

Spring 2015

CrossSections, Spring 2015

University of Northern Iowa. Department of Physics.

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University of Northern Iowa. Department of Physics., "CrossSections, Spring 2015" (2015). *CrossSections*.

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CROSSSECTIONS

SPRING 2015

A MESSAGE FROM THE DEPARTMENT HEAD, DR. PAUL SHAND

DEAR UNI PHYSICS ALUMNI AND Friends, *Cross Sections* rises again! After a more than decade-long hiatus, we have reactivated our annual newsletter and there is much to communicate. I have now served as Interim Department Head for a year and half and it has been an honor and a privilege for me to do so. The death of our previous Head, Cliff Chancey was a severe blow to the Department. Since that terrible event, we have grieved, reflected and healed. With Cliff's spirit forever in our hearts, we are moving forward with renewed zeal. Since *Cross Sections* was last published, there have been many significant events that have impacted the Department; Cliff's passing is clearly the most momentous of these. The 'Timeline of Significant Events' section of this newsletter will highlight some of these noteworthy events that happened over the past decade.

To avoid repetition, I will focus this message on events and issues that will not be covered in detail elsewhere. First, we have strengthened our recruitment efforts over the

past three years. Several strategies have been implemented: mailings to prospective students; greater contact and communication with high-school teachers; faculty visits to high schools and community colleges. The new UNI president, Bill Ruud, has also made recruitment a centerpiece of his administration. UNI now hosts several Open Houses for prospective students and parents during the fall and spring semesters. The Saturday Open Houses are the main events, with hundreds of students and parents visiting the UNI campus. The Physics Department is a full participant in these events. Students expressing an interest in physics or engineering are given tours of our marvelous research and teaching labs. The tour guides are physics majors who have previously participated in research with a faculty member. We have also reached out beyond our shores to China, where our faculty member Rui He's efforts have resulted in eight Chinese students currently enrolled in our physics programs, i.e., about 12% of our majors. I hereby enlist all of you as recruiters for UNI Physics. If there

is a good prospective physics major that you know of, please contact me. I will follow up with gusto.

Next, there is a Board of Regents initiative that is currently casting a shadow over UNI. An Efficiency Study of the operations of UNI, Iowa State and the University of Iowa is currently underway. The goal of the Efficiency Study is to increase operational efficiency and reduce cost. Any savings found at a given university would be reinvested in that university. Deloitte Consulting was given a \$3.5 million contract to conduct the study and make recommendations. Other firms will be responsible for the implementation phase. Purchasing, Human Resources, Finance, IT, and Facilities have already been examined and efficiencies identified. They are now at the implementation stage. The assessment of academic operations has lagged because of problems with the first company that was given the subcontract for that task. A new subcontractor has been identified and the process will restart in Fall 2015. The general feeling is that no major

changes in academic affairs will result from the study but we remain watchful. I sincerely hope that this process will result in useful measures that will strengthen the institution.

Finally, I will use this space to express my gratitude for your generous donations that resulted in the successful launch of the C. Clifton Chancey Endowed Scholarship in Physics. Mary Pat and Michael Bolner were especially generous in their support of this initiative. The UNI Physics Department is extremely fortunate to have such wonderful supporters. I must also specially thank Jerry and Chris Intemann for the establishment of the Gerald and Chris Intemann Endowed Fund for Undergraduate Research in Physics. Undergraduate research has always been a strength of the UNI Physics Department and Jerry and Chris' gift will ensure that even more students will benefit from being able to pursue research alongside our first-rate faculty.

The state of UNI Physics is healthy, thanks in large part to your continued support. With this support, we can look forward to a bright future for UNI Physics.

Dr. Paul Shand
Professor and Interim Head of the
UNI Department of Physics



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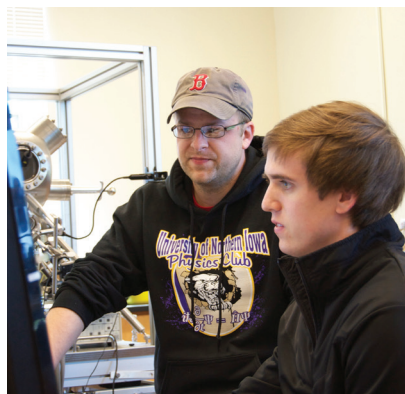
FACULTY SPOTLIGHT

ANDREW STOLLENWERK

CALL IT LUCK, CALL IT A MATTER of circumstance, or call it a fortunate chain of events, but whatever you call it, all Andrew Stollenwerk, Assistant Professor of physics, knows is it wasn't planned. "I wanted to go to Miami University of Ohio—not Florida—because all my high school friends were going. My initial interest was electrical engineering but Miami didn't have an engineering program, so I did physics instead." However, what first seemed like an act of settling for Dr. Stollenwerk became the awakening of a passion. "I ended up liking the fact that physics was a mixture of mechanical and electrical engineering, various other sciences, as well as a number of topics unique to physics. This worked out well for me, because my attention span is short, and I don't think I would be happy doing 'just' electrical engineering my whole life."

After graduating from Miami, Dr. Stollenwerk pursued and received his Ph.D. in nanoscience from the State University of New York at Albany, then completed postdoctoral work at Harvard University. "It started after I got my B.S. in physics. I didn't feel as though I knew enough physics to be worthy of this degree. So, I got my masters thinking that would boost my knowledge to an acceptable level," said Dr. Stollenwerk. "I still felt like a fraud to be called a physics major. So, I got a Ph.D. This feeling continued as I did postdoctoral work. Honestly, I wanted to teach because I thought that would be the best way."

It was in 2009 that Dr. Stollenwerk landed a job at UNI. He has taught several courses, including General Physics I and II, Physics III: Theory and Simulation and Mathematical Methods of Physics. He has conducted research in the physics of surfaces and thin-film nanostructures. He fabricates many of the samples that he studies in a thin-film growth chamber he built



with the assistance of his undergraduate research students. With his state of the art facilities and unique expertise, Dr. Stollenwerk has guided many undergraduate students in research projects at UNI. Working within a community of students and like-minded peers is the source of greatest joy for Dr. Stollenwerk, "There are brief moments," he said, "when I get the feeling that my wife doesn't share my level of excitement when I tell her, 'Jen, look what someone was able to prove using a simple Fourier integral transform.' Teaching physics majors allows me to share my enthusiasm for some of the more 'mundane' details of physics with those who actually want to learn about them."

Dr. Stollenwerk continues to do research in the areas of atomic surface science and electronic properties of low-dimensional materials. "Recently, I've started investigating materials composed of two-dimensional molecular sheets, sort of like phyllo dough. When separated, these two-dimensional sheets can have properties that differ significantly from the 'mother crystal.' Perhaps the most well known of these two-dimensional crystals is graphene, formed by peeling away a single layer of graphite. Graphene, in its purest state, is strong, light and an excellent conductor of heat and electricity. The seemingly limitless potential applications, combined with the need to understand the fundamental physics, have made graphene a superstar of condensed matter physics, making other layered materials jealous. As such, I have turned my attention toward those materials that have been overlooked, due to the graphene craze."

Dr. Stollenwerk says his students help out tremendously in his research, with just about everything. "They take data, maintain equipment, build new equipment and lab setups," he said. "Most of all, they do lots of spreadsheets and plots. Also," he added, "they are required to organize the bin of assorted bolts." A task not dissimilar to hazing, he explained.

DEPARTMENT PROFILES

MEET THE PHYSICS FACULTY



Lawrence (Larry)

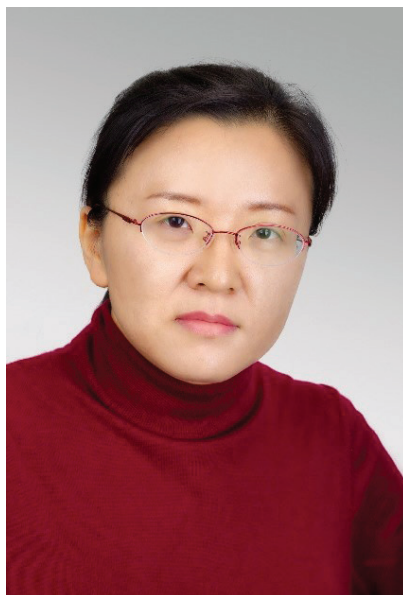
Escalada

Professor of Physics
and Science Education

For the past two years, I have been serving as the Chair of UNI Science Education, a department that includes faculty with science teaching expertise from Biology, Chemistry and Biochemistry, Earth Science, Physics, and the College of Education, and offers undergraduate and graduate degrees for science teachers.

I came to UNI in 1997 with undergraduate and graduate degrees from Kansas State University. I taught high school physics in Topeka, Kansas, and now teach undergraduate introductory physics and physical science courses, secondary science teaching methods courses, and graduate physics and physics teaching courses for teachers. Additionally, I teach a course for the Regents Alternative Pathway to Iowa Licensure (RAPIL) program.

My research involves developing high school physics curricula, including PRISMS PLUS. I facilitate numerous professional development opportunities for science teachers, including several multi-year workshops designed to train out-of-field secondary science teachers to teach high school physics. In addition to content and pedagogy training, workshop participants also have access to numerous instructional resources for teaching physics. I'm active in many outreach activities, including coordinating the State of Iowa Physics Competition for high school students and leading an after-school science club at a local elementary school.



Rui He,
Assistant Professor of Physics

I performed my undergraduate work at Fudan University in Shanghai China. I received my Ph.D. degree in Applied Physics from Columbia University in New York City in 2006.

After my graduation from Columbia, I joined the Hong Kong University of Science and Technology as a postdoc in the Physics Department and as a research assistant in the Mathematics Department. In 2009, I returned to Columbia University where I worked as a postdoctoral research scientist. I joined the Physics Department at the University of Northern Iowa in August 2011.

In addition to teaching General Physics courses, I teach Optical Science, Electrodynamics, and Thermodynamics and Statistical Mechanics. I've been active in leading departmental efforts to recruit undergraduate students from China, and I sponsor the Women in Physics Club.

My research interest is in the general area of optical studies of nanostructures, including atomic layers of graphene, topological insulator nanostructures, and low-dimensional transition metal dichalcogenides, and the heterostructures of these materials. In my research, I have demonstrated that optical emission and Raman spectroscopy are venues for materials characterization and for studies of fundamental physics and interface effects in novel nanostructures.



Tim Kidd,
Associate Professor of Physics

I performed both my undergraduate and graduate work at the University of Illinois at Urbana-Champaign, receiving a Ph.D. in Physics in 2002. I joined the Physics Department in 2005 after postdoctoral work at Brookhaven National Laboratory.

I teach general physics, nanoscience, and various electronics courses within the department, including a new Project Lead the Way electronics certification course for high school science and engineering teachers. Recently I've been involved in faculty leadership on campus, and have spent this past year chairing the UNI Faculty Senate.

My research interests include nanoscience, the electronic properties of 2D materials, and the development of new methods for forming nanostructures. I also work with students in various projects related to physical computing and electronics. Since arriving at UNI, I've supervised over 30 undergraduate research assistants, published over 30 research articles in scientific journals, and have been involved in obtaining grants totaling approximately two

million dollars. My greatest passion as a professor is giving students every opportunity to learn the real-world skills they need to succeed after graduation.



Pavel Lukashev,
Assistant Professor of Physics

I joined the Physics Department in August 2014. From 2007 to 2014, I worked as a postdoctoral research associate in the University of Nebraska at Omaha and the University of Nebraska – Lincoln. I received an M.S. and Ph.D. in Physics from the Case Western Reserve University in 2003 and 2007, respectively, as well as an M.S. in Industrial Engineering and Systems Management from the American University of Armenia in 2000. My B.S. in Physics is from the Yerevan State University in 1996. I was born in Yerevan, Armenia (former USSR), and moved to the United States in 2001. I speak three languages fluently – Armenian, English, and Russian.

My research interests are in the field of computational and theoretical condensed matter physics and materials science, in particular electronic structure calculations with emphasis on

magnetic materials and their potential applications. I use high performance computer clusters to perform simulations and analytical study of materials at the atomic level with a wide scope of academic and industrial applications. One of the specific goals of my work is to improve information storage and transfer applications by performing research in the areas of magnetic materials and nanocomposite structures. I regularly publish in peer-reviewed journals and present findings at major professional conferences. I also involve interested UNI students in my projects, providing them with a valuable research experience.



Jeff Morgan,
Associate Professor of Physics
and Physics Education

I joined the Physics Department in 2006, settling into an average geographic position after receiving a B.S. in physics from Walla Walla College in Washington and my Ph.D. from the University of Maine. In between the two degrees, I spent three years teaching high school physics in Tennessee.

My primary teaching for the past five years has been the Physics I and

II courses for majors; we've adopted the Workshop Physics curriculum, centering the in-class learning on small group experimentation and discussion, and moving lectures to recordings viewable online. It's been a lot of fun working with physics majors as they begin their studies at UNI and wrestle with physics applications of vector calculus, Gauss' law, electromagnetic induction, and other such topics for the first time. Additionally, I teach physical science and science teaching methods courses as a member of the Science Education faculty.

My research interests include student understanding of energy ideas in quantum physics courses, increasing engagement and learning in large-lecture courses, and conducting a semi-regular survey of Iowa high school physics teachers. I've had the privilege of working with Larry Escalada and other collaborators on several teacher workshops, and have looked at the connections between teacher learning in workshops and the subsequent learning of their students.



Dale Olson,
Professor of Physics

I'm on phased retirement, enjoying fall semesters with more freedom to tackle physics-related tasks that are labors of love. This spring I'm teaching General Physics II and a mini-sumo robotics course, which is preparing sixteen students to compete in the world's only robotics ship-in tournament. Last year two robots from Los Alamos pinned our ears back.

My interest in applied optics and holography continues, and I hope to do some more publishing, including more complete descriptions of what I believe to be the simplest and most efficient possible quantitative description of hologram formation and viewing, encompassing all types of holograms.

I've been doing two or three triathlons each summer, using these as motivation to keep getting through some very early morning workouts. I enjoyed attending the Iowa-Illinois joint AAPT meeting in early December, where I met alumni Andrew Morrison (chair of the Illinois AAPT) and Richard Rockrohr. Richard subsequently came to UNI and gave a presentation on the Iowa roots of

Robert Millikan. I enjoy seeing Roger Hanson in the Department on a fairly regular basis, and also see Ralph Engardt occasionally. Alumnus Paul Jones volunteered an informal talk on his exploits in Antarctica. I enjoy visits by alumni. You provide a great window to the world.



Paul Shand,
Professor of Physics and
Interim Head

I assumed the role of Interim Department Head in August 2013. Having been a faculty member since 1992, it was certainly an honor and one of the most significant milestones of my life to assume leadership of the department. Department Heads before me have overseen a dynamic unit, with faculty engaged in innovative teaching and research. Our increased emphasis on original faculty research has strengthened the already superlative environment for our undergraduate students to engage in significant and meaningful research. I have inherited a great department. It will be difficult to make it better but that is my objective.

Though much of my time is now spent on administration, I still have

been able to teach two courses per semester. I have taught the Modern Physics course for 15 consecutive years, and have enjoyed every minute. The combination of bright students and mind-bending material (do you remember encountering time dilation and probability waves for the first time?) makes for perpetual enjoyment and engagement on the part of the instructor. I have also recently taught our first completely on-line offering of General Physics I. Given the interest in and demand for online degree programs, the demand for such courses will likely increase.

I also continue my magnetic materials research. Most recently, I have investigated nanostructured rare-earth alloys in collaboration with workers at the University of Nebraska-Lincoln. The objective of the research is to ascertain the effect of preparing the alloys in nanocrystalline form on the magnetic properties. Of course, rare-earth magnets (e.g., neodymium iron boron) are very important for the production of high magnetic fields. I also work collaboratively with other members of the department to study the properties of intercalated transition-metal dichalcogenides, materials with a layered crystal structure akin to that of the wonder material graphene. Magnetic atoms have been inserted (intercalated) between the layers, which gives rise to very rich and fascinating magnetic behavior.



Andy Stollenwerk,
Assistant Professor of Physics

I received my Ph.D. in Nanoscience from SUNY Albany in 2007. I joined the Physics Department in 2009 after a two-year postdoctoral fellowship at Harvard University in the field of applied physics. To date, I've taught Physics III, Quantum Mechanics, and Mathematical Methods of Physics, in addition to several sections of General Physics I and II.

My research interests lie in the field of condensed matter physics focusing primarily on surfaces and low-dimensional material systems. Results from this research are applicable in electronic devices, sensors, and sources of alternative energy. Recently, my research efforts have centered on two-dimensional material systems similar in structure to graphene. The electrical and structural properties of these materials are studied using a variety of techniques such as scanning tunneling microscopy and ballistic electron emission microscopy.

In addition to my research activities, I have started to explore the more practical side of physics in the form of robotics. Currently, undergraduate research assistants in my lab are working

on an artificial hand controlled by the electrical impulses generated in the body and an autonomous six-legged robot. Outside of the Physics Department, I enjoy running, biking, woodworking, and building random machines and devices for the sole purpose of proving that I can.



S. M. Ali Tabei,
Assistant Professor of Physics

I did my Ph.D. work in the Quantum Matters Group at the University of Waterloo, Ontario, Canada. Through my Ph.D., I studied collective properties of disordered quantum magnetic materials. Receiving the Human Frontiers of Science Cross-Disciplinary Fellowship provided me the opportunity to join the University of Chicago as a biophysicist and collaborate with researchers at the James Franck Institute.

In 2014, I joined the small family of the UNI Physics Department. I am excited about my close interaction with undergraduates here at UNI. This semester, I've been teaching the Computational Physics course for the first time, in addition to General Physics I.

The general scope of my research is to develop theoretical models and stochastic analysis to understand the mechanisms of strongly coupled

nonlinear biological systems that are not in equilibrium. I am inspired by how spatial and temporal fluctuations lead to precise emergent properties in living systems. I have theoretically investigated a number of concrete, not disjoint, topics in the context of spatial pattern formation, intracellular transport and adaptive immunity.

Adjunct Faculty and Staff



Becky Adams,
Secretary

I have worked at the University of Northern Iowa for 28 years, and spent 25 of those years in the Physics Department. The first Department Head I served with was Roger Hanson in Fall 1990. Since then there have been a total of five with varied terms of service. There are two things in particular which have kept me in the Physics Department: the collegiality of the faculty and staff; and the students. I love to assist and interact with the physics majors. When alumni return or I read or hear about their life after UNI, it warms my heart with a certain sense of pride to have known them as an undergraduate student at UNI.



Megan Yasuda,
Instructional Lab Technician

I attended the University of Iowa and received a B.S in Physics and a B.S. in Astronomy. While an undergraduate, I worked under the lab technician and the demonstration coordinator for four years. I took the position of Lab Technician at UNI in 2004. My main job is to maintain and set up lab equipment for the undergraduate courses. I also serve as the Safety Officer for the Physics Department.



Takeshi Yasuda,
Adjunct Instructor

I started my college education at Saddle Back College in California and later transferred to California State Polytechnic University, Pomona, where I received a B.S. in physics. My graduate work was done at the University Iowa, where I received a Ph.D. in theoretical high-energy physics. My research interests are in the field of general relativity and quantum field theory, in particular black holes and cosmology. I am also interested in the applications of wavelets in quantum field theory. I have been at UNI since 2004 and taught General Physics I, General Physics II, and Conceptual Physics Lab in the past and will teach Physics in Everyday Life and Conceptual Physics next semester.

COURTNEY KEISER

“I WASN’T GOING TO BE JUST ANOTHER student,” senior Courtney Keiser said after first visiting UNI on a personal campus tour. Keiser, like many, was a community college sophomore seeking for the next step on her academic path when she came upon UNI. “I was given a tour of the [physics] department by the previous department head, Dr. Cliff Chancey,” she said. “He made me feel excited to come to UNI, as he talked about the smaller class sizes, which would enable a more personal relationship with the professors and my classmates, and all the opportunities the students could get involved in.”

Keiser transferred to UNI from North Iowa Area Community College (NIACC) in 2012 to pursue a B.S. in physics, but surprisingly physics wasn’t always what she had imagined for herself. “Originally, I wanted to be a biomedical engineer, when I was in community college,” Keiser said. “However, I took an engineering class that taught FORTRAN [a programming language], which was my first time programming.” Keiser found that she didn’t enjoy programming and turned to a friend for advice. “She asked me what I liked to study,” Keiser said, “and I told her I loved math and science, so she told me give physics a try. So, I did, and I liked it. It’s crazy thinking that her suggestion changed my life so much.”



Of Keiser’s coursework, her favorite is quantum mechanics. “I really enjoyed the challenge of the class, and the material was so interesting that I enjoyed studying and doing the homework,” she said. Her fascination with physics has also led her to get involved in extracurricular activities—she became the founding president of the Women in Physics Club at UNI.

But, as if classes and helping found a student organization weren’t enough, she has also performed a great deal of research, both here on campus and across the nation. During the school year, Keiser works alongside physics professor Dr. Rui He, doing Raman Spectroscopy of novel nanostructures. Keiser has also worked at Purdue University over a summer with Dr. Yong Chen, in his quantum matter device lab. “I’ve studied superconducting materials and fabricated twisted bilayer graphene,” she said. “I spent last summer in Chicago, working in the materials science division at

Argonne National Lab, where I studied superconducting emission of terahertz radiation.”

She has also given research presentations at Argonne National Lab in Chicago at both the 2013 and 2014 Undergraduate Research Symposium. She attended the American Physical Society (APS) March Meeting in 2014 in Denver, Colo., and gave a poster presentation on her research with Dr. Rui He on topological insulators. “It was a very educational experience,” Keiser said, “and I felt like I had grown as a physicist. I was able to network, receive constructive criticism on my presentation and learn about the physics research being done by my fellow students and by professors/physicists while exploring the conference center.”

“I also attended the 2014 National Conference for Undergraduate Research (NCUR) in Lexington, Ky,” said Keiser. There, she gave an oral presentation on twisted bilayer graphene. “That was a fun conference, at which I got to bond with other students who did research outside of physics,” she said. “I was able to attend a wide variety of talks, and I truly enjoyed my time there.” Keiser will be attending the 2015 NCUR in Spokane, Wash., where she will be giving an oral presentation on laser oxidation and the optical properties of topological insulator nanoplates.

Keiser plans to graduate in May 2015 with her B.S. in physics, with minors in math and nanoscience. After graduation, she plans to pursue a graduate degree in materials sciences and engineering.

WHAT HAS HAPPENED IN THE LAST 10 YEARS?

2004 – 2014

External Funding Success

2005

*Renovation and
Re-dedication of
Begeman Hall*

2005 – 2014

*New Faculty Faces,
Tim Kidd, Jeff Morgan,
Andrew Stollenwerk,
Rui He, Ali Tabei,
Pavel Lukashev*

2005: Renovation of Physics Building and rededication as Begeman Hall

The renovation of the Physics Building began in the fall of 2005. The rededication ceremony took place in October 2007. The building was renamed Begeman Hall in honor of Louis Begeman, the first head of the Physics Department. In addition to Begeman Hall, the Physics Department occupies an adjoining section of Lang Hall, where instructional laboratories and a machine shop are housed. Begeman Hall is connected to the adjoining sections of Lang Hall by a skywalk on the second floor. The skywalk is named for Jerry Intemann, former Physics Department Head and dean of the College of Natural Sciences.

One of the laboratories in Lang Hall is the Center for Education in Nanoscience and Nanotechnology (CENN). This facility was established and equipped with the aid of grants from the National Science Foundation and the Department of Defense. Contemporaneously, a minor in Nanoscience

and Nanotechnology was introduced. The nanoscience courses that support the minor are cross-listed as chemistry courses. The focus on nanoscience coincided with the research interests of several faculty members in the electronic, magnetic and optical properties of nanostructured materials. These faculty have been very successful in obtaining external funding for research and specialized equipment more characteristic of a research university.

2004 – 2014: External Funding Success

From 2004 through 2014 the Physics Department has been the recipient of approximately five million dollars in external grants. These grants have supported the purchase of equipment, faculty/student research, and the implementation of several professional development programs for science teachers in the State of Iowa. A partial list of the funding agencies include the National Science Foundation, Roy J. Carver Foundation, the State of Iowa Department of Education and the

American Chemical Society (Petroleum Research Fund)

2005 – 2014 New Faculty Faces:

The Physics faculty are a youthful bunch. Only Dale Olson, Paul Shand and Larry Escalada were hired before 2005. Please see the Faculty Profiles section for more information on the faculty. One-liner descriptors for the “youngsters” are given below. (Year of hire in parentheses.)

Tim Kidd (2005)

3D is good for houses but 2D is better for electrons.

Jeff Morgan (2006)

Are they learning and can we quantify it?

Andrew Stollenwerk (2009)

Just do it.

Rui He (2011)

Just measure it.

2012

*Restructuring of
Degree Programs*

2013

*Recognition for
Teacher Education
Program*

2013

*Dr. Chancey
Passes Away*

Ali Tabei (2014)

Biology is the physics of life.

Pavel Lukashev (2014)

When it comes to computing power, more is more.

2012: Restructuring of Degree Programs

Dramatic program changes occurred at UNI during spring 2012, among them the closure of Malcolm Price Laboratory School, the termination of some degree programs and the restructuring of others, including physics. In the tradition of the Physics Department, we viewed this as an opportunity to revamp our program offerings to meet the challenges of the 21st Century. Beginning in Fall 2013, our degree offerings areas were reduced to two: the Bachelor of Science in Physics and the Bachelor of Arts in Physics Teaching. We also offer minors in Physics and Nano-science. The B.S. Physics major has seven tracks to prepare students for a variety

of careers and is flexible enough to pair physics as a second major with almost any other field. In addition, we still offer the B.S. Physics/Engineering Dual-Degree which allows qualified students to pursue a B.S. in physics from UNI and a B.S. in engineering from Iowa State University (ISU) or University of Iowa (UI). This requires approximately three years of attendance at UNI followed by approximately two years at ISU or UI.

2013: Recognition for Teacher Education Program

In spring 2013 the University of Northern Iowa's physics teacher education program was cited as one of 11 outstanding programs in the nation. The Department was recognized for developing summer institutes that enable high school science teachers to earn endorsements to teach physics and for offering programs designed for teachers in small rural schools. Details can be found in the report "Transforming the Preparation of Physics Teachers: A Call

to Action," which was published by the American Physical Society with support from the Physics Teacher Education Coalition. Our teacher education efforts are led by Larry Escalada. Congrats to Larry!

2013: Chancey Passes Away

After serving as Physics Department Head and Professor since 2001, Cliff taught his last class in May 2013. In early August he was diagnosed with ALS (Lou Gehrig's disease). He passed away on October 19, 2013. The impact of Cliff's teaching, service, and research was felt by many. His memory will be carried on through the C. Clifton Chancey Endowed Scholarship in Physics to which many of you have so generously contributed.

RECENT NEWS

Begeman Lecture

The Begeman Lecture is held in the spring semester each year, typically in early April. This lecture series is made possible through the generosity of the Jourdan family. Richard Jourdan and Mary Frances Jourdan are the grandchildren of Louis Begeman, the first head of the UNI Physics Department. Begeman, under the supervision of Nobel Prize winner Robert Millikan, carried out the first accurate measurement of the charge of the electron

using water droplets. The 2015 Begeman Lecturer is Dr. Jennifer Wiseman, senior Project Scientist for the Hubble Space Telescope.

Visits by Alumni (Harken, Rychkov, Jones, Rockrohr)

The 2014-15 academic year has been a bumper one for visits and presentations by Physics alumni.

Among our speakers were Paul Jones (1962), Richard Rockrohr (1967) and Andrew Harken (1999). Another presenter was Dmitry Rychkov, who spent the 1998-99 academic year at UNI as an exchange student. Dmitry received his bachelor's and doctoral degrees from Hertzen State University in St. Petersburg, Russia. All alumni have a standing invitation to speak at a departmental colloquium. Just let us know when you would like to visit!



Dr. Jennifer Wiseman speaks at the 2015 Begeman Lecture

Alumni in Residence

Alumni in Residence Day is a university-wide initiative that was started several years ago. An alumnus or alumna is selected by a department to visit UNI during Alumni in Residence Day. A luncheon is held in honor of the Alumni in Residence. The president and other UNI dignitaries attend the luncheon. Each department plans its own activities for the alumnus, including seminars, meetings with students and faculty, campus tours, etc. The 2015 Alumnus in Residence in the Physics Department is Brad Neagle (1986).

Mini-Sumo Robotics Competition

The incorporation of Mini-Sumo robotics into the physics curriculum and outreach efforts at UNI was due to the instrumentality of alumnus Randy Dumse (1975) and faculty member Dale Olson. This led to the birth of a new Mini-Sumo robotics competition, the annual “Mini-Sumo Smackdown,” held on the UNI campus. UNI Physics students participate (as the culmination of their robotics course) as well as enthusiasts from all across the U.S. and sometimes other countries. The tenth annual Mini-Sumo Smackdown was held on April 25, 2015 in the Maucker Union.

Physics Club Honors and Women in Physics Club

Under the leadership of Darian Everding and Cassara Higgins, the UNI Physics Club has been very active over the past two years. In addition to taking trips, doing tours,

and participating in outreach events, the Physics Club hosted the Society of Physics Students (SPS) Zone 11 Meeting in April 2014. The event was a great success, with the opening speech given by UNI President Bill Ruud, and students from Iowa and neighboring states in attendance. In recognition of their outstanding performance, the UNI Chapter of the SPS (i.e., the UNI Physics Club) was given an Outstanding SPS Chapter Award for 2013 and 2014 by the SPS national office. As one recent communication from the Physics Club stated, “The Physics Club is awesome – but you already know that!”

It is also noteworthy that the UNI Women in Physics Club was formed two years ago. The driving forces behind that effort were faculty member Dr. Rui He and student Courtney Keiser, who became the first president of the WiPC. The WiPC has been very active in encouraging early participation in research among women physics majors and minors and in outreach events involving the promotion of STEM (Science, Technology, Engineering, Mathematics) careers.

Alumni Picnic

The second annual Physics Alumni Picnic was held on September 20, 2014. The picnic is scheduled to coincide with Homecoming. The day started out with rain but by the time we gathered at Seerley Park for the picnic, the sun was out. We had a great crowd and we all had a good time. Please make plans to join us at the third annual Alumni Picnic on October 17, 2015.



Alumnus Erik Wolter and future UNI Physics major at the picnic



Left to right: Roger Hanson, Chris Intemann, Jerry Intemann and Fred Behroozi at the picnic

TALKS AND EVENTS

2014 – 2015



Dr. Paul Shand introducing Dr. Dmitry Rychkov before his talk



Dr. Andrew Harken answering questions after his presentation



High school student and his mousetrap car at the Annual Physics Competition



Student Matt Cook discussing the results of his undergraduate research project



Judging a toothpick bridge at the Annual Physics Competition



Student John Danker presenting his summer research results



Dr. Ali Tabei and Alumnus in Residence Brad Neagle



Dr. Pavel Lukashev at the 2014 Holiday Colloquium



Dr. Paul Shand and Dr. Rui He with Chinese physics majors



Physics Club Members at the UNI Metal Casting Center



Dr. Paul Shand and Clark Fensterman at the 2015 Alumni Picnic



Women in Physics members



Students Josh Frost and Corey Cooling chat with their guests before the 2015 Physics Banquet



Attendees seated at the 2015 Physics Banquet

ALUMNI SPOTLIGHT

ERIC POTRATZ



ERIC POTRATZ STARTED HIS undergraduate studies at UNI in the Fall of 1999 as a B.S. Computer Science major. He subsequently added a B.A. Physics major and Mathematics minor. Eric managed to complete both majors in four years despite the scheduling complexities that resulted from overlapping courses. He graduated summa cum laude in Spring 2003.

In January 2004, Potratz moved to St. Louis where he began his career in industry at Boeing as an embedded systems software engineer. He worked on mission computer and display software for F/A-18E/F and EA-18G fighter jets. His main focus was the on-board software that managed mission data received and transmitted via the aircraft's radios. The data included navigation information that could be used with the autopilot and targeting data that could guide the aircraft's weapons.

"The coolest part of this job was the opportunities that I had to run mission computer software checkout tests in Boeing's full-dome flight simulators," says Potratz.

In December 2006, Potratz decided to move to Rockwell Collins in Cedar Rapids to be closer to his family and to get some career experience with commercial aircraft avionics. At Rockwell Collins, he developed GPS receiver avionics software for commercial aircraft. The software analyzed signals received from the orbiting GPS satellites and then calculated receiver position relative to Earth. Potratz enthuses, "Einstein's theory of special relativity had to be taken into account!" He later worked on aircraft-carrier landing guidance avionics for military aircraft.

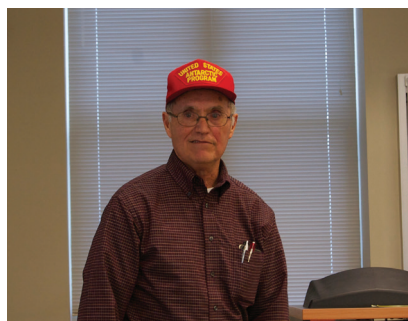
Potratz currently works as a Software Engineer at DISTek in Cedar Falls, where he moved in May 2010. "Switching to the automotive industry from the avionics industry was definitely a change," he says. At DISTek, Potratz has worked on transmission controller software and automatic-steering controller software for various tractors. "Certain data collection activities that I had to perform for the transmission controller work were comparable to undergraduate physics labs," Potratz states.

When he is not at his day job, Potratz plays the clarinet and handbells. He has been on concert tours to the United Kingdom and Ontario (Canada) as well as cities in the United States

with "Bells in Motion," a community handbell choir based in Springfield, Illinois. He also plays clarinet seasonally in the Waterloo Municipal Band.

Potratz has endured difficult patches in his personal life. Both his parents passed away in relatively quick succession (2009 and 2013), which has been an emotional strain for Potratz and his siblings. Living close to home in Cedar Falls for the past several years has helped him in bringing some closure. Though there is still sadness in his eyes, there is also a steely resolve: "I am ready to take the next step," he says.

ALUMNI NEWS



Paul Jones

Paul Jones graduated from UNI (then State College of Iowa) in 1962. He taught physics, chemistry and biology at Montezuma High School in Iowa for 36 years. Paul spent those summers engaging in various enrichment and professional development activities, including participating in the National Science Foundation's Teachers Experience in Antarctica (TEA) program. After he retired, Paul went back to Antarctica several times, where he worked at the utility plant at McMurdo Station research facility. Paul described his adventures in Antarctica in a Physics Colloquium at UNI on February 25, 2015.



Andrew Harken

Andrew Harken graduated from UNI in 1999 with a B.S. degree in

physics. Andrew subsequently received a Ph.D. in Chemical and Materials Engineering from the University of Nebraska-Lincoln. Andrew worked at Advanced Diamond Technologies, Inc. in Illinois and then moved to the Radiological Research Accelerator Facility (RARAF) at Columbia University in 2007. Andrew currently holds the position of Associate Research Scientist at RARAF. His research interests are radiation detection, microbeam technologies and materials properties. Andrew gave a talk at UNI about his work at RARAF on December 2, 2014.



Richard Rockrohr

Richard Rockrohr graduated from UNI in 1967 with a bachelor's degree in Science Teaching. He subsequently received an M.A. degree in Physics Teaching from UNI. Richard taught at Mount Vernon High School in Iowa for 11 years and then started a construction company. He remained in construction until he retired. Richard and his wife moved to Maquoketa 5 years ago and he has been active in the Jackson County Historical Society ever since. Richard visited the UNI Physics Department on January 21, 2015 and gave a presentation on the life and times of Nobel laureate in physics

Robert Millikan, who, by the way, attended Maquoketa High School.



Brad Neagle

Brad Neagle graduated from UNI with a B.S. degree in physics in 1986. After completing his Masters degree in Electrical Engineering at the University of Michigan, Brad worked for several years as a research engineer at the Environmental Research Institute of Michigan. In 1992, he left to co-found Noveltech Systems and develop the FLIPR technology. After the sale of NovelTech systems to Molecular Devices, he led the development of the second generation FLIPR in his capacity as an Associate Technical Director. In 1999, he returned to Michigan to found Essen Instruments, where he developed innovative technologies for automated electrophysiology (IonWorks) and live cell imaging (IncuCyte). Brad and Kirk Schroeder jointly received the prestigious SBS Accomplishment Award in 2000 for their work on FLIPR from the Society for Biomolecular Screening. Brad is the 2015 Alumnus in Residence at the UNI Physics Department and visited UNI on April 9, 2015, which was Alumni in Residence Day at UNI.

ANNUAL PHYSICS COMPETITION

THE PHYSICS DEPARTMENT HOSTED both the UNI/AEA 267 Regional Physics Competition and the State of Iowa Physics Competition this past spring, continuing a long history of leadership with the event. The Physics Competition (formerly called the Physics Olympics) currently consists of five competitive events testing the physics understanding and ingenuity of high school students from around the state of Iowa. Typically, over 200 students from northeast Iowa compete in the regional competition. Winners and runners-up from regional competitions around the state qualify to advance and compete in the state competition.

Events include the catapult, where students build a stationary device that launches ping pong balls at a variety

of targets; the mousetrap car, where students build a mousetrap-powered vehicle that travels closest to a specified distance; bridge building, where students attempt to maximize the ratio of force supported by to the mass of a toothpick-and-white glue bridge; the soda-straw arm, where students assemble a mass-supporting arm of soda straws and straight pins within a time limit; and the challenge problem, where teams of students use their physics knowledge to design experiments and perform analysis to determine the mass of an unknown object. Past events have included an optical slalom (guiding a laser beam through obstacles via mirrors) and a bicycle-powered water heater.

The UNI Physics Department has been hosting the regional competition

for more than 25 years, originally under the leadership of Professor Emeritus Roy Unruh. Now, Larry Escalada, Professor of Physics and Science Education, organizes the competitions (the state competition was moved to UNI in 2010) and chairs the State of Iowa Physics Competition Committee. Physics faculty, physics majors, and other UNI physics students serve alongside community volunteers as judges and scorers for the event.



Awardees at the 2015 State of Iowa Physics Competition

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ALUMNI INFO REQUEST

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University of Northern Iowa
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Cedar Falls, IA 50614-0506

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