University of Minnesota
school of physics & astronomy

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A letter from the department head

It is my honor to write this as the new Head of the School of Physics and Astronomy. In July I succeeded Professor **Allen M. Goldman** as he concluded thirteen years of service. It is fitting that I begin my first report by highlighting some of the recent achievements of Allen, one of the most distinguished physicists ever to serve on our faculty. In 2008 Allen was named a Regents Professor, honoring an extraordinary career of contributions to the study of superconductivity. Among the other honors Allen has collected are election to the National Academy of Science in 2007, the London Prize in 2002, and Fellowship in both the American Association for the Advancement of Science and the American Physical Society. The Goldman Alumni Celebration this past spring and new **Allen M. Goldman Fellowship,** which will provide support for exceptional graduate students in the School, are highlighted on pages 3 and 6 of this newsletter.

As usual, there are more milestones and accomplishments of the students, postdoctoral researchers and faculty of the School than space to report them. Professor **Cindy Cattell** was named a Fellow of the American Geophysical Union in 2008, joining **Emeritus Professors Paul Kellogg** and **Robert Pepin**. Pepin, who retired in June, was also named a Fellow of the Geochemical Society and of the European Association for Geochemistry in 2008. **Professor Yong-Zhong Qian,** a theoretical nuclear astrophysicist, and **Professor Paul Crowell,** a condensed matter experimentalist, were recently elected Fellows of the American Physical Society, joining 21 other APS Fellows on our faculty. The **W. I. Fine Theoretical Physics Institute** continues to bring great distinction to the School, and FTPI visitors and symposia enrich the intellectual environment for us all. We are very proud that the Institute's newest addition, **Professor Alex Kamenev**, was selected for membership based on research achievements as a member of our faculty.

The newest member of the School's faculty is **Professor Martin Greven** (p. 4). His arrival marks an important step in the our push to strengthen experimental physics in general and experimental condensed matter physics in particular. A crucial

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New Physics building moves ahead

President Robert Bruininks has announced that an $80 million dollar building to house physics research and the Center for Nanostructure Applications is included in the University's proposed 2010 capital request. In presenting the building project to the Board of Regents at its September meeting, President Bruininks noted that physics represents one of the largest research enterprises at the University and that the nearly 80-year-old Tate Laboratory is not compatible with the demands of cutting-edge research programs. He emphasized the opportunity for new connections and collaborations between physics and nanotechnology, which aligns well with the University's strategic plan.

The Regents will vote on the capital request in October, and it will be considered by the Legislature at their session beginning in February. New facilities to support expansion in experimental physics research are crucial for the future of the School and will deliver great benefit to the University and the state. All members of the community of the School, including alumni, current students, staff, faculty, and friends can help make the new building a reality by expressing enthusiastic support to your friends and elected representatives.

A satellite image of the two-acre site of the proposed Physics and Nanotechnology Building, which lies between the Washington Avenue Parking Ramp and the Civil/Mechanical Engineering Building, just north of the Scholar's Walk.

Inside

Awards & Announcements

2009 Student Awards

Alex Schumann

Back row, l to r:Alex Levchenko, Tyler Hennen, Jack Hellerstedt, Vanessa Cheesbrough, Sam Gleason, Christopher Geach, Grant Remmen, Sean Bartz, Todd Springer, David Stark, Miranda Pihlaja, Adam Schreckenberger. Front row l to r: Nathan Mirman, Addishiwot Woldesenbet, Nicholas Howell, Anthony Hatke and Perrie Cole

A. O. C. Nier Undergraduate Scholarship: Molly Krogstad
Harry and Viola St. Cyr Scholarship: Christopher Geach
Jeffrey Basford Scholarship: Grant Remmen
Edmond G. Franklin Scholarship in Physics: Jack Hellerstedt, Tyler Hennen, Nicholas Howell, Nathan Mirman, David Stark and Can Zhang
Hagstrum Award: Sam Gleason and Vanessa Cheesbrough
Hoff Lu Fellowship: Anthony Hatke
Robert O. Pepin Fellowship: Anthony Hatke
Aneesur Rahman Prize: Todd Springer and Alex Levchenko
Outstanding T. A. Award: Sean Bartz, Daniel Brinkman, Perrie Cole, Joseph Kinney, Adam Schreckenberger, Addis Woldesenbet, Miranda Pihlaja and Ryo Namba

Barthel, de la Cova and Marchand Retire

Alex Schumann

Sharon Barthel retired from her job as Executive Office and Administrative Specialist in June. She began her "physics" career in 1971, working for then Head, Professor Morton Hamermesh and has worked for the Space and Nuclear physics groups since 1978. She graduated from the University in 1969 with a B.A. in Sociology. She obtained a second B.A. (Linguistics) and a Master's degree (English as a Second Language), taking advantage of the opportunity to take classes at the U. In retirement, Sharon plans to continue learning languages, travel and possibly teach part time.

Joe de la Cova retired from his position as Research Shop Foreman in October, 2008. He began his University career as a Senior Laboratory Machinist in 1980. Joe enjoyed challenges of the assignments, the variety in the work, the interaction with shop coworkers and customers. Joe received a degree in Geology from Columbia University in 1969. He attended the University of Minnesota as a Ph.D. candidate in geology with a specialization in mineralogy. Joe received a Civil Service Outstanding Service Award in 1994-1995. He is using his retirement to catch up on lots of deferred projects and entertainment, and has been studying Spanish.

Alex Schumann

Ron Marchand retired from his job as Principal Research Shop Foreman in May. He began his University career in 1981 as a lab machinist in the Scientific Apparatus Machine Shop in Shepherd Labs. He managed that shop for three years. He joined the School of Physics and Astronomy Machine Shop in 1997. Ron feels that his most important project was working with Dr. Kurt Amplatz in the Medical School, making molds for the first heart plugs for babies who were born with holes in their hearts. Ron's plans for his retirement include playing golf, traveling and spending more time with his family.

Letter from the department head cont.

ingredient for the success of this initiative is obtaining approval of the new Physics and Nanotechnology building, which has just been announced as part of the University's 2010 capital proposal (this page). The building will also meet the needs of expanding programs in experimental cosmology, biological physics and elementary particle physics. We expect the profile of physics at the University and in the state to continue to grow with discussion of the capital request and exciting developments like the groundbreaking for the NOvA Far Detector Laboratory (page 3). This was made possible by $40.1 million awarded by the Department of Energy and is the University's largest block of funding under the American Recovery and Reinvestment Act. The construction project in Ash River is having a highly visible impact on northern Minnesota.

I have been overwhelmed in my first months as Head by the amazing generosity of our alumni and other donors, including current and emeritus faculty. Scholarships and fellowships (page 2) propel the education and careers of talented young physicists, thanks to your support. There are many ways to help shape the educational and research programs of the School, and I look forward to working with you to as we develop new ones. Some of the initiatives being considered are funds to support outreach activities (Physics Force), to enhance the physical and social environment for our students, and to reward the outstanding contributions of our staff. I invite you to email me (ron@physics.umn.edu) with your thoughts on these ideas or any of your own suggestions. We also count on your support in spreading the good word about physics research and education at the University, especially as we

NOνA gets green light

The University has received a grant of $40.1 million for the NOνA neutrino experiment construction. The grant is part of the stimulus money from the Recovery Act to be disbursed by Department of Energy's Office of Science. The NOνA funding for Minnesota will generate an estimated 60-plus construction jobs and procurements for concrete, steel, road-building materials and mechanical and electrical equipment from U.S. firms. The NOνA Experiment (Fermilab E929) will construct a detector optimized for electron neutrino detection in the existing NuMI neutrino beam. The primary goal of the experiment is to search for evidence of muon to electron neutrino oscillations. This oscillation, if it occurs, may hold the key to many of the unanswered questions about the nature of elementary particles and the universe. The NOνA far detector will be located in Ash River Minnesota. The groundbreaking for construction took place on May 1, 2009.

l to r: Mark Messier, Gary Feldman, Dennis Kovar, Ron Ray, Pier Oddone, Congressman Jim Oberstar, Congressman Bill Foster, Marvin Marshak, Honorable Robert Bruinicks, Timothy Mulcahy , Mark Pederson and John Cooper.

Goldman Celebration

On May 1-3, 150 of Professor Allen Goldman's colleagues and former students attended a workshop and celebration in his honor. The workshop, "Superconductivity from Collective Modes to Quantum Phase Transitions," was hosted by the William I Fine Theoretical Physics Institute. The celebration, which recognized Goldman's 40 years of accomplishments, included alumni talks about their current research, a banquet and reception. A committee of Allen's former students (Ying Liu, Jinxiang Liu, J.C. Wan, Fang Yu and Ted Wang) organized the effort for the Professor Allen M. Goldman Fellowship in honor of their mentor. The fellowship was announced to Allen at the dinner. Many former students thanked Allen and his wife Katharine for the kindness and positive impact they had on their personal and professional lives. A wonderful time was had by all.

More information about the **Professor Allen M. Goldman Fellowship** can be found on page 15 of this newsletter.

J.C. Wan, Christine Berkley, Dale Berkley, Jon Maps, Fang Yu and David Haviland.

Dean Steven Crouch and Allen Goldman

Reception for Allen.

(Left to right back row) Vlad Vasko, Yu Fang, Jon Maps, Phil Kraus, Robin Cantor,Bill Huber, Joe Kinney,Mark Tuominen, Steve Snyder,Yu Chen, Yen Hsiding Lin,Xiang Leng, Brad Orr, David Haviland, Ed Nowak (front row) J. C. Wan, Laura Adams,Heinrich Jaeger, Melissa Eblen-Zayas, Cathryn Christiansen, Nina Markovic, Allen Goldman, Gloria Martinez-Arizada, J. J. Nelson, Matthew Schmidt, Sarwa Tan, Anand Bhattacharya

Faculty Profiles

Alex Schumann

Ronald Poling

When Professor Ron Poling arrived in 1987 he established Minnesota's first colliding-beam program, a new direction for a particle physics group that was strong in fixed target and non-accelerator experiments. His first project was the AMY experiment in Japan, studying electron-positron annihilations with a main goal of discovering the top quark. Top proved beyond AMY's reach, so Poling rejoined CLEO, the experiment where he began his career. CLEO has concentrated on studies of the *b* and *c* quarks. This research leads to deeper understanding of the matter that makes up the everyday world, even though these heavy quarks exist only fleetingly in high-energy collisions. CLEO's pioneering *b* studies spawned new experiments of greater sensitivity, and in 2003 CLEO shifted focus to *c* quarks, becoming CLEO-c. The *c* or charm quark, a third as massive as *b*, is also a key component of the Standard Model of elementary particles. CLEO-c has measured charm properties with unprecedented precision, rigorously testing the Standard Model, setting limits on "new physics," and providing input for experiments at higher energies, including the LHC.

With CLEO near completion, Poling opened a new front in neutrino physics, joining a strong Minnesota group. The NOvA experiment (more on p. 2) will measure transformations (oscillations) of neutrinos as they travel from production at Fermilab to the 15,000-ton "far detector" near Ash River, Minnesota. Detectors will be assembled in the Twin Cities, installed at the lab, and filled with liquid scintillator to activate them for neutrino detection. NOvA is designed to measure oscillations of muon-type to electron-type neutrinos, allowing determination of the last unknown mixing parameter and revealing the full picture of neutrino masses. Excitement surrounds the possible observation of "CP violation," which could explain how an early universe with equal parts matter and antimatter evolved to one where we and everything we see are matter.

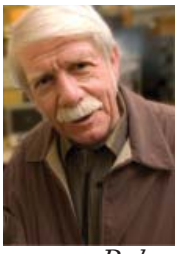
The tiny interaction probabilities of neutrinos means their study requires patience and immense detectors. To keep data rolling during NOvA construction Minnesota (Poling, Cronin-Hennessy) joined BESIII, a new experiment to study *c* quarks in China. They bring well-tested CLEO-c techniques and facilities to BESIII. Experiments like BESIII and NOvA are described as being on the "precision frontier." They complement experiments on the "energy frontier," like the LHC, by offering offer unique data samples and real chances for unexpected discoveries.

Martin Greven

Professor Martin Greven's research interests are the mysterious electric and magnetic properties of certain oxide materials. These exotic materials are made up of square grids of copper atoms that are surrounded by cages of oxygen atoms. In a crystal, many of these two-dimensional copper-oxygen planes are then stacked on top of each other, with other atoms located between the planes. Ceramic materials such as La-Ba-Cu-O had been known for some time, but it was the Nobel-Prize-winning discovery of superconductivity at unusually high temperatures in the mid 1980's that ignited a new era in materials physics.

Superconductivity involves the formation of electron pairs (Cooper pairs) and their condensation into a macroscopic quantum state. In conventional low-temperature superconductors discovered in the first half of the 20th century, electrons pair as a result of their interaction with the vibrations of the crystal lattice. In contrast, the unconventional d-wave superconductivity in the copper-oxides appears to be the result of significant electronic and magnetic interactions. Despite a tremendous effort over the past two decades, the 'driving force' that leads to electron pairing and to numerous unusual electric and magnetic properties has remained elusive.

In order to study these complex copper-oxides, Professor Greven's students and postdocs grow them in form of crystals. The crystals are then taken to national and international research facilities – nuclear research reactors and X-ray synchrotrons – where they are bombarded with intense beams of neutrons and X-rays. The fashion in which these beams are scattered off the crystals provides detailed information about the positions of magnetic and non-magnetic atoms and the waves that they form. Professor Greven and his group and collaborators reported on the discovery of a novel 'hidden' magnetic order in their modeling material, which exhibits superconductivity at high temperatures of about 100 Kelvin. Most recently, they discovered an unusual new magnetic wave that appears to be associated with the hidden order. One intriguing aspect of these findings is that the novel magnetism appears to involve the oxygen atoms, which have been thought to be non-magnetic. Could this new wave be part of the glue that binds the electric charges into Cooper pairs? This is one of the key questions that Professor Greven and his students hope to answer in the future.



Pat O'Leary

Robert Pepin

Robert O. Pepin retired in May from the School of Physics and Astronomy. He joined the University of Minnesota as a Research Scientist in 1964, ultimately attaining the rank of Professor in 1975. Pepin received his A.B. in Physics from Harvard University in 1956, and his Ph.D. in 1964 from the University of California, Berkeley.

Pepin continues an active research program. He studies the origin and early history of volatile elements and compounds in the solar system. This is revealed by mass spectrometry measurements of the distributions and compositions of noble gas and nitrogen isotopes trapped in meteoritic carrier phases, implanted in lunar and asteroidal surfaces by solar wind ion irradiation, and carried in a comet and in interplanetary dust particles collected in the Earth's stratosphere. His measurements on noble gases and nitrogen isotopes in the SNC class of meteorites established that these meteorites originated from Mars. His current experimental work is focused on determining the nitrogen composition in solar wind samples collected by the NASA Genesis Mission. He has carried out the first measurements of noble gas distributions in comet samples returned by the NASA Stardust Mission. His 1987 paper with two colleagues on the physics of hydrodynamic escape from planetary atmospheres introduced a new and currently dominant paradigm, later verified observationally in an extrasolar planetary system, for atmospheric loss and fractionation on planetary bodies. He expanded this breakthrough in 1991 by applying it in a comprehensive model, now recognized as the standard in this field, for evolution of isotopic distributions in the atmospheres of Earth, Mars, and Venus. Recently he examined the physics of volatile evolution within the Earth during its first 100 million years, and identified noble gas signatures created by a giant Moon-forming impact on Earth during this epoch.

Pepin has been a significant contributor to NASA and space and planetary physics. He served as the Director of the Lunar Science Institute in Houston, TX during 1974-77. He received the NASA Medal for Exceptional Scientific Achievement in 1971. The Asteroid "Robertpepin" was named after him in 2002.

Pepin has also been a very important educator. He was the enthusiastic Director of the Institute of Technology Honors Program. He has been recognized as an outstanding teacher, receiving the Morse-Alumni Award for Outstanding Contributions to Undergraduate Education in 2000, and the George Taylor Distinguished Service Award in 2001.

Alex Schumann

Michael Zudov

Michael Zudov is a condensed matter experimentalist who leads a group studying new phenomena observable at the interface of semiconductor crystals. These phenomena occur in a state called two-dimensional electron gases, so termed because it is made up of a gas of electrons free to move in only two dimensions, but confined in the third. Such systems, known as Quantum Hall Systems (QHS), are most famous for quantum Hall effects observed when devices are exposed to strong magnetic fields and low temperatures.

Zudov's group studies QHS in weak magnetic fields when normally their magnetoresistance is featureless. However, if the QHS is further exposed to microwave radiation, dc electric field, or is simply heated to a few Kelvin, the resistance will oscillate with the magnetic field. In very high quality microwave-irradiated QHS the oscillations get so strong that the minima evolve into zero-resistance states. It was proposed that these states result from the formation of current domains which are expected to disappear when a high enough dc current is passed through the QHS. This is why Zudov initially decided to study QHS in electric fields. In one series of experiments Zudov's group exposed QHS to microwaves and dc electric fields simultaneously and found that the radiation-induced resistance zeros and the resistance peaks are extremely sensitive to the dc field. Some peaks were even transformed into new states with zero differential resistance. These results identified the microscopic mechanism responsible for microwave-induced oscillations in the presence of an electric field.

Zudov's group continues to use novel methods to study QHS. They have expanded their experimental efforts to include nonlinear response, or experiments in which the resistance of the material is not constant. They have found what might be the first evidence of recently proposed microwave-induced sidebands in the electron spectrum. Two dimensional systems occur in every semiconductor device currently in use and the novel physics being observed today may lead to future improvements in these devices.

Highlighting Alumni from the 1970s

1979

Curtis D. Weyrauch (B.S., Physics, 1979) After graduating from dental school, I was commissioned in the U.S. Air Force as a captain. Over two tours, I lived a total of 10 years in the United Kingdom. I had an absolutely grand time touring Europe and enjoyed the English people. I spent time in San Antonio, TX and then in Grand Forks, ND. I retired from the Air Force in 2003 as a lieutenant colonel. I now live in a home I had built in Shakopee, MN. I have a wonderful 11 year old daughter who keeps me very busy! We are currently learning to play golf and tennis. I play clarinet in the University of Minnesota alumni band, and am serving on its alumni council as treasure elect. Once a week I help teach a science class in an elementary school. What a joy it is to work with such inquiring minds! Learning physics seems more a way of approaching a problem than a collection of facts and relations. That has had a great impact on how I approach problems. Midway through my time at the University of Minnesota, I traded my slide ruler for a mirror and explorer. Being a dentist means dealing with people's problems, some of which are very painful. I enjoy being able to solve their problems and restore their health. In addition to being a dentist in the Air Force I had the wonderful opportunity to have an assignment as the Officer in Charge of Test and Evaluation for the Air Force for dental equipment, which got me back to my physics origins. Currently, I work in a dental office on the north side of the Twin Cities. I am having a grand time with the staff and patients. I really enjoyed the experiments that were presented during the lectures of our first year of physics. They brought the fun and playfulness of science into the classroom. During one of the lectures, Dr. Nier was talking about Newton's Second Law and between writing on the chalk board he was pumping air into one of those toy water/air rockets. A few pumps here, a few pumps there, by the end of the lecture he was having difficulty pumping air into the rocket. He finished his lecture and to demonstrate the principles, he struggled to release the latch holding the rocket to the pump. After a minute of this the latch gave way, the rocket shot up, soaking him (white shirt, tie and all) and the front row of students; it struck the ceiling with a crunching sound and down came the shattered rocket and a section of the ceiling. I had the exceptional opportunity to work as Dr. Nier's undergraduate assistant. His way of simplifying a problem, his dedication and love of what he did was inspirational. My favorite class was a classical mechanics class taught by Dr. Kellogg. There were just four students in the class. We were able to cover a lot of material in great detail. We had a great time (including doughnuts and coffee during finals).

1978

Judit N. Moschkovich (B.S., Physics, 1978) During my last year as a physics major, my second home was the sub-basement in George Freier's lab. One of my many jobs was to maintain, fix, and improve the electric field mills we installed on the roof of the building to track electric field changes before, during, and after electric storms. One of my most vivid memories was one afternoon when George and I ran up the many flights of stairs from the sub-basement to the roof, when an electrical storm coincided with my work in the lab. Thirty plus years later, I am not sure why we ran or what we did once we got to the roof, but I do know it was important that we got there quickly. I also remember spending lots of time designing and testing one tiny transformer for the mills. This required skill using the lathe. Other than a short woodworking class I had taken five years earlier while I was at the University of Chicago, I did not have any experience with a lathe or, for that matter, other machinery (my interests ran more towards mathematics, programming, and theoretical physics). However, I was eager to learn and expand my horizons. I especially wanted to learn in a real laboratory where I was finally getting my hands dirty. Unfortunately, I was also facing the reality that I was one of only two women in a class of roughly 70 men. The technician in the machine shop did not have much experience teaching women how to use machines. I struggled to convince him that snatching the piece of metal out of my hands would not help me learn how to use the lathe. Yes, I have had a variety of first-hand experiences with sexist attitudes in science, enough to fill a large volume with stories. In fact, having someone take an instrument out of my hands and try to do technical things for me whenever I engage in any activity remotely related to science or technology continues to this day to be my most pervasive experience of sexism. "Yes, I do know how to connect my laptop to the projector.....and by the way, did I tell you I have a B.S. in physics?" Dr. George Freier was a notable exception to this experience. He never took a piece of equipment or material out of my hands but instead led me to see how I needed to use the equipment or manipulate the material myself. He never told me how to do something technical, but instead allowed me to explore and learn on my own. I think this was simply his attitude towards how human beings learn. I will always be grateful for my opportunity to work with him. Only much later, after I had pursued my own career in mathematics and science education did I discover that Dr. Freier was passionately dedicated to science education at all levels. In retrospect, he may have influenced me in many more ways than I was aware of at the time. I encourage the School and the Institute to continue to support faculty who are dedicated to mathematics and science education. These faculty can have an amazing impact on young students. I came to the Education Department at the University of California at Santa Cruz as an Assistant Professor in July, 1999. I am now an Associate Professor. Currently my research focuses on mathematical thinking and learning.

Michael W. Wade (B.S., Physics, 1978) I am married with two children. I enjoy traveling, skiing and cooking. I obtained my M.S. and Ph.D. in Physics from the University of Illinois Urbana-Champaign in 1984. I worked for Bell Labs for 17 years. I worked for a small start-up for seven years. Now I work for an electronic trading firm. During my time at the University of Minnesota, I enjoyed working as an undergrad assistant for Dr. Alfred Nier when he was head of the atmospheric entry team for the Viking Mars Lander project. I analyzed the data regarding the composition of

the Martian atmosphere. Those were very exciting times! I had a close working relationship with Professor Nier. I really enjoyed working in his mass spectroscopy lab.

1977

Thomas M. Coughlin (B.S., Physics, 1977) I now live and work in San Jose during the week and spend my weekends with my family in San Luis Obispo County, CA. I met my wife Francis at a dance camp in the Sierras in 1991. We were married in 1992. We have two boys Will (junior high) and Ben (grade school). We spend a lot of our weekends going to sports and other events for the boys. After graduating with my physics degree in 1977, I worked for a year at the Honeywell Research Center where I became interested in magnetic phenomena. I went back to graduate school at the University in 1978, and received my Masters in Electrical Engineering in 1981. After graduate school I worked at 3M and Nortronics making magnetic recording heads. In 1985, I moved to Boston where I worked at Polaroid on a magnetic recording product for digital imaging applications. I worked on advanced magnetic recording at Seagate Technology in Scotts Valley, CA in 1987. After Seagate I became an engineering manager at Maxtor managing heads and media for 3.5-inch hard drive products. I spent a short time at Micropolis where I was director of heads and media for all of the company's disk drive products. I was Vice President of New Technology and Customer Support at Nashua Computer Products. Since then I held management and engineering positions at Ampex and Syquest. I formed my own consulting company in 1999. We are involved in a variety of activity associated with magnetic recording and data storage. I wrote a book, *Digital Storage in Consumer Electronics: The Essential Guide* published in 2008. I am the founder and organizer of the annual Storage Visions Conference, as well as the Creative Storage Conference. I am a co-author of six patents on magnetic recording and air bearing technology. I have published many articles and papers as well as sections in several books related to digital storage products and applications. I am a senior member of the Institute of Electrical and Electronics Engineers, Inc (IEEE), a member of the Adcom for the IEEE Consumer Electronics Society, and the IEEE Central Area Region 6 chairman. I am also active in the Storage Networking Industry Association (SNIA) solid state storage initiative and long term archiving initiative. I have been on the IDEMA program committee for years. I am also a member of APS, AVS, AAAS and SMPTE. Quantum mechanics was one of my favorites because of the general weirdness and potentials that it revealed to me. I had many excellent and stimulating teachers. My undergraduate advisor was Professor Zimmerman. He was a generous and kind advisor. He helped me choose courses that developed my experiences in physical phenomena. I remember Dr. Marshak demonstrating standing waves using his belt.

Roger C. Knutson (B.S., Physics, 1977) I have been married for 35 years. We do not have children, but do have many small dogs. I have traveled extensively for work and pleasure. I have many hobbies - astronomy, biology, zoology, archeology, photography, sculpting, metal casting, pottery, glass slumping, stained glass, lapidary, coin collecting, silver smithing, carpentry, architecture, woodworking and enameling. I am a Systems Engineer with broad systems experience in identifying, analyzing, and providing effective corrective action solutions to engineering, manufacturing, and procurement issues. Currently, I am working part-time at General Dynamics. For three years as a manufacturing engineer at United Defense, I supported the Crusader program electronics design and manufacturing. I worked for 33 years at Honeywell/Alliant Techsystems: on the Outrider TUAV, providing support to the Hondo flight operations and testing of the Army's common UAV ground system, the Tactical Control System (TCS). As the MK 50 ILS staff engineer, I provided support for the ILS program including S&TE requirements definition, IMA requirements definition, proposal support, FMS support, MK 540 installation and customer liaison. I was responsible for all aspects of torpedo design, fault analysis, and configuration management. I also completed an Electronics Technician Course at Brown Institute. I worked at Franklin Manufacturing as an electronic technician developing various electronics in their advanced R&D. After Litton bought them, I worked one summer with a small team of people designing, developing, testing, and building the first ten models of the current style of microwave ovens. I have patents for a Peristaltic Pump (1991) and a Microwave No Load Detector (1965).

Frank J. Pinski (Ph.D., Physics, 1977) I am married and have three sons. I am currently a physics professor at the University of Cincinnati.

Louis A. Rose (Ph.D., Astrophysics, 1977) My wife, Emmanelle, and I have been married for 42 years. We have three children: a daughter in Scotland, a daughter in Tennessee, and a son, who has his doctorate in physics and works at the Lawrence Berkeley Laboratory in California. Our daughter in Scotland is head of socially responsible investments for a Scottish firm. She has two little boys. Our daughter in Tennessee teaches art and has a little girl. We make every effort to see our grandchildren as much as possible. As a graduate student, I was extremely fortunate to be able to work for Dr. Ed Ney. My thesis project involved measuring the infrared emission spectra of various fine grained materials and making comparisons to the infrared spectra of comets to gain information about the composition and size of cometary grains. After leaving Minnesota, I spent two years as an Research Associate in the Laboratory for High Energy Astrophysics at the Goddard Space Flight Center, analyzing spectra of X-ray emitting astrophysical objects obtained from the High Energy Astrophysical Observatory (HEAO-1) satellite, launched in 1977. Following my postdoctoral appointment, I worked as an optical systems analyst for Analytic Decisions Incorporated, Rosslyn, VA, providing infrared technical support to government agencies. In 1981, I joined the Naval Research Laboratory (NRL) as a research physicist, working first in the Acoustics Division for two years and then moving to the Remote Sensing Division where I remained for the rest of my 25 year career. In the Remote Sensing Division, I conducted numerous field experiments measuring the microwave brightness temperature and/or the microwave emissivity of various land, sea and atmospheric scenes. I retired from NRL in April, 2006. Four months later I accepted an

appointment as an adjunct professor at the U.S. Naval Academy in the Electrical Engineering Department, where I have taught the last three years. While I was at Goddard, Dr. Ney delivered a scientific colloquium on dust grains in the astrophysical environment. Frank McDonald (Ph.D., Physics, 1955), who was one of Ed's first Ph.D. students introduced him by saying, "It is sometimes said that there is a Minnesota Mafia at work in NASA. If that be true, then our speaker today is surely the Godfather." Ed gave one of the most entertaining lectures I had ever heard him give. One of the postdocs commented, "Wow, working for him must have been a lot of fun." Ed Ney was one of my heroes. Working with him was one of the highlights of my professional life. All of the physics and astrophysics classes I had at Minnesota were excellent.

1976

Thomas M. Demaree (B.S., Physics, 1976) I have never been married (c'est dommage!) I enjoy fishing and hunting. I am employed as a pilot with Pro Aire Cargo and Consulting. I have Airline Transport Pilot certification. I remember rebuilding the CO mass spectrometer as a senior lab project under Professor Clayton Giese's supervision. We learned a lot about mass spectroscopy! Professor Russell Hobbie was my advisor. He wrote a good book on medical physics. Modern Physics was a good class taught by Professor Stephen Gasiorowicz. I read all his class notes bound into one volume. I enjoyed working as an undergraduate research assistant for Professor Waddington in cosmic ray physics. It was an enormous creative and free-thinking time in my life! Oh, to be involved in a research project once more and to push back the barriers of ignorance. As a professional pilot, I enjoy occasional forays into atmospheric physics and improvements in weather forecasting.

Mark J. Engebretson (Ph.D., Physics, 1976; M.S., Physics, 1975) My wife Lynette and I have three children -- David (Ph. D., Physics, University of Minnesota, 2003), John, and Julie (Helps). Since 1976, I have been a physics faculty member at Augsburg College. I teach classes in physics and related fields including Issues in Science and Religion and continue my research in aeronomy and magnetospheric physics. I was the recipient of the Dean's Award for Outstanding Teaching (2004) and a Fulbright Senior Scholar in Germany (1997). My research in Antarctica was recognized with the naming of Engebretson Peak in the Royal Society Range in Antarctica. I served as Vice Chair of the Panel and Education and Society on the National Academy of Sciences' Decadal Survey of Solar and Space Physics 2001-2002. My favorite professors were Benjamin Bayman, Russell Hobbie, Allen Goldman and Chuck Campbell.

Roger Knutson (B.S., Physics, 1976) I am married and have a four year old son. I work for Oracle Product Lifestyle as a Management Consultant. I am the patent holder for Mindshare (7050753). I have patents pending for Individual Health Record Management, Fuel Free Magnetic Motor, and Wind Soil-Ultra-Efficient Wind Machine. My favorite memory from my time at the University was closing Washington Street and exchanging view points with police during Vietnam War era. My favorite courses were by Professor Gasiorowicz who taught Mechanics and Professor Tang who taught Quantum.

1975

Kristine M. Black (B.S., Physics, 1975) I am married with two stepchildren and a granddaughter. My stepson is a sergeant in the Army currently serving in Baghdad. Currently, I am interested in methods for hand made paper and computer forensics. Previously, I worked on medical devices and conductors for 30 years. I recently retired from Medtronic after 14 years. I specialized in supplier relations and developments for most of my career. My favorite memory was Dr. Broadhurst walking back and forth in front of our class and being totally oblivious of the cord from the overhead screen as it crossed his forehead. He never lost his train of thought. My favorite professor was also Dr. Broadhurst for his physics and measurement and electronics course. Dr. Hamermesh was always very inclusive of his students, and often shared his experiences with us.

Anne R. Douglass (M.S., Physics, 1975) I left University of Minnesota in 1975 with a Master's. My husband finished his Ph.D. in Chemistry and had taken a teaching position at Drake University in Des Moines. I started graduate school at Iowa State University (ISU). I switched into atmospheric physics when I was at ISU. I received my Ph.D. from Iowa State in 1980. My major professional decision was to do something I thought would help the environment. I took a job at Goddard Space Flight Center (NASA) in Greenbelt, MD, and have been there my whole career. I am a global atmospheric modeler and data analyst. I have been deputy project scientist for two successful spacecraft – the Upper Atmosphere Research Satellite that took data 1991 – 2005 and now Aura which was launched in July 2004. Check us out at http://aura.gsfc.nasa.gov. I am a Fellow of the American Geophysical Union and a Fellow of the American Meteorological Society. This year I was awarded a NASA medal for Scientific Excellence. My husband and I have two boys and three girls. Finally, all of our children have graduated from college and are fully launched in their lives – in age order M.B.A, Ph.D. (chemistry), M.D. (emergency/international medicine), Ph.D. (oceanography) and soon to be Masters in Social Work. We have five beautiful grandchildren (three to eight years old) so far. It is a close, active, demanding and interesting family. The kids are the stars in my universe. My two technically-minded daughters and I contributed essays to a collection about women scientists and motherhood called *The Elephant in the Laboratory*. Speaking of that elephant, when my son was born 35 years ago, I was back teaching my labs one week later with the baby carriage in the lab. I think that might have been breaking some rules. The University of Minnesota was a pretty difficult time for me. I had attended a small women's college. I had some serious catch up work to do on my physics knowledge. I made some good friends though, and had a spectacular 24th birthday. My favorite class was Classical Mechanics and E&M. My professor was Ben Bayman who always said BEETa and THEETa where most of use grew up saying beta and theta. He was an excellent teacher. Many things I learned in those

classes were useful later. For example, when I had to study radioactive transfer in the Earth atmosphere at ISU, it was an easy class for me because I really did understand Maxwell's equations inside out and upside down thanks to Dr. Baymen.

James A. McLinn (M.S., Physics, 1975) I am married and have two children. My son has an M.B.A. and works for Bain Management. My daughter is a professor at Cornell. I am a reliability consultant. I am able to travel the world doing work with companies wishing to improve their products. My favorite memory at the University of Minnesota was spending a few evenings at the St. Croix Telescope with Dr. Ed Ney. I liked Dr. Nick Woold who taught a cosmology class, and Dr. Allen Goldman who taught solid state physics.

Michael A. Young (B.S., Physics/Astronomy, 1975) I moved to Massachusetts in 1979 when my ex-wife, Judith (nee Rubin) took a post-doc at University of Massachusetts, Amherst. We have one daughter, Laura, who graduated from Vassar in 2005, married in 2005 and is now living in the Chicago area. Judy and I divorced in 1990. I remarried in 2000. My wife, Beth Ann teaches English at Westfield State College. I have been teaching in the Physical Science Department at Westfield State College since 1984. I was the department chair. I completed M.S. degrees in geophysics and mathematics, but never finished a thesis in geology at the University of Massachusetts. I have taught mostly introductory-level courses in several areas at Westfield. As an astronomy teaching assistant during my senior year, I enjoyed the camaraderie of the T.A. office, including many games of triple zinger. The chance to visit the Argonne Laboratory with Professors Marshak and Courant was a memorable experience. I had many excellent teachers at the University of Minnesota, but my favorite included Professor Kaufmanis (astronomy), who had stories to explain everything. I also enjoyed Professor Hintz whose upper-level mechanics course was excellent, and who made an effort to get to know the students.

1974

Jim E. Broughton (B.S., Physics, 1974) I enjoy longevity medicine, traveling and reading. I am the Senior Vice President at a medical device start-up company. My favorite memory is the last day of Dr. Karlis Kaufmanis' Astronomy class when all of his students gave him a standing ovation! I also liked his star of Bethlehem lectures. My favorite courses were Beginning Astronomy with Dr. Kaufmanis and Dr. Edward Nye's Senior Astrophysics course.

Stephen L. Mischke (B.S., Physics, 1974) I have been married for 35 years to the same woman who I met at a dance in the Coffman Memorial Union. We have two daughters, but no grandchildren. In 1974-1979, after graduating and receiving my commission (I attended the University of Minnesota on an ROTC scholarship) I served in the U.S. Navy aboard the nuclear powered submarine U.S.S Andrew Jackson (Honorable Discharge in 1979). From 1979-1984 I worked with Westinghouse Hanford Co. at the Fast Flux Test Facility (FFTF), a fast-breeder test reactor on the U.S. D.O.E. Hanford Reservation in southeastern Washington. I enjoyed living in southeastern Washington where I learned fly fishing. I hated to leave, but sometimes you have to go where the job takes you. I worked with General Electric Co. in their Nuclear Services Division from 1984-1989. I was a consultant in the San Jose, CA office, at the Brunswick Nuclear Power Plant near Wilmington, NC and the Nine Mile Point Nuclear Power Plants near Oswego, NY. In 1989-2005, I returned to the FFTF and worked there until 1998 when it was decided to permanently shutdown the test reactor. After leaving the FFTF, I worked on various radioactive waste cleanup projects at the Hanford Reservation including disposal of spent nuclear fuel from the N-Reactor, and characterization and disposal of transuranic waste. I was awarded the Robert Lane Graduate Fellowship in Environmental Science in 2003. From 2006 until the present, I have been employed with the State of Illinois in the Illinois Emergency Management Agency as a Resident Inspector at the Clinton Nuclear Power Plant near Clinton, IL. My favorite memories were: the first "real" day of spring weather on "The Mall"; halter-tops; watching Gopher Basketball games under Coach Bill Musselman, and his "Harlem Globetrotter-style" pre-game warm-up show; and intramural co-ed softball. My favorite courses were not related to the physics curriculum: engineering drafting, Greek and Roman mythology, and art history. (Maybe I should have chosen a different major … nah!)

1973

Donald W. Hillger (B.S., Physics, 1973) I obtained my M.S. and Ph.D. at Colorado State University. I married in 1994. We just celebrated our 15th wedding anniversary. I have been an amateur radio operator most of my adult life. I am now Faculty Advisor and Trustee of Colorado State University Amateur Radio Club. I am also interested in topical stamp collection. I publish articles on my stamp collections about weather and un-manned satellites on postage stamps. After graduate school, I joined the National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data and Information Service (NESOIS), in the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University (CSU). I specialize in satellite meteorology and remote sensing. Our current work is on the next generation of Geostationary Operation Environmental Satellites (GDES). I worked for Homer Mantis while at the University. I took care of a facsimile machine that printed large-format weather maps. That launched my career in meteorology! I can remember a class with George Freier and the intense interest he took in our success. I also graded papers for Dr. Cahill's optics class. Astronomy was one of my favorite topics, but I left that area to become a meteorologist.

Thomas P. Krick (M.S., Experimental Nuclear Physics, 1973) I am married with two daughters and two granddaughters. I am the manager for the Center for Mass Spectrometry and Proteomics at the University of Minnesota. I have written 50 journal articles. My name appears on the Wall of Discovery at the University (www.scholarswalk.umn.edu/discovery/wall_names.html). I met my wife who was a fellow physics grad student. Being a grad student was great. I got to know Professor Alfred Nier.

I was able to help with an oral history of Nier for Chemical Heritage Museum.

James P. Mellema (M.S., Physics/Geophysics, 1973; B.S., Physics, 1971) I have been married to my wife Debra for more than 35 years. We have four children: Joseph, Steven, Laura and Mike. I am a Senior Partner at Richfield Medical Group where I have been on staff at Fairview Southdale Hospital for more than twenty-six years. A professor whose name I unfortunately cannot remember was my favorite. He had a handle bar mustache and smoked cigars. He chronically singed mustache from lighting his cigars. Hamermesh was also a great mentor. Favorite courses include solid state and theory mechanics, astrophysics with Ed Ney.

Robert M. Swinehart (Ph.D., Physics, 1973) I have been married for forty years. We have two daughters and four grandchildren. I have participated in automobile racing on ice during Minnesota winters for over twenty years. I worked for 3M in technical management for 29 years. I retired in 2004. My favorite memories were being told that I had passed the doctoral program preliminary oral exam; followed closely by being told that I had passed the first year graduate written exam. Maybe one other favorite memory was teaching introductory physics labs to nursing students. My favorite professor, Professor Weyhmann taught a special not-for-credit class in the physics of photography. It was great fun, practical and reinforced lessons in optics.

1972

Daniel P. Korolchuk (B.S., Physics, 1972) I have been married 26 years to my wife Debbie. We have three sons. We are Florida residents, but we spend the summers at our home in Minnetonka. We ride our Harley-Davidson motorcycles around the Midwest in the summer and the southeast during the winter months. After graduation I served on active duty in the U.S. Army Corps of Engineers. I followed that with management positions at Control Data Corp., and the Perkin-Elmer Corp. I was vice president of Operations for Physical Electronics. This company was a surface analytical instrument manufacturer founded by University of Minnesota alumni. Currently, I am president of Applied Vacuum Technology. We are a supplier of ultra-high vacuum equipment and engineering services for science and industry. The period from 1968 to 1972 was not a good time to be active in ROTC (as I was). Physics classes in general provided opportunities to escape the turmoil on campus and concentrate on the science education I wanted. It is not that physics students did not know or care about what was going on then. We took our studies seriously and the material often was not "easy" so classes were important too. I do remember one lecture disrupted by three "activist" students. They rudely interrupted the professor and encouraged the class to leave and join in the campus strike. The professor calmly asked the class to raise their hands if they wanted to leave. He said he would stop the lecture if a majority wanted to leave. One hand went up and quickly went down. Our guests moved on and so did the lecture. My favorite professor was Norton Hintz. He dressed outrageously. His clothing used nearly every wavelength of the visible spectrum. He lectured, recalled every end of chapter question, and solved problems without notes of any kind. He always carried the class textbook. He never opened the text even though he frequently referenced page and paragraph and could recite a problem verbatim if you gave him the page number.

Ellen Kuhfeld (Ph.D., Nuclear Physics, 1972; M.S., Nuclear Physics, 1966) I married Mary Monica Pulver in 1979. (Her 24th murder mystery is coming out in October.) I changed sex in 1998, but Mary and I are still together. So far, I have not been murdered. I have completed a novel and a chapbook, and co-authored Sparks and Shocks: Experiments from the Golden Age of Static Electricity. I am working on a popular history of electrical science and engineering. My current hobby is bookbinding. I graduated at a bad time for nuclear physics employment, and ended up instead in the world of science museums. I spent eight years at the Science Museum of Minnesota, then moved over to The Bakken Library and Museum. I was there a quarter of a century, most of those years as curator. For five of those years I had a column in the IEEE journal Engineering in Medicine and Biology. I was an operator at the University's proton linear accelerator. The first moon landing came during one of my shifts. We rigged a television in the control room to watch; so there I was, running a great metropolitan atom-smasher, watching the first moon landing surrounded by scientists and techies who were equally fascinated by the landing. It does not get more "sense of wonder" than that! My favorite professor was Ben Bayman. I was an experimentalist, but the faculty demanded theoretical calculations of me. Ben helped immensely with those calculations, lending his expertise and the use of computer time.

David P. Thimsen (B.S., Physics, 1972) I have lived and worked in Minnesota with brief sojourns in Honolulu (1973-1975) and southern California (1998). I married young and have three children and four grandchildren. I discovered sport bicycling later in life. I promote local bicycle races on the road and at the National Sports Center Velodrome in Blaine, MN. I was a high school teacher in the early 1970s. Looking around in the mid-70s (think first energy crisis), all the interesting jobs were being done by mechanical engineers. I went back to graduate school with an emphasis in thermodynamics (power production), heat transfer, and aerosol physics. My B.S. in Physics was great preparation. Since then, I have been a field/process engineer for expanded use of agricultural materials as fuels, coal gasification pilot plant engineer, fluidized bed combustion power plant commissioning, distributed electrical power generation technology and application, aerosol instrument engineering and advanced coal power plants. I will probably close out my working life as a Senior Project Manager for the Electric Power Research Institute. Not many memories could be termed "favorite". Working for Professor Nier in his mass spec lab was certainly memorable. As a real link to the Manhattan Project he was larger than life, but he was personable, approachable and friendly. He could tell a good story. I also have fond

memories of working with the machinists during that time. Two courses stand out in my memory: Professor Bayman allowed me, as an undergraduate senior, to take the graduate series in Classical Mechanics. I enjoyed it very much. His lectures were clear and through. In retrospect, the senior lab courses were instrumental in organizing my thinking about making measurements and coming to quantitative conclusions. I have used the error analysis techniques I learned then throughout my career.

1971

Everett H. Harvey, Jr. (Ph.D., Physics, 1971; B.S., Engineering Physics, 1967) I chose to go to graduate school in physics at the University of Minnesota because it was a highly rated school. I acquired a teaching assistant position so I could actually afford school. During my second year, I got a research job with the experimental high-energy particle physics group. I spent about a year of the next three traveling to Argonne National Lab working on my thesis experiment. I enjoyed working with the team led by Dr. Keith Ruddick, my thesis advisor, on a wonderfully elegant optical spark chamber experiment looking at the radiative decay of mesons. I got a postdoc job with Walter Selove at the University of Pennsylvania in Philadelphia. (Remember jobs in science were hard to get at this time.) This meant spending a lot of time at Brookhaven National Lab working on a large collaboration experiment headed by Frank Turkot. This experiment was one of the early electronic based multiparticle spectrometers, ARGO. After that I got a (another) postdoc job at University of Wisconsin in Madison. Madison was a great place to live. I married my wife Marie, a local Wisconsin native, in 1976. I worked on several experiments at Fermilab. I spent five years in Madison and was getting to be an old postdoc. In 1978, I landed a job at Lawrence Berkeley National Lab as a career employee. I went to work for the real-time computer systems group in the engineering division. I moved to Berkeley, CA expecting to be there for a short time. I ended up spending over 27 years at Berkeley Lab. I took an early retirement at age 60. About 10 years before retiring, my wife moved to a ranch in Trinity County. I commuted to Berkeley for work during the week for that decade. Since retirement, I no longer make that long, long drive. We live in Weaverville in the Trinity Alps area of California. Our county is very rural, and proudly not a single traffic light in the whole county.

David E. Stoltzmann (B.S., Physics, 1971) Even though the course load of an IT physics student provided some of the necessary knowledge of what would be needed for employment, by far the best class I ever took was “Stars 11” from Karlis Kaufmanis. His office door was always open. He would welcome us students to come in and challenge him about a test question we felt might be in error. Having taken a couple of classes in astrophysics at Iowa State University, I once asked him about a simple exam question dealing with stellar magnitudes. When I mentioned that there were also other definitions of magnitudes such as the bolometric magnitude, his face lit up and he said “You know about bolometric magnitudes?”. With a smile he immediately gave me a revised test score, upon which my brother who was also in the same class asked for the same revision. “Not you!” he retorted, while winking at me. During a senior physics lab I was introduced to a bell jar coating chamber and began to become fascinated with optical technology. No one else seemed to care about this old machine, but I put it to good use. After scrounging some thin gold wire and a small alumina crucible, I proceeded to resistively evaporate a few molecular layers of gold on a polished brass ring I had made on a small lathe. I presented this to my wife-to-be (Joy) when we were married a few months later. We still have the ring 38 years later. My jewelry-making grandfather was quite impressed at the time (1971) with the $1.22 I spent on it and that someone would be willing to marry a physics student on such a meager offering. My interest in optics was encouraged by summer work at 3M in its Microfilm optics lab. This interest eventually led to a graduate degree from the Institute of Optics and the founding of Optical Engineering of Minnesota (OEM). This year we begin our third decade of optical design and testing activities. We are proud to say that we have helped to put thousands of criminals behind bars. When people ask what an optical engineer does, I just say that you do not want to be involved with most of the machines I design and help build, although someday they might save or enhance your life. The questioner then moves on to a more interesting person with whom to converse. The late 60’s and early 70’s at the University had quite a bit of controversy on campus with the Vietnam War in full swing. I remember that IT students were given the rare opportunity to take some required classes pass-fail, which actually helped in one of my upper-division math classes. When it came time to finally graduate after four years (the United States Air Force was waiting), I remember about a dozen of us physics seniors standing up in unison at Northrop during graduation ceremonies and then being told to sit down. My early interest in optics and the related classes in astronomy and physics at the University helped feed the need to build an observatory in the dark skies of western Wisconsin. This 20-year long task will never be finished, but for now there is a research-class Zerodur 20” Newtonian-Cassegrain telescope to show for the efforts, with a roll-off roof and some stunning views of God’s creation. What a great journey it has been since those days at the Tate Lab of Physics building!

1970

Francis M. Gasparini (Ph.D., Physics, 1970; M.S., Physics, 1966) I have been married since 1967 to my wife Lucille. We have two children: Francis and Nicole and one grandchild. I have always been an avid cyclist. In 1990, I even managed to compete in the state road race in Minnesota. I placed third and am particularly proud of my bronze. Lucille and I have been riding a tandem bicycle for many years. The picture is from a tour we took in New Zealand a few years ago. I graduated in 1970 after completing an experimental thesis on the critical behavior of superfluid 4He in the presence of the isotope 3He. I

spent three years as a postdoc at Ohio State. I then joined the Physics Department of the University at Buffalo, State University of New York in 1973. I am currently Distinguished Professor of Physics. I have chaired the Department for the last five years. My research has been in the area of quantum fluids, liquid 3He and 4He and critical behavior at phase transitions. Recently, I focused on the study of the modification of thermodynamic behavior due to uniform spatial confinement. I have had 14 PhD students and 12 Masters students. I have been a Fellow of the American Physical Society since 1990. I remember the friendly atmosphere in the 'low temperature' group with many graduate students, the experimentalist faculty: Zimmermann, Weyhman, Goldman, Moldover and a theorist, Nosanow. This atmosphere extended from the casual interactions of physics discussed over lunch to friendly volleyball games. It was Nosanow who was particularly encouraging, supportive and most instrumental in my eventual career. I have always appreciated his mentoring. I took the graduate Quantum Mechanics course with Zimmermann. He was the best professor I ever had. He had a high level of preparation and care for his course.

Jay R. Hanson (B.S., Physics, 1970) My wife Ann and I live on Vashon Island in Puget Sound. I have four children and five grandchildren. I started a second family later in life, and have been thoroughly engaged in parenting. My main hobby is boating. We own a 35 foot sailboat. We enjoy sailing and cruising Puget Sound and British Columbia waters. I retired this summer. I plan on spending more time boating. I also play and repair mandolins. After graduating, I went to work full-time for the Cosmic Ray Physics lab under Dr. Jake Waddington. I worked there four years. I constructed and launched balloon-borne high-altitude cosmic ray experiments. I went on a number of field trips to Texas and Manitoba. In 1975, I moved to work for the University of Washington (UW) High Energy Physics group for a few years. I helped support high energy physics experiments at Fermilab. After my stint at the UW, I shifted my career to electrical engineering. I have worked for a number Seattle electronics companies. I received a patent on a digital radar. I did many years of consulting work. Eventually I ended up in the computer system engineering field. I have many fond memories of the years I spent in the physics building as a student and as an employee. I have pleasant memories of my time working in the cosmic ray physics lab, and many enjoyable hours working in the student shop. I have great memories of all the people who worked in the basement of the Physics building (shop machinists, stores people, electrical engineers, plus all the other lab and support people). I also remember hanging out with the lecture hall demonstration equipment people. Some professors I remember are Jake Waddington, Phyllis Freier, J. Morris Blair, Karl Poppe, Clayton Giese, Ed Nye, Marvin Marshak, Allen Goldman, Hans Courant, Stephen Gasiorowicz, and Paul Kellogg. My favorite class was senior lab. I still remember doing the Rutherford alpha particle scattering experiment.

Michael T. Kauper (B.S., Physics, 1970) I have a wonderful girlfriend. I enjoy traveling within the United States and abroad. In July I traveled to China for the longest solar eclipse. I am an amateur astronomer. My favorite memory was the time I brought a big pile of Marvel comics (Spiderman, Fantastic Four, Silver Surfer, and Dr. Strange) to Jake Waddington's gamma ray lab. The comics slowly migrated to every office and classroom in the building. I also enjoyed my astronomy course with Robert Pepin.

Gregory D. Potasek (B.S., Physics, 1970) I am married to my wife Claudia. She is a nurse. We have three children. All have graduated from the University of Minnesota: Aimee (School of Dentistry); David (IT Mechanical Engineering); and Andy (Carlson School of Business). I am currently Division Manager of AP Engineering Services. Previously, I spent 28 years with Honeywell in Military Avionics and Home and Building Controls. It was not a favorite memory, but I will always remember spring on the mall when the Tate Laboratory of Physics building was hit by tear gas.

Frederick M. Schaer (Ph.D., Physics, 1970; M.S., Physics, 1963) I have retired to agricultural and geological pursuits. I was a technician with the Navy Nuclear Program. I held numerous other technician jobs. I did some teaching early on in my career. The many and beautiful things I learned in the school still bring me great pleasure. The professors were excellent. The classes were all favorites!

Jerry A. Sievers (Ph.D., Nuclear Program, 1970) After graduating, I joined 3M Corporation and engaged in computational physics for 35 years. The diverse scientific environment there allowed me to work in many technology areas: charged particle beams, fluid dynamics, mechanics, magnetic recording, friction, vibration, noise spectral analysis, and laser, holographic and thin film optics. I retired from 3M in 2005. I now teach part time at Century College in White Bear Lake, MN. Some favorite memories are of helping develop the polarized proton source for the linear accelerator, and operating the "linac" with fellow grad students for nuclear scattering experiments. My favorite courses were: Modern Physics with Russ Hobbie, Nuclear Physics with Ben Bayman, and Field Theory with Mark Bolsterli. I thoroughly enjoyed my time at the University of Minnesota because of the excellent faculty and fellow grad students.

Additional Class Notes

1995

Heidi L. K. Manning (B.S, Physics, 1995) I am an Associate Professor of Physics, Chair of the Division of Sciences and Mathematics and director of the Credo Honors Program at Concordia College, Moorhead, MN. My research is working with a high speed dust particle accelerator housed at the college. I was awarded the Flatt Distinguished Scholar Award 2006-2008, an award at the college to a professor for outstanding scholarship. My new position as division chair and honors program director has reduced my teaching load and put me on the road a lot more. I have had the opportunity to travel to Greece, Hong Kong and China this past year as well as many less exotic, domestic destinations. I am married and

have two boys, Zachary (12) and Ian (9). I enjoy swimming and bike riding (weather permitting).

1981

Noel J. Petit (Ph.D., Physics, 1981; M.S., Physics, 1978) I am married and have two children. I retired from the Navy Reserve. I now drive trains for the Minnesota Transportation Museum as a hobby. I am a Professor of Computer Science at Augsburg College. My favorite memory was the weekly colloquia with doughnuts and coffee. My favorite professor was George Freier, with his lab full of tinkering things and his books on weather proverbs.

1962

Richard D. Platte (B.S., Physics, 1962) I went to Princeton University until early 1957 and to Stanford that spring. In fall 1957, I transferred to the University of Minnesota to study physics. I enjoyed language studies (Russian and Chinese), intramural sports (championships in football, wrestling, and swimming), varsity tennis, and the Sigma Nu Fraternity. In fact, I enjoyed the University a little too much, flunking out and going back to California to work. In 1962 I returned with a determination to graduate. I started my graduate physics studies at the University. I got married in 1964. From 1964 to1966, I was a system analyst at General Motors, A.C. Electronics Division working on advanced navigation and guidance systems for ICBM's. I also continued evening graduate physics classes. We moved to Milwaukee for my first professional job. In 1966, I joined the C.I.A. I spent the next 33 years in that exciting and rewarding career, working in the operational, technical and analytical directorates, as well as being a special staff advisor to five Directors. I managed, founded, or reengineered five line organizations in both the Directorate of Operations and the Directorate of Science and Technology. My work with the technical program management included systems for space, airborne, marine, and ground applications. Conducting advanced research, development, and support to operations, I used imagery, signals, signature, and robotics technologies. I was the recipient of the CIA's Distinguished Intelligence and Intelligence Commendation Medals, and the Directorate of Operations' Donovan Award. I retired from the CIA as the Director of the Office of Advanced Projects in 1999. I then joined a small company that supports many members of the national intelligence community, civilian and military. I still enjoy the challenges of the intelligence mission, working full time for several sponsors. I have been blessed with three sons- David (44), John (39), and Tyler (18), a daughter Robin (16), and two grandchildren. I have been married to my wife Karen for the past 30 years. We live in Vienna, VA. Over the years, I have occasionally gone "up north" to Leech Lake with friends to open walleye season. I remember being greatly inspired by Professor Ney in his physics honors course, when he challenged us with the mysteries of "magic numbers" and the broader enigmas of the universe. Like Einstein, Ney reminded us of how little we know. He gave me a sense of intellectual humility. I also remember fabricating balloons in the basement for his cosmic ray research and, later flying them at all hours from a small airport.

1961

Earle Kyle (B.S., Physics, 1961) My son, Jonathan Kyle, graduated from Carnegie Mellon University (B.S., Mechanical Engineering) in May. At the Wisconsin/Iowa/Minnesota section of the Great Lakes Planetarium Association Spring Conference, I gave the Solar System Ambassador's presentation "Inspiring the Next Generation of Space Explorers" which focused on techniques to increase diversity in the space program.

A special thanks to our alumni for the overwhelming submission of class notes. If you do not see your submitted class note here, please look forward to seeing it in our next newsletter.

In Memoriam

Stephen C. Davidson (B.S., Physics, 1970) died on December 2, 2008 in Minneapolis, MN.

David R. Harsh (M.S., Physics, 1978) died suddenly in Cleveland, GA on August 26, 2008.

Donald B. "Mac" McIntyre died on April 29, 2007 of cancer. He was 81 years old. McIntyre worked at the School of Physics and Astronomy machine shop from 1952 to his retirement in 1990. He was shop foreman during the largest period of expansion of the School. He was born in New Richmond, WI and attended "Stout State" (now University of Wisconsin, Stout). He came to work at the University shortly after graduating. His son Peter said that his father was especially proud of the work the shop did for various NASA projects in the 1970s, building equipment that was used in the Mars landers and the deep space probes Viking and Voyager. According to Peter, his father had a life-long interest in flight. He served in the Second World War as a B-17 crewmember and continued to be fascinated with aviation after he left the service. He took flight lessons and built model aircraft in his spare time. Peter also said that his father collected old machinery which he would occasionally restore. Mac started a part-time business while he was working as shop foreman building specialized machine parts that the University shop was not interested in building. Usually these would be related to a prototype that the shop had built. After he retired, Mac made this business a full-time occupation and brought his sons Peter and John on board to help. John and Peter's wife, Nancy now run the company. McIntyre is survived by his wife Susan and his sons Peter and John.

Alumnus Profile

Stanley Brodsky

(Ph.D., Physics, 1964; B. Physics, 1961)

You received your B.S and Ph.D. degrees from the University of Minnesota. What helped you decide to come here for your education? I hoped to become an electrical engineer when I was a high school student in St. Paul. The Institute of Technology at the University had an outstanding reputation as an engineering school. In 1957, the amazing Athelstan Spilhaus was the Dean and Head of IT. By developing a way to extract iron ore from low-grade taconite, the University helped save northern Minnesota's depleted Mesabi Range. Professor A.O.C. Nier, of mass spectrometer fame, was head of Physics. I realized in my sophomore year that I really wanted to be a physicist, especially after reading Dirac's elegant book on quantum mechanics. I benefitted from the honors undergraduate program in physics and the opportunity to work as a lab technician in both the vacuum tube laboratory in electrical engineering and the experimental physics program in the Van De Graaff laboratory. I was offered an NSF Cooperative Fellowship to finance my graduate studies at the University, so the decision to stay on in graduate physics was easy. Fortunately, it was a very good decision.

Who were your favorite professors? Professor Donald Yennie was an extraordinarily brilliant and kind Ph. D. advisor. He had a worldwide reputation in theoretical physics. I was very fortunate to have him as a teacher of Advanced Quantum Mechanics and to have him guide my research in precision atomic physics tests of quantum electrodynamics. Don and his remarkable wife, Lois, were more than advisors; they were like a second family. Professor Stephen Gasiorowicz was an outstanding teacher of advanced graduate courses in physics. He wrote his classic book on Elementary Particle Physics while teaching my class. I also greatly appreciate learning experimental nuclear physics techniques from Professors J. Morris Blair and Russell Hobbie while working in their Van de Graaff ion accelerator laboratory. Professor Edward Ney was a memorable undergraduate teacher for our honors physics class. Professor T. Michael Sanders was a remarkably patient teacher of quantum mechanics. I also recall the wonderful sense of humor of Professor Don Geffen.

What were some of your favorite memories of your time while you were here? I was fortunate not only to benefit from an excellent education, but also gaining from the friendship of many talented students, including **Bill Bardeen** (Ph.D., '68), **Jim Loken** (BS, '61), **Stan Ecklund**, **Bruce Nemer** (B.S., E.E., '62), **Jeff Arenson** ('61), **Gene Paymar**, **George Gamota**, **Jim Walker** (Ph.D., '64; M.S., '61; B.S., '59), **Bill Kuretsky** (E.E., '61), and many others. Many students in my graduate class went on to successful careers in physics.

Tell us about your research. My research spans high-energy and nuclear theoretical physics, especially the quark-gluon structure of hadrons and novel effects in quantum chromodynamics; fundamental problems in atomic, nuclear, and high energy physics; precision tests of quantum electrodynamics, light-front quantization; nonperturbative and perturbative methods in quantum field theory. In 1970, Tom Kinoshita, Hidezumi Terazawa, and I initiated the field of two-photon processes. In 1973, Glennys Farrar and I developed "dimensional counting rules" for hard exclusive processes, extending my earlier work with Blankenbecler and Gunion. In 1979, G. P. Lepage and I derived the theory of hard exclusive processes in quantum chromodynamics (QCD), including factorization theorems and evolution equations for meson and baryon distribution amplitudes. H. C. Pauli and I developed the discretized light-cone quantization (DLCQ) method for solving quantum field theories in 1985.

Is there anything else you would like us to know about you or your research? I have always tried to understand physical phenomena from basic principles. I pay great attention to experiments which check, validate theory and lead us to new directions. My great love is all aspects of QCD (quantum chromodynamics) -- the fundamental quark and gluon theory underlying the strong and nuclear interactions. I have especially advocated Light-Front Quantization. This is a Hamiltonian approach to relativistic quantum field theory, where a bound state wavefunction is defined at the time set by a light-front, rather than ordinary time. It has kinematical and dynamical advantages: Lorentz-boost invariance and simplified vacuum structure. Recently we have developed light-front holography, which allows one to compute hadron spectra and light-front wavefunctions using a theory in higher dimensions.

Tell us about your family. I am married to Judith Ellen Brodsky. We have three children, Stephen, David, and Jyoti, and four great grandchildren, Ethan, Ryan, Alex, and Alicia. My hobbies consist of my family, politics, and physics.

What are some of your beliefs on how to be successful? I have been singularly fortunate in having a great education at the University of Minnesota and an amazing opportunity to do fundamental research at SLAC for the last 43 years. I hope to do even more.

What advice do you have for current students and recent alumni? There is no better career than basic science. My advice to others is to learn as much as you can, and take advantage of every opportunity you can at the University of Minnesota.

Full interview online at: www.physics.umn.edu/alumni

Kim Dockter
Director of External Relations

Honoring Professor Allen Goldman's 40+ Years of Dedication

Faculty members often have a profound and lasting influence on the lives of their students, and Professor Allen Goldman is a shining example. When Professor Goldman indicated his intentions to step down as head, a group of his former students pulled together to plan a party to appropriately honor him. They spearheaded a fundraising effort to endow a fellowship in his name. The former students including Ying Liu, Jinxiang Liu, JC Wan, Fang Yu, and Ted Wang, along with Professor Paul Crowell, planned a wonderful celebration, which took place on May 2.

Professor Goldman's former students were also successful in raising funds to permanently endow the **Professor Allen M. Goldman Fellowship**, which will serve as an enduring tribute to him. The fellowship will be awarded each year to a full-time graduate students enrolled in the School of Physics and Astronomy working toward a graduate degree.

To date, $35,000 has been raised for the endowment. Additionally, the graduate student fellowship award will be matched each year on a 1:1 basis by the University of Minnesota.

Professor Goldman has dedicated his life to teaching and mentoring students and there is no more appropriate way to honor him than to create a fellowship fund, which bears his name and that will support Physics graduate students in perpetuity. Because this is a permanently endowed fund, gifts may be contributed at anytime. If you would like to honor Professor Goldman, please feel free to use the form below or make a gift online at: **www.foundation.umn.edu/pls/dmsn/online_giving.start_null**

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

Allen Goldman Fellowship Fund

I (we) wish to make a gift/pledge to the Professor Allen M. Goldman Fellowship Fund in honor of Professor Allen Goldman.

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Next issue: Focus on 1980s alumni

We will highlight our alum from the 1980s in the fall edition of the newsletter. 1980s alumni should have already received a class notes mailing. Send your Class Notes responses by November 15, 2009 for inclusion in the next newsletter. We can not wait to hear from you!

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