LSU Department of Chemistry

NEWSLETTER

Fall 2018

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Message from the Chair

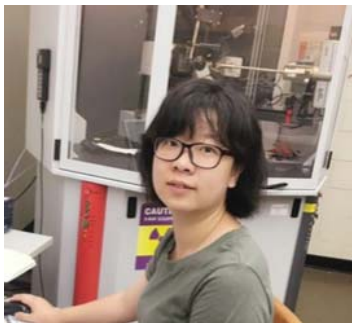
Professor Michael Cherry
Chair, Department of Chemistry

It is a distinct pleasure to be able to write this note for my first newsletter since becoming chair. I spent much of this past summer meeting individually with the faculty and learning from them about my new department. I very much appreciate the time they graciously spent with me and the information and insights they have provided, and especially appreciate the excellent work done over the past three years by Carol Taylor, the outgoing chair.

This is an impressive department with great potential, as evidenced by the many recent awards and accolades: The department has recently received notification of four new patents; in the past few months, faculty have received grants from the National Science Foundation, Department of Energy, National Institutes of Health, and Exxon-Mobil to fund their research and support our students; Graca Vicente and Zakiya Wilson-Kennedy on behalf of the Office of Strategic Initiatives have separately been honored by receiving the Presidential Award for Excellence in Science, Technology, and Mathematics Mentoring; Weiwei Xie has received the Beckman Foundation Young Investigator Award; Kevin Smith was named as the recipient of the 2018 Florida Award of the American Chemical Society; Andy Maverick was named a Fellow of the American Chemical Society; and Isiah Warner was named a Fellow of the National Academy of Inventors.

The faculty are beginning to work on a new Strategic Plan, asking ourselves: What are our Strengths, Opportunities, and Weaknesses? Where are the most promising areas for investment in the future? How do we best make the argument that an investment in LSU Chemistry is a valuable investment for the Department, the University, the State, and the Nation? The faculty will be debating these questions over the coming months. Input from our alumni, friends, and former colleagues will be appreciated. We look forward to hearing from you with both your comments and your news about yourself – and I look forward to meeting with any of you who are in Baton Rouge. Please stop by, and we will be happy to show you around Choppin Hall and the Chemistry and Materials Building and tell you about the new things that are happening in the department.

Weiwei Xie - 2018 Beckman Young Investigator



Assistant Professor Weiwei Xie

Assistant Professor Weiwei Xie has received a Beckman Young Investigator Award for her research project titled, "Chemistry Perspectives to Design New High Tc Superconductors." From the viewpoint of a chemist, she will design and construct novel superconductors. The grant is for $600,000 over a 4-year period. According to Dr Xie, "superconductors are the key materials for the next-generation of technologies."

The Beckman Young Investigator Award program provides research support to the most promising junior faculty members in the chemical and life sciences. In particular, the awards aim to foster the invention of methods, instruments and materials that will open up new avenues of research in science. In 2018, 10 awards were made, following an intense nationwide competition that included a research presentation and interview. The last LSU recipient of this honor was Professor Robert M. Strongin in 1998.

Through empirical chemical insights, theoretical calculations and experimental work, Dr Xie is in a strong position to predict the properties of intermetallics via rational design frameworks. The long-term goal of her research program is to identify the chemical influences on the physical properties of solid-state materials to build a bridge between solid state chemistry and materials physics. Prior to the Beckman Award, she also received funding from the Louisiana Board of Regents Research Competitiveness Subprogram (RCS) and seed funding from the Louisiana Consortium for Neutron Scattering (LaCNS), a DOE-funded initiative based at LSU. More recently, her ground-breaking research at the chemistry-physics interface was recognized by an EPSCoR RII Track-4 Fellowship from the NSF.

The Xie Group is currently composed of a postdoctoral fellow, two graduate students, visiting students from LSU Physics and Poland, with Dr Xie planning to recruit one or two new members on the strength of her recent funding successes. Their laboratories are housed on the 6th floor of Choppin Hall. A large part of the Beckman funds will be dedicated to the purchase of a Physical Property Management System (PPMS)® Dynacool™ manufactured by Quantum Design. This instrument measures electrical, transport, and magnetic measurements, with exquisite control of temperature and magnetic field.

Dr Xie has taught Chem4570 (Inorganic Chemistry) and Chem1201 (General Chemistry I). In 2017, she attended a 3-day summer institute, convened by LSU's Office of Academic Affairs, to strengthen participation in the Communication Across the Curriculum (CxC) program. Thus, Chem4570 is CxC-certified. Students describe Dr Xie as passionate, enthusiastic and helpful. She has also been actively involved in the ChemDemo and Upward Bound programs.

Dr Xie received a BS in Chemistry from Nankai University (China) in 2010 and a PhD in Chemistry from Iowa State University with Gordon J. Miller in 2014. As a post-doctoral associate, she worked with Professor Robert J. Cava, one of the world leaders in the materials science, at Princeton University. She joined the faculty of LSU's Department of Chemistry in Fall 2016, when she was featured in the newsletter in a New Faculty Focus.

2018 Benjamin P. Boussert Lecture

PROFESSOR ROBERT J. CAVA

Russell Wellman Moore Professor of Chemistry
Princeton University, Princeton, NJ

"Superconductivity: Where we are and where we are going"

Friday, October 5th, 3:30 pm
Life Sciences Annex Auditorium, LSA101

to be followed by a reception in the Benjamin P. Boussert Conference Room (CMB100)

Vicente, OSI Wins 2016 PAESMEM

Professor Graça Vicente, the Charles H. Barré Distinguished Professor of Chemistry, received an individual Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM) in a ceremony at the White House this past June. The PAESMEM award represents the highest honor bestowed upon mentors who work to expand STEM talent. In 2018, the White House announced 41 PAESMEM awardees from 2014, 2015 and 2016, of which 27 were individuals and 14 were organizations. LSU's Office of Strategic Initiatives, led by Boyd Professor Isiah Warner, received one of the awards for organizations. Research Associate Professor Zakiya Wilson-Kennedy (formerly OSI) accepted the award on behalf of OSI. All the awardees are considered leaders in the national effort to develop the nation's human resources in STEM.

In her research laboratories at LSU, Dr Vicente has mentored 44 undergraduate students, 30 graduate students and 7 post-doctoral students, the majority being women and under-represented students. Her research goals are centered on the synthesis and development of pyrrole-based materials for medical and biological applications. With her mentees, she has published over 180 scientific articles, 11 book chapters, and has been awarded 4 patents. Among her graduate students, 22 have graduated with PhDs, 4 obtained MS degrees, and 4 are currently in her research group. Among her undergraduate students, about half have gone to pursue MD or PhD degrees.

In 2007, Dr Vicente became the LSU program director for the Initiative for Maximizing Student Development (IMSD), which has provided research training, academic develo.pment, mentoring and career development to under-represented students in the sciences. In recent years, the program has expanded to support graduate students, with 4 students receiving LSU doctorates to-date. Data from the past decade demonstrates that IMSD has been effective in preparing these students for careers as biomedical researchers, and has increased their persistence towards the completion of doctoral degrees.

IMSD scholars at the 2018 Summer Undergraduate Research Forum (from left to right): Paris Taylor, Briasha Jones, Ashley Merriweather, Dr Vicente, Tanner Reed and Amy Turner

IMSD Fast Facts

https://sites01.lsu.edu/faculty/imsd/

Director:
Graça Vicente (2007-present)
Robert Strongin (2004-2007)

Co-PIs:
Isiah Warner
Marcia Newcomer

Manager/Counselor:
Gretchen Schneider

Students (over 13 years):

105 undergraguates

87 BS degrees

>50% entered graduate programs

8 PhDs to-date

4 at LSU

26 peer-reviewed publications

204 regional/national meeting presentations

Higher GPAs than LSU averages

New Patents Issued

Louis Haber (Associate Professor) and former graduate students **Tony Karam** (PhD '16) and **Holden Smith** (PhD '17) were recently awarded US 9,821,061 B2 for "Enhanced Plasmonic Nanoparticles for Cancer Therapy and Diagnostics."

Bob Hammer (former Professor, now Principal Scientist and Group Leader at Ra Pharmaceuticals in Cambridge, MA), along with William Hansel and Sita Aggarwal (Pennington) were awarded US 9,937,260 for "Circumin Conjugates for Teaching and Preventing Cancers."

Steve Soper (Professor Emeritus, now at the University of Kansas) and **Robin McCarley** (Alumni Professor), along with collaborators, were awarded US 9,909,173 for "Biomolecular Processing Platform and Uses Thereof."

Scattering Neutrons to Better Understand Materials

In 2018, Associate Professor Schneider has received funding from both the National Science Foundation (Division of Materials Research, DMR) and the Department of Energy. This would be a major coup for any faculty member, made all the more impressive because Gerald achieved this support within three years of becoming a faculty member in the USA.

His NSF-funded project, "Understanding the Impact of Confinement on the Dynamics of Entangled Chains" is concerned with modeling the molecular motion of nanoparticles in nanocomposites. Researchers in the Schneider Group will investigate modifications to the polymer chains that are grafted to the surface of the nanoparticles, manipulating their spatial distribution. Scattering experiments will be used to study the relationship between the topology of the polymer chains on the nanometer scale and the mechanical properties of the melt.

Associate Professor Gerald Schneider

The research that has attracted the attention of the DOE is focused on bottlebrush polymer melts. "Bottlebrushes" are comprised of linear chains with bonded arms; they derive their name from their microscopic analogy to brushes used to clean baby bottles. These polymers have unprecedented flexibility and can be as soft as a jellyfish, as brittle as glass, or as elastic as a car tire. Their meaningful application to designer materials demands a better understanding of how their microscopic structure and dynamics is translated into physical properties. Schneider will use neutron scattering as a "microscope" to provide valuable insights.

Both projects capitalize on Professor Schneider's expertise in neutron scattering. He was recruited to LSU to be a key member of the Louisiana Consortium for Neutron Scattering (LaCNS). He joined the faculty at LSU in August 2015. He received his Diploma in Physics from Bayreuth University and his PhD from Regensberg University, both in Germany. Prior to coming to LSU, Gerald was a Lecturer and Full Member of the Institute of Chemistry and Pharmacy at Münster University, where he received his Habilitation in 2013.

News In Brief

Gail E. Pryor, wife of Boyd Professor Emeritus Bill Pryor, and longtime friend of the Department of Chemistry, passed away on May 24th.

Effective August 15th, **Louis Haber** was promoted to Associate Professor with Tenure and **Donghui Zhang** became a Full Professor.

Andrew Maverick (Philip and Formaye West Professor of Chemistry and Associate Dean for Student Services in the College of Science) has been selected as a member of the 2018 Class of Fellows of the American Chemical Society.

Evgueni Nesterov (Professor) has left us to join Northern Illinois University where both he and his wife, Irina Nesterova, have tenure-track positions.

Jim Traynham (Professor Emeritus) will deliver a lecture at the American Chemical Society Southwest Regional Meeting, the afternoon of Friday, November 9th. The title of his talk is, "Mary L. Good: Career insights via an Oral History Interview." The SWRM is being held in Little Rock, AK, from 7-11 November (https://swrm.org/2018).

Robin L. McCarley (Barbara Womack Alumni Professor) is on secondment to the NSF, in Arlington, VA. He is a Program Director in the Division of Chemistry with responsibilities in both the Chemistry of Life Processes and the Chemical Measurement and Imaging programs. His appointment is for one year with the possibilility of renewal.

Benson Edagwa (Taylor Group, PhD '12) is an Assistant Professor at the University of Nebraska Medical Center. His research is affiliated with Professor Howard Gendelman and their project, "Chemical, Nanomedicine, and Autophagy Strategies to Create Sustained-Release Antiretroviral Products," was recently awarded R56 NIH funding and published in *Nature Communications* (**2018**, *9*, 1-14).

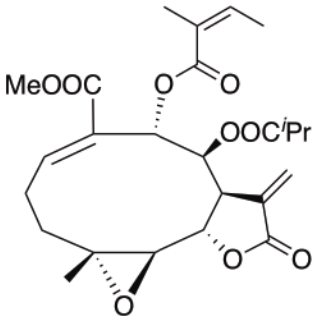
John Pojman (Professor) has appeared in episodes one and three of this season of "Strange Evidence" on the Science Channel. https://www.sciencechannel.com/tv-shows/strange-evidence/

Sesquiterpenes in the Seventies

An article in the *Journal of Organic Chemistry* (**1979**, *44*, 3400-3404) describes the isolation and characterization of the first sesquiterpene lactones from *Tetragonotheca repanda*, with an emphasis on NMR and MS data. The major constituent was repandin A. The *Tetragonotheca* family, commonly known as nerveray, belongs to the Compositae and the specimens were collected from Texas. The authors on the paper were Fred Seaman, Gary Juneau, Daniel DeFeo, Steven Jungk and Nikolaus Fischer of the Department of Chemistry at LSU. Former LSU graduate student, Gary Juneau, and Professor Emeritus Klaus Fischer have recently gotten back in touch as a result of the article.

Professor Emeritus Klaus Fischer

Klaus Fischer was born in a region of Germany that is now in Poland. His family was expelled from their homeland in 1946 and they resettled in West Germany. The young Fischer received two years' schooling as a technical chemist and then became a student at the University of Tübingen, from whence he received the equivalent of BS, MS and PhD degrees. He came to the USA as a postdoc at the University of Texas at Austin and joined the faculty at LSU in 1967. His research program was focused on the natural products chemistry of higher plants. He rose through the ranks to become the Charles Barré Distinguished Professor of Chemistry and retired from LSU in 1999. He served as President of the Phytochemical Society of North America (1995-96) and received, amongst other awards, the ACS' Charles E. Coates Memorial Award (1987) and an LSU Distinguished Faculty Award (1996). From 1999-2003 he served as Chair of the Department of Pharmacognosy at the University of Mississippi in Oxford, MS. Today, he lives in Denton, TX, with his wife Helga.



repandin A

Gary Juneau grew up in New Orleans and received his undergraduate degree from UNO. He worked as a waiter at the Roosevelt Hotel, where his father was the banquet manager. After some time in the military and a BS-level lab tech position, Gary was looking for more of a challenge and joined the PhD program at LSU. Throughout his graduate research, he was focused on NMR. He started out in the Bhacca Group, performing structure elucidation of alkaloids. He transferred to the Fischer Group where he studied terpenoid natural products, specifically sesquiterpene lactones. For 20 years following graduation from LSU, Gary held a number of positions at research institutes and in industry. In 1996 he was laid off by Staley (formerly Tate and Lyall). Disinterested in another job at the mercy of mergers and layoffs, and following a short business course, Gary purchased the NMR equipment from his former employers and started NMR Analysis and Consulting in Decateur, IL. He still enjoys the NMR and running the business today.

Tetragonotheca repanda

Reflecting on his time at LSU, Gary says, "I enjoyed working for Dr Fischer very much … I remember our baseball league." Of his former graduate student, Klaus Fischer says, "Gary was a hard-working and independent graduate researcher and a good and helpful group citizen." When asked to elaborate on the baseball league, Professor Emeritus Fischer confessed that, growing up in Germany, he had learned to play "Schlagball," a game in which the players run the bases in a clockwise manner. In the 1970s, the Department of Chemistry had a very competitive baseball team. As he stood on the sidelines on the Parade Ground, cheering the team on, Fischer was encouraged by George Sexton (team coach and Chemistry coordinator of instrumentation) to join in. Fischer hit the ball and ran, instinctively, to third base. He says, "People were rolling on the ground, they were laughing so hard." It was his first and last baseball game, but he understands why Juneau has a smile on his face as he remembers that game. More information on the lives and careers of Fischer and Juneau can be found on the LSU Chemistry website.

Gary Juneau processing NMR data in 2018

Organic Laboratory Innovations

Over the past 18 months we have made major strides in modernizing our undergraduate organic laboratory course. This rite of passage for premeds and science majors has faced challenges, including low faculty numbers in organic chemistry, the demise of instrumentation and the growing number of students waiting to take the class (we have capacity for 340 students each semester). In Fall 2017, a significant component of Senior Instructor Tamara Nauman's teaching assignment was to rewrite the laboratory manual and look at the online delivery of resources. We surveyed various stakeholders (faculty, students, TAs) and sought information from other Southeastern schools about how their organic lab operates in the 21st century. In Spring 2018, Associate Professor Rendy Kartika taught the Honors section of the course and this was an opportunity for him to try some new experiments. Dr Tyrslai Williams (PhD '17, Vicente Group) worked with TAs to produce videos of experimental techniques (*e.g.*, melting point determinations, setting up glassware for a distillation).

Other faculty involved in the revisions are Drs Alfonso Davila and Fedra Leonik, regular teachers of the lab course, Dr Linda Allen (Director of Undergraduate Laboratories) and Dr Carol Taylor (then-Chair and part-time Organic Chemist). We looked carefully at the existing experiments and the relevance of the reactions and techniques that they taught. Students naturally enjoyed experiments where they could see the relevance to medicine or everyday life, *e.g.*, the 3-step synthesis of lidocaine. When students perform reactions with their own hands, they gain deeper understanding and appreciation for such mechanistic moguls as the Diels-Alder, aldol and Grignard reactions. Nauman expanded an existing synthesis of azo-red dye, so that the class now produces a library of dyes and investigates their properties on a multifiber test fabric. Other experiments investigated included the isolation of caffeine from tea, the stereoselective reduction of benzoin and the TLC of analgesics.

Sunset during evening organic lab from Williams Hall 3rd floor. Photo credits: Rendy Kartika

Dr Kartika wrote a successful proposal to the Student Technology Fee Fund that provided three benchtop NMR spectrometers. The Department was able to purchase two basic IR spectrometers and one GC. In Fall 2018, we will be submitting a targeted education proposal to the LA Board of Regents' Enhancement Fund to acquire the remaining equipment needed for our students to get hands-on experience with the instrumentation they are likely to encounter in the workplace. With Dr Kartika's involvement in the lab course, we have been able to add an extra section of lab this Fall, specifically for Chemistry majors, on Monday and Wednesday evenings. In an evaluation of the Spring Chem2463 Honors lab, one student wrote, "You guys made a course that everyone dreads to something I looked forward to going to everyday," and another said, "I loved the lab and it was my favorite lab ever taken." While the evolution continues, it seems we are on the right track!

Benchtop NMR spectrometers

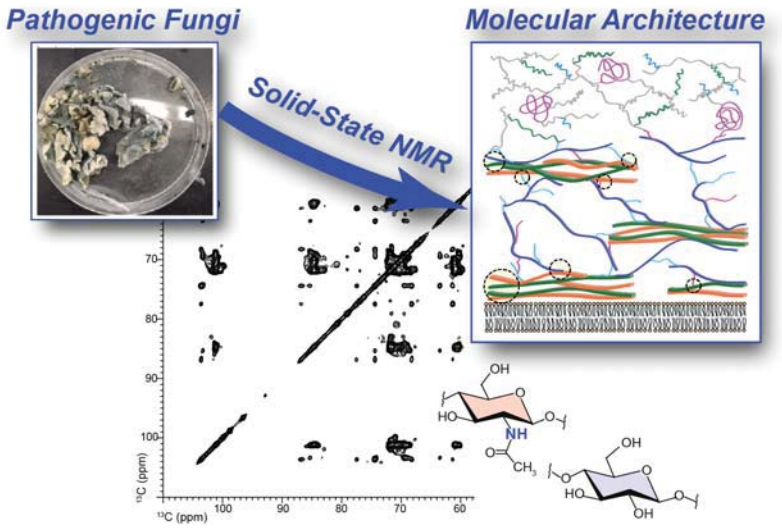
Students engrossed in their Grignard reaction

Wang Group Uncovers Secrets of the Fungal Cell Wall

The current repertoire of antifungal agents, their poor efficacy, and the high mortality rate of invasive fungal infections necessitate the development of new drugs. The fungal cell wall is a promising target as it contains polysaccharides that are absent in humans. Unfortunately, our limited understanding of the cell wall structure has impeded this endeavor.

Assistant Professor Tuo Wang

To address this issue, Dr Tuo Wang's Laboratory has been developing dynamic nuclear polarization (DNP) solid-state NMR methods to elucidate the structure of intact and native fungal cell walls, in collaboration with Dr Ping Wang of the Department of Microbiology, Immunology and Parasitology at the LSU Health Sciences Center In New Orleans. Wang and Wang recently received funding from the Louisiana Biomedical Collaborative Research Program (LBCRP) for their project titled "Solid-State NMR Studies of the Dynamic Structure of *Aspergillus fumigatus* Cell Walls."



The LSU Baton Rouge team is led by Dr Tuo Wang and includes postdoctoral researcher Dr Xue Kang, two graduate students, Alex Kirui and Malitha Dickwella Widanage, plus an undergraduate, Adrian Chen. Group members have traveled to collect data at the National High Magnetic Field Laboratory in Tallahassee, FL; they will continue to do so as part of the EPSCOR Track IV program. Analyses of sugars have been conducted at the Complex Carbohydrate Research Center in Athens, GA.

Wang's findings were recently published in *Nature Communications* (**2018**, *9*, 2747) The study revealed the high-resolution architecture of the cell wall in a pathogenic fungus and has substantially revised our existing knowledge of *Aspergillus fumigatus*. These experiments lay the foundation for further evaluation of intact cells with molecular resolution. Moreover, the methods can be adapted to assess the impact of bound antifungal agents, providing the basis for drug development.

New Research Funding

Associate Professor **Gerald Schneider** has received funding from the DOE for his project titled "Fundamental Understanding of Bottlebrush Polymer Melts and Networks and Manipulation due to Dynamic Asymmetry" (see article on p. 4)

Associate Professor **Rendy Kartika** has received an R01 grant from the NIH titled, "New Synthetic Chemistries Enabled by Oxyallyl and 2-Aminoallyl Cations," that will support his work in this area for 5 years.

Assistant Professors **Tuo Wang** and **Weiwei Xie** have each received an RII Track 4 EPSCoR (Established Program to Stimulate Competitive Research) grant from the NSF. These research fellowships are for non-tenured investigators to further develop their research potential through visits to premier governmental and academic research centers. Wang will collaborate with Timothy Cross (Florida State and the National High Magnetic Field Laboratory, NHMFL) on his project, "Elucidating the Structure and Interactions of Complex Carbohydrates in Fungal and Plant Cell Walls via Dynamic Nuclear Polarization Solid-State NMR" (see article above). Xie will work closely with David Mandrus and Huibo Cao at Oak Ridge National Laboratory (ORNL); and the University of Tennessee at Knoxville. The project, "Investigation into Structure-Magnetism Correlations in 4d/5d Transition Metal Halides Using Combined X-ray and Neutron Diffraction Techniques," will further strengthen ties between LSU and ORNL (see article about Dr Xie on p. 2).

Research Assistant Professor **Lavrent Khachatrayan** has renewed his NSF grant with the Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET). The project, titled, "Oligomers vs. Phenolics from Hydrolytic Lignin Pyrolysis" has been funded for 3 more years.

A significant measure of a great university is the support it receives from its alumni. Join us as we work on the leading edge of discovery and innovation to educate the next generation of scientists. If you would like to support LSU Chemistry, regardless of the amount, we would be most appreciative. All donations are tax deductible and qualify for Tiger Athletic Foundation (TAF) points.

To make your gift online, go to www.lsufoundation.org/givetoscience . Click 'Designations' and choose 'Chemistry Development Fund'. To send your gift by mail, make your check payable to "LSU Foundation," note "Chemistry Development Fund" on the memo line and mail yourcheck to: LSU Foundation, 3796 NIcholson Drive, Baton Rouge, LA 70802

LSU Chemistry 1897

Professor Charles E. Coates surrounded by his students
(Courtesy of LSU Archives and Charles H. Coates)

Message from Carol

Professor Carol Taylor I would like to express my gratitude to the alumni and friends who support the Department newsletter, events and the Chemistry Development Fund. Thanks to those who have shared their stories through alumni profiles; keep them coming! It was a pleasure to serve you as Chair for the past three years. In the year to come, I will continue to contribute to these newsletters. In December 2019, I will retire from LSU, after 13.5 years and more than 25 years as a chemistry professor. I will return to New Zealand to address that "life-work balance" that I've heard about.