

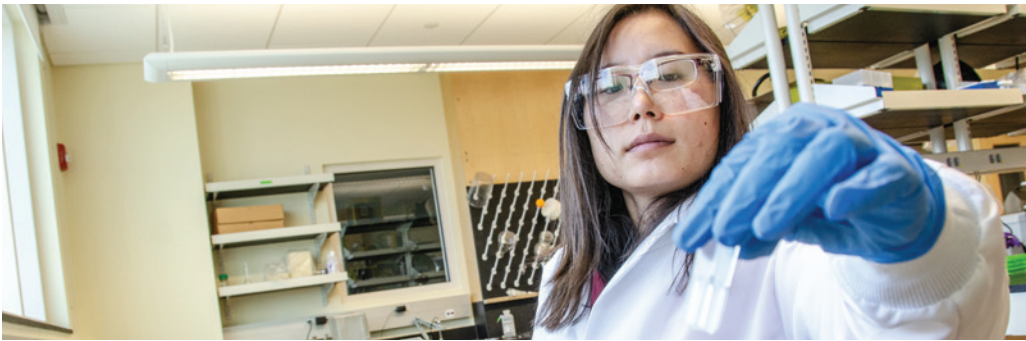
# THE MAJOR

## WEST VIRGINIA

VOLUME 34 NO. 1 SUMMER/FALL 2020

BENJAMIN M. STATLER COLLEGE OF ENGINEERING AND MINERAL RESOURCES

WEST VIRGINIA UNIVERSITY®



### THIS ISSUE

» CHAIR MESSAGE	1
» DEPARTMENT NEWS	2-3
» COLLEGE NEWS	4
» UNIVERSITY NEWS	4
» ACADEMY NEWS	4
» STUDENT NEWS	5-9
» CLASS NOTES	10
» IN MEMORIAM	11

## MESSAGE FROM THE CHAIR



As we all know, this has been a very disruptive year for higher education in general and for the Department specifically. Our semester transformed to online classes for everyone at the spring break and we (the faculty) had only two weeks to manage this transition. I am very proud of the way everyone (faculty, staff and students) adapted and managed to get us through the semester with very few problems. Certainly, for our graduating senior class it was particularly difficult. As you know, the senior design capstone courses require a final oral presentation open to the public.

We handled this through a large Zoom meeting and all the presentations in both the chemical and biomedical engineering programs went off without a hitch. Details of the projects for both programs are given in this newsletter. Likewise, no in-person graduation ceremonies were held this year, but we did have a virtual ceremony for the department that was well received by the students. To honor WVU's August and December graduates the university announced they will be conducting another virtual ceremony on December 19. Information regarding an in-person commencement for both the May and December 2020 ceremonies will be posted at a future date.

The annual Chemical Engineering Academy meeting and banquet was postponed until next year when the nominees for membership for 2019 will be recognized along with the inductees for 2020. I continue to keep in touch with the Academy Executive Committee and we may be reaching out to academy members over the next few months.

Moving onto other news, it is with great sadness that I report the death of Teaching Professor Paul Daniell who passed away unexpectedly in October 2019. Paul was recently inducted into the Chemical Engineering Academy, so this was a particularly difficult period for all of us and of course our deepest sympathy continues to go out to his wife Debbie and family.

On the brighter side, we continue to excel in the academic area with Professor Cerasela Dinu being awarded a College Teaching Award, Professor John Hu receiving the Outstanding Research Award in the College and also a highly prestigious Benedum Outstanding Research Award at the University level, he was one of only three recipients given this year. Professor Shuo Wang received a prestigious NSF CAREER award for his innovative work in neuroscience and I was recently elected a Fellow of AIChE. Our students also continue to excel with four BMEG seniors recognized as outstanding seniors and Daniel Behar won the outstanding Professional Promise Award from the Pittsburgh Section of AIChE.

Finally, we will be welcoming a new faculty member in the department and a new dean to the College. Dr. Oishi Sanyal will be joining the department in June as a tenure-track assistant professor. Taking over from Interim Dean Earl Scime is Pedro Mago, who started on July 1.

What the fall semester holds for us is still being debated but you may rest assured that we will be up to the task and whether we will be teaching in-person, online, or a mixture of both (most likely), we will be up to the challenge.

Stay healthy and let's go Mountaineers,

**Dr. Richard Turton**  
*WVU Bolton Professor and Chairperson*  
*Department of Chemical and Biomedical Engineering*

## DEPARTMENT NEWS

# FACULTY AWARDS RECOGNITIONS & ADVANCEMENTS



### WANG RECEIVES CAREER AWARD

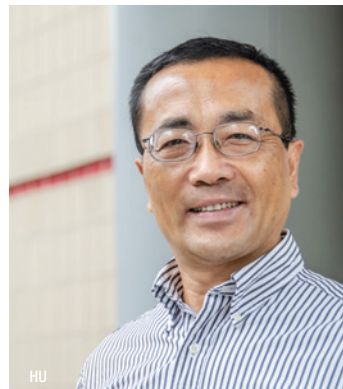
**Shuo Wang** earned the prestigious NSF CAREER award to expand research on early warning signs of autism spectrum disorder. The award comes with nearly \$500,000 in funding over a five-year period. Congratulations to Shuo. This is the fourth CAREER award for the department in recent years.



**Cerasela Dinu** was recognized as Statler College Outstanding Educator for the 2020 Academic Year and selected to chair the Diversity Equity and Inclusion Committee for the Statler College.



**Fernando Lima** was elected the program coordinator of the Systems and Process Control Area of the Computing and Systems Technology (CAST) Division of AIChE for 2022.



**John Hu** was named Researcher of the Year for Statler College for the 2020 Academic Year. He also received a prestigious Benedum Outstanding Research Award at the University level.



**Richard Turton** was named an American Institute of Chemical Engineers Fellow in April 2020. He was nominated by peers and elected by the AIChE Board of Directors. The recognition represents a pinnacle of professional achievement for a chemical engineer.



### KLINKE RECEIVES PROMOTION

**David Klinke** was promoted to full professor effective August 2020. Klinke joined the department in January 2006 as an assistant professor and was promoted to associate professor with tenure in August 2012. He received his PhD in chemical engineering from Northwestern University in 1998. David directs an interdisciplinary research group that aims to identify alterations in communication

between different cell types present within tumors that locally suppress anti-tumor immunity. The group believes that targeting these alterations may provide a therapeutic advantage that distinguishes between the cellular communication occurring in normal versus malignant tissue. Their approach blends experiments, mathematical modeling and simulation and data analytics to varying degrees.

# NEW FACULTY HIRES

Our department continuously searches for additional tenure-track faculty and teaching faculty to compliment and elevate the quality of our program. Our newest hires are:



PHOTOGRAPH SUPPLIED

**Jeremy Hardinger** has been hired as a teaching assistant professor in the department. Hardinger was previously a teaching instructor in the department. Hardinger will be teaching courses, helping with undergraduate academic and professional advising, serving on the departmental undergraduate curriculum committee, helping with ABET accreditation practices, and participating in planned student related outreach activities. Congratulations to Jeremy on this new appointment.



PHOTOGRAPH SUPPLIED

**Oishi Sanyal** has been hired as a tenure-track assistant professor in the department and arrived on campus in June. Sanyal comes to WVU after four years as

a postdoctoral researcher at Georgia Institute of Technology. She received her PhD in chemical engineering from Michigan State University in January 2016. Her research focuses on energy-efficient gas and vapor separations using fundamental principles and pragmatic approaches to create the next generation of scalable membranes. Sanyal will be teaching heat transfer in the fall 2020. We welcome Oishi to WVU and the Department of Chemical and Biomedical Engineering.

## NEW POSITION FOR PROFESSOR ROBIN HISSAM



NESBIT

**Robin Hissam**, teaching associate professor in the department, has been appointed as the Director of Undergraduate Education, effective November 2019. By establishing a leader in curriculum development and review for both the chemical engineering and biomedical engineering programs, the new position will ensure consistent quality and assessment of programs. The position will help ensure our students continue to receive the high-quality education that prepares them to succeed in the future.

## RETIREMENTS

Please join us in wishing them the very best for their futures.

**Gene Cilento** retired from his position as professor of chemical engineering in June 2020. Cilento came to WVU in 1979 as a faculty member in what was then known as the Department of Chemical Engineering, served as department chair from 1988-99 and Dean of the Statler College from 2000-2019. Cilento will continue as project director for a multi-million-dollar NASA grant to develop robotics technology for repair of orbital assets and will serve as the inaugural director of the Innovation Hub in the Statler College. To this day he remains dedicated to the success and advancement of this college.



NESBIT

**John Zondlo** retired from the department in May 2020. John joined the department in 1982 and has had an outstanding career throughout his 38 years in the department. He has won numerous awards for teaching, service and research and has contributed to the department and the lives of undergraduate and graduate students in every way possible. He was a model for collegiality in the department and he leaves a gap in our ranks that will never be replaced.



NESBIT

## DEPARTMENT NEWS, CONTINUED ...

### CHEMICAL ENGINEERING ACADEMY OF DISTINGUISHED ALUMNI

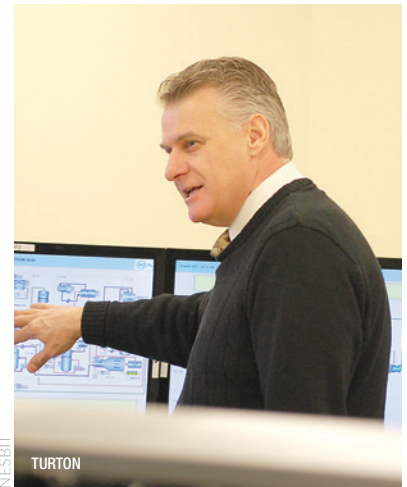
We were unable to have our usual annual Academy Meeting and banquet this year due to COVID-19. However, the Academy's executive committee has been meeting regularly and met with Dean Pedro Mago in July. We hope that everything will be back to normal for the meeting in Spring of 2021.



## COLLEGE NEWS

### NEW COLLEGE LEADERSHIP

**Pedro J. Mago** has been appointed as the Glen H. Hiner Dean of the Statler College of Engineering and Mineral Resources. Mago joined the College on July 1. Mago comes to WVU from Mississippi State University where he served as department head and PACCAR Chair Professor in mechanical engineering. He is a distinguished higher education leader and expert in energy systems and sustainability.



### CHAIR TO STEP DOWN

**Richard Turton** will be stepping down as chair of the department during the academic year 2020-21. A search for a new chairperson is currently underway.

## UNIVERSITY NEWS



PHOTO SUPPLIED 2019

### WVU NAMED AS TOP EMPLOYER IN 2019 CANDE AWARDS

West Virginia University has been nationally recognized as one of 65 employers – and the only higher education institution – to receive the 2019 North American Candidate Experience award. This is the second time WVU has received this honor. CandE awards are conducted by the Talent Board, a non-profit research organization committed to improving candidate experience.

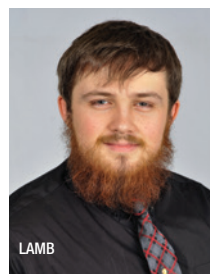
# STUDENT NEWS

## AMERICAN INSTITUTE OF CHEMICAL ENGINEERS ANNUAL MEETING

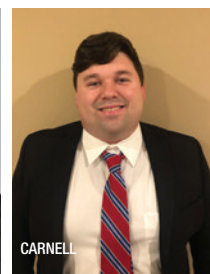


Several undergraduate chemical and biomedical engineering students and numerous graduate students attended the annual meeting of the American Institute of Chemical Engineers in November 2019. The meeting was held in Orlando, Florida. Several of the students made poster and oral presentations at the meeting. **Brian Leonard** ('20) placed 1st in Fuels, Petrochemicals and Energy I Division with a poster titled "Synergistic Natural Gas-Biomass Co-Processing to Produce Hydrogen Rich Syngas." Leonard is performing research under the direction of Professor **John Hu**.

## BEST SENIOR PRESENTATION



LAMB



CARNELL



DASHI

**Blaine Lamb, Alex Carnell, and Ahmed Dashti** were recognized for having the best final senior year major presentation. They each received an iPad for their award. This award is sponsored by Dow Chemical.



DOLLY



GALL



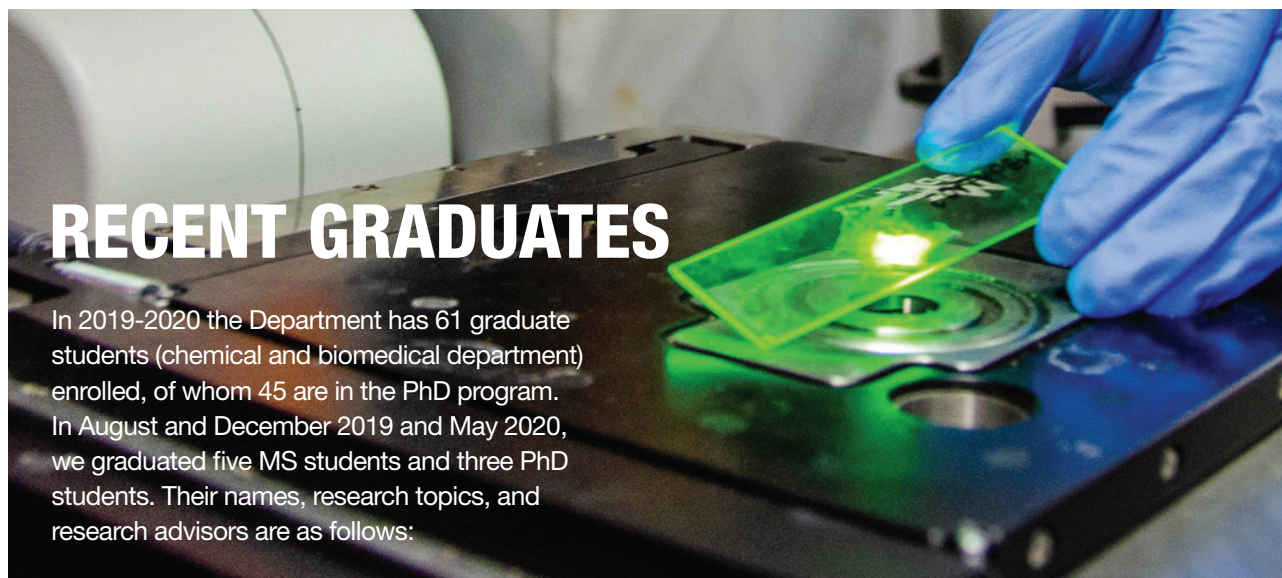
LANSBERRY



LAYNE

## WVU OUTSTANDING SENIORS

Biomedical engineering seniors **Arlie Dolly, Ashley Gall, Taylor Lansberry** and **Molly Layne** were named WVU 2020 Outstanding Seniors. WVU outstanding seniors are the best of the best, showing academic achievement and serving others. There were 49 students named WVU Foundation's Outstanding Seniors this year.



## RECENT GRADUATES

In 2019-2020 the Department has 61 graduate students (chemical and biomedical department) enrolled, of whom 45 are in the PhD program. In August and December 2019 and May 2020, we graduated five MS students and three PhD students. Their names, research topics, and research advisors are as follows:

### AUGUST 2019

#### **Matthew Artimez (MS)**

Research Advisor: Alfred H. Stiller  
Title: New Method of Creating Carbon Foam

#### **Parikshit Sanjay Sarda (MS)**

Research Advisor: Debangsu Bhattacharyya  
Title: Development of Rigorous Dynamic Model of Supercritical Coal-fired Power Plants

### DECEMBER 2019

#### **Oluwasogo Bolaji Alonge (MS)**

Research Advisor: Nagasree Garapati  
Title: Design of the Geothermal District Heating and Cooling System for the West Virginia University

#### **Shuyun Li (PhD)**

Research Advisor: Fernando Lima  
Title: Development of Sustainability Evaluation and Control Framework for Chemical Processes

### MAY 2020

#### **Hadi Almusawa (MS)**

Research Advisor: Hanjing Tian  
Title: Dynamic Study of Mo/ZSM-5 Catalyst for CH<sub>4</sub> Dehydroaromatization

#### **Brad Crawford (PhD)**

Research Advisor: Ahmad Ismail (John Zondlo)  
Title: Elucidating the Properties and Mechanism for Cellulose Tetrabutylphosphonium-Based Ionic Liquids Using High Concentrations of Water

#### **Chinyere Ezeobinwune (MS)**

Research Advisor: Debangsu Bhattacharyya  
Title: Modeling of Rotary Packed Beds for Reactive and Non-Reactive Systems

#### **Andrew Graves (PhD)**

Research Advisor: Charter Stinespring  
Title: Synthesis of Graphene Using Plasma Etching and Atmospheric Pressure Annealing: Process and Sensor Development

# BIOMEDICAL ENGINEERING SENIOR DESIGN

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Six design projects were undertaken in the 2019-2020 academic year. Students under faculty mentors in chemical and biomedical engineering (Jessica Allen, Gene Cilento, Cerasela Zoica Dinu, Robin Hissam and Shuo Wang) and Lane Department of Computer Science and Electrical Engineering (Yuxin Liu) in the Statler College of Engineering and Mineral Resources, worked with clients in academic (Alexander Stolin, *In vivo* Multifunctional Magnetic Resonance (IMMR) center and Sergiy Yakovenko, Health Sciences Center), clinical (John Hollander, School of Medicine) and industrial (Manoj Mittal, Alcon and John Twist, Mylan) settings for prototype, computer- and/or analysis-based development to allow implementation of biomedical engineering concepts into health care strategies.

At the end of the 2019 fall semester, each group presented their work via poster and oral presentation to an audience of students, faculty, clinical and industry representatives, as well as parents and alumni. One of the projects abstract and deliverables are included below.

## **Desktop High-Resolution Computed Tomography Scanner for Imaging of Damaged Lung Tissue**

**Client: Dr. Alexander Stolin**

**Faculty Mentor: Dr. Eugene V. Cilento**

The objective of this project was two-fold. Goal number one was the modification of an X-Ray computed tomography (CT) medical imaging device tailored to the particular need of assessing lung tissue damage. Following satisfactory performance metrics, goal number two was to utilize the device for imaging extracted tissue samples of animals with known exposure to harmful analytes (e.g. nanomaterials, etc.).

The need for this project is based on clinical demands that aim to allow for the development of X-Ray CT based imaging strategies for improved diagnosis to lead to subsequent improved clinical outcome when considering lung tissue damage. The interest in nanomaterials was driven by current studies which show that exposure to nm sized materials may cause adverse effects to the lung with long term and acute lung injury proven to depend on the materials characteristics as well as systemic effects of inhalation. The necessity of high spatial resolution came from a combination of the small geometrical size of the imaged object (i.e., nanomaterial) and even smaller areas of possible damage to be identified in a demanding low contrast lung tissue.

For this project, an existing scanner was retrofitted with fast exposure shutter mechanism; further, an X-Ray detector was run in the highest spatial resolution mode to allow for optimal X-Ray technique and reliable visualization of lung tissue and possible "clinical diagnosis." The project allowed the students to be introduced to the field of medical imaging devices through a series of short lectures and hands-on lab demonstrations. Further, it facilitated learning of how to run an existing scanner, explore its performance, identify shortcomings and propose physical/engineering solutions to such shortcomings. Moreover, students involved in this project familiarized with the existing simulation software and suggested and validated improvements to the experimental set up for allowing sample analysis at a lower resolution. Lastly, through introduction of a cost/benefit analysis while designing an improved CT prototype for optimized scanner blueprint, students were also required to participate in all aspects of the experimental work for both data acquisition and analysis of the lung tissue.

This work in team facilitated implementation of knowledge and concepts from the biomedical engineering curriculum while further allowing student' creativity and performance assessment in a real-application driven medical scenario.

# CHEMICAL ENGINEERING SENIOR DESIGN

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In 2019-2020, chemical engineering students worked on two year-long senior design projects similar to previous years with each team having around 30 members. Both teams proposed feasible technologies for their projects, developed process models, completed material and energy balances, conducted topological and parametric optimizations, sized the process units and calculated capital and operating costs. In addition, both teams prepared piping and instrumentation diagrams, conducted a hazard and operability study, and carried out a sustainability analysis for select units.

## One team investigated alternative uses for the components of the American gasoline pool.

Given the increasing number of electric cars and the availability of natural gas in the country, the future market for gasoline is predicted to go down, thus creating a potential surplus of gasoline. The team proposed, designed, and evaluated a six-unit facility using the components that are currently in the gasoline pool. These units consisted of an aromatization unit that converts paraffins, olefins, and naphthenes into the aromatics BTX (benzene, toluene and xylene), an aromatic extraction unit containing a divided-wall distillation column that facilitates achieving high purity and recovery of the products, a thermal steam cracker for olefin production with models for coking/decoking, an olefin extraction unit that used reactive absorption for obtaining ethylene, propylene and butadiene while recycling non-olefins to the cracker, an ethylbenzene production unit, and a dinitrotoluene production unit. These units finally produced ethylene, propylene, butadiene, xylene, ethylbenzene, and dinitrotoluene. Overall, the economic viability of the proposed process was found to be solid as reflected through a Monte Carlo analysis of net present value with due consideration of uncertainties in product demand, selling prices, and capital and operating costs.

## Another team worked on a project that investigated a future world in which fuels and energy are obtained completely from non-renewable sources.

They proposed, designed and evaluated a process that utilizes geothermal, wind, and photovoltaic energy for electricity generation while the pumped hydro-storage technology is employed for energy storage. The team also investigated a thermal storage technology using a phase change material that stores energy when it is in excess and discharges it to the geothermal surface plant to produce electricity when the supply is lower than the demand. The team also investigated a biomass-based process for producing fuel. In this process, corn stover was fed to the fermentation unit to produce ethanol along with a valuable waste-gas stream. A feed of yellow poplar and red oak was fed to the pyrolysis unit to produce bio oil and gaseous byproducts. The gaseous byproducts of pyrolysis, fermentation, and upgrading were used to make hydrogen. The hydrogen and oil from pyrolysis were then sent to an upgrading unit producing valuable hydrocarbon products. It was found that while the electricity price from the proposed process is unfavorable in our region for the foreseeable future, the fuel production process using biomass can be profitable in the near future under certain economic scenarios.



# AN ALTERNATIVE GRADUATION CELEBRATION

On Saturday, May 16, WVU held Mountaineer Graduation Day – an online commencement experience that allowed students to share their accomplishments with classmates, family and friends, as well as a few special moments that connected our students with the University they love. All of Mountaineer Nation supported and cheered for our students on the biggest day of their lives. On social media were videos, memes, congratulations and well wishes from students, families and alumni.



*“This experience was just one of many that will shape you throughout your life. Though the time in which we find ourselves is one of the most challenging our nation has ever faced, we know that our campus, our state and our country will come together again – stronger and more resilient than ever before. After all, we are Mountaineers.”*

— WVU President E. Gordon Gee



While we wish that we could all be celebrating together, may the bond that has been formed by the ChE Class of 2020 last a lifetime.



The Department of Chemical and Biomedical Engineering hosted a special Zoom session to celebrate their best and brightest graduates. Each program hosted a Zoom meeting to which faculty, students and parents were invited. It was a chance for everyone to share stories of their time in the department and to wish each other well as they embark on their new careers.

Congratulations to the Class of 2020 graduates.

# GROWING GRADUATE FELLOWSHIPS

When we take a look at other R1 classified research institutions, we think of Harvard, Stanford, MIT and Georgia Tech as examples of excellence in higher education because of their high profile research programs. The high-caliber research that happens within the chemical and biomedical engineering department at WVU seems to be a well-kept secret.

The future of growing our research base, reputation and reach is by funding highly qualified incoming graduate students during their first year of study at WVU. Such funds would allow us to make offers without having to worry about who the student would work for as a graduate or teaching assistant and whether or not that professor had funding at the time to offer to the student. This sort of funding model is common at many, if not all, established research universities.

Following this model, a fund has been created but needs to grow to have a meaningful impact. The department has a goal of about \$500,000 — that would allow three incoming graduate students to be funded for their first year at WVU.

We need your help to boost our national reputation and stature, and remain viable. It is crucial that the research mission and productivity of our department flourishes.

Can we count on you to make a commitment to help us take chemical and biomedical engineering to new heights?

Contact Jenna Nypaver at [jmnypaver@mail.wvu.edu](mailto:jmnypaver@mail.wvu.edu) or 724-415-9527

## CLASS NOTES

### 2015

**Megan P. Jewell** (BS) has been living in Colorado since her graduation in May 2015. Megan received her PhD in December 2019 from the Colorado School of Mines. Megan resides in Highlands Ranch, Colorado.

## REMINDER

For those who have sent contributions to the department this past year, **OUR MANY THANKS!** These funds are used to support many undergraduate and graduate activities, and to help enhance the overall academic and learning environments in the department. Your support is greatly appreciated.

Please remember to designate your tax-deductible gifts for use by the department. The best way for contributing to support of WVU Chemical and Biomedical Engineering is to write your check out to the WVU Foundation and designate it for use by chemical and biomedical engineering on the memo line. Also, please check with your company — many will provide matching gifts.

Follow. Like. Share.     @wvustatler

# IN MEMORIAM

Teaching Associate Professor **Paul T. Daniell** passed away at his home on October 12, 2019. He was born on October 5, 1959 in New York City and raised in eastern Long Island. He earned his BS degree from Rensselaer Polytechnic Institute and his MS and PhD degrees from WVU chemical engineering. He worked for Union Carbide and Dow for many years in research and development. After retiring from Dow, he joined the faculty at Marietta College. In August 2018, Paul joined the WVU Department of Chemical and Biomedical Engineering. In April 2019 Paul was elected to the WVU Chemical Engineering Academy of Distinguished Alumni. He is survived by his wife Debra, and his sons Benjamin and Joshua, and two stepdaughters Erica and Amber.



**George E. Keller II** passed away on October 7, 2019. George was an accomplished chemical engineer. He worked at Union Carbide for 36 years and achieved national and international acclaim for contributions in separation science and catalysis. After he retired from Union Carbide, George and others founded the Mid-Atlantic Technology Research and Innovation Center (MATRIC) and he served both on the board of directors and as chief engineer. In April 2017, George was awarded the Distinguished West Virginian award by governor Jim Justice and in May 2017,

he was recognized in the United States Senate with a resolution sponsored by Senator Shelley Moore Capito. George was a long-time supporter of the Chemical and Biomedical Engineering Department and was an honorary member of the WVU Chemical Engineering Academy of Distinguished Alumni.



**James Reginald (Reg) Dietz** passed away peacefully on May 29, 2020. Reg was a founding member of the Academy of Chemical Engineering (1986). He retired from National Steel after 30 years. At the time of his retirement he was vice president of research and development. He was a past president of the WVU Alumni Association, chairman of the WVU Board of Advisors, and a member of the board of directors of the WVU Foundation. He was inducted into

the WVU Order of Vandalia in 1987. He is survived by his wife of 60 years Billie Jewell Kast, his children Allan, Barbara, Jennelle, and John as well as three grandchildren and a brother.



On December 1, 2019, **Alex Chiahuei Kuo** passed away peacefully at home in New Orleans after a long battle with cancer. He was born on October 20, 1949 in Taipei, Taiwan. Alex earned his PhD in chemical engineering in 1978 from West Virginia University. He worked for 25 years with Union Carbide Corporation and Dow Chemical Company. At the time of his retirement in 2012, he was the president, CEO, and a member of the Board of Directors of Taiwan-based Oriental Union Chemical Corporation (OUCC). Alex was elected to the WVU

Chemical Engineering Academy of Distinguished Alumni in the Class of 2010. Alex is survived by his wife, Eva, two sons and a daughter.



**Ronald James Robson** (BS, 1968) passed away on April 29, 2020 at his home in Hurricane, West Virginia. His career with Union Carbide spanned 30 years. He was a member of AIChE and spent many years as a volunteer with Habitat for Humanity. Ronald is survived by his wife, Pauline and his daughter and son.



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# Alumni Update Summer/Fall 2020

PLEASE WRITE TO US! We want to know where life has taken you since you left West Virginia University. Complete and return this form with your news and comments. Pass this newsletter on, or let us know any alumni who are not receiving *The Major*.

Send to: Department of Chemical and Biomedical Engineering  
West Virginia University | 413 ESB | PO Box 6102 | Morgantown, WV 26506-6102

Or, email updates to [linda.rogers@mail.wvu.edu](mailto:linda.rogers@mail.wvu.edu).

Name: \_\_\_\_\_

Degree(s): \_\_\_\_\_ Year: \_\_\_\_\_

Home Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Home Phone: \_\_\_\_\_

Business Phone: \_\_\_\_\_

E-mail: \_\_\_\_\_

Employer: \_\_\_\_\_

Position Title: \_\_\_\_\_

Employer Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Preferred Mailing Address:  Home  Work

Brief News of Professional and Family Activities for Future Newsletters:

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Suggestions/Comments: \_\_\_\_\_

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This newsletter is published twice yearly to keep our alumni and friends informed of departmental news and ongoing activities. For additional information, visit our website: [cbe.statler.wvu.edu](http://cbe.statler.wvu.edu)

We continue to make it more informative and useful to our visitors. Let us know your thoughts and comments, and drop us a line.