CHEM Newsletter

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Where innovation meets collaboration. chemistry.rice.edu

Message from Chair

Year 2020 is one that all of us will remember! However, despite these global issues, our Department of Chemistry successfully continues its research and educational activities. Please enjoy our regular CHEM Newsletter, which appears every 6 months, that highlights some recent accomplishments and several exciting news in the Department. We are very proud that our Chemistry Department is still one of the world leading research centers!

All activities in the Department stopped for almost 3 months in the Spring-Summer 2020 due to the coronavirus pandemic. Eventually, we slowly restarted our research and preparations for teaching in the Fall 2020 are under way. Sadly, Prof. Lon Wilson retired on July 1, 2020. His contributions to the Department are countless. We will miss Lon, but we wish him happy retirement and we will always be happy to see him in the Department!

On the bright side, we are happy to announce that a new Assistant Professor, Dr. Anna-Karin Gustavsson, an extraordinary talented researcher in the field of experimental physical chemistry and biophysics, has joined our Department from August 1, 2020. We look forward to more exciting news and research accomplishments from the Department of Chemistry!

Anatoly Kolomeisky, Chair
Department of Chemistry

Recent Faculty Awards

DR. ANGEL MARTÍ
APPOINTED FELLOW OF THE ROYAL SOCIETY OF CHEMISTRY

DR. JIM TOUR
WINNER OF A ROYAL SOCIETY OF CHEMISTRY CENTENARY PRIZE

IN THIS ISSUE

DR. JEFFREY HARTGERINK
NAMED TO THE COLLEGE OF FELLOWS OF THE AMERICAN INSTITUTE FOR MEDICAL AND BIOLOGICAL ENGINEERING

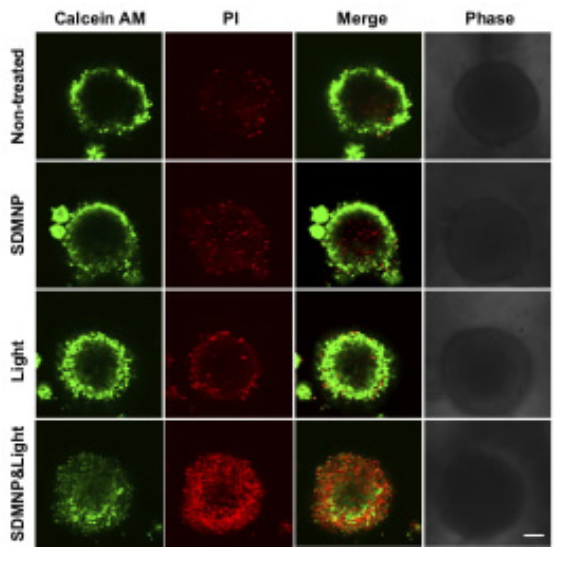
RICE NEWS *features*

Our faculty, students, and researchers are doing oustanding work in the classroom and in the lab. Catch a glimpse of a few of their stories featured on *Rice News* this cycle.

Rice lab turns fluorescent tags into cancer killers

(Mike Williams, Rice News)

Replacing one atom in molecule gives it the power to destroy tumor cells when light-activated



Images of multicellular tumor spheroids treated with photosensitizers and light (in the bottom row) show how the compounds, when excited by light, damage the cells. Images courtesy of the Xiao Lab

HOUSTON - (June 11, 2020) - Rice chemist Han Xiao and his colleagues found that replacing a single oxygen atom with a sulfur atom in a common fluorophore turns it into a photosensitizing molecule. When exposed to light, the molecule generated reactive oxygen species (ROS) that destroyed breast cancer cells in the lab.

The study led by co-lead authors Juan Tang and Lushun Wang, both Rice postdoctoral researchers, appears in the Royal Society of Chemistry flagship journal Chemical Science.

This method of photodynamic therapy is already in use, as light-triggered molecules are known to generate cytotoxic ROS. Most current photosensitizers require the incorporation of heavy atoms, but they are difficult and costly to synthesize and remain toxic in the dark, potentially damaging healthy cells, Xiao said.

Full article: http://news.rice.edu/2020/06/11/rice-lab-turns-fluorescent-tags-into-cancer-killers-2/

Exotic nanotubes move in less mysterious ways

(Mike Williams, Rice News)

Rice scientists, engineers show boron nitride's promise for composites, biomedical

HOUSTON - (June 2, 2020) - Those properties and others — BNNTs are nearly transparent to visible light, resist oxidation, are stable semiconductors and are excellent conductors of heat — could make them useful as building blocks for composite materials or in biomedical studies, among other applications. The study will help scientists better understand particle behavior in the likes of liquid crystals, gels and polymer networks.

Rice scientists Matteo Pasquali and Angel Martí and graduate student and lead author Ashleigh Smith McWilliams isolated single BNNTs by combining them with a fluorescent rhodamine surfactant.

This allowed the researchers to show their Brownian motion — the random way particles move in a fluid, like dust in air — is the same as for carbon nanotubes, and thus they will behave in a similar way in fluid flows. That means BNNTs can be used in liquid-phase processing for the large-scale production of films, fibers and composites.

Full article: http://news.rice.edu/2020/06/02/exotic-nanotubes-move-in-less-mysterious-ways-2/

Rice scientists analyzed the motion of single boron nitride nanotubes. The nanotubes are stable semiconductors and excellent conductors of heat. They could be useful as building blocks for composite materials or in biomedical studies. (Photo by Jeff Fitlow)

New tool helps nanorods stand out

(Mike Williams, Rice News)

Rice team's SEMseg method makes nanoparticle analysis quicker and more affordable

HOUSTON - (June 8, 2020) - The Rice labs of chemists Christy Landes and Stephan Link created an open-source program called SEMseg to acquire data about nanoparticles, objects smaller than 100 nanometers, from scanning electron microscope (SEM) images that are otherwise difficult if not impossible to analyze.

The size and shape of the particles influences how well they work in optoelectronic devices, catalysts and sensing applications like surface-enhanced Raman spectroscopy.

SEMseg is described in a study led by Landes and Rice graduate student Rashad Baiyasi in the American Chemical Society's Journal of Physical Chemistry A.

The program is available for download from GitHub at https://github.com/LandesLab?tab=repositories.

SEMseg — for SEM segmentation — springs from the team's study in Science last year that showed how proteins can be used to push nanorods into chiral assemblies. "This work was one result of that," Landes said. "We realized there was no good way to quantitatively analyze SEM images."

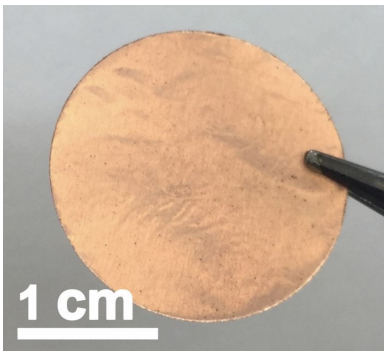
Full article: http://news.rice.edu/2020/06/08/new-tool-helps-nanorods-stand-out-2/

Tale of the tape: Sticky bits make better batteries

(Mike Williams, Rice News)

Rice scientists stick to their laser guns to improve lithium metal technology

HOUSTON - (July 14, 2020) - Where things get sticky happens to be where interesting science happens in a Rice University lab working to improve battery technology.



A copper current collector with a laser-induced silicon oxide coating created at Rice University. Courtesy of the Tour Group

Using techniques similar to those they employed to develop laser-induced graphene, Rice chemist James Tour and his colleagues turned adhesive tape into a silicon oxide film that replaces troublesome anodes in lithium metal batteries.

For the Advanced Materials study, the researchers used an infrared laser cutter to convert the silicone-based adhesive of commercial tape into the porous silicon oxide coating, mixed with a small amount of laser-induced graphene from the tape's polyimide backing. The protective silicon oxide layer forms directly on the current collector of the battery.

Full Article: http://news.rice.edu/2020/07/14/tale-of-the-tape-sticky-bits-make-better-batteries-2/

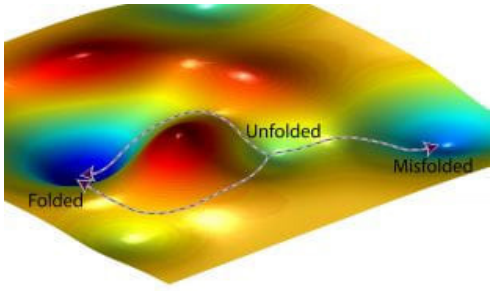
Hidden symmetry found in chemical kinetic equations

(Jade Boyd, Rice News)

Rice University discovery has implications for drug design, genetics, more

HOUSTON - (April 30, 2020) - Rice University researchers have discovered a hidden symmetry in the chemical kinetic equations scientists have long used to model and study many of the chemical processes essential for life.

The find has implications for drug design, genetics and biomedical research and is described in a study published this month in the Proceedings of the National Academy of Sciences. To illustrate the biological ramifications, study co-authors Oleg Igoshin, Anatoly Kolomeisky and Joel Mallory of Rice's Center for Theoretical Biological Physics (CTBP) used three wide-ranging examples: protein folding, enzyme catalysis and motor protein efficiency.



An artist's representation of a free-energy landscape (Image courtesy of O. Igoshin/Rice University)

Full article: http://news.rice.edu/2020/04/30/hidden-symmetry-found-in-chemical-kinetic-equations/

FACULTY

INTRODUCTION

Anna-Karin Gustavsson

I joined the Department of Chemistry in August 2020 as an Assistant Professor, CPRIT Scholar, and Norman Hackerman-Welch Young Investigator. I earned my PhD in physics at the University of Gothenburg, Sweden, with Prof. Mattias Goksör. I later joined the group of Prof. W. E. Moerner at Stanford University as a postdoctoral fellow where I refined my specialty in single-molecule imaging and super-resolution microscopy. I have greatly benefitted from having strong mentors who have been able to encourage and guide me in both science and career development. I am now looking forward to sharing this mentoring approach that has been so valuable to me with students and postdocs at Rice University.

The work in my research group is interdisciplinary and focused on the development and application of 3D single-molecule tracking and super-resolution imaging in cells. We strive to gain detailed information about cellular nanoscale structure, dynamics, and molecular mechanisms by designing innovative and versatile imaging tools and analysis algorithms. The goal of our research is to improve our understanding of cellular function and pathogenesis to answer important biophysical and biomedical questions related to aging, cancer, and other diseases.

UPDATES

PROMOTIONS

Angel Marti to Full Professor
Krista Kobylianskii to Assistant Teaching Professor
Kristi Kincaid to Associate Teaching Professor

RETIREMENT

Lon Wilson

Congratulations Graduates!

Bachelor's Degree in Chemistry

Elliot Ballato
Solana Kathryn Buchanan
Michelle Cindy Dai
Kevin Jaime Gonzalez
Aviva Elaine Gordon
Ruchi Gupta
Katharyn Leigh Hernandez
Marissa Hurley
Erin Ann Kilbride
Hsinhui Mandy Li
Max Liu
Steven Liu
Michelle Minh Xuan Nguyen
Jared Ethan Nirenberg
Evan Paul Rebesque
Troy (Q) Tabarestani
Yash R. Wani
David Cheng Hua Yang
Krisitine Yang
Olivia Zhang

Bachelor's Degree in Chemical Physics

Louis E. Cole
Fabio M. Fasanelli
Benjamin Ruben
Kevin Tian

Doctor of Philosophy in Chemistry

Federico Bocci
Yiyu Cai
Pengxi Chen
Benjamin Daniel Clark
Liangliang Dong
Luiza Gomes Ferreira
Hassan Javed
Jarin Damani Joyner
David Gilbert Leach
Tania Lizeth Lopez Silva
Alicia Elizabeth Mangubat-Medina
Samuel Cody Martin
Mikita Misiura
Olivier Brian Cyril Monty
Nicholas Anthony Moringo
Nicole Christine Moringo
Meredith McDowell Ogle
William Sikkema
Ashleigh Smith McWilliams
Macy Stavinoha
Shu Tian
Yu Zheng

CHEMISTRY GRAD STUDENTS, ASSEMBLE!

RACHAEL KRESS

To the rest of the world, the arrival of spring typically elicits thoughts of flowers, cute woodland creatures, allergies, and tax season, but to chemistry students, spring always marks the beginning of Qualifying Exam season. This year, spring meant a pandemic to the rest of the world – and a pandemic WITH QEs to second years! Suddenly, "zooming" became a verb that did not just apply to cats at 3 A.M. Resourceful and adaptive as ever, students delivered their QEs and thesis defenses via the internet, streaming science from one couch to another. There was a learning curve of figuring out how to mute the audience, making screen-share work properly, and remembering to tidy the corner of your room that was visible in the background. However, our fellow graduate student friends and colleagues made sure Breakfast Talks were as well attended as ever, and our professors were patient and understanding with technical difficulties. Even more so, we found ways to turn adversity into advantage as family and friends around the world were able to virtually attend our presentations and celebrations as we passed major milestones in our career.

As the pandemic worsened, we had to learn how to adjust both our work and play to social distancing. As experimental chemists, we had to learn how to be programmers, civil engineers, or even mathematicians! (And those whose work was already mostly computational found themselves very popular as the rest of us sought their expertise!) In our off time, we set-up Zoom trivia nights to keep our geography and Harry Potter knowledge sharp. CGSA created a reimbursement program for grocery delivery to keep our community as safe as possible. When we needed to see each other's smiling faces, we held Zoom Happy Hours to "share" a beer, a new hobby, or a listening ear.

When political unrest struck in June, we immediately sought ways to help and support underrepresented communities. We took a second look at STEM and our own program to see how we could improve diversity. With the help of the department, a committee with Dr. Martí, Dr. West, and Pam On was created whose goal was to make positive changes within our community.

As June wound down, we worked with our PIs to find ways to minimize risks as the University began to reopen. Shift work and additional PPE is certainly not ideal, but we make it work. We stay alert and adapt to our situation while still making progress on our own projects.

Finally, as the fall semester looms closer, we look to the future. We continue to come up with creative ways to connect with each other and to have fun in trying times. CGSA is taking steps to make our incoming first years feel welcome and provide assistance when needed. We are working to start a "book-club" to educate ourselves and to continue the discussion on the impact of racism and other prejudices in STEM as well as in society. There are many uncertainties and many challenges to face, but looking back over how much we have accomplished in the past few months, is there any doubt that we will rise to the occasion?

Rachael Kress is starting her fourth year in the Jones Lab and currently VP of the CGSA.

STAFF CORNER

By Patricia Villanueva, Seminar & Event Coordinator

We asked our staff to describe their experience of working from home in one word. Certainly, our "new normal" came as a surprise twist halfway through the Spring semester, leaving our staff to learn how to best support faculty, students, and research staff while being away from campus. We join many around the country in describing this moment as complicated and frustrating. Best described, "liminal" hit the nail on the head to accurately express the in between feelings of uncertainty and relief, exhausting and tranquil, isolating and freeing. We included weekly staff Zoom meetings into our schedules and happy hours to celebrate staff birthdays and will probably continue to do as we head into the Fall semester. It will come with its challenges,

but during this rollercoaster moment, we remain hopeful and committed to adapting seamlessly to the Department's needs. And we may take advantage of the time to learn new personal and professional skills and maybe take on the hobby that we have been putting off.

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We love to hear from you!

Let us know what you have been up to since leaving Rice by filling out our alumni form:

https://bit.ly/2Mezkwb

Giving to Chemistry

The global impact of Rice University is expanded and sustained by the accomplishments and support of its alumni and friends. The continued generosity of donors is paramount to the mission and goals of Rice Chemistry.

Graduate education and research are top priorities in the Department of Chemistry. Graduate student fellowships are of crucial importance to attract and sustain a strong body of doctoral students, an important component of our research programs. The department's research accomplishments would not be possible without the hard work of graduate students. Named endowment(s) for graduate student fellowships will complement and improve our chemistry graduate program, thereby contributing to educating and training the next generation of scientists to improve our healthcare, protect our environment, develop new and clean energy sources, and create the novel materials of the future—for all intents and purposes, for a better world.

We recommend that you give a donation to our Chemistry General Support Fund, which may be used for student support and other departmental needs. Please indicate your desired use. We also have several already established award and endowed funds to which you may make a specific donation. To learn more about our funds, please visit our website.

Your gift will tremendously help our research program in advancing science and in training new generations of educated specialists!

If you would like to know more about how you can support the Department of Chemistry please contact the Wiess School of Natural Sciences Director of Development Jackie Macha at jackie.macha@rice.edu or 713-348-4268.

https://riceconnect.rice.edu/donation/support-chemistry

The Department of Chemistry thanks you very much for your continued support!