University of Minnesota
school of physics & astronomy

July 2010 Newsletter • Issue 12

A Letter From the Head of the School

It's been an exciting year for the School of Physics and Astronomy. The approval of bonding funds to design the new Physics and Nanotechnology Building (P&NT), positions P&NT as the U's "shovel-ready" high-priority project for the next bonding request. Strong support from government and corporate leaders, as well as from the School's alumni and friends, has been crucial and is greatly appreciated. Despite financial challenges we have been able to add three physics faculty members this year, all with outstanding research programs and strong commitments to undergraduate and graduate education. Professor Lucy Fortson is an experimental high energy astrophysicist and world leader in "citizen science." Professor Clem Pryke is an experimental cosmologist who reinforces Minnesota's leadership in cosmic microwave background (CMB) research. Professor Jorge Viñals, who will also serve as Director of the Minnesota Supercomputing Institute, is a theoretical condensed matter physicist specializing in nonequilibrium phenomena, nonlinear dynamics and other properties of advanced materials. All three will be profiled in an upcoming issue of this newsletter.

These new professors strengthen a physics research program that is already thriving. Funding is at an all-time high, highlighted by Minnesota-led projects in elementary particle physics (NOvA) and space physics (RBSP). The big science news of the year included projects with strong Minnesota involvement, including the Large Hadron Collider (LHC) and searches for gravitational waves (LIGO) and dark matter (CDMS). We have outstanding programs in experimental condensed matter physics and biological physics, in spite of the constraints of a too-small faculty and the dire need for the state-of-the-art laboratory facilities that the P&NT project will bring. Our theoretical research is world-renowned and diverse. The past year saw the well-deserved recognition of Professor Alex Kamenev's achievements in theoretical condensed matter physics by appointment to our Fine Theoretical Physics Institute.

Once again this year we celebrate the exceptional achievements of our students, alumni and faculty. At our annual awards ceremony, fourteen scholarships were awarded to undergraduate students, and three graduate students were recognized with fellowships. Another seven students received awards for teaching or research. All scholarships, fellowships and awards are made possible by the generosity of the School's many donors. National recognition included undergraduate Grant Remmen, named a Goldwater Scholar, and grad student Sean Bartz, who was awarded a Department of Energy Office of Science Graduate Fellowship. Our 1968 Ph.D. alumnus Professor Chandra Varma of UC Riverside received a U of MN honorary Doctor of Science degree, recognizing exceptional contributions to theoretical condensed matter physics. Faculty honors included a McKnight Land Grant Professorship (Professor Vuk Mandic), a Taylor Career Development Award (Professor Dan Cronin-Hennessy), and one new APS Fellow (Professor Alexander Heger).

On July 1, the Institute of Technology was renamed the College of Science and Engineering. We welcome this change, which puts in the spotlight the unity of science and engineering in one College. This is a major contributor to our research success and to the educational opportunities that draw a more highly qualified student body every year.

Too much happens in the School to rely solely on a twice-yearly newsletter to spread the word. Our website has news and other information to help you keep in touch, and we are opening other channels of communication. Our new informational displays in the Tate foyer are available as web links, providing news and events and a "research spotlight" (www.physics.umn.edu/foyer).

This year has been my first as Head and it's been quite an experience. I'm very grateful for the terrific support of the U's administration and the School's faculty, students, staff, alumni, and other friends. Pulling together, we can make 2010-2011 an even better year.

-Ron Poling (poling@umn.edu)

Inside

Awards & Announcements

Mandic Wins McKnight


Wendy Tschampl

Vuk Mandic was named a 2010-2012 McKnight Land-Grant Professor for his research "Searching for Gravitational Echoes of the Big Bang." Mandic was chosen as one of ten winners from the University. The Professorship competition is a career development program for junior faculty with a two-year appointment. In addition, each professor is awarded either a year's leave to pursue research or a supplementary research grant.

Lysak Appointed Senior Editor of JGR


Alex Schumann

Professor Robert Lysak has been appointed Senior Editor of the Journal of Geophysical Research in Space Physics for the American Geophysical Union (AGU), the leading publication in its field. The position is a four year term. The Senior Editor position officially started on January 1, 2010. Professor Lysak is looking forward to his term as Senior Editor. He says that "the publication of papers is one of the primary duties of scientists, and helping to assure that JGR continues to publish papers of the highest quality in space physics and maintains its leading role in our field is my primary goal for my term as editor."

Joyce Clarkin Retires


Alex Schumann

Joyce Clarkin joined the School as a Senior Secretary in 1990 and was promoted to Senior Office Supervisor in 2002. She retired in April, 2010. Joyce, has been the most visible face and the heart of our undergraduate program as (the coordinator of the physics undergraduate office). "The logistics of Joyce's job are overwhelming, her knowledge of the University is amazing, and the effortlessness with which she accomplishes the most daunting of tasks inspires us all," says Ron Poling. Joyce's favorite part of her job was the people: students, staff, faculty, and the general public. Visitors and students who are lost, confused or have been sent from office to office with no assistance, often find that Joyce could give them the answer they need. The bonus for her, she says, is that she has met some wonderful people. Director of Undergraduate Studies (DUGS), Jim Kakalios, said of Joyce, "When I was asked to become DUGS my first step was to speak with Joyce and ascertain if she was going to step down in the immediate future. If so, then I did not want the job. " Joyce plans to spend more time with her three daughters and four grandchildren and their sundry pets. She intends to devote more attention to interests and creative projects that have long been on the back burner.

Cronin-Hennesey Wins Taylor Award


Wendy Tschampl

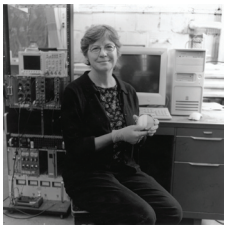
Professor Daniel Cronin-Hennessy won the Taylor Career Development Award in recognition of his exceptional contributions to teaching. Professor Cronin-Hennessy will receive $2,500 for professional development toward his research.

Remmen Named Goldwater Scholar


Alex Schumann

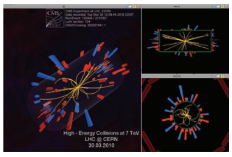
Undergraduate Grant Remmen has been named a 2010 Goldwater Scholar. Remmen is an honor student pursuing degrees in astrophysics, physics and mathematics. He plans to pursue a Ph.D. in astrophysics and conduct research in theoretical and/or experimental astrophysics, quantum physics, and galactic dynamics. Remmen is investigating the effect on event horizon shape caused by velocity of a black hole relative to the Cosmic Background Microwave Radiation with Professor Robert Gehrz.

Inventive Women




Professors Cynthia Cattell, Priscilla Cushman and Liliya Williams are featured in a photography exhibit, "Inventive Women" which will run at the Minnesota History Museum until July, 2010. The exhibit of the female faculty in the Institute of Technology consists of a series of portraits by photographer Nancy Johnson.

CMS Sees First Results at LHC



On March 30, 2010, the Large Hadron Collider (LHC) at CERN in Geneva, Switzerland reached 7 TeV, a new world record for energy produced in a collider. The (Compact Muon Solenoid) CMS experiment successfully detected these collisions, signifying the beginning of the 'first Physics" at the LHC. "The achievement of collisions at 7 TeV has opened the door to what we hope is a vast hall full of new and deeper understandings about the universe and the interactions between particles," said Professor Jeremiah Mans. The University of Minnesota has played a key role in the creation of the CMS detector. The Minnesota team, jointly supervised by Professors Rusack, Mans and Kubota, currently consists of three postdoctoral researchers, five graduate students, and six undergraduates.

Physics Force Budget Crisis

"Y'all see these on the wall at school and you didn't know they could be used for physics, did ya?" says Dan Dahlberg holding a fire extinguisher as part of a demonstration in the annual Physics Circus held at Northrop for a week every January. Dahlberg is seated on a go cart that is about to become a "rocket car." Using the propulsive force of the fire extinguisher Dahlberg launches the car across the stage. Behind the curtains a loud crash is heard and Dahlberg appears again with a bent wheel to the laughter and delight of the packed house of school children. This trademark combination of vaudeville slapstick humor and science has brought the Physics Force outreach team national and international attention. The group, started in 1985, is made up of University professors and high school teachers, many of whom are alumni or have a strong connection to the U. The group performs to 35,000 people a year in person. Their website and DVD reach even more people.

The Physics Force is facing a period of change and uncertainty. Budget and personnel pressures have already forced the group to turn away some bookings for this year. Cindy Cattell, a long time member of the Next Generation Physics Force Group, was recently made group coordinator**.** There is concern because the Physics Force faces a budget shortfall for the remainder of this academic year. "Given the very tight budget for the University for the next few years, we anticipate that the support for our program will be reduced. We will not be able to do the number of free shows that we have typically done. This affects school districts with fewer resources and our ability to excite children in communities typically under-represented in physical sciences and engineering," Cattell said.

The group's popularity is greater than ever and its service to the community has continued to grow. This past year, the Original Force added extra matinee and public performances to their sold out line-up of shows at Northrop. The Force continues to travel to schools around the metro area and greater Minnesota. Dahlberg says "I am always amazed by the number of children and parents who come up to me when I am out in public and say 'Aren't you in Physics Force? I saw you at my school. It was great. Where can we see another show?' We are the face of the School of Physics and Astronomy (and often the University) for many students and their parents."

Teacher in Residence Program

Alex Schumann

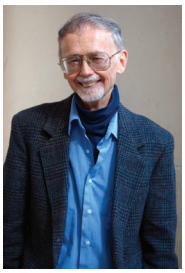
Steve Olsen is a high school teacher at Simley High School in Inver Grove Heights. He is also the current PhysTEC Teacher-In-Residence for 2009-10. When asked about his favorite aspects of the Teacher in Resident program he said, "I like the opportunity to be with physics professors and people at the top of their research areas. I also enjoy being around people who understand teaching pedagogy. It is a break from working in a highly structured high school routine. My days at the University are never the same. It is difficult for me to adapt to the variety after 33 years of structure. I never know what is going to happen."

The PhysTEC teacher-in-residence is a unique program encouraging high school teaching by helping students in introductory physics courses be more successful. "It is a privilege to do something new and experimental," he said. Steve would like to see more students stay in physics and become teachers, engineers and researchers. "The program is doing many good things beyond its original purpose." It has greatly affected lives of physics students here on campus, Olsen says, by providing more individual trained help. "We are getting students off on the right foot in calculus based physics." Steve does not want to see any student drop out of the courses. "The math and pace of class is fast compared to what students are accustomed to taking, but working with the Learning Assistants (L.A.) gives them a friend, a helper and guide."

"The L.A.s are a spectacular group of students," Olsen says. Only the top students are chosen to be L.A.s. Olsen says that the L.A.s provide suggestions on how to improve the courses. "They are concerned and involved in the program. They understand that this is a dynamic program and that their input effects how we teach and do things." Olsen likes seeing the Learning Assistants grow throughout semester. "They become better at demos and tutoring. Their ability to teach changes and gets better. It is fun to see the changes."

Steve feels that teaching is one of the greatest jobs. "Being a physics high school teacher gives you a chance to teach a demanding subject." He finds that he studies constantly. Steve says, "choose to be a high school physics teacher if you want to help students and work with people. As a high school physics teacher, you know you have effected lives."

Profiles



Alex Schumann

Woods Halley

J. Woods Halley has worked many years on problems associated with alternative energy. Halley applies his knowledge of the physics of electro-chemistry to energy-relevant problems. He has been working with chemists from 3M and Argonne National Laboratory on problems in hydrogen fuel cells proposed for use in cars that would refill at hydrogen stations. In an energy economy depending on renewable, intermittent sources such as wind and solar energy, hydrogen would serve as a means to store and transport the generated energy. At the point of use, oxidation of hydrogen as a fuel produces no emissions except water.

The Halley group has studied the physics associated with two technical problems which have arisen in fuel cell development. During fuel cell operation, when the electrons are stripped from the hydrogen molecules, and the resulting protons are transported through the device to reach the electrode where they combine with oxygen from the air to form water and generate electrical energy. The proton transport through existing devices causes a dissipation of energy. The dissipation is tolerable as long as temperatures in the fuel cell are low. Device engineers would like to raise the temperature to increase reaction rates, but the proton transport slows down too much. They are studying alternative transport media called 'ionic liquids' which have improved proton transport properties at higher temperatures. The transport mechanism was found to have unexpected properties including dependence on the concentration of protons. "We found that at a certain concentration the protons were clustering, though they are of like charge, as if they were on the ragged edge of phase separation" Halley says. The clustering can account for the anomalous behavior and suggests design strategies for optimizing proton transport in fuel cells using ionic liquids as transport media.

Another problem with the hydrogen fuel cell is that the reaction in which protons combine with molecular oxygen to form water, called "oxygen reduction" is anomalously slow. The mechanism of the reaction is still not fully understood, making scientifically guided improvements in performance difficult. The group has developed software that models the surface of the platinum electrodes at which the reaction takes place, making a more comprehensive theoretical study of the process.

The group is also currently studying a proposed method for improvement of the efficiency of conversion of wind generated electricity to hydrogen stored energy with support from the University Center for Urban and Regional Affairs.

Alex Schumann

Asad Aboobaker

Launching a balloon-borne scientific experiment, or "balloon campaign" can be a long, intense operation where physicists work in isolated locations makinge a balloon experiment seem like a military campaign. Asad Aboobaker, a post doc at the University of Minnesota, working in Shaul Hanany's Observation cosmology group, blogged the EBEX launch in Fort Sumner, NM. Aboobaker chronicled the group's set-backs, near-disasters and small triumphs as they readied for launch.

Aboobaker lead the integration of the instruments in the cryostat, a large "fridge" full of liquid helium that keeps the instruments cool so that they could reach the maximum detection power. He also worked on the mechanics of the balloon gondola. At one point, the group believed they were going to need to add a lot more ballast to one side of the balloon to keep it level in the air. Adding the ballast would have added weight which would force them to use a smaller cryostat, compromising the entire point of the flight. Aboobaker came up with the idea of adding heavy duty springs to one side of the gondola. The group ended up using springs very similar to the kind used to raise and lower garage doors. The solution saved 600 pounds of counter-weight.

Aboobaker also worked on the gondola's baffle, a large, light weight shell that protects the detectors from signals from the sun leaving them free to concentrate on the Cosmic Microwave Background radiation. High winds shredded the baffle during a launch attempt. "We had to completely change the design and rebuild it from scratch. It was a disheartening day." The group managed to pull together a new baffle in time for the next launch window.

EBEX successfully launched, but that was just the beginning. The flight was a dry run to optimize the detectors for a flight to take place in Antarctica in December of 2010. The group is doing data analysis to improve their design for the Antarctic flight. Abobaker says the gondola was damaged when it landed. They need to strengthen the gondola to prepare for the winds in Antarctica. He is busy working on the new design. He plans to be in Antartica for the balloon campaign at the end of the year along with his blog. "We have a lot of work to do, but I'm looking forward to it."

Alex Schumann

Bob Lysak

The aurora borealis, or Northern Lights have long been a subject of fascination for those of us lucky enough to see them. Professor Bob Lysak is a theoretician who has been studying the unique physics of aurora since the 1970's. The classic model of the aurora is that electrons trapped in the Earth's magnetosphere are accelerated by quasi-static electric fields that form parallel to the Earth's magnetic field causing the light display. Lysak has created an alternative model of the aurora which insists that Alfven Waves, an oscillation that occurs along the lines of the Earth's magnetosphere, play a part in delivering energy to the aurora. Lysak's model was borne out by data from the recent FAST satellite, which showed patterns of acceleration that were more consistent with the Alfvén wave picture than what was predicted by the standard model of aurora physics.

Part of the problem with constructing a model of the physics of the aurora is that the magnetosphere and ionosphere are not uniform. Due to the Earth's gravitational field, the ionosphere has layers that vary in density at different altitudes. The Alfvén waves move through this plasma more slowly when it is more dense and more quickly where it is less dense. When plasma density falls off rapidly it creates a cavity where packets of Alfvén waves form, leading to the particle acceleration. The speed of Alfven waves increases exponentially above the ionosphere and can sometime hit relativistic speeds. Lysak has created a mathematical model to predict this ionospheric "weather."

Certain other space "weather" conditions such as the solar maximum, a cycle of Sun storms that peaks every eleven years, enable physicists and aurora enthusiasts alike to be able to see the strongest aurora in high northern latitudes, and correspondingly at high southern latitudes as well. Although electrons and ions hit the Earth's atmosphere continuously, the large energies required to form a visible aurora are only kicked up when a storm on the sun disturbs the Earth's magnetosphere. Most aurora are diffuse and appear in the sky as a single colored haze. Occasionally more spectacular aurora appear like a changing multi-hued light show in the sky. Lysak describes these "dancing" aurora lights as being Alfvenic, because the Alfven wave picture predicts more dynamic aurora than the standard static model. Lysak says that although we are now at the low point of the sun storm cycle, physicists believe that solar activity is increasing and Northern Minnesota will once again be a good place to observe the Northern Lights.

Alex Schumann

Oleg Kamaev

Oleg Kamaev is a Research Associate in the Cryogenic Dark Matter Search (CDMS) collaboration. He helped the group publish its latest findings on the dark matter candidate Weakly Interacting Massive Particle (WIMP) in *Science*. The collaboration found two events that meet all the characteristics for a WIMP particle in their detector at the Soudan Underground Laboratory. The number of events is not enough for the group to claim that they have discovered the elusive dark matter particle. "Had we found five events that matched all the criteria, the odds would have been that we had discovered dark matter." Kamaev says. The chances that the detector saw five false positives are 1:500 and that would have been enough to say that the group had discovered dark matter. "With two events the odds are one in four," While one in four odds might sound pretty good, it's simply not good enough. "We could have been unlucky, " he says and those two results could have been false positives.

The group devised a series of discrimination techniques in their software to eliminate background. They also only use events from detectors which were operating perfectly and take only "single-scatter" events, where the incoming particle causes the detector material to make one bounce instead of multiple bounces on collision. They also use shielding and statistical analysis to weed out all those events in which incoming particles collide with the electron shell of their detector material, rather than the nucleus. Having the experiment deep underground shields the detector from radiation induced by cosmic rays. The detectors are housed inside lead and polyethylene shielding and surrounded by scintillator veto panels which further reduce the chance of a false positive. The detector modules are chilled down to <50 mK to eliminate vibration in the detector material which can muddy their data.

Kamaev, like everyone else in CDMS, does ten day shifts at the Soudan mine operating the detector. Otherwise, he is busy tweaking the data-quality software. Currently the group is in the midst of research and development of discrimination techniques for the SuperCDMS detector which is already installed and taking data. Kamaev also works on material-purity of the CDMS detector materials and shielding. "It is important to use "clean" materials to minimize the background. We do this with high purity germanium gamma counter that is located in Soudan mine as a separate detector." The group expects to have the next results from SuperCDMS in early 2012.

Highlighting Alumni from the 1980s

1989

Stephen G. Gabbard (B.S., Physics, 1989) After finishing my B.S. in physics, I completed an M.S. in Mechanical Engineering. I have worked at several companies in Boulder, CO. I currently work as an engineer at the National Center for Atmospheric Research.

Haile K. Haile (M.S., Physics, 1989; B.S., Physics, 1984) Striving to study physics and mathematics, I joined the School of Physics and Astronomy at the University of Minnesota, soon after I arrived in the United States in the early 1980's. There, I learned something that I had never known before: that the color of my skin could be the criterion that is used to decide to accept/reject me. Hitherto I had always thought that my character and abilities were what others evaluated when they considered me. At the School, most of my classmates consistently avoided me. For months, even my greetings were consistently unreciprocated (ignored). Still, I was too naïve to understand why I was being treated so badly. After all, I had no prior experience of being in a school where I was not liked. In Ethiopia I was a very treasured student who was liked by both teachers and fellow students. My financial situation at the time exposed me to additional unfair treatment at the School. While other graduate students received assistantships for the entire academic year (and summer assistantships/summer internships), my assistantship was limited to the non-summer terms and was renewed on a quarterly basis. One Saturday, a graduate student requested to join me while I was studying classical mechanics in a classroom in the Physics building. Excited by the prospect of a classmate finally talking to me, I gladly welcomed him. He told me that although I considered myself an Ethiopian, to him and others in the School, I was an unwanted Negro. Indeed, I was the School's only African-American at the time. I was too new to the United States and its society to consider reporting the graduate student's racist comment. Instead, I felt so unwelcome, uncomfortable and even scared for my safety that I started planning to leave the School of Physics and Astronomy, even though I had passed the written Ph.D. preliminary examination. I do not put the blame wholly on others. I should have devoted time to learning the standards and norms of the society that I had just joined, instead of rushing to learn physics and mathematics. I also state that certain faculty members (especially Professor Benjamin F. Bayman and Professor J. W. Halley) treated me very kindly throughout my days at the School. I now teach mathematics at Minneapolis Community and Technical College. I would have loved to teach physics but since we do not have many students that take it, I do not teach it here. However, I taught physics for a semester at an institute several years ago. In 2005, I took part in the "Einstein Centennial Conference" organized by the Physics Department of Addis Ababa University.

Tao Pang (Ph.D., Physics, 1989) I am married with two children. My daughter is a sophomore at University of California, Berkeley, and is inspired to become a pediatrician. My son is an eighth grader and plays both violin and tennis. My wife, who is also a University of Minnesota alumna, works in a middle school as the school librarian. I enjoy teaching. I also play a lot of tennis under the scorching sun of the Mojave Desert. After receiving my Ph.D., I worked as a Miller Research Fellow at University of California, Berkeley, for a couple of years. I joined the Physics Department at the University of Nevada, Las Vegas (UNLV), as an Assistant Professor. I received my tenure and promotion to Associate Professor in 2002. Currently, I am Chair of the Department of Physics and Astronomy. My book, An *Introduction to Computational Physics*, published by Cambridge University Press, is well received as a textbook as well as a reference for researchers in scientific computing. I came to the School of Physics and Astronomy as a foreign graduate student on a full scholarship in 1984. Those were the best five years of my life. Everyone around me extended his or her helpful hand; from fixing my broken English to guiding me through my life in that foreign but yet warm land (it felt warm even in the middle of the Minnesota winter). By the summer of 1989, I accomplished three major things in my life: receiving a Ph.D. in Condensed Matter Theory, getting married to my wife, and finding the best postdoctoral position I could have ever dreamed of, thanks to the faculty and other people in the School of Physics and Astronomy. My favorite professors were my thesis advisor Professor Charles E. Campbell and Professor Morton Hamermesh. Campbell taught me how to think independently. Hamermesh taught me how to see the beauty of nature and its symmetries. I still consult his book (a signed copy), *Group Theory and Its Applications to Physical Problems*, for my research and teaching. Quantum Field Theory taught by Professor Stephen Gasiorowicz was my favorite course where I learned the elegance of working out a tough and long problem. I also learned how to appreciate the discoveries made by theorists.

James P. Wire (B.S., Physics, 1989) I am divorced with two high school boys. My oldest son is interested in a history major from the University of Minnesota. I enjoy scuba diving, travel, piano and film photography. I am a Plastic Surgeon with a practice in Chaska, MN. My favorite memories from my undergraduate career are visiting professors, especially Stephen Hawking and graduating with plans of some day returning for medical school. I graduated from the University of Minnesota Medical School in 1994.

1988

Gregory R. Edlund (B.S., Physics, 1988) I have two kids in college now and more time on my hands. Last year I started building a wooden airplane which I hope to test in 2011. IBM pays me to help their computers run faster. I have helped design four supercomputers since I graduated. Two years ago Prentice Hall published a book I wrote on computer design. One of my favorite memories was measuring Cherenkov light from cosmic rays. We hauled a van load of gear eighty miles and stayed up all night watching an oscilloscope. I enjoyed courses with Professors Peterson and Marshak. I also liked Methods of Experimental Physics with Professors Giese and Shapiro.

William F. Bottke, Jr. (B.S., Physics, 1988; B.S., Astrophysics, 1988) I am married and have three daughters. My wife, Veronica, and I met in Tucson in 1991 while I was in graduate school at the University of Arizona. We were married in 1996. My wife works at St. John's Catholic School in Longmont as a pre-school teacher. All my kids are in school, with the younger ones busy with sports, ballet, and seasonal fun. Veronica and I have a great time just trying to keep up with them. After completing my B.S. in Physics and Astrophysics at the University of Minnesota in 1998, I moved to Tucson to attend graduate school at the University of Arizona's Lunar and Planetary Laboratory. I completed my Ph.D. in Planetary Science in 1995. I did postdoctoral fellowships at Caltech and Cornell University before accepting a research scientist position at the Southwest Research Institute (SwRI) in Boulder, CO in 2000. Nine years later, I am the Assistant Director of the Space

Studies Department at SwRI-Boulder and the Director of the Center for Lunar Origin and Evolution (CLOE), one of NASA's new Lunar Science Institutes. My main research interests are the collisional and dynamical evolution of small solar system bodies (e.g., the moon, asteroids, comets and meteorites) and how they can be used to tell us about the formation and evolution of our planets. My favorite memory, strangely enough, concerns the Minnesota Twins World Series playoff run in 1987. Growing up in Minnesota, I had seen several of our favorite teams make it to the big game and blow it. This was hard on me as a kid. This set the stage for the following dilemma; do I study for the big midterm exam in my Statistical and Thermal Physics class, or do I watch games six and seven of the World Series over the weekend? On the Friday before the weekend games, I recall getting into an argument about this issue with a friend of mine just before class. In a loud voice, and with no professor in sight, I announced "What are you going to remember 20 years from now: a blown test, or the Twins winning it all?" What I did not know was that my professor was standing right behind me when I said this. After lots of laughter, the professor said to my very red face, "Well, I guess we could move the test to Tuesday". The Twins went on to win it all, the Twin Cities went wild, I passed my test, and I got lots of complements after class from those who were going to watch the games, test or no test. Other great memories come from my physics laboratory class that we took during our senior year. For our final project, my friend **Scott Demars** (B.S., Physics, 1988) and I decided to use holograms to investigate the vibration modes produced on a violin. It was a fun project, but very quickly we realized that to do it, we needed to learn about lasers, optics, vibrationless tables, electronics, violins, and photography. Our friends in the same class were in similar situations. The upshot of all this work was that for months, there were always several people around late at night willing to go out and drink a beer. It taught me that science is much more fun when friendships go with it. I enjoyed all of my professors at the University of Minnesota. I would say that the one that made the biggest different to my career was Dr. Mauersberger, who taught my introductory physics course during my freshman year (1984-1985). I grew up in the small town of Faribault, MN. Suffice to say, I was unprepared for the huge difference in work that existed between my high school physics classes and my coursework at the University of Minnesota. Fortunately, the Institute of Technology had a great open tutoring program as well as many professors who were willing to keep long office hours for people like me. Dr. Mauersberger not only was an exciting, dynamic teacher, but he also allowed me to essentially move into his office so I could get the help I needed to understand his homework and prepare for his tests. This made an enormous difference to me. I ended up passing his class with straight A's. In my Junior and Senior years, I have very fond memories of working with Professors Tom Jones, Larry Rudnick and Bob Gehrz on various undergraduate astronomy projects. They all impressed upon me the excitement of science and how things were done in the real world. They were also a lot of fun to hang out with in the Astronomy Department reading room, where all of us, along with several other Astronomy undergrads, would discuss the science and political topics of the day. I was later told that I had gained the nickname "Yeah, but…" for my contrary opinions on certain topics. I do not think much has changed in more than twenty years.

Theodore W. Hodapp (Ph.D., Physics, 1988; B.S., Physics, 1981) I was married this past fall in St. Paul. I love to dance and to teach dance as well. I became a pilot in 1999 and fly whenever I get the chance. I also love mountaineering and hiking up mountains and glaciers.

Robert F. Szalapski (B.S., Physics, 1988) I am divorced with three sons. I am currently engaged. I spent four years in Japan and one in Rochester, NY as a post-doc. Currently, I am employed as a Dilbert. I hope to return to academics someday. My favorite memory from the University of Minnesota was studying with my physics homies: Daryl, Margaret, Toby, Bill and Scott. I was a chemist, but freshman physics with Professor Tang inspired me to take more physics courses. Modern physics with Professor Rudaz got me to switch majors! Professor Bayman was a great mentor.

Roger C. Wiens (Ph.D., Physics, 1988) I am married with two children in high school. I am the Principle Investigator of an instrument to be used on the Mars rover, "Curiosity." We plan to deliver the ChemCam instrument to NASA next spring. The rover is to be launched in 2011. An interesting experience was when my advisor, Bob Pepin, was quoted in the National Enquirer! It turns out they had misused a quote from him in the New York Times regarding the Martian meteorites we were studying at the time.

1987

Jeffrey W. Stein (Ph.D., Physics, 1987; B.A., Physics and Applied Math, 1976) I live in New Jersey with my wife, Ging, and son, William (9). I joined AT&T Bell Labs in 1987. I have worked at AT&T for twenty-two years, primarily in the area of network management. I am a co-inventor on a patent relating to the management of IP-based networks. My favorite memory includes coffee, doughnuts, and cross word puzzles with the other grad students. My advisor, Professor Freier was my favorite professor. I think most people remember Professor Bayman's seminars on passing the written test. I also enjoyed the course he taught on applications of group theory to physics.

Siu-Yue Tam (B.S., Physics, 1987) I earned both an M.S. and Ph.D. in Civil Engineering. I am currently married and have two children.

1986

Brian D. Beecken (Ph.D., Physics, 1986; M.S., Physics, 1984) I married my wife Kim in 1986. We have four children. I worked at Texas Instruments as a systems engineer for two years. I have been a faculty member in the Physics Department at Bethel University since 1988, and chair since 1996. I have had five NASA Fellowships and eight Air Force Research Laboratory Fellowships. My favorite memories were passing the written and oral qualifying exams. On the oral exam, Dr. Campbell asked "if I dropped an object where would it go?" I too quickly responded, "in orbit about the Earth's center of mass." He immediately went to another question for which I was unprepared. Bill Zimmerman was my favorite professor. His thermodynamics course was my favorite class. I now teach themodynamics, and still use the same text and some of Bill's text questions.

Gerald C. Blazey (Ph.D., High Energy Physics, 1986) I am married to my wife Jean. We have two kids. I am a professor at Northern Illinois University. My favorite memories from my time at the University of Minnesota were the crock pot dinners in the Tower Soudan Mine and playing Frisbee on the mall.

Miles A. Finn (Ph.D., Physics, 1986) I worked for many years in Minnesota's medical device and software fields. Over the course of this work, I received several patents. I became so interested in patent law that I became a Patent Agent in 2004 and an attorney in 2009. I work at Robins, Kaplan, Miller & Ciresi, a law firm with a strong patent litigation practice. I started there as a "Science Advisor," where I worked with seven other Ph.D.s, most of whom were physicists. We helped support patent litigation. Patent law offers the intellectual challenge of physics but on a much wider level than I found in industry.

Class Notes

1985

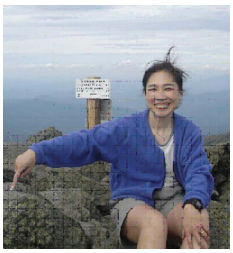
Charles L. Blilie (Ph.D., Physics, 1985; B.S., Physics and Astrophysics, 1981) I have been married to my wife Shelley since 1981. She is a University of Minnesota Physics graduate and is now teaching Introductory Physics at the University of St. Thomas. From 1985 to 1995, I worked in computational physics for several research companies. Since then, I have been a software developer and software architect. I am currently a consultant for Trissential working on a contract a Siemens in power system automation. I spent the summer of 1981 at the Los Alamos Meson Physics Facility (LAMPF) in Los Alamos, NM. At the time the University of Minnesota has a group of researchers doing pion-nuclear physics at LAMPF.

Scott D. Dobbins (B.S., Physics, 1985) I was married in 1990 to Nancy Lewis, whom I met through a friend at work who ran the electron microscope. This is pretty romantic, when you think about it. Nancy has been a Registered Dietitian at the VAMC in Minneapolis since 1987. We have two children, David (15) and Ellen (13). Shortly after graduating, I got into running and have been doing that ever since. I am lucky to have run 18 marathons and many other races. Three years ago I joined a friend running with Team in Training, helping to raise funds for the Leukemia and Lymphoma Society. I raised over $20,000 with the help of very kind and generous people. The last several years I have volunteered as a math and physics tutor at Normandale Community College in Bloomington, MN. Back in school there were a lot of problems that were really hard to do, but I like helping students do them now. This is mostly because I do not have to turn in any homework. About a year after graduating I landed a job at the disk drive division of Control Data. In the subsequent twenty-two years with Control Data/Seagate, I worked on some amazing projects in electrical test and measurement for disk drive heads. I remember that when I first started, the state-of-the-art in drives was 200 Mbytes at a cost of about $4,000. Now it's 1 Tbyte at about $100 which is five thousand times the storage, at one forth the cost. Phenomenal! I designed and deployed electrical test systems in Seagate's Minnesota and Ireland wafer fabrication sites. In 2001-2003 I delivered diversity training to the Seagate workforce, with people from more than sixty countries. It was the best gig I ever had. Unfortunately, I was recently caught in a layoff at Seagate. Though I miss my buddies at work, this has given me the chance to further my education and to take a look at alternate careers in teaching and training. Though looking for work is a drag (a huge drag, in this economy!), I have a lot of interest in meeting people and taking on challenges at a new job. The inevitable jobless person's shameless plug: look Scott Dobbins up on LinkedIn! I enjoyed the time I spent with Professors Keith Ruddick, Robert Pepin, Walter Johnson and Ken Heller. Dr. Johnson had a talent and love for instruction. His office was always open to help students. Dr. Pepin was our adviser for SPS. I remember how fun it was to be around him with his high-energy personality and his innate ability to tell a story. One day after mechanics class, I was making plans to study with my buddies. Dr. Ruddick gave us the best advice possible: "You're young. Have some fun. Put down the calculators. Relax and get some pizza and beer. The problems are still going to be there for you." Earlier in the quarter, he mentioned that throwing pennies was a time-honored tradition for students and professors in the UK. The last day of class, we showered (actually pelted) him with pennies. His face turned so red I thought he was going to pop. My most memorable course was Methods of Experimental Physics, taught by Dr. Heller. A lot of hair was lost and pencils broken trying to get those damn breadboard circuits to work right. We had a lot of late-nighters in that lab. My lab partner, **Mike Montean** (B.S., Physics, 1985; deceased), suggested we resort to writing poetry in our lab books when it was clear that we had lost the ability for rational thought. Though tough, I learned more practical skills in Experimental than in any other class. Dr. Heller stressed the importance of "measuring something in the real world and getting it into a computer." Indeed, most of my career involved variations on doing just that.

Daniel M. Murphy (Ph.D., Physics, 1985) I am married with two ten-year old boys. I am the leader of a research group at the NOAA lab in Boulder, CO. I was one of the authors of the third IPCC report on Climate Change. Professor Konrad Mauersberger was a wonderful advisor. I also remember Dean Abrahamson from the Humphrey Institute as someone ahead of his time.

Gregory Hall (Ph.D., Physics, 1985) I grew up in Oregon and attended Oregon State. I met my wife Lynn there. We moved to Minnesota for graduate work. Lynn started in the Physical Therapy program at Mayo in Rochester while I attended the University of Minnesota. After graduation, we moved to South Carolina. I started a research job at the government lab near Aiken. I was recruited by **J. E. Halverson** (Ph.D., Physics, 1977; M.S., Physics, 1976), for mass spectrometry development work. I went directly from graduate school to full time employment at the Savannah River Laboratory (SRL), the DOE nuclear materials production site in South Carolina. The SRL was the original process development lab for the site. Reactors were still running when I was hired, but have since been shut down. The group I joined worked in the diverse world of environmental nuclear effluent monitoring. I spent time with a project on laser detection of environmental hydrogen molecular isotopes, automated and reprogrammed a helium isotope mass spectrometer, and more recently branched into thermal ionization mass spectrometry. I still work for J.E. Halverson, who originally recruited me, and am still in the same building after nearly 25 years in the lab. The SRL laboratory morphed in to the Savannah River Technology Center, and several years ago became the Savannah River National Laboratory. Throughout these contractor shifts, my coworkers and management were essentially unchanged. My favorite memory from the University of Minnesota was being the lone physics guy in a chemistry group, weekly afternoon colloquiums, wandering around in the multiple libraries and the student machine shop. We have two daughters and a son. The eldest completed a Music Performance degree in Kent, OH and a program in Instrument Repair. She currently works in a music shop in Kent. The second completed a degree in Genetics at the University of Georgia, and is now doing graduate work in Gene Expression at the University of Wisconsin - Madison. The youngest is about to complete a degree in Mechanical Engineering at Clemson, and is also looking into graduate work. He spent two months last summer at the University of Minnesota as an intern in Mechanical Engineering Research, and had a great time.

1984



Li-Jen T. Lin (Ph.D., Physics, 1984; M.S., Physics, 1982) I have a B.Ed. degree in Science Education with a concentration in Physics from overseas. After graduate school, I did a postdoctoral term at Yale University in Thin Film Superconductors, and a term at Bellcore in Red Bank, NJ (Baby Bell research center after the splitting of Bell Labs) in novel semiconductors. When I was six months

pregnant, I relocated to Massachusetts with my husband who was starting a career at Massachusetts Institute of Technology (MIT) Lincoln Laboratory. I stayed at home raising my two kids. I was a full time school and community volunteer for 18 years. During these 18 years, I obtained Massachusetts teaching certificates in math and science at the middle and high school levels, as well as a second bachelor's degree in Computer Science and Information Technology from the University of Massachusetts at Lowell. I am currently working as a software engineer at General Dynamics C4 System in Taunton, MA. Both my son and my daughter currently attend MIT. During my child rearing years, we lived five years in the Marshall Islands, and four years in the Washington, D.C. area. We have traveled with the children to foreign countries and across the United States. We have done many hiking and skiing trips, backpacked into 12,000 foot mountains and sailed across the Caribbean. I have fond memories of my years at Minnesota. My most profound memory at Minnesota was riding my bike around the lakes in Minneapolis on Sunday afternoons. My thesis advisor was Professor Allen Goldman. My favorite course professors were Jonathan Rosenberg for Mathematics Physics and Woods Halley for Solid State Physics. My favorite Department Head was Professor Hamermesh. My favorite grad school friends were **Dr. John Viner** (B.S., Physics, 1971), now at Utah University, **Dr. Cory Umbach** (Ph.D., Materials Science, 1982; M.S., Chemical Engineering, 1979), now an attorney, **Dr. Alan Kadin** at Hypres and **Dr. Kenneth A. Epstein** (Ph.D., Physics, 1982) at 3M.

Jim D. Povlis (Ph.D., High Energy Physics, 1984) I am doing well. I worked at Ragthorm as a software engineer. I took an early retirement this past year. While at the University of Minnesota, I enjoyed working on my experiment at Fermilab and collaborating with other students from different universities.

1983

Thomas W. Kenny (B.S., Physics, 1983) I am married. We live in San Francisco and are enjoying the city. I am a Professor in the Department of Mechanical Engineering at Stanford Proctam Marur DARPA microsystems technical office. My favorite memory from the University of Minnesota was working with Professor Bob Pepin.

George D. Vernstrom (B.S., Physics, 1983) I have been a professional physicist at the 3M Company for twenty-six years. I am married and I have two daughters. One daughter is working at the University of Minnesota at a trauma nurse and the other daughter is a graduate student in Astrophysics at the University of British Columbia at Vancouver. My wife, Kathy, is an IT manager for Subway. I have six issued patents in organic LED and fuel cell technology and six patents pending in fuel cell technology. I also have more than forty publications in various journals. I am presently doing a catalyst research for 3M on two Department of Energy government contracts. My favorite memory was Professor Ruddick who taught analytical mechanics. He told the story of an old professor back in England who was pelted with English pence at the end of an academic year. We did the same to Professor Ruddick at the end of our year with him. He appreciated it a lot. J.S. Brooks was another favorite professor. He taught a beginning physics course in the summer and was always open to students coming to his office and further discussions of physics outside of the classroom.

1982

Paul M. Williams (B.S., Physics, 1982) I am married and live with my wife and daughters in Plymouth, MN. We enjoy every kind of sporting activity. We are active in our church and parish activities. I worked as a physicist in several 3M Company laboratories until 1990. I "re-trained" from 1990 through 2000 as an Otolaryngologist - Head and Neck Surgeon. I have ten years of private practice at Oakdale E.N.T. Clinics. It may be my imagination, but I recall many British accents! I enjoyed my youthful years and the many enlightening lectures. I especially recall Dr. Geenlees and appreciate his teaching. I greatly enjoyed lectures with demonstrations.

1981

James W. Babcock (Ph.D., Physics. 1981) After grad school, I worked for Control Data in Minneapolis for three years before joining Sperry Univac, working in the area of advanced semiconductor packaging. After four years, my job moved to San Diego when Sperry became Unisys. About six years ago I helped start a new business group within Unisys designing semiconductor test equipment. That group was then sold three years ago to a local company, Delta Design. I am still at it, designing test equipment, with an emphasis on thermal control and with a couple dozen patents in the field. I have been very fortunate to work with very nice and talented people. I hope to continue doing this for a while longer. I am still happily married to Joanne, the same gal I married in grad school. I am enjoying the wonderful weather and everything else San Diego has to offer, including mountain biking, hiking, cars, wine tasting, and playing with our wonderful Bengal cat. My memories of graduate school are very pleasant ones. I remember Roger Jones for his support in easing me back into academia after four years in the Air Force. Hans Courant who let me drive his hot rod Mercedes. I recall the kindness and patience of Walter Weyhman, my thesis advisor, who virtually adopted me into his family.

Robin H. Cantor (Ph.D., Physics, 1981) I am currently President of STAR Cryoelectronics in Santa Fe, New Mexico. I founded the company in 1999. The company is engaged in the business of developing, manufacturing, and marketing LTS and HTS dc SQUIDs and related control electronics for applications in basic research, biomedical imaging (MEG and MCG), non-destructive testing and evaluation of materials, and geophysics. More recently we have developed superconducting transition edge sensor (TES) microcalorimeter detectors for X-ray and alpha particle spectroscopy as well as superconducting tunnel junction X-ray detectors for synchrotron science applications. We are currently working on the commercialization of a next-generation cryogen-free microcalorimeter X-ray spectrometer for X-ray microanalysis. We have our own clean room and offer custom thin-film fabrication services for a wide variety superconducting devices aside from SQUIDs and detectors, including bolometers, resonators, and RF filters. There are only five employees, including myself and my wife, so we are very busy! With potential new R&D contracts coming in I hope to hire at least one additional person next year. Prior to founding the company I worked at Los Alamos National Laboratory for a year in the Biophysics Group, and before that I spent five years at Conductus in Sunnyvale, CA. I was the Manager of the SQUID Technology Group and ended up buying this part of the business when Conductus decided to narrow their business focus to HTS filters for wireless base station applications in 1999. I joined Conductus and moved to Sunnyvale from Europe in 1993. I had spent a year working at a start-up company in Italy. I was a staff member at the Physikalisch-Technische Bundesanstalt (German national standards laboratory) in Berlin from 1986 - 1992. This was quite an exciting six years for me professionally and personally. My wife and I were married at Rathaus Schoeneberg where Kennedy gave his famous speech after the Berlin Wall was erected. We were able to witness first-hand the fall of the Wall in 1989. Our daughter Sarah was born in Berlin. She is now a sophomore at Occidental College in Los Angeles. She is enjoying the big city after so many years in Santa Fe. It was great fun to attend Allen's birthday celebration on campus last May. I hope there will be other occasions in the future to return to the University and visit with former students and staff.

Mark A. Molenaar (B.S., Astrophysics, 1981) I am a Technical Marketing Manager at STMicroelectronics. My favorite memory from the University of Minnesota was the 1984 College Bowl National Championship. In 1985 I earned my Masters in Electrical Engineering and in 1992 I earned an M.B.A., both from the University of Minnesota.

Noel J. Petit (Ph.D., Physics, 1981; M.S., Physics, 1978) I am married with two children and two stepchildren. We have seven granddaughters. I am a Professor of Computer Science at Augsburg College. I currently hold the position of Computer Science Department Chairman. I have active research in geomagnetic fields. My favorite memory from my time at the University of Minnesota was George Freier's demonstration conservation of momentum with a 22 gauge rifle and watching the front few rows of students clear out! I enjoyed Homer Mantis and George Freier as "old school" faculty.

Additional Class Notes

2007

Aaron M. McGowan (Ph.D., Physics, 2007) I am a visiting Assistant Professor of Physics at Saint John Fisher College in Rochester, NY I am continuing work in neutrino physics on MINOS through a Guest Researcher appointment at Argonne. I also work on MINERvA through a Visiting Scientist appointment at the University of Rochester. I live in Rochester with my wife Sarah, who is a pediatrics resident.

2003

Aron J. Cooper (B.S., Astrophysics, 2003) I am working for an international hedge fund called Marshall Wace in Greenwich, CT. I am a quantitative analyst and portfolio manager. I have three kids Gideon (10), Lillian (3), Oliver (1) with my wife Heather (a University of Minnesota alumnae).

2001

Sidi Benzahara (Ph.D. Physics 2001) I am now an assistant professor of physics at the Claremont College in Southern California. I invented a mechanism called the Rocket Bungee Booster, to help land rovers in Mars and planets with no atmospheres. It is under consideration by NASA. I have written eight books (fiction and non fiction—one of them adapted into a film). I have written and directed a movie called Woman City: www.womancitymovie.com. Above is a picture of me with the actors. I will be filming another movie called, Fritz, this summer. I'd like to say "hi" to the physics geeks, especially Benjamin Bayman and Joseph Kapusta. Without them I wouldn not have received my PhD.

2000

Rupak K. Mahapatra (Ph.D., Physics, 2000) After graduation, I was a postdoc at University of California, Santa Barbara, doing research on Dark Matter search. I have joined Texas A&M University as a faculty member in Physics.

Andrew D. Ferstl (Ph.D., Physics, 2000) I have been married to my wife Kerri for 14 years. We have two wonderful sons (ages 6 and 8). I am currently in my ninth year as an Associate Professor in the physics department at Winona State University. I teach classes and direct undergraduate research projects. I would also like to mention that I closely work with two other University of Minnesota Alumnus, **Nathan Moore** (Ph.D., Physics, 2006) and **Jennifer Anderson** (B.S., Physics, 1994). In addition, I am temporarily the Science Education Coordinator for the College of Science and Engineering.

1997

Laura E. McCullough (M.S., Physics, 1997) I am a tenured Associate Professor at the University of Wisconsin-Stout. I was recently elected as chair of the Physics Department. My husband Kelly McCullough is a science fiction author with three novels published and more forthcoming.

Thomas E. Wald (B.S., Physics, 1997) I pursued a second bachelor's degree in Philosophy with a minor in German at University of Texas at Austin, finishing in May 2009. My primary interests in philosophy are Philosophy of Mind and Philosophy of Science. I received my first ever scholarships for my studies this fall at University of Texas. I am single, but dating. My time is also filled with volunteer work to promote and advocate for bicycling in Austin, Texas. I am involved with a number of local organizations including University of Texas Orange Bike Project, Bicycle Advisory Council, and League of Bicycling Voters. I am also on the board of directors for the only grocery store cooperative in Texas, called the Wheatsville Co-op. The Twin Cities have it so good when it comes to co-ops. I returned to my professional life as a web developer in fall 2009.

1992

Matthew Evans (M.S., Physics, 1992; B.S., Physics, 1989) I have run the past 25 Grandma's Marathons in Duluth, MN. I earned my Ph.D. from the University of Wisconsin-Milwaukee. I have taught since 1999 at the University of Wisconsin-Eau Claire. My favorite memory was Professor Weyhmann wearing a hand-knit sweater that he received from Christmas. It was the first time I saw teachers as real people.

Roger T. Goerke (Ph.D., Space Physics, 1992; M.S., Space Physics, 1989) I have been married for 20 years to the most wonderful person in the world, my wife Terry. She is also a physics teacher. Terry and I have been blessed with two children: John (18) and Katy (15). John is a recent recipient of the Boy Scout Eagle rank. Katy is a recent recipient of the Girl Scout Gold Award. We enjoy camping, hiking, biking and living in the great state of Minnesota. I have been a computer consultant for ten years primarily doing Java programming for various Twin Cities consulting companies. My Java programming skills are built on the massive amount of Fortran computer programming I did while in graduate school. I am currently a partner in the Harbinger Partners consulting firm and on assignment at Thomson Reuters (formerly WestLaw). My favorite memory from the School was meeting my wife in the Physics department coffee room at 7:00 am on the first Monday of my second year at the University of Minnesota. She asked me if I was in Mechanics (because I was taking Thermodynamics and was carrying the book). I replied that I was not, but had taken it last year. She suggested that I would not remember it from last year and I assured her that I did remember it. After a long pause to make coffee, I asked her if she needed help and the rest is history. My favorite professor at the University of Minnesota was Bob Lysak. He had the uncanny ability to grasp and explain the multivariable multi-dimensional calculus needed to understand plasma physics, but was down to earth and easy to talk to over a cold beer.

1977

Roger L. Knutson (B.S., Physics, 1977) I am currently a Lead Systems Engineer at General Dynamics. I contributed to two patents: one in 1965 for a Microwave No Load Detector and in 1991 for a Peristaltic Pump. I am a Staff Engineer with broad systems experience in identifying, analyzing, and providing effective corrective action solutions to engineering, manufacturing, and procurement issues. I have many years of engineering experience as a production Engineer, Design and Development Engineer, Quality Engineer, Logistics Engineer, and

Reliability Engineer. I have designed and implemented systems using systems engineering, hardware design, and software design. Analysis of failures, determination of root cause, and implementation of effective corrective action are some of my strengths. I have interfaced with many customers (U.S. and foreign) and vendors to solve technical, procurement, and implementation issues.

1976

Group photo: Standing from left to right: **Kevin Loeffler** *(B.S., Physics and Astrophysics, 1976),* **Richard B. Dorshow** *(B.S., Physics, 1976), Thor Olson,* **Jeffrey A. Harvey** *(B.S., Physics, 1977),* **John Bowers** *(B.S., Physics, 1976),* **Kevin Thompson**. *Squatting l to r:* **Greg Hull** *(B. Physics, 1977) and* **Curt Weyrauch** *(B.S., Physics, 1976).*

John E. Bowers (B.S., Physics, 1976) When we were in physics, we formed a group called "The Roving Photons". One of the more organized members of the group kept the 1975 picture shown below. I am the "propeller head" at the top with glasses. I continue to work in photonics. I have been a professor at UCSB for the past 22 years. My hobbies are skiing, biking, and sailing. We enjoy living in Santa Barbara, but three major wildfires and our two mandatory evacuations in the past year added a bit of strain. I have two sons. One is a lawyer in Newport Beach, and the other is in grad school at Caltech.

Frank J. Carlson (B.S., Physics, 1976) I was one of the less stellar physics majors. Due to immaturity, and lots of family and personal issues I graduated in March 1976 after five and a half years working on the degree. I started in fall 1970 and my graduating grade point average was a stunning 2.6. A fellow physics colleague, **Richard Wesenberg** (M.S., Physics, 1979; B.S., Physics, 1974) graduated and joined the Air Force. I applied to the Air Force, was accepted into their officer program and then was stationed in Florida and Germany. Half-way through, I decided I wanted to go to Medical School and become a doctor. Rather miraculously, all of the grand plans came through with me graduating from Medical School at the University in 1989 on Navy Scholarship. I have now been in the Navy over 20 years and am a senior Captain. I am a specialist in Internal Medicine. I have been all over the world, including serving in the Persian Gulf during the 1990 Gulf War and then the 2003 war. In addition, I have had two separate four year tours at the Naval Hospital in Naples, Italy. I am currently working in a senior administrative post for the Navy in Washington, D.C. Once a week, I do clinical work at Bethesda Naval Hospital. I had hopes of being another Albert Einstein, but instead I ended up traveling the world and saving and extending lots of lives in the process. I look back very fondly on my time as a physics student. The physics curriculum has helped me throughout my entire life. The logical and analytical mindset that it instilled has kept me thinking in terms of statistics and probabilities. Physics has also given me an awe and respect for the physical universe--its order, stunning complexity, and also its beauty. Steve Gasiorowicz who taught Quantum Mechanics was one of my favorite professors. He described electrons as "little green men running along a wire." I also remember the calm, laid-back demeanor of Professor Cahill who in his brilliance could explain amazingly complicated things in a very matter of fact way. I did not become Einstein, but my physics studies have had an enormous influence on my life for which I am very thankful.

Richard B. Dorshow (B.S., Physics, 1976) After completing my B.S. at the University of Minnesota, I applied to graduate schools mainly in the southwest. I received an offer from the University of California at Santa Barbara that I could not refuse. My Ph.D. thesis was on the study of surfactant systems employing light scattering. I found a job in Cleveland, OH with the Standard Oil Company doing just that after my thesis was completed. We spent about 10 years there, during which the company was bought by British Petroleum. The new owners eventually decided to consolidate research back in England. I found a job with Mallinckrodt Inc. in St. Louis, MO, due to my skills in light scattering techniques. I have been there many years, and am very happy to contribute to medical devices and pharmaceutical agents that help people. I have been able to publish regularly and patent frequently. Of course, in the corporate world of today, change is a constant. Mallinckrodt was bought by Tyco and then spun off, so today I work for Covidien (although I am in the same lab as when I first joined years ago). I have been married to my wife Gayle for 27 years. We have two boys, Sam (20) and Nate (16). Both Gayle and I were born and raised in St. Paul, and many of our relatives on both sides of our family still live in the Twin Cities. so we try to visit as often as we can. One of my favorite memories was from my sophomore year. A small group of us formed an undergraduate physics club, the Roving Photons. I was elected Executive Director, mainly because I wrote the rules for election and eliminated the competition. It was a very friendly group of comrades (Greg, two Kevins, Jeff, John, and Thor). We were given a small, narrow room in the sub-basement of the Physics building. There was an exit sign in the hallway outside the door. Thor, who was also an art major, somehow put the club name on two pieces of glass and we replaced the exit sign with the glass such that we had a lighted club sign. I think the sign lasted less than one night as it apparently violated the fire safety code. We had a refrigerator in the club room and arranged a delivery of soda pop every so often. Our main impact was a faculty lecture we sponsored and arranged. We would take the faculty speaker out to lunch on the day of the presentation. I remember we used to go to Sammy D's. I think our first speaker was Professor Gasiorowicz. I still have a autographed copy of his book written and completed during my time at the university. The School used to get audited by the American Physics Society and a group of distinguished physicists came to do the audit. This included William Fowler, then president or president-elect of the APS, and also the famous physicist Herman Feshbach. Because there was an undergraduate physics club, the distinguished group talked to us too. Here we were with this group of esteemed physicists, and we were telling them about the lunches at Sammy's D's and the soda pop delivery. In hindsight, this seems a very surreal event. In our senior year, we took a mathematical physics course from Professor Geffen. It was in a room that had a wooden lectern with a metal book holder on the top. At the beginning of each class, Professor Geffen would pick up the metal book holder and place it elsewhere, I think so he could lean more comfortably on the lectern. This moving of the book holder occurred before every class. One day, before class, we put lead bricks from the undergraduate laboratory inside the metal lectern. Even Professor Geffen laughed when he was unable to move the book holder off the lectern that day. Professor Stephen Gasiorowicz was also a favorite, whose explanations of probability usually involved some sort of food: a tablespoon of peanut butter spread over a cracker, many crackers, and then the entire universe to explain probabilities.

1972

James N. Hollenhorst (B.S., Physics, 1972) My wife, Mary and I got married the day before we left for graduate school in California. We have been married for 36 years. We have four wonderful children, ages 15 to 29. After getting my B.S., I did one year of graduate school, then transferred to Stanford for my Ph.D. I spent 11 years at Bell Labs working on superconductivity, semiconductors, and optoelectronics.

I returned to California to work for HP Labs, which later spun off its measurement business as Agilent Technologies. I have been with HP/Agilent for almost 20 years where I have worked with outstanding people and managed various R&D organizations in electronics and bioanalytical technologies. One great memory that comes to mind was when Keith Ruddick, in a great state of excitement, asked me if I would like to "see antiprotons." This was while we were tuning up for an experiment at Argonne's zero gradient Synchrotron. His enthusiasm was infectious, but I had no idea what to expect. In great anticipation, I walked with him to the trailer, where he sat me down and did a calculation of detector efficiencies and counts. This all seemed rather dull, and I wanted to see those antiprotons, so I politely listened while he deduced what percentage of the beam was electrons, protons, muons, and pions. When he added it all up, it came to 98%. With a final flourish, he announced that the remaining 2%, which we had not seen at all, had to be antiprotons! I vividly recall my own excitement at "seeing antiprotons" for the first time and learning a valuable lesson from Keith at the same time. I had some wonderful teachers and mentors. Ben Bayman taught E&M and was one of the best teachers I have ever had. Keith Ruddick was great in freshman physics. Jon Rosner taught a difficult but excellent sophomore course in oscillation and waves. Marvin Marshak and Hans Courant were superb mentors. I worked part time on their high energy physics projects. Hans talked me into applying for an NSF Fellowship and changing graduate schools. Allen Goldman also gave me some excellent advice along the way.

1971

Michael Hintz (B.S. 1971; M.S. 1972) I am married to a school psychologist who graduated from the U of M in 1974. She has worked in the White Bear Lake school system since them. We have two daughters Carol (30), a children's book editor at Lerner Publishing in Minneapolis, and Anne (28), who is a second year Internal Medicine resident in Peoria, IL. We have no grandchildren yet, but are hoping for some in our "golden years." I have worked at 3M since December 1972 doing radiation safety/health physics work. I have set up radiation safety programs for laboratories and factories, learned how to make training programs interesting to participants, became an expert in laser, UV, RF and magnetic field safety. Since 2003 I have visited every factory outside the U.S. that uses radiation source to do audits, radiation surveys and training. I feel fortunate to have had this opportunity. My favorite memory was when the unexpected would happen during Dr. Morten Hamermesh's course on electromagnetic fields. There are students who would never come to the lectures but would show up for the exams. He referred to them as "Phantom Payrollers". Hamermesh made it understandable to us young physics students. Recently, I have appreciated the opportunity to attend the Van Vleck lecture and dinner and to see my former professors at the dinner.

Mark Kamin (B. Physics, 1971; M.S.Ed, 1973; M.S.E.E., 1976) I have two daughters, Amira (and Jeff) Gaynor and Rachelle (and Brad) Minus, and a step-daughter Shira (and Billy) Good, all of whom are married and scattered across the Midwest in MN, IL and MI respectively. My wife Marsha and I have two beautiful grandchildren, Amira and Jeff's daughter Sophie, and Shira and Billy's daughter, Chaya.

1970

David G. Madland (Ph.D., Nuclear Physics, 1970; M.S., Nuclear Physics, 1969) After obtaining my Ph.D, I had a postdoctoral fellowship at Indiana University where we lived for three years while I worked on the new sector-focused cyclotron facility (IUCF). My wife, Juanita, taught music and all three of our children began playing string instruments which they have continued to the present. In 1973 I was invited by Norton Hintz to work at the Los Alamos Scientific Laboratory (LASL) at the meson physics facility (LAMPF) to build and conduct 800-MeV proton experiments on the high-resolution spectrometer (HRS). This 400-ton spectrometer was supposed to have a momentum resolution of two parts in ten to the power five. When first assembled it had a resolution of one part in 500! After two years of work, including hand grinding of the four pole-tips (180 square feet of surface), we achieved a resolution slightly better than design. Our first experiment with the HRS was conducted in late 1975. Following a number of experiments on the HRS, I became a member of the Nuclear Physics Group in the Theoretical Division of LANL (Los Alamos National Laboratory). I remained at LANL until my retirement in April 2005 I was honored to become a Fellow of the American Physical Society in 2003. My work there included development of a new theoretical model of the fission neutron spectrum and multiplicity with my colleague Ray Nix. This model, known as the Madland-Nix or Los Alamos model, was now used over much of the world. My most interesting work in nuclear theory is the use of the Dirac equation in nuclear structure calculations, continues to this day. We attempted to link nuclear structure physics to QCD by use of Weinberg's scaling hypothesis, and calculate nuclear ground-state properties with higher accuracy. My favorite course was nuclear theory taught by Ben Bayman. I took this course three times, once for credit and twice by audit. In my opinion, his pedagogical ability was unsurpassed. The professor that I held in the highest esteem was the chairman Al Nier. In my mind he was exactly what a professor of physics should be. Finally, Norton Hintz may be the best experimentalist I have known, having almost always, immediate and correct physical insight. My most vivid memory at the School was in 1963. After lunch one day I walked into the main office to check my mailbox and, suddenly, Mort Hammermesh rushed in and shouted to the secretary "Is it true?" And she answered "Yes, it was just on the radio." He rushed out, and I said to the secretary "Is what true?" She then told me that John F. Kennedy had been shot and killed. In the 36 years that we have been in Los Alamos we have hiked to the bottom of the Grand Canyon ten times, on different back-country trails. We even spent Christmas Eve at the bottom of the canyon one year, and we hope to do that again.

1968

Horst L. Truestedt (B.S., Physics, 1968) I graduated in Physics from the University of Minnesota in 1968 after studying eight years and working most of the time at 3M in physics research. I had my own lab at 3M, but when they wanted me to move to one of the divisions, I applied for other jobs through the University of Minnesota. Since many of my friends were starting to use computers more, when IBM offered me a job in Rochester, MN, I decided to go that route. I started as a Diagnostic Engineer and ended my career after 30 years as a system architect with special focus on computer storage and interfaces. I started a consulting company at that time called TrueFocus, Inc. to focus on storage and high-speed interfaces (primarily Fibre Channel). My two daughters also started an art promotion business beginning with my former roommate, Gerald Hjelm, who is a Minnesota artist. My wife, Jeanne and I have five grandchildren (four boys and one princess). I travel extensively with my work (in the first year that I retired from IBM, I was home the first week in January and then not four consecutive days until Thanksgiving). My wife travels often with me and together we have been around the world four times. So far, we still enjoy seeing new things.

1961

Richard Rue (Ph.d Physics 1961) In 1962 I moved to Ridgecrest, CA to teach physics at the high school and junior college. From 1963 to 1968 I was a physicist at the Naval Weapons Center (NWC) in China Lake, CA. My first two years were devoted to oceanography and

honing my skills at computer programming. During the next three years I developed a better system for remote control of drone aircraft using wide angle TV from the cockpit for the ground based pilot. Two patents were issued for this and assigned to the Navy. While attending Pacific University College of Optometry in Forest Grove, OR from 1968 to 1971, I taught physics. I also worked at Tektronix in nearby Beaverton, OR exploring new ways of recording electronic data and generating software for new monitors. Currently I am an optometrist in Bonney Lake, WA. My hobbies include skiing, piano, and restoring large format cameras, antique clocks, pianos and harpsichords. My wife and I enjoy frequent travel to different countries. My favorite memories at the University include monitoring the early passages of Sputnik, the derivation of Einstein's theory of Special Relativity, getting an "A" in advanced calculus on the second try (which was granted to almost our whole class), and graduation day.

Athanasois "Tom" Patitsas (M.S., Physics, 1961; B.S., Physics, 1958) Many years have passed since I found myself in a large first year classroom in the Physics Building in September of 1954. My command of the English language was minimal. I had to work in the kitchen of one of the fraternities. The boys there had a terrible time pronouncing my name, so when I decided to adopt the name Tom they all jumped with joy and relief. After a couple of lectures, I approached Dr. George Freier, the lecturer, and I said that I have a problem, since my English was not adequate to follow his presentation. He smiled and said, "That is a problem alright. You come and see me whenever possible." During the seven years that followed Dr. Freier was my mentor and advisor. I appreciated his perseverance and intellectual honesty in his effort to understand some of the physical phenomena around us, such as the electric field on the surface of the earth. During the 1970s, while teaching physics at Laurentian University in Sudbury, Ontario, Canada, I did computations on the scattering of the sun's rays by water droplets, in connection with the phenomenon of the rainbow. Since 1990, and especially after my retirement in 1996, I have been involved with the understanding of the phenomena of the singing sands and booming sand dunes. In the former case, a pleasant sound is emitted, with frequency of about 600 Hz, when certain beach sands are stepped on or impacted by a rod. In the latter case, a droning sound is emitted, with frequency of about 100 Hz, when sand masses avalanche down the slope of a sand mountain. The results of this study are summarized in a manuscript recently completed that will be published in *Scientific Journals International*. It can be accessed through Google by the title, "Singing sands, musical grains and booming sand dunes". Last June, I had the opportunity to meet my son, Steve at Quebec City during the annual meeting of the Canadian Association of Physicists. My son is a professor of Physics at the University of Lethbridge in Alberta, Canada.

Correction: Dr. Curtis D. Weyrauch graduated in 1976 with a Bachelor in Physics.

In Memoriam

George C. Francis (M.S., Physics, 1949) died on September 9, 2009 in Baltimore, MD.

Ardis Hovland Nier (Staff) Ardis was a staff member for many decades at the School of Physics and Astronomy. She died suddenly at the age of 88 on December 16, 2009. The cause of death was a complication following routine heart surgery. Ardis began her employment at the School in 1948 as a Senior Account Clerk in 'room 80' (the stockroom). In 1952 she started working as Professor Al Nier's secretary and later became his Executive Secretary. In 1969 Al and Ardis were married, and she transferred to the College of Education. She retired in 1981. Her work location throughout most of her time in the School of Physics and Astronomy was in the basement of the building and close to graduate students and their research. Over the years she became the friend of many and will be remembered for her interest, positive outlook and encouragements, and – last but not least – for her typing skills to obtain a completed thesis. During the last decades her interest in education led her to a strong involvement in scholarships and fellowships. She became a major benefactor through her individual contributions. In addition, after she retired she was active in the University Women's Club Scholarship Section which provided scholarships to women students at the University. For eight years she chaired the selection committee. In honor of her late husband, she also funded a fellowship awarded yearly to a young scientist selected in a worldwide competition by the Meteoritical Society. She has also sponsored a yearly Nier Lectureship at the University's School of Earth Sciences concerning the isotope composition of extraterrestrial material. Often Ardis attended the meetings when the awards were presented and the lectures were given. The University has benefited in many ways through Ardis's involvement and generosity over more than 60 years. She was an inspiration to all who knew her well.

David R. Young (M.S., Physics, 1989) died October 27, 2001 in a Newburgh, NY. He grew up in the Northwest and went to school in California (B.S., 1987, University of Berkley California), Minnesota and Florida. His professional positions included: Thin Film Engineer, IDT Corporation where he integrated circuit semiconductor manufacturing; APTOS Corp, where he integrated circuit semiconductor manufacturing; EMagin/FED Corp., where he designed flat panel displays; L.J. Gonzer Association (IBM), where he was a senior micro fabrication associate. In 2001, he attended Pace University in New York City to widen his resume by studying in their publishing program.

Mark Hirsch

B.S., Physics, 1981

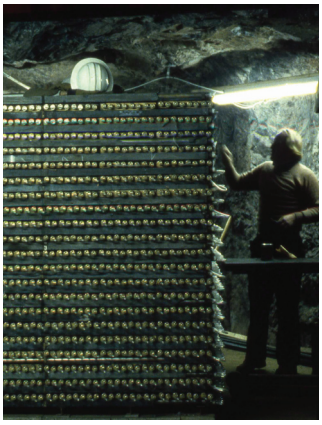
What influenced your decision to become a physicist?
In a word, curiosity. I wanted to know how things work.

Tell us about your professional life.
I earned my M.S. (1984) and Ph.D. (1987) in Solid State Physics from Cornell. I am a Principal Scientist at Xerox Corp., where I have spent my entire career, working on electrophotographic printers. I am responsible for the creation, design, testing, and evaluation of the system that applies charge to toner particles, transports those charged particles to the latent image, and establishes the electric fields that cause the particles to develop the latent image. Pieces of physics that I have had to employ include electrostatics, small-particle adhesion, feedback control systems, experimental design, evaluation of image quality, and color science.

I loved my experience as a physics student and have always wanted to return to my roots, so to speak. Recently I became an adjunct professor in the Physics Department at the University at Brockport, which is part of the State University of New York system. It has been a wonderful experience so far!

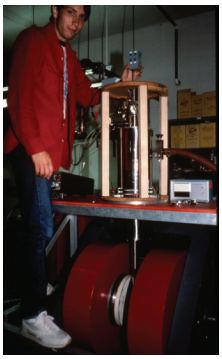
What are some of you favorite memories from your time at the University of Minnesota?
My best memory is working with the high-energy physics group, constructing a detector to try to measure the decay of a proton. I got to work with Professors Marvin Marshak, Keith Ruddick, Earl Peterson, Ken Heller and Mike Shupe. The idea was to look for a signal showing that a charged particle originated from the interior of the detector, which might then be evidence of the decay of a proton.

Tell us more about the detector.
Two features really made this detector unique. First, to get as many protons as possible within the detector, the tubes were encased in a high density material. Among other things, it had to be dense, affordable, and, most important to us working grunts, non-toxic. What better than a native Minnesota product – taconite! So we got to mix Portland cement with a dense grayish-black taconite powder and pour it into forms that encased about eight tubes, forming a slab. It was hard work, but we were young and enthusiastic. By the end of a day, each slab seemed to weigh a few hundred pounds. Two people could handle one slab, so the real weight must have been closer to 80 pounds. We poured these taconite cement slabs in a gritty old physics research building on the bank of the Mississippi River. I will always remember the thick layer of grimy dust that covered everything.The second feature that made this a special experience was that the detector had to be shielded from the high flux of cosmic rays that exist on the surface of the earth. So the detector was built under 2000 feet of rock in an old iron mine in Tower, MN. We had to truck the taconite counter slabs up to the mine, ship them down via the mine elevator, and assemble the detector piece by piece like giant LEGO blocks in what amounted to a bat cave with lights. Great fun!



Professor Ruddick working with the detector

I graduated before the detector could take a serious look for proton decay. As I remember, there was a window of time in which the University of Minnesota detector would be taking data before any of the larger and more sensitive detectors being built elsewhere could be brought on line. So there was a possibility that if the proton decayed with a certain lifetime that the University of Minnesota detector would be able to discover some very important physics. Well, so far proton decay still has not been seen by anybody. I do remember seeing some articles in the mid 1980's in which the University of Minnesota detector found a signal from some very high energy cosmic rays coming from outside our galaxy. The underground detector I was involved with turned out to be a very specialized sort of telescope! I believe the high energy physics group at the University of Minnesota has branched out considerably from these humble beginnings and currently has an impressive experimental operation deep underground Soudan Laboratory in Tower, MN.



Hirsch working on experiments

Tell us about your family.
I am married and have two children, ages 14 and 10. I have lived in upstate New York since graduating from Minnesota in 1981. Work and family take most of my time. When I get a free moment I occupy myself with tennis, golf, hiking (mostly in the Adirondacks), fly fishing and brewing beer.

What advice do you have for current students and recent alumni?
We live in a mind-boggling universe. Use physics to unravel the mystery and exhibit the beauty of the world we inhabit.

Mark can be contacted via email at
mhirsch@brockport.edu

Kim Dockter
Director of External Relations

Consider Including the School in Your Estate Plan

Now more than ever, alumni support of the School of Physics and Astronomy is essential. I offer my sincere thanks to each of you who contributed to the department last year. Your gifts, in any amount, are very much appreciated and put to good use.

During these challenging economic times, large outright charitable contributions may not be an option for many, but you can still make an important contribution by including the School of Physics and Astronomy as a beneficiary in your estate plans. There are several ways to do this and probably the simplest way is by including the department as a beneficiary in your will.

When Ardis Nier, widow of the late Albert O. Neir, passed away last December, she left an important legacy. She had made a provision in her will to leave a portion of her estate to more generously endow funds that she had established during her lifetime in honor of her late husband. These two funds, the Albert O. Nier Scholarship in Physics and Alfred O. Nier Lectureship in Geology and Geophysics will serve as a lasting reminder of the amazing contributions Professor Nier made to the University of Minnesota.

Carlos Avery (BS '60, MS '65, and PhD '67) makes regular annual contributions to The Edward P. Ney Graduate Student Fellowship in Astrophysics, but he wanted to make sure that his support continued after his lifetime. He decided to direct a portion of his estate, through a will provision, to the Ney Fellowship.

Another simple way of including the department in your estate plan is to make the department beneficiary of your retirement plan assets, after you no longer need them. Since retirement plan assets are heavily taxed when passed to another individual, they make an ideal gift for charity. These assets pass tax-free to charity from the taxable estate.

There are also ways to make a charitable gift, receive income on the asset for life, and also enjoy a tax deduction. A very popular "life income gift" is the charitable gift annuity. Because of the current economic downturn, charitable gift annuities are an attractive way to supplement retirement income, especially given that interest rates for bank savings accounts and certificates of deposit (CDs) are near an all-time low.

A gift annuity may be established for either one or two persons (the minimum age is 55), requires a minimum amount of $10,000, and pays a fixed payment for the life of the annuitant(s). Because charitable gift annuities are irrevocable gifts, donors also are entitled to a charitable income tax deduction for the year the gift annuity is established. The calculation for this deduction is based on the amount of the gift and the life expectancy of the annuitant(s). For example, the current annuity payout rate for a 60-year-old is 5.0% and for a person who is 90 or older is 9.5%. Additionally, a portion of the payment is income tax-free.

When Mr. Robert Kempe, a 1943 Chemical Engineering graduate, established a charitable gift annuity in 2002, he decided to direct the remainder of the annuity when he passes to the Alfred O. Nier Scholarship. Mr. Kempe had great respect for the late Professor Nier and wanted to honor his memory though his gift.

Thank you again for your support. If you are interested in learning more about any of these gift opportunities, please feel free to call me at 621-626-9385 or email me at dockter@umn.edu. If you have already included the School in your estate plan, please let us know, so that we can recognize you during your lifetime and better understand how you would like us to use your gift.

Contact Kim Dockter at (612)626-9385 or dockter@umn.edu.

Sample Bequest Language
"I give, devise and bequeath to the University of Minnesota Foundation, Minneapolis, Minnesota 55455, (percentage of residue, sum, or description of property), the principal and income of which shall be distributed by the Board of Trustees to the School of Physics and Astronomy for use where the need is greatest."

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Next Issue: Focus on the 1990's Alumni

We will highlight our alum from the 1990s in the fall edition of the newsletter. 1990s alumni will receive a class notes mailing. Send your Class Notes responses by September 15, 2010 for inclusion in the next newsletter. We can not wait to hear from you!

Send Class Notes, comments and mailing list changes to:
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