



RICE NATURAL SCIENCES
Department of
Chemistry

CHEMISTRY

DEPARTMENT

Newsletter

| Winter 2024



Message from the Chair

Prof. Angel Marti, Chemistry Department Chair

Greetings from the Department of Chemistry at Rice University!

As this year begins, I would like to share with you some of the highlights and achievements of the Rice Chemistry Department community in 2023.

The chemistry department continues to excel in research, teaching, and service, climbing a few steps in the US News Ranking from no. 35 in 2022 to no. 27 in 2023. This is a testament to the hard work of our faculty, students, postdocs, and staff. At the same time, we continue growing. This fall, we welcomed a class of 32 graduate students, one of the largest in the last few years. Furthermore, James Shee officially joined us in the fall, as an assistant professor. We are currently conducting a search for faculty in physical chemistry, chemical biology, and organic chemistry. Stay tuned!

We also celebrate the recognitions and awards received by members of our community. Some of the awards received by our faculty include the Aneesur Rahman Prize (Scuseria), the ECS Richard E. Smalley Award (Weisman), the ACS-Greater Houston Section Younger Chemist Award (West), the Mildred Dresselhaus Prize (Halas), the C&EN Talented 12 (Hernández Sánchez), and the Rice Excellence in Graduate Mentoring Award (Hartgerink), among others.

Our students have also been recognized for their outstanding achievements in research and education. Undergraduate students Maria Hancu (Hartgerink Lab) and Alex Lin (Ball Lab) were named Goldwater Scholars. Graduate student Eric Jordan Gomez and undergraduate student Ruoyu Qian were awarded the National Science Foundation Graduate Research Fellowship.

The Chemistry Department staff have also been instrumental in supporting the department's mission and vision. I would like to thank them all for their commitment, professionalism, and hard work throughout the year. Due to their dedication, Abby Vacek was awarded the Ruth Parks Award for Distinguished Service, and Selena Zermeño received the Outstanding Service Award from the Wiess School of Natural Sciences.

In October, we learned that Rice alumnus, Prof Louis Brus ('65) was awarded the Nobel Prize in Chemistry for the "discovery and development of quantum dots." The chemistry research community at Rice is really excited to receive these news. We feel inspired to continue Rice's culture of research excellence at all levels and to further our mission to educate and nurture the next generation of leaders in the chemical sciences. We look forward to celebrating this important achievement with Prof. Brus.

Finally, in December, we celebrated the Chemistry Department Strategic Planning retreat. During the retreat, we defined the core values, the vision, and the mission of the department as stated below. A variety of goals were defined, and we will report on the progress in the next newsletter.

- **Core Values:** Responsibility, integrity, community and excellence
- **Vision:** Inspire curiosity, pioneer chemical innovation and educate the next generation of scientific leaders.
- **Mission:** Through cutting-edge research and transformational education, we advance discovery across the realm of fundamental and applied chemical sciences and empower a diverse and inclusive scientific community to address the challenges of our complex world.

As the year 2024 starts to unfold, we await with excitement the opportunities and challenges that lay ahead. It is a privilege to serve as the chair of this outstanding department, and I deeply appreciate the support and collaboration of our faculty, students, staff, alumni, and friends. Together, we are making a difference in advancing science and solving global problems.

Warmest regards,

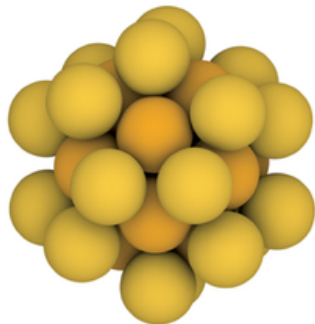
Angel

Gold buckyballs, oft-used nanoparticle ‘seeds’ are one and the same

Rice University chemists have discovered that tiny gold “seed” particles, a key ingredient in one of the most common nanoparticle recipes, are one and the same as gold buckyballs, 32-atom spherical molecules that are cousins of the carbon buckyballs discovered at Rice in 1985.

Carbon buckyballs are hollow 60-atom molecules that were co-discovered and named by the late Rice chemist [Richard Smalley](#). He dubbed them “[buckminsterfullerenes](#)” because their atomic structure reminded him of architect Buckminster Fuller’s geodesic domes, and the “fullerene” family has grown to include dozens of hollow molecules.

In 2019, Rice chemists [Matthew Jones](#) and [Liang Qiao](#) discovered that golden fullerenes are the gold “seed” particles chemists have long used to make gold nanoparticles. The find came just a few months after the [first reported synthesis](#) of gold buckyballs, and it revealed chemists had unknowingly been using the golden molecules for decades. “What we’re talking about is, arguably, the most ubiquitous method for generating any nanomaterial,” Jones said. “And the reason is that it’s just so incredibly simple. You don’t need specialized equipment for this. High school students can do it.”



Read more at: news.rice.edu/news/2023/gold-buckyballs-oft-used-nanoparticle-seeds-are-one-and-same

Making hydrogen from waste plastic could pay for itself

Very strong, light materials that can withstand extremely high temperatures could usher in next-generation spacecraft, enhance current devices or enable the development of new biomedical imaging or hydrogen storage applications, among others. To this end, Rice University scientists in [the lab of Angel Martí](#) have uncovered a new way to make high-purity boron nitride nanotubes, hollow cylindrical structures that can withstand temperatures of up to 900 degrees Celsius (~1652 Fahrenheit) while also being stronger than steel by weight.

According to [a study](#) published in *Chemistry of Materials*, Rice researchers figured out how to get rid of hard-to-remove impurities in boron nitride nanotubes using phosphoric acid and fine-tuning the reaction.

“The challenge is that during the synthesis of the material, in addition to tubes, we end up with a lot of extra stuff,” said Kevin Shumard, a chemistry doctoral student and lead author on the study. “As scientists, we want to work with the purest material we can so that we limit variables as we experiment. This work gets us one step closer to making materials with a potential to revamp whole industries when used as additives to metals or ceramic composites to make those even stronger.”

Read more at: news.rice.edu/news/2024/rice-chemists-find-new-way-rid-boron-nitride-nanotubes-impurities



Welcome new faculty member, Prof. James Shee

The Chemistry Department would like to welcome our newest faculty member, James Shee!

James Shee was born in Portland, Oregon and grew up in El Dorado Hills, California. He joined the faculty of Rice University in the summer of 2023 as a Norman Hackerman-Welch Assistant Professor of Chemistry. James aspires to develop and apply ab initio computational methods to accurately model chemical systems exhibiting both weak and strong correlations. In particular, he is interested in the electronic structure of transition metal and f-block compounds, and specializes in quantum Monte Carlo techniques and algorithms amenable to quantum computation. Prior to this appointment, he was an NIH postdoctoral fellow at UC Berkeley. James received his Ph.D. in Chemical Physics from Columbia University and his A.B. in Chemistry from Princeton University.



Rice Alumnus Louis Brus Awarded Nobel Prize in Chemistry

Rice University alumnus Louis Brus '65 has been awarded the Nobel Prize in chemistry for the "discovery and development of quantum dots," nanosized particles with unique properties "that now spread their light from television screens and LED lamps," according to a Royal Swedish Academy of Sciences announcement today.

Brus, who started his undergraduate education at Rice in 1961, shares the distinction with Mounqi Bawendi and Alexei Ekimov. Their work has been crucial to the development of nanotechnology, which has helped drive major computing advances and transformed electronics. The Swedish Academy highlighted Brus' role as "the first scientist in the world to prove size-dependent quantum effects in particles floating freely in a fluid."

While at Rice, Brus studied chemistry, physics and mathematics and developed "a love of history that has stayed with me to this day," he said in a statement delivered when he received the 2008 Kavli Prize in nanoscience. Brus praised his undergraduate alma mater for its "rigorous, fundamental, yet broad education."

Read more at: news.rice.edu/news/2023/rice-alum-louis-brus-awarded-nobel-prize-chemistry

Faculty Awards

Congratulations to:

- **Naomi Halas**, Mildred Dresselhaus Prize
- **Gustavo Scuseria**, Aneesur Rahman Prize
- **Bruce Weisman**, Electrochemical Society 2024 Richard E. Smalley Award
- **Julian West**, ACS-Greater Houston Section Younger Chemist Award
- **Han Xiao**, \$3.2M National Cancer Institute grant

Student Spotlight: FACETS

Joseph Swain, Graduate Student

As a first-generation college graduate raised in a low-income household, I had no idea what graduate school consisted of. Despite being fortunate enough to receive my bachelor's degree, information regarding the next steps in higher education was scarce. After scouring online forums, I eventually gained enough information about graduate school where I was confident enough to apply. After getting into Rice University, I was told about a group named FACETS that would have made my road to graduate school much easier had I attended one of their workshops.

FACETS is a non-profit organization dedicated to promoting diversity and inclusion in the field of chemistry. We are a collection of chemistry PhD students from all walks of life, united by the passion for making higher education accessible to all. Our primary focus is on students at under resourced universities and bringing necessary information about graduate studies to them, though we have given presentations to many different universities around the world. We hold Zoom workshops during the application season that consist of three parts: 1) Grad Journeys, 2) Application Process, 3) Life of a PhD Student. Grad Journeys involves FACETS' members telling their personal stories about how they got to graduate school, including all the obstacles and hardships that came with it. The goal of this is to show students that your background shouldn't hold you back from pursuing higher education, and that everybody has a unique story to tell. The Application Process goes over the logistics of what is required for applying to a PhD program, as well as tips and tricks for beefing up applications. Life of a PhD Student focuses on how we navigate our day-to-day lives in graduate school the academic requirements for completing the degree, and managing an appropriate work-life balance.

Apart from these Zoom workshops, our members also travel to universities around the world to give these presentations in person. We support the invitation of diversity speakers, who hold seminars about diversity and inclusion on Rice's own campus, by hosting social gatherings for graduate students to interact with the speakers. As a group we are still growing, but we are constantly looking for new recruits who are passionate about diversity and inclusion in science! If you are interested in learning more about FACETS, please contact us at facets@rice.edu.

[The Department of Chemistry thanks you very much for your continued support!](#)

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**WE WANT TO HEAR
FROM YOU!**

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