

# Augustana

Augustana College  
Sioux Falls, SD  
57197

## DEPARTMENT OF PHYSICS ALUMNI NEWSLETTER

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Fall 2005

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### **FROM THE DEPARTMENT CHAIR...**

Physics is alive and well at Augustana! We currently have a total of 27 declared physics majors spread over the four classes. The department offers majors in Physics, Engineering Physics and Chemical Physics and also coordinates the dual degree engineering program. In recent years, all our graduates have gone on for further study—either to graduate school or to an engineering school.

We have three physics faculty: Dr. Eric Wells, Dr. Amy Engebretson and myself. Eric joined the department two years ago when John Larkin took a position at Whitworth College in his native state. Eric attended Hastings College as an undergraduate and has his Ph.D. from Kansas State University. Before coming to Augustana he was a post-doc at the University of Virginia. He and his wife Beth have a young son, David. Eric is very involved in research and has several students working with him again this summer. His research area is atomic, molecular, and optical physics. He is doing an excellent job of making the department stronger and we are very fortunate to have him at Augustana.

Amy is our newest faculty member. She is a graduate of Carleton College and has her Ph.D. in physics from Michigan State University. She and her husband Dan, an Augie grad with a Ph.D. in chemistry, have three children and recently moved to Sioux Falls from Fargo. Amy will be teaching our algebra-based physics class. [Each year we have about 50 students

taking calculus-based physics and about 35 taking algebra-based physics].

This will be my last year of teaching. After completing a post-doc at the Naval Research Lab in Washington, D.C., I came to Augustana in 1968. At that time my colleagues were V.R. Nelson, Chet Whitney, and J.D. Thompson. Over the years this has been a great place to work. I have enjoyed teaching my classes and getting to know students has been a rich experience. All of you who graduated from Augustana with a degree in physics have gone on to make significant contributions in your careers and in your communities. We are very proud of each of you.

My wife Joyce and I plan to remain in Sioux Falls. Augustana will continue to be an important part of our lives. Our daughter Ellen is married, lives in the Twin Cities and has two sons (age 2 and 4). Being a grandparent exceeds all expectations. Our son Bill is also married and is finishing his Ph.D. in English from Indiana University. He and his wife will be in Berlin next academic year while she completes her dissertation in German studies. So, Joyce and I are anticipating a trip to Germany next spring as a retirement celebration.

Currently, the college is constructing a new fine arts building which will be attached to the present Humanities Building. The next big building project will be a renovation/addition to Gilbert Science Center. We have met several times with architects, and

specific building plans are being developed. All of us in GSC are excited about the possibilities for student research and for innovative teaching the new facility will provide.

Send me an e-mail before I retire. I would love to hear from you.

*-Karel*

### **Department Activities**

It has been a busy year outside of the classroom as well. Students and faculty participated in the annual Science Day activities, which saw nearly 300 students visit campus. This spring, a number of students & faculty volunteered as part of community service day, helping Habitat for Humanity and other non-profits around the area. The annual spring picnic was held jointly with chemistry this year, and included a spirited student-organized paper airplane throwing contest.



*Karel shows his skill with a saw on the Habitat for Humanity job site as part of community service day.*

## From Dr. Wells...

Greetings from the Physics Department! As the newest member of the department (at least for the next few weeks until Amy officially starts) I only know a few of you that will be getting this newsletter, but I look forward to meeting many more of you in the coming years. Since starting here in the fall of 2003, I have enjoyed the students and colleagues I've found here at Augie.

My focus in the two years since I have been here has mainly been in two areas. First, I have tried to bring more opportunities for undergraduate research in physics to Augustana. This has been rewarding work, as I have been blessed with several extraordinary research students. You will read more about this elsewhere in this newsletter. To some extent, progress in this area can be measured in dollars, and we have some successes to report. A small grant from the NASA/South Dakota Space Grant was used to conduct some proof-of-principle experiments that eventually secured a Research Corporation Cottrell College Science Award. This grant is supporting two students in summer 2005 and 2006, with some additional funds for travel, supplies, and equipment. In addition, we have recently learned that the National Science Foundation will fund the Northern Plains Undergraduate Research Consortium, a joint venture of the chemistry (Gary Earl is a co-PI) and physics departments at Augie along with the University of South Dakota chemistry department and five other small regional liberal arts and tribal colleges. This award is for \$2.97 million spread over five years. Besides funding initiatives that will infuse research into the curriculum earlier, this award will fund student and faculty stipends for research. It is my belief that research experience, at the undergraduate level, is essential for a well-rounded science education. While this is a start, we need to continue to grow in this direction.

The second area, which consumes most of my time, is teaching (of course). Specifically, I have been trying to implement some of the strategies that recent physics education research has shown to be effective. In the calculus based introductory physics course (which now has had 50+ students for three

straight years), this has meant using a lot of peer-instruction based techniques in lecture and generally taking an inquiry-based approach in lab sessions. We secured, from the Bush Foundation, a grant to purchase 55 radio-frequency responders and outfit the classroom accordingly. This allows me to pose questions for students to ponder in the middle of class, and gives me (and them) instant feedback. It is hard to quantify progress in this area, but for what it is worth, one measure of what the experts call "instructional gain", has steadily risen from 0.2 in 1999 to 0.5 in 2005. (For those of you in the know, those numbers are based on pre- and post-instruction performance on the Force Concept Inventory).

Continued growth in both of these areas is going to depend on the College's ability to expand its holdings of scientific equipment and update the science facility. To this end, this year I was on a committee that, in



*The physics department faculty. From left to right, Eric Wells, Amy Engebretson, and Karel Vander Lugt.*

consultation with architects, arrived at a conceptual design for an expansion/renovation of the Gilbert Science Center. The building committee took input from a number of groups, traveled to facilities at other schools, and had two on-campus workshops during the year to discuss the future of science instruction at Augie. The input we gathered, especially from our students, was

invaluable. Breaking ground is still a long time away, but the conceptual study will provide some targets for fund-raising which will soon begin.

Securing external funding for both education and research will continue to be important for the department. As many of you are aware, most of this funding comes from federal sources, and as a function of GDP, federal funding for basic research (excluding NIH) is at a historic low. If we are to continue, as a nation, to produce graduates that are competent and competitive in science and technology, this long-term trend cannot continue. So take a moment to write your congressional representatives.

Finally, it is a year of transitions here. By next year at this time I will be the senior member of a three person department instead of the junior member of a two person department. As our national search to replace Karel begins, please direct likely candidates our way. As for me, I remain thankful that Karel isn't going too far. As always, we look forward to hearing from you.

*-Eric*

## ***FROM THE EMERITI FACULTY...***

### **From Dr. Whitney...**

Dee retired from 42 years of nursing 10 years ago. She did her basic sciences at Augie in 1950-52 as a part of the SVH program for RN's. In her final several years of work she was in the SVH hospice program. She just finished 9 years as volunteer Parish Nurse in our church, leading the charge for a Caring Ministries program.

I retired from Augie 9 years ago, and am in the 10th year of serving on the Board of Trustees of Oklahoma Wesleyan University, serving as chairman of the Academic Affairs Committee. I have also done a bit of work lately for Loren Koepsell at Augie, massaging some admissions data.

We are celebrating our 50th wedding anniversary this fall.  
*Chet Whitney*

### **From Dr. Thompson...**

Aloha from Hawai'i. I have now lived on the Big Island of Hawai'i for five years, something this SD farm boy would never have imagined. But I now understand why one of my first physics students, Andy Wall, chose to take a job with an observatory in Hawai'i. When I first came here, I taught in the Physics/Astronomy Department of UH-Hilo. Now I am fully retired, enjoying gardening and taking visitors up to the 13,796 ft. Mauna Kea summit (starting at sea level in Hilo) to tour two observatories. The sunsets seen from up there are awesome. In keeping with my farm roots, I have completed all the requirements to be certified as a Master Gardener, which I put into practice on my three acres. You can see some of my flowers, house, and other Hawai'i views on my web site, [www.orchidvoices.com](http://www.orchidvoices.com). I also do lots of reading, including trying to understand string theory. I am fascinated by cosmology (It's all just physics, you know.) I took a course in Observational Astrophysics- we spent ten nights up on the summit getting images of galaxies and stars using the department's 24 inch telescope.

On Oct. 1, I will be back at Augie for my class of '55 reunion, our 50th. I hope to see some of you there in Sioux Falls. I would love to hear from you, or, better yet, to enjoy a visit by you to my place here on the Big Island. I have lots of room in my house- just let me know when you would like to visit. I live about 15 miles from Pu'u O'o, the active volcanic vent of Kilauea (applied thermodynamics and dynamics). My email address is: [jdthom@lava.net](mailto:jdthom@lava.net). The pleasure and honor of working with you at Augie are gifts to me that I treasure. I have wonderful memories of the great times that we had, and the home work, exams, lab reports, etc., that we went through together. Thank you, or, as we say here, Mahalo. I hope you are enjoying a rich life. *JD*

### **From Dr. Nelson...**

Hello to the Physics Alumni,

I retired from Augustana in 1996 having taught Physics and Aviation here for 50 years. I began my teaching career in 1946 after serving in the Navy Air Corps during WWII.

My wife, Joyce, and I are enjoying retirement and have done a considerable amount of travel including such places as Italy, Ireland, Caribbean, Venezuela, Panama Canal, and several trips to Norway, Alaska, and Mexico. We enjoyed a leisurely auto trip on the coastal Highway of California. We have decided, however, it is always nice to come back to Sioux Falls.

I currently serve on several community and College Boards which keep me connected to the real world! I have been active in the operation and docent work at the Heritage Park which is located on the Augustana Campus south of 33rd Street. The Park has a pioneer church, school, and house as well as the personal lake cabin in which Ole Rolvaag wrote "Giants in the earth". Please include this historic walk on your next trip to Sioux Falls.

Home coming this year is September 30 through October 2, complete with parade, football game, Viking Varieties and good fellowship.

In any event I do hope you can make it back to the campus sometime. I think you will be amazed at the physical changes that have been made. I am pleased to report the Augie Spirit remains. It is always nice to hear about you and your activities.

*Keep in touch,  
V.R. Nelson*



*Physics majors Kelsie Betsch (pointing, '05) and Ashley Chipman ('06) explain what works and what doesn't in a science building to a roomful of interested faculty, alumni, administrators, and architects.*

## *Recent Physics Graduates*

- **Kelsie Betsch. (2005)** - 2004 Goldwater Scholar, now a graduate student in physics at the University of Virginia.
- **Nora Johnson. (2005)** - graduate student in physics at Kansas State University, recipient of the Timothy R. Donoghue Graduate Scholarship in Physics.
- **Mark Johnson. (2005)** - dual-degree student in engineering at Washington University in St. Louis.
- **Al Shaffer. (2004)** - graduate student in physics at Rice University.
- **Justin Schmidt. (2004)** - studying engineering at University of Minnesota.
- **Sean Corum. (2003)** - graduate student in physics at University of Minnesota.
- **Brad Hartmann. (2003)** - studying civil engineering at Washington University in St. Louis as part of the dual degree program.
- **Justin Latterell. (2003)** - former aide to Senator Daschle, now attending Union Theological Seminary in New York.
- **Aaron Murra. (2003)** - studying civil engineering at University of Minnesota as part of the dual degree program.
- **Hans Arneson. (2002)** - graduate student in theology at Duke Divinity School.
- **David Baker. (2002)** - graduate student in physics at North Carolina State University.



2005 Physics graduates Nora Johnson (left, magna cum laude) and Kelsie Betsch (right, summa cum laude). Nora received the prestigious Donoghue scholarship in physics from Kansas State, and Kelsie was a 2004 Goldwater scholar.



### *A list of recent presentations made by students at off-campus conferences and events is below.*

- **Jamie Kapplinger and Eric Wells**

“An Imaging Spectrometer to Probe Pondermotive-Gradient Field-Ionization”, U. South Dakota Summer Symposium, Vermillion, SD [July 28, 2005].

- **R.N. Mello, M.E. Lundy, J.D. Kapplinger, N.G. Johnson, E. Parke, K.D. Carnes, I. Ben-Itzhak, and E. Wells,**

“Single Ionization of Hydrogen Molecules by Fast Ions as a Function of the Molecular Alignment”, U. South Dakota Summer Symposium, Vermillion, SD [July 28, 2005].

- **K.J. Betsch and E. Wells**

Applying Principal Control Analysis to Optical Pulse Shapes Optimized for Selective Fragmentation of Clusters", DAMOP 2005, Lincoln, NE [May 20, 2005].

- **Nora G. Johnson, E. Wells, K.D. Carnes, and I. Ben-Itzhak,**

Measurement of alignment dependence in single ionization of hydrogen molecules by fast protons", DAMOP 2005, Lincoln, NE [May 19, 2005].

- **Nora G. Johnson, K.D. Carnes, Heather D. Baxter, I. Ben-Itzhak, and E. Wells,** Angular Dependence of Single Ionization of Hydrogen Molecules by Proton Impact", 39th Midwest Regional Meeting of the American Chemical Society, Manhattan, KS [October 20, 2004].
- **Nora G. Johnson, K.D. Carnes, Heather D. Baxter, I. Ben-Itzhak, and E. Wells,** Isotropic Trend of Single Ionization of Hydrogen Molecules by Proton Impact", Sioux Valley ACS Section student poster session. [September 25, 2004].
- **Heather D. Baxter, Nora G. Johnson, K.D. Carnes, I. Ben-Itzhak, and E. Wells,** Kinetic Energy Release in Proton-Carbon Monoxide Collisions from 0.01-14 MeV", U. South Dakota Summer Symposium, Vermillion, SD [July 30, 2004].
- **Nora G. Johnson, K.D. Carnes, Heather D. Baxter, I. Ben-Itzhak and E. Wells,** Isotropic Trend of Single Ionization of Hydrogen Molecules by Fast Protons", U. South Dakota Summer Symposium, Vermillion, SD [July 30, 2004].

## *Department Research*

Students in the physics department have produced some significant research results recently. Nora Johnson ('05) and Heather Baxter ('06) are co-authors of a forthcoming article "Proton-Carbon Monoxide Collisions from 10 keV to 14 MeV" which will appear shortly in Physical Review A. This detailed measurement of cross sections and fragmentation branching ratios over a wide velocity range has a few interesting results for researchers interested in the upper atmospheres of Earth and moons such as Triton and Titan. This work was conducted as part of a strong and on-going collaboration between Augustana College and the J.R. Macdonald Laboratory, a Department of Energy research facility for atomic, molecular, and optical physics located at Kansas State University. In another project from that collaboration, Nora will be the lead author on a soon-to-be-submitted study that measures single ionization of hydrogen molecules by fast ions as a function of the relative angle between the projectile and the internuclear axis. This study was conducted over the past two summers by Nora and three other Augie students, Jamie Kapplinger ('06), Mike Lundy ('08), and Ryan Mello ('06).

Kelsie Betsch is co-author of a paper entitled "Closed Loop Control of Intense Laser Fragmentation of S<sub>8</sub>" recently submitted to Physical Review A. As part of her senior research project, she deconstructed laser pulse shapes optimized to selectively fragment S<sub>8</sub> clusters, finding which properties of the pulse were required and which were superfluous based on a statistical analysis technique.

Nora and Kelsie presented the results of their work at several conferences, notably the American Physical Societies annual meeting of the Division of Atomic, Molecular, and Optical Physics. They both received rave reviews for their presentations, including a nice post-conference email from a member of the National Academy of Science.

Besides those mentioned above, several other physics students are involved in research projects this summer outside of the department. Ashley Chipman ('06) was awarded an engineering-related internship at NASA's White Sands Test Facility in New Mexico. David Huebner ('08) spent his summer building a computer cluster to be used for theoretical chemistry and physics calculations. Collin Taphorn ('08) worked with Brian Moore of the chemistry department on developing object-oriented computer code for simulations of molecular dynamics. The on-campus physics research students enjoyed a close collaboration with students involved in chemistry research - including joint meetings each Friday and social events.



*Undergraduates in the Augustana-KSU collaboration in front of beamline LA15 where their apparatus is located. From left, Ryan Mello, Mike Lundy, Eli Parke (KSU, '07), Nora Johnson, and Jamie Kapplinger.*



*The entire chemistry/physics summer research crew for 2005. Front row (L-R): David Huebner, John Schniedermaier, Dr. Duane Weisshaar, and Ryan Mello. Middle row (L-R): Mike Lundy, Katie Severson, Angela Hays, Lesli Johnson, Heidi Reuter, Jessica Pauman, and Collin Taphorn. Back row (L-R): Jamie Kapplinger, Dr. Eric Wells, Dr. Jetty Duffy-Matzner, Will Buchanan, Eric Villa, Dr. Gary Earl, and Dr. Brian Moore. Not pictured: Kelsie Betsch, Michael Amolins, Brian Rekken, and Ashley Chipman.*

### **REMEMBERING WHEN...**

- The physics steak fry was a wild man (just steak on a stick) event at Gitchie Manitou Park in 1969.
- The steak and keg event moved to J.D.'s dome and property along the Sioux River. Accoutrements like silverware and baked beans were added in the 70's and 80's.
- The kegs were abandoned due to legal concerns.
- Frisbee golf became part of the event at Karel's home bordering Tuthill Park. Steak and more in the 90's.
- 2005: Joint physics/chemistry picnic at Pine Lake Hills Clubhouse.
- No steak but good food and fun.

# 2005 PHYSICS ALUMNI FILE UPDATE

## 2005 Alumni File Update

Name \_\_\_\_\_  
Date \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Class Year \_\_\_\_\_

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.

Mail or email any of us:

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## Contact Information:

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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