Department of
PHYSICS alumni newsletter
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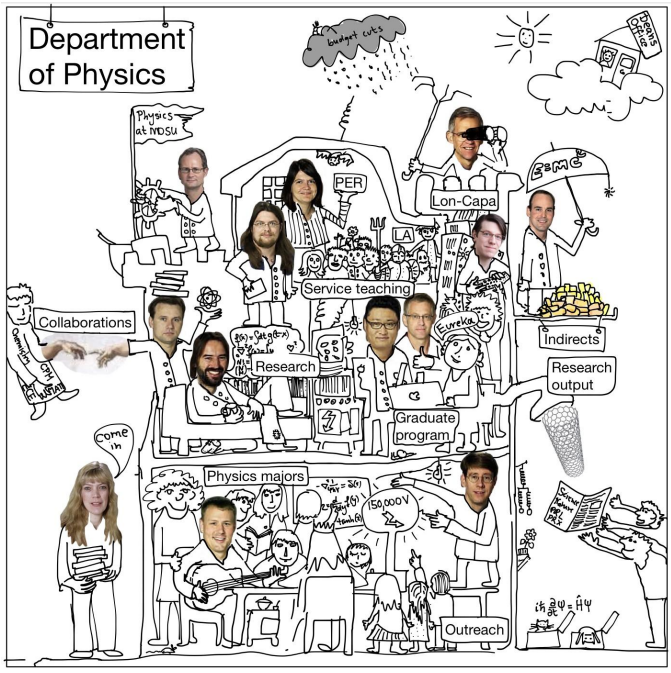
NDSU NORTH DAKOTA STATE UNIVERSITY

December 5, 2020

Greetings Alumni and Friends

This year has been very special. A pandemic has disrupted most of our social life, has challenged the way we teach our students, and has taken a toll on our ability to do research and communicate with each other. NDSU has adopted a HyFlex teaching model, where some students are physically present in class and others zoom in from a remote location. This model has worked reasonably well, sometimes more and sometimes less so. Both students and instructors are under much more stress, often suffering from isolation, zoom fatigue, email overaccumulation, and lots of uncertainty about the future. The Upper Midwest has not been doing so well in terms of infection numbers. However, virtually all students that I have interacted with here at NDSU follow social distancing guidelines, wear masks, get tested, and care about their environment. I remain optimistic, especially in view of a vaccine hopefully becoming available soon.

A few weeks ago, after being asked to introduce our Physics Department in a 5-min presentation, I pulled an IPad out of my bag and produced the drawing on the right column of this page. It shows our faculty and staff together with students and other people in a house that represents our department. You can see some of the things we do, like teach a diverse population of students, engage in outreach, write grant proposals, produce research results, help our majors in becoming wonderful physicists, be inspired by our graduate students, collaborate with other faculty worldwide, and navigate through bad weather and budget cuts. The house is pretty dynamic, never looks the same, and is teeming with creativity and life (including Schrödinger's cat and Alexander's dog). Even now, in the middle of a pandemic, we are doing our best to maintain our activities and support our students. Indeed, the last year was a good one in terms of getting new grants funded, which will soon translate into a growing number of graduate students. We have also had a strong group of incoming physics majors, twelve students of which five are female. Gender diversification remains a challenge in our department. The Physics of nucleation teaches us that only sufficiently large nuclei continue to grow and eventually form a new thermodynamic phase. My hope is that the incoming cohort of female physics majors forms such a growing nucleus.



Faculty and staff, with Orv, Sylvio, Mila, Andrew, John, Paul, Andrei, Erik, Yongki, Alexander, Alan, Patty, and Warren (from top to bottom).

This fall we have started to offer our new double major of Physics with Mechanical Engineering, which adds to the existing ones with Mathematics, Computer Science, and Electrical Engineering. Our goal is to further strengthen all our double major programs and to provide an education of outstanding quality to some of NDSU's most talented students.

I am sincerely hoping that you, dear reader, are doing well, stay healthy and support your loved ones. Please don't hesitate to share your thoughts with us.

Sylvio May,
Department Chair

George Gillies named a Fellow of the National Academy of Inventors

George Gillies is a Professor of Mechanical and Aerospace Engineering as well as Biomedical Engineering at the University of Virginia. He also is an alum of our Physics Department (B.Sc., Physics, 1974) and one of the recipients of the NDSU Alumni Achievement Award in 2007. George has retired from full time activity at the end of 2019 and became Research Professor Emeritus as of January 2020.

The National Academy of Inventors has named George Gillies as a 2018 fellow. Election to fellow status by the organization is considered one of the highest professional distinctions for academic inventors. George holds 36 U.S. patents on several medical devices for neurosurgery and cardiology.

Professor George Gillies (Photo by Dan Addison, University Communications, University of Virginia).

According to the academy, he has demonstrated "a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development and the welfare of society."

Visit of Alum Mark Novotny

One of our alumni, Professor and Head of the Department of Physics and Astronomy at Mississippi State University, Mark Novotny, visited NDSU's Physics Department in Oct 2019. He presented the seminar "Quantum Dragon Nanodevices: Zero Electrical Resistance in Disordered Systems." Mark graduated from NDSU Physics in 1973.

The image shows Mark (right) after his seminar in a discussion with Alexander Wagner, one of our faculty members. Mark's background as a computational physicist working on materials science and nanophysics connects very well with some of our current departmental research directions, sparking fruitful discussions. Moreover, his leadership role in a large and successful department allowed him to share best practices and valuable advice.

Mila Kryjevskaia named Meier Junior Professor

One of the most outstanding faculty of our department, Mila Kryjevskaia, has been awarded the James A. Meier Junior Professorship. Congratulations Mila!

In her 12 years at NDSU, Mila has worked tirelessly to discover, implement, and communicate to peers more effective methods to teach physics. Her groundbreaking work on revealing and addressing conceptual challenges and cognitive errors encountered by students in physics courses has profoundly impacted faculty and students of all levels at NDSU and beyond our institution. We can think of no one who better fits the goals of this award, to recognize contributions to teaching through research, with the primary criterion of demonstrated success interacting with students.

Joining NDSU in 2008 as an Assistant Professor with a shared appointment in the Department of Physics (80%) and the School of Education (20%), Mila has also been a leading member of the interdisciplinary STEM Education Doctoral Program from its inception. In 2015, she earned tenure and was promoted to Associate Professor. Since her start, Mila has published many significant works, educated many educators and students, and received external funding for her research.

The professorship endowment is funded by James A. Meier, BS '59, mathematics. He earned his chemistry doctorate in 1971 and an honorary doctorate from NDSU in 2007. The department would also like to thank James for founding and funding this prestigious professorship.

Students Organize Outreach Events

As every year, our students–especially our graduate students–engaged in a number of outreach activities.

Science Fun Night: In April 2019, our Society of Physics Students (SPS) teamed up with our Graduate Student Organization (Grad Phi) to host a Science Fun Night event at Longfellow Elementary School. Over 80 students (plus parents) from grades K-5 enjoyed a variety of activities and demonstrations facilitated by NDSU students and faculty.

Red River Market: At the beginning of October 2019, Grad Phi hosted a physics demo booth for kids at the Red River Market while their parents went shopping. The favorites of the day were the Soapy Science and Wheel & Stool demos. Curious market-goers stopped by to learn about the science of soap bubbles, rotational motion, and optical illusions. It's always so much fun working with the kids and teaching them. On the photo from left: Brianna Santangelo, Nekeisha Johnson, Lina Alhalhooly, and Alistair McInerny.

Boo! at NDSU At the end of October 2019, around twilight, Grad Phi students hosted a booth of science demonstrations and activities at Boo! at NDSU, a family-friendly, Halloween-themed carnival and trick-or-treating event organized by Residence Life. Over 750 costumed kids haunted Cater Hall and learned some tricks about cryogenics (liquid nitrogen and marshmallows), soft matter (soap films, slime and candy), and rotational motion (spinning wheel). This was a fun time for everyone involved. The image shows our graduate students Rachel Downing and costumed Wathsala Jayawardana.

Classroom content support for Liberty Middle School in West Fargo: When an email from a local middle school came in requesting help discussing magnetic forces, Grad Phi worked to organize a small event. Graduate students Nekeisha Johnson and Brianna Santangelo, alongside faculty members Alan Denton and Anne Denton, spent a day with Hadley Steffen's sixth graders at Liberty Middle School. They brought some classic magnetism demos, the spinning chair demo (because who doesn't love that?) and a modified version of the electromagnetism lab. The response from the teachers (and students!) was overwhelmingly positive, and they hope to transition this into an annual event when it is safe to do so.

Danette Brown, Technology Integration Specialist, West Fargo Public Schools wrote "What a day! Thank you so much for your planning and support in the classroom today! The students were engaged and excited from start to finish. I appreciated how you let them explore and participate at each station. It was a fantastic hands-on experience for our learners. I heard the kids making so many connections to the real world based on the activities and hands-on learning that was happening and selfishly, it was great–I learned a thing or two. . . or five that I didn't know. Thank you for bringing science to life today!"

Two Notable Publications from Physics Faculty

Reza Parsa, currently postdoc at UC Merced, and his former advisor Alexander Wagner discovered unusual fluctuating behavior in the coarse-graining of fluids. While it is textbook knowledge that the aggregate behavior of noise of larger parts of a system should follow the central limit theorem and become Gaussian, these researchers were able to show that this perceived wisdom fails when coarse-graining also involves a time-average. Since time-averaging is nearly always present, this discovery has profound implication on modeling fluctuations using a large variety of mesoscale methods. The research "Large fluctuations in non-ideal coarse-grained systems" was published in Physical Review Letters (PRL 124, 234501, 2020).

A team led by Erik Hobbie, Professor of Physics, Coatings & Polymeric Materials, and Director of the Graduate Program in Materials and Nanotechnology at NDSU, recently developed a new method of creating quantum dots made of silicon, one of the most utilized semiconductors in the world. "This approach

has the potential to take the production of these materials to a new level of quality and scale," Hobbie says. "I believe this is the best work I've been involved with in my career and I'm very proud that it was done at NDSU." With support of the National Science Foundation their research paper "Bright Silicon Nanocrystals from a Liquid Precursor: Quasi-Direct Recombination with High Quantum Yield" was published in ACS Nano (ACS Nano, 14, 4, 3858–3867, 2020).

Erik is recipient of the 2019/20 Research Award from the College of Science and Mathematics at NDSU. This award is well deserved. Congratulations, Erik!

Teaching in the Time of COVID-19

By WARREN CHRISTENSEN

In what might be the most challenging year in academic life, the faculty in the Department of Physics has been rising to the challenges of conducting research and doing our best to provide the highest level of instruction possible. The shift in the spring semester was abrupt, as nearly all instruction was shifted to remote learning after spring break. Most faculty were in survival mode, as concerns with our own families and children were coupled with learning new technologies and platforms and concerns for students' safety and health.

With the summer months to plan for the fall, a massive effort was put forth by multiple departments and offices on campus. We all learned a new term: HyFlex teaching. HyFlex is a construction of the two terms Hybrid Flexible teaching. The main principle of HyFlex teaching is to provide instruction that can be delivered live and in-person (in a classroom with a 50% maximum capacity with all persons wearing mask and keeping safe distance), while simultaneously broadcasting the instruction via Zoom or another audio/video platform to students who are synchronously online. The broadcast of the class is recorded so that students could watch the video in an asynchronous fashion. The teaching of labs is among the most difficult challenges. Incredible effort was put forth by our graduate students and our lab coordinator, Paul Omernik, to record labs to allow students to get the best possible experience.

This mode of instruction is exceptionally challenging. It requires many technological and time resources. NDSU was fortunate to receive funds from the CARES Act that provided faculty and the classrooms with resources to enable this to happen. For many faculty, teaching a course in HyFlex requires twice as much time. In a recent faculty survey, a majority of faculty reported having a lower mental state of health and being less productive in research compared to the previous year. We recognize that all people are struggling during this time and life on campus has become different. One thing I can tell you without a survey, is that all of us are looking forward to future semesters when we can return to full in-person classes and really connect with our students in the most authentic ways.

2019-20 Awards, Graduates, Donors

Faculty Awards:

CSM Research Award: Erik Hobbie
Meier Junior Professor: Mila Kryjevskaia

Student Awards:

Physics Scholarship: Andrea Strange, Ibrahim Bukhari
Horvik Award: James Riley, Nathaniel Wicklund
Sinha Scholarship: Dustin Oelmann, Joseph Bonin
Physics Achievement Award: Jose Agudelo
Darrell and Carol Strobel Awards:
– *Graduate Research*: John Spaight
– *Graduate Excellence*: Lina Alhalhooly
– *Undergraduate Excellence*: Noah Seekins

Graduates:

Noah Seekins, Jens Jensen, Patrick Pochant, John Rucker (BS Physics, Spring 2020); Rachel Downing (MS Physics, Fall 2019); Kevin Gima, Nathan Walker, Braden Weight (MS Physics, Spring 2020); Brian Farlow (PhD Physics, Fall 2019), James Froberg (PhD Physics, Spring 2020); Mohammed Alziyadi (PhD Physics, Fall 2020)

Donors:

Darrell Strobel, Harold Korb, Ping He, Dan Chen, John Daly, Scott Fricke, Michael Reich, Michael Nelon, Paul Flasch, Jun Kyung Chung, Arlen Johnson, Gordon Kepner

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.

Yongki, Mila, Andrew, Patty, Sylvio, John, Andrei, Alan, Alexander, Erik, and Warren: Physics Department meetings have moved to an all-online Zoom-format in 2020.

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.

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Thank you!

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We are eager to hear from our alumni. Please send an email or note to update us on what's happening in your world.

Email updates to:
patty.hartsoch@ndsu.edu