

CHAIR continued

injection of modern physics the centerpiece of the improvements. Second, we have been able to give research stipends to an average of 3.5 students per summer since 2004. Undergraduate research is now a growing part of the culture here at Augie, and not just in the physics department. Over fifty Augustana students, including six physics majors, were conducting scientific research this summer, either in Sioux Falls or around the country.

With the addition of Amy Engebretson to the faculty in 2005-2006, we were able to standardize our course rotations and ensure that all of our majors would be able to take the appropriate courses needed for entry into graduate school or one of our affiliated engineering programs. Amy has been doing a great job of teaching the Physics for the Life Sciences Course, and as a result the two introductory physics courses have been serving a total of 70-80 students a year. As the mathematical background of the average Augie science student has increased, we have made the decision to only teach calculus-based introductory courses for the foreseeable future.

Karel's retirement from the department in spring 2006 was a loss – it is virtually impossible to replace the wisdom he accumulated over the last few decades. We especially miss his gift for teaching the general education courses and are working hard to fill this void. Karel was replaced by Dr. Drew Alton, who arrived in August 2006. Drew received his undergraduate training from the University of Iowa, a master's from Ball State University, and his Ph.D. from Kansas State University in 2000. From 2000-2006 he was a postdoctoral fellow at the University of Michigan, but he worked at Fermi National Accelerator Laboratory as a member of the DØ collaboration. Drew jumped right in last year, teaching Astronomy, General

Physics I, Modern Physics, and Computational Physics.

A significant factor in the decision to hire a particle physicist was the possibility that a deep underground national laboratory would eventually be located at the abandoned Homestake mine near Lead, SD. More news about that can be found elsewhere in this newsletter.

We hope to continue the momentum we have built over the last few years. There is reason to believe we can do it. Sioux Falls continues its rapid growth, and the surrounding research community is growing as well. While the biomedical and ethanol sectors are leading the way, physical science plays its part as well. On campus, the 2008 U.S. News & World Report rankings show Augie rising to #5 in the Midwest baccalaureate category. Flawed methodology or not, it is probably better to be going up than going down! Finally, as I mentioned in our 2005 newsletter, we are anticipating an extensive renovation and addition to the Gilbert Science Center, the cost of which will probably exceed \$45M. Fundraising is underway, and we are getting down to working on the details of the plan. The new facility will enable us to educate our students better, in the classroom, the laboratory, and with independent research opportunities.

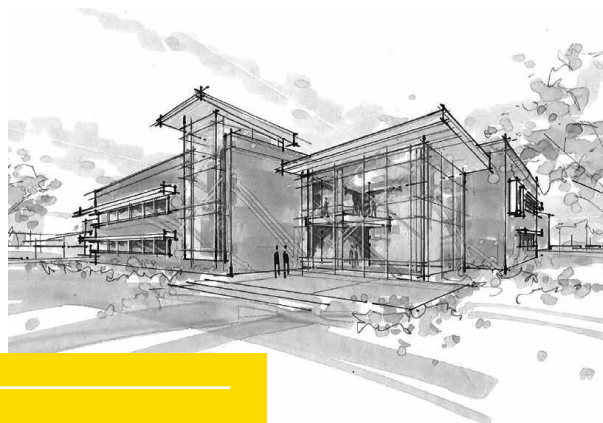
There has been a lot of change in the physics program in recent years, but I would like to assure all of you that we remain committed to providing outstanding scientific and technical instruction as well as undergraduate research opportunities, all within the

context of a broad liberal arts education. Our goal is a program that prepares our students for lives of intellectual growth and service.

On a personal note, my family and I are enjoying living in Sioux Falls. My son David started kindergarten this year. I continue to pursue my atomic, molecular, and optical physics research. The collaboration we have established with Kansas State University has worked well. I continue to be grateful for the talented, hard working students participating in research with me. You will read of many of their exploits in the next few pages.

As always, we are glad to hear from you. Please let us know what you have been doing.

Best regards, Eric



An early conceptual sketch of the proposed expansion to GSC, as viewed from the corner of 33rd and Summit Avenue.

NOTES FROM DREW

I'm glad to meet most of you, even in this fashion. Since I have only been with Augustana College or the Physics Department for a year, I have met almost none of you in other ways. All the people at Augie have made my family and me feel at home. My family consists of my wife, Julie, who just started teaching middle school; my daughter Kaylyn who is five and my two-year-old son Chance.

Since I have been here, I have focused on two things: teaching and research. Teaching has taken front row in my focus, but I've had some time to continue with my research. The teaching has been full of new challenges. Eric, Amy and Karel (he still sticks his head in every so often) have given me lots of good advice, but there's nothing like experience to teach you how to teach.

I've attempted to incorporate a lot of the strategies suggested by physics education research, specifically using the 'clickers' (radio frequency responders), and trying to get the students to solve problems together during class. The primary thing the research says, is that engaged students will learn much better. This is nice, but the hard part is figuring out how to keep the student engaged. The clickers seem to do a good job of that, but you need to come up with engaging questions. There's a lot of this aimed at first year physics, but very little for other topics we teach, so that will require some effort in the future. On this front, I attended the American Association of Physics Teachers (AAPT) New Faculty Workshop in November and got some ideas.

For research, I study particle physics; for the last 6 years I have worked on an experiment/collaboration called DØ (D-zero) at Fermi National Accelerator Laboratory (Fermilab). Since arriving at Augie, I've continued that collaboration, and even had two students work with me on projects for DØ. Lucas Kramer worked with me on a calibration project

last year as part of a senior research project, and I was able to hire Russ Averin for the summer with some money from the Augustana Research and Artist Fund. We are currently putting some polishing touches on the analysis he did and hope to publish it later this year. The analysis is a search for a new particle that no one has observed, and perhaps not even one that someone predicted. In addition to the research at DØ I have submitted a grant application to Research Corporation to continue my research on DØ.

As you probably are aware, the National Science Foundation has been investigating building a Deep Underground Science and Engineering Laboratory, and one of the sites they were considering is Homestake Mine, in Lead, SD. Recently, the NSF decided that this was the best site and for the next three years they will fund efforts to get it in shape and arrive at a realistic final price tag. I am sure the Homestake choice was helped by money the state of SD put forth to improve the conditions, and the donation T. Denny Sanford offered. This will be a very good lab for doing particle physics and I have been laying the groundwork to participate in a number of projects there. I (along with many collaborators from around the state and Lawrence Berkley National Laboratory) have a grant in to DOE to build a counting facility. We go deep underground to avoid background signals from cosmic rays, but once you are there, you are sensitive to low level contamination in the rock or even your detectors. For this reason it's good to test your detector components before you construct a detector that has too much background just from its own pieces.

It's good to be part of such a nice school and a growing physics department.

Drew

FROM AMY...

Hello, I have enjoyed teaching the introductory physics class for the life science majors at Augie for the last two years. I appreciate how Augie students do a great job of asking questions and participating in class. The course has evolved over the last couple of years. Last year we adopted a formal lab session. In addition to doing experiments during lab, we also run computer simulations and focus on problem solving. This year we will add another twist. The standard physics course for life sciences is algebra based. This was a limitation for us in a couple of ways. The first was if a student in the course fell in love with physics, they could not take any advanced courses in physics without taking the calculus based introductory course. The second was that, as you know, physics is a calculus based science. Trying to explain concepts without using the words integral or derivative is somewhat tortuous for the instructor and sometimes requires a simple derivation to become much more complicated. Thus, this year the students will have an algebra based text, but in lecture I will occasionally use calculus in some of the explanations. This will allow an interested student to take upper level physics courses without having to retake introductory physics, yet hopefully not scare the other life science majors (many of whom I have noticed don't enjoy calculus even though most have taken it).

Wishing you all success in your endeavors,

Amy

EMERITI FACULTY NOTES

A NOTE FROM KAREL VANDER LUGT

Greetings to all. I am now in my second year of retirement and enjoying it. My wife and I have traveled (to the Baltic States, Maui, Alaska, and the Caribbean) and we make regular trips to the Twin Cities to see our two grandsons ages four and six. I volunteer as a tutor at a local grade school, have become interested in digital photography, and enjoy going to Augie sporting events.

J.D. Thompson writes: Aloha, my friends. I appreciate this opportunity to be back in touch with you. I have so many wonderful memories of working with you, even of my 7:45s on Saturday mornings, eons ago. Thank you for all the good work and talks we shared. You have been the highlight of my life. And I have been blessed with good colleagues in Karel, Chet and VR. I am excited about the recent growth of the Physics Department, especially in research opportunities for the students.

My life here in Hawai'i is a busy one. I just returned from an 18-day trip around Australia, from Melbourne to Cairns to Darwin to Sydney. A major reason for the trip was to visit the Great Barrier Reef before it was dead. Unfortunately, as I snorkeled in it I had the feeling of being in a graveyard – a few reef fish but not the abundant colorful reef flora and fauna. Alarming and eye-opening.

Just a few weeks before that I had a two week tour through China, entering at Beijing and leaving through Shanghai. I saw some spectacular

sights, including the ring-neck pheasant in its native habitat. Walked on the Great Wall, saw the Terra Cotta Warriors, the karst limestone formations along the Li River, and spent three days on the Yangtze River which led to a visit to the Three Gorges Dam. An immense country, an unpredictable conflict between Communism and capitalism, and horrendous air and water pollution.

Meanwhile, I am a busy reader and gardener – palms, orchids, citrus fruits of numerous types, bananas . . . the climate here is delightful. And as I have said before, I have space for you to stay in a visit. Check my website, www.orchidvoices.com, for pictures of my place and my trips.

I love to hear from you so please send me a note at jdthomp@hawaiiantel.net.

Wishing you the best, JD

V.R. Nelson writes: This is my 11th year in retirement. After 51 years of teaching aeronautics and physics I am still inspired by the changes and innovations in the sciences. I recall teaching physics on the third floor of the administration building, and then moved to the center in the social science building brought to the campus from the airbase. It was inspiring to assist in plans for the new Gilbert Science Center. It is interesting to observe that the Gilbert Science Center, which to me is still referred to as the new Science Center is 40 years old. This building has served the campus very well. The exciting event will be the fund drive to renovate the building space for the years to come. I hope you will check out the progress on the college web site.

On a personal level, I have enjoyed relatively good health, get to the Sanford Wellness Center three times each week, and keep busy with our

three rescue dogs and garden. I remain active in the community by serving on several boards including the Good Samaritan Retirement Facilities in Sioux Falls, the United Day care center, Nordland Heritage Foundation Park on the Augie campus and the Center for Western Studies. My wife Joyce and I have enjoyed many trips both local and national.

Finally, it is always a pleasure to hear about our graduates. Do continue to keep us posted on your activities and your lives.

– V.R. Nelson.

NEWS & NOTES

• **Vander Lugt Honored:** A reception attended by colleagues, friends and family honored Karel Vander Lugt for his 37 years of service to Augustana College. Professor Vander Lugt, who earned his doctoral degree from Wayne State University, came to Augustana College in 1968 following a postdoctoral fellowship at the Naval Research Laboratory in Washington D.C.

Professor Vander Lugt taught across the physics curriculum, but was particularly fond of teaching general education courses. He developed the current astronomy course and the popular "Atoms to Stars" class, which is a qualitative introduction to physics and the history of science based upon Thomas Kuhn's book "The Nature of Scientific Revolutions." He developed and taught special courses in acoustics, chaos, and war and peace in the nuclear age.

His scholarly work included publications ranging from solid state physics to galactic halos to an analysis of how faculty salaries correspond to tuition at small private schools. He was a visiting scholar at Cornell University and the University of Arizona.

Karel served the College in many ways, including being the chair of the



Atomic, Molecular, and Optical Physics (DAMOP). The function of the DAMOP Education Committee is to organize public information sessions, promote undergraduate research, and to solicit and administer funds for support of student travel to DAMOP meetings.

Karel's last class – the computational physics class gathers for a photo following the last lecture of the 2006 spring semester.

physics department and the chair of the natural science division (1979-84). He also served on the personnel and curriculum councils, the North Central Accreditation Steering Committee, and numerous task forces, including a recent one to craft the College's vision statement.

Karel and his wife Joyce plan to remain in Sioux Falls during their retirement, at least when not traveling or enjoying their children and grandchildren.

• **Averin Speaks at Fermi:** On July 31, 2007 Augustana sophomore-to-be Russ Averin visited Fermilab where he presented the status of his summer research project to collaborators in the D0 detector di-boson physics group. Russ has been improving on an analysis first completed by Augustana Assistant Professor Drew Alton in 2006. The new analysis has a number of improvements, including the use of three times as much data. Both searches look for a hypothetical particle that decays into a pair of bosons: the Z and the photon. The analysis may be sensitive to the Higgs boson, but is intended as a model independent search for any particle that decays into a Z and a photon.

• **Committee Appointment:** Eric Wells has been appointed to the three-member Education Committee for the American Physical Society's Division of

• **Scholarship Award:** Amy Lueking, ('07) received a Rossing Physics Scholarship for the 2006-2007 academic year. Lueking was one of five students attending liberal arts colleges affiliated with the Evangelical Lutheran Church in America selected to receive the scholarship, established by Dr. Thomas D. Rossing, professor emeritus at Northern Illinois University. Selected as a first alternate, Lueking received \$5,000. Lueking graduated summa cum laude this May and is now attending medical school. She was a physics tutor and laboratory assistant. She was also a member of the Viking soccer team and was named to the North Central Conference Academic All-Conference team in 2005 and 2006.

• **Kapplinger Gives Invited Talk:** Jamie Kapplinger, ('06) from Spring Grove, Minn., was among five undergraduates invited to discuss their research at the 37th conference of the Division of Atomic, Molecular, and Optical Physics (DAMOP) May 16-20, 2006, in Knoxville, Tenn. Kapplinger joined undergraduate students from Illinois State University, Colorado School of Mines, Brigham Young University, and Auburn University

in giving presentations. Kapplinger was selected from a nationwide competition among students who have done significant research in the area of atomic, molecular, and optical physics. His work is titled, "An imaging spectrometer to probe pondermotive-gradient field-ionization." It involves designing a spectrometer that can identify ions which have been highly excited by an intense laser pulse and simultaneously determine their initial location within the focus of the laser.



Jamie Kapplinger (left) poses with Eric Wells and his undergraduate research award at DAMOP '06.

• **Particle Decays into Z + photon Unlikely:** Our current understanding of the universe includes four forces: gravity, electromagnetism, the strong force, and the weak force. Particle physics provides, through the standard model, explanations of three of these forces. The electromagnetic force is carried (propagated) by photons; the strong force is carried by gluons; and the weak force is carried by Z and W bosons. Gravity, however, has so far not been successfully incorporated into the standard model, indicating that our understanding of the fundamental forces is incomplete. New experimental results, such as the detection of new

particles not predicted by the standard model, might provide clues as to why we do not understand the gravitational force.

Augustana College Assistant Professor Drew Alton is the primary author of a 2006 article in *Physics Letters B* that places stringent new limits on one possible decay mode of several new particles. In a search for particles decaying into a Z boson and a photon, no evidence was found for particles with mass above $100 \text{ GeV}/c^2$. This result places limits on theoretical predictions that go beyond the standard model.

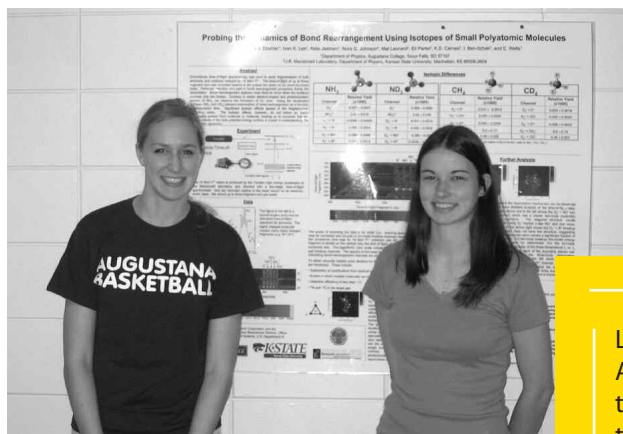
GRANT AWARD

The Augustana atomic, molecular, and optical (AMO) physics group has received a three year award from the National Science Foundation to study the mechanisms that allow molecular fragmentation to be controlled using a shaped ultrafast laser pulse. The award provides funds for equipment, supplies, undergraduate research stipends, and travel. The experiments will be carried out at the J.R. Macdonald Laboratory located at Kansas State University in collaboration with several of the researchers there.

ANOTHER YEAR, ANOTHER INVITE

For the second year in a row, work done by Augustana students in the area of atomic, molecular, and optical physics was selected for an invited talk at the annual meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP). Augustana students Laura Doshier ('07) and Amy Lueking ('07) are part of a collaboration of undergraduate students at Augustana and Kansas State University that have been studying the dissociation of small polyatomic molecules. The collaboration has been selected to give one of five

invited talks in the session devoted to undergraduate research. Eli Parke, a senior at Kansas State University, delivered the talk on behalf of the collaboration, entitled "Isotopic effects in bond rearrangement caused by sudden ionization of ammonia and methane molecules." Other schools represented in the invited session were Denison University, St. Olaf College, Union College (NY), and the University of Nebraska-Lincoln. Augustana was the only school to be represented in both 2006 and 2007.



Laura Doshier (left) and Amy Lueking in front of the poster summarizing their research work.

WE HEAR THAT...

... **William Dannehl** ('81), Vice President, North American Sales and Dealer Services for Harley-Davidson, Inc. will serve on the College's Board of Trustees.

...2002 graduate **David Baker**, now at North Carolina State, was first author of a 2006 article in *Physical Review Letters*. In the article, Baker used extended x-ray absorption fine structure (EXAFS) to study how the alloys coating your DVD-RAM disks work.

...2003 graduate **Brad Hartman** completed a B.S. and M.S. in civil engineering from Washington University in St. Louis, and is now at Schemmer Associates, Council Bluffs, Iowa. He and Nicki Berger were married in June 2006.

...**Kelsie Betsch** ('05) married Brady Steffl in July 2006. The couple resides in Charlottesville, VA.

...**Justin Schmidt** ('05) completed his B.S. in civil engineering from the University of Minnesota as part of the dual degree program.

...**Jamie Kapplinger** ('06) and his wife Kara were married shortly after graduation in the spring of 2006. Jamie and Kara live in Connecticut.

...2007 dual degree graduate **Mark Johnson** completed work on his B.S. in civil engineering at Washington University. He is employed by Fagen Engineering in Granite Falls, MN.

RECENT PHYSICS GRADUATES

- **Heather Baxter** ('07) - Music/physics major will attend seminary.
- **Mark Daly** ('07) - US Army Corps of Engineers.
- **Lucas Kramer** ('07) - Graduate student in mathematics at the Minnesota State University-Mankato.
- **Amy Lueking** ('07) - attending the Sanford School of Medicine at the University of South Dakota, received an Avera Health System Scholarship.
- **Gwen Smith** ('07) - Physicians assistant program, Mercy College, New York.
- **Will Buchanan** ('06) - Graduate student in Chemistry at Syracuse University.
- **Ashley Chipman** ('06) - Studying aerospace engineering at the University of Minnesota.
- **Mike Hulstein** ('06) - Teacher, Patrick Henry Middle School, Sioux Falls.
- **Jamie Kapplinger** ('06) - working for Cogenics Inc., a division of Clinical Data. Planning to start M.D./Ph.D. work in fall of 2008.
- **Ryan Mello** ('06) - Pursuing Ph.D. in Medical Physics at the University of Minnesota.

NEW STUDENTS

The department welcomed thirteen new majors in 2006 and nine in 2007 to replace the recent graduates. We are always looking for talented students. If you know anyone who might be interested in our program, please let us know.

Bryan Kaemingk and Daniel Black work on their paper tower during the fall 2007 physics gathering welcoming the new freshman.



CONTACT US

Please feel free to contact any of the department faculty. We would like to hear from all of you. If you happen to be in Sioux Falls, please stop by and say hello. To stay abreast of current happenings in the department,

check out the department home page, which we try to update in a timely manner.
<http://www.augie.edu/dept/phys/index.shtml>

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2007 ALUMNI FILE UPDATE

Let us know what's new in your life. New address or email? Marriage, children, degree received, change in employment, trips, awards, or anything else of note, please let us know.

Name _____

Address _____

City _____ State _____ Zip _____

Class Year _____ Date _____

Email _____

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