Wonders of Physics 20th Anniversary Show

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• ***Remember to talk to us and send your updates to maclarke@wisc.edu***

Tom Lovell Jim Adney Ray Blum Rebecca Nonn Bob Greenler

Jeremy Hanson Steve Narf Paul Nonn Jim Reardon

GREETINGS TO PHYSICS ALUMS & FRIENDS

There are many ways we try to reach our friends and alumni. The primary way, of course, is through **The Wisconsin Physicist**, our annual newsletter. We bring you the best stories of the year, some science scoops, and "what's what" in the department. Did you realize that even though we send you a hard copy of **The Wisconsin Physicist** each fall/winter we also keep a historic copy for you on the web in the alumni section *www.physics.wisc.edu*? You might enjoy going back and checking out some important event we reported or how someone looked in 1994, for instance.

What's new? Well, in addition to our annual newsletter, we now will be giving you current news throughout the year — only in briefer form — in our new **PhysWEB** newsletter (same web address). Hopefully, this will be just enough to keep you in the "know" about what's happening here. When the fall issue of **The Wisconsin Physicist** arrives, you can spend your time reading about us.

We hope you will visit our "**Giving to Physics**" web page (same web address), where you will find a listing of philanthropic opportunities in the Physics Department. You'll also find that you can now contribute electronically. It's very easy!

We also will be adding a new form to the alumni section of our home page. This form will provide you with the opportunity to update your name, address, phone, email, and/or web site address. Please send us your alumni news electronically: tell us about you or interesting events in your part of the country/world, awards you have received, etc. Also let us know what you'd like to hear about.

We are very excited about these new developments and hope to keep you in our news loop throughout the year. Let us hear from you anytime — and remember, please stop by and visit us when you are in Madison!

Mary Anne Clarke, Editor

Looking for a Classmate/Friend?

The Wisconsin Alumni Association has a feature to locate other Wisconsin Alumni. Check out http://www.uwalumni.com. Scroll to the bottom to locate "Find a Friend." You will need to set up an account, as this service is available to UW Alumni only. If you wish to call the University's Alumni Records Office to update your address, please contact them directly at 1-800-442-6469.

GREETING FROM THE CHAIR

The last year — my third in this term — went by so swiftly that I have begun to question Einstein's time dilation. I am reminded almost daily of the old Chinese curse "May you live in interesting times." There are far too many "interesting" happenings. Reality is an uncomfortable officemate.

The Governor and the Wisconsin Legislature have finally begun to confront the deficits that had been built into the state budget by history and the actions of the national government. Unfortunately for the University, they seem to view the system as the major opportunity to reduce costs. The result is that the University of Wisconsin system, although its budget is less than 9% of the state expenditures, was subjected to the largest reduction of state support in its history. The biennial budget calls for a reduction of $250 million (to be partially offset by $150 million from increased tuition). The result is that the steady decline in state support that has been painfully obvious for several decades has been re-established. The bump in funding from the Madison Initiative, proposed by former Chancellor Ward to reverse this trend, has now been "erased." As the reductions "trickle down" to the departmental level, their effect becomes only too apparent. Although we will attempt to ameliorate the situation as much as possible, there will be consequences. Customarily, it is at the margin where the amenities and small flexible opportunities are lost. This illustrates the importance of the newly re-named Newton Fund, which can be used to partially restore these important items. Be assured of our great appreciation and thanks for helping to augment the fund. (See page 24 for information on how to contribute.)

The renovation for the Physics Department of that portion of Chamberlin Hall that previously housed the School of Pharmacy proceeds with all deliberate speed. An old cliche is that sausage making should never be watched. Alas, I fear that is also valid for the renovation of old buildings. But we have made an excellent start, albeit delayed by budgetary uncertainties. We hope that the delays will not affect the schedule too much — I am reminded that it snows and is cold in Madison, as many of you no doubt fondly recall! Please check in from time to time on the web site to view the progress (*http://www.physics.wisc.edu/*).

But our glass can also be viewed as half-full. The talents and accomplishments of the members of the

department continue to be recognized and utilized. Among the recent noteworthy events are:

- In August the American Association of Physics Teachers had its annual meeting in Madison at the Monona Terrace Conference Center. More than 1200 educators from across the nation attended. The department was able to assist and participate in many ways. Among the most dramatic was a special presentation of the "Wonders of Physics" by Professor Clint Sprott.

- Two colleagues are enjoying sabbatical leaves; Professor Peter Timbie intends to pursue his study of the Cosmic Microwave Background, and Professor Don Cox will recharge in the "hardship" location — Mexico City. Both these great teachers will also work on new physics courses during this period.

Don Reeder

- The IceCube project is the construction of a very large cosmic neutrino observatory at the South Pole. The instrumentation of a cubic kilometer of ice has been approved by the National Science Foundation as a Major Research Equipment (MRE) project. The required expenditure of about a quarter billion dollars will be managed at the UW, and the subsequent analysis of data obtained is envisioned to be done in large measure in the Department. Professors F. Halzen, R. Morse and A. Karle are among the leaders of this strong collaboration.

- Finally, arguably the most significant development (at least for the future of the department), is the successful recruitment of the cluster of three faculty members in String Theory and Topology. You may recall that last year I alluded to the search being undertaken together with the Department of Mathematics to establish an interdisciplinary activity concerned with non-local quantum field theories and the geometries and symmetries used to describe them. This fall we welcomed Dr. Albrecht Klemm of Berlin, Germany and Dr. Aki Hashimoto of the Institute for Advanced Study (Princeton) to join Dr. Gary Shiu of the University of Pennsylvania who came last year. After a period of relative quiet, we hope to again field an outstanding team in fundamental physical theory.

I was privileged to again preside at the Department's Fourth Annual Awards Banquet held in May, during which I presented two Distinguished Alumni Fellow Awards. The first was to Dr. J. Anthony Tyson, a Distinguished Member of the technical staff of Bell Labs, in recognition of his outstanding career in experimental gravitation, cosmology, optical instrumentation for low-light-level imaging, pattern recognition and oceanography. His current astrophysical research centers on experimental cosmology, specifically observational probes of dark matter and dark energy in the universe. The second was to Dr. John Lynch, formerly at the National Science Foundation, who has had a very illustrious career in government science, most recently as the program manager for aeronomy and astrophysics at the South Pole.

Another highlight of the ceremony was the presentation of Distinguished Faculty Fellow Awards to two outstanding former UW faculty members: Professor (Emer.) Converse H. (Connie) Blanchard and Professor (Emer.) W. F. (Jack) Fry in recognition of their outstanding and productive careers, filled with contributions to students, to the department and to physics in general. These awards are made in addition to the customary recognition of the outstanding TA and various others to our excellent graduate and undergraduate students.

Don D. Reeder, Chair

THE WISCONSIN PHYSICIST

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Department of Physics

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UPDATE ON CHAMBERLIN REMODELING

After a 4-month delay due to state budget difficulties, construction has resumed on Phase II of the remodeling of Chamberlin Hall. Phase II largely involves rebuilding the space previously occupied by the School of Pharmacy, which is now located in a building close to the University Hospital. In addition, the second floor of the center section of Chamberlin, which formerly housed research labs, offices and the department mail room, is being demolished to make room for lecture halls and a lecture preparation room.

The building project is scheduled to be completed by the spring of 2005. As soon as the work is finished, the department will begin moving offices and labs from Sterling Hall. Classes in Chamberlin will begin in the fall of 2005. The department will retain 10,000 square feet of lab and office space in the basement of Sterling in the vicinity of the tandem accelerator. Overall, the department space will remain the same, approximately 100,000 square feet. The remodeling of Sterling Hall, which will provide space for the Psychology and Astronomy Departments, has been delayed at least two years by the state's financial crisis.

Further information about the progress of the remodeling project can be found at:

http://www.physics.wisc.edu/chamberlin_remodeling/remodel-home.html

Chamberlin Construction

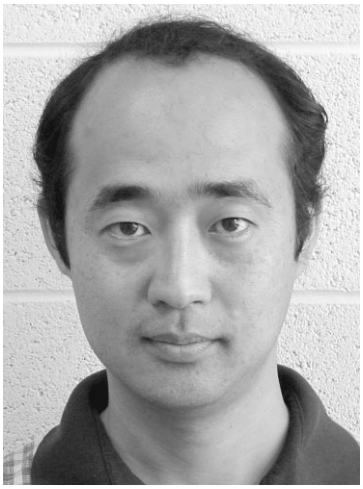
FACULTY NEWS & AWARDS

After a vigorous 2002–03 faculty recruitment effort led by the New Staff Committee (Dan McCammon, Susan Coppersmith, Vernon Barger and Baha Balantekin), along with Don Reeder, Chair and Herb Wang, the Associate Dean of Physical Sciences, the Physics Department starts this fall with two new Assistant Professors, **Akikazu Hashimoto** and **Daniel J. H. Chung**, and one new Associate Professor, **Albrecht Klemm**, who began teaching this fall.

Assistant Professor **Daniel J. H. Chung** received his Ph.D. in theoretical physics in 1998 from the University of Chicago. He held postdoctoral positions at the University of Michigan and at CERN before joining University of Wisconsin-Madison as a faculty member this year. Prof. Chung's research is in early universe cosmology and particle astrophysics, at the interface between high energy theory and astrophysics. More specifically, his main interest is in finding novel observable connections between physics beyond the Standard Model (these "beyond" conjectures include string theory and supersymmetric extensions of the Standard Model) and cosmology. He is well-known for proposing nonthermal dark matter scenarios and proposing a new class of dark matter (sometimes known as WIMPzillas) which have a natural connection to string theory and supersymmetry. He also discovered a novel observable signature to the string theory inspired scenario of "brane world" (universe on a thin hypersurface of a higher dimensional world). His recent research interests include cosmic microwave background radiation, accelerated expansion of the universe, cosmic rays, baryogenesis, and topological defects.

Daniel Chung

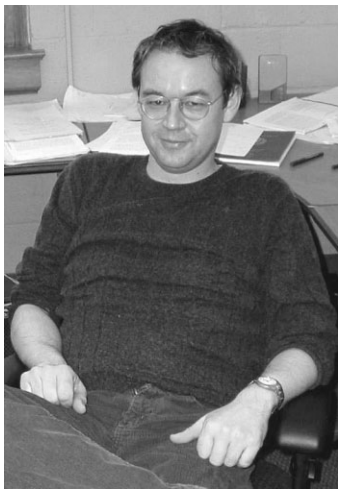
Assistant Professor **Akikazu Hashimoto** received his Ph.D. in theoretical physics in 1997 from Princeton University. He initially was a research associate



Akikazu Hashimoto

at Institute for Theoretical Physics at University of California-Santa Barbara and then a long-term member at the Institute for Advanced Study, Princeton before joining the Physics department at the University of Wisconsin-Madison. Professor Hashimoto's research focuses on formal aspects of quantum field theory, general relativity, and string theory. He is especially interested in exploring and exploiting the interplay of modern concepts in theoretical physics. He has made significant contributions in many areas including AdS/CFT correspondence, non-commutative geometry, and supergravity.

Associate Professor **Albrecht Klemm** received his Ph.D. in theoretical physics in 1990 from Heidelberg University. He did research at the University of Munich, CERN, the physics and mathematics departments of Harvard University, the Enrico Fermi Institute in Chicago and the Institute for Advanced Study in Princeton. Before he was appointed Associate Professor at the UW-Madison, he was a Professor at the Humboldt University in Berlin. The main focus of his research is on non-perturbative aspects of string and field theory. His contributions include string compactifications, duality symmetries such as mirror symmetry, the extraction of effective theories "real world Theories" from string theory and the understanding of supersymmetric gauge theories, using string inspired topological and geometrical methods. Interesting physical questions in the field require techniques which are also of mathematical research interest. Albrecht Klemm is partially (25%) affiliated with the mathematics department to trigger interdisciplinary collaboration.



Albrecht Klemm

Cary Forest

Faculty Promotions

Congratulations to **Cary Forest**, who has been promoted to Associate Professor with tenure, effective Fall 2002–03.

Faculty Retirements

Professor **James D. Callen**, joint appointment in Engineering Physics and Physics, retired effective July 1, 2003.

Faculty Awards 2003-04

Romnes Early-Career Awards

Four professors received the 2003 Romnes Fellowships, a program that helps younger faculty members further establish their scholarly careers. The Wisconsin Alumni Research Foundation supports the program. One of this year's winners is **Gelsomina "Pupa" De Stasio** of Physics, who explores questions at the boundaries of physics and other disciplines.

"Pupa" De Stasio

Sabbaticals Awarded

Professor **Don Cox** is awarded a sabbatical for Fall 2003-04, and Professor **Peter Timbie** is awarded a sabbatical for the full Academic Year 2003-04 to pursue research.

Particle Accelerator Science and Technology Award

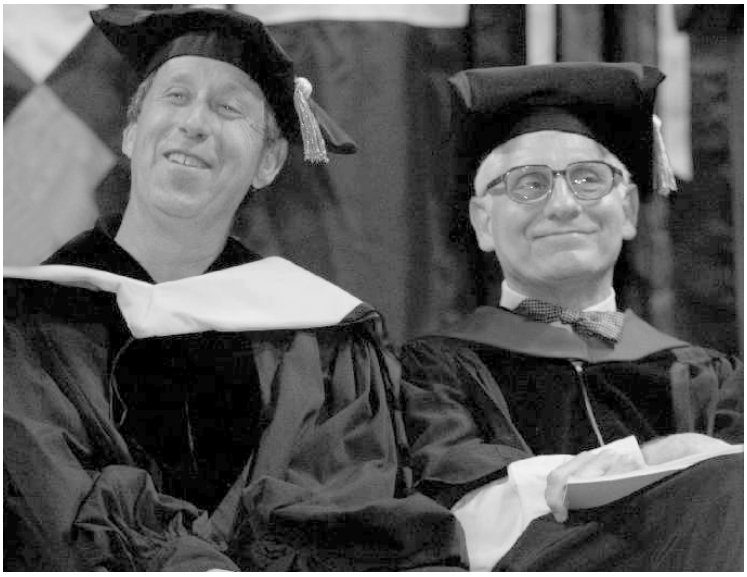
This award is given to individuals who have made outstanding contributions to the development of particle accelerator science and technology. One of the 2003 recipients is **Keith Symon**, University of Wisconsin-Madison. This award was presented at a ceremony on May 14, 2003 during the biennial Particle Accelerator Conference (PAC03) held in Portland, Oregon, May 12–16, 2003. Keith received this award for many fundamental accelerator concepts which include invention of Fixed Field Alternating Gradient Accelerators (FFAG), most notably incorporated into spiral sector cyclotrons; for defining a formalism describing motion under the influence of RF as required for stacking and other particle manipulations; and for techniques for analyzing collective instabilities. Dr. Symon is an Emeritus Professor of Physics at the University of Wisconsin-Madison.

Honorary Degree Recipient

Dr. **Carl J. Anderson**, IBM, distinguished UW-Madison alumnus, was an Honorary Degree Recipient this spring at the **150th Year Commencement at the UW-Madison**. He was awarded an Honorary Degree in Physics at this Spring's Commencement Service on

Friday, May 16. Dr. Anderson has spent his entire career at IBM, where he currently serves as chief engineer of physics design. He is the world's top microprocessor designer. Anyone making airline reservations, involved with the stock exchange or interested in the weather forecast can thank Carl Anderson for his contributions to mainframe computing. Anderson revolutionized the digital industry by introducing new and improved high-performance computers. His design of the microprocessor that powers IBM's award-winning Power4 system has enabled the United States to maintain leadership in an area that affects almost every aspect of contemporary society. In 1998, his work changed IBM's mainframe system from bipolar to field-effect transistors. The result was a product that can run at gigahertz speed, allowing IBM to deliver high-end processors that perform twice as fast and at half the cost of their competition.

In addition, Carl has earned three IBM technical team awards, two IBM Outstanding Technical Achievement Awards and a Corporate Award. Currently one of the elite IBM Fellows, Anderson now is chief engineer of physical design for the IBM Enterprise Server Group. His understanding of science and technology has been described as "dazzling," while his breadth, insight and inventiveness, as well as his ability to comprehend a broad array of concepts make him a truly outstanding figure in the technological world. He holds twenty-nine technology patents and serves as a mentor to a number of colleagues. Carl Anderson earned his Ph.D. in atomic physics from UW-Madison in 1979.



Carl Anderson & Wilmer Anderson

WONDERS OF PHYSICS TWENTIETH ANNIVERSARY PRESENTATION — FEBRUARY, 2003

Never has there been a time when an understanding of science has been more important to the well-being of individuals and to the nation than the present. Yet many recent studies have documented a lack of interest in science and hence a decline in science literacy in the United States. To address this problem, the **University of Wisconsin-Madison** in 1984 began a program called **The Wonders of Physics**, aimed at generating interest in physics among people of all ages and backgrounds. The heart of the program is a fast-paced presentation of physics demonstrations carefully chosen to be entertaining as well as educational.

Scheduled presentations of **The Wonders of Physics** and tours of the Physics Department laboratories are given on the UW-Madison campus for the general public in mid-February each year. Free tickets are recommended and are available by calling (608) 262-2927 or by e-mail to *wonders@physics.wisc.edu* or by using the On-Line Ticket Form at *http://sprott.physics.wisc.edu/tickets.htm* during the month of January.

The next public presentations of **The Wonders of Physics** are scheduled as follows:

- February 8, 2004 1:00 and 4:00 pm
- February 14, 2004 1:00 and 4:00 pm
- February 15, 2004 1:00 and 4:00 pm

The show has been presented by Professor Clint Sprott on the Madison campus over 160 times to a total audience of over 50,000. In addition, a smaller traveling show has been developed and presented by physics graduate students and staff several hundred times to audiences of all ages throughout Wisconsin and the nation. A variety of educational tools and materials have been developed including printed handouts, videotapes, and computer software. The Department of Physics celebrated the twentieth anniversary of The Wonders of Physics this February with a series of six presentations to a packed house. Professor Clint Sprott started the show by emerging from a large cake. Special guests included Bassam Shakhashiri, Robert Greenler, and Ray Blum (AKA Professor Numbers). Upwards of 2,000 people attended the performances this year. Many of them took advantage of the Open House tours and demonstrations offered between the shows each afternoon by several of the Department's research laboratories.

More information on The Wonders of Physics can be found at *http://sprott.physics.wisc.edu/wop.htm*

THE WONDERS OF PHYSICS

by Prof. J. C. Sprott

In December of 1983, a friend invited me to attend the "Chemistry Can Be Fun" annual public Christmas presentation of Prof. Bassam Shakhashiri. I had heard about it and had been meaning to see what all the fuss was about. That semester I was teaching general physics for the first time and thought I might be able to pick up some teaching ideas.

What I saw was quite amazing, not so much because of the nature of the demonstrations or even the quality of the presentation, but because of the wildly enthusiastic audience of all ages. How could people get so excited about mixing a few chemicals?

I realized that the demonstrations we have used for decades in our general physics courses could generate the same excitement if presented in an entertaining way to a similar public audience. I set about to plan the first presentation of **The Wonders of Physics**.

That first presentation on February 15, 1984 drew an overflow crowd to 1300 Sterling Hall, and the level of interest and excitement was quite a contrast to the sleepy undergraduates who populate our introductory courses. So many people were turned away from that first presentation that we scheduled a second show later the same evening.

Since the first show was near Valentine's Day, we decided to make it an annual tradition, and within a few years, we settled into a pattern of having six presentations on the two weekends that surround Valentine's Day. We began issuing free tickets and learned how to control the demand so that every show was filled to capacity. We began including tours of the Physics Department laboratories in what has become an annual open house. This year we celebrated our 20th season with a special anniversary show.

Requests began coming in to do special shows for groups, and I did of number of those, eventually totaling 162 shows to an estimated audience of over 50,000. To reach a wider audience, we began videotaping the annual shows, and there are now 20 hours of these tapes available at a cost of $25 each.

About the time that I realized these activities could consume me, one of our graduate students, David Newman, approached me to suggest that we take the show on the road. He and another student, Christopher Watts, did dozens of these shows, mostly in southern Wisconsin but as far away as Connecticut; they even organized a 3-day workshop for teachers to train them to do similar presentations. About a dozen other graduate students also became involved in the program.

We eventually hired a part-time person, Rich Woodring, to handle the many requests, and soon thereafter we hired Roger Feeley, under whose leadership the traveling show blossomed for nearly a decade. We are now in the third generation with the recent addition of Jim Reardon, a Ph.D. in plasma physics from MIT who works full-time doing outreach. We are doing approximately 100 off-campus shows a year (mostly in schools), and the traveling show has been to all four corners of the U.S. as well as Canada. We request a nominal donation of a few hundred dollars when we do these shows.

Clint Sprott

Along the way, with support from NSF, we assembled a lecture kit intended to help teachers and scientists develop similar outreach programs of their own. This kit is available for $90 and includes a recent videotape of the annual presentation as well as a list of over 100 demonstrations suitable for such audiences, written materials for students and teachers, publicity samples, lists of vendors and other resources, computer software suitable for stand-alone museum use, and more. Over 500 kits have been distributed around the world, and a number of groups point to our program as the inspiration for their own.

We now have funding from the Department of Energy and the National Science Foundation to support a full-time person, and we are using the popularity of the program as leverage to inform the public about magnetic fusion energy and plasma astrophysics.

What began as a one-time experience, just for the fun of it, has grown into a major outreach enterprise that we hope will bring pleasure and awareness of physics to the public for many years to come.

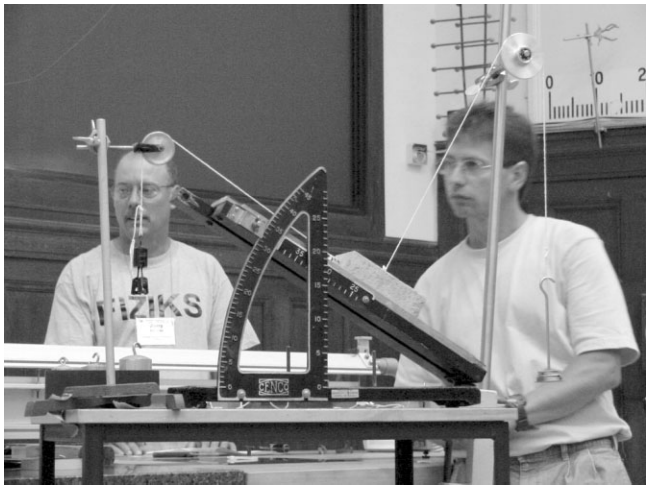
For more information about **The Wonders of Physics**, see *http://sprott.physics.wisc.edu/wop.htm*

THE 127TH AMERICAN ASSOCIATION OF PHYSICS TEACHERS NATIONAL MEETING

by Dr. Susan Nossal

The University of Wisconsin-Madison Physics Department hosted the 127th American Association of Physics Teachers National Meeting August 2–6, 2003 at the Monona Terrace Convention Center. Teachers from high schools and middle schools, community colleges, 2- and 4-year colleges, and small and large universities participated in the meeting, enabling attendees to gain greater awareness of the curriculum, advantages and challenges of teaching physics in a variety of institutional settings. The attendees included many graduates of Wisconsin's graduate and undergraduate physics programs, creating the feel of a Wisconsin reunion.

The conference began with weekend workshops that provided opportunities for participants to explore topics in greater depth, including Introductory Instructional Laboratories, Humanized Physics Activities, Improving Astronomy Learning for Non-Science Majors, Facilitation in the Active Learning Physics Classroom, and Energy in the 21st Century, as well as many others. The workshops provided resources that participants could use in their own classrooms, as well as opportunities to try many related hands-on activities. Workshops were held in Sterling Hall on the UW campus, at Edgewood College, and at the Monona Terrace Convention Center. The team of Bill Grogan, Joe Sylvester, and Jim Hanesworth provided invaluable assistance to workshop presenters to insure that they had the necessary equipment and computer support for their workshops.



AAPT, August 2-6, 2003 at UW-Madison

The meeting portion of the conference followed the workshops and included plenary sessions, talks, poster sessions, and discussion forums. The sessions addressed a wide array of topics such as educational reforms for commonly taught courses, assessment techniques, strategies for teaching particular physics concepts, physics and society, and physics education research. There were also exhibits of the newest physics textbooks, laboratory equipment, and outreach materials. A smaller conference devoted to Physics Education Research followed the AAPT meeting and addressed topics such as student reasoning, higher-order thinking skills, working with special populations, and women in the physics classroom.

Many UW-Madison faculty and staff presented at the conference. Professor Gelsomina "Pupa" De Stasio gave a plenary talk about how the Spectromicroscope for the Photoelectron Imaging of Nanostructures with X-rays (SPHINX) is used to investigate cancer therapies for treating lethal brain cancer, the early Earth, and bacterial metabolism. Profs. Robert March, Willy Haeberli, and Donald Osterbrock (University of California-Santa Cruz) provided a Retrospective on Physics and Astronomy at Wisconsin. Profs. Vernon Barger and Francis Halzen and Dr. Robert Benjamin provided educators with an update concerning neutrino and infrared astronomy research. Dr. Robert Benjamin runs a summer astronomy Research Experience for Undergraduate program at the University of Wisconsin and arranged for the REU students to attend the AAPT conference. Dr. Nossal and Prof. Peter Timbie presented a poster concerning the Physics Peer Mentor Tutor program in which upper-level undergraduate physics and pre-secondary education majors are trained and paired in small study groups with students taking introductory physics. The students in this program may be having trouble with the course and/or feeling isolated at the University. Prof. Don Reeder chaired a session on the Revision of the Major's Introductory Courses. Prof. Mark Eriksson and faculty from the Universities of Illinois and Minnesota talked during this session about how to make introductory courses at large research universities more effective through modifying the curriculum and creating a more active learning environment for students. A highlight of the conference was a 20th anniversary Wonders of Physics presentation by Prof. Clint Sprott, Tom Lovell, Jim Reardon, Steve Narf, and Roger Feeley (currently at the University of Maine). An enthusiastic audience gained ideas for physics demonstrations and explanations and enjoyed the humor and acting.

Participants at this summer's AAPT conference gained resources and strategies for improving the teaching of physics and astronomy. This fall, for example, the University of Wisconsin has changed the structure of both its algebra-based introductory courses, utilizing reforms discussed at the conference by professors at the Universities of Illinois and Minnesota.

ASSOCIATE VICE CHANCELLOR BERNICE DURAND

Taken from **Wisconsin Week** *article from January 15, 2003 issue, written by Kent Barrett.*

Bernice Durand, a Professor of Physics who has been deeply involved in campus climate and diversity programs, has been chosen by Provost Peter Spear to become the university's associate vice chancellor for diversity and climate.

Spear created the position and reorganized the duties of the existing associate vice chancellors last fall to better position his office to address campus priorities, especially climate and diversity. The associate vice chancellor for diversity and climate replaces a vacant position that oversaw duties now shared by other associate vice chancellors.

"It is essential to the continued success of UW-Madison that we increase the diversity of our faculty, staff and students, and encourage a positive living and working environment for the entire campus community," Spear says. "Bernice's tireless dedication to increased diversity and improved campus climate makes her the perfect choice to help lead our efforts."

In her new role, Durand will provide leadership to ensure that faculty, staff and student diversity and climate issues are addressed. Among her many responsibilities will be to help implement the recommendations of the Campus Climate Network Group, an advisory committee chaired by Spear and made up of a cross section of the campus community.

Durand will work to implement the campus goals contained in UW-Madison Plan 2008, a blueprint for attaining the diversity goals adopted by the Board of Regents, and aimed at boosting the recruitment and retention of minority faculty, staff and students.

Durand will also develop ways to evaluate current practices and policies, develop accountability measures and collect benchmarking information. In addition, she will work with campus staff and academic programs to develop and enhance diversity and climate content for university training sessions, assist in aligning academic programs with campus diversity goals, work with the Equity and Diversity Resource Center to coordinate sexual harassment information sessions, and oversee the development of ombuds services.

Because diversity and climate issues affect all aspects of campus life, Durand's responsibilities will require a close working relationship with Spear, Vice Chancellor for Student Affairs Paul Barrows, the other associate vice chancellors and the campus community.

"I am very excited about working with the groups and individuals who have been planning and making progress in these two interrelated areas during the past two years," Durand says. "Everyone on campus deserves an environment of mutual respect and acceptance, free from prejudgment. We have some big steps to take. I look forward to serving as a coordinator and a support person as we all move toward this goal."

Durand has played a key role in the development and implementation of Plan 2008. In 1998–99, she worked with Barrows, Assistant Vice Chancellor for Student Affairs Ruby Paredes, the University community and the public to research and draft the plan. She oversaw the plan's implementation while co-chairing the Plan 2008 Steering Committee and Plan 2008 Oversight Committee during 1998–2001. These groups were predecessors to the current Campus Diversity Plan Oversight Committee.

Durand was the campus coordinator of the Ethnic Studies requirement when she chaired the College of Letters and Science Curriculum Committee in 1987–89.

Chancellor John Wiley presented Durand with a special recognition award May 7 in honor of her outstanding leadership in the area of campus diversity.

Assoc. V.C. Bernice Durand

In addition, Durand is on the leadership team of the NSF-sponsored Women in Science and Engineering Leadership Institute, which works to enhance the advancement of women in science and to measure the success of such efforts.

Durand has served in a number of other campus leadership positions. She is the current chair of the Athletic Board and chaired the University Committee, the executive committee of the Faculty Senate, from 1999 to 2000. She also chaired the search committee for the UW-Madison chancellor in 2000.

"I have learned how much this campus can accomplish through shared governance and hope to apply those lessons to our diversity and climate goals," she says. "One person can't do it all and it will take everyone's effort."

Durand, a theoretical physicist who specializes in particle theory and mathematical physics, will continue some of her teaching activities while serving as associate vice chancellor for diversity and climate.

In the provost's office, associate vice chancellors are selected from among the UW-Madison faculty to provide leadership in academic affairs. They typically serve part-time for three to five years.

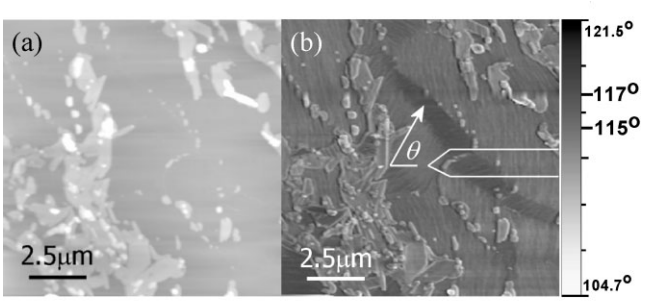
TAPPING FROM A NEW ANGLE

by Mary Anne Clarke

Imagine the situation: your collaborator, a leading synthetic chemist, Fed Ex's you a precious sample. You carefully cleave and mount it, store it under dry nitrogen, and place it in a humidity controlled environment to do a little…hammering? If that sounds a bit incongruous, you are not alone! The scientists at Digital Instruments thought so too, and "hammering-mode" morphed into the more sensitive, gentler, and infinitely more marketable "tapping-mode." With this turn of phrase, one of the world's most sensitive atomic force microscopes was born.

Tapping-mode AFM is ubiquitous because it is, in fact, an extremely gentle method for imaging surfaces and extracting their properties. In tapping-mode AFM, a microfabricated cantilever with a super-sharp tip oscillates over a surface. With each oscillation, the sharp tip "taps" on the surface causing a (reversible, one hopes!) depression that is frequently less than an atom deep. This technique is used with an enormous variety of samples; in Assistant Professor Mark Eriksson's lab, this range extends from silicon nanoelectronics to polymers to viruses.

Over a year ago, in the basement of Sterling Hall, graduate student Matthew Marcus, working with Prof. Mark Eriksson, was imaging a poly-diacetylene monolayer film using tapping-mode AFM. Surprisingly, a beautiful map of the polymer backbone appeared, where instead a smooth polymer surface should have been. The answer to the puzzle was surprising. Matt was, in essence, imaging the backbone direction because he was tapping at an angle to the surface. Anyone who has tapped a pencil eraser on a desk knows why he had to do this: a flat pencil will hit along the entire length, but at an angle it's impossible to hit anything except the eraser. By tapping at an angle, Matt would sometimes shear along the length of the backbone, and sometimes he would shear perpendicular to the backbone — two very different processes. With a little luck, and a lot of work, Matt's image found the cover of PRL.

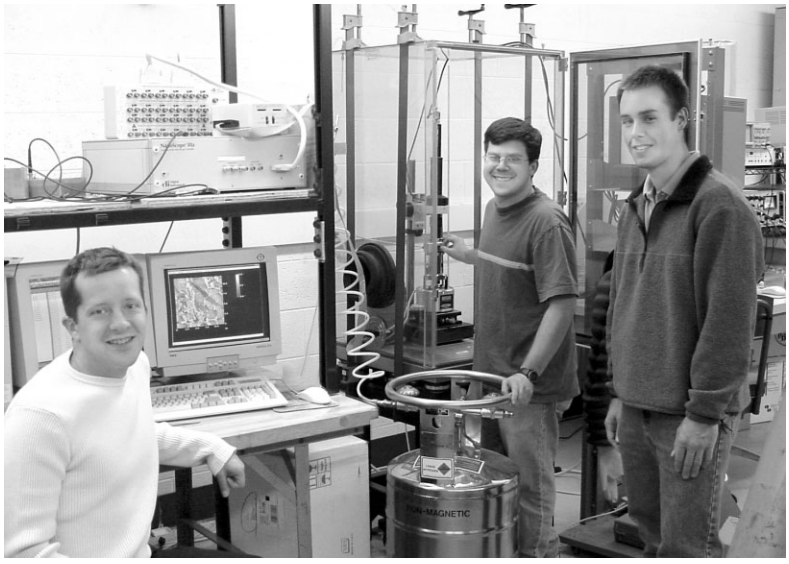


(a) Topography of a poly(diacetylene) film. Regions of monolayer, bilayer, and trilayer are visible. (b) Simultaneously acquired phase image. The gray-scale variations through the center of the film correspond to variations in in-plane shear and friction as measured by tapping mode AFM.

Tapping at an angle is universal in AFM. Why had no one noticed the consequences until now? According to Eriksson, thanks are due to the person who grew the sample, in this case Dr. Darryl Sasaki of Sandia National Labs. His monolayers were sufficiently uniform that the small effect of the tilted cantilever became the dominant signal. Eriksson also emphasizes the role of collaboration with Assistant Professor Rob Carpick in Engineering Physics.

The spin-offs from this one image show the advantage of being at the University of Wisconsin-Madison. Carpick, Matt D'Amato (a new student) and Eriksson continue to pursue the novel effects of tapping at an angle, and have recently shown that one can extrapolate back to pull out the "zero-angle" signal from tapping-mode AFM. Discussions about this same image led to a new connection with the UW-Madison Materials Research Science and Engineering Center (MRSEC), where the team uses similar techniques to study viruses bound to polyurethane thin films. Finally, Carpick, Sasaki, and Eriksson have started a new project to use the original poly-diacetylene thin films to move and manipulate nanoparticles. None of this would have happened without a clever student, a remarkable image, and a university where diverse teams are easy to assemble.

And what about the company that marketed tapping-mode to the world? Digital Instruments is now part of Veeco Instruments. And at least one of the former employees is rumored to be making wine in the hills of California. The moral of the story? Always be gentle, and a little marketing can be a good thing.



Prof. Eriksson's Lab
(L to R, Mark Eriksson, Matthew Marcus & Matt D'Amato)

CP VIOLATION AND THE BABAR EXPERIMENT

by Professor Yibin Pan

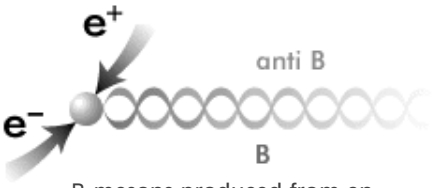
Modern physics tells us that every matter particle has an "antimatter" counterpart. For instance, the electron has an antimatter partner called the positron, the proton has a partner called the anti-proton, the neutron's partner is the anti-neutron, and so forth. It is well known that our universe is made from matter; for example, everything on Earth, the Moon, the planets, sun, stars and galaxies — in fact, the entire visible universe — is entirely composed of matter. Antimatter does exist but in a transient form. It is only produced in laboratories or through cosmic reactions. In fact, cosmological observations show that in today's universe the matter to antimatter ratio is over a billion-to-one. How do we explain this dramatic asymmetry between matter and antimatter? This remains one of the key mysteries in our understanding of the universe.

Yibin Pan

It is believed that our universe originated from a "Big Bang" 13.5 billion years ago. At the time of the Big Bang, matter and anti-matter were equally produced. Some asymmetric process must have happened between then and now to make the current matter-dominated universe. Much of the physics community, including physicists from UW-Madison, is actively involved in identifying the mechanism of this asymmetric process.

In 1967, physicist Andre Sakharov proposed three necessary conditions that would lead to a matter-dominated universe. One of these conditions is called "CP Violation." The "C" refers to charge conjugation, which is responsible for transforming matter to anti-matter or vice versa. The "P" refers to parity transformation, which reflects a system around the origin ($\vec{r} \rightarrow -\vec{r}$). An asymmetry in the combined CP operation is a necessary condition for a matter-antimatter asymmetry.

CP violation was first discovered in 1964 by physicists James Watson Cronin and Val Logsdon Fitch through their study of the decay of a class of subatomic particles called "K-mesons" ("mesons" are hydrogen-like pairings of a quark and an anti-quark). Although the discovery of CP violation in K-meson decays was exciting, the origin of CP violation remained unknown for decades, and the scale of the violation (two parts per thousand) was too small to explain the matter-dominated universe. It was necessary to search for CP violation in other classes of particles and to encapsulate the entire picture into a single theoretical framework.



B-mesons produced from an electron-positron collision

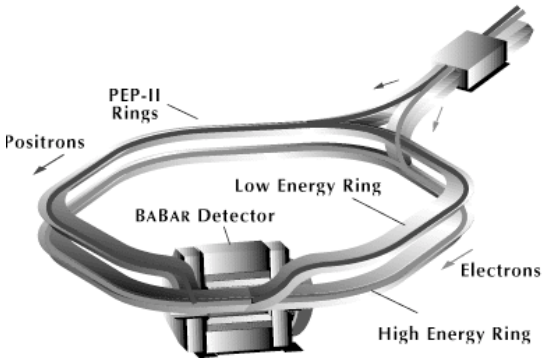
One particularly useful class of particles for CP violation searches is called "B-mesons." Like K-mesons, B-mesons are also made of a quark and anti-quark but are much heavier than their K-meson cousins. B-mesons come in two forms, matter B-mesons (hence referred to as "B") and antimatter B-mesons (hence referred to as "anti-B"). B and anti-B are charge conjugates. A B-meson typically exists for a trillionth of a second before it decays into other particles (referred to as the "final state particles"). To study B-mesons, scientific facilities must be fast and precise.

B-mesons do not exist in nature; in order to study them, they have to be produced in the lab in large quantities. Today, physicists have at their disposal the largest sample of B-mesons ever produced, in excess of 600 million of them! The facilities in which B-mesons are produced are called "B-Factories." A B-Factory collides electrons and positrons at an energy corresponding to the mass of a resonance called the Upsilon-4S (denoted "$\Upsilon(4S)$"), which subsequently decays into a B and an anti-B. Currently there are three electron-positron based B-Factories in the world: the CESR collider and CLEO detector (CESR/CLEO) at Cornell University, KEKB/Belle in Japan, and PEP/BaBar at the Stanford Linear Accelerator Center (SLAC) near Stanford University. The latter two are particularly useful for CP violation studies due to their design, which allows the precise measurement of B-meson's decay rate and decay time. Physicists at UW-Madison, including Professor Richard Prepost, Professor Sau Lan Wu, Assistant Professors Sridhara Dasu and Yibin Pan, and over 20 post-docs and graduate students are ac-

tively engaged in B-meson and CP violation research at the BaBar experiment.

The process of creating and detecting B-mesons starts with SLAC's two-mile long linear accelerator, capable of accelerating electrons and positrons to almost the speed of light. The electrons and positrons are diverted from the linear accelerator into a stacked pair of 1.3-mile circumference storage rings. Once in the rings the electrons and positrons collide every four nanoseconds. The Upsilon-4S (and subsequently B-mesons) is produced in these collisions.

BaBar detector is a three-story-tall, 1000-ton cylindrical electronic detector surrounding the electron-positron collision point. It is designed to detect a variety of subatomic particles that result from the decay of B-mesons. The detector is constructed in layers, starting at the center with a silicon detector and wire drift chamber for particle tracking; a Cherenkov radiation detector for particle identification; an electromagnetic calorimeter for energy measurements; a superconducting solenoid to allow particle momentum measurements; and an instrumented magnetic flux return for detecting long-lived or high energy particles. Together these components form a high-precision particle detector with excellent space and time resolution and particle identification. The SLAC B-factory was completed in 1999 at a total cost of $250 million and is supported by a 550-person international collaboration.

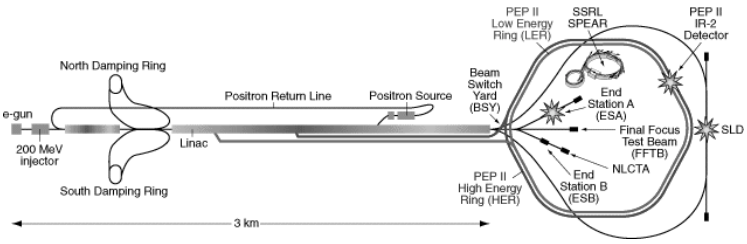


PEP/BaBar B-Factory

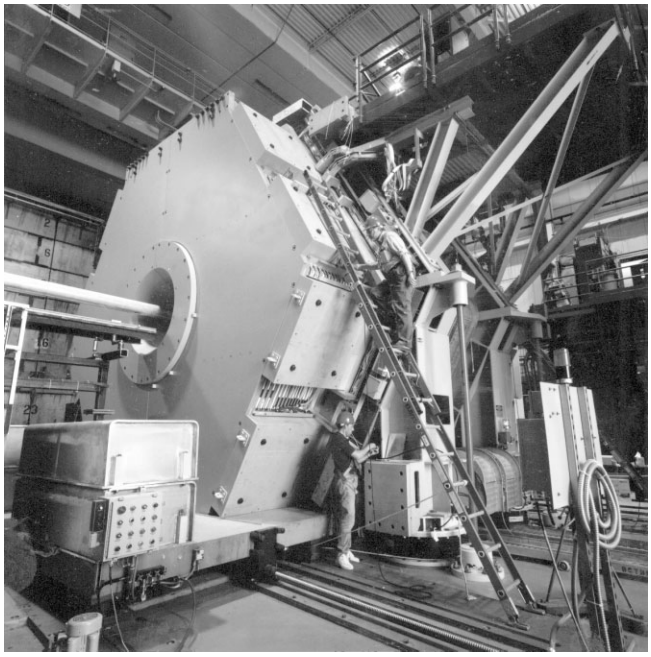
By studying the difference in the decay time of the B and anti-B mesons into a set of particles called $B \to J/\psi K_s$ (pronounced "Bee to Jay-Psi Kay-short"), physicists at Belle and BaBar confirmed for the first time in history the existence of CP violation in the B-meson system in 2001. Beside $B \to J/\psi K_s$, many other decay modes are being searched for evidence of CP violation. Only by exploring a large number of these decay modes can we gain complete understanding of CP violation. Examples of such final states which are under scrutiny at Belle and BaBar are $B \to \phi K_s, \eta' K_s, \rho^+\rho^-, \pi^+\pi^-$, etc.

The large number of B-mesons available to physicists at Belle and BaBar also lends itself to the study of rare decay processes. A rare decay process occurs in less than one in every 10,000 decays of the B-meson. In addition to CP violation studies, physicists, both at UW-Madison and around the world, are also engaged in the search for and study of these rare events.

The B-Factories are scheduled to run until 2006. In that time they plan to collect over two billion B-mesons. Because of the large involvement of the international physics communities in these projects, plans are being explored beyond 2006. Since these facilities started taking data in 1999, great strides have been made in the search for and understanding of CP violation. The B-Factory program is rich in discovery and more aspects of the universe are illuminated with each new accumulation of data.



Schematic of the Stanford Linear Accelerator Center


The BaBar Detector

GRADUATE PROGRAM

Graduate Program Report

by Barb Schutz

The Admissions and Fellowships Committee, under the chairmanship of Jim Lawler, is pleased to report that a total of 76 offers were made (73 domestic, 3 international) to this year's graduate program applicants. Although the total number of applications was up approximately one-third this year, the current budget constraints limited the number of offers we were allowed to make to approximately 70% of those in the past several years. Still, the acceptance rate was good with 28 new students for the Fall of 2003, including two who will be receiving WARF Fellowship supplements of $9,000 during their first year of study and three Advanced Opportunity Fellowships. Twenty-six of the incoming students are domestic, and two are international.

There were a total of 403 applications for admission (up 30% from last year) to the Physics graduate program. Of these, 140 were domestic and 263 were international. Offers were made to 58 males and 18 females, with 20 males and 8 females accepting.

Recruiting actions instituted a few years ago continue to be successful — namely, two group visit events in March, greater involvement of current graduate students, an increased financial supplement to all TA offers with a marked boost to our top 9 applicants, and several summer RA offers to prospective students. Our current group of first-year graduate students deserves special recognition for the effort and enthusiasm they demonstrated in assisting with our group visit events this year. They are a cohesive group who have proven to be terrific ambassadors for our graduate program. Prospective students unable to participate in the group events were given the option of an individual visit to campus.

We invite you, as alumni, to encourage prospective graduate students to consider pursuing their graduate studies at the UW-Madison.

Awards Honor Graduate Students

Rob Young won the **Joseph Dillinger Award for Teaching Excellence** in May, 2003. Rob has consistently taught and received top-notched evaluations in several physics courses!

Xianglin Ke and **Pavle Juranic** won the **Emanuel R. Piore Award**, which is presented annually to recognize excellence in the first year of graduate studies. Congratulations to Xianglin and Pavle!

For the first time, the **Jansky Award** was given to two recipients, for 2002 to **Christopher Watson** (Astronomy) and for 2003 to **Daniel Hooper** (Physics). This award is given annually to an outstanding graduate student pursuing an advanced degree with interest in astrophysics and astronomy.

NEW PHYSICS Ph.D.'S

August 2002

Todd Coleman
"Phenomenology of heavy-light mesons" (Olsson)
Visiting Assistant Professor, Gustavus Adolphus College Physics Dept.

John Kelly IV
"Surface and Interface Magnetization probed by soft x-ray resonant magnetic scattering" (Lagally)

Benjamin Wood
"Neutrino oscillations from astrophysical sources" (Barger)

December 2002

John Frandy
"An online separator and point source for oxygen-14 beta spectroscopic study" (Knutson)
Academic Instructor, UW-Whitewater, Physics

Rellen Hardtke
"The search for high energy neutrinos from gamma-ray bursts with the AMANDA detector" (Halzen)
Visiting Professor, Gustavus Adolphus College

Angela Laird
"Applying nonlinear time series analysis methods to functional magnetic resonance imaging" (Meyerand)
Research Imaging Center, San Antonio, Texas

Chien-ye Tsau
"Energy level statistics of disordered quantum dots" (Joynt)

May 2003

Bien Chann
"Studies of spin-exchange optical pumping" (Walker)
Technical Staff, MIT-Lincoln Labs

Daniel Hooper
"Beyond the standard model with astroparticle physics" (Halzen), Postdoctoral Research Associate, UW-Madison, Medical Physics, Madison, WI

Armen Kirakosian
"One-dimensional nanostructures on vicinal silicon surfaces" (Himpsel)

Masters Degree Recipients

August 2002	*December 2002*	*May 2003*	
Susana Castillo	Matthew Marcus	David Albers	Jason Simmons
Anthony Gerig	Michele Rosen	Mirela Cengher	Robert Young
Daniel Lucas		Damien Mathew	Hasan Yuksel
		Lindsay Rocks	

AWARDS HONOR UNDERGRADUATE STUDENTS

Congratulations to **Sara Childs** and **Dan Shumow**, who under the directions of **Brenda Dingus** and **Bob Joynt** respectively, have won a 2002–03 Hilldale Undergraduate research award.

Undergraduate/Faculty Hilldale Awards

L.R. Ingersoll Awards

L.R. Ingersoll Awards for distinguished achievement in undergraduate physics for Spring and Fall were awarded on May 9, 2003 at the Physics Banquet & Awards Ceremony at the University Club. Awardees included:

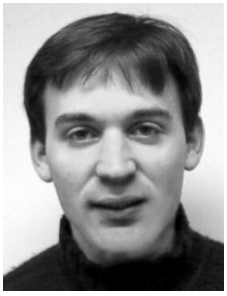
Spring 2001–02
Sattar Gojraty (103-104)
Meredith Bond (201-202)
Alysa Stafford (207-208)

Fall 2002–03
Nicole Meyer (103-104)
Tsz-Yan Chan (201-202)
Joseph Wildenberg (207-208)
Samuel Stambler(247-248)

Albert Augustus Radtke Scholarship

The 2003 Albert Augustus Radtke Scholarship for distinguished achievement in the study of undergraduate physics was awarded to several physics students, including **Benjamin Cain, James Braun and Kyle Swanson**.

Jim Braun writes: "This is my fifth year as an undergraduate at the University of Wisconsin-Madison, and I graduated in May with a B.S. in physics and mathematics. My interests include thunderstorms, electronics, and many areas of physics. Recently, I've focused on work with the AMANDA group, where I assisted Dr. Darryn Schneider with the installation of one of the most powerful computer systems in the state.


Jim Braun

After graduation, I plan to continue working with AMANDA as a graduate student under the supervision of Professor Albrecht Karle. My work this summer will primarily involve testing photomultiplier tubes in preparation for ICECUBE, which will employ a cubic kilometer of ice to detect neutrinos and other particles, as well as developing my own research interests with AMANDA."

Fay Ajzenberg-Selove Award

The 2003 Fay Ajzenberg-Selove Award for outstanding undergraduate women majoring in Physics, Astrophysics or Astronomy had two winners this year: **Katie Kern and Kristin Morgenstern.**

Katie Kern writes: "My career goal is to be an astronaut, and I have been working towards this achievement since the eighth grade. Coming into the U.W., I knew precisely what I was going to major in, and that was Astronomy-Physics and Physics. Upon arriving, I met Eric Wilcots almost immediately and started doing research under his guidance the following semester. So far I have worked on two major projects, one on HII regions, and the other on a lost group of galaxies. The second one has resulted in a paper to be published shortly.


Katie Kern

This summer I was accepted to an REU at Northern Arizona University and will be working at Lowell Observatory with Sally Oey, researching stellar properties of a star-forming region in the Milky Way. Next year I will work on my senior thesis, and in the spring, I will graduate. From there, I plan on continuing in research and applying to be an astronaut. Finally, I will most likely end up teaching at the university level."

And from **Kristin Morgenstern**: "I fell in love with physics during my advanced physics class in high school. Although I did not originally want to take it, the rewards have been well worth the challenge. My high school teacher instilled in me a deep love for physics, even teaching us modern physics, and a desire to learn more about it. My physics professors here have been wonderful in keeping my love of physics alive, and after having an exciting first semester in the new physics 247 class, I became a declared physics major. Next year I will likely declare math and astronomy majors as well.


Kristin Morgenstern

I have recently completed my second year of study here at Madison, and I currently work with Mark Eriksson and the quantum computing team. After my graduation, probably in May of 2005, I plan on entering a Ph.D. program in-

volving either quantum physics or particle physics. I would love to do research with a particle accelerator one day, and I also hope to teach at a university."

Liebenberg Family
Undergraduate Summer Research Fellowship

Our thanks go to the family of **Maude Liebenberg** and her son, **Don**. Because of their generosity, this Undergraduate Summer Research Fellowship was presented to **William Creighton Hogg** at the May awards banquet. This award provides funding to encourage undergraduates to become involved in summer research programs. Creighton will be working with Professors Dasu and Smith investigating and designing algorithms at both level-1 trigger electronics and high level trigger software for physics channels involving higgs production in vector boson fusion as well as developing analysis software in evaluating this physics.


Creighton Hogg

Dr. Maritza Irene Stapanian Crabtree
Undergraduate Award

This is the first year of this award, which stems from a bequest by William Crabtree on behalf of the late Dr. Maritza Irene Stapanian Crabtree to the University of Wisconsin to support tuition and fees based equally on merit and need for undergraduate students in Physics. This year's winners are **Tyson Mueller and Moire Prescott.**

Here is the story of **Moire Prescott**, who graduated in May 2003, with majors in Astronomy-Physics, Physics, and French: "In my 23 years, I have spent a lot of time hanging around Madison. I moved here when I was less than a year old, learned to walk on the bridge between Sterling and Van Vleck, attended James Madison Memorial High School, and when it came time to choose a college, I had no desire to leave! I did take a year to live in Aix-en-Provence, France, where I studied anything but Astrophysics – instead soaking up the language, literature, history, life in general, and traveling about Europe a large amount. Upon returning to Madison, I finished up my undergraduate majors in perhaps typical harried fashion, taking the GREs and writing a senior thesis on the stellar velocity dispersion in Magellanic Spirals with Professor Wilcots.


Moire Prescott

In the coming year, I will begin my graduate work in Astronomy at the University of Arizona Steward Observatory. With Tucson surrounded in all four directions by craggy, cactus-laden mountains topped with telescopes, I look forward to many observational opportunities. My first- year project will be on galaxy morphology and evolution, a topic that has intrigued me for some time. I have had a wonderful experience at UW-Madison – thanks to everyone who has been a part of it – and I am excited to try out a new life in a new locale!"

Bernice Durand Undergraduate Research Scholarship

Our second new award in its first year of presentation goes to undergraduate women or minorities majoring in or planning to major in Physics or Astronomy. It is made possible through the generosity of Associate Vice Chancellor and Physics Professor Bernice Durand, who established this scholarship to encourage young women and minorities to do research and continue their career in science. This year's winner is **Michal Ziv-El**.


Michal Ziv-El

Michal writes: "I got interested in physics in my freshman year here at the UW. Going into college I knew I wanted to study math and one of the sciences, so I took courses in a variety of scientific disciplines. Physics was what I found the most challenging and exciting, so I decided to major in it. Last summer I worked in the Observational Cosmology lab under Professor Peter Timbie. I look forward to continue working there again beginning this summer. As a soon-to-be senior I am beginning to think more seriously about what I want to do when I graduate. Right now, aside from considering going to graduate school for some area of physics, I am also considering a career in environmental law or environmental science. I am very grateful to have been chosen for this research scholarship and look forward to my final year as a physics undergraduate."

UNIVERSITY PHYSICAL SOCIETY

The Physics Club of University of Wisconsin-Madison, also known as the University Physical Society, can be found at:
www.sit.wisc.edu/~ups/index.html.
Check it out!

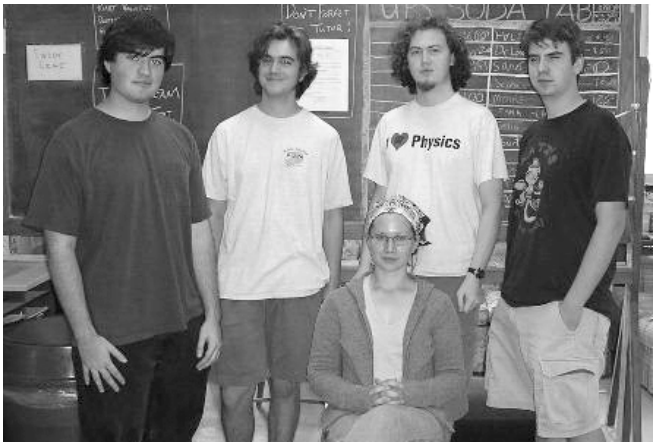
They feature information on:

- **Jobs**: Job postings in the UW Physics Department
- **Events**: Upcoming UPS Events
- **Officers**: Your UPS Officers
- **Research**: How to find research opportunities
- **About**: What is the University Physical Society?
- **Tutoring**: We offer volunteer tutoring
- **Humor**: Bad physics humor
- **Photos**: Physics Club memories

They also provide links to The American Physical Society and the Society of Physics Students.

The officers for 2003–04 academic year are:

Kyle Swanson (President)
Alane Petrowski (Vice President)
Chris Malec (Treasurer)
Chris Wilson (NetAdmin)
William Creighton Hogg (Secretary)



L to R, Creighton, Chris M., Alane (seated), Chris W., & Kyle

NORTHSIDE KIDS GET A GLIMPSE AT THE WONDERS OF PHYSICS

by George Zens (from Middleton Times-Tribune*, Thursday, January 30, 2003 edition)*

The English 19th century physicist Michael Faraday is credited with having been the first physicist to take his science out of the ivory tower and make it accessible to the interested lay public by giving demonstrations that were both entertaining and educational.

In the spirit of Faraday, the Northside Elementary PTA had invited University of Wisconsin physicist, Jim Reardon, to show some of the amazing, diverse and fun aspects of physics to the students. As Jim Reardon explained, there is a serious backdrop to the sometimes spectacular demonstrations: "It is important to get kids interested in science," not only to hopefully cultivate a new generation of scientists, but also to increase science literacy.

Judging by the applause and the excited enthusiasm of the audience, Reardon's physics show seems to have had a promising effect. Even though some of his explanations probably passed straight over many of the smaller kids heads, the accompanying experiments definitely fascinated them, as did the statement that "if you can ride a bicycle, you know all about inertia and the principles of motion."

The kids were thrilled when one of their schoolmates couldn't stop herself going round and round on a swivel stool or when Reardon used a banana frozen in liquid nitrogen (-320° F) as a hammer to pound a nail in a block of wood. They were amazed when he demonstrated the expanding power of gas by shooting a large cork out of a metal tube and when he showed them what sound looked like. The principles of conservation of energy were demonstrated by a bowling ball swinging on a rope (it took a brave volunteer to help with that one) and static electricity was shown to make hair stand up.

TEACHING IN GAMBIA

by Jillian Meyer, B.S. in Physics*, June 2001*

Some of you might remember me as one of the purple-haired girls lurking around Sterling Hall and showing up at the occasional colloquium. Since my undergrad days, my life has taken a turn in another direction — to The Gambia, where I am a Peace Corps Volunteer teaching at Gambia College. The two worlds could not be more different!

The Gambia is a tiny country in West Africa that is nearly surrounded by Senegal (check a map). The predominant religion is Islam, and the official language is English, though one will more commonly hear the local languages of Mandinka, Wolof, and Fula, among others. I've managed to become semi-proficient in the first two of these, but the others still elude me. Luckily, in the schools and administrative offices English is spoken, so I teach in English too.

In September 2001, I was assigned to teach physics at Gambia College in the School of Education (the college also has schools of nursing, agriculture, and public health). All students in the School of Education are studying to be teachers, either for primary school (grades 1-6) or junior high school (grades 7-9). All students have to take science, and my job is to give them enough physics background to be able to teach their own science classes.

Now I have to admit, out of all the classes I took as an undergrad, my least favorite was introductory physics. I've always preferred more adventurous topics like cosmology, quantum mechanics, and relativity, and while I appreciate the importance of the classical stuff, easy-to-measure macroscopic systems have never excited me. So imagine my chagrin upon receiving this assignment: I'd never taught before, and I'd been told to teach the class I most dreaded in undergrad. I also didn't realize how truly difficult this subject is to teach! Many of the concepts are difficult to grasp for American college students, and my students are products of the less-than-spectacular Gambian school system, being taught in their second or third language. I knew I was about to be challenged.

Jill in a lab where she conducts experiments with her students.

Classes have between 55 and 75 students, and the classrooms are barely big enough to fit them all in. I meet each class once a week for one or two hours. The school year is very short (October to June), there are many miscellaneous holidays throughout, and I find there's never enough time to teach everything they need to know. The syllabus that I am supposed to teach is very detailed, and since I can't do everything, I pick and choose what I think is most important. Additionally, a lot of my time is spent reviewing material that they should already have learned in high school, like algebra and trigonometry. Class here is a lot different from at UW, where every class had lectures, discussion, and labs.

The students range from fresh out of high school to middle-aged teachers who want to get their qualification certificates. Many students have poor math skills, and therefore have a lot of difficulty in physics. However, some students are brilliant and fly through everything (sometimes I think I should make THEM teach — they'd be better at it than I).

With the limited time I am given, I am lucky if I can do one lab each trimester. The science lab at the college is fairly well equipped, but a lot of the equipment is old and broken, or there are only one or two of each apparatus, which aren't enough to go around. Some students have never done a lab in their lives — a few didn't know the difference between millimeters and centimeters on the meter stick because they had never seen one before. Often, I have to take a step back when I realize I am making too many assumptions. But I can see how the students really benefit from the practical experience, and I hope it will

Jill (and her brother Paul behind the post) in front of a building of classrooms at Gambia College.

make them better teachers and give them ideas of things to do in their own classes.

I've gotten quite good at using locally available materials to do demonstrations. I've made beakers out of coke bottles, rulers out of sticks, prisms out of mirrors and water, and longitudinal waves out of chains of students. I hope to teach them that you don't need high-tech equipment and a fully stocked lab to do science — science is everywhere in all the things we do. Hopefully, they'll take some of my ideas to their classrooms and share them with their own students. When there are no materials in the schools, it is amazing what one can come up with in the local environment.

Now that I've adjusted to life here, I do enjoy teaching and watching my students progress. I have newfound respect for all the physics professors I ever had — teaching is hard! But it's also very rewarding, and it's been valuable for me to see this side of the coin, after being a student for so long. This experience has taught me so much, and I will carry it with me in all the things I do later in life.

Other classroom buildings at Gambia College

FOR UW SCIENTISTS, IT WAS A YEAR OF DRAMATIC DISCOVERIES

*by Ron Seely (*Wisconsin State Journal, *Thursday, December 19, 2002)*

During a year dominated by mostly bad news, scientists here at UW-Madison continued doing something that, ultimately, should give us plenty of reason for optimism. They kept asking that simple but durable question: Why?

As a result, if there is any one place to look for hope in assessing how we humans fared in 2002, it is probably in the many pages of journal articles churned out by UW-Madison researchers.

Scientists at UW-Madison last year uncovered remarkable secrets in surprising places…

Some of the most interesting research conducted by UW-Madison scientists in the past year is aimed less at understanding ourselves than it is at understanding our place in the universe. One such project has taken researchers to one of the most inhospitable places on Earth, the South Pole. There, they are building an instrument that will allow them to see, perhaps, deep into the universe and its mysteries.

The scientists are using the extremely clear ice beneath the South Pole to capture the flashes of light left by a little-understood and nearly undetectable particle called a neutrino. Unlike other particles, neutrinos barely interact with matter. As a result, they pass through space almost unchanged from the time and place of their origin and they carry messages that could tell us important things about how the universe works, how it started, and how it might end.

UW-Madison researchers are sinking bowling-ball sized light detectors more than three-quarters of a mile below the surface of Antarctica.

The collection of as many as 5,000 detectors will represent the largest single scientific instrument ever built — a monument to optimism if ever there was one.

"With the detector," said UW-Madison physicist Francis Halzen, "scientists will be able to trace neutrinos back to their cataclysmic beginnings — black holes and exploding stars. The neutrinos carry with them the largely unadulterated information that will allow scientists to make exact measurements of such phenomenon, measurements that will provide key insights into the broader principles that govern the workings of the universe."

"The hope" Halzen said, "is that a particle that is almost nothing may tell us everything about the universe."

ALUMNI CORNER

Tom O'Brian (Ph.D., 1991) is promoted to Division Chief of Time and Frequency at the National Institute of Standards and Technology in Boulder, Colorado. This position puts Tom at the center of some of the most important and exciting research in Atomic Physics today. Congratulations, Tom!

This year the Physics Department chose to honor two more alumni as Distinguished Alumni Fellows: **John T. Lynch, Jr.** (Ph.D., 1972), and **J. Anthony Tyson** (Ph.D., 1967). Both were present on May 9, 2003 at the University Club for the Physics Banquet and Awards Ceremony. They provided faculty, award winners and guests with very interesting examples of the many rewarding roads physics degree recipients may follow. **John Lynch** began graduate studies at UW in 1963 and was a compatriot and fellow student of Bob Morse, Max Lagally, Dale Meade, John Wiley and Don Reeder, among many others. He received his Ph.D. under Bill Walker in 1971. His career includes stints at Los Alamos and NASA. From 1982-2001, he was the program manager for the NSF Polar Programs Division. He began to interact with UW professionally in 1986 when we were considering putting muon detectors in the ice. The rest is history. Beginning with funding for projects like SPASE (South Pole Air Shower Experiment), AMANDA (1990), and finally working toward the successful funding of ICECUBE array, John has helped mentor important science projects to fruition. John Lynch's career is certainly one which has earned him the highest admiration and respect of his colleagues. "Among the other accolades that he has earned, John is truly one of the founding fathers of the field of Neutrino Astronomy," said Chair Don Reeder. It was a pleasure for the Physics Department to grant him a Distinguished Alumni Fellow Award in 2003.

Tony Tyson received his B.S. in Physics from Stanford in 1962 and a Ph.D. from UW in 1967, under the direction of Joe Dillinger and Dick Dexter. After a postdoc at the University of Chicago, and a visiting position in Israel, he joined Bell Labs where he's been since 1969. Tony is one of the world's leading observational cosmologists. He has led the development of cameras and analysis techniques for ground-based imaging of the distant, younger universe. His innovative pioneering work on galaxy counts and gravitation lensing has advanced understanding of the evolution of galaxies and of the Universe. "Tyson tackles problems at the heart of astrophysics with exceptional innovation and physical insight. His continuing contributions to the field of observational cosmology have left an indelible mark on the study of the distant Universe. Tony is indeed worthy of one of the Department's Distinguished Alumni Awards for 2003," said Reeder.

John Lynch

Both **Connie Blanchard** and **Jack Fry** joined the ranks of **Distinguished Faculty Fellows** in the Physics Department this spring. Banquet guests enjoyed hearing their interesting banter once again. We thought you might enjoy looking at their recent photos and knowing that they were enjoying their retirement years. Seeing them brought back many memories.

Tony Tyson

Whitman College's Associate Professor of Astronomy, **Ulysses J. Sofia**, who earned his Ph.D. in Physics from the University of Wisconsin-Madison in 1993, received the A.E. Lange Award for Distinguished Science Teaching from the college at commencement ceremonies on Sunday, May 25, 2003.

Sofia joined the Whitman faculty in 1998. He has been a National Research Council Fellow at NASA's Goddard Flight Center and was recipient of a DARA (German Space Agency) ASTRO-SPAS Award for contributions to the OEFEUS-SPAS II Space Shuttle Mission.

Connie Blanchard

Sofia's background includes more than a decade of work with the development, calibration and use of space-based instrumentation, including the Hubble Space Telescope. He continues to do research funded by NASA, and is currently co-investigator on a number of projects involving subjects such as the Hubble Space Telescope and the NASA/Far Ultraviolet Spectrograph Explorer. Since coming to Whitman, Sofia has involved Whitman students in much of his research and has led field trips to South America and East Africa to view solar and stellar phenomena. (Taken from Whitman College News Service)

Jack Fry

Max Mutchler, (B.S., 1988) was an Astronomy-Physics undergraduate student in the department from 1983-1988. He worked in the Plasma Physics Lab in the Hi-Bay from

1985-1988, helping to build the Madison Symmetric Torus (MST) — perhaps the most important educational experience of his life.

After school, Max went from MST to HST — the Hubble Space Telescope. Since 1990, he has been working at the Space Telescope Science Institute at Johns Hopkins University in Baltimore. He is looking forward to visiting campus again in a few weeks for the first time in many years.

Johannes Loschnigg, (B.A., 1992) majored in Physics and International Relations, (also Hoofer Sailing Club Commodore 1990-1991, and Hoofer Sailing Club windsurfing instructor 1989–1992). Now working as the Legislative Fellow for Science and Technology for Senator Lieberman in Washington D.C., he handles such issues as wireless broadband and spectrum, nanotechnology, semiconductor manufacturing, technology related to Homeland Security, and climate change.

Previously a Research Faculty at the University of Hawaii in the School of Ocean Earth Sciences and Technology (1998–2002), he received a Ph.D. in Astrophysical, Planetary and Atmospheric Sciences at the University of Colorado-Boulder, 1998.

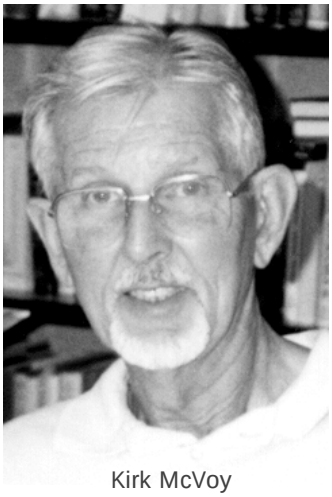
OBITUARIES

Richard Dangle, (Ph.D., 1963) died Wednesday, April 30, 2003 after a long and distinguished career. In 1965 Dr. Dangle accepted the position of assistant professor, where he also served as assistant dean, then associate dean of the College of Letters and Sciences at the University of Georgia. In 1973 he moved to Carrollton to become professor of physics and dean of the School of Arts and Sciences at West Georgia College, now the State University of West Georgia. Dr. Dangle retired in 1992.


Richard Dangle

His professional memberships included the American Physical Society, Sigma Xi, and the Association for the Advancement of Science, the American Association of University Professors, and the Honor Society of Phi Kappa Phi. He authored numerous scientific articles and abstracts, as well as, being awarded numerous NSF grants.

Professor **Kirk W. McVoy** died at age 75, Tuesday, Oct. 21, 2003, in Madison after a battle with cancer. He addressed the illness with grace and good spirits until the end and would want us to know that a healthy exercise regimen was a tremendous help. Two weeks before his death he went for one last canoe paddle with his wife on John Muir Pond.


Kirk McVoy

Professor McVoy studied at Oxford as a Rhodes scholar and received a Ph.D. from Cornell in physics. He was a well-published professor at the University of Wisconsin-Madison for 30 years, active in both research and teaching. He was invited to teach at many universities throughout the world, including engagements in Holland, Germany, France, and Israel. He had a lifelong passion for learning and was fluent in eight languages. One of his last works was translating a poem by Chilean Nobel Prize winner, Pablo Neruda, entitled "Alturas de Macchu Picchu."

He had a great love of the outdoors and became a passionate activist for outdoor causes such as the Wisconsin Waterfowl Association and the Wisconsin Wetlands Association. In his retirement, he divided much of his time between enjoying the water in one of his beloved canoes and trying to save the water and the land around it. One of his favorite places was one of the few remaining lakes in Wisconsin not surrounded by housing.

He is survived by his wife, Hilda; sister, Mary Boe; three children, Christopher, Larry and Annelies; and six grandchildren, Jacob, Ezekiel, Zoey, Samuel, Travis and Dylan.

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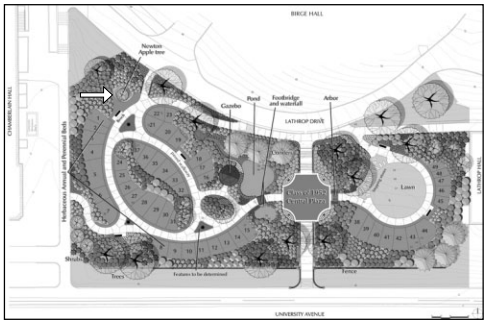
NEWTON APPLE TREE

The Newton Apple tree is witnessing an almost complete replacement of the UW Botany Garden where it is located.

The photographs below (and many others) of the construction can be found at: *www.botany.wisc.edu/garden/photo-gallery.html .*




Newton Apple Tree at the beginning of new Botany Garden construction.


New path takes shape on Western end of garden.


Close-up of the Newton Apple Tree

YOUR OPPORTUNITY = OUR OPPORTUNITY

Adequate or Excellent? Despite its antiquity, the question is still valid.

"As a UW-Madison Physics alumni or friend, you can make the difference! Please help us keep our teaching and research among the finest in the nation." You have seen these words many times over the years — I know I have. However, this year, as we make our annual appeal to you, there are important developments to share with you.

Don Reeder

First, the University of Wisconsin Foundation will soon be announcing they are in the midst of a new fund-raising campaign entitled, "Creating the Future." This new seven-year effort has completed its internal stages. This fall, the campaign has gone public, and alumni and friends will be advised of the opportunity to assist their fellows as the campus reaches toward its goal of one billion dollars. All contributions to the physics department during this time will be counted toward the final goal. On the flip side, we will piggyback on the Foundation's effort. If contacted by the Foundation during this time, please earmark your donation to the Department of Physics. Remember — all gifts are tax deductible.

Meanwhile, back in the department other exciting things are happening. We are delighted to welcome back "retired" Jean Buehlman, our former Instructional Program Manager, who will symbolize our commitment to improving our alumni relations. As our alumni relations specialist, she can be found at buehlman@wisc.edu or by leaving a phone message at (608) 262-4829. Jean has initiated our new mini-newsletter, which can be found on the Web (see the department home page www.physics.wisc.edu) and is designed to inform alumni and friends about the happenings in the department. She also is the physics "point" person on all other facets of interest to our alumni and friends.

Most importantly, your faculty have made a commitment to increase our general (unrestricted) fund, and to recognize this change, they have renamed the fund, "The Physics Newton Fund." (Newton's apple tree outside the department is an ever-constant reminder of the fund and its uses!) This fund is by far the most useful in smoothing out the bumps and potholes caused by the decrease in state and federal dollars that has become of ever greater concern. We can flexibly adapt to the changing needs with these funds — whether to attract top faculty and/or graduate students; to sponsor special events, e.g., our "Honors Banquet," at which we recognize the enormous contributions of our outstanding graduates, undergraduates, alumni and former faculty members; or to provide opportunities to travel and participate in professional meetings.

Also new this year is the provision of two ways to donate to Physics — by paper or by electrons! You can clip the donation page, mark the fund of your choice, include information on the gift and mail it. Or, for electronic giving, go to the web page at www.physics.wisc.edu/giving/index.html and complete the form. You can select for your gift to go to the **Newton Fund**, or to the fund of your choice. Much more detailed information regarding the funds, their history and intent can be found at this web site. We thank you for your interest in UW Physics and invite you to visit us at any time!

Don D. Reeder

Don D. Reeder, Chair

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We thank you.