Message from the Chair

Dear Students, Alumni and Friends,

In the same year as the 50th anniversary of the first moon landing (Apollo 11 mission), I welcome everyone back to a brand new academic year!

I am very pleased to welcome Distinguished Research Professor Abbas Firoozabadi (NAE) and Research Professor Glen C. Irvin Jr., who bring decades of experience in the areas of energy and materials to our Department. Dr. Dilip Asthagiri received a promotion to Associate Research Professor, reflecting his well-regarded achievements in chemical and biological physics, as applied to energy and and biomolecular engineering problems. In addition, we welcomed faculty from other Departments as joint members in the past year: Pedro Alvarez (CEVE Dept, NAE); Christy Landes (CHEM Dept); Joff Silberg (BIOS Dept); and Junghae Suh (BIOE Dept). We also welcome Maria Salgado and Angie Smith as new staff members.

At the 106th Commencement Ceremony this past May, 53 BS/BA, 10 MCHE/MS, and 20 PhD degree holders received their hard-earned degrees. Females make up ~43% of our advanced degree holders and ~30% of our bachelor degrees awarded. Eight graduating CHBE’s were inducted into Phi Beta Kappa (ΦBK), which honors “outstanding achievement in the liberal arts and sciences, in courses that reflect a breadth of intellectual interest and a love of learning for its own sake”, by far the most number from any Engineering Department. Well-rounded indeed!

The Riki Kobayashi Award honors the best thesis proposal from among the second-year PhD students. Following the presentations made in spring and summer 2018, the committee this past year named Jordan Shivers as the award recipient for his thesis “mechanics of semiflexible polymer network materials”. Jordan is advised by Prof. Fred MacKintosh. Congratulations Jordan! This year, the department will institute a new graduate student award. The Sunit Patel ’85 Endowed Fellowship will be awarded based on research accomplishments in pursuit of the PhD, nominally after their third year in residence.

My faculty and I were delighted to host prominent visitors as recipients of our department’s named Lectureships: Paul Nealey from U. Chicago (Leland Lecture), Chaitin Khosla from Stanford (Wilbur Lecture) and Ed Emmett, former Harris County judge (Chevron Lecture on Energy). These Lectureships bring prominent leaders to speak on topics of general importance to the chemical engineering community and to the general public.

Finally, I am extra happy to announce that the new CHBE Undergraduate Teaching Laboratory is open for business this fall! Located in Keck Hall (Room 108), the CHBE UG Lab is ~50% larger than our former space in Abercrombie Lab. It has new instrumentation, facilities, and equipment for our lab courses CHBE 343 and 443, which allows new pedagogy to be used for the first time. The juniors and seniors have ample opportunities to learn chemical engineering concepts important not only in the chemical industry, but also in the areas of materials & nanotechnology, biomolecular engineering, and energy & sustainability. All the best for a super year!

Michael S. Wong
Department Chair
August 2019
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Covid-19 Update

Rice University decisions regarding COVID-19 are guided by the following four priorities:

• Protect the health, safety and wellbeing of every member of our community, and contribute to the local and national efforts to reduce the spread of this deadly virus.

• Base our decisions on health guidance from an authoritative scientific source - the Centers for Disease Control and Prevention.

• Continue carrying out our academic mission as best as possible given the circumstances.

• Take actions that are consistent with our Rice values of responsibility, integrity, community, and excellence.

For more information on Rice’s policies and actions relating to events on campus, undergraduate and graduate students, research activities and more, find some useful links below:

• Live Updates regarding Coronavirus and Rice
• School of Engineering
• Research Policy
• Undergraduate and Graduate Student resources
New Faculty: Dr. Gerald McGlamery
DR. ABBAS Firoozabadi
DR. Glen C. Irvin, Jr.

By Karen Shelton

New Faculty Join ChBE

The ChBE department welcomed three new, non-tenure track faculty members in 2019. These faculty members enhance our ability to deliver world-class research and high quality undergraduate learning experiences.

Professor Gerald (Gerry) McGlamery joined the department for the spring 2019 semester, co-teaching senior design as well as offering a new undergraduate elective Decision Tools for Chemical Engineers. He taught the new course again in fall 2019, while adding a graduate-level version and a second new elective course, Industrial Chemical Processes. Following in the footsteps of his father who also was a chemical engineer (and whose college classmate was none other than astronaut Ken Mattingly), Dr. McGlamery earned his BChE at Auburn University in 1984 and his PhD at the University of Texas at Austin in 1988, under advisor Jim Fair. He joined Exxon Chemical in Baton Rouge, Louisiana following graduation, and then transferred to Houston in 1998 where he remained with Exxon and ExxonMobil for thirty years. He retired in 2018 as a Senior Advisor in Global Chemical Research. During this time, he added an MBA from Auburn in 2001, and met and married his wife who also once worked at Rice in the Development Office. Their family includes one middle-school aged daughter, and together they enjoy traveling, which usually involves getting out into nature. During family trips, where hiking is a frequent activity, Dr. McGlamery indulges in his photography hobby, taking many pictures of nature and aviation, his favorite subjects. Be sure to visit his website photography.mcglamery.com to see his work. Dr. McGlamery tells of one interesting experience he had while traveling – running into Gene Kranz, also of NASA fame, while waiting for a flight in the United Club lounge. He relates: “like a star-struck kid, I went over and introduced myself to Gene, who was very gracious, and we ended up having about a 45-minute conversation.” From the earliest days of his career at ExxonMobil, Dr. McGlamery found he enjoyed mentoring younger engineers, and from that point “started thinking about teaching after retirement.” When he was introduced to ChBE Chair Mike Wong, he found his opportunity. So far, things have gone well and he is looking forward to a continued association with Rice ChBE.

Research Professors at Rice are self-funded through projects they are able to secure through proposals to federal agencies, industry partners, and foundations. Dr. Abbas Firoozabadi joined the department as a Distinguished Research Professor in May 2019, after securing a research contract from ExxonMobil. His co-investigators on the project are Professor Emeritus George Hirasaki and Department Chair Mike Wong. Originally from Iran, Dr. Firoozabadi earned his PhD in 1975 in Gas Engineering from the Institute of Gas Technology, Illinois Institute of Technology in Chicago, followed by post-doctoral research at the University of Michigan, Ann Arbor. Since then, his career has taken him across the world, and he has taught at many universities including Abadan Institute of Technology in Iran, the University of Texas-Austin, Imperial College London, Yale University, Tokyo University, and Peking University, as well as at Rice University. In 1990, he founded the Reservoir Engineering Research Institute (RERI) in Palo Alto California, where he remains the Director and Senior Scientist. RERI is a research consortium with funding from the U.S. DOE as well as numerous U.S. and international energy companies. In his leisure time, Dr. Firoozabadi enjoys playing the piano and gardening. At his Southern California residence, he has 15 different types of fruit trees; his favorites being Persian mulberry and pomegranate. Although he has since traveled the world, his most interesting experience remains his first trip to Japan in 1986, where he stayed for a month. This may explain why his favorite food is Japanese cuisine! Dr. Firoozabadi is passionate about “working with bright minds” and the learning that takes place with those interactions. He is excited to bring his research and teaching to Rice University.

Also joining the ChBE Research Professor ranks is Dr. Glen C. Irvin Jr., who started at Rice in March 2019 as a co-Investigator on the APRA-E funded Methane Pyrolysis Project and related research activities. Dr. Irvin earned his BSChE in 1995 from the University of Illinois Urbana-Champaign, followed by a PhD from Tulane University in 1999 under the direction of Dr. Vijay John. Following on his PhD experience, his nanotechnology career began at Eastman Kodak where for eight years he worked as a Project Leader, an Advanced Manufacturing Team Lead, and a Principal Research Engineer. In 2007, he joined Unidym, Inc. in Sunnyvale, California, as Vice President-Products; then in 2009 moved to Shocking Technologies in San Jose California as Vice President of Operations where he designed and built a state of the art specialty manufacturing plant to produce 250M+ mobile components annually. He returned to Unidym in 2012 as President and Chief Operating Officer, where he was “responsible for the transparent, conductive inks and films businesses, global operations including manufacturing, supply chain, product development and business interface with customers and partners worldwide.” In 2015, Glen began his consulting firm, Irvin Global Industries, through which he has helped clients design and deploy Advanced Nanomaterials Fabrication Systems and develop strategies for new products and processes.

These professors bring a wealth of industry and teaching experiences for our students, and we look forward to collaborating with them in the years to come.

Welcome to Rice and ChBE!
William W. Akers Design Competition 2019 Winners

It Takes Guts by Hannah Campo

Each ChBE senior design team in the class of 2019 completed a unique project leveraging cutting-edge intensification techniques to address pressing environmental concerns. The proposed processes handled everything from animal manure to hurricane debris, and produced green fuel alternatives, potable water, and other sustainable and in-demand products.

The It Takes Guts team built our project around an especially shocking feedstock - porcine offal. Although macabre to think about, slaughterhouse waste is organically rich and energy dense, making it an optimal starting point for the production of fuels. Using wasted animal products in an industrial process like ours makes environmental sense too.

When offal is not converted into useful products, it is most commonly landfilled or burned. Landfilling presents dangerous opportunities for pathogens to multiply and spread and anaerobic decomposition which produces significant amounts of greenhouse gases like methane, while burning wastefully produces CO2.

Our process combined an upstream process for solid protein recovery through water evaporation and lipid clarification with a downstream lipid/methanol transesterification to produce fatty-acid-methyl-esters (FAMEs, or biodiesel), and glycerol. The isolated solid proteins were saleable as bone and blood meals - organic fertilizers which displace ammonia-laden (and thus energy expensive and environmentally damaging) synthetic analogs. Because FAMEs burn significantly more cleanly than conventional fuels, our plant’s 24.8 kTon/yr biodiesel output promised to reduce CO2 production by 87.7M pounds annually. By producing commercial grade glycerol, we ensured that our plant produced almost no waste.

What little waste that was produced was stored on site for back-up power production - necessary only because on a normal day our plant ran on nothing but the wind. Four industrial scale windmills powered our process, and the entire process leveraged heat integration and mechanical vapor recompression to minimize overall power consumption.

In addition to heat integration and mechanical vapor recompression, our team leveraged a number of other intensification techniques to make our process greener, safer, and more cost effective. We used in-line rotor stator mixers and a centrifuge to achieve better mixing and separation respectively, and thus meet the needs of our highly viscous streams. At the same time, these units eliminated the use of large mixing or settling tanks, decreased floor-space requirements and reducing the size of vessels containing flammable liquids, made the plant safer overall. Perhaps most impressively, the process used a cheap calcium carbonate catalyst and an ultrasonic probe to achieve industrial-scale transesterification in a 77 gallon reactor.

Bringing our project to life would cost approximately $90M. Despite requiring high capital outlays, the process yields a net present value of $9.9M, and generates a profit throughout the facility’s projected life cycle. Ultimately, we are most proud that our project meets the mission we crafted: a commitment to use everything but the squeal to protect human and animal health, promote sustainable agriculture, prevent environmental degradation, and provide for the plant’s surrounding community.
The 2019 Chevron Lecture on Energy was held in March 2019 and featured Edward M. Emmett, Professor in the Practice and Senior Fellow in the Kinder Institute for Urban Research at Rice University. This event was hosted by the department with significant planning and coordination by CHBE alumni, students and faculty and made possible by Chevron’s sponsorship. Ed Emmett is well-known for his time as Harris County Judge, an elected position he held from 2007 through the beginning of 2019. As County Judge, Emmett was the highest executive officer of the county and was the Director of Homeland Security and Emergency Management for the county, a role which established him as a national leader in emergency response and community resilience. A member of the Texas House of Representatives from 1979 to 1987, Emmett was chairman of the Committee on Energy, a member of the Transportation Committee, and represented the state on numerous national committees relating to energy and transportation policy. Judge Emmett has received international recognition for his work in transportation and logistics policy. He graduated from Rice University in 1971 with a Bachelor of Arts degree in Economics and from the University of Texas at Austin in 1974 with a Master of Public Affairs degree.

Judge Emmett spoke on some of the unique challenges for Harris County, the largest county in Texas and third largest county in the United States by population. The city of Houston, often considered the “energy capitol of the world,” lies mostly in Harris County and serves as the county seat. The relationship between the city and county, as both grew over the years, has led to some challenges, especially as related to flood control, a crucial concern for the county as made clear by Hurricane Harvey. Beginning in the 1960s, the City of Houston embarked on a plan of annexing strips along the major highways all the way to the county line in order to have orderly annexations in the future. However, the city only annexed certain parcels such as Clear Lake City and Kingwood, leaving the rest of the county in the extra-territorial jurisdiction of Houston, but not actually in the city. This contributed, along with other factors, to Harris County having a large urban population not located within the city limits of Houston or any other city. In fact, by 2019, Harris County had a population of almost 2 million in unincorporated areas, the most in any county in the country. This number is expected to exceed the population of Houston sometime in 2020. Because county governments in Texas do not have the same regulatory tools that a city does, this limits some of the options for dealing with issues such as flooding in unincorporated areas of the county, requiring innovative and collaborative solutions.
The audience was invited to a post-lecture networking event.

A pre-lecture reception attracted many alumni and faculty.

Chevron Lecture host Walter Chapman with speaker Ed Emmett and department chair Mike Wong.

Francisco "Paco" Vargas talking with ChBE Ph.D. students.
2019 AIChE Annual Meeting
Orlando, Florida

ChBE PhD students with Prof. Ken Cox at recruitment fair

Professors Lisa Biswal and Mike Wong met up with former students

Walter Chapman and colleagues enjoying the Sunday night reception

Former student Dr. Nate Lin with current student Roy Mei and Zhongyue Yang of MIT

WHERE ARE THEY NOW

Here are some updates from Rice ChBEs who are celebrating 10-year graduation milestones. If you graduated in the Class of 2010, please send an update to RiceChBEAlumSecretary@gmail.com for next year’s newsletter!

Clint Rendall
AAdi Home Health & Hospice
President
Corpus Christi, TX
Significant Assignments/Accomplishments:
Spent 7 years in the liquefied natural gas industry with ConocoPhillips, including two assignments in Australia. Used lots of my ChBE coursework during this time! Then attended MIT’s Leaders for Global Operations program, graduating in 2018 with an MBA and MS in Mechanical Engineering (the dark side). During this time, I spent about 7 months working in Amgen’s biomanufacturing division. After graduating, I formed a search fund to identify and acquire a privately-held small company, and successfully completed the acquisition in October 2019. Improving a company is really just a different form of process engineering - people have systems and processes just like chemicals.
Notable Qualifications, Certifications, etc.
Attained: Professional Engineer in Texas, USA and Queensland, Australia Project Management Professional (PMP) credential. MBA and MS in Mechanical Engineering, MIT - 2018
Fun Information You Want to Share: Happily married to Margeux Rendall (also Rice ’09 but not a ChBE) for 10 years. We have three children, Gavin (5), Adelaide (3), and Coralie (5 months). We used to do lots of fishing, sailing, and camping, but now we go to soccer, ballet, and kickball for the kids. We love South Texas!

Robert Wydra
Boston Scientific
Senior R&D Engineer
Minneapolis, MN
Significant Assignments/Accomplishments: helped launch the Eluvia Drug-Eluting Stent in 2018
Notable Qualifications, Certifications, etc.
Attained: PhD University of Kentucky

Sriram Chandrasekhar
Chevron
EOR Consultant
Houston
Significant Assignments/Accomplishments:
Surface science research lead
Notable Qualifications, Certifications, etc.
Attained: PhD from University of Texas-Austin
Fun Information You Want to Share: Visited Svalbard to study geology & dipped in the Arctic

Jung-Joon Kim
Samsung SDI
Staff Engineer
Suwon, Korea
Notable Qualifications, Certifications, etc. Attained: Ph.D. in Chemical Engineering (Electrochemistry)

Sam Banon
Gauge Capital
Vice President
Dallas, TX
Significant Assignments/Accomplishments: Married in 2019;
Earned MBA from Stanford in 2016
Notable Qualifications, Certifications, etc. Attained: MBA, Stanford - 2016
Fun Information You Want to Share: Still a Rockets and Texans fan!

Rob Wydra with dog Luna
To our Rice ChBE Alumni – We have two email distribution lists – one for the greater Houston region and one for everywhere else – to keep you in the loop on the following Rice ChBE alumni activities:

1. Major ChBE alumni events such as Fall Networking and the Spring Energy Lecture;
2. Short-term mentoring support needs; and,
3. The e-version of this newsletter.

We are working with the university to transition to using the official Rice University Alumni directory for all contact info and contact preferences. We will provide an update when we officially move to the new system, but in the meantime, for all alumni, please ensure your contact info is up-to-date in your profile within your Rice Portal (alumni.rice.edu/connect). If you have any questions or concerns, please send them to:

RiceCHBEAlumSecretary@gmail.com

Many thanks from the Alumni Advisory Committee!

Help Us Keep You in the Know!

Alec Walker
MBL Industries -- a clean tech completions fluid treatment company, and Delfin -- a natural language processing company.
Houston, TX
Significant Assignments/Accomplishments: Following graduation, traveled to Nigeria and North Korea with help from Rice for 3 months to engage in journalism projects. Following that joined Shell for 3.5 years, moving from technical service engineering to software product management and then to reservoir engineering. After earning my MBA at Stanford I started a consulting company to assist multinationals to develop internal entrepreneurship programs. Returned to Houston at the end of 2017.
Notable Qualifications, Certifications, etc. Attained: MBA, Stanford

Kevin Daly
ExxonMobil Research and Engineering
Senior Engineer, Reactor Engineering & Mixing Group
New Jersey
Notable Qualifications, Certifications, etc. Attained: PhD
Sibani Lisa Biswal
Professor, Chemical & Biomolecular Engineering, Materials Science & NanoEngineering; Ph.D. Stanford, 2004
Interactions of colloidal particles with solid and liquid media, interfacial behavior of biomolecules.

Walter G. Chapman
W. W. Albers Professor, Chemical & Biomolecular Engineering; Ph.D. Cornell, 1988
Thermodynamics, statistical mechanics, polymer solutions, surface fluid interactions, molecular simulations, gas hydrates, waxes and asphaltenes.

Kenneth R. Cox
Director, Undergraduate Studies; Professor in the Practice, Chemical & Biomolecular Engineering; Ph.D. Illinois, 1979
Product and process design, phase equilibria for advanced separations design.

Xue Sherry Gao
T. N. Law Assistant Professor, Chemical & Biomolecular Engineering; Ph.D. University of California, 2013
The interface of chemical biology and biomolecular engineering with primary focus on small- and macro-molecule discovery and their applications to human health, agriculture, and energy.

Frederick C. MacKintosh
Abercrombie Professor of Chemical & Biomolecular Engineering, Professor, Chemistry, Physics & Astronomy; Ph.D. Princeton, 1989
Fundamental material properties of biological and soft matter networks.

Amanda Marciel
William Marsh Rice Trustee Assistant Professor Chemical & Biomolecular Engineering, Ph.D University of Illinois at Urbana-Champaign, 2015
Effects of polymer sequence and architecture on polymer properties.

Aditya Mohite
William Marsh Rice Trustee Associate Professor Chemical & Biomolecular Engineering, Ph.D. University of Louisville, 2007.
Photo-physical processes occurring at the interfaces created with layered 2D materials, organic and inorganic materials for thin film light to energy conversion technologies.

Matteo Pasquali
Professor, Chemical & Biomolecular Engineering, Chemistry Department Chair; Ph.D. Minnesota, 1999
Micro- and nano-structured liquids, carbon nanotubes, free surface flows, computational modeling of processing flows.

Marc A. Robert
Professor, Chemical & Biomolecular Engineering; Ph.D. Swiss Federal Institute of Technology, Lausanne, 1980
Thermodynamics, interfacial phenomena, thin films, random media.

Thomas Senftle
Assistant Professor, Chemical and Biomolecular Engineering; Ph.D. Penn State, 2015
Development and application of computational modeling tools for assessing complex, multi-component catalysts at both the electronic and atomistic level.

Francisco Vargas
Assistant Professor, Chemical & Biomolecular Engineering; Ph.D. Rice University, 2010
Phase behavior and flow assurance.

Rafael Verduzco
Associate Professor, Chemical & Biomolecular Engineering, Materials Science & NanoEngineering; Ph.D. California Institute of Technology, 2007
Polymer design and synthesis, organic electronics, liquid crystals, and polymer self-assembly.
Michael S. Wong
Department Chair and Professor, Chemical & Biomolecular Engineering, Chemistry, Materials Science & NanoEngineering, Civil & Environmental Engineering; Ph.D. MIT, 2000
Catalysis, quantum dots, hollow microspheres, materials chemistry, green chemistry, nanotechnology.

Haotian Wang
William Marsh Rice Trustee Assistant Professor Chemical & Biomolecular Engineering, Ph.D. Stanford University, 2016.
Exploring highly efficient catalysts for important renewable energy applications.

Kyriacos Zygourakis
A. J. Hartsook Professor, Chemical & Biomolecular Engineering, Bioengineering; Ph.D. Minnesota, 1981
Cellular and tissue engineering, chemical reaction engineering, biocr for soil amendment, energy and sustainability.

Research Professors

Dilip Asthagiri
Associate Research Professor of Chemical & Biomolecular Engineering; Ph.D. University of Delaware, 1999
Statistical physics of soft matter and liquids, especially theory and modeling of aqueous phase physics and chemistry.

Abbas Firoozabadi
Distinguished Research Professor of Chemical & Biomolecular Engineering; Ph.D. Illinois Institute of Technology, 1975
Hydrocarbon energy production from conventional and unconventional subsurface formations and the stewardship of the environment.

George J. Hirasaki
A. J. Hartsook Professor Emeritus of Chemical & Biomolecular Engineering, Research Professor; Ph.D. Rice, 1967
Foams and emulsions, aquifer remediation, NMR measured transport properties of fluids and rocks, enhanced oil recovery, gas hydrates and carbon capture.

Glen Irvin, Jr.
Research Professor of Chemical & Biomolecular Engineering; Ph.D., Tulane University, 1999