Welcome to our inaugural Physics departmental newsletter!
This is the first in a bi-annual series of informal internal bulletins that will give you a glimpse of the many activities and events that are happening in the department. In this issue, you can read about the new “quantum kitchen” in Sanfeng Wu’s brand new lab, where he and his group prepare their “sandwiches” made from single atom thin two-dimensional crystals, about the new Princeton Gravity Initiative, which moved into its new space on the fourth floor this Fall, about all the activities of the Women in Physics groups, and learn some random facts about the seven (!) new staff members who joined our department over the past year. Welcome to Katherine Lamos, Mandeep Sidhu, Martina Macakova, Neelima Sharma, Nick Krysko, Patrick Bradshaw, and Travis Venables!

The newsletter is also a place to highlight upcoming events. This Spring, we are particularly excited to host the 2020 Rising Stars in Physics Workshop, which will bring together the top group of early career women in Physics and Astronomy for two days of scientific discussions and informal sessions aimed at navigating the early stages of the academic career.

We hope that over time, this newsletter will become a dynamic open forum to which everyone in the department can contribute. You are all invited to make suggestions for improvements or provide one of the news items that you think deserves the spotlight in the next issue.

Thank you, Angela Lewis and Kim Dawidowski, for putting together this first newsletter!

Cheers,
Herman Verlinde
Sanfeng Wu Lab

Two-Dimensional Quantum Matter and Devices | Quantum Cooking

The Wu Laboratory in Princeton's Department of Physics focuses on experimental condensed matter research. Our research involves developing novel structures and devices from crystalline atomic monolayers and studying their emergent quantum phenomena.
hours in our special fabrication room, which we call the “quantum kitchen”, to find the perfect selection of crystals that are made of only a single atomic layer. They are the so called “two-dimensional crystals”. The selected layers are then sandwiched together into atomically thin burgers, in which the electrons will behave according to their intrinsic topology and correlations. Unlike a chef who relies on ovens and high temperatures to make a tasty dish, our quantum chefs want to serve everything as cold as possible, so we use refrigerators that can cool down to 10 milliKelvin, ~ 30,000 times lower than the room temperature. At such a low temperature, close absolute zero, the quantum nature of our burgers will happily show up, and you can “taste” them!

Of course, tools are needed to taste them. We develop diagnostic tools using electronics or optics to look for signatures of new quantum phenomena. To give an example, we try to make very special kinds of atomically thin burgers, in which, at near absolute zero, the electrons will act as if they have split themselves into parts, producing new particles that we call “partons.” Surely elementary electrons in free space can’t split, but effectively, they can do so in quantum materials. These new particles can then form new types of quantum matter that behave differently from all known matter, and they could be critical for use in the future to manipulate energy and information at the quantum level.

2020 Rising Stars in Physics Workshop
The Department of Physics at Princeton will be hosting the 2020 Rising Stars in Physics workshop this April 16-17, 2020. This workshop is geared towards the top early career women in Physics and Astronomy who are interested in careers in academia. Participants will have an opportunity to present their research, as well as attend panel discussions with faculty focused on issues related to navigating the early stages of an academic career. Keynote addresses will be given by Premala Chandra (Rutgers), Samaya Nissanke (GRAPPA), and Meg Urry (Yale). A dedicated session on leadership and professional development will be led by Associate Dean Eva Kubu.

The goal of the Rising Stars in Physics workshops is to foster a new generation of women in academia and promote diversity in the faculty ranks. Previous workshops have been held at MIT and Stanford. We are thrilled to be able to bring the event to Princeton this year, with support from the Heising-Simons Foundation.
The Princeton Gravity Initiative
Black holes are the ultimate manifestation of gravity. The LIGO discovery of colliding black holes proves the existence of black holes and gravitational radiation, both of which are consequences of Einstein's theory of relativity. Princeton can and must be at the forefront of ongoing discoveries related to black holes and more broadly to strong field gravity, defined as situations in which gravity is as strong or stronger than any other force.

Women in Physics
Princeton first admitted a woman to its Physics Ph.D. program in 1965, after 59 years of admitting only men. Since then, only 78/810 Princeton Physics Ph.D.s have been awarded to women. The Princeton Women in Physics (WiP) Group consists of women graduate students, postdoctoral researchers, and faculty from Princeton's Physics and Astrophysics Departments. In addition to being a source of...
attended WiP's first "Ally Workshop" in Spring 2019 to learn how to support underrepresented students in STEM fields. WiP also holds "What is Grad School?" workshops each semester that have drawn over 50 undergraduate students over the past year. WiP represents Princeton Physics at the American Physical Society's CUWIP (Conference for Undergraduate Women in Physics) conferences, and held physics demos for younger students. Finally, this semester, WiP started a Diversity and Inclusion Journal Club open to undergrads, grad students, postbacs and postdocs in Physics and Astrophysics. If you’re interested in contributing to educational outreach with WiP this semester, look out for department-wide emails about WiP’s upcoming Ally Workshop and "What is Grad School?" workshop! If you’d like to join WiP’s Diversity and Inclusion Journal Club mailing list, contact us at wip-exec@princeton.edu.

For more general updates, follow us on Twitter at @princetonwip or check out our website at https://wip.princeton.edu

*We use an inclusive definition of "woman" and "female" and we welcome trans women, genderqueer women, and non-binary people.

Undergraduate Women in Physics - UWiP

The goal of Undergraduate Women in Physics (UWiP) is to offer mentorship, academic enrichment, and a welcoming community to students majoring in physics or related fields. We invite all students, regardless of gender identity/expression, race, socioeconomic background, and/or sexual orientation, to become members. As a joint collaboration between students in physics and the astrophysical sciences, we aim to provide guidance in order to aid students in their strides to achieve their academic, personal, and professional goals.

In the Fall, we launched the second year of our Women in Physics Mentorship Program, as well as hosted multiple study breaks for students to relax and socialize. We also co-hosted the "Applying to Graduate School Workshop", which involved a faculty Q&A and dinner with time to mingle with graduate students to ask specific questions.

This March, we have a JP symposium coming up, where Juniors and Seniors majoring in physics, astrophysics, and related fields can sign up to give short presentations on their JPs. It's a great opportunity for underclassmen to get an idea of the scope of a JP, as well as a chance for students to learn about research going on in the department.
New to Physics in 2019!
Each one from the group has provided a random fact about themselves.

Can you match the fact with the person.
1. My favorite sport teams are the Toronto Raptors and Toronto Maple Leafs.
2. I have seen Aladdin on Broadway 4 times.
3. I was a collegiate level swimmer.
4. I commuted to work in Switzerland for a year.
5. Four years ago, I ran 50 miles, ended up on crutches, lost all of my toenails and haven't run since.
6. I sell wine for Onehope, a charity based online wine selling platform.
7. I love to travel.

The Graduate Program
A graduate education in Physics at Princeton emphasizes world class research in many areas of cutting edge physics, with the goal of getting students started on research as soon as possible. There are a total of 130 graduate students, G1 through DCE (G6&7) who hail from 21 different regions around the world. On average about 20 students graduate each year, with about half defending in the spring and half over the summer and fall.

We have already seen our first graduate student of the year successfully complete his Final Oral Public Exam. Congratulations to Sihang Liang, who is advised by Professor N. Phuan Ong.

In December the upper year graduate students brought some holiday cheer to the first year students who were hard at work studying for their prelims, which they took in early January. Video of the caroling can be found at this link http://www.kaltura.com/tiny/u5hhc.

The Graduate Admissions committee is reviewing over 600 applications for admission to the graduate program for fall 2020. The department is committed to increasing the diversity of the graduate student body by continuing to target outstanding female physicists and students from underrepresented...
Students: Offers of admission will go out in February and we will welcome those admitted students during an open house on March 26th with a full day of meetings with faculty, socials and dinner. Everyone is encouraged to participate!

Undergrad News
The Physics undergraduate class of 2021 has 26 majors and the class of 2020 has 38 majors, one of the largest we’ve had! The juniors have just submitted their Fall JP on January 7th and the seniors are hard at work producing their senior theses. There are two Physics undergrad groups which support our students. The UWiP which is featured in the article above and the Princeton Society of Physics Students. The Princeton Society of Physics Students is an undergraduate organization that focuses on connecting physics students to resources and other students. Overall, their goal is to make the undergraduate experience in physics as fun, fulfilling, and worthwhile as possible. The events they organize include study breaks, mentorship events, faculty research talks, and guest speakers.

Important upcoming dates: Spring term begins February 3rd, Senior thesis due May 4th, Spring JPs due May 5th.

By the Numbers:

- The Department of Physics has approximately 80 active sponsored research awards totaling almost $29M.
- The Purchasing Department places approximately 5,000 orders per year or 2,500 per semester.
- The amount of cookies consumed by the department annually is approximately 11,000 per semester- that's 22,000 for the year!

Thanks to Rick Soden for his assistance with the banner and photos.