

▲ From Left: Professor John Kuhn, T2C COO and alum Devin Walker, Professor Babu Joseph, and Post-doc Xianhui "Andy" Zhao.

## TWO DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING FACULTY HONORED WITH 2018 USF EXCELLENCE IN INNOVATION AWARD

Professors Babu Joseph and John Kuhn were lauded for their efforts to advance their startup company, T2C-Energy LLC, which was awarded a U.S. Department of Energy Phase II SBIR grant in 2017 to convert landfill gas to liquid hydrocarbon fuels. This grant followed a successful DOE Phase I award and private investments. The patent for this conversion process was published in 2017. Last year, Professors Joseph and Kuhn were invited to deliver several talks at energy and waste conferences on this subject, and co-authored several peer-reviewed journal articles and a book chapter. Professor Kuhn was funded to participate in the National Science Foundation's I-CORPS program in 2017 and Professor Joseph was named a Fulbright Scholar at IIT/Bombay in 2017.



# A MESSAGE FROM THE CHAIR

Let me start by saying that it is a tremendously exciting time for USF, our College of Engineering, our department, and our faculty, staff, and students. Having myself joined USF as Department Chair for Chemical and Biomedical Engineering now a little more than a year ago, I can honestly say that the progress we have made in just the past year has been astounding and I have been thrilled to play a small role in those developments. I also want to say that our faculty, staff, and students can be awfully proud of all of their hard work and the results we have achieved. While I spent almost 20 years at Georgia Tech and appreciate the role and contributions that such large and long established engineering programs make, I am proud to say that here at USF and in our department we have rapidly grown to be a force to be reckoned with both nationally and internationally and we are setting our goals even higher.

As many of you may know, USF was this past year named a **Preeminent State Research University**, joining the University of Florida and Florida State University in being recognized as premier academic institutions in the State of Florida. This new designation will bring additional resources to the university that will continue to propel USF forward in its pursuit of excellence. The College of Engineering and our department have and continue to play a major role in that university success. Also, USF is in the middle of consolidating the three previously separately accredited USF campuses in Tampa, St. Petersburg, and Sarasota/Manatee into one single accredited university. This consolidation will result in a single university serving approximately 52,000 students. That will make USF one of the 10 largest universities in the country and continue to help raise the visibility of the university on the local,



national, and international stage. At the College of Engineering level, the College of Engineering continues to grow and now enrolls more than 7,000 students. There are too many exciting developments within the College to go into detail on all of them, but I will take a minute to highlight a few. The College has launched the new **USF Institute of Applied Engineering** that is poised to provide a more flexible and direct route for establishing research relationships and contracts with both industry and federal agencies. The College has also this year launched the new Academy of Distinguished Engineering Educators

(ADE2) whose goal it is to both recognize faculty who are making exceptional contributions to the College's mission of providing excellent educational experiences to our students and to leverage those best practices to improve student education across the College. Finally, in a major impact to our students, the College of Engineering with the assistance of our departments and faculty have completely reimagined the freshman engineering experience to engage our students in a new and significant way when they first arrive on campus. We will follow up with stories on some of these topics in future newsletters.

Within our department, there is also no shortage of amazing developments over the past year. Certainly one exciting development has been the **addition of two new faculty** to our department at the beginning of the Fall 2018 semester. Professor Ramon Gonzalez, who most recently was a faculty member in the Department of Chemical and Biomolecular Engineering at Rice University, has joined our department as a State of Florida 21st Century World Class Scholar. Professor Gonzalez and his research group are focused on metabolic engineering and thus harness the power of biology and microorganisms to produce useful chemicals and fuels in new and exciting

ways. Professor David Simmons, who most recently was a faculty member in the Department of Polymer Engineering at the University of Akron, has joined our department as an Associate Professor and a recent National Science Foundation CAREER Award winner. Professor Simmons and his research group are focused on areas related to computational materials science and polymer engineering and work to apply chemical engineering, molecular modeling, and polymer science principles to provide solutions to a wide range of challenges in areas including energy, materials, and chemical processing. That brings our full-time faculty in the department up to 20 faculty. Going forward this year, our department has already begun its search for additional junior and senior faculty to join us in the coming year and to continue on our very dynamic growth. This past year has also seen a number of our faculty receive **awards recognizing their outstanding work and contributions** including several faculty being named Fellows of major professional societies including the American Institute of Chemical Engineers, the American Association for the Advancement of Science, and the American Institute for Medical and Biological Engineering. Impactful research by our faculty and students continues to be well funded, with major new grants recently from both private and federal agencies and through collaborations with industrial sponsors. With the continued success of extramural research funding and the addition of new faculty, we look forward to the continued growth of our

graduate and research programs. To enable that growth, our department is continuing **to expand its laboratory research space footprint** significantly with the assistance of the College of Engineering and the university to identify and renovate or build new space as we add new faculty to the department. These state-of-the-art research laboratories, spaces, and the corresponding equipment and capabilities this ongoing expansion provides will continue to give our faculty and students the resources they need to be leaders in a variety of fields relevant to chemical and biomedical engineering. We hope this newsletter gives you a small glimpse of the many wonderful things happening in the department, and I encourage all of you to stay in contact with us and come visit us if you haven't been with us in some time. I think you will be pleasantly surprised and impressed with all of the recent progress and hope you share our excitement about the many terrific things to come in the near future.

We will continue to keep you updated on the news and developments within the department in upcoming issues of "The Column" and we hope you enjoy this issue. If you have news and announcements or stories you think we should know and include in the newsletter, please contact us. We love to hear about exciting developments with all of our alumni and friends and look forward to seeing many of you on campus or out in the community in the near future.

**GO BULLS!!**

**Clifford L. Henderson**

Chair and Professor

Department of Chemical and Biomedical Engineering





▲ From Left: Nathan Roberto, Professor John Kuhn and Nada El-Sayed.

## DOE GRANT TO FUND LIQUID FUEL FROM BIOMASS RESEARCH

<https://bit.ly/2NwTKwg>



A USF-led project by PI's **John Kuhn** and **Babu Joseph** was selected for a \$1.8M federal funding from the Office of Energy Efficiency and Renewable Energy (EERE), an office within the U.S. Department of Energy. Along with team members, the National Renewable Energy Laboratory (NREL) and Big Ox Energy, the overall goal of this project is to establish an economically feasible pathway for producing liquid hydrocarbon fuels from residual biomass resources such as forest residues, municipal, and agricultural waste. The potential impact of a successful outcome of this research is huge since the U.S. has a supply of biomass (nearly a billion tons/year), yet has to import nearly 50% of its liquid fuel needs from politically unstable regions in the world, which has national security implications. The research effort is based on USF-patented technology for process intensification using composite catalysts and was spurred by initial grants from the Hinkley Center for Solid and Hazardous Waste Management and the Florida Space Grant Consortium.

## ENGINEERING INNOVATION

According to rankings by the National Academy of Inventors (NAI), USF is the nation's fifth leading public university in generating new U.S. utility patents. Further, USF ranks 12th among universities worldwide. This is the eighth year that USF has ranked in the top 20. Recent contributions from the Chemical & Biomedical Engineering Department include:

- Drs. **Mark Jaroszeski** and **Richard Gilbert**, "System and Method for Controlling the Surface Charge of a Region of Tissue," U.S. 9981126 (awarded 05/18)
- Dr. **Chris Passaglia**, "Continuous wireless powering of moving biological sensors," U.S. 10027179 (awarded 07/18), Inventors: SA Bello, CL Passaglia.
- Drs. **Mark Jaorszeski** and **Richard Gilbert**, "Systems and Methods for Controlling the Spatial Distribution of an Electromagnetic Field," US 10080907 (awarded 09/18)

## NEW FACULTY PROFILE:



### DR. RAMON GONZALEZ, PROFESSOR AND FLORIDA 21ST CENTURY WORLD CLASS SCHOLAR

Dr. Ramon Gonzalez joins the department as a professor and Florida 21st Century World Class Scholar. Prior to joining USF, Dr. Gonzalez was a professor at Rice University where he led the Laboratory of Metabolic Engineering and Biomanufacturing, and was the founding director of the Advanced Biomanufacturing Initiative. From 2012 to 2015, Dr. Gonzalez served as a program director with the Advanced Research Projects Agency-Energy (ARPA-E) of the U.S. Department of Energy. We sat down with him to discuss his interests and why he made the leap from Houston to Tampa.

#### ● WHAT IS THE "BURNING QUESTION" IN YOUR RESEARCH?

"The main question in our research is whether we can engineer efficient biological systems for the sustainable biomanufacturing of fuels, chemicals and pharmaceuticals."

#### ● WHAT IS MOST "CHALLENGING" IN THE RESEARCH THAT YOU DO?

"My research primarily deals with engineering metabolism, a field that is referred to as metabolic engineering. Given the high dimensionality and complexity of metabolic networks, engineering them is an extremely difficult task. We are driven by the challenge of creating simpler and more efficient metabolic networks that can be deployed in the microbial production of fuels, chemicals, and pharmaceuticals."

#### ● WHAT DREW YOU TO UNIVERSITY OF SOUTH FLORIDA?

"Throughout my professional career and personal life, I have always gravitated toward dynamic environments that can provide me with opportunities to grow and contribute to their growth. The University of South Florida, and specifically our department, is on a trajectory that provides me with such an environment and opportunities, so it was not difficult to decide that I wanted to be a part of this institution."

#### ● WHO ARE THE KEY MENTORS/PEOPLE THAT HAVE INFLUENCED WHO YOU ARE TODAY AND WHAT YOUR COMMITMENTS ARE IN YOUR WORK AND LIFE?

"I find great inspiration in the career and personal life of Michael Faraday. In my professional career, I have greatly benefited from the guidance and mentorship of Professors Alfredo E. Curbelo Sánchez (University "Marta Abreu" of Las Villas, Cuba), Juan A. Asenjo (University of Chile), and Lonnie O. Ingram (University of Florida). But none of it would have been possible without the support, encouragement, and inspiration provided by my mother (Maria D. Diaz Suarez), my wife (Belkys C. Gutierrez) and my daughter (Nicole E. Gonzalez). Because of them, I strive to be the best possible (bio) chemical engineer and human being I can be."

#### ● WHAT DO YOU ENJOY OUTSIDE OF WORK?

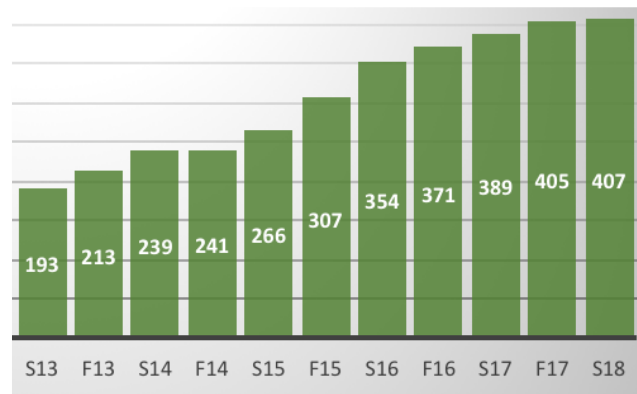
"I really enjoy spending time with my daughter and my wife, preferably at a nice beach with white sands and warm, blue waters!"



## CHEMICAL ENGINEERING EXPLOSION

Over the last decade, the department has seen record growth. Enrollments (declared Chemical Engineering undergraduates) have nearly doubled since 2013. The record setting Spring 2018 graduating class (116 students) celebrated their achievements with faculty at the World of Beer in Tampa.

DECLARED CHEMICAL ENGINEERING ENROLLMENT BY SEMESTER



## NEW CHEMICAL PROCESS SAFETY COURSE UPDATES EDUCATION FOR USF CHBME STUDENTS

An issue that continues to be critical for practicing chemical engineers, and one that is receiving increasing emphasis at a variety of levels including from within the profession and its major professional society AIChE, is that of safety. The general concept of chemical process safety, which focuses on the both design and operation of safe chemical processes, has in many cases been one that chemical engineers have received little formal education on while in college and have instead learned while on the job. In one of the many new initiatives he started with his arrival as the new Department Chair for Chemical and Biomedical Engineering at USF, Professor Clifford Henderson with the help of other faculty and USF alumni is seeking to change that fact. Professor Henderson and USF Alumni Dr. Christopher Schemel, Tom John, and Joe Guida piloted a new course entitled Chemical Process Safety during the Spring 2018 semester. In that course, students were exposed to a wide range of topics related to chemical process safety including chemical toxicity, HAZOP analysis, chemical release modeling, inherently safe process design, and many others. Professor Henderson credits the other three USF alumni with making the course both very practical and very interesting for the students by contributing significant amounts of their time to return to campus each week (from as far away weekly as Houston, TX), by teaching portions of the course for which they are experts, and most importantly by sharing their practical real-world engineering experience in safety topics. According to Professor Henderson, "This direct contact for our students with industry experts who span the chemical process safety disciplinary areas and community creates a unique course to which few chemical engineering students around the country have access." A longer article about the course will be featured in an upcoming newsletter, but in the meantime if you have any questions or would like to find a way to get involved with the course and the department, please feel free to contact Professor Henderson.

## FACULTY NEWS



**Dr. Clifford L. Henderson**, ChBME Dept. Chair, named 2018 AIChE Fellow and 2018 AAAS Fellow. Professor Henderson also received a 2018 USF Outstanding Faculty award.



**Dr. Robert Frisina** received a 2018 USF Outstanding Faculty award and was also elected a Senior Member of IEEE.



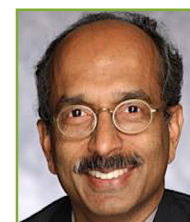
**Dr. John Kuhn** presented an invited talk at the 2018 FL AVS Meeting titled "Carbon dioxide conversion by chemical looping using perovskite oxides." Professor Kuhn was also named a USF Global Faculty Fellow.



**Dr. Chris Passaglia's** research group published a new paper in *TransVisSciTechnol*. Titled "Automated Method of Grading Vitreous Haze in Patients With Uveitis for Clinical Trials." His research group made the cover of the *Journal of Neuroscience* with their paper titled "Autophosphorylated CaMKII Facilitates Spike Propagation in Rat Optic Nerve."



**Dr. Sandra Pettit** received the Distinguished Alumni Award at the College of Engineering's annual Engineering Honors event and was awarded a Student Success Award for Academic Excellence by the USF Student Affairs and Student Success Office.



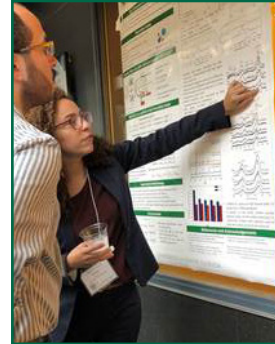
**Dr. Babu Joseph** has been invited to give a series of lectures on the topic of Waste to Energy Sustainable Approaches at IIT/Bombay as part of a short course organized by the government of India under the GIAN (Global Initiative on Academic Networks) program.

## STUDENT NEWS



Graduate student **Ram Kumar** won a very competitive student fellowship to attend the TOUGH Symposium to present his paper "Effect of salinity on the geological sequestration of CO<sub>2</sub> in a layered carbonate formation" (co-authors: Professors S.W. Campbell and JA. Cunningham).

Ram also presented a paper titled, "New Method for Numerical Modeling of CO<sub>2</sub> Sequestration in Dollar Bay Formation" at the 43rd International Conference on Clean Energy.



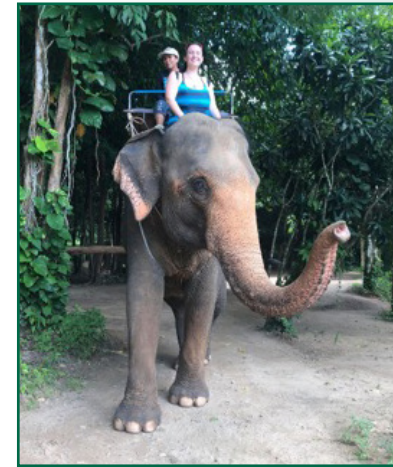
**Tosin Sokefun** and **Adela Ramos** were poster award recipients at the Southeastern Catalysis Society meeting.

Graduate student, **Roger Tipton** was awarded a NASA FSGC fellowship.

Dr. Aydin Sunol and his students **Komal Rathore**, **Kyle Cogswell**, **Aaron Driscoll**, and collaborators were awarded the Best Presentation Award at the recent ICBWTB 2018 Conference.

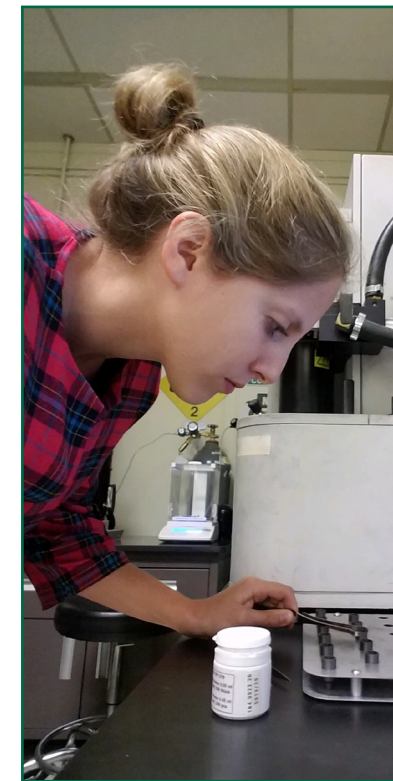
Graduate student, **Brandon Lorentz** published the paper, "Characterization of Florida kaolin clays using multiple-technique approach" in Applied Clay Science with members of his research group. This work was also presented at the 9th Advances in Cement-Based Materials conference.

Drs. Norma Alcantar and Ryan Toomey were awarded supplemental funding for two graduate students for a Non-Academic Research Internship from NSF. **Tunan Peng** will be interning at Connectsix, and **Zeinab Veisi** will be at Catalent Pharma Solutions.



Graduate student **Molly Skinner** completed a graduate student research abroad experience through the NSF IRES program in Singapore. She will be presenting her work, "Using Turnip Crinkle Virus and Mass Spectrometry to Determine Virus Interactions with Osmolytes" at the Society of Women Engineers conference as a National Finalist in the Rapid Fire Oral Presentation Competition.

## ALUMNI PROFILE:



**A**nnie Meier is from New York and earned her B.S. and M.S. in chemical engineering from Manhattan College. She earned her Ph.D. in 2018 from the University of South Florida in chemical engineering while developing photocatalyst materials that are activated by sunlight to support the reduction of carbon dioxide into possible fuels in the presence of water vapor. Annie joined NASA Kennedy Space Center (KSC) in 2011 and has supported technology development for deep space exploration and resource reutilization for human spaceflight. She worked full time at KSC while earning her Ph.D in Tampa. Her research currently includes logistical waste conversion (i.e. steam reforming, combustion and plasma gasification) which takes mission waste and reduces the volume of trash while recovering valuable products from it.

She has also conducted extensive research on in-situ resource reutilization (ISRU) systems that collect and convert the carbon dioxide from the Mars atmosphere into methane (fuel) and water. Annie was selected as a crewmember in the 120-day Mars analog HI-SEAS II mission in 2014. At HI-SEAS, she performed various research projects while living in an isolated Mars-like habitat with an international crew. She is a graduate of the 2012 NASA FIRST leadership development program and recipient of the NASA Trailblazer Award. Annie is passionate about human space flight, developing systems for future deep space exploration, and enjoys inspiring the future generation through education and outreach.

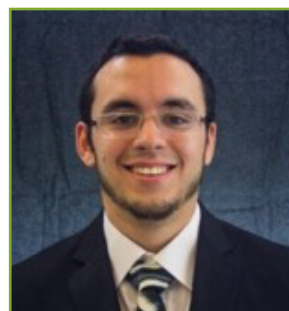
## ALUMNI NEWS

**Cynthia Grim '17** started graduate school at the University of Illinois at Chicago seeking a PhD in Pharmacognosy.



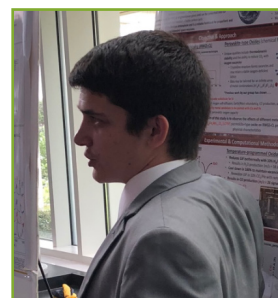
**Jenna Newman '18**, E.I.T., started a new role as Process Engineer for Firestone Industrial Products in Williamsburg, Kentucky.

**Carlos Babilonia '17** started a new role as Process Engineer with Duracell in LaGrange, Georgia.



**Haley Stone '18** started a new role as Process Automation Engineer in light hydrocarbons for the Dow Chemical Company in Freeport, Texas.

**Bryan Hare '16, MSCH '18]**, now a PhD student at Georgia Tech, was the recipient of the top poster award at the Southeastern Catalysis Society meeting for his USF master's research, "Low temperature Martian CO<sub>2</sub> to CO conversion by perovskite oxides through in-situ resource utilization."



▲ USF Chem-E-Car team from left to right (Ryan Toomey, Faris Hawari, Christopher Bertan, Neckodemus Davison, Casey Monroy, Rajeev Gopal, Alex Faustini, William Westerfled, and Carson Zide).

## USF CHEM-E-CAR IS A NATIONAL FINALIST

The USF Chem-E-Car team led by USF undergraduates Rajeev Gopal and Casey Monroe competed in the AIChE Southern Regional Student Meeting held at Louisiana State University (April 7, 2018). The competition requires students to design and build a small autonomous vehicle whose propulsion system and control mechanism rely on chemical reactions. The goal is for the car to travel a defined distance and to stop without outside intervention. The distance is announced 1 hour before the start of the competition. The USF car, called the Phoenix, was propelled by a hydrogen fuel cell and electric motor. The stopping mechanism relied on an iodine clock reaction, in which the solution turned opaque after a specific time that is controlled by the reactants. A photodiode detects the change in the opacity of the solution and shuts off the hydrogen fuel cell.

The USF car was amongst 23 teams competing. Only the top 5 teams qualify for the national competition. The USF missed the target distance of 54 feet by only 3 feet and placed 5th in the competition, thus qualifying for the National Competition to be held in Pittsburg, PA. A new team led by undergraduates Christopher Bertram and William Westerfield will be competing in the National Competition on October 27, 2018.

*The team gratefully acknowledges the financial support of Mosaic.*



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