Notes From the Editor:
I hope everyone had a smooth start to their spring semester. This is the second issue of the PUMRS newsletter, Materials Today. This semester, PUMRS is planning a series of club events including an Imaging and Analysis Center (IAC) tour, movie nights, study breaks, and speaker events. Be on the lookout for club emails! In addition, PUMRS is expanding the newsletter committee by including more undergraduate volunteers. The newsletter will also begin to feature spotlights for Princeton professors and student researchers. Registrations for MRS and PRISM events and some openings for material science-related internships and the APS student ambassador program are noted in this issue. Enjoy!

— Zihan Lin

Upcoming deadlines and club events:

- **February 8** - Center for Engineering MechanoBiology Research Experiences for Undergraduates (REU) program
- **February 11** - Boise State University Energy Conservation, Storage, and Renewable Production REU
- **March 1** - Interative Biomaterials 2022 Internship
- Rolling admission (typically filled by March 31st) - Interdisciplinary Materials Science Summer Program at Cornell University in Ithaca, New York
- Applications are open for American Physical Society (APS) Student Ambassador Program

Thawing the cold chain: Princeton technology for room-temperature delivery of vaccines and biological drugs selected to receive Science Center innovation funding

Jan. 20, 2022 | Catherine Zandonella | Princeton Innovation

Princeton Research Scholar Maksim Mezhericher in collaboration with Howard Stone, Princeton’s Donald R. Dixon ’69 and Elizabeth W. Dixon Professor, have developed a new technology to improve the storage and transport of vaccines and other drugs at room temperature. They have created a system for rapid room-temperature dehydration of biopharmaceuticals that uses ultra-fine-droplet aerosols to convert drugs into dry form, eliminating the need for expensive refrigeration or freezing. The technology was selected to receive funding from the University City Science Center.

A glance at 2021...
Princeton chemists discover a key to greener food production

Jul. 30, 2021 | Wendy Plump | Department of Chemistry, Princeton News

The Haber-Bosch process revolutionized food production by mass-producing fertilizers, however, the carbon dioxide that comes as a byproduct is a big environmental concern. Princeton’s Edwards S. Sanford Professor in Chemistry, Paul Chirik, and his lab have made a key discovery towards a new method that produces fertilizer without generating carbon dioxide. They use blue light on an iridium catalyst to drive the formation of weak element-hydrogen bonds, which are very difficult to make, and without a harmful byproduct. It is very exciting to see what this discovery will bring to the field.

Physical chemist Roberto Car named a lifetime AAAS fellow

Jan. 26, 2022 | Wendy Plump | Department of Chemistry, Princeton News

Robert Car, Princeton’s Ralph W. “31 Dornte Professor in Chemistry and PRISM, was honored for his “techniques for the dynamic simulation of materials with quantum mechanical accuracy.”
Crystallography for Misfit Crystals: Advanced Algorithms Reveal Material Structures

Jan. 21, 2022 | Lawrence Berkeley Laboratory | SciTechDaily

Determining crystal structure has been a central problem in material science research. Namely, traditional X-ray crystallography is applicable for materials with crystalline structures. Substances that form powder cannot be examined due to the entanglement of diffraction patterns. New X-ray free-electron laser (XFEL) technology allowed the development of small molecule serial femtosecond X-ray crystallography, which can reveal material properties without damaging microcrystals that are sensitive to existing techniques.

Read More on Nature

Revolutionary Carbon-Based Magnetic Material Finally Synthesized After 70 Years

Jan. 28, 2022 | Osaka University | SciTechDaily

Crystalline nanographene has been synthesized for the first time by researchers at Osaka University since its magnetic property was first theorized in 1950. Graphene edges steel in its abilities for long-distance charge transport and strength at comparable sizes. The techniques used in their reported synthesis may be applied to future materials that can supplement silicon in electronics.

Read More on the Journal of the American Chemical Society

Engineers develop new software tool to aid material modeling research

Jan. 5, 2022 | Penn State | ScienceDaily

Researchers from Penn State and the Sandia National Laboratory developed an open software called propSym that can calculate the fundamental physical properties of solids. Traditional acquisition of physical constants requires searching through tabulated data. Missing constants and inconsistencies across literature often create more challenges for researchers. The new tool programmed using MATLAB can adapt to almost all physical properties in question.

Read More on the Journal of Applied Crystallography

Irreversible synthesis of an ultrastrong two-dimensional polymeric material

Feb. 2, 2022 | Zeng et al. | Nature

Researchers at MIT have developed a process to synthesize a polymer four to six times stronger than bulletproof glass and two times tougher than steel. The new polymer, consisting of compound melamine as the monomers, is also impenetrable to gases, a key property ideal for use as ultrathin coatings.

Read More on Nature

Programmable Macroscopic Self-Assembly of DNA-Decorated Hydrogels

Jan. 31, 2022 | Vyankat A. Sontakke and Yohei Yokobayashi | ACS

Researchers at the Okinawa Institute of Science and Technology Graduate University have successfully developed a method to conjugate short sequences of DNA to hydrogel blocks. These hydrogel blocks were able to self-assemble in an aqueous solution, indicating that the power of DNA strands to self-assemble can be harnessed for use in the self-assembly of synthetic materials.

Read More on the Journal of the American Chemical Society

Events

PRISM Seminar

- Feb 9, 2022, 12:00 pm–1:00 pm - "Insights on Nanostructured Bio-Carbon Materials and their Sustainable Production"

- Feb 24, 2022, 12:30 pm–1:30 pm - "Engineering Functionality through Dynamic Visualization and Control of Atomic Motions"
Registration opening soon for the 2022 MRS Exhibit!

2022 PRISM Symposium (April 6-7) open for registration