the Department of Energy. It took one year and 12 people for him to be paid from the right account! Current research requires more collaborative effort than in the past, as a single stream of money often must be divided into multiple currents. Mary Ann gets satisfaction from working with people and having things come together.

The invaluable Mary Ann Ryan at her desk.

Mary Ann, who has an MBA from UMass Amherst ('92), came to the Physics Department in 1994 after **Bob Gray** retired. Since 1980, she has been active in various social service agencies, in particular the Robert F. Kennedy Children's Action Corps, a statewide agency serving the needs of abused and neglected children and will become chair of the board of directors next year.

Mary Ann says that one of the biggest administrative changes in the Department since she joined is the advent of "People Soft" administrative software, which includes large data bases that store campus administrative, personnel, and financial records that can be accessed by different people for different reasons. The development of this interface has taken many years and many people—and still continues. Mary Ann was the College's liaison for the People Soft Implementation Team.

Continued/ ***People-Staff***

We are sorry that Margaret MacDonald has left us for a new position in the Chemistry Department—but they've made an excellent choice! Margaret came to Physics in 1987, working primarily with the High Energy Theory Group in the LGRT. She had state-of-the-art equipment for those times: a mechanical typewriter and a Wang word processor. But the following year, she was the first to have a personal computer to prepare theory papers and class work, a McIntosh SE with a 5 x 7 inch screen. She became known as MacMargaret. One of her high points of working in the Tower was the weekly breakfast club, famous for **Dick Kofler's** donuts. In 2000, Margaret moved to Hasbrouck as grants bookkeeper, building coordinator, and general office manager.

Margaret MacDonald

When asked what changes she has noted in the Department over the years, she says that now all professors have their own computers and do their own typing, but things are busier than ever. She adds there has been remarkably little turnover in the Department staff. Margaret has two children and four grandchildren. She now takes time for her garden, her cat Mini, and her miniature horses who won multiple championships in 1995.

Alumni News

Ravi Bhatia (Ph.D. '73) writes us: "It was a pleasant surprise to receive your email a few days back. I had lost all contact with UMass Amherst and its professors. The only persons from UMass Amherst I communicate with occasionally are **Justus Koch, Floyd Peterson,** and **Martin Purvis**. The former two are in Europe and Martin is in New Zealand. Only Justus is still doing Physics. I suppose you must have obtained my email address from one of them. Yes, there is also **Satish Prasad** who got his Ph.D. with Prof. **Sternheim**. He is in Medical Physics in Dewitt, NY and is now an American citizen.

I have had to give up physics after a few years of my return to India in 1973 as I was unable to get a job in research level physics. However, I did teach physics for a few years to future schoolteachers and also wrote textbooks. Then I lost all touch with Physics and became a bureaucrat. From 1985 until my retirement in December 2004, I was a senior executive in the University of Delhi.

But fortunately I developed a taste for working in certain areas of the Social Sciences – Political Science, Law, and Education, and I have published a few articles in these subjects. I am also a peace researcher and work on Ghandhi-like nonviolence and related topics. In this connection I have had the opportunity of traveling to meet peace researchers and activists in different countries. Recently I was nominated for an Honorary Peace Ambassadorship by an organization based in Geneva. (ravipb00@yahoo.com)

Jonathan Dick (B.S. '04) writes: "I am living in Chicago and just left a job as a consultant to the pharmaceutical industry to become a Project Coordinator for Blue Cross and Blue Shield of Illinois. That's the boring part of me though. My true passions continue to lie in the theater. I'm currently performing in a show called *Dirty Water*, which is like an improvised sitcom. We perform nearly every Friday night and have been named 2005 "Best of the Fringe" by the *Chicago Tribune*! Also, I am writing a show for the studio theater at the Second City. I hope all is well, and say hi to anyone who'll listen for me. Cheers!" Jon (jondick@dickandhyman.com)

Whittak Huang (Ph.D.'74) writes: "Here is a brief summary of my professional life after leaving UMass Amherst. After completing my Ph.D. program with Professor **Guyer,** I took a postdoctoral position at Case Western Reserve University, where I taught university physics while conducting basic solid state physics research. From there in 1976 I went to the Computer Sciences Corporation and started my aerospace career.

My early aerospace work was focused on spacecraft attitude determination using a Kalman filter, and other more direct geometrical methods using gyroscopes, star trackers, and sun sensors. Later I focused on launch vehicle navigation, guidance and control systems, in architecture, analytical development, and performance analysis. Hardware programs

Tom Marsh congratulates Dr. Whittak Huang on becoming a Lockheed Martin Fellow in recognition of his many services to the company. A prestigious award!

involved state of the art IMUs, GPS, and flight computers. Many spacecraft programs were involved: Heat Capacity Mapping, SEASAT, Solar MAX, and the (Venus mapping) Magellan Spacecraft. Later, I led the formulation and analysis of Navigation/Guidance and Control for a small rocket built for the missile defense test program.

Since the late 90s I have been more involved in inertial sensor hardware technology such as inertial measurement units, the GPS receiver, avionics computers and their integration into a system application." (whittak.h.huang@lmco.com)

Alan Sliski (B.S. '78) writes: "I remember doing some interesting independent study work with Professor **Kofler** in addition to the normal undergrad physics courses while at UMass Amherst. In the Physics Department, I did some work on a plasma loudspeaker that combined some of my interests in electrical, acoustical, and experimental work. I worked in the machine shop in Radio Astronomy a few hours a week and spent a summer at Quabbin installing the surface on the millimeter dish. I also took a summer for a transatlantic sailing trip before returning for my senior year. After graduating, I went into industry to work on electron beam lithography at Micro-Bit Corp. in Lexington, Mass., beginning in analog electronics and getting more into systems engineering, optics, and servo systems. My next venture was co-founding a start-up, Digital Measurement Systems, building instruments for measuring the magnetic properties of materials. We built a vibrating sampling magnetometer and I developed the first commercial torque magnetometer, based on an air bearing suspension. I found myself being drawn back to electron beam technology, and was involved with founding a small company in Waltham, Mass., Photoelectron Corp., which developed a small interstitial x-ray generator system for treating cancer. I designed the dosimetry equipment to characterize the x-ray distribution around the source and participated in clinical trials at several hospitals worldwide. I worked with the Ionizing Radiation Division of NIST on the details of calibrating the output of the device, and became somewhat of an expert in the field of low energy x-ray dosimetry. I also won an SBIR grant to develop a photon-counting scintillator dosimeter for them. NIST presently has four instruments that I designed in their lab in Gaithersburg, Md. I spent about a year working in the physics department at Harvard helping manage two sets of labs involved with nanotechnology and cold atoms. I am presently co-founder and CTO of a new start-up developing radiation therapy equipment. I have 23 patents to date.

On a personal note, I have been married to my wife, Susan for 20 years, have two boys, 11 and 17, and live in Lincoln, Mass. on a small farm. I do some volunteer work for the Harvard-based Optical Search for Extraterrestrial Intelligence and the project to digitize the Harvard Plate Stack, a collection of astronomical photographs spanning a century. Along with my sons, I have a renewed interest in astronomy and have taken up the hobby of antique telescopes, among many others. My older son is interested in physics and astronomy and is now engaged in the college application process. We have visited the physics and astronomy departments at UMass Amherst where we talked to Profs. **Candela, Krotkov** and **Snell** to understand the undergraduate programs and research opportunities." (asliski@gmail.com)

Here is David Wei (Ph.D. '69) at the Livingston, Louisiana, laser-interferometer gravitational-wave observatory LIGO, on its inauguration day, 11/12/1999. The large evacuated pipe beside the ladder encloses an interferometer arm for laser beams that travel to and from mirrors set four kilometers apart. The reflections from these mirrors—and David's

David Wei

invention for coating them--are crucial to the success of LIGO. (In another era, UMass Amherst Professor **John Strong** was responsible for coating the 200 inch mirror of the Palomar telescope.) David was our second Ph.D. recipient, 10 seconds behind our first Ph.D., **Richard Piazza**. Richard's pictures were shown in the last two issues. We thought it was only fair that we should show David's picture too! (david.wei@lycos.com)

New Alumni

Degrees awarded since Spring 2005 Newsletter

B.S. Degrees			
David W. Bearse	Robert A. Horton	Pjerin Luli	Theodore N. Plettner
David A. Bloore	Megan E. Juszkiewicz	Ryan J. McGorty	Daniel J. Pomeroy
Shawn P. Cahill	Christopher J. Lammi	Troy A. McMahon	Amir A. Ressaissi
Benjamin R. Farley	Teresa A. Liberatore	Steven J. Merrill	Adam E. Sannicandro
Nicholas A. Gorga	Joseph P. Liskowsky	Jennifer C. Misuraca	David W. Ryan
Matthew P. Gray	Yutaka Maki	Jared P. Orgeron	Katherine E. Whitaker
Thomas C. Hall			

M.S. Degrees			
Derek Chace	Jake Ferguson	Peter Laviolette	Laura Sparks
Elizabeth Clark	Kirsten Fuoti	Michael Ray	Honqiang Wang
Kevin Facto	Rui (Kerry) Kong	Gladys Nangami Simiyu	Vasileios Zarkos

Ph.D. Degrees	Thesis Title	Advisor
Paul Bourgeous	Virtual Compton Scattering on the Proton Below Pion Threshold	Miskimen
Oliver Ruebenacker	Weakly Interacting Bose Gases in the Fluctuation Region	Prokofiev
Kyaw Z. (KZ) Win	Dielectric Susceptibility of Supercolled Liquids Glycerol and Triphenyl Phosphite	Menon
Youn Wu	Computational Studies of Classical Disordered Spin Systems	Machta

Spring '05 Undergraduate Award Winners

From left to right: Pjerin Luli, Banjamin Farley, Thomas Hall, Christopher Serino, Kirsten Fuoti, Dwight Luhman and Ryan McGorty.

The awardees were listed in last year's Newsletter. Their picture was not available in time for publication.

We present here a picture of a subset of the 2005 award winners. Included are two graduate students: **Kirsten Fuoti,** who was the recipient of the Quinton Teaching Assistant Award and **Dwight Luhman,** recipient of the Outstanding Graduate Student in Physics Award.

Honor Roll

This Honor Roll lists those who contributed to the Department of Physics from January 1, 2005 to December 31, 2005. We apologize for any omissions and request that you bring them to our attention.

Karen Armstrong
Walter and Elaine Bearse
Elizabeth Brackett
Francis Canning
Philip Catagnus
Scott Chase
Christopher Davis
Edward Demski
Jonathan Dick
John Donoghue
Laurence Dutton
Ronald Eckhardt
Christophper Emery
Karen Fusco
Fabrizio Gabbiani
Robert Gamache
Paul Gardner
Nicholas and Margaret Gralenski
Douglas and Carole Gregor
Leroy Harding
Evan Heller
Pamela Houmere
David Jagodowski
Julie Johnson
Daniel and Maureen Juszkiewicz
Neal Kalechofsky
Philip Kan
Paul Kendra
Grace Kepler
Joseph Kinard
Per Kirstein
Gary Kleiman
Christopher Koh
Elizabeth Kornack
James Leas
Roger Legare
Mark Leuschner
Gregory Loring
Margaret Loring
Jonathan Maps
Anthony Mann
Charles Mayo
Barbara Merrill
Mark Messier
Caleb Mills
Steven Moore
Elizabeth Ouellette
Anthony Papirio
John Polo
John Pribram
Arthur Quinton
Francesco and Kathleen Roig
Frederick Rowland
Ronald Rothenberg
Thomas Ryan
Edwin Sapp
Mr. and Mrs. William Savola Jr.
Mr. abd Mrs. Anthony Serino
Karen Shramko
Mary-Anne Siegel
Arthur Signorella
Thomas Silvia
Scott Simenas
Mary Skinner
Alan Sliski
Kathryn Smith
Luther Smith
Peter Smith
George Theofilos
Harold Tinney
Jorge Uribe
Robert Vokes
Jonathan Wainer
Edward Weinberg
John and Lynn Yeslow Finn

Gifts

Thank you!!

Your generous contributions to the department are greatly appreciated and are vital to our success. The days are long past that we can carry out our mission relying only on state and federal funding. Private giving by our friends and alumni is essential for us to maintain and improve the quality or our teaching and research. In the past your support helped us to upgrade optics equipment in our introductory teaching labs, sent students to conferences, sponsored the Five College Physics Symposium, and renovated the conference room on the fourth floor of Hasbrouck. Our thanks to the 2005 donors who contributed to the direct support of undergraduate physics education and to the Sternheim Scholarship Fund. Among the activities supported this year were a PSCITAP outing to the Boston Museum of Science, and the Five College Undergraduate Physics Symposium (see p. 9). PSCITAP is a program that encourages physics majors to live on the same floor of a dormitory and to interact with each other. The Sternheim Scholarship Fund supports excellence in outreach and undergraduate preparation for science teaching.

To Make a Donation

Visit our Physics donation page on the web at http://www.physics.umass.edu/donate/ for information and a link to the University of Massachusetts Amherst online donations site. Please follow the instructions carefully to ensure that your gift is targeted toward funding teaching and research in the Department of Physics. If you prefer to make your gift offline, please indicate that your gift is for the Physics Department.

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The frontispiece from Galileo's *Dialogo sopra i due massimi Sistemi del Mondo*. That's Aristotle on the left, Ptolemy at center, and Copernicus on the right.

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**Condensed from the original by Professor Stephen Arons of our Department of Legal Studies

With the advent of the "Information Age," the printed page will lessen in importance. But will it disappear? If so, this might be an advertisement of the distant future.

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