

Department of

# PHYSICS

alumni  
newsletter

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**NDSU** NORTH DAKOTA  
STATE UNIVERSITY

NOVEMBER 4, 2021

## Greetings Alumni and Friends



The translation of *Black Hole* into German is *Schwarzes Loch*. This summer I had an opportunity to visit a Black Hole located in a small mountain range, the Zittau Mountains in Saxony, Germany. Like all physicists who teach 100-level intro courses, I had always wanted to be close to a Black Hole, maybe feel some of the tidal forces or use the time delay as an excuse for missing my next dentist appointment. But

The “Black Hole” 1600-1915 was this rock wall really a reference to a Black Hole? Maybe not. I learned that this place had been used for quarrying of sandstone to produce millstones and that the years on the plate just specify the time range when sandstone was quarried here. But I’m still intrigued by the years 1600-1915. In 1600, Tycho Brahe, Johannes Kepler, and Galileo Galilei were just about to introduce methods of scientific discovery into the field of astronomy. One of the most singular events, the burning for heresy of Giordano Bruno, took place in Rome on February 17, 1600. Bruno was a visionary, the first to propose that the stars were distant suns surrounded by their own planets. In 1915 Albert Einstein introduced general relativity, and in the same year Karl Schwarzschild derived the first exact solution to the Einstein field equations. This Schwarzschild solution predicted an event horizon – the radius of a black hole. So, 1600-1915 may be looked at as a 315-year-long process that gave birth to the idea of a Black Hole in the human mind. I find it remarkable that the plate “Schwarzes Loch 1600-1915,” which just marks the time of quarrying activity also makes a refer-

ence, likely an unintended one, to one of the most interesting structures in our Universe – the black hole.

The last year was still dominated by the pandemic, and that was challenging and demanding. Everyone, staff and faculty alike, have worked many extra hours, scheduled zoom meetings late in the evening, and used what was left to do or support research. What keeps us going is our students: physics majors, graduate students, and the many students we teach in our service courses. I’m thankful to everyone who contributed to getting us through the last year. This includes support from our Dean, Dr. Kimberly Wallin, which has enabled our department to purchase iPads and offer them to our graduate students and physics majors to be used. Fortunately, this fall semester we have been able to go back to in-person teaching (with all necessary precautions including mask wearing). We also had four new graduate students join our graduate program – one of them making it to Fargo from Nepal and one other from Bangladesh. Also, two of our faculty were promoted: Dr. Andrei Kryjevski to Associate Professor and Dr. John Buncher to Associate Professor of Practice. I’m optimistic that our activities will further normalize, allowing us to carry out research with students, invite seminar speakers, attend conferences in person, and start to do outreach activities again. As always, I am hoping that you, dear reader, are doing well, stay healthy and support your loved ones.

Sylvio May,  
Department Chair

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## Orv Swenson’s 50th Anniversary

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This newsletter is the perfect platform to celebrate Orv Swenson’s 50th Anniversary of receiving his M.S. degree in Physics from NDSU. The title of his thesis is “A Field Emission Study of Silicon on Tungsten”; see [https://www.ndsu.edu/physics/graduate\\_studies\\_and\\_research/graduate\\_program/recent\\_graduate\\_theses/](https://www.ndsu.edu/physics/graduate_studies_and_research/graduate_program/recent_graduate_theses/).

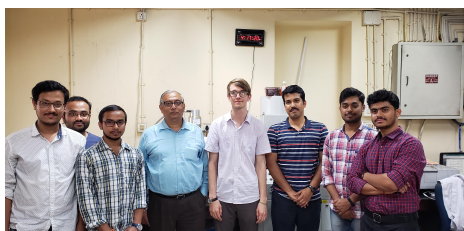
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## Fulbright Studies in India

By REED PETERSEN

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This past year, I received a Fulbright grant to collaborate with Dr. Amlan Pal in nanocrystal device research in Kolkata, India. I spent the first three months of the grant learning the local language, Bangla, and doing cultural enrichment activities. I spent the remaining four months of the grant in the lab of Dr. Pal.



Reed with Dr. Pal and his research group  
ing there for a few short months gave me a better perspective on what research can look like internationally. Since my prior research experience had all been with the NDSU physics department, it was eye-opening to note the differences in leadership style, lab procedures, and emphases. I also enjoyed connecting with my fellow research associates, who had different educational and cultural backgrounds than me. We enjoyed playing table tennis and drinking tea together.

My time in the research lab was spent making hybrid silicon nanocrystal-layered perovskite thin film LED devices. Such devices would utilize the advantages of the excellent inter-plane conductivity of layered perovskites and the exceptional photoluminescence properties of silicon nanocrystals if proper loading could be achieved. However, after four months of research in the lab, the COVID-19 pandemic started and I was forced to return to the USA five months early.



Reed with friends just before a cricket match between the Indian national team and the Bangladesh national team

Despite this abrupt departure, my experiences in India increased my knowledge of the field and motivated my research

at NDSU. It also provided a well-rounded context for my master's thesis, which I completed in Spring 2021 under the guidance of Professor Erik Hobbie. I am thankful for the opportunity I had with the Fulbright program and grateful for those who helped me along the way.

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## Faculty Member Featured in Physics Today

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### Intuitive or rational? Students and experts need to be both

Mila Kryjevskaja, Paula R. L. Heron, and Andrew F. Heckler

Research into dual-process theories of reasoning from cognitive psychology suggests ways to improve classroom instruction in physics.

The research of our faculty member Mila Kryjevskaja is featured in the August 2021 issue of Physics Today magazine. She is one of the authors of the feature story, "Intuitive or Rational? Students and Experts Need to Be Both." Mila wrote the article with Paula Heron, professor of physics at the University of Washington, Seattle, and Andrew Heckler, professor of physics at Ohio State University, Columbus. The authors' research into dual-process theories of reasoning from cognitive psychology suggests using both intuitive and rational approaches may improve classroom instruction in physics. "Rather than learn to reflexively discount their intuitions, students should be taught that intuition and formal knowledge are both important and can — and often do — interact fruitfully," the authors said. "Instruction that makes the dual nature of thinking explicit and visible to students may affect teaching in ways that extend beyond improvements in student performance." The authors said it also may "help bolster students' sense of self-worth and belonging in physics."

Mila is the Meier Junior Professor for the College of Science and Mathematics. She received NDSU's Peltier Award for Teaching Innovation in 2019 and the 2003 Outstanding Teaching Assistant Award from the American Association of Physics Teachers.

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## Success again at University Physics Competition

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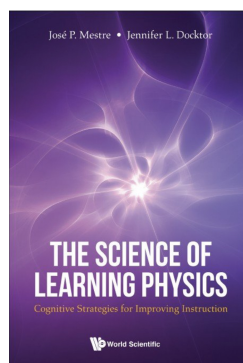
Two teams from our Physics Department participated at the 2020 University Physics Competition, an international contest



for undergraduate students, who work at their home colleges and universities all over the world analyzing a real-world scenario using the principles of physics, and writing a formal paper describing their work; see <http://www.uphysicsc.com/>. A total of 346 papers were submitted to the 2022 University Physics Competition; 6 teams (1.7%) were ranked as Gold Medal Winners, 54 teams (15%) were ranked as Silver Medal Winners, 99 teams (29%) were ranked as Bronze Medal Winners.

One of our two NDSU teams, with Jose Agudelo, Jessica Tsao, and Jacob Lundstrom, won a bronze medal. They solved Problem A “Ion Thrusters to Saturn.” The other team, with Kyle Nietfeld, Michael Noah, and Ibrahim Bukhari, won a silver medal. They solved Problem B “Quadcopter Stability in Wind.” Both medals are major accomplishments, and all six students deserve our recognition and congratulations.

## *Alumna Jennifer Docktor Co-authors Book*



José P. Mestre and Jennifer Docktor have authored the World Scientific book “The Science of Learning Physics: Cognitive Strategies for Improving Instruction.” The main subject discussed in the book is how evidence from education research can be used to inform physics teaching and learning. Jennifer is an alumna of our department, receiving her Bachelor of Science degree in Physics and Physics Education from North Dakota State University in 2004.

She is a faculty member in the Physics Department at the University of Wisconsin-La Crosse. Her research in Physics Education focuses on cognitive science and problem solving.

## *Avenues of Scientific Discovery*

Due to the COVID-19 pandemic, NDSU’s annual graduate student run high school event “Avenues of Scientific Discovery” offered presentations to high school students virtually, through recorded videos. Our graduate student organization, Grad Phi, produced an award-winning video on light pollution, discussing how to measure and document light pollution for scientific purposes. The video is available at <https://youtube.com/watch?v=rESF4WpxHIU&feature=share>. The image above shows five of the seven physics graduate students (Brianna Santangelo, Lina Alhalhooly, Safana Ismael, Wathsala Jayawardna, Nekeisha Johnson, Tim Twohig and Kurt VanDonselaar) when they recorded the video during one of our chilly winter nights in Fargo.



*Video producers Kurt, Brianna, Nekeisha, Tim, and Lina*

## *Seminar and Visit of Alumnus Ping He*

Among the highlights earlier this year were a seminar and a visit by our alumnus, Ping He, in our department. Ping’s zoom seminar “Fargo, my Second Hometown” took place on Feb 22, 2021. He then visited NDSU on July 09, 2021, where he met with students, staff, faculty, and Dean Wallin, toured South Engineering, our research labs, and NDSU’s campus.



*Ping He (left) together with Sylvio May in one of the active learning classrooms of NDSU’s A. Glenn Hill Center*

Ping obtained his M.S. degree in 1988 from NDSU and his Ph.D. in 1993 from the University of Nebraska-Lincoln (UNL). He came to Fargo in 1985 as a foreign student from Beijing, China – he was among the first students who were able to enter the US from China to pursue graduate studies. Prof. Sinha

served as Ping's advisor at NDSU from 1985 to 1988. During his seminar, Ping shared his experience of studying and living in the city of Fargo. Ping noted that Fargo did not even exist in most of the US maps back in the 80's in China.

After graduating from UNL in 1993, Ping was employed at J. A. Woollam Co., a startup specializing in ellipsometry, an optical technique for investigating the dielectric properties of thin films. Ping is now a research engineer and a director of Engineering/R&D at J.A. Woollam Co., Lincoln NE. He shared valuable experiences with our students and what it takes to be successful in industry as a physicist.

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## Undergraduate Research Experience

By JESSICA TSAO



Jessica Tsao

Greetings, my name is Jessica Tsao, and I'm a junior at NDSU double majoring in mathematics and physics; my primary interests and dream plans involve studying astrophysics as a graduate student, particularly black holes, warp drives, dark matter, and dark energy. As someone with the aspiration of becoming a graduate student one day, I happened to ask our Department Chair Dr. Sylvio May about research opportunities available at the Physics Department and then successfully applied for and got accepted to be a research intern at Dr. Alexander Wagner's group with a project about molecular dynamics lattice gas simulations.

The research experience was an eye-opening event, particularly about how far I needed to go before I would become ready to handle the many aspects of research. Though due to the pandemic most of my research was carried out remotely on the computer and not necessarily in an in-person lab setting, the zoom meetings I had with Professor Wagner and his students involved in similar research were not only informative but kept me on my toes in regards to what I could learn about the topic that was being researched. I was introduced to subjects that I had almost no experience with and had to learn about concepts like the velocity correlation function and the displacement correlation function and how to code LAMMPS simulations with meaningful parameter choices that correspond to a lattice gas on a two-dimensional square lattice.

All in all, I would definitely recommend this to any student who even remotely plans to go to graduate school or thinks about research as a career path. This experience taught me the basics of what the expectations were from me to complete a research project and just how far I needed to go in learning. Working on physics research at NDSU with Dr. Wagner and his group members was an amazing experience for me, and

such an experience is certainly what I would like to participate in again when I have the next opportunity.

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## 2020-21 Awards, Graduates, Donors

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### Faculty Awards:

*CSM Service Award:* Alan Denton

### Student Awards:

*Physics Achievement Award:* Joseph Granlie

*Physics Scholarship:* Lily Leong, Kai Nellermeoe,  
Dominic Rosch-Grace

*Horvik Award:* Madison Floden, Talon Kandler

*Sinha Scholarship:* Jessica Tsao, Andrea Strange

*Darrell and Carol Strobel Awards:*

– *Graduate Research:* Mohammed Alziyadi

– *Graduate Excellence:* Nekeisha Johnson

– *Undergraduate Excellence:* Kyle Nietfeld

**Graduates:** Jose Agudelo, Joe Bonin, Tucker Lehr (BS Physics, Spring 2021), Kyle Nietfeld, Dustin Oelmann, Gabriel Shepherd (BS Electrical Engineering and Physics, Spring 2021), Chris Sorensen (BS Physics, Summer 2021), Reed Petersen, Brianna Santangelo, Jayawardana Amadoru (MS Physics, 2021), Mahmud Sefannaser (PhD Physics, 2021)

### Donors:

donors: Gordon Kepner, John Loucks, Amanda Broderson, Patrick Pochant, Orv Swenson, Ping He, Michael Nelson, Scott Fricke, Andrew Croll, Darrell Strobel, Dan Chen, Harold Korb, Paul Flasch

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.



*Grad Phi Tie-Dye event in October 2021: Wathsala, Brianna, Kurt, Nekeisha, Mahesh, and Faruk (from left to right).*

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

Donations can also be made at [www.ndsualumni.com/donate](http://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.

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**Thank you!**



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Email updates to:  
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