

Department of

PHYSICS

alumni
newsletter

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NDSU NORTH DAKOTA
STATE UNIVERSITY

SEPTEMBER 7, 2016

Greetings Alumni and Friends

Our Department of Physics has always been and continues to be relatively small. And yet, with only 12 faculty we offer several undergraduate degrees (a BS in Physics and double majors with Mathematics and Computer Science), a set of five (each Spring) or six (each Fall) large-enrollment service courses, and a graduate program. We have about 45 majors and 17 graduate students. Being "small" offers advantages and disadvantages. On the one hand, we have unique opportunities for close student-faculty interactions. Every faculty member knows and interacts with the majority of our students. Also, a significant number of our undergraduates, including freshmen students, are actively involved in research projects with faculty (below, Alexander Wagner, gives a brief account of this). This results not only in valuable student experiences but also in conference presentations and publications. On the other hand, offering all our courses regularly has been challenging. Some of our undergraduate core courses, including Classical Mechanics, Electromagnetism, Thermodynamics, and the Quantum Mechanics sequence, have been on a two-year course rotation, implying that some students take, for example, Quantum Mechanics prior to Classical Mechanics. A two-year course rotation is not a good basis to design a coherent curriculum for all students. We have therefore decided to switch to a one-year rotation, starting Fall 2016, where every required course is offered every year and where every student has the opportunity to go through the same curriculum of core courses in the same order. I believe this an important step towards a consistent course sequence, where the content of one course serves as input for subsequent courses. It has not been trivial to prepare the switch. We had to consolidate some of our courses, such as merging Thermodynamics and Statistical Mechanics into a new "Thermal and Statistical Physics" course. We will soon start to see how our curriculum changes are working out. I strongly believe our students will benefit from this.

Sylvio May
Department Chair

NDSU's Newest Academic Building – The A. Glenn Hill Center

The spring term of 2016 saw the opening of the STEM Building, since renamed the A. Glenn Hill Building, east of the Memorial Union at NDSU. Since a number of decades this is the first new classroom building on the main campus. It has a multitude of flexible classroom spaces throughout its three stories. NDSU faculty had a great deal of input on the design of these classrooms, including SCALE-UP rooms such as that depicted on the following page. This flexible classroom space emphasizes student-student interactions, which have been shown repeatedly to improve student learning when compared to traditional lecture instruction.



*The new STEM building, which has just been renamed
A. Glenn Hill Center.*

You can hear more about how some of our faculty are using these classrooms in a YouTube clip that features Associate

When I was in Germany I ...

By GRADUATE STUDENT CODY GETTE

After one eight-hour flight, two trains, and lost baggage, I arrived in Bonn, Germany, ready to start my two-year Master's program studying astrophysics at the Rheinische Friedrich-Wilhelms-Universität Bonn (colloquially Uni-Bonn).



The main train station in Bonn
(Image courtesy of Cody Gette)

The Master's degree I earned was in many ways similar to studying at NDSU, where I received my Bachelor's degree. I frequently attended the library (and more frequently attended the espresso vending machine and local bakery), and attended lectures given on the same fancy triple-sliding chalkboards we have in South Engineering 221. In other ways, my experience was quite different. I studied most often with people from Serbia, Italy, Turkey, and France (one of my Serbian friends was a competitive black-belt in judo who would effortlessly throw me over his shoulder and loudly announce that we're all going for ice cream), and on sunny days (of which my parents are convinced there were none) we would stroll along the Rhine and stop at the local Biergarten for some Kölsch. My experience in Germany was one I'll never forget and I'm sure my peers and coworkers will eventually tire of my references starting with "When I was in Germany I..." (if they haven't already).

University Physics Competition

As in the previous year, two teams from the Department of Physics participated in the 6th annual University Physics Competition on November 13-15, 2015. One group – with Matt

Urich, Parker Pavlicek, and Eric Kubischta – solved Problem A "Terraforming Mars" and was ranked as Accomplished Competitor (77 teams participated). The other group – with Mitch Zubich, Joseph Roth, and Lane Morrison – solved Problem B "Golfing around a tree" and was ranked on the level of a Bronze medal (73 teams participated). Congratulations Matt, Parker, Eric, Mitch, Joseph, and Lane!

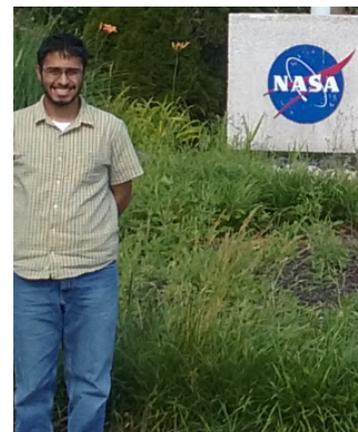
Problem A "Terraforming Mars": It has been proposed that we could begin the process of terraforming Mars by directing comets or asteroids into trajectories that will impact on the planet. The energy imparted by these bodies might warm the atmosphere of Mars sufficiently to sublimate gas frozen at the polar ice caps, thus giving Mars a thicker and warmer atmosphere. Suppose that we want to subject Mars to a series of 10 impacts that would together carry enough energy to give Mars an atmosphere which would allow pure liquid water could exist in a stable form on the Martian surface. How large would these impactors have to be and how much impulse would need to be given to each impactor in order to put it into a Mars intersecting orbit?

Problem B "Golfing Around a Tree": A golfer hits an errant shot and finds the ball directly behind a tree, 120 meters from the green. The tree is too close and too tall to hit the ball over the tree, so the golfer is forced to hit the ball either to the left or to the right of the tree. Let us model the tree as a cylinder, with its center 10.0 meters from the ball, with branches extending in all directions to give our cylinder a radius of 5.0 meters. Describe the ball/club interaction that will result in a shot that will go around the tree and end up on the green. Assume the green is circular, 10.0 meters in diameter, and the center of the green is directly behind the center of the tree, as seen from the location of the ball.

Summer Internship at NASA

By GRADUATE STUDENT VIJAY SHAH

As someone who has wanted to work at NASA for a very long time, I felt extremely excited when I got an offer for an internship in theoretical astrophysics. While I was there, I learned a lot about coding and physics, and I met people from many different places. It was challenging to learn topics that I had no prior knowledge about at a fast pace (such as two programming languages and the theory behind pulsars), but it



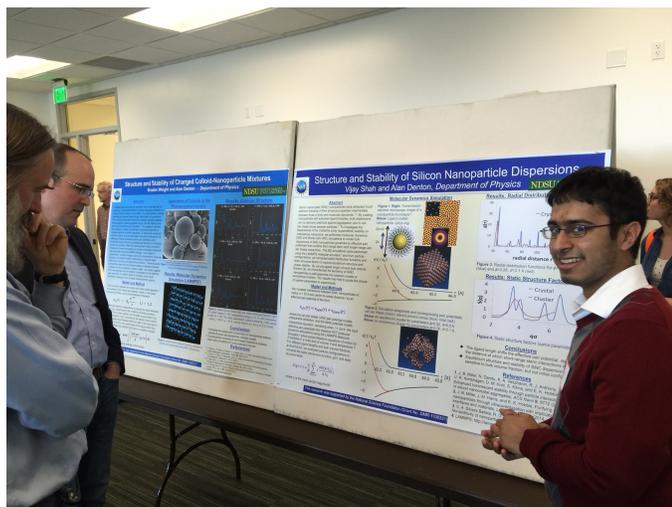
Vijay Shah at NASA

was also very fun. All of the interns presented posters on the work that they had accomplished so that others could see the different projects that were completed during the 10-week period. Overall, this internship was a great experience, and it made me even more determined to do well in my academic career. I would like to thank the North Dakota Space Grant Consortium for funding the internship.

2016 Undergraduate Physics Research Symposium

The 2016 North Dakota State University Undergraduate Physics Research Symposium took place on April 26, 2016, in the newly constructed Hill Building on NDSU's campus. The symposium kicked off with a welcome address delivered by the Dean of the College of Science and Mathematics, Scott Wood. Five undergraduates, representing Minnesota State University Moorhead, University of North Dakota and North Dakota State University, presented 15-minute talks on their original research. Associate Professor Warren Christensen, who also coordinated the event, conducted a tour of the new STEM Building for all attendees. After the tour, an additional seven students including those who gave talks, presented their research through poster presentations for all attendees. In total, nearly two dozen people were present, including faculty, undergraduates, and graduate students from local universities.

The Symposium has rotated between UND and NDSU over the past 3 years, and we hope to continue showcasing undergraduate research for years to come.



Vijay Shah, who is enrolled in the Accelerated Masters program, makes two of our Physics Faculty, Alexander Wagner and Andrew Croll, think very intensively

Graduate Program Growing

By ALAN DENTON, GRADUATE COORDINATOR

With 17 students enrolled, our graduate program is now larger than ever. Over the past two years, we admitted 5 new students (3 Ph.D., 1 M.S., and 1 Accelerated Master's). After two students graduated in the spring (Matthew Semler, Ph.D., and Alex Waters, M.S.), we admitted four new students to the Ph.D. program this fall, including our first two women doctoral students in this millenium. One of these admissions was made possible by the Dean of the Graduate School, who will generously fund a teaching assistantship, and one by Yongki Choi, whose start-up funds will support a research assistantship. Office space for new students was created just in time by last year's remodeling of the third floor of South Engineering.

The maturing of our program sparked the creation of an official Physics graduate student group. In its first year of life, "Grad Phi" has been very active, under the able leadership of President Aaron Feickert, Vice President Alex Waters, and Treasurer Tim Twohig. To supplement their departmental budget, the group secured additional funding from NDSU's Student Government. Most of this year's budget was allocated for conference travel, enabling students to attend the American Physical Society (APS) March Meeting, an American Association of Physics Teachers (AAPT) meeting, and a Gordon Research Conference. To augment the departmental seminar, the group has instituted a new seminar series, the "Grad Phi Forum", which provides graduate students a more informal venue for communicating research results. (Faculty are welcome, but not allowed to ask questions!) Our graduate students have also been active in science outreach activities, partnering with the SPS to facilitate a Science Fun Night event for K-5 students and parents at Longfellow Elementary School in November and organizing an Avenues of Scientific Discovery event for visiting high school students at NDSU in April.

In an attempt to promote diversity, our Department has become a Partnership Institution of the APS Bridge Program, which is a national effort to increase the number of physics Ph.D.s awarded to underrepresented minority students, defined as African Americans, Hispanic Americans, and Native Americans. The goals of the program are to "increase, within a decade, the fraction of physics Ph.D.s awarded to underrepresented minority students to match the fraction of physics Bachelor's degrees granted to these groups; develop, evaluate, and document sustainable model bridging experiences that improve the access to and culture of graduate education for all students, with emphasis on those underrepresented in doctoral programs in physics; and promote and disseminate successful program components to the physics community." After submitting a proposal and participating in a video conference interview, involving several of our faculty and gradu-

ate students, we were offered membership in a select group of 22 departments around the country who are committed to increasing the diversity of their graduate programs and providing mentoring for students to successfully complete Ph.D. programs. This recognition will entitle us to early access to the Bridge Program pool of applicants. Although we were unfortunately unable to offer admission to Bridge Program applicants this year, because of university-wide budget cuts, we look forward to recruiting from this pool in the future. Further information about the APS Bridge Program can be found at <http://www.apsbridgeprogram.org>.

Finally, to enhance the visibility of our program and to further promote our recruitment efforts, we updated and renewed our listing on GradSchoolShopper. This comprehensive online and print directory, a service of the American Institute of Physics, is a global network of graduate programs in the physical sciences and engineering, freely available to students worldwide, with information updated and approved annually by all participating departments. The website – the only global online graduate program network exclusively dedicated to the physical sciences – targets prospective graduate students seeking a comprehensive resource to research and discover the best graduate program for them. After renewing our profile last year, the number of applications to our graduate program doubled. Funding to continue our listing for the coming year was provided by the NDSU Graduate School through a Graduate Student Recruiting Enhancement Award. To view our updated profile, please visit <http://www.gradschoolshopper.com>.

Avenues of Scientific Discovery

By GRADUATE STUDENT AARON FEICKERT

Graduate and undergraduate students from the department participated in the second annual Avenues of Scientific Discovery event on the NDSU main campus. The event featured interactive experiment booths from a variety of departments and invited area high school students to learn about science in a hands-on way. Physics students used liquid nitrogen to show the effects of rapid cooling on flowers, paper, fruit, and the air inside a balloon and even condensed oxygen directly from the air! Participants learned the different basic circuit elements and used them to design their own electrical circuits with lights, resistors, and pushbuttons. Finally, we involved students in hands-on demonstrations of phenomena like the Meissner effect and Lenz's law. The event was a great way for physics students to showcase what makes physics exciting and relevant to the next generation of scientists by providing exciting, safe, and interactive experiments for students in the community. Stay tuned for next year's event!

Graduate Student Invited to Conference in Spain

By GRADUATE STUDENT GUILHERME VOLPE BOSSA

In addition to a solid education, the NDSU Department of Physics and the Graduate School have provided me with excellent opportunities to disseminate some of the results I obtained during my work as PhD student. In October 2015, I was invited to give a talk at an international meeting, the 4th Workshop on Biomaterials and their Interactions with Biological and Model Membranes in Salou, Spain. This was a great honor for me and an early recognition of my work with Dr. Sylvio May.

At the conference, I talked about the role of electrostatic interactions at the boundaries of membrane domains and, more importantly, interacted with leading scientists in biophysics from around the world.



The Marina at Salou, Spain

AAPT Faculty Development Workshops

Two faculty members attended separate weekend workshops organized and hosted by the American Association of Physics Teachers (AAPT) in collaboration with the American Physical Society and the American Astronomical Society in College Park, Maryland. In November, Andrei Kryjevski attended the Workshop for New Physics and Astronomy Faculty, designed to help new faculty at research and four-year institutions become more effective educators and to support their efforts to achieve tenure. This workshop presented an introduction to some of the novel teaching techniques resulting from extensive Physics education research, such as "Just-in-Time Teaching", "Think-Pair-Share (Peer Instruction)", "Interactive Engagement in Upper-Level Courses", "Tutorials in Introductory Physics" (which are already used at NDSU), and tools, such as the "Open Source Physics Project." Workshop sessions with lively discussions combined with interactions with fellow

junior faculty members from other institutions provided valuable hands-on knowledge on implementing these methods in Physics courses.

In March, Alan Denton attended the Workshop for Experienced Physics and Astronomy Faculty, designed to help tenured faculty members become more effective leaders, mentors, and educators. This workshop, with about 50 participants, focused on the best physics and astronomy teaching practices and featured presentations by national leaders, such as Eric Mazur, and several smaller group discussions. Session topics included “Interactive Engagement in Large Introductory Courses”, “Peer Instruction,” “Interactive Engagement in Upper-Level Courses,” and “Teaching for Retention and Diversity.” The broad range of sessions and energetic discussions provided a valuable refresher and practical advice on implementing evidence-based active learning methods.

Prafull worked on low temperature physics; this is one of his publications from 1973

2015 – 2016 Student Awards, Graduates, and Donors

Student Awards:

Horvik Award: Parker Gunderson and Carly Snell
Sinha Scholarship: Vijay Shah and Jacob Wieber
Physics Achievement Award: Vijay Shah and Matthew Urich
AAPT Outstanding Learning Assistant Award: Scott Jezusko
AAPT Outstanding Teaching Assistant Award: Kyle Strand
Graduate School Research Award: Guilherme Volpe Bossa

Graduates:

Joseph Roth, Matthew Urich, Jacob Wieber, Mitchell Zubich (BS Physics, Spring 2016); Jacob Sockness (BS Physics, Summer 2016); Nate Grosz, Guilherme Volpe Bossa (MS Physics, Fall 2015); Aaron Feickert, Tim Twohig, James Froberg, Alex Waters (MS Physics, Spring 2016); Matthew Semler (PhD Physics, Spring 2016)

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The Department of Physics wishes to thank all donors who have contributed to our scholarship programs. You are making a significant difference in the lives of our students.

We Welcome a New Faculty Member



Dr. Naresh Sen is the newest faculty member in the Department of Physics. He is an Assistant Professor of Practice who teaches predominantly large-enrollment physics courses. In addition, he will be involved in student advising and in the curriculum committee. Naresh received an M.S. in Physics from Rice University at Houston, Texas, and a Ph.D. in Physics from The University of Colorado at Boulder, Colorado.

Physics Alumnus Visits Department

44 years after graduating from NDSU, Prafull Doshi and his family visited our Department of Physics on May 31, 2016. Prafull came from India predominantly to meet family members living near Boston and San Francisco. We're glad he made a side trip to Fargo, stayed on campus for one day, even run into our Provost, and shared his memories about the Department of Physics and NDSU with our current faculty. Prafull spoke highly of his teachers from 1970-72, Dr. J.C.Glass, Dr. M.K.Sinha, Dr. G.Q.Hassoun, and Dr. Ross.

PHYSICAL REVIEW B

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1 MAY 1973

Low-Temperature Structure of PbTiO_3 [†]

P. Doshi, J. Glass, and M. Novotny
Department of Physics, North Dakota State University, Fargo, North Dakota 58102
(Received 19 October 1972)



Department of Physics start-of-the-semester BBQ, 08/31/2016. Our Physics building shines brightly.

Your continued financial support is requested to keep the scholarship and awards programs growing.

Donations can also be made at www.ndsualumni.com/donate. Please select "Other" from the "Designation drop-down box and type "Physics Development Fund" or the name of a particular award (see below) in the box that appears.

<p>Physics Development Fund</p> <p>Name: _____</p> <p>Enclosed is my gift of \$ _____.</p> <p><i>Please detach or copy and mail with you gift to:</i> NDSU Development Foundation 1241 N. University Dr. Fargo, ND 58102</p> <p><i>Make checks payable to:</i> NDSU Development Foundation</p> <p><i>Please designate your gift to one of the following:</i></p> <ul style="list-style-type: none"><input type="checkbox"/> Eivind Horvik Memorial Award<input type="checkbox"/> Sinha Family scholarship<input type="checkbox"/> Physics Achievement Award<input type="checkbox"/> General Purpose Donation<input type="checkbox"/> Darrell and Karen Strobel Endowment Fund	<p><i>Payment options:</i></p> <p><input type="checkbox"/> Check enclosed # _____</p> <p><input type="checkbox"/> Charge my credit card <input type="checkbox"/> Visa <input type="checkbox"/> MasterCard <input type="checkbox"/> Discover</p> <p>Name on Card: _____</p> <p>Card No.: _____</p> <p>Expiration Date: _____</p> <p>Billing Address: _____</p> <p>_____</p> <p>Phone: _____</p> <p>Signature: _____</p> <p>Thank you!</p>
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Email updates to:
patty.hartsoch@ndsu.edu

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