THE WISCONSIN PHYSICIST

Vol. 6, No. 1 *A Newsletter for University of Wisconsin Physics Alumni* *Fall, 1999–2000*

COME & CELEBRATE

THE 100TH ANNIVERSARY OF THE FIRST PHYSICS PH.D.

October 8 & 9, 1999 in Madison, Wisconsin

(See page 26 for Program details.)

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FROM THE EDITOR

by Jean Meyer Buehlman

CELEBRATION! And, you, of course, are invited to share in the fun! The most important activity of this newsletter is to remind you of the October 8th and 9th, 1999 Celebration of 100 years since the first Physics Ph.D.

The schedule of events is very interesting, with speakers sharing views on the past, present and future of physics. In addition to other daytime activities, there will be a banquet held on Friday evening, October 8th. Saturday, October 9 will feature activities at historic Sterling Hall, including tours and the dedication of Room 1300. Best of all, it will be a time for our alumni to reconnect with their roots, network with each other, and get a glimpse of today's students — tomorrow's leaders.

Jean Buehlman, Editor

Who was the person that caused all of this excitement? His name was **John Cutler Shedd**. He received his Ph.D. in 1899, the first in our recorded history. It was entitled "An interferometer study of radiations in a magnetic field." From these humble beginnings, to present time, 1,015 graduate students have received Ph.D's in the department. Of those 1,015 degrees, 965 have been made to men, while 50 have been awarded to women.

We hope that you will make plans to attend our celebration. Currently we have heard from 200+ alumni who have expressed an interest in attending. Come and meet our retired, current, and new faculty and share your ideas on the future of physics with us.

Updated information will be posted on the physics web site at www.physic.wisc.edu.

If you returned your "blue card" which we sent to you a few months ago, you are already on our current mailing data base for information on this activity. If you didn't mail in your card, but want to get on the 100th Anniversary Celebration list, just email buehlman@facstaff.wisc.edu now. See you soon. ❑

Chairman's report for 1998-99

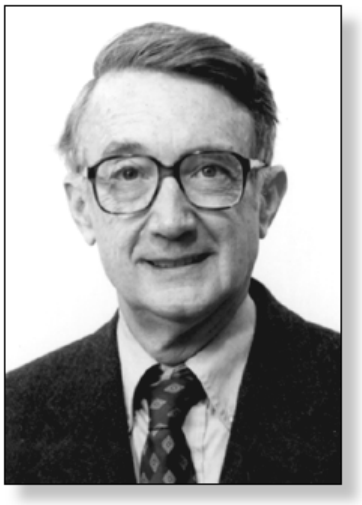
I have now completed my second year as Department Chair. My, how time flies. Last year's report was remarkably prescient about what took place this year. Some things were even more exciting than I had anticipated.

This was a banner year for recruiting. Yibin Pan joined the faculty as an assistant professor in experimental high energy physics. Starting next fall there will be three new assistant professors in the Department. Mark Eriksson joins the Department in condensed matter, as part of the nanosystems interdepartmental hiring initiative; Mark Saffman will join the Department in experimental atomic physics; and Albrecht Karle will be a new assistant professor in neutrino astrophysics. There will also be a new full professor, Gelsomina DeStasio, who joins the Department as part of the biophotonics interdepartmental hiring initiative. These initiatives were approved for recruiting last fall by the Chancellor's office. Eriksson, who was a UW undergraduate, comes to us from Bell Labs, Lucent Technologies. He is interested in new types of scanning probes, molecular electronics, and low density two dimensional electron systems. He will have labs both in Sterling Hall and in Engineering. Saffman comes to Madison from Denmark, and is interested in nonlinear effects in quantum optics involving photons and atoms. Karle joined the AMANDA group in Madison as an assis-

Features:

tant scientist in 1977 from DESY in Germany, and will continue to work on AMANDA. DeStasio, who comes to us from Rome, but who has worked with the x-ray beams at the Synchrotron Radiation Center in Stoughton for several years, will continue to study questions of biological significance with x-rays. She will have a lab for instrument development and sample preparation in Chamberlin Hall. She is presently interested in chemistry of the brain in relation to Alzheimer's disease and brain cancer therapy.

These are the confirmed additions to the faculty. A second addition to the AMANDA group at the tenure level awaits the approval of the Physical Sciences Divisional Committee. The Chancellor's office approved in December, 1998, a sesquicentennial hiring initiative for two positions, one in Physics and the other in Astronomy, in the field broadly defined as cosmology. Recruiting for this position got a late start, but we anticipate that the Physics position will soon be filled with a candidate who will join the faculty either in January or August of 2000. The Department plans to seek other new faculty in the fall of 1999.



Lee Pondrom, Chair

Last year the Department FTE count stood at 45. The addition of seven new people will have a big impact on the Department structure. High energy physics is a traditionally strong activity, to which Pan will add new, younger talent. Similarly, the Department has an active group in atomic physics, to which Saffman will add new thrusts in a rapidly developing field. Condensed matter is also strong, and has good links with Engineering, so Eriksson will fit in easily. Astrophysics is a field which has been gaining strength in the Department, and this year's hire of three people will essentially double its size. There are close ties between high energy physics and astrophysics, both intellectually and technologically. Biophysics has been dormant in the Department for more than a decade, but is a growing field of research, and an important one for both undergraduate and graduate education. DeStasio's appointment will strengthen ties between Physics and the large presence of the life sciences on the Madison campus.

While I think it is fair to say that faculty recruiting, which was in a deep freeze for so long, is beginning to open up across most departments in major universities, Physics at UW Madison has been exceptionally fortunate to have so many new hiring opportunities in one year. Two faculty members were granted emeritus status this past year, Robert March and Murray Thompson. We will miss them on the faculty, and we wish them well.

The Department review by a campus committee chaired by Jay Gallagher in Astronomy has been under way since this spring. The committee met with undergraduate and graduate students, each research group separately, and the chair and council. Their report is expected soon.

This year was a banner year for recruiting.

The new Pharmacy building near Nielsen Tennis Stadium and University Hospital at the west end of campus is now well under way. Pharmacy will move out of Chamberlin Hall by late 2000 or early 2001. The remodeling of Pharmacy space in Chamberlin for occupancy by Physics is then planned to commence. The Department is working on creating a footprint for its space needs in the newly remodeled Chamberlin space. On this time scale, work will start on the vacant space in Sterling Hall in 2003 or so.

The Department has continued the TV broadcasts to other UW campuses this past year, albeit on a reduced scale. The funding from Central Administration ran out, and the costs have been borne by each campus individually. The technical quality of the broadcasts has improved, and the impact on the local audience has been minimized. We do not yet know whether there is enough interest to continue the broadcasts next year.

The Department participated in an open house at the Atlanta American Physical Society meeting on Tuesday evening, March 23, 1999. This was a very successful reception. Many UW alumni and friends dropped in to say hello and meet old acquaintances. I want to thank everyone who took the time to come to the reception and contribute to its success. Don't forget the local symposium this fall, October 8 and 9, 1999, here in Madison. This will be a two day affair for all of the friends of the Department in observation of the 100th anniversary of our first Ph.D. in Physics.

Next year's entering graduate class will be 23 students, after a vigorous recruiting effort. This is smaller than the class entering in 1998. Attracting and keeping qualified

graduate students remains one of our top priorities. The demand for research assistants remains strong in the various research groups, and the new staff hires are going to be looking for new students as well. The drop in undergraduate majors nationwide is one factor in the decrease of applicants from US universities. In this regard the Department is looking to strengthen its own undergraduate major program.

The Department has taken a close look this past year at the undergraduate program in general, and the introductory courses in particular. One proposal which is under consideration is the rearrangement of introductory physics so that modern physics ideas are introduced earlier in the curriculum, in order to make the course content more interesting. Computerization of the laboratories continues to place a heavy work load on those involved.

I hope this gives you a flavor of what has been happening around here this last year. Best wishes to you all. ❑

Lee G Pondrom

Lee Pondrom
Professor of Physics
Chair of the Physics Department

FACULTY RESEARCH AWARDS

James Lawler Receives Named Professorship

Congratulations to James Lawler who became the Arthur and Aurelia Schawlow Professor of Physics on July 1, 1999.

Jim Lawler

Arthur Schawlow was the J. G. Jackson-C. J. Wood Professor Emeritus of Physics at Stanford University. Born in Vernon, NY in 1921, he married Aurelia Townes in 1951. He was educated at the University of Toronto. He was known worldwide for his work in optical and microwave spectroscopy and especially for his contributions in the invention of the laser. Applications of the laser including laser-fiber optic communications have had an immense and profoundly beneficial impact on society. He was one of the "towering giants" of twentieth century science. Aurelia was his spouse and companion throughout his adult life.

Jim Lawler has been on the UW Physics faculty since 1980. He was educated at the University of Missouri, receiving a B.S. in 1973, and at the University of Wisconsin, receiving an M.S. in 1974 and Ph.D. in 1978. Professor Lawler worked as a Research Associate at Stanford University with Professors A. L. Schawlow and T. W. Hansch from 1978 to 1980. His current research interests are in two areas, both of which involve plasmas and spectroscopy. He is developing and using laser and synchrotron radiation techniques for determining accurate absolute atomic transition probabilities. He is also developing and using spectroscopic techniques to study weakly ionized plasmas. His research has helped to make atomic spectroscopy more quantitative in astronomy and other fields. It has also led to a deeper understanding of weakly ionized plasmas used for lighting and semiconductor fabrication. He is a Fellow of the American Physical Society and the Optical Society of America. For his research, Professor Lawler has received the H. Q. Fuller Award from the University of Missouri (1973), the W. P. Allis Prize of the American Physical Society (1992), and the Penning Award from the International Conference on Phenomena in Ionized Gases (1995).

Cary B. Forest Awarded Packard Fellowship

Assistant Professor Cary Forest has been awarded a David and Lucile Packard Fellowship for Science and Engineering.

Cary Forest

Forest received his B.S. in 1986 in AMEP at the University of Wisconsin-Madison, his M.A. in 1988 and his Ph.D. in 1992 in the area of Astrophysical Science-Plasma Physics from Princeton University. Forest joined the UW Madison faculty as an Assistant Professor in 1997. Prior to that

time he had been a Senior Scientist at General Atomics in San Diego, CA.

His current research is focused on current and magnetic field generation in plasmas, phenomena of importance to understanding many aspects of space physics, astrophysics and geophysics. Last year, Forest was the winner of the Sloan Foundation Fellowship and a Research Innovation Award. He has been teaching Electromagnetic Fields (322) and Introduction to Plasmas (525) during the past academic year.

Wes Smith Recipient of WARF Kellett Mid-Career Faculty Researcher Award

The Graduate School Research Committee announced that Professor Wes Smith is the recipient of a five-year Kellett Researcher Award, which began on July 1, 1999. With this award the University recognizes proven potential and provides an opportunity for critical judgment by the winner on the best strategies for continued development of their outstanding research program. The Research Committee expects the researcher to make imaginative use of these funds to make a major impact.

Wesley Smith

Wes Smith joined the faculty in 1988. His prior awards include a Vilas Fellowship, a Presidential Young Investigator Award, an Exxon Education Foundation Award, and an Outstanding Junior Investigator Award. He became an APS Fellow in 1997. ❑

Faculty News

Promotions

Duncan Carlsmith Promoted

Congratulations to Duncan Carlsmith who will become a full professor in fall 1999.

Carlsmith joined the faculty in 1987 as an Assistant Professor and received tenure in 1993. He received his B.S. in 1979 from Yale University and his M.S. (1980) and Ph.D. (1984) from the University of Chicago. His current research activities include work at the Collider Detector Facility at Fermilab and the Compact Muon Solenoid Collaboration at CERN.

Duncan Carlsmith

Professor Carlsmith has taught many different courses at UW-Madison ranging from 107 "Physics for Poets," for which he is developing a set of web pages to augment the text, to 535 "Introduction to Particle Physics" for which he is refining lecture notes. He has served on the Faculty Advising Service of the College of Letters & Science for the past several years and acts as the Faculty Minority Liaison in the department.

Sabbaticals

Zeppenfeld Receives 99–00 Sabbatical Award

As a follow-up to his Vilas Associateship (1998–2000), Professor Dieter Zeppenfeld was the recipient of a one year (1999–2000) sabbatical award from the College of Letters and Science. Zeppenfeld plans to pursue research in theoretical particle physics, specifically the theory of strong interactions (QCD), and to redesign Physics 832 and a special topics course. Zeppenfeld received his Ph.D. at the University of Munchen, Germany in 1984 and became a full professor in the department in 1994. Congratulations!

Dieter Zeppenfeld

Retirements

Professor Robert March Retires

Robert March came to Wisconsin from the University of Chicago in 1960 as a postdoc with Professors Walker and Erwin. He joined the faculty as an Assistant Professor in 1962, and joined with Professors Camerini and Fry, and later Cline and Reeder. He was promoted to Associate Professor in 1965 and Full Professor in 1971. Highlights of his research career included participation in the discovery of the rho meson, the first direct test of time reversal invariance in weak interactions, and development of a hyperon beam at Fermilab. He later switched to particle astrophysics.

Robert March

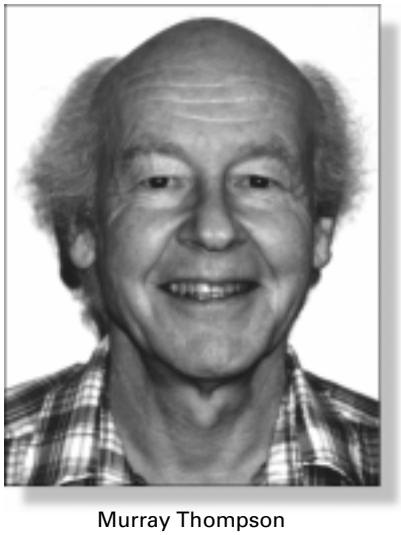
In the areas of teaching and outreach March made some noteworthy contributions. He created Physics 107, and his award-winning text *Physics for Poets*, which has gone through four editions and been translated into six foreign languages, helped establish such courses at other universities. He also taught in the Integrated Liberal Studies (ILS) Program, and served as Chair of that program for six years.

Of his more than 240 published articles more than 100 were written for a popular audience. His frequent appearances on public radio and TV broadcasts, and occasional popular lectures, have reached a wide public. He is a two-time winner of the American Institute of Physics award for the best book or article by a physicist or astronomer for a general audience, and a recipient of a Distinguished Teaching Award. He retired at the end of the spring semester, but intends to remain active in University life.

Professor Murray Thompson Plans December 1999 Retirement

Murray Thompson came with his wife, Megan, from Auckland, New Zealand in December of 1962 to be a Research Associate with Bill Walker and Al Erwin. Murray and Megan survived the transition from a subtropical summer to a continental winter. Murray was involved in a number of bubble chamber experiments and gathered a team to make an automatic system (SATR) to recognize and measure the bubble chamber films.

Murray was Director of the Physical Sciences Laboratory for 13 years and was personally involved in the design of a number of projects. One project was the design and construction of a small version of the VAX computer called the PSL1. This work was funded by Digital Equipment Corporation. Another project was the design and fabrication of an X-ray Microbeam which used a fine beam of X-rays to recognize and follow about eight tiny gold pellets on a subject's tongue as he/she spoke particular phrases. This used both an efficient detector and an efficient recognition algorithm to operate with a negligible dose to the subject. Another project was to design and build a number of Time to Digital Converters with 1 nsec resolution for the Fermi National Laboratory. Murray also hosted and worked with electrical engineers from Brazil and China.



Murray Thompson

He has worked with Computer Scientists to explore a high bandwidth network made by AT&T across the USA to find any fundamental limitations in the transmission of scientific data which might be caused by the finite transmission times. This work was funded by Darpa, AT&T and HP.

Murray built a team to design and build a high bandwidth Router to interface high bandwidth Local Area Nets with Wide Area Nets. This work was funded by HP.

He has worked with Medical Physicists on a "Tomotherapy" system to give X-ray dose therapy to patients with tumors. The system was designed by Rock Mackie and is intended to deliver precise doses to tumors with minimal dose to nearby organs. The first unit will be delivered to the UW Hospital.

More recently, Murray edited the notes "Applied Optics" written by Ed Miller and Fred Roesler, for the Physics 625 class, into a thick book with index, table of contents and with text files which can be easily edited further if needed in the future.

Murray and Megan had two sons in Madison, Bruce and David, who now live in Seattle.

Murray and Megan will retire to live again in Auckland where they have kept track of many old friends. The tem-

perature is seldom beyond 5 to 30 Celsius and the country now uses only metric units. They expect to be more active in the hills, sea, forests and beaches than they were in the US and Canada. Murray hopes to dabble with Neural Nets to understand more about learning in brains. Retirement will not be restful!

Murray and Megan say they will miss Madison and people here and hope to visit Madison during excursions to visit their sons in Seattle. Murray will miss working with both the faculty, staff and students in Physics and the craftsmen at PSL. Both Murray and Megan hope to see anyone from Physics or PSL who visits Auckland.

Obituaries

Myron L. Good, 1923–1999

Myron L. Good, a pioneer in developing the underpinnings of modern particle physics and in forging new particle physics facilities, died February 26, 1999 at his home on Long Island, New York of heart failure. Good, known almost universally as Bud, was emeritus professor at the State University of New York at Stony Brook, having led the experimental particle physics group there from his arrival at the fledging campus in 1967 until his retirement in 1992. His contributions to physics spanned an extraordinarily broad range.

Good was born on October 25, 1923 in Buffalo, New York, and did his undergraduate work at the University of Buffalo and Cornell University. He received his Ph.D. from Duke University in 1951. He then worked as a Research Scientist in the Alvarez group at the then University of California Radiation Laboratory until 1959, during the period of many landmark observations using bubble chambers. In 1959, he joined the physics faculty at the University of Wisconsin-Madison. While here, with W. Walker, Good introduced the idea of diffraction dissociation and worked out the kinematic properties of this process by which high energy beam particle waves can diffract into states of the same quantum numbers, but different final particle composition. In 1967, Good moved to Stony Brook to establish a new experimental group there.

Robert G. Sachs, 1916–1999

University of Chicago theoretical physicist Robert G. Sachs, 82, who helped create the Argonne National Laboratory and served as its director from 1973–1979, died in Chicago on April 14, 1999, of complications following surgery.

Sachs established himself as an influential scholar, scientific policymaker and research administrator early in his career. He taught nuclear physics to Hyman Rickover before the future admiral went on to establish the US nuclear submarine program. He also helped create Argonne in 1946 and 1947 as director of the Theoretical Physics Group of the University of Chicago's Metallurgical Laboratory. The Met Lab gave birth to the atomic age in 1942 when it created the first controlled nuclear chain reaction.

Sachs was a faculty member at the UW Physics Department from 1947 to 1964. He was associate director at Argonne from 1964–1968. In 1968, he returned to a full-time academic career in Chicago, but continued his research administration duties. He served two terms as Director of the University's Enrico Fermi Institute, from 1968–73 and 1983–1986. An Emeritus Professor since 1986, Sachs continued an active research program until his last days. He particularly sought to understand the origin of the imbalance between matter and antimatter in the universe, a surprising phenomenon discovered in 1964, and the physics of time reversal.

Sachs was born May 4, 1916 in Hagerstown, MD. He received his Ph.D. in 1939 from Johns Hopkins University where he worked with Maria Goeppert Mayer, who later became a Chicago faculty member and co-winner of the Nobel Prize in physics. ❑

Staff News

Rick VanDerGeest has joined the electronic shop as an electronic technician.

Karen Mattison, instrument maker in the physics machine shop, has recently retired.

Jean Meyer Buehlman was the recipient of one of seven Academic Staff Excellence Awards presented on the UW Madison campus annually. Jean received the Alumni Association Excellence Award for Leadership. This was the ninth year for the Awards Program for academic staff which recognizes exceptional individuals and their contributions to the University of Wisconsin-Madison. Jean was recognized for her work in Physics as Instructional Program Manager and for envisioning, planning and organizing a highly successful academic staff mentoring program for the UW Campus.

Sunggi Chung, a Senior Scientist, working with Professor Chun Lin, died unexpectedly on June 22, 1999. Sunggi has worked with Professor Lin for more than 30 years. He started working at the UW in 1972. He was a fixture in left field for the Physics Dept. softball team for

many years. He was an avid bridge player and enjoyed UW Hockey and Volleyball.

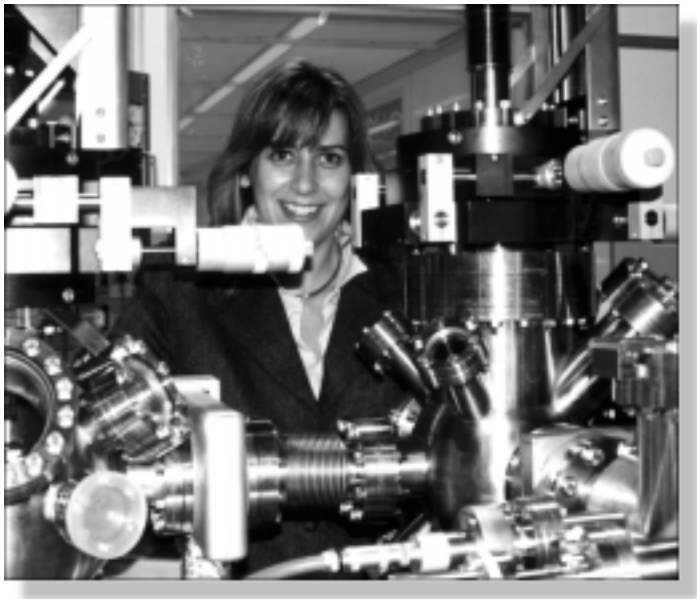
Sue Hessen recently joined the department as a program assistant for the atomic and solid state area office.

Congratulations to **Barb Schutz**, graduate secretary, **Bill Klabunde**, undergraduate secretary, and **Jesse Prochaska**, financial specialist, on their recent classified promotions in the department.

Carla Schmidt, payroll and benefits specialist, transferred to Physical Plant in July 1999. ❑

New Faculty Members

Several new faculty members will be joining the department beginning with the 1999–2000 academic year. They include:



Pupa DeStasio with MEPHISTO, the spectromicroscope she designed and built, installed and operational at UW-SRC. It currently holds the world record resolution of 20 nm.

Gelsomina "Pupa" DeStasio, Professor

Professor Gelsomina De Stasio received her degree in Physics from the First University of Rome in 1987. She has been employed as a Permanent Staff Scientist at Institute for the Structure of Matter of the Italian National Research Council, and of the Institut of Applied Physics of the Ecole Polytechnique Federale de Lausanne, in addition to being principal investigator of the MEPHISTO project, jointly funded by the Fonds National de la Recherche Suisse, the EPF-Lausanne, ISM-CNR Rome. Professor DeStasio has also been an Honorary Faculty Staff Fellow at the University of Wisconsin Synchrotron Radiation Center since May, 1994. Professor De Stasio will start a new biophysics research and teaching program under the biophotonics interdisciplinary initiative.

Mark Saffman, Assistant Professor

Mark Saffman received his B.S. degree from CalTech in 1981 in Applied Physics. During the eighties he worked in industry on optical measurement techniques, including development of phase Doppler anemometry. He received a Ph.D. in Physics from the University of Colorado at Boulder in 1994 working on nonlinear optics in the group of Dana Z. Anderson. From 1994–1999 he held the position of senior scientist at Risø National Laboratory in Denmark where he worked on nonlinear, quantum and atom optics, as well as turbulence measurements in plasmas. From August, 1999 he will join the atomic physics group at Madison.

Mark Saffman

Current interests encompass experimental and theoretical aspects of optical soliton and vortex dynamics, spatial instabilities, pattern formation, and linear and nonlinear atom optics. Work is being conducted in a variety of nonlinear optical media, including quadratically nonlinear crystals and hot and cold atomic vapors.

Albrecht Karle, Assistant Professor

Albrecht Karle will become an Assistant Professor in the Physics Department in fall 1999. He will begin his teaching duties in the Spring 2000 semester.

Albrecht received his Ph.D. at the University of Munich, Germany in 1994. During his Ph.D. studies he developed a new detector for high energy gamma ray astronomy at the Max-Planck-Institute for Physics in Munich. The observation of gamma rays from active galaxies deepened his interest in the field of Astroparticle physics. He also holds a baccalaureate in Philosophy from the Hochschule for Philosopie, Munich.

At DESY he worked in the field of high energy neutrino astronomy, first participating in an experiment

located at Lake Baikal, Siberia, and then in the Antarctic Muon and Neutrino Detector Array (AMANDA) experiment.

Albrecht Karle

Albrecht Karle came to UW-Madison as an Assistant Scientist in 1997. Here he has concentrated on neutrino astronomy with the 10 string AMANDA array, and the development of the next generation of optical sensors for kilometer scale neutrino observatory at the South Pole.

Mark Eriksson, Assistant Professor

Mark joins the department this fall after two years as a postdoctoral member of the technical staff at Bell Laboratories. While at Bell Labs, Mark's research focused on strongly interacting two-dimensional electron systems.

Mark Eriksson

He received his Ph.D. from Harvard University in 1997. His undergraduate degrees in physics and math were from the University of Wisconsin-Madison in 1992. Mark's research at the UW-Madison will be centered on semiconductor nanostructures, molecular electronics, and biophysics. (Editor's note: As an outstanding physics undergraduate, Mark won the Ingersoll Prize in 1989 and the Albert A. Radtke Award in 1992.) ❑

FACULTY RESEARCH

Big Bang, Big Chill: A Trip to Dome C, Antarctica

by Lucio Piccirillo & Peter Timbie

The University of Wisconsin has long had a strong presence in Antarctica. The South Pole is the site of the AMANDA experiment, a UW-led effort to open our eyes to neutrinos from astrophysical sources by using the underlying ice sheet as a giant detector. Also, the UW's Space Science and Engineering Center manages a network of Automated Weather Stations sprinkled across the continent. These stations tell us that the atmosphere is exceptionally cold, dry, and stable — perfect for astronomical observations. Furthermore, sites on the Antarctic Plateau, such as the South Pole, are at elevations of over 3,000 m. When combined with the fact that Earth's atmosphere is thinner at the poles (and bulges at the equator), these plateau sites have a pressure altitude comparable to that of Mauna Kea (3,750 m), home of the world's most powerful optical and infrared telescopes. Atmospheric stability and transparency are consistently better in Antarctica and make it the best observing spot on the planet.

All these qualities have particularly caught the attention of scientists making precision measurements of the 2.7 K cosmic microwave background (CMB) radiation. The CMB is the thermal radiation left over from the Big Bang, which bathes the Earth nearly uniformly with microwave light. The CMB is made of the oldest photons in the universe. Faint differences in the intensity of this radiation across the sky give us a picture of the very beginnings of structures like superclusters of galaxies when the universe was only 300,000 years old. Patterns in the radiation can tell us a host of cosmological parameters, such as the density of the universe or its expansion rate. These intensity differences are tiny — only a few parts in 100,000 of the average faint glow. Further primordial details are expected to be encoded in a slight polarization of the CMB, at the level of a few parts per million of the 2.7 K glow. Measurement of these small signals has driven observers to space probes, scientific balloons, and Antarctica.

Although the US has considerable infrastructure at the South Pole itself, including a new station, Dome C is higher and has lower wind speeds. And, unlike the South Pole, Dome C's latitude of -75 S, means that

telescopes that view the zenith are able to scan over a considerable amount of sky. For observations of the CMB, this feature is a significant advantage over the Pole. To test the site further, Dr. Lucio Piccirillo, who has been visiting Wisconsin for the past two years from the Bartol Research Institute at the University of Delaware, led an expedition to Dome C last December and January. The Italians and French have established a research base there which houses about 50 scientists and support staff for 10 weeks each year, during the Antarctic summer. In 2001, this base will open year-round for 30 hardy souls. Piccirillo, assisted by graduate student Slade Klawikowski and freshman Mark Supanich, developed an unusual telescope to search for CMB "anisotropy" and to test the site. The trip was full of excitement and some danger, but was ultimately successful.

Dr. Piccirillo at Dome C with the "Big Plate" instrument in the background.

"Big Plate" at Dome C. A 1.5 m diameter reflector telescope points at a large steerable mirror, which sweeps the beam across the sky to make a map of the 2.7 K cosmic microwave background radiation. At the far right, behind the telescope, is a cryostat that cools the detectors to 300 mK.

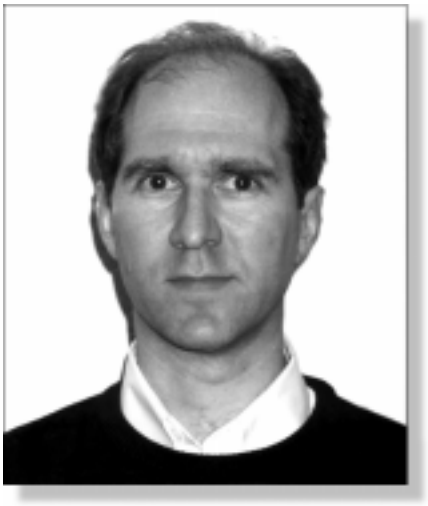
Any trip to Antarctica is a logistical challenge. One first flies by commercial airline to Christchurch, New Zealand, a journey of some 24 hours from Madison. There, staff at a center operated by the NSF issue Extreme Cold Weather gear, similar to that used by the military in cold places. We're talking about lots of thermal underwear and face-masks and fur-hooded red suits. The next step is to board a propeller-driven military transport plane (C-130) bound for the Antarctic coast. In the case of Dome C, the landing spot is Terra Nova Bay, an Italian research base, and it takes 8 hours to get there. These planes are designed to carry cargo, not people, so accommodations are rustic at best. The choicest seat is often on top of a crate of bananas. Whether or not there is a toilet on board is a closely-guarded military secret.

Terra Nova is a well-outfitted spot with machine shops, computer facilities, and room for 150 people. Best of all, it has the best chef on the continent. Here, Piccirillo unpacked and tested the instrument and prepared for the final leg of the journey. Dome C is reached by a small prop aircraft called a Twin Otter. Heavy equipment and fuel arrives by "traverse," a cargo train on skis pulled by a snow-cat that takes weeks to make the trip. People and light equipment take the plane. This fall, the US will send a C-130 transport to Dome C, marking the beginning of increased air contact with the site.

At Dome C, Piccirillo spent two weeks re-assembling the instrument and observing the CMB. Preliminary analysis of the data shows the observing conditions to be superb. On most days, the fluctuations in the atmosphere are too small to measure. Since these data were taken during the Antarctic summer, when the sun is out all day and drives the temperature up to a balmy -28 C, the site is extremely promising for year-

round observations; the place is plunged into darkness for 6 months out of the year and the temperature plummets to -65 C.

We are planning another visit to Terra Nova this fall, and have proposed to the NSF to develop a remotely operated observatory dedicated to CMB observations at Dome C. This instrument is now under construction at UW's Pine Bluff Observatory, 10 miles west of Madison, under the care of graduate students Brian Keating and Chris O'Dell and undergrads Kip Hyatt and Jessie Sincher, and recent grad Nate Stebor. The plan is to treat this experiment like a space probe, that must be tested thoroughly ahead of time to work unattended for months at a time. Luckily, we have at our disposal the best polar simulator imaginable; if we can get this instrument to work through a Wisconsin winter, then it will have no trouble operating unassisted in Antarctica. ❑



Peter Timbie

Searching for the "Holy Grail" in Lighting Science Research

by James Lawler

Atomic Physics at UW-Madison includes a variety of research activities, some of which are quite fundamental and some of which could be described as applied science. Like my four other faculty colleagues in Atomic Physics, I have an appreciation for scholarly research whether or not it has immediate benefits to society. My group works on problems in low temperature plasma science and in spectroscopy. We use our knowledge of plasmas to produce samples of species for spectroscopic studies, and we use our knowledge of spectroscopy to diagnose plasmas. We achieve a degree of synergism by having substantial experience and capabilities in two different areas. Some of our projects are laboratory astrophysics projects while others are actually joint projects with private industry. The remainder of the article describes our research activities with private industry.

The depletion of fossil fuels and the increase of "Greenhouse Gases" in the atmosphere are serious challenges for humanity in the Twenty First Century. Our country is also likely to face some economic and political difficulties due to increasing energy imports. Lighting is one part of the overall energy budget of our country and the world. Lighting consumes about 20 to 25% of the electrical energy generated. New technologies under development today have the potential to reduce energy consumption due to lighting while protecting the environment and enhancing our quality of life.

Lighting is one part of the overall energy budget of our country and the world.

A few terms should be defined before I present a description of our research in lighting science. A lumen is a measure of useful visible light. An imaginary light source which produces pure green light with 100% energy conversion efficiency would have a luminous efficacy of 680 lumens per Watt. Blue and red light sources yield a lesser number of lumens per Watt. Ultraviolet and infrared radiation yields zero lumens per Watt. The wavelength dependent conversion function from Watts of radiation to lumen is the photopic eye response curve.

The imaginary green lamp described above would not be suitable for indoor use, but might be acceptable for street lighting. Light sources for indoor use need to have a mix of colors approaching white light. Commonly used measures of color are the Color Rendering Index (CRI) and the Color Temperature. The Color Temperature is a measure of the balance of blue verses red light from the lamp. It is the temperature of "black body" with a similar balance of blue to red light. The CRI is a more subtle number representing the "completeness" of the spectrum from a lamp. In a black body spectrum all wavelengths are present and objects which reflect specific wavelengths will appear to have their natural color. A hot black body has a CRI of 100. A lamp which has gaps in its spectrum will make some objects appear to have an unnatural color; the lamp will have a CRI of less than 100. A monochromatic source has a CRI of near zero.

Incandescent or hot filament lamps provide at most 20 lumens per Watt of input power but they have CRI of 100. Incandescent lamps are the most common light source in American homes in part due to their excellent color. Modern fluorescent lamps provide up to 100 lumen per Watt with a CRI somewhat less than 100 de-

pending on the phosphor used in the lamp. Fluorescent lamps contain a glow discharge plasma in a few mTorr of mercury with a few Torr of argon as a buffer gas. Mercury-argon glow discharge plasmas are extraordinarily efficient at converting electrical energy into ultraviolet radiation. About 60% of the power into the glow discharge reappears as radiation from one atomic transition at 254 nm, and about 10% of the power reappears as radiation from a second atomic transition at 185 nm. The ultraviolet radiation excites a phosphor coating on the inside of the fluorescent lamp tube. This phosphor produces most of the visible light from fluorescent lamps. Unfortunately energy is lost during the conversion of each ultraviolet photon into a single visible photon.

Metal halide High Intensity Discharge (HID) lamps produce up to 120 lumens per Watt with good color. These lamps are basically mercury arc lamps, like the older blue street lamps, but with additives to enrich the mercury spectrum in the visible. Metal Halide HID lamps are used in application requiring both good color and good efficiency. They tend to be high power lamps and thus are often used in large buildings like shopping centers and stadiums.

Our current lighting research projects with Osram-Sylvania Inc. and with the Electric Power Research Institute will lead to improvements in fluorescent lamps and in Metal Halide HID lamps. Extending the range of applicability of these lighting technologies with higher efficiency than common incandescent lamps is an important part of our work. Osram Sylvania has recently introduced a class of fluorescent lamps with significantly higher power density than traditional fluorescent lamps. These lamps are actually electrodeless radio-frequency excited lamps being sold in Europe as "Endura" lamps and in North America as "Icetron" lamps. The mercury-argon glow discharge plasmas in these high power density fluorescent lamps produces a different ratio of 254 nm to 185 nm radiation. Understanding the behavior of the plasma is quite important because a large excess of 185 nm radiation might degrade the phosphor efficiency and the phosphor life. The project demands all of our expertise in spectroscopy, in discharge diagnostics, and in discharge modeling. Another task of the ALITE consortium is to provide basic spectroscopy data for rare earth elements used in Metal Halide HID lamps. This basic data is needed in modeling and diagnosing new types of Metal Halide HID lamps. We are working as part of the "ALITE" consortium with the National Institute of Standards and Technology, Los Alamos National Lab, and one other university. Funding is relatively generous but we work under intense time pressures with a high level of accountability. Monthly, quarterly, and annual progress reports are required as well as participation in semi-annual consortium meetings. Although it is sometimes difficult for me to balance the urgent demands of our industrial sponsors with the needs of graduate education, the close work with industry has major advantages for graduate students interested in applied physics. The advantages become most apparent when a student starts looking for a job. Dr. Heidi Anderson completed her Ph.D. research with my group this spring and was offered two permanent staff positions. She is now a staff scientist with General Electric. Although she did not have post doctoral experience, she did have experience as a summer intern at Osram Sylvania labs.

Although it is sometimes difficult for me to balance the urgent demands of our industrial sponsors with the needs of graduate education, the close work with industry has major advantages for graduate students interested in applied physics.

We also have a long-term, high risk/high payoff project in the lighting science area. In recent years long-term projects are typically supported by Federal agencies, such as the NSF, rather than industry. (Competitive pressures are so intense that it is difficult to work on a long-term project in an industrial research setting.) The best known scientist in the lighting field, Dr. John Waymouth, has argued that it should be possible to make a glow discharge lamp which produces acceptable white light and an efficacy of 200-300 lumen per Watt. This challenge is, in a sense, the "Holy Grail" of the field. For comparison, low pressure sodium lamps provide about 200 lumens per Watt which is the highest efficacy of any commercially available lamp. Unfortunately low pressure sodium lamps produce nearly monochromatic light and they are unsuitable for indoor use. We have ideas for using a barium glow discharge as a light source. Barium is an ideal atom in many respects because it's strongest resonance line is at 553 nm in the green. It also has an energy level structure with a low lying excited configuration like mercury and sodium. We have demonstrated some of the advantages of barium glow discharges and the Wisconsin Alumni Research Foundation is seeking broad patent on barium light sources. There are still many difficult problems to be solved before you can purchase a barium glow discharge lamp at the hardware store, but we are optimistic that barium glow discharge lamps will achieve 200-300 lumens per Watt. We have already demonstrated that under some conditions barium glow discharges produce white light.

Lighting research has been greatly satisfying for me and for many of my research students, post-docs, and scientists. It is "table top" research with a good mix of experimental and theoretical or modeling activities. The field has great challenges, the solutions of which could have a very beneficial impact on society.

(Editor's Note: Prof. Lawler's group is known world-wide for excellent research in low temperature plasma science. He has won the highest national honor, the American Physical Society Allis Prize, and the highest international honor, the Penning Award, in the field of low temperature plasma science. He was appointed the Arthur and Aurelia Schawlow Professor of Physics this year.) ❑

Muons & Neutrinos Sought

From* Wisconsin Week*, March 17, 1999 (Vol. XIV, No. 5) by Terry Devitt

The hunt for the cosmic neutrino is on. This winter, after an extensive shakedown period, the Antarctic Muon and Neutrino Detector Array or AMANDA, a novel telescope set kilometers deep in the ice at the South Pole, began its search for the ghost-like cosmic neutrino.

The nearly massless particle is rocketed through space, scientists think, by supernovas, black holes, quasars, gamma ray bursts and whirling neutron stars.

Unlike any other astronomical telescope ever built, AMANDA is not a telescope in the conventional sense. It is composed of 422 basketball-sized glass orbs, photomultiplier tubes arranged on cables and sunk deep into the Antarctic ice in concentric rings.

The device looks down through the Earth and is designed to catch the fleeting signals left by cosmic neutrinos, high-energy particles that are believed to emanate from objects deep in space and whose bizarre properties permit them to pass through entire planets without skipping a beat. If AMANDA successfully detects cosmic neutrinos and traces their paths back to the objects from which they come, it will open a new window to the universe, permitting scientists to study some of the most intriguing phenomena in the cosmos, according to Francis Halzen, a UW-Madison scientist who helped develop the telescope.

"We've spent over a year understanding the idiosyncratic nature of this instrument," says Halzen. "Nobody's ever built anything like this before."

AMANDA was built with extensive support from the National Science Foundation and in collaboration with other institutions in Europe and the United States.

The AMANDA telescope works by detecting the fleeting flashes of blue light created by muons, particles created when neutrinos occasionally collide with other subatomic particles called nucleons. The muon's flash of light creates a bow wave much like that made by a boat in water. In theory, the bow wave will point back to the source from which the neutrino comes.

The deep Antarctic ice is crystal clear and, at great depths, is free of air bubbles and nearly free of other imperfections. It serves as an ideal medium in which to look for the rare signals left by the billions of neutrinos that continuously pass through the Earth.

> *"Deep in the South Polar ice, a new neutrino telescope at last has seen first light. Its targets are the most violent events in the universe." (Francis Halzen, "Antarctic Dreams" in* The Sciences*)*

To detect these signals, AMANDA looks down through the Earth to suspected neutrino sources in the sky of the Northern Hemisphere.

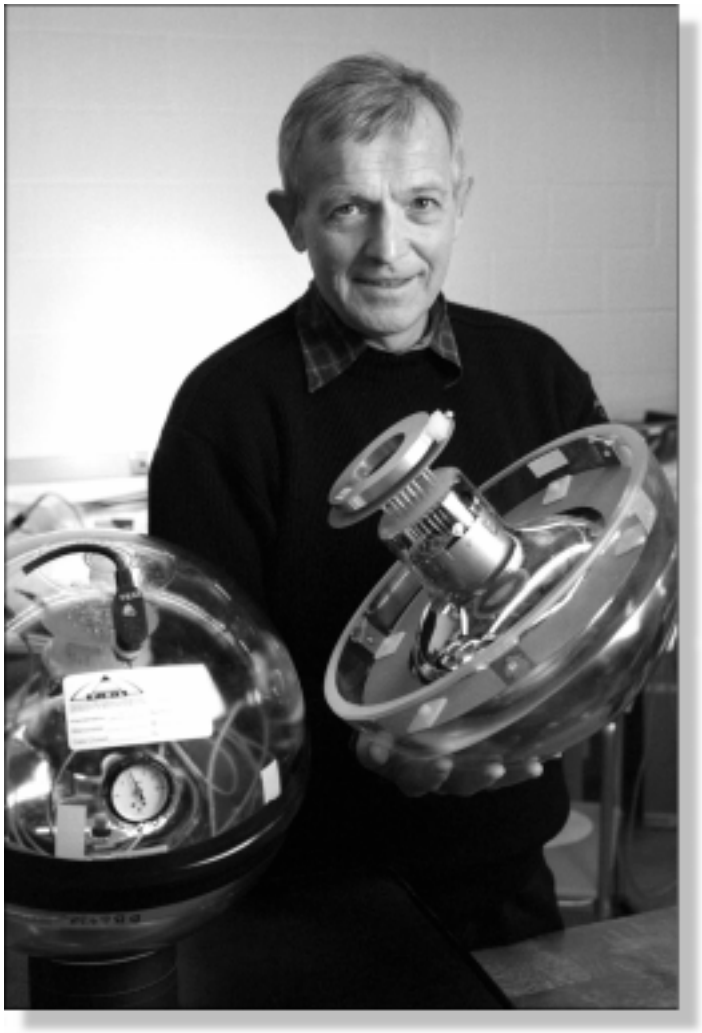
If something emits a lot of gamma rays, it's a good bet there are a lot of neutrinos there," says Robert Morse, a UW-Madison physicist who has spent years helping oversee the construction of the AMANDA telescope. Suspected sources include black holes, the remains of supernovas, and neutron stars, planet-sized, burned out husks of stars that spin at amazing speeds. Other potential sources are what scientists call active galactic nuclei, things like quasars and blazers, extremely bright and energetic objects at the centers of distant galaxies.

What all of these objects have in common, says Morse, is that they act like enormous versions of the accelerators scientists build on Earth to study high-energy, subatomic particles. They also are at great distances from Earth.

"The sources are far away. Gamma ray bursts, for instance, could be three to five billion light years away, or maybe even half way to the suspected edge of the universe. So you need a big detector," Morse says.

In conventional forms of astronomy, the photon, the particle that makes up visible light and other parts of the electromagnetic spectrum, is what is sampled by

telescopes on remote mountaintops, satellites and radio telescopes. But photons can be deflected and absorbed as they traverse space and encounter interstellar dust and pockets of gas and radiation. The cosmic neutrino, on the other hand, is unhindered by such obstacles. The tradeoff, says Morse, is that neutrinos are very hard to detect. Moreover, the sun and cosmic rays crashing into the Earth's atmosphere also make neutrinos, creating a soup of high-energy particles.



Francis Halzen, a UW-Madison professor who helped develop AMANDA, shows the inside of one of the 422 basketball-sized glass orbs, called photomultiplier tubes, used to catch the fleeting signals left by high-energy neutrinos.

But neutrinos from different sources, whether the sun or from a distant black hole, have defining characteristics that would permit scientists to identify the particles of interest.

"It's like a police line-up," says Morse. "They have to pass the test."

Over the past year, the AMANDA telescope has been tuned and tested and has succeeded in sampling neutrinos, but not the cosmic neutrinos of interest.

"We've gotten the apparatus tuned up to the point that what we're seeing really are neutrinos," Halzen says. "But the majority of the neutrinos we've seen are atmospheric neutrinos. What we have to do now is pick out that one event out of 10 million."

Yet the neutrinos now being sampled by AMANDA are the highest energy neutrinos ever detected, according to Albrecht Karle, a UW-Madison physicist. And the muons they spawn are tracked in the AMANDA detector for distances of up to 400 meters through the crystal clear Antarctic ice.

Constructed at a cost of $7 million over seven years, the AMANDA detector will nearly double in size next year with the addition of seven more strings, each with 48 photomultiplier tubes. The ultimate configuration, says Morse, is a proposed cubic kilometer detector of 80 to 100 strings with as many as 5,000 to 6,000 photomultiplier tubes.

The larger telescope will not only make a bigger target for the elusive cosmic neutrino, but also will make a key diagnostic test, measuring the energy of neutrino particles more precisely. That enhancement would permit a search for neutrino oscillations on a cosmological scale, says Morse.

"Neutrinos can bring us a message of the most violent and cataclysmic processes occurring at the very edge of the universe — colliding black holes, neutron stars and maybe even colliding galaxies," Morse says. "But it's very difficult to make the measurements. AMANDA, we think, is our best bet to do that."

(Editor's note: For further reading on this topic, see "Antarctic Dreams," by Francis Halzen in The Sciences*, March/April 1999, pp 19-24.)* ❑

GRADUATE AWARDS

Emanuel R. Piore Award

Paul Cassak

This award is given annually to recognize excellence in the first year of graduate studies. This year our congratulations go to Paul Cassak and Yuegang Zhao.

Paul Cassak received his B.S. in Mathematics and Physics with Honors in May of 1998 from the University of Arizona, Tucson. His undergraduate research experience included an internship with the University of Arizona's NASA Space Grant Program. In addition to receiving the highest score on the spring 1999 qualifier, he has also been an excellent teaching assistant. His interests include both experimental and theoretical physics. Paul plans to continue his teaching assistantship in the Fall 99 semester, as he begins his research work with Professor Balantekin.

Yuegang Zhao

Yuegang Zhao received his B.S. from Peking University in the PR of China in July, 1997. He did undergraduate research work on theoretical condensed matter as a junior. As a senior, he chose experimental physics and designed a circuit to simulate the properties of Josephson Junction at low temperature. He spent one year at Carnegie Mellon University before coming to the University of Wisconsin-Madison. His areas of interest include condensed matter, solid state physics, plasma and experimental physics. As one of the winners of this year's Piore Awards, he is continuing his academic excellence in graduate school. He expects to continue his research work in the fall semester with Professor Lagally.

Elizabeth Hirshfelder Award

Jodi Cooley

This year we have a new scholarship, the **Hirshfelder Award**. This award has been made possible through a fund established by Elizabeth Hirshfelder for graduate women in physics, math and chemistry. This year, physics has received 1/3 of the annual $10,000 award to distribute to two deserving graduate women to get them started on their research activities. The winners are:

Jodi Cooley, a first-year student from The University of Wisconsin-Milwaukee. This scholarship will allow Jodi to begin working on a project with Professor Halzen in Madison this summer.

Magda Gonzalez

Magda Gonzalez, a first year student from Universidad Nacional Autonoma de Mexico.

Magda will begin her research program with Baha Balantekin during the summer session. She will also be spending a month doing research at the University of Washington, Seattle.

Joseph Dillinger Award for Teaching Excellence

And, as you know, the department is always proud to present the **Dillinger Teaching Assistant Award** for excellence in teaching undergraduates. This award was made possible by the family of Professor Joseph Dillinger in memory of their father.

This year's winner is **Steve Peterson**. Steve has taught for many semesters in the Physics Department, always receiving top rankings for his efforts. He is also in charge of our

teaching assistant training program, works with summer international teaching assistants, and is always willing and able to help resolve a problem by visiting a teaching assistant's class. Most of the current teaching assistants in the department have spent some time with Steve as they began their teaching careers.

In addition to the Dillinger Award, Steve was nominated to attend the week-long Engineering Education Scholars Program held in July on the UW-Madison campus.

Jeff & Lily Chen Graduate Teaching Assistant Fellowship

Graduate woman, **Angie Richmond**, was the 1998 awardee of the **Jeff & Lily Chen Graduate Teaching Assistant Fellowship**. Angie, who began her fellowship in August, 1998, came to Madison from Tallahassee, Florida. She is interested in medical physics. ❑

GRADUATE PROGRAM REPORT

by Barb Schutz

The results of the recruitment of graduate students for the 1999–2000 year are now available. A total of 98 offers were made (53 domestic, 45 international). Fellowship offers, included in the total, consisted of 13 WARF and 3 AOF. Acceptances numbered 23, including one WARF and one AOF fellow. Nine of the incoming students are domestic, and 12 are international.

There were a total of 216 applications for admission to the Physics graduate program. Of these, 72 were domestic and 144 were international. Offers were made to 76 males and 22 females, with 18 males and 5 females accepting.

International students who accept our teaching assistantship offers are required to participate in the Summer Orientation Program for International Teaching Assistants sponsored by the College of Letters and Science. This program provides a head start in teaching instruction, English proficiency, and an introduction to Physics classroom settings and situations as well as a little more time for new students to become familiar with their surroundings. It was very strongly encouraged that new non-native English speaking Physics graduate students attend the 8-week session, beginning in mid-June. However, because of the varied exam schedules in their countries, some of the new international students arrived in time for the 5-week program (beginning in early July) only. One Korean, one Malaysian, and seven Chinese students participated this summer. At the end of the summer, all were required to pass a SPEAK exam to assure that their level of English competency was satisfactory for teaching assistant duties.

Masters' Degree Recipients

Fall, 1998

Chu, Zhonghua
He, Gang
Lepore, Brian
Newell, Raymond

Summer, 1998

Gehrke, Mark

Spring, 1999

Callaway, Matthew
Donkov, Alexander
Li, Dongqiao
Schiemann, Andrea
Zhou, Chao

New Physics Ph.D.'s

Summer1998

Almy, Richard
"Distance limits on the bright x-ray emission toward the galactic center" (McCammon)

Postdoc and Faculty Asst., UW-Madison Physics Department, Madison WI

Fall 1998

Armstrong, Stephen
"A search for the standard model higgs boson in four-jet final states at center-of-mass energies near 183 GeV" (Wu)

Chapman, James
"Spectroscopic measurement of the MHD dynamo in the MST reversed-field pinch" (Prager)

Principal Software Engineer, Siemens Medical Systems, Hoffman Estates, IL

Craig, Darren
"Controlling fluctuations and transport in the reversed field pinch with edge current drive and biasing" (Prager)

Postdoc, UW-Madison Physics Department, Madison, WI

Elmer, Peter
"Potential to measure CP violation in the mode $B^{\circ} \rightarrow D^{*+} D^{*-}$ with the BaBar detector" (Wu)

Moving to Rio de Janeiro

Morgenthaler, Jeffrey
"The study of the diffuse x-ray background between 150eV and 280eV with the diffuse x-ray spectrometer (DXS)" (McCammon)

Postdoc, UW-Madison Physics Department, Madison, WI

Olsen, James
"Measurement of bottom quark-antiquarks rapidity correlations in proton-antiproton collisions at square root of s = 1.8 TeV" (Carlsmith)

Postdoc, SLAC, Stanford, CA

Orejudos, William
"Search for scalar quarks at square root of s = 130 - 184 GeV with the ALEPH detector" (Wu)

Piech, Garrett
"Electron impact excitation of metastable rare gas atoms" (Lin)

Scientist, Mission Research Corp, Torrance, CA

Redwing, Ronald
"Observation of Strong to Josephson-coupled transition in high-T_c grain boundaries" (Rzchowski/Nordman)

Smith, Morag
"Measurement of the analyzing powers and differential cross section of p-d radiative capture below deuteron breakup" (Knutson)

Postdoc, Los Alamos National Lab, Los Alamos, NM

Stenson, Kevin
"A study of D0 production from 500 GeV negative pi-nucleon interactions" (Halzen)

Research Associate, Vanderbilt University, Nashville, TN

Yoo, Tae-Oog
"On spherical shells in general relativity" (Goebel)

Spring 1999

Deiker, Steven
"High resolution spectroscopy of the diffuse x-ray background using an array of microcalorimeters" (McCammon)

Postdoc, NIST, Boulder, CO

Vaiciulis, Anthony
"Observation of isolated high transverse energy photons in photoproduction at HERA (Smith)

Postdoc, Fermilab, Batavia, IL ❑

UNDERGRADUATES

Undergrad Report

by Peter Timbie,
Coordinator of Undergraduate Programs

Last fall Lee Pondrom convened a committee to assess our undergraduate program. This group, named the "Walker Committee" after our fearless chair, met diligently to decide how to improve the Physics Major. We started by trying to figure out where we need to improve, by sending out questionnaires to recent and not so recent graduates and by interviewing a panel of current majors and encouraged them to "tell all." We convened recent instructors of our introductory courses, and we arranged for discussion time with the full faculty in a couple of meetings. We also spoke with some of our colleagues in Chemistry and Math, who have built very successful major programs.

The Walker Committee Report came up with a number of good ideas, which we are now trying to implement. The boldest of these is to invent a new introductory course specifically aimed at potential physics majors. Of course we all are passionate about physics, but our usual first-year courses are so full of the standard things that have to be "covered" that there never seems to be time to talk about the modern physics ideas that drive us out of bed in the morning. The goal for the new course is to cover fewer topics in more depth and to bring in more goodies from modern physics. We will first offer this three-semester course in fall, 2000, and there is lots of planning going on now. The committee also recommended adding at least one new course at the intermediate/advanced level. This fall Vernon Barger will introduce a course on General Relativity and Cosmology, which we plan to turn into a permanent offering.

We also learned that we need to do a better job of advising and involving students in the life of the department. The "Find Our People Meeting" started by Don Cox has now become an annual event. Next year we're planning to tell students more about the research in the department and reasons to choose physics as a major. We're also trying to get more of our advising literature easily accessible on the web, including the newly-revised Undergraduate Handbook. We may try to post research job openings on the web as well. Another major step was to post photos of the undergraduates on the second floor of Sterling, next to the images of our photogenic graduate students and our unusual-looking faculty and staff. For some reason our majors are so shy that we have had to threaten them to get their pictures taken. From now on,

Bill Klabunde, who is a camera buff, won't let anyone sign up to become a major without standing before his flash bulb. Bill now keeps a hairbrush, mirror and a can of hairspray in his desk for those that require last-minute preening.

There were lots of other suggestions too. For example, many students and faculty felt that the recommended math courses don't integrate (sorry) well with our physics offerings. Negotiations with the Math Department have begun.

We've been fortunate in finding funds to improve our teaching labs. This year Dick Prepost successfully spearheaded a proposal to the university for $150,000 to replace outdated equipment in some of our intermediate and advanced undergraduate labs. One dramatic improvement will be to replace our computer lab's fleet of feeble "NeXT" computers with substantially more aggressive machines. Loaded with research-grade software, they will be integrated with homework assignments and projects from all of our courses. Already we have plans for more improvements next year, including completion of the computerization of the labs of all of our first-year courses.

We've had a number of visitors this year to advise us on new teaching methods. Far and away our largest enrollments are in our "service" courses for engineers, health professionals, etc. We're trying to find better ways to educate these students who are fortunate enough to be with us for a couple of semesters. Ken Heller came from U. Minnesota and Marjorie Olmstead visited from U. Washington and told us about their innovative programs, which involve students in group problem-solving exercises during lectures and discussion sections. Some of us have been experimenting with those kinds of techniques here.

By the way, if you would like to make comments about our undergraduate program, just send an e-mail to me (timbie@wisp.physics.wisc.edu) or Jean Buehlman (buehlman@facstaff.wisc.edu).

Peter ❑

1999 Undergraduate Awards

The **L. R. Ingersoll Awards** are presented each May for distinguished achievement in undergraduate physics. The 1998–99 award winners were:

Physics 103-104 — **Goeffry Schroeck**

Physics 201-202 — **Kin Yan**

Physics 207-208 — **Daniel Searing**

The Albert Augustus Radtke Scholarship Awards are given during the spring semester to outstanding junior or senior students majoring in Physics or Applied Mathematics Engineering and Physics. This year's award winners are:

Allison Bloomquist — Allie is one of our outstanding young women. She came to the university to prepare to become a math and physics teacher, and is now planning to switch to an AMEP major. Allie is also a top athlete on the women's golf team. She is from Afton, Minnesota where she was a National Honors Society student. She currently tutors students at West High in Madison.

Allison Bloomquist

Samuel Gross — He is currently in Junior Year in Germany Program.

Nicos Savva
by N. Savva

Nicos was born in Limassol, Cyprus in 1977. During his high school career he participated in many national competitions in math, physics and chemistry and almost always was rewarded for his performance. In 1995, he was selected to be one of a five-member team to represent his country at the International Physics Olympiad held in Canberra, Australia. After two years of military service, he came to UW-Madison to study sponsored by the Cyprus America Scholarship Program. His major is Applied Math, Engineering and Physics. He intends to pursue graduate studies in either Applied Math or Theoretical Physics.

In addition to his Radtke Scholarship in Physics, he received the Irma L. Newman Memorial Scholarship awarded by the Mathematics Department.

The last of the undergraduate awards, the **Fay Ajzenberg-Selove Award,** was first instituted in 1996–97 and is now presented annually to an undergraduate woman majoring in physics or astronomy for the purpose of encouraging that young woman to continue her career in science. Dr. Ajzenberg Selove, who received her Ph.D. at UW-Madison in 1952, is currently a professor of physics at the University of Pennsylvania. She has chosen to make this award possible with the creation of an on-going scholarship fund. A joint committee from Physics and Astronomy meets annually to determine the award recipient.

This year's award winner is **Jodi Supanich**. Jodi is currently a senior who is finishing her second year at Wisconsin. She is majoring in Philosophy and Math and has now decided to add an astronomy/physics major. Technically she could graduate next year, but is planning to stay an additional year to complete these majors. Below Jodi describes her conversion to physics in her own words:

Jodi Supanich

"I grew up in Cedarburg, Wisconsin (a little town north of Milwaukee) loving mathematics. Thus, when I got to college, I was absolutely sure I would double major in mathematics and philosophy (a new-found interest).

I had never thought to major in physics. I was convinced that I hated physics ever since my high school physics teacher forbade me to use calculus when solving problems. Last fall, I decided to give physics another shot. And, after desensitizing myself to the occasional math-slaughtering in lecture, physics grew on me — a whole lot! One of my friends was applying for a Sophomore Summer Honors Research Apprenticeship in physics. It sounded like fun, but I wanted to do one in philosophy. However, finding little collaborative opportunities there, I gave physics a shot. I probably e-mailed just about the entire department AND WOW! what a response — I received at least 30 e-mails back from physics faculty. The fact that the faculty in this department are so willing to involve undergraduates in research is wonderful, as research is an extremely important element of any young physicist's education. I decided to work for Professor Peter Timbie's Observational Cosmology Lab. That cinched it — I was just going to have to major in physics too! Working in that lab has probably been the single greatest learning experience I've had in college. Consequently, my interest in physics, especially cosmology has expanded (dare I say exponentially)."

Jonathan D. Nix Wins Campus Award

Jonathan Nix, a physics and math major, from Middleton, Wisconsin won an award for his presentation at the Sesquicentennial Undergraduate Research Symposium on February 10, 1999. His sponsor in the event was Professor W. Kluzniak. Good job, Jonathan!! ❑

University Physical Society — In Vivo '99

by Beth Petrus and Nate Gemelke

There are times in an organization's life when it must turn an eye introspectively to the past, present and future. We call this time the "Wisconsin Physicist Newsletter Deadline." The Physics Club just wrapped up its most active year in recent history with over eighty members, and has nothing short of world conquest planned for the upcoming year.

In the last newsletter, we mentioned the generous donation from Nicolet of several infrared telescopes. This equipment, combined with a strong desire in the physics club for an autonomous research project, formed the seed for our newest venture, auspiciously dubbed the Icarus Project. After some intense debate and an early change of course, the telescopes were shelved in favor of a more terrestrial subject of research — sonoluminesence. The project has enjoyed much success; we recently received a $2,000 grant from the Society of Physics Students for equipment, and construction of our first experimental apparatus is nearly complete. As a fortuitous side-effect, the Icarus Project will have left the Physics Club in possession of a modest educational laboratory, open for general use by its members, and hopefully to inspire future projects. I once heard undergraduates compared to academic vultures, circling atop researchers with the slightest glimmer of generosity on their face. The Icarus project and its burgeoning lab would very gladly accept any donations of soon-to-be discarded lab equipment, particularly out-dated or malfunctioning electronic test instruments and hand tools.

Several members of the club had the great opportunity to attend the Centennial Meeting of the American Physical Society in Atlanta this year, as the physics club took the opportunity to venture out of Sterling Hall. The trip provided an outstanding opportunity for students to experience physics "in vivo," including the participation of one undergraduate member in a poster session. Any definition of "in vivo" physics must also include physics education. Members of the physics club were provided the opportunity to give feedback on their own curriculum this year to the department's review committee. Suggestions ranged from course restructuring to improvements in advising.

The Physics Club has a long history of annual events, which were continued with fervor this year. Part of the continued activities of the physics club included the undergraduate meetings with the weekly colloquium speaker, which provided an excellent outlet for students to interact with the physics community outside of the classroom. The club also maintained its traditional line of events, featuring drop-in tutoring, liquid nitrogen ice cream, and mind-numbing social events (with a character further alienating its members from the rest of society.) In a rare act of social consciousness, the club also participated in the Habitat for Humanity Aluminum Can Creation Contest this spring. (We won.)

New officers were elected for the club this year, and have already begun an aggressive schedule of events for the coming academic season. Several members are already participating in the Astronomy Department's Universe in the Park this summer, an outreach program taking astronomy boldly to the people. Trips are in the works for next fall and beyond to Yerkes Observatory and Fermilab; anyone generous enough to provide "insider" tours of these labs should contact any following new officers:

Angel Klohs ..... klohs@cae.wisc.edu
Beth Petrus ..... obafugakum@yahoo.com
Lucas Finco ..... lmfinco@students.wisc.edu
Hal Canary ..... hwcanary@students.wisc.edu
Lisa Weltzer .... lweltzer@students.wisc.edu ❑

The Tin Man, which won first place in the Habitat for Humanity Can Creation Contest, stands in the UW library mall. It was created by Hal Canary and Beth Petris, members of the UPS.

Ironically, The Tin Man met an ignominious end when it was "cannibalized" by another contest entry — a can crusher also made from aluminum cans — filled with 150 lbs. of cement!

Peer Mentor Tutor Program Successful

Susan Nossal recently reported on a highly successful year for the Physics Peer Mentor Tutor Program. This program is designed to assist at-risk students, as well as to provide teaching and leadership experience for upper-level undergraduates.

This was the second year of the program, but it was the first year that the program really took root in Sterling Hall. This was evidenced by a room just around the corner from 1300 & 1313 Sterling with a big sign on the door announcing the **Physics Peer Mentor Tutor Program** and the colorful posters, pleasant atmosphere and smiles that abounded.

As part-time director of the program, Susan has had the job of creating the administrative structure, hiring and guiding the tutors, assessing the needs of student applicants and deciding how the program would be run. This past year, the tutors were five upper-level physics majors who conducted study sessions twice a week for small groups of at-risk students. Such students included returning adult students, students with English as a second language, students on academic probation, students with severe test anxiety, and students feeling isolated in the course.

During the fall semester, the program served the non-calculus based General Physics 103. In the spring semester, it followed that same population into Physics 104. Susan worked with Professor Paul Quin, one of the 103/104 instructors, to facilitate the at-risk student learning process.

Participants in the program have been very successful in "surviving" their first college physics course, thanks to Susan and her dedicated tutors. Participants reported that they feel comfortable with the peer tutors and are much less inhibited about asking for repeated explanations of physics theories. This is one of a suite of new campus programs designed to improve at-risk student retention on campus.

The Physics Department is dreaming about the possibility of doubling the size of the Peer Mentor Tutor Program to serving both Physics 103 and 104 both semesters, adding an assistant director and expanding into larger space.

The Physics Department appreciates the support which Dr. Tony Jacobs and others at the Chemistry Learning Center have provided to this program. The Physics and the Chemistry Peer Mentor Tutor Programs have been run jointly over the past two-year period. ❑

Susan Nossal, Director of Physics Peer Mentor Tutor Program, and student Karl Jablonowski (who works as an undergraduate researcher for Profs. C.C. Lin and L.W. Anderson) pause for photo.

JUST FOR FUN...

Famous Composer Denizen of Sterling Hall

by William A. Friedman

World renown micro-tonal composer Harry Partch, characterized both as "genius" and "crackpot," was housed in the basement of Sterling Hall in the 1940s. A recent performance, in Madison, of one of his works by the Kronos quartet brought this fact to light. During his stay in Madison from 1943 to 1947 Partch, while under the sponsorship of the late Gunnar Johansson of the Music Department, apparently was not very welcome in that Department. Instead, he and his instruments were sent to the basement of Sterling Hall where presumably his experimentation would have a more natural setting. Partch developed a "Just" scale which contains 43 intervals per octave. He was consequently obliged to build his own instruments. Pictures of these can be found on the Web at http//www.corporeal.com, and links therein. At least three of the instruments shown are said to have been built in Madison (probably in Sterling Hall). We contacted one of our alumni, Prof. Paul Kaesberg (Biochemistry), who was a Physics graduate student at the time Partch was here. He remembers his presence and that the Physics students would occasionally drop into his office to visit. Partch's contact with the department was otherwise not very great.

Harry Partch

When the words "Sterling Hall" and "original instruments" appeared together in the Madison Magazine article about Partch by James Rhems, a fleeting hope of discovering some of these instruments around here briefly flourished. This would have been a wonderful discovery, especially in conjunction with our course, Physics 371, acoustics for musicians, which I am teaching. (Among other topics, this course deals with the principles of physics behind music, scales, and various instruments.) However, the hope faded when we found that when Partch left in 1947 he apparently took everything with him. Furthermore, Prof. Kaesberg, points out that that was period of rapid post-war growth in the Department, when every bit of space was at a great premium. Partch died in 1974, but his enthusiastic followers today encircle the Globe. ❑

FUND RAISING

What Difference Does It Make?

An Editorial by Jean Meyer Buehlman

Let's take a stroll down memory lane. In your case, you may have come to the University of Wisconsin-Madison as a "green country kid" undergraduate or as a "city-slicker" graduate student, but no matter where you came from, chances are that this place grew on you. As you read through the alumni newsletter, you are probably remembering many of your days as a student in the Physics Department. As you know, some things stay the same, for the most part — lots of courses; a new, somewhat timid group of new freshman taking 103 General Physics because they have to do so; a grinning group of physics majors who really live here, just down the hall in the UPS room; tradition makers who are still around like that major professor of yours who taught physics out of Jackson "the way it should be taught."

As I sit here in my Sterling Hall office and write this, the lakes are still shining blue, students are still clamoring about the halls, and the timetable for Spring 2000 is just about a wrap. Everything looks good. But, I'm worried. Something has changed. You see, as the Instructional Program Manager, I get to see things from a bit different perspective than everyone else. To just run the instructional program here, I need 50 teaching assistants each semester. I just don't have them. All of us know that there are fewer undergraduate physics majors graduating around the country. This means, of course, there are fewer physics majors to come here as new graduate students. This means I have trouble filling my teaching assistant slots and that faculty have trouble filling their research assistant slots down the road.

The question, of course, is how can we, as a State institution, remain competitive with what is happening in the science area nationwide?

That's where you come in. You could really make a difference. And, I expect that in the future you will be hearing more from us about the importance of private donations to help us remain competitive. In addition, you can encourage young people in science. You can go into the schools in your area and make a difference. You can be enthusiastic and motivated about your choice of science as your life. You can encourage high school students to investigate studying physics here at Wisconsin. And, you can send all of those really bright young graduate student minds that your encounter our way.

You can make a difference! Come by and brainstorm with us. Jean ❑

Physics Fund Drive

The department is pleased to announce that the **Jeff and Lily Chen Fellowship** has been further endowed by the Chens, enabling it to be eligible for matching monies by the Wisconsin Distinguished Graduate Fellowship Program. This program will provide selected graduate fellows with stipends and professional development funds. Annual support for one graduate student currently requires approximately $24,000. Full fellows are also eligible for remission of non-resident tuition. An endowment of $500,000 is necessary for each fellowship. Thank you, Jeff and Lily!

In addition, many thanks to the Ray and Anne Herb Fund for the gift dollars to create further Wisconsin Distinguished Graduate Fellowships to promote advances in material science.

Fund Drive Donors

On behalf of the Department of Physics, we thank all alumni, faculty, staff and friends who have contributed to this year's fund raising efforts. We have listed, by fund, the names of all contributors to Physics Department funds for the period of July 15, 1998 through July 14, 1999. **We greatly appreciate your financial assistance.**

Physics Graduate Student Recruiting Fund Donors

Bennett, Jonathan
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Glen Ward Giddings Estate
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Lockheed Martin Corp.
Long, William
Sherfinski, John
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Stolzenburg, Mark
Warren, Robert

Physics General Fund Donors

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Cornelius P. and Cynthia C. Browne Endowed Fellowship Fund

Cornelius Browne

Raymond G. and Anne W. Herb Endowment Fund

Estate of
Raymond G. Herb

❑

ALUMNI CORNER

Matt Bernstein (Ph.D., 1985)

Matt tells us that 1998 was an eventful year for him. From 1987 until 1998 he worked in R&D at GE Medical Systems, in Waukesha, Wisconsin. He was fortunate enough to contribute to many growing areas, such as Magnetic Resonance Angiography. In July, 1998, he started an exciting new job as a physicist on the staff of the Department of Diagnostic Radiology at the Mayo Clinic in Rochester, Minnesota.

Dan Schultz (Ph.D., 1993)

Dan is still in the Army and has now returned from Korea where he commanded the 2nd Maintenance Company. He is now teaching physics at the US Military Academy at West Point. He expects to be there until 2001. His E-mail is danbschult@aol.com.

Paul Schmidt (Ph.D., 1953)

We have received word that Paul Schmidt, former Missouri University professor of physics and astronomy passed away at Columbia, MO on October 6, 1998 at the University Medical Center. Paul had been invited to talk on his specialty — small-angle x-ray scattering — at almost every European country you can name. He started out doing research in his field, but with a biological bent; he first worked on yellow turnip mosaic virus. Since then he had evaluated the structures of aluminum hydroxide, argon, clay platelets, gold particles, fractals, and several types of coal. Over his career he wrote 110 papers with over 100 co-authors. Paul Schmidt and John Anderegg worked together as students in 1949–53 in Professor Beeman's University of Wisconsin Physics Department lab.

J. Scott Price (Ph.D., 1993)

Scott is now with the Global Components portion of GE Medical, one of the several businesses under the GE umbrella. He says his work is very stimulating with problems similar to the ones he faced as a member of the Polarized Source Group at Jefferson Labs. He hopes to make the departmental celebration in fall.

Norbert J. Nitka (B.S., 1953)

Norbert, who now lives in Watertown, Wisconsin, sent me a submission of a sample paper using only algebra and trigonometry, but which he says gets profound results. My apologies for not having printing space. Anyone who is interested can contact Norbert directly.

Collis Matterson Bardin (M.S., 1925)

Professor at Compton College (Compton, CA) for 31 years, Professor Bardin passed away on January 15, 1999 at the age of 94. He was born in West Winfield, NY and received his B.S. at Cornell University (Chemistry '24) and his M.S. (Physics, '25) at the University of Wisconsin. He was a resident of Palo Alto, CA from 1990–94 and then lived in the Health Center at the Sequoias in Portola Valley, CA until his death.

Richard I. Brown (Ph.D., 1961)

Dick writes that he got his Ph.D. in experimental nuclear physics at UW-Madison in 1961 under Willy Haeberli. He now works for Philips Display Components in Ann Arbor, MI

Douglas B. Clarke (Ph.D., 1972)

Doug writes that he works at Livermore Labs. His division is called "Geophysics and Global Security." His research is on computer simulations of shockwaves, earth materials and elastic waves.

Arnab Bhattacharya (Ph.D., 1998)

Arnab stopped by to visit the editor in person one day recently. He is still working at the Ferdinand Braun Institut in Berlin, Germany. He thought Madison was undergoing lots of face changes.

James Ireland (M.S., 1995)

Jim e-mailed us that he is working at a biomedical research institute at MIT called the Whitehead Institute. He is a scientific programmer and loves it!

Barry Berman (Ph.D. 1969)

Barry received his Ph.D. under Professor J. Dillinger. He says that after teaching and chairing the physics department at Wells College in Aurora, NY for seven years, he caught the educational computing "bug." He is currently Vice President and National Director of Curriculum Services for Logal Software in Atlanta. Logal offers high quality simulation and modeling software for education in physics, chemistry, biology and mathematics. While their primary market is in high schools, many of the physics simulations are sufficiently robust for undergraduate curricula at the University level. Logal is also the first educational software company to Internet-enable all of their software. Barry can be reached at barryb@logal.com.

Jim O'Donnell (Ph.D., 1997)

Jim is working at the University of Illinois Department of Physics at Urbana, IL.

Ted Allen (B.S., 1982)

Ted has a new tenure-track faculty position at the State University of New York at Utica/Rome for fall 1999. ❑

PHYSICS DEPARTMENT CENTENNIAL

October 8-9, 1999

Check the Centennial web page for latest information at:
www.physics.wisc.edu/ann-100th/100th.html

Friday Oct. 8, 1999
(All events at the Pyle Conference Center)

8:30 am - 9:00 am

Welcome and Introduction -
Dept. Chair Lee Pondrom
Welcome - Provost John Wiley

9:00 am - 10:20 am

Physics in the 21st Century
Theoretical Particle Physics -
Vernon Barger
High Energy Physics - Wesley Smith
Session Chair - Lee Pondrom

10:20 am - 10:50 am - **Coffee**

10:50 am - 12:10 pm

Physics in the 21st Century
Nuclear Physics - Baha Balantekin
Plasma Physics - Stewart Prager
Session Chair - Willy Haeberli

12:10 pm - 2:00 pm **Lunch** ("On the town")

2:00 pm -3:20 pm

Physics in the 21st Century
Astrophysics - Rocky Kolb,
Fermi National Accelerator Lab
Condensed Matter Physics -
Franz Himpsel
Session Chair - Dan McCammon

3:20 pm — 3:50 pm - Coffee

3:50 pm - 5:10 pm

Physics in the 21st Century
Biophotonics - Pupa DeStasio
Atomic Physics - Thad Walker
Session Chair - Wilmer Anderson

5:30 pm - 6:30 pm

Reception at Conference Center

6:30 pm - 10:00 pm - Dinner

Banquet at the Conference Center
After-dinner Speaker,
Daniel Gelatt, Pres. of the NMT Corp.

Saturday Oct. 9, 1999
(All events in Sterling or Chamberlin Hall)

8:30: am - 8:45 am -1300 Sterling

Dedication of room 1300 Sterling Hall in honor of Ragnar ("Rollie") Rollefson -
Hugh Richards, Keith Symon
& Barney Webb
Session Chair - Clint Sprott

8:45 am - 10:15 am -1300 Sterling

Past and Future
The Department: 1899~1999 (Historical Overview) - Bob March
The Department: Current Activities and Plans for the Future -
Lee Pondrom
Session Chair - Dave Huber

10:15 am - 10:45 am - **Coffee**

10:45 am - 12:45 pm -1300 Sterling

Talks and Discussion on Careers in Physics Outside Academia
Matt Bernstein, Mayo Clinic
Steven Bomba, Johnson Controls
Jorge Lopez, Shell Technology
Jeffrey McAninch,
Lawrence Livermore National Lab
John Nimmo, US Geological Survey
Fred Rose, Far Systems
Carol Wilkinson,
Los Alamos National Lab
Session Chair - Randy Durand

12:45 pm - 2:00 pm - **Lunch** ("On the town")

2:00 pm - 5:00 pm

Department Open House in Sterling and Chamberlin Halls
- *An opportunity to visit labs and meet with faculty and graduate students. As part of the open house, there will be an informal presentation and discussions from 2:00 PM to 3:00 PM in 1300 Sterling Hall for students considering studying physics at the undergraduate level at UW-Madison.*

•Talk to Us

Tear-out Sheet

Address Correction and Alumni News

Please use this form if you are writing to us hard copy. We are more than happy to hear your news and publish it in next year's issue of The Wisconsin Physicist. This is also the way to update your address. Send this hard copy to:

Jean Buehlman
Department of Physics
University of Wisconsin-Madison
1150 University Avenue
Madison, WI 53706

or E-mail to: *buehlman@facstaff.wisc.edu*

❒ Please check here if your address is different from last year.

Name: _____

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Employment: _____

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City, State and Zip _____

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Phone: _____

City, State and Zip _____

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My E-mail address is: _____

_____

- I would be willing to be a part of an informal informational Physics network in my area for Physics graduates.

  ❒ yes ❒ no

- Do you have access to the World Wide Web?

  ❒ yes ❒ no

- Have you found us on the World Wide Web at: http://www.physics.wisc.edu/ ? ❒ yes ❒ no

- I would be interested in being included in a UW-Physics alumni database available on WWW.

  ❒ yes ❒ no

- Contact me about linking my WWW home page to the Physics Dept. homepage. ❒ yes ❒ no

Feel free to include the following information in the next issue of "Alumni News:"

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Tell Us More

Survey question:

What's your best advice to physics graduate students?

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Important Web Addresses:

For admissions materials, general UW information: ***www.wisc.edu***

For information on Physics Majors, Graduate Program, Centennial Celebration: ***www.physics.wisc.edu***

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Please send comments, ideas, photos to:

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