



Gupta

PERSINGER

A FAREWELL MESSAGE

Many of you may have heard that I have resigned as Department chair as of June 30 and will be spending the next academic year on professional development leave. I will have served in this position for nine years, and I have enjoyed every moment of it. Professor Richard Turton will assume the leadership of the Department on July 1, after having served the Department, the College and the University in a variety of roles for more than 30 years.

For those of you who attended the Centennial Celebration last year, you know that we have had a glorious past. I believe that we have a very bright future as well. Our enrollments are at a historic high, and we now have two undergraduate majors – chemical engineering and biomedical engineering. The latter program will be going up for accreditation this year. We attract some of the most talented students, including WVU Foundation and Bucklew scholars, into these programs. These students conduct undergraduate research, participate in the co-op program, study abroad and successfully take part in research competitions. A large number graduate with honors and many go on to successful careers in industry. Others choose to go to graduate school, business school, law school and medical school. The number of graduate students has never been higher, and they are a diverse group. The majority are pursuing doctoral degrees, and all are supported on external funds. Our students are able to compete very successfully for University-wide fellowships and assistantships. Soon we will have a graduate program in biomedical engineering, beginning with the fall semester of 2018.

This past year was very successful from the viewpoint of faculty recruitment. Jessica Allen and Margaret Bennewitz started as assistant professors in fall 2017. Dr. Allen has a PhD in mechanical engineering from the University of Texas at Austin, and before joining WVU she was a postdoc at Emory University. Dr. Bennewitz did her doctoral work in biomedical engineering at Yale University and was then a postdoctoral scholar at the University of Pittsburgh. Shuo Wang joined us as an assistant professor with a joint appointment in WVU's Rockefeller Neurosciences Institute. Dr. Wang's doctorate is from the California Institute of Technology in computational and neural systems. He was a postdoctoral fellow at Princeton University. Our faculty members are all active in research, and they all have external grants and contracts. They are routinely recognized for their research, and they win awards on a regular basis, including receiving the prestigious CAREER award from the National Science Foundation.

This is the last time that I will be writing the Message from the Chair, but I do so with a sense of satisfaction. I want to thank our alumni for their friendship and support, and I am sure that they will support Professor Turton in his new role as Department chair, just the way that they have supported me. I wish him much success.

Dr. Rakesh Gupta

*George and Carolyn Berry Professor and Chairperson
Department of Chemical and Biomedical Engineering*

THE MAJOR WV

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BENJAMIN M. STATLER COLLEGE OF ENGINEERING AND MINERAL RESOURCES
DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

TABLE OF CONTENTS

DEPARTMENT/COLLEGE NEWS	2-3
UNIVERSITY/STUDENT NEWS	4-6
CLASS NOTES	7

NEW FACULTY HIRES



Allen

Jessica Allen joined the Department faculty on August 16. Her primary responsibilities are in biomedical engineering. Allen received her PhD in mechanical engineering from the University of Texas at Austin in 2012. Her teaching interests are biomechanics, dynamics and computational modeling. Her research interests are neuromuscular biomechanics; aging, injury and disease-related mobility impairments; rehabilitation engineering; and musculoskeletal modeling and simulation. Prior to joining the CBE faculty, Allen was a postdoc in neural control of movement in the Department of Biomedical Engineering at Emory University and Georgia Institute of Technology.



Bennewitz

Margaret (Maggie) Bennewitz also joined the Department on August 16. Her primary responsibilities are in biomedical engineering. Bennewitz received her PhD degree in biomedical engineering from Yale University in 2012. Her teaching interests are biomedical engineering, biomedical imaging, biomaterials, cellular machinery, tissue engineering, biomedical design, cellular and molecular biomedical imaging and biomedical nanotechnology. Her research interests

are biomedical imaging, fluorescence intravital lung microscopy, MRI contrast agents, micro/nano drug delivery systems, microfluidics, tumor microenvironment, cancer metastasis and stem cells. Prior to joining the CBE faculty, Bennewitz was a postdoctoral scholar at the University of Pittsburgh.



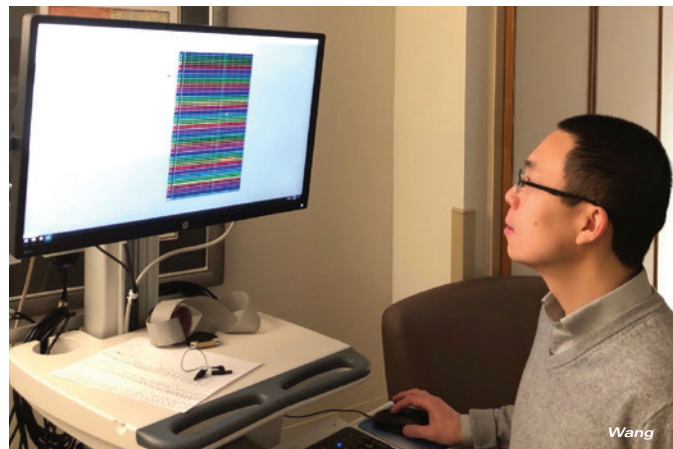
Wang

Shuo Wang joined the Department on June 30. Wang also holds a joint appointment as an adjunct assistant professor in the Department of Physiology and Pharmacology in WVU's Health Sciences Center. Wang received his PhD in computation and neural systems from California Institute of Technology in 2014. His teaching interests are cognitive neuroscience, human electrophysiology and research methods in neuroscience. His research

interests are human intracranial electrophysiology and cognitive and social neuroscience. Prior to joining the faculty, Wang was a postdoctoral research associate at Princeton University.

The trio are hard at work developing new courses for the new biomedical engineering graduate degree program. Bennewitz taught an undergraduate biomedical engineering course during the fall 2017 semester and Allen is teaching an undergraduate biomedical engineering course during the spring 2018 semester. All three are working on getting their research up and running and submitting proposals.

CONGRATULATIONS



Wang

PHOTOGRAPH SUBMITTED

Shuo Wang is the recipient of a Dana Foundation Award. Wang will conduct electrophysiology studies on abnormal signaling in the amygdala, the brain's alarm circuit for fear and a critical brain structure for social behavior. He will conduct neuroimaging studies on people with autism. The Dana Foundation Award is a three-year, \$200,000 grant and is the first-ever received at WVU.



PHOTOGRAPH SUBMITTED

DOW CHEMICAL COMPANY, WVU CHEMICAL ENGINEERING SEMINAR SERIES HONORING JEAN B. CROPLEY

The Dow Chemical Company, WVU Chemical Engineering Seminar Series honoring Jean B. Cropley was given by **Arvind Varma** on Friday, October 20, at the WVU Museum Education Center. Varma's talk was titled, "Selected Topics Related to Energy and Chemicals." Varma is the R. Games Slayter Distinguished Professor of

Chemical Engineering at Purdue University. He was also the Jay and Cynthia Ihlenfeld Head of Chemical Engineering until July 2016. He received his PhD degree from the University of Minnesota in 1972. Varma has published more than 305 archival journal research articles, co-authored three books and co-edited two books. He is the founding editor of the Cambridge Series in Chemical Engineering, a series of textbooks and monographs published by the Cambridge University Press.

COLLEGE RANKED IN THE TOP 10 PERCENT OF ENGINEERING SCHOOLS

For the fourth straight year, the Statler College of Engineering and Mineral Resources has been ranked in the **top 10 percent** of all engineering schools nationwide for offering the best value for the money for undergraduate degree programs. The rankings, released by College Factual, ranked the College **28th out of 302** engineering schools for offering a "quality education at a price that will keep student debt to a minimum." Engineering was also ranked as the **44th most popular** school in the nation for engineering, placing it in the **top 10 percent** of all programs nationwide.



ALUMNUS GIVES \$5 MILLION TO WVU

Verl Purdy (BSChE 1964), along with his wife, **Sandra**, gave \$5 million to WVU. The gift was part of WVU's A State of Minds fundraising campaign. The majority, \$4 million, will go to the Statler College to fund endowed scholarships, faculty fellowships and an endowed faculty chair to be initially held by **Brian Anderson**, director of the WVU Energy Institute.

Left to right: Sandra and Verl Purdy, President E. Gordon Gee and Cindi Roth



Purdy



Anderson



WVU RANKED ONE OF WORLD'S TOP UNIVERSITIES

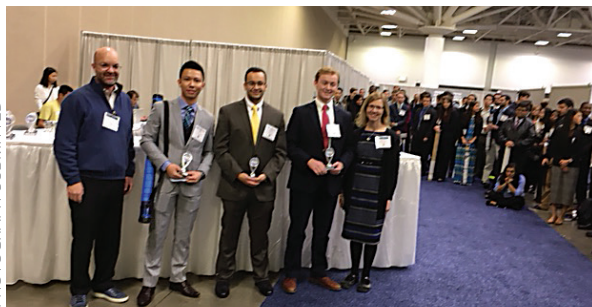
West Virginia University has been ranked among the top 1.5 percent of all universities in the world by the Center for World University Rankings. The center evaluated 27,770 degree-granting institutions of higher education worldwide with the top 1,000 research-intensive institutions ranked. The ranking measures the quality of education and training of students as well as the prestige of the faculty members and the quality of their research without relying on surveys and university data submissions. WVU ranked **410 worldwide** and **134 in the United States**.

WVU NAMED AS TOP 50 EMPLOYER IN 2017 CANDE AWARDS

WVU was one of only 50 organizations honored by the Talent Board with a 2017 North American Candidate Experience Award. WVU was the only higher education institution to be recognized. The **CandE Awards** are presented annually to employers throughout North America that demonstrate excellence across all aspects of the hiring process. The award is based on research and feedback from job candidates.

STUDENTS PARTICIPATE IN POSTER COMPETITION AT AICHE

Several undergraduate chemical and biomedical engineering students and several graduate students attended the annual meeting of the American Institute of Chemical Engineers in November. The meeting was held in Minneapolis, Minnesota. Several students made poster and oral presentations at the meeting. **Yacine Feliachi** ('18) placed third in the Process Simulation and Control Division with his poster, "Design and Simulation of Pollution Control Units for Improving Sustainability." Yacine is performing research under the direction of Fernando Lima.



PHOTOGRAPH SUBMITTED

RECENT GRADUATES

In 2017-2018 the Department has 48 graduate students enrolled, of whom 31 are in the PhD program. In August and December 2017, the Department graduated two MS students and eight PhD students. Their names, research topics and research advisors are as follows:

AUGUST 2017

Juan Carlos Carrasco Moraga (PhD)

Research Advisor: Fernando Lima

Title: *Operability-Based Design of Energy Systems: Application to Natural Gas Utilization Processes*

Nicholas J. Fouty (MS)

Research Advisor: Fernando Lima

Title: *Modeling and Design Optimization of Multifunctional Membrane Reactors for Direct Methane Aromatization*

Jeremy Hardinger (PhD)

Research Advisor: Alfred Stiller

Title: *Reactions of Metal Carbides to Produce Carbon*

Joshua C. Morgan (PhD)

Research Advisor: Debangsu Bhattacharyya

Title: *Physical Property Modeling of Solvent-Based Carbon Capture Processes with Uncertainty Quantification and Validation with Pilot Plant Data*

Lin Shi (PhD)

Research Advisor: Yong Yang

Title: *Substrate Nanotopography and Stiffness Modulation of Cell Behaviors for Disease Detection and Modeling*

Prathyusha Sridhara (PhD)

Research Advisor: Brian Anderson

Title: *Numerical Simulations for Enhanced Methane Recovery from Gas Hydrate Accumulations by Utilizing CO₂ Sequestration*

Man Chio Tang (PhD)

Research Advisor: Rakesh Gupta

Title: *A Model for Permeability Reduction in Polymer Nanocomposites and Its Experimental Validation*

DECEMBER 2017

John Cordonier (MS)

Research Advisor: Debangsu Bhattacharyya

Title: *Modeling and Simulation of a Direct-Write Manufacturing Process*

Daniel J. Haynes (PhD)

Research Advisor: John W. Zondlo

Title: *Steam Reforming of CH₄ Using Ni-Substituted Pyrochlore Catalysts*

Qiao Huang (PhD)

Research Advisor: Debangsu Bhattacharyya

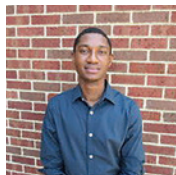
Title: *Dynamic Model and Estimator Development for a Refractory Brick with Embedded Wireless Sensors for Gasifier Applications*

OTHER STUDENT AWARDS AND HONORS



PERSINGER

▲ **Morgan Cunningham** ('18) was named the WVU Homecoming Queen at halftime of the WVU football game with Texas Tech on Saturday, October 14.



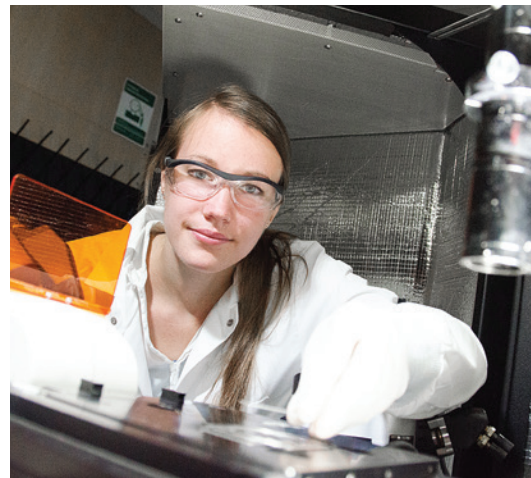
◀ **Selorme Agbleze** ('18) was selected as a McNair Scholar for the 2017-2018 academic year. Agbleze is doing research under the direction of Fernando Lima.

Ryan Gibson ('17) and Jacob Ivey ('17) were recognized for having the best final senior year major presentations. They each received a leather briefcase. This award is sponsored by The Dow Chemical Company.



PERSINGER

◀ **Tanner Filben** ('18 BMEG) was a finalist for the 2017 WVU Mr. and Ms. Mountaineer. Filben is a biomedical engineering major with a minor in computer science. He serves as an undergraduate researcher with the WVU Neural Engineering Laboratory and is an assistant executive director of the Mountaineer Maniacs.



NESSBIT

▲ **Alixandra Wagner** (PhD candidate) received the Best Graduate Student Oral Presentation Award at the 31st Annual Meeting of the Allegheny-Erie Society of Toxicology in May. Her presentation title was, "Early Assessment and Correlations of Nanoclay's Toxicity to Their Physical and Chemical Properties." **Andrew White** (PhD candidate) received the Best Scientific Methodology Award. His presentation was titled, "Real-time Assessment of Human Lung Integrity Following Nanoclay Exposure." Both conduct research with Cerasela Dinu.

UNDERGRADUATE SENIOR DESIGN

“Feasible Routes for Producing Value-Added Chemicals from Ethane”

Senior Design Presentation, April 18, 2017
Room 414, Evansdale Crossing
Chief Engineer: Jacob Ivey

On August 22, 2016, Appalachian Gas Processing Technology was tasked with researching value-added chemicals that could be produced from ethane obtained from locally abundant shale gas. The project comprised of three phases. In Phase 1, six products were selected for further research, including vinyl chloride monomer, ethylene, polyethylene, acetic acid, ethylene oxide and ethylene glycol. Feasibility studies were completed for each of these chemicals during Phase 2, which concluded with plant-wide simulations and satisfactory material and energy balances.

Six units are in the process of optimization in Phase 3, based on the chemicals listed above. Unit 100 produces VCM. Optimization of this process has helped to reduce its overall capital and operating costs significantly in comparison to the base case by reducing the number of process equipment and by optimizing the operating conditions. Unit 200 is focused on ethylene production by cracking ethane. Extreme temperature conditions in this unit have offered considerable opportunities for reducing energy of the hot and cold utilities. Unit 300 produces polyethylene. Very high operating pressure of this unit with a challenging reactor configuration has incentivized reactor optimization including its operating conditions, single-pass conversion, and recycle ratio. Acetic acid is produced in Unit 400 that uses ethylene as the feed stock as opposed to ethane. Process optimization of this unit has significantly helped to reduce the capital and operating costs mainly due to considerable reduction of the undesired combustion products. Unit 500 produces ethylene oxide followed by Unit 600 that produces ethylene glycol. Synergistic use of ethylene from Unit 200 and considerable superstructure and parametric optimizations have been instrumental in improving the profitability of these two units. The plant uses 40,000 barrel/day of ethane generating products that satisfy commercial specifications.

Other group members included Jordan Chapman, Garith Duncan, Kasey Fisher, Brice Games, Jeremy Gibbs, Ahmed Almutlaq, Talal Alohal, Seth Aportadera, Onyinyechi Asoluka, Simon Brown, Jacob Douglas, Ryan Gibson, Evan Goetz, Candace Kesselring, Logan Odom, Dhruvi Patel, Erica Peklinsky, Maxwell Pinion, Patrick Rukundo, Alec Salakovich, Patrick Sisler and Paranthaman Subramani.

“Feasibility of Producing Value-Added Fuels and Chemicals from Heavy Cuts of Petroleum”

Senior Design Presentation, April 20, 2017
Room G39, Engineering Sciences Building Atrium
Chief Engineer: Katherine Reynolds

Following contact from OilFutureTek, Inc. on August 22, 2016, Mountaineer Energy & Oil was tasked with performing a techno-economic evaluation of methods to upgrade the heavy cuts of petroleum. This analysis was conducted in three phases. Phase 1 comprised of investigating feasible process routes and the potential profitability of these routes. Phase 2 involved the development of models for the selected process with a focus on completing preliminary mass and energy balances. Phase 3 focused on the optimization and techno-economic evaluation of these processes culminating in a final report and presentation. For the purpose of this project, it is assumed that the designed refinery would be built alongside a sister refinery, from which the process would get the vacuum residue feed.

Processes that were evaluated herein include a delayed coking unit, a calcining unit, a fluidized catalytic cracking unit, a hydrocracking unit, and three sulfur removal units – a hydrodesulfurization unit, acid-gas removal unit and Claus unit – as well as a hydrogen production unit. These units produce jet fuel, calcined coke, and elemental sulfur as marketable products. The other products from these units, such as gasoline, kerosene, diesel, light gas oil, and heavy gas oil, which would require further processing, are sent back to the main refinery. The project has evaluated a large number of mass and heat integration options along with optimization of process configurations and operating variables to improve the profitability of the entire plant.

Other group members included Josh Buckland, Anika Coolbaugh, Elijah Hedrick, Julie Peng, Abigail Snyder, Khaled Alkhateeb, Ghaliya Almahrouqi, Abdullah Alzahrani, Chris Atallah, Sierra Caswell, Michael Fouts, Matthew Fox, Chad Glasscock, Ray Gould, Daniel Kenyon, Kumarenderan Mahalingam, Kameron Miller, Charles Owens, Justin Talbott, Zane Troutman and Frederick Wagner.

2018 MOUNTAINEER FOOTBALL SCHEDULE

Sat/September 1	vs Tennessee
Sat/September 8	vs Youngstown State
Sat/September 15	at NC State
Sat/September 22	vs Kansas State
Sat/September 29	at Texas Tech
Sat/October 6	vs Kansas (Homecoming)
Sat/October 13	at Iowa State
Thurs/October 25	vs Baylor (Mountaineer Week)
Sat/November 3	at Texas
Sat/November 10	vs TCU
Sat/November 17	at Oklahoma State
Fri/November 23	vs Oklahoma

THANK YOU!

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.

CLASS NOTES

1949

Daniel J. Dowling (BS, MS '51), is retired and resides in Parkersburg. Dowling writes that he just returned from California to visit his great grandson and second granddaughter. He stopped in the Dakotas to see the capitols, Mt. Rushmore, Badlands and Lewis and Clark-reproduced winter fort.

1969

Lun-Yan "Bill" Wei (MS) came from Taiwan in August 1967 to study with Dr. Wen and received his master's degree in 1969. He then went to Northwestern University where he received his PhD. He went onto work at DuPont for 34 years. Wei and his wife, Wendy Fu-Yung Wei, visited the Department on October 17. They currently reside in New Jersey.



Left to right: Lun-Yan Wei, Wendy Wei, Rakesh Gupta, Peter Maa, Carol Maa

PHOTOGRAPH SUBMITTED

1971

Peter S. Maa (PhD) did his research under the direction of Richard Bailie. His wife, Carol Y. Maa, received an MS in forestry in 1969 from WVU. The Maa's visited the Department with Bill and Wendy Wei on October 17.

1986

David Velegol, Jr. (BS) was elected to his fourth term as mayor of Follansbee and is working for McKim & Creed, a consulting engineering firm. Velegol and wife, Lisa, 1987 WVU Pharmacy, are keeping the Mountaineer Spirit alive as Alexandra is a senior and Gabbie is a freshman. Both are enjoying their WVU experience.

2011

Matthew Thompson (BS, PhD '16) recently changed positions. He currently works for TorayCMA and resides in Alabama. Thompson said that he will be working a lot characterizing fiber/resin compatibility and helping grow business in industrial markets, including composite overwrapped pressure vessels and other filament winding applications.

2013

Kiran Chaudhari (PhD) is working for Gas Technology Institute in the Energy Supply and Conversion Department. He joined the Woodland Hills office near Los Angeles. He will be working initially with the demo unit of R-GAS that is being built in China.

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Department of Chemical and Biomedical Engineering
West Virginia University
P.O. Box 6102
Morgantown, WV 26506-6102

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Alumni Update

Winter / Spring 2018

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 | PO Box 6102 | Morgantown, WV 26506-6102

Or, email updates to 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:

Suggestions/Comments: _____

This newsletter is published twice yearly to keep our alumni and friends informed of departmental news and ongoing activities. For additional information, visit us online: 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.