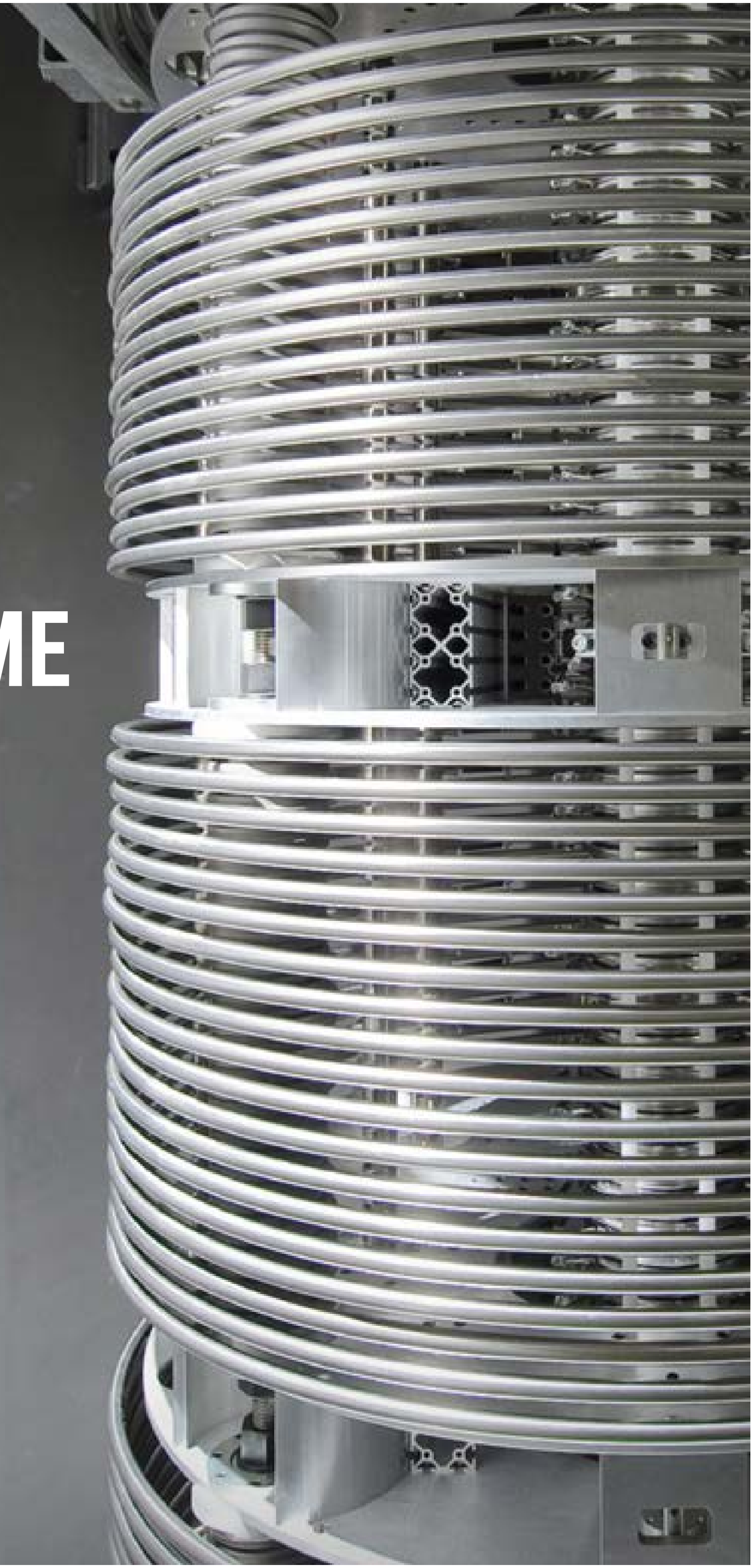
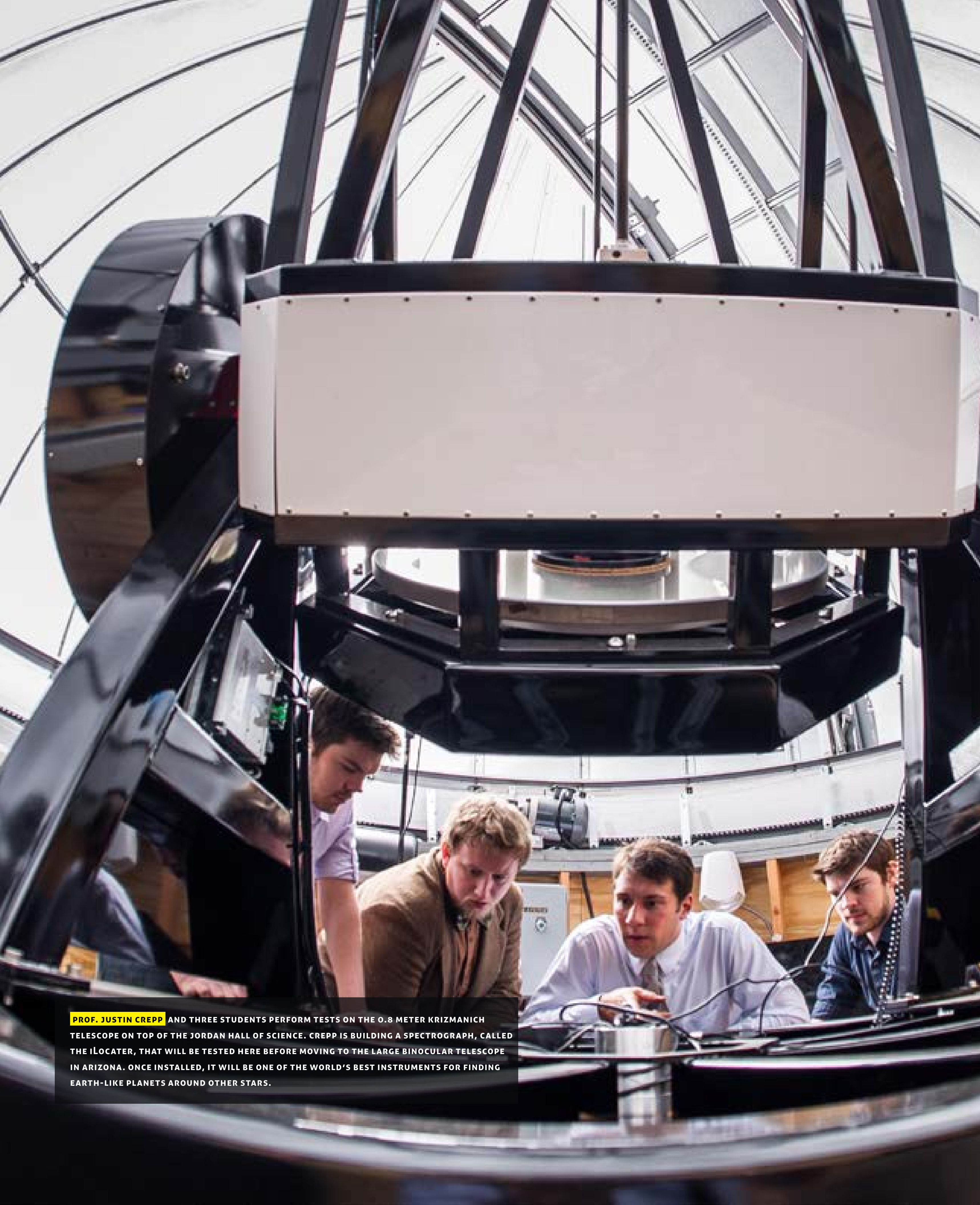
NOTRE DAME
PHYSICS

UNIVERSITY OF NOTRE DAME
College of Science



Fall 2015



PROF. JUSTIN CREPP AND THREE STUDENTS PERFORM TESTS ON THE 0.8 METER KRIZMANICH TELESCOPE ON TOP OF THE JORDAN HALL OF SCIENCE. CREPP IS BUILDING A SPECTROGRAPH, CALLED THE iLOCATER, THAT WILL BE TESTED HERE BEFORE MOVING TO THE LARGE BINOCULAR TELESCOPE IN ARIZONA. ONCE INSTALLED, IT WILL BE ONE OF THE WORLD'S BEST INSTRUMENTS FOR FINDING EARTH-LIKE PLANETS AROUND OTHER STARS.

Letter from the Chair

Over the last year, the University of Notre Dame's College of Science has been commemorating 150 years since our first science faculty began teaching at what was then a small, quiet campus in 1865. A century and a half later, there is nothing small or quiet about Notre Dame or its nationally ranked science programs.

The Notre Dame Department of Physics is in the midst of vigorous expansion, of both our faculty and infrastructure. In the last two years alone, our department added 12 faculty members. We currently have 63 regular faculty members, of whom 44 are tenured or tenure-track. These faculty members collaborate with an impressive group of 102 graduate students and 114 physics majors. With the completion of McCourtney Hall in 2016 and subsequent renovations to Nieuwland Science Hall, we will be able to expand our physical footprint to match the size of our research enterprise.

Of particular note has been the expansion of our nuclear physics program. Already a leader in nuclear research, the Nuclear Science Lab now houses 16 faculty members, making ours the third largest university-based nuclear physics program in the nation. With the addition of the 5MV accelerator in 2012, a new 3MV accelerator to be installed this year, the installation of the CASPAR accelerator one mile underground in the Black Hills of South Dakota, and a planned 18-30 MeV cyclotron to be installed on the edge of campus, the nuclear program and its faculty have never been stronger.

At the same time, our effort in astrophysics has now grown to 14 faculty, adding four faculty members in just the last three years, including Prof. Timothy Beers, former director of the Kitt Peak National Observatory. While continuing the take advantage of our partnership in the Large Binocular Telescope (LBT), the group also joined the Sloan Digital Sky Survey and is building stronger ties to our partner in Chile, the Pontifical Universidad Católica. One of our youngest "stars" in the group, Prof. Justin Crepp, is making quick progress on the iLocater project, an ultra-precise spectrometer that will be installed on the LBT, making it one of the best instruments in the world for finding Earth-like exoplanets.

These are just a few highlights of all that has been happening in the Notre Dame Department of Physics over the last year. I encourage you to learn more about the department and its activities by perusing these pages, visiting our website (physics.nd.edu), liking us on Facebook, or following us on Twitter (@NDPhysics).

Go Irish!

Christopher Kolda
Chair, Department of Physics
Glynn Family Honors Collegiate Professor
University of Notre Dame

DEPARTMENT OF PHYSICS
BY THE NUMBERS

44 FULL-TIME TENURE TRACK PROFESSORS

28 POSTDOCS & VISITING RESEARCHERS

114 Undergraduate physics majors

102 GRADUATE STUDENTS

17 Research Professors

$12 million in annual research expenditures

MORE THAN **300 ARTICLES** PUBLISHED IN 2014

U.S. News & World Report ranked the Notre Dame Department of Physics **#4** in physics international collaboration in the 2015 Global University Rankings

91 NUMBER OF SEMINARS AND COLLOQUIA GIVEN BY VISITORS DURING THE 2014-15 ACADEMIC YEAR, INCLUDING 2 NOBEL LAUREATES

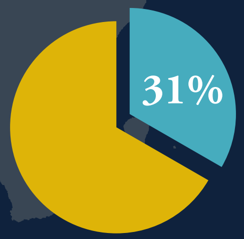
64 Number of Ph.D. graduates, 2010-2014

WOMEN IN PHYSICS

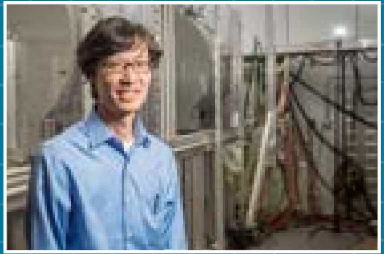
7 FULL-TIME TENURE TRACK PROFESSORS

Fewer than 15% of U.S. research universities have 5 or more women on their faculty.

31% of our graduate students are women, compared to an average of 20% nationwide.



New Faculty



Tan Ahn
Assistant Professor, Physics
- Ph.D., Physics, Stony Brook University
- Postdoctoral Associate, Yale University
- Research Associate at National Superconducting Cyclotron Laboratory, Michigan State University (MSU)

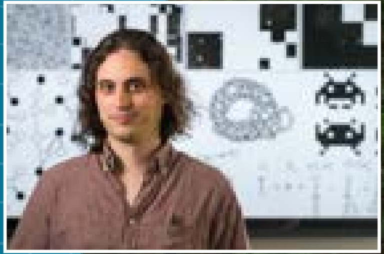
Timothy Beers
The Notre Dame Chair in Astrophysics
- Ph.D., Astronomy, Harvard University
- University Distinguished Professor, MSU, 1986-2011
- Director of the Kitt Peak National Observatory, 2011-14
- Awards: Humboldt Senior Research Award (2009), ISI Highly Cited Author (2009), Thomson Reuters' Highly Cited Researchers (2014 and 2015)

Daniela Carollo
Research Assistant Professor, Physics
- Ph.D., Astrophysics, Australian National University
- Australian Research Council Super Science Fellow, 2011-2014
- Research Astronomer, National Institute for Astrophysics, Italy, 2001-2011
- Humboldt Research Fellowship for Postdoctoral Researchers

Vinicius Placco
Research Assistant Professor, Physics
- Ph.D., Astronomy, Universidade de São Paulo
- Postdoctoral Fellow, Universidade de São Paulo
- Postdoctoral Fellow, National Optical Astronomy Observatory
- Science Fellow, Gemini Observatory

Rebecca Surman
Associate Professor, Physics
- Ph.D., Physics, University of North Carolina at Chapel Hill
- Professor, Union College, 1998-2014
- Awards: Stillman Prize for Excellence in Teaching, Union College, 2007

Anna Simon
Assistant Professor, Physics
- Ph.D., Physics, Jagiellonian University
- Research Associate, National Superconducting Cyclotron Laboratory, Michigan State University
- Postdoctoral Researcher, University of Richmond

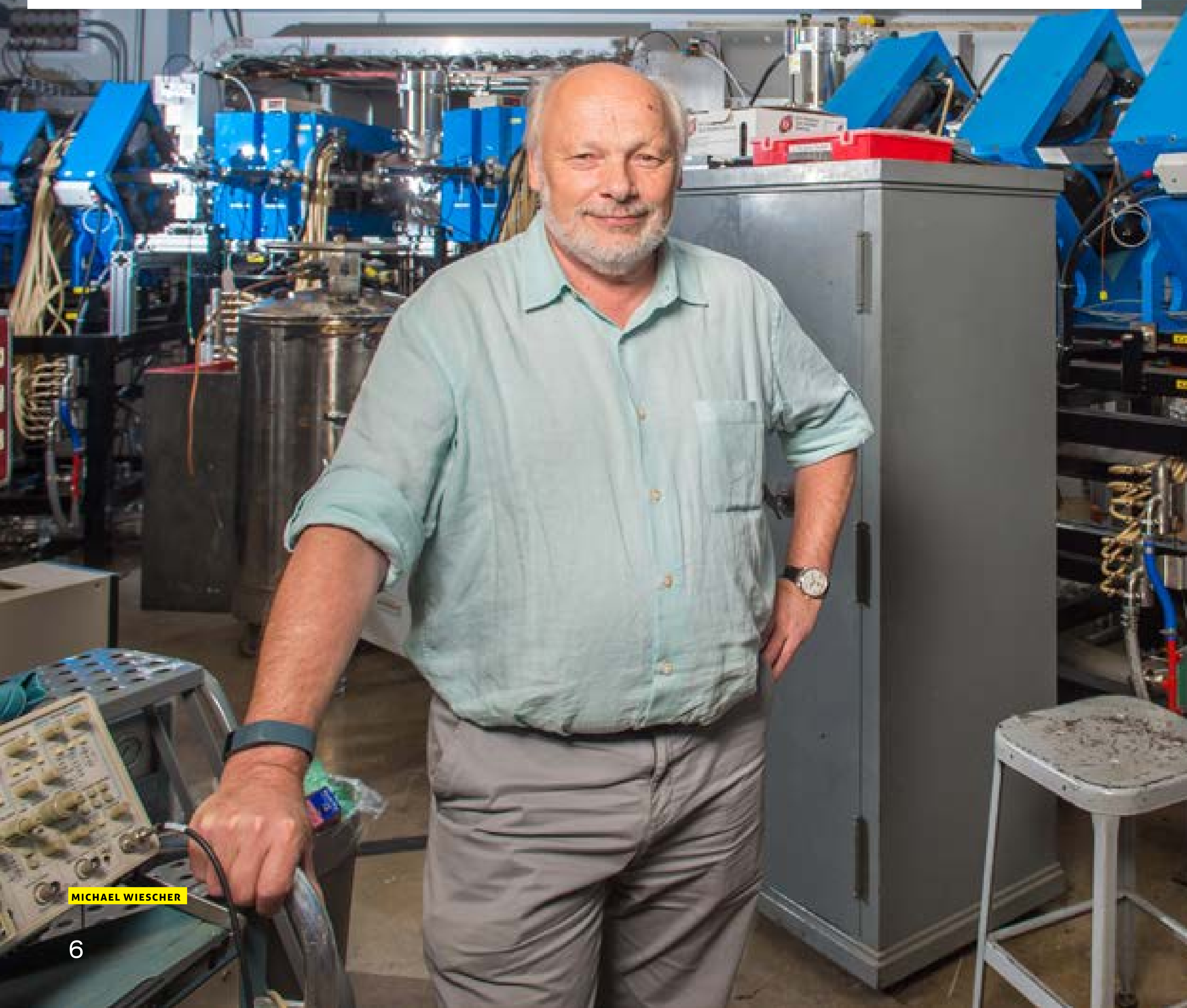


Dervis Vural
Assistant Professor, Physics
- Ph.D., Physics, University of Illinois at Urbana-Champaign
- Postdoctoral Researcher, Harvard University
- Postdoctoral Researcher, Yale University

Faculty Spotlight

Building a world-class nuclear astrophysics program

When Michael Wiescher left Germany in 1986 to join Notre Dame's faculty, he was joining a storied nuclear physics program that had its genesis with the University's first nuclear accelerator in the 1930s, a program that had played a key role in the Manhattan Project of the 1940s. But, he was also joining a program whose future was very much in doubt. Similar university-run nuclear physics labs around the country were closing, victims to rising costs and more powerful competing accelerators at national and international laboratories. Notre Dame desperately needed to change course if it wanted to avoid a similar fate. That change began when Jim Kolata developed the first low-energy radioactive beam program in the country. It culminated with Michael Wiescher and Ani Aprahamian transforming the Notre Dame facility from a traditional university-based, small-scale nuclear physics laboratory to an internationally known research entity.



MICHAEL WIESCHER

Now the Frank M. Freimann Professor of Physics and director of the Notre Dame Nuclear Science Laboratory (NSL), Wiescher saw a future in the growing interface between nuclear physics and stellar astrophysics, what is known today as nuclear astrophysics. Collaborating with theoretical astrophysicists and observational astronomers, Wiescher began a program to study the processes by which stars produce the atoms from which we are all made. For his research accomplishments he received the prestigious Hans Bethe Prize from the American Physics Society in 2003 in recognition of his leadership in the field. Wiescher's efforts culminated in the creation of the Joint Institute for Nuclear Astrophysics (JINA), a collaboration of Notre Dame, Michigan State University, the University of Chicago and Argonne National Laboratory. JINA is one of only 10 Physics Frontier Centers funded by the National Science Foundation in the nation, and Wiescher served as its director for 11 of its 12 years.

Wiescher is spearheading the construction of a new accelerator laboratory, CASPAR, one mile underground at the Sanford Underground Research Facility.

Though JINA is only one part of the Notre Dame nuclear science program, it has helped to solidify the NSL as one of the strongest university nuclear labs in the nation. The NSL is now home to nine full-time faculty, seven research faculty, and 35 graduate students. With support from the NSF and the University, it continues to break new ground in nuclear physics. The first new accelerator for low-energy nuclear physics in the United States since the 1980s was installed in 2011—a $3.5 million project that provides beams to the St. George Recoil Separator, a prototype for the next-generation Facility for Rare Isotope Beams at Michigan State University. Complementary to that, Wiescher is spearheading the construction of a new accelerator laboratory, CASPAR, one mile underground at the Sanford Underground Research Facility (the old Homestake gold mine) in the Black Hills of South Dakota. Experiments done with the CASPAR accelerator will be free of much of the background of cosmic rays that plagues the measurement of very rare nuclear processes in above-ground labs.

After nuclear physics, Wiescher's second love is history; in his leisure, he has published several books and articles on the scientific and industrial revolution in Germany. Ever mindful of the recent history of his own field, Wiescher has been working to diversify the nuclear program at Notre Dame into more applied fields. To that end, the NSL will soon be installing a new 3-MeV accelerator from Lawrence Livermore National Laboratory that will be used primarily for industrial, medical, energy science, and materials analysis applications. Not surprisingly for Wiescher, work is already underway with archeologists, anthropologists, and librarians to analyze cultural artifacts, and these efforts will expand with the new facility.

With an eye toward the future, Wiescher has dedicated his time to training the next generation of nuclear scientists. While other programs were moving toward giant shared facilities with limited beam time for single investigator experiments, Wiescher focused on leveraging and expanding on-campus resources to provide research and training opportunities for undergraduate and graduate students. The approach produces highly skilled graduates who quickly become leaders in the field. In all, Wiescher has advised 34 Notre Dame graduate students who have earned PhDs. "The students get real hands-on training," Wiescher says. "I think that's a big advantage. They immediately become group leaders at national labs, and professors at universities."

But Wiescher is also keenly aware of the long-term investment that facilities like the NSL require. "We tried to invest in the place and build it. Here, the University community has something of its own that we can be proud of, that adds to the national and international visibility of Notre Dame. University support is what provides us with the flexibility that is needed in the present highly competitive research and funding environment."

Faculty Spotlight

Discovering the secrets of the universe

When the Danish astronomer, Tycho Brahe, discovered a "new star," or stella nova, in the night sky over Europe in 1572, Western scientists had their first unequivocal evidence that the heavens were not perfect and unchanging. Unbeknownst to Tycho, that new star was actually a Type Ia supernova, a white dwarf that had pulled enough gas off a neighboring star to ignite a massive thermonuclear detonation, yielding in only a few moments as much energy as the star had previously released over its entire multi-billion-year life. Tycho never observed another such event, for supernova are rare by human standards, happening in our own galaxy only about once a century.

But, if somehow you were able to watch hundreds of thousands of galaxies, those rare events would become almost common, happening daily instead of only once per lifetime. This was the challenge that Peter Garnavich and his collaborators in the High-Z Supernovae Team undertook in the mid-1990s: harnessing the combined power of large networks of telescopes with superfast computing in order to actually watch 100,000 galaxies each night, waiting for the inevitable flickers of distant supernovae that had exploded billions of years ago in galaxies on the far side of the universe.

PETER GARNAVICH

But Garnavich wasn't watching stars explode simply for the raw spectacle, but as a technique for measuring fundamental properties of the space that lay between that distant star and us. Since the 1930s astrophysicists have understood that the universe is expanding, its galaxies flying apart with momentum imparted by the Big Bang. But it was always assumed that the expansion was slowing down over time, a victim to the indomitable pull of gravity. Instead, through the study of those distant supernovae, Garnavich and this collaborators discovered in 1998 that the expansion was actually accelerating, a result that stunned the scientific community. The leaders of the High-Z Supernovae Team shared the Nobel Prize in Physics in 2011, and Garnavich and the entire team shared this year's Breakthrough Prize, a new prize created by Sergey Brin, Yuri Milner, Mark Zuckerberg and other Silicon Valley entrepreneurs to celebrate paradigm-shifting discoveries in science and math.

"Type-Ia supernovae have the same properties in all galaxies and have a fairly uniform energy output," Garnavich explained. "By measuring the brightness of supernovae, we can estimate their distance from our galaxy, which allows us to measure how fast the universe is growing." But the discovery of an accelerating universe required physicists to reconsider their fundamental beliefs about the emptiness of space. "The acceleration of the universe is caused by what is now known as dark energy," a mysterious anti-gravity that provides roughly 68 percent of the energy in the entire universe.

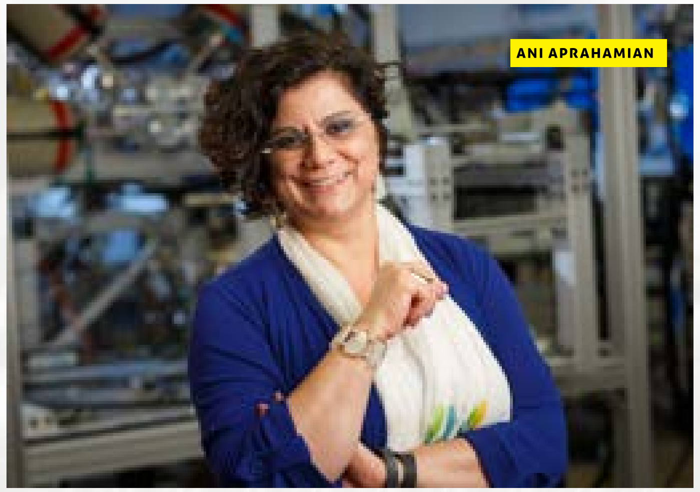
"The acceleration of the universe is caused by what is now known as dark energy..." —Peter Garnavich

Fresh off his experience overthrowing the foundations of modern cosmology, Garnavich joined Notre Dame's faculty in 2000 with the mission to build a world-class astrophysics program at a university that had no reputation for astronomy.

Today, the astrophysics group has grown to 14 faculty members, is a member of the Large Binocular Telescope and Sloan Digital Sky Survey consortia, and collaborates with astronomers across the globe. Notre Dame's reputation in astrophysics has itself undergone an explosive transformation in just 15 years.

But Garnavich still doesn't know what the dark energy is exactly. And so he continues to pursue his passion for finding supernovae, but now with the Kepler space observatory. "Typically, when we observe supernovae from Earth, we see the star long after it has exploded," Garnavich explained. "Kepler records an observation every 30 minutes. This data allows us to actually watch supernovae happening from the very beginning, without the distractions of the sun and clouds." So far, Garnavich and collaborators have discovered over 500 supernovae using Kepler's data. And given enough of those rare events, perhaps his next act will be to finally explain the dark energy that he once helped discover.

Faculty Highlights



Ani Aprahamian, the Frank M. Freimann Professor of Physics, was elected to the International Union of Pure and Applied Physics Commission on Nuclear Physics. She was also elected to chair the American Physical Society's Division of Nuclear Physics for 2014-15.

Timothy Beers, the Notre Dame Professor of Astrophysics, is part of a team that found a rare star that may help explain the origins of the universe, giving us clues about what happened just after the Big Bang. Their report, "A chemical signature of first-generation very-massive stars," appeared in the August 22, 2014 issue of the journal *Science*.

NASA selected **Justin Crepp**, the Frank M. Freimann Assistant Professor of Physics, to serve as a member of the Transiting Exoplanet Survey Satellite (TESS) science team. A space mission coordinated through MIT, Harvard, and NASA's Goddard Space Flight Center, TESS will discover thousands of exoplanets in orbit around the brightest stars in the sky. Crepp was selected based on his team's expertise with adaptive optics and their ability to use the Large Binocular Telescope to acquire follow-up observations for intriguing planetary signals that TESS will detect.

Morten Eskildsen, professor of physics, was elected as a Fellow of the American Physical Society (APS). The department now home to 15 APS fellows.

Umesh Garg, professor of physics, was selected for a five-year term as a Fulbright Specialist in Physics Education. The Fulbright Specialist program promotes linkages between U.S. scholars and professionals and their counterparts at host institutions overseas. Garg's work will take him to the Indian Institute of Technology at Gandhinagar.

Michael Hildreth, professor of physics, accepted a three-year term on the National Science Foundation Advisory Committee on Cyber-Infrastructure. The committee advises the NSF on matters related to vision and strategy regarding solutions to problems of efficiently connecting laboratories, data, computers, and people, with the goal of better enabling computational and data-enabled science and engineering.

Colin Jessop, professor of physics, has been leading efforts within the Compact Muon Solenoid (CMS) collaboration at the Large Hadron Collider (LHC) to study lepton flavor-violating decays of the Higgs boson. He and his collaborators have just published in *Physics Letters* a 2.4 standard deviation excess in these decays above the expectations of the Standard Model, using data from the first run of the LHC. Jessop played a key role in the discovery of the Higgs boson in 2012.

Using NASA's Hubble Space Telescope, **Nicolas Lehner**, research associate professor of physics, led a team of scientists in identifying an immense halo of gas surrounding the Andromeda Galaxy, the nearest major galaxy to Earth. The halo stretches about one million light-years from Andromeda, halfway to the Milky Way. The discovery will tell astronomers more about the evolution and structure of giant spiral galaxies.

Notre Dame hosted the first annual **Notre Dame Europe Symposium on Nuclear Science and Society** at the Notre Dame London Global Gateway in October 2014. The symposium attracted more than 50 scientists representing over 20 institutions across Europe. The talks focused on the applications of nuclear science in the areas of healthcare and energy. The 2015 Symposium will be held November 4-6 at the Notre Dame Rome Global Gateway in Italy with a focus on the applications of nuclear science in the areas of art, archaeology, architecture, and the environment.

Sylwia Ptasinska, the Tom and Carolyn Marquez Assistant Professor of Biophysics, was selected to serve a three-year term on the editorial board of the *European Physical Journal D: Atomic, Molecular, Optical, and Plasma Physics*.

In a paper published in *Physical Review Letters* in April 2015, **Zoltán Toroczkai** and collaborators have solved the degeneracy problem in network theory that prevented researchers from uniquely solving complex systems using maximum entropy methods. The problem had remained unsolved for 30 years.

Mitchell Wayne and the high energy physics experimental research group received $4.3 million from the NSF to support work on the Phase 1 upgrade of the CMS detector at the Large Hadron Collider at CERN. Under Wayne's direction, Notre Dame is responsible for two important parts of the overall upgrade project, both involving the Hadronic Calorimeter (HCAL). All of the photo detectors in the HCAL will be replaced with approximately 16,000 silicon photomultipliers, an exciting new technology for photon detection. Notre Dame personnel based at CERN will complete this upgrade.

Technologies in the Classroom

New technologies enhance physics classrooms

MARGARET DOBROWOLSKA-FURDYNA, PROFESSOR OF PHYSICS AND ASSOCIATE DEAN FOR UNDERGRADUATE STUDIES, PREPARES A VIDEO RECORDED DEMONSTRATION AT THE LIGHTBOARD.

Inspired teaching, delivered by dedicated and research-active faculty, has been, and remains today, one of the keys to the success of Notre Dame's undergraduate program. At the same time, the recipe for success in the classroom is constantly changing. In particular, new technology can greatly benefit the classroom experience, adding to the undergraduate experience in ways undreamt by previous generations of Notre Dame faculty. Here, we consider just three of the technologies that are playing large roles in our classrooms today.

The College of Science at Notre Dame has introduced a new teaching tool, the Lightboard, that inspires faculty to "flip" their classrooms and optimize class time by creating instructional videos that students can watch on their own time. The technology enables faculty to create tutorials for solving difficult problems, detailed explanations for complex topics, and pre-laboratory lectures.

The Lightboard utilizes an LED-illuminated glass board which allows faculty to face the student viewer and write highly visible notes, drawings, formulas, and equations to produce high-quality, web-ready short videos. The Lightboard also can display PowerPoint or Keynote slides that can be annotated.

MICHAEL HILDRETH, PROFESSOR OF PHYSICS, TEACHES MATH IN SPORTS USING VIDEO FOOTAGE FROM NOTRE DAME ATHLETICS.

Notre Dame faculty have implemented several strategies to take advantage of the technology. Tan Ahn, assistant professor of physics, used the Lightboard several times during spring 2015 for his Concepts of Energy and Environment course. "I used it to record myself solving problems for the course that I did not have time to go over in class," he said. "Overall, I liked using it, as it was a way to supplement class time. Also, it is quite accessible, as the videos can be watched anytime and anywhere you have Internet access."

Notre Dame has joined the EdX consortium, founded by Harvard, MIT, UC Berkeley, and others, with the goal of offering online learning that is distinctly Notre Dame. Math in Sports, one of five inaugural online courses, explores how mathematics and basic physics can explain various athletic phenomena and strategies. Co-taught by Michael Hildreth, each module focuses on a sports question, such as, "Is the 'Hot Hand' real?" or "How do you set a world record in the long jump?" Basic statistics, probability, game theory, and various physics concepts are introduced in order to explore each question more deeply.

The course makes extensive use of Lightboard technology to present content and work out sample problems. Course materials were developed in close collaboration with the Department of Athletics. Notre Dame varsity athletes provided extensive video footage, data, and examples for the modules to be shown alongside vintage and current Notre Dame athletic video footage. Physics demonstrations were also filmed and annotated with animations for the course, which are accessible to all physics faculty.

Notre Dame is one of the few institutions in the United States with its own Digital Visualization Theater (DVT). The DVT enables instructors to immerse up to 136 students at a time in high-resolution, high-fidelity images projected onto a 50-foot-diameter dome. The instructional content is infinitely customizable, and Notre Dame has created teaching materials for subjects including physics, biochemistry, anatomy, philosophy, and engineering. The DVT provides real-time rendering of custom content like the action of the enzymes, anatomical structure from scans of cadavers, and the structure of diamond and other crystals. With a skilled operator behind the console and these real-time data, an instructor can respond immediately to questions, keeping the lecture interactive and engaging.

The DVT enhances courses across the curriculum. General astronomy students learn the motion of the planets and stars by personally tracking their positions collecting "years" worth of data in one class day. The exploration of the solar system becomes a personal experience as they fly with space probes through the solar system to learn their discoveries. Physics and aerospace engineering students see beautiful examples of communications satellites and the paths of Cassini, Maven, Messenger, and New Horizons space probes as they study the mathematics that guides bodies through space. After seeing the structure of the enzyme chymotryposin, chemistry and biochemistry students see 3D animations of the amide hydrolysis with and without enzyme, to see how the presence of the enzyme changes the energetics of the reaction.

Students also have an opportunity to create their own informational content for the dome in a Motion Design course, exploring the unique design challenges that the dome provides. One of their first projects was to create a fly-through of the Large Hadron Collider and the CMS detector, allowing students to visualize the creation and detection of a Higgs boson at every step in the process.

KEITH DAVIS TEACHES IN THE DIGITAL VISUALIZATION THEATER.

Student Achievements and Awards

Notre Dame physics students are an active and accomplished group. The 102 graduate students and 114 declared physics majors author publications, give presentations at conferences across the world, attend prestigious summer schools, and participate in important experiments in labs across the globe.

Graduate student **Anthony Ruth** received a 2015 NASA Space Technology Research Fellowship for the project, "Hybrid Van Der Waals Materials in Next-Generation Electronics." Advised by Boldizsar Janko, professor of physics, Ruth's research was inspired by recent developments in the field of two-dimensional materials. Using density functional theory methods, he hopes to determine what happens when single atomic layers are stacked onto each other. Such layered structures are expected to form stable materials called Van Der Waals solids, which provide a wide range of materials that have great potential to be incorporated in novel catalytic, opto-electronic devices and detectors operating under extreme conditions typical of NASA missions.

Annie Stephenson earned a National Science Foundation Graduate Research Fellowship in 2015. As an undergraduate researcher in the laboratory of Kenjiro Gomes, the Frank M. Freimann Assistant Professor of Physics, Stephenson's research focused on creating artificially engineered electronic systems that are not possible in nature. Tailoring the physics of two-dimensional electronic systems enables the creation of novel quantum devices that could eventually lead to advances in energy and technology. Stephenson earned a Bachelor of Science in Physics in 2015 and now attends graduate school at Harvard University.

Graduate student **Stephen Kuhn** received a U.S. Department of Energy (DOE) Office of Science Graduate Student Research Award for his research project, "SANS Studies of the Vortex Lattice in Unconventional Superconductors." Kuhn is advised by Morten Eskildsen and will collaborate with DOE laboratory scientist Ken Littrell, Ph.D. at Oak Ridge National Laboratory in Tennessee to complete his project.

Anna McCoy also received a 2015 DOE Office of Science Graduate Student Research Award for her project, "Enabling nuclear symplectic calculations at large scale." McCoy is advised by Mark Caprio, associate professor of physics, and will complete her project at Lawrence Berkeley National Laboratory.

Graduate students **Matthias Wolf** and **Anna Woodward**, advised by Michael Hildreth and Kevin Lannon respectively, received a 2015 Notre Dame Center for Research Computing Award for Computational Science and Visualization. They wrote a software package to enable high energy physicists on the CMS experiment to make use of a broader set of computing resources than they can usually access.

Graduate student **Aparna Bhattacharya** also received an award from the Center for Research Computing at Notre Dame. Advised by David Bennett, research professor of physics, Bhattacharya measures exoplanet system properties from Hubble Space Telescope images using microlensing methods.

Darshana Patel earned the department's 2015 Graduate Student Research and Dissertation Award in recognition of producing the best thesis of the year. Patel's thesis, "Study of Isoscaral Giant Monopole Resonance to Explore the Role of Symmetry Energy in Nuclear Incompressibility in the Open-Shell Nuclei and its Future Prospects," was also recognized by Springer Theses as the "best of the best." She was advised by Umesh Garg, professor of physics.

This 3D-printed scale model (1:100) of the CMS detector at the Large Hadron Collider was produced by Notre Dame guest professor and Fermilab senior physicist Don Lincoln. Notre Dame's CMS group includes seven faculty members and has played key roles in the discovery of the Higgs boson and the ongoing search for physics beyond the Standard Model, including supersymmetry and extra dimensions. This model will be used as a teaching aid for the QuarkNet program, which was founded by Notre Dame and Fermilab in 1999 and now works with more than 570 high school physics teachers nationwide.

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College of Science

Department of Physics
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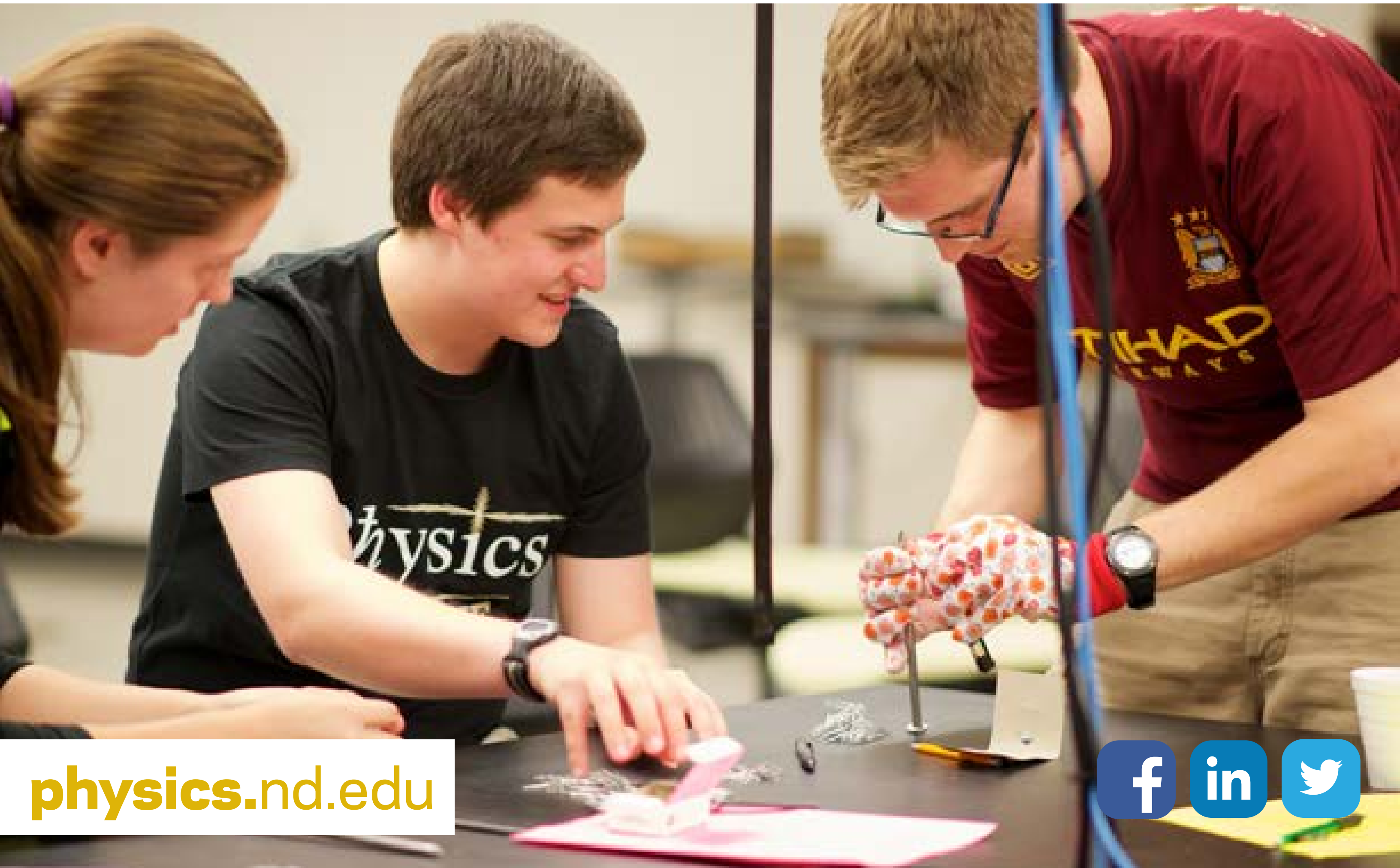
Notre Dame physics REU celebrates thirty years

Students from the University of Notre Dame, Michigan State University, and Purdue University participate in the 2015 Research Experience for Undergraduates (REU) Physics Olympics in the Jordan Hall of Science. Celebrating 30 years of immersing undergraduates in front-line research, Notre Dame's REU program is one of the largest, oldest and most diverse in the nation. Notre Dame receives 250 applications each year for 22 NSF-funded slots.



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