

THE MAJOR

WEST VIRGINIA

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MESSAGE FROM THE CHAIR



TURTON

It has been another eventful year for the Statler College as **Dean Pedro Mago**, formerly the chair of mechanical engineering at Mississippi State University, took over the deanship of the College in summer 2020.

In the last edition of *The Major* the retirements of **Gene Cilento**, **Richard Turton**, and **John Zondlo** were mentioned. **Charter Stinespring** also retired from West Virginia University on December 31, 2020. Charter has been a faculty member since 1990 and played a key role as a teacher of both undergraduate and graduate courses, as the graduate faculty adviser, and also as an active

researcher in the area of thin film electronics and sensors. As of this year, he has transitioned to an emeritus faculty member and will carry on doing research. He will also be sorely missed. Finally, **Hanjing Tian** and **Shuo Wang** will also be leaving the Department this summer and we wish them well.

I am glad to report that we have successfully recruited five new faculty into the Department and short biographies for each are listed in the next section. We have also recruited a new Department chair, **Srinivas Palanki**, who will be joining us from Lamar University and we wish him all the best for the coming years.

As in previous years, we continue to attract very bright, capable, and motivated undergraduate students and their accomplishments reflect well on the Department. News about our undergraduates starts with **Madelynn (Maddie) Watson** (ChE) who was the recipient of the 2021 AIChE Professional Promise Award. Madelynn also served as one of our chief engineers in the senior design project and has a very bright future. **Nicholas Haynes** (ChE) and classmate **Brian Leonard** (ChE) won the team event for the AVEVA Competition for Chemical Engineering Students 2020. Brian has joined **Oishi Sanyal's** research group as a master's student. **Sarah Jenness** (BMEG) and **Thomas Ogershok** (BMEG) were named WVU Outstanding Seniors for 2021 and **Rushik Patel** (BMEG) was named a 2020 Foundation Scholar. Other student achievements are listed in the following sections.

On the faculty and staff side of the Department, we also had a successful year. **Maggie Bennewitz** was one of three faculty recognized as a Statler Outstanding Advisor/Mentor for 2020-2021. **Robin Hissam** was recognized as the Statler Advisor/Mentor of the Year for 2020-2021. **Nagasree Garapati** was the recipient of the Inaugural Statler Excellence in Diversity, Equity and Inclusion Award for faculty. Finally, **Fernando Lima** was one of three faculty recognized as a Statler Outstanding Researcher at the Senior Level.

In research news, funding in the Department increased by about 8% in the last year, which is coupled with a 10% growth in the previous year. This is great news given the tight funding situation across the country. Interesting to note is that **two** of the **top three** individual researchers (measured by annual research expenditures) in the College are from CBE. This effort in increased research funding has allowed the continued growth of our graduate programs and our funding base. We currently have 63 full-time graduate students. Significant research awards have been granted to multiple faculty including; **John Hu** and **Debangsu Bhattacharyya** for their work in sustainable energy; Bhattacharyya for his work in intelligent monitoring of power plants; Allen for her work in the area of neuromuscular simulations for predicting functional walking ability; and multiple other awards that continue to support our growing research program and our graduate students.

The Day of Giving for 2021 was held on March 3rd and was a big success. I am pleased to announce that the total contributions to CBE totaled \$31,875, which is about 20 times greater than we received last year. Most of these resources went to CBE General Fund and my thanks go to everyone that contributed. These resources will be very helpful to the incoming chair as he assumes his new position. In a related announcement, I want to acknowledge **Jim Faller** for his generous gift of \$50k to establish the James and Catherine Faller Chemical Engineering Scholarship and a subsequent bequest to fund this scholarship and the James and Catherine Faller Chemical Engineering Graduate Fellowship. This bequest is currently valued at approximately \$1.7 million.

Finally, I would like to offer my thanks and appreciation for all the assistance and help that I have received from the Academy of Distinguished Alumni, members of the Advisory Committee, faculty and staff during my tenure as chair of the Department and also as a regular faculty member. I would also offer my thanks to all the students, both undergraduates and graduates that I have taught over the years. It may not seem obvious, but I have learned as much from you as I hope you learned from me. I am leaving WVU with mixed emotions. But after nearly 35 years at WVU in this Department, I am looking forward to my retirement and feel confident that the new generation of faculty will carry on the traditions of the department and take it to new heights.

Dr. Richard Turton
Chair, Department of Chemical and Biomedical Engineering

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DEPARTMENT NEWS

A CHANGING OF THE GUARD!



PALANKI

As mentioned in our previous newsletter, Richard Turton is stepping down as chair effective June 30, 2021.

Srinivas Palanki has been hired as the new Chairperson for Chemical and Biomedical Engineering effective July 1, 2021. Palanki comes to WVU from Lamar University in Beaumont, Texas. At Lamar, Palanki served as the Charles and Eleanor Garret Dean, College of Engineering and Professor in the Department of Chemical Engineering from 2015 to 2018. In 2018-

2019 he was the associate provost for research and sponsored programs and most recently he was the Regional Director, TMAC-SE and professor in the Department of Chemical and Biomolecular Engineering. Palanki received his PhD in chemical engineering from the University of Michigan, Ann Arbor, Michigan.

Along with Palanki, five new faculty members will be joining the Department this coming fall.

Madelyn Ball received her PhD in chemical engineering from the University of Wisconsin-Madison and is currently a postdoctoral researcher at Georgia Institute of Technology. Ball will be joining the program in September 2021. Her primary research will be in the general area of using synthetic materials chemistry to develop materials for both catalytic and adsorption applications.

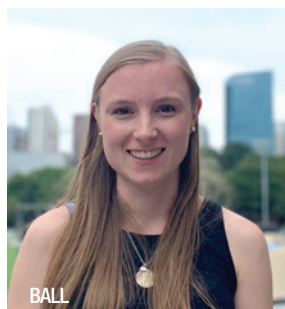
Stephen Cain received his PhD in biomedical engineering from the University of Michigan, Ann Arbor, and is currently an assistant research scientist in the Department of Mechanical Engineering at the University of Michigan. Cain will be joining the Department in August 2021. His research will be in the general area of advancing the use of wearable sensor systems to quantify and understand human biomechanics, health and performance.

Wenyuan Li received his PhD in materials science and engineering from WVU and was a research assistant professor in the Department of Mechanical and Aerospace Engineering at WVU. Li will be joining the Department in August 2021. His research will be in the general area of materials synthesis and catalysis with particular emphasis on shale gas and CO₂ utilization.

Soumya Srivastava received her PhD in chemical engineering from Mississippi State University and is currently an assistant professor of chemical engineering at the University of Idaho. Srivastava will join the department in August 2021. Her research will be in the general area of microscale bioseparations for health care and medical diagnostics.

Yuhe Tian will complete her PhD in chemical engineering at Texas A&M University in May 2021. Tian will join the Department in August 2021. Her research will be in the general area of process systems engineering.

Please join us in welcoming all the new faces to the Department of Chemical and Biomedical Engineering.



BALL



TIAN



LI



CAIN



SRIVASTAVA

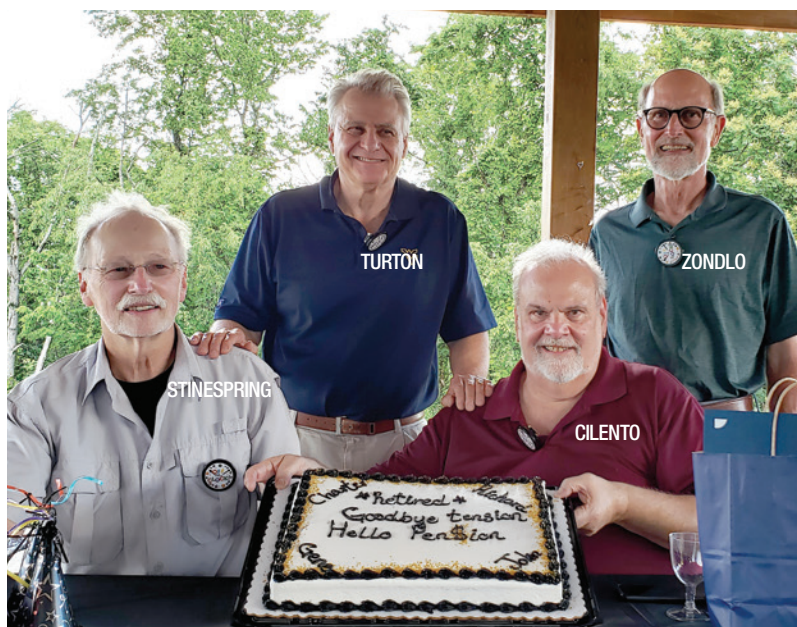
WISH THEM WELL

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

Professor Charter Stinespring retired from the Department at the end of December 2020. Professor Stinespring joined the Department as a research associate professor in 1990 and in 1996 he was promoted to associate professor. Stinespring received his PhD in solid state physics from WVU. He has been a very valuable asset for the Department for many years. He will remain as emeritus faculty and continue to mentor students and seek research opportunities.

Professor Shuo Wang joined the department in 2017 as an assistant professor in biomedical engineering. Wang will be departing WVU in June 2021 and will continue his academic endeavors at Washington University in St. Louis.

We wish both Stinespring and Wang the best of luck in their future endeavors.



On Thursday, June 10th we hosted a small retirement celebration at Dorsey's Knob to honor our four recent retirees. We had about 25 people in attendance and a good time was had by all.

FACULTY AWARDS & RECOGNITION



BENNEWITZ

Maggie Bennewitz was one of three faculty recognized as a Statler Outstanding Advisor/Mentor for 2020-2021.



GARAPATI

Nagasree Garapati was the recipient of the Inaugural Statler Excellence in Diversity, Equity and Inclusion Award for faculty.



HISSAM

Robin Hissam was recognized as the Statler Advisor/Mentor of the Year for 2020-2021.



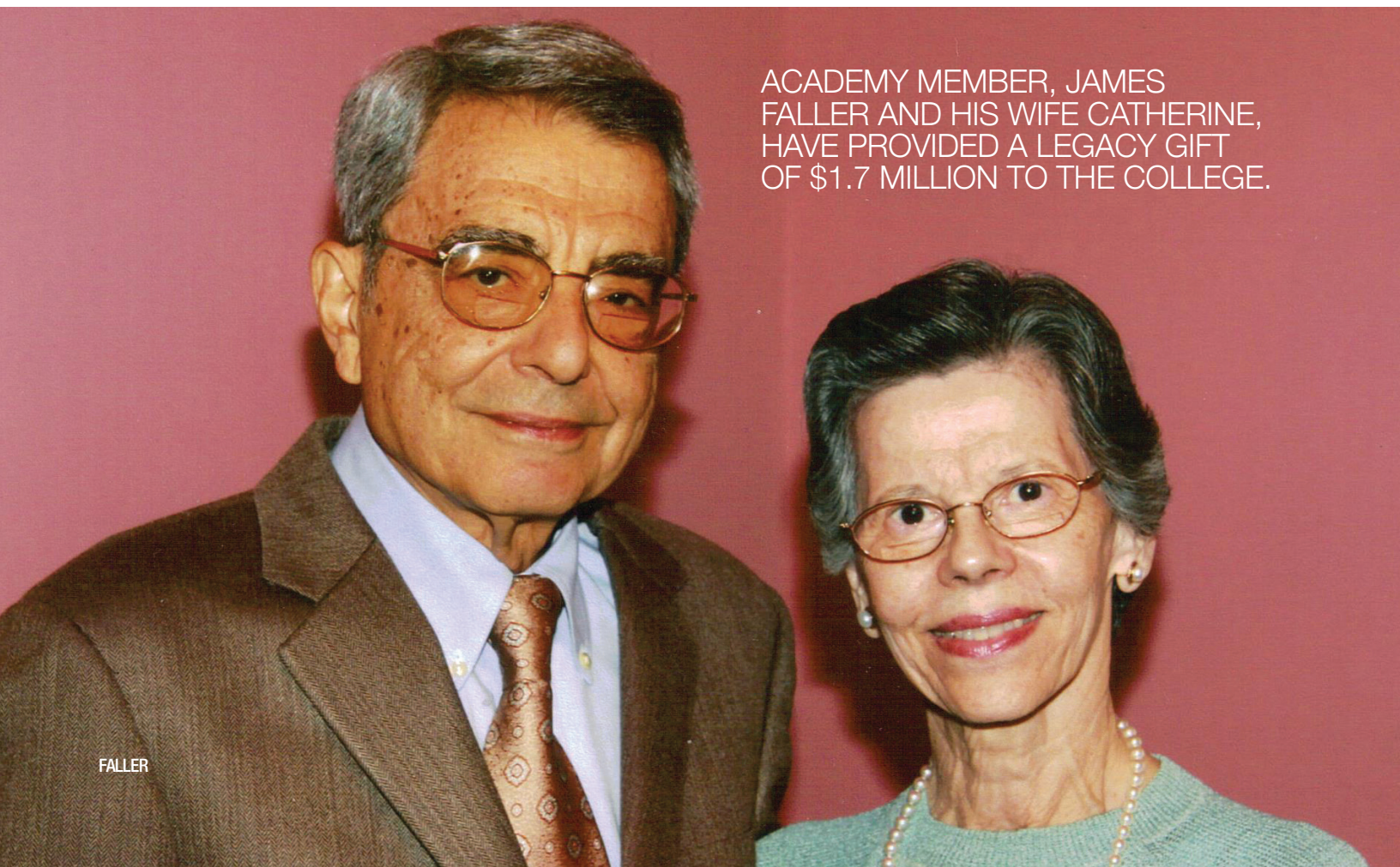
LIMA

Fernando Lima was one of three faculty recognized as a Statler Outstanding Researcher at the Senior Level.

ACADEMY NEWS

Academy member, **Jack Dever** (BS 1979, MS 1981) was elected as a fellow of the American Institute of Chemical Engineers in November 2020. Jack is currently the chief technology officer and executive vice president of Mid-Atlantic Technology, Research & Innovation Center, Inc. in South Charleston, West Virginia.

Due to COVID-19 the most recent meeting of the Academy of Chemical Engineers was held virtually via zoom on Friday, April 9, 2021. During the meeting five new members and two honorary members were inducted into the Academy. Their bios follow.



ACADEMY MEMBER, JAMES FALLER AND HIS WIFE CATHERINE, HAVE PROVIDED A LEGACY GIFT OF \$1.7 MILLION TO THE COLLEGE.

Academy member, **James Faller** and his wife Catherine, have provided a legacy gift of \$1.7 million to the College. The gift provides \$50,000 to establish an endowed scholarship for chemical engineering majors with a demonstrated financial need, with first preference to natives of West Virginia and the surrounding states. The remainder of the couple's gift is a bequest to be divided between the namesake scholarship

fund and a new endowment for the James and Catherine Faller Chemical Engineering Graduate Fellowship, which will be awarded at the department chair's discretion. Jim is a native of Wheeling, West Virginia. He worked for private industry, academia and the U.S. military during his career, retiring in 2006 from the U.S. Army's Aberdeen Test Center as senior engineer and team leader for modeling and simulation.



Brian J. Anderson (BS 2000)
Director, National Energy
Technology Laboratory of the
Department of Energy
Morgantown, West Virginia

Brian J. Anderson is the Director of the National Energy Technology Laboratory (NETL) of the Department of Energy. He manages the complete NETL complex, including delivery and execution of the Laboratory's mission. Anderson leads NETL's national programs in fossil energy

and other DOE mission areas, with industry, universities, and national laboratories. Anderson began his career as an assistant professor in the Department of Chemical and Biomedical Engineering at WVU. He is a recognized expert in natural gas hydrates, unconventional oil and gas development and clean energy technologies. In 2014, Anderson founded the WVU Energy Institute, focused on advancing technology through research, development and demonstration within the energy industry. Anderson has a long history of working with DOE to advance energy technologies. For his work in natural gas hydrates and carbon dioxide sequestration, he received the 2012 Presidential Early Career Award for Scientists and Engineers, and he received the Department of Energy Secretary Honor Award for his work with DOE in response to the BP Deepwater Horizon oil spill. Anderson holds a bachelor's degree in chemical engineering from WVU, and a master's and PhD in chemical engineering from the Massachusetts Institute of Technology.



Eugene V. Cilento (Honorary
Member)
Dean Emeritus, Statler College
of Engineering and Mineral
Resources
Morgantown, West Virginia

Gene Cilento served as the inaugural Glen H. Hiner Dean of the Statler College for 19 years. In July 2019 he became Dean Emeritus. While dean, he implemented numerous strategies to promote recruitment, retention, especially women and

underrepresented minorities, and faculty diversity. He developed an exciting learning environment that enhanced the College's academic and national reputation.

During his tenure, enrollment and graduation numbers, faculty size, and research funding increased significantly; and he successfully completed two major capital campaigns, investing over \$100 million in facilities, including a new Engineering Sciences Building addition and the Advanced Engineering Research Building. The College was renamed after Benjamin M. Statler in 2012, and two departments were named during the campaigns. Cilento has been a member of the chemical engineering faculty since 1979 and served as department chair from 1988-99. He also was a research professor in the School of Medicine from 1978-2014.

He was very active on the ASEE Engineering Deans Council and is a member of AIChE and Biomedical Engineering Society among others. He is a member of the West Virginia Golden Key Society and Tau Beta Pi, an AIChE Professional Promise Awardee, and College Researcher and Outstanding Professor of the Year.

His research focus is on microcirculatory transport phenomena to study organs, tissues and cells. He developed the WVU Robotics Center with NASA in 2009 for servicing orbital satellites that continues to prosper. His teaching interests included transport phenomena and thermodynamics. A native of New York City, he earned his bachelor of science in chemical engineering from Pratt Institute in Brooklyn and his masters and PhD from the University of Cincinnati. His children Salvatore, Regina, and Dominic are all WVU graduates, and he has five grandchildren.



Victor W. Dean (BS 1986)
General Manager, JM Huber
Corporation
Marietta, Georgia

Victor Dean was born and raised in New Martinsville, West Virginia. He graduated from WVU in 1986 with a bachelor of science in chemical engineering. During his time at WVU he was a member of several honor societies including Omega Chi Epsilon and Mortar Board. He also holds a master of science in chemical

engineering from Pennsylvania State University and a Master of Business Administration from Louisiana State University.

He began his career in 1988 when he joined The Dow Chemical Company at Dow's Louisiana Operations site. In 1999, after numerous manufacturing roles and earning his MBA, he moved to Dow's corporate headquarters in Midland, Michigan, into the finance function. From 2002 to 2012, Victor held various senior business leadership roles within Dow's specialty chemicals and plastics divisions, from global marketing and business development director to global business director for the building and construction business.

In May of 2012, he accepted the role of vice president of strategy and business development for the JM Huber Corporation in Atlanta, Georgia. Since 2015, he has served as senior vice president and general manager for several JM Huber specialty chemical businesses. Currently, he is the general manager for JM Huber's Flame Retardant business.

His volunteer work includes The Boy Scouts of America, Habitat for Humanity and coaching numerous youth sports.

Dean has been married to his wife, Myra, for over 30 years and has three children — Michael, Ryan and Katelyn.

ACADEMY NEWS, CONTINUED ...



John (Jack) P. Dever (BS 1979, MS 1981)
 Chief Technology Officer, Mid-Atlantic Technology, Research & Innovation Center
 South Charleston, West Virginia

Jack Dever is chief technology officer and executive vice president, Mid-Atlantic Technology, Research & Innovation Center, Inc. (MATRIC) in South Charleston, West Virginia. He is responsible for strategic planning, new business development, research strategy, intellectual property techno-economic-chemical-design-technology-improvement, customer partnerships and technical staff development.

With more than 30 years of experience in technical and organizational leadership, he previously held roles of increasing responsibilities at Dow Chemical and Union Carbide Corporation.

Jack earned his bachelor's degree in chemical engineering and master's in chemical engineering from WVU, and his PhD in chemical engineering from the University of Notre Dame. Jack has three patents from his work in ethylene oxide and acrylic acid/acrolein and has presented several papers on technology transfer and commercialization.

Jack is on the Board of the West Virginia Symphony Orchestra and is involved with several organizations within his church and community. He and his wife, Anne, have two adult children, and reside in South Charleston.



Rhonda L. Radcliff (BS 1989)
 ExxonMobil Lubricants & Specialties
 Mountain View, California

Rhonda L. Radcliff was born in Fairmont, West Virginia, and raised on a dairy farm outside of Morgantown, West Virginia. She started at WVU in 1985 and was a resident assistant in the dormitories for three years. She worked at the WVU Library and tutored the WVU athletes in math, chemistry, and physics. She graduated from WVU

with a bachelor's degree in chemical engineering in 1989.

Radcliff moved to Houston, Texas, and began her career with Exxon in the Refining and Supply Division in June 1989. She held various positions in refining and then transferred over to Exxon Research and Engineering in 1998 to focus on process design for U.S. refineries. She led the engineering development of a grass roots delayed coker unit at the Baytown Refinery

and worked in the Bechtel Engineering office to oversee the development from 1999-2000.

Radcliff transferred to ExxonMobil Lubricants and Specialties and moved to Mountain View, California, in 2001. She has been home based for the last 18 years. She consults with Lubricant distributors in the U.S. on business and marketing.

Radcliff began her first endowed scholarship for WVU engineering in 2001 and set up an additional six scholarships for engineering students from West Virginia. She also set up two fellowship awards for research. Each of these scholarships were named to honor members of her family or friends.

Radcliff and her husband, Robert Mullenger, have a daughter, Stella, and reside in Mountain View, California.



Darrell Velegol (BS 1992)
 Distinguished Professor, Chemical Engineering, Penn State University
 State College, Pennsylvania

Darrell Velegol was born and raised in Colliers, West Virginia. He received a Foundation Scholarship from WVU (1988), and graduated with a bachelor's degree in chemical engineering as chief engineer of the Senior Design Project (1992). Afterwards he went on to earn his PhD with John Anderson and Steve Garoff at Carnegie Mellon University. In

1999, Darrell started as a faculty member in chemical engineering at Penn State University, where he is now a distinguished professor.

Velegol built his career in teaching and in the research field of colloidal systems. He has published over 100 articles, especially in colloidal active matter and chemically-driven transport, and has written books including "Colloidal Systems." For his work in dynamic colloidal systems Velegol was elected to be a fellow of the American Association for the Advancement of Science in 2011.

In 2013 Velegol co-taught a MOOC in "Creativity, Innovation, and Change," and he became a student of innovation processes, which he came to see as a type of process manufacturing. In 2017 he started the Knowlecular Processes Company, which specializes in strategies that enable innovation processes to be of higher speed and value. He has also published articles in this area of "Econochemical Engineering".

Velegol has been active in his church in State College, Pennsylvania, serving as Elder and participating in many church activities for the community. Velegol and his wife, Stephanie Velegol, have two daughters Lauren and Sabrina.



John W. Zondlo (Honorary Member)
Professor Emeritus, WVU
Chemical and Biomedical
Engineering
Morgantown, West Virginia

John Zondlo was born and raised in Bethlehem, Pennsylvania, and graduated from Bethlehem Catholic High School in 1966. He attended Allentown College of St. Francis DeSales, earning a bachelor's degree in chemistry in 1970. In

1973, he graduated from the University of Maryland with a master's in physical chemistry. Subsequently John did a brief stint in industry, first working as a plant operator in an acid-recovery pilot plant, and later as a research associate for Air Products and chemicals in Trexlertown, Pennsylvania. He was co-inventor on several U.S. patents in gas-phase separations.

In 1976, Zondlo realized that his true calling was in education, so he accepted a position as instructor in the Chemical Engineering Department at Carnegie-Mellon University. He began taking graduate chemical engineering courses and earned a master's in chemical engineering and eventually his PhD in chemical engineering in December 1982.

He began his academic career at WVU in 1983 as an assistant professor and rose through the ranks being promoted to professor in 1993. His research program was focused on energy conversion processes for coal and specifically the areas of pyrolysis, gasification and catalyzed liquefaction. Later he was part of WVU's Carbon Products group where the goal was the production of value-added carbon materials from coal. When the program ended, he applied his background to biomass conversion and later to the study of degradation mechanisms for fuel cells.

While at WVU, Zondlo was recognized with numerous awards for his teaching and advising activities, including the Nick Evans Advising Excellence Award, the Neil S. Bucklew Award for Social Justice, the Mary Catherine Buswell Award, the CEMR Student Organization Advisor of the Year Award and the WVU Foundation Award for Outstanding Teaching. He was the proud faculty advisor for the WVU Sections of the Society of Women Engineers, the National Society of Black Engineers and Omega Chi Epsilon for over 30 years.

Since his retirement in 2020, he has been living with his wife Rena on their farm in Preston County where he enjoys being a gentleman farmer. He has two daughters, Anne Marie and Kate, and three grandchildren, Cora, Oliver and Mary Grace.

COLLEGE NEWS

A new report by the National Science Foundation ranked the Benjamin M. Statler College of Engineering and Mineral Resources **84th in research expenditure** with Chemical Engineering ranking 64th, among 403 engineering programs surveyed. The NSF survey tracks total R&D expenditures at U.S. academic institutions each fiscal year.

STUDENT NEWS

STUDENT AWARDS AND RECOGNITION

Matthew Alastanos, Thatcher Stevens and Shumooa Zawad were recognized for having the best senior year major presentation for 2020-2021. They each received an Apple iPad for their accomplishment. The award is sponsored by Dow Chemical.

Xinwei Bai (ChE – PhD) is the recipient of a WVU Distinguished Doctoral Scholarship.

Savannah Hays (BMEG) was named WVU's 2021 Newman Civic Fellow and will undertake a year-long project to increase access to engineering mentorships for young women in West Virginia.

Sarah Jenness (BMEG) and **Thomas Ogershok** (BMEG) were named as WVU Outstanding Seniors for 2021.

Rushik Patel (BMEG) was named a 2020 Foundation Scholar. He will use his stipend to conduct research and study abroad in Germany or Italy, and ultimately, he hopes to develop a single blood test to detect cancers in their earliest stages.

Raafay Uqaily (BMEG) was the recipient of the Inaugural Statler Excellence in Diversity, Equity and Inclusion Award for students.

Madelynn Watson (ChE) was the recipient of the 2021 Professional Promise Award announced on April 8, 2021, by the AIChE Pittsburgh Chapter.



RECENT GRADUATES

In 2020-2021 the Department had 69 graduate students (chemical and biomedical) enrolled, of whom 56 are in the PhD program. In August and December 2020 and May 2021, we graduated three master's students and eight PhD students. Their names, research topics and research advisors are as follows:

AUGUST 2020

James M. Koval (MS)

Research Advisor: John Hu (Ahmed Ismail)
 Title: Review of Established and Emergent Methods for the Production of C4 Olefins

Qingyang Li (MSE)

Research Advisor: Hanjing Tian
 Title: Cu-Based Electrocatalysts for Carbon Dioxide Conversion to Value-Added Chemicals

Qian Liu (PhD)

Research Advisor: Cerasela Zoica Dinu
 Next Generation of Applications of Metal-Organic Frameworks for Energy and Environmental Sustainability

Andrew White (MS)

Research Advisor: Cerasela Zoica Dinu
 In vitro Assessment of Deleterious Impacts of Organomodified Nanoclays and Their Incinerated Byproducts on Human Cells

DECEMBER 2020

Amoolya D. Lalsare (PhD)

Research Advisor: John Hu
 Title: Process Development of Shale Gas Assisted Lignin and Biomass Reforming Through Novel Reaction Pathway and Catalyst Design to Produce Hydrogen Rich Syngas for Fuels and Value Added Chemicals

Chirag Mevawala (PhD)

Research Advisor: Debangsu Bhattacharyya
 Title: Process Modeling and Techno-Economic Analysis of Thermo-Catalytic Dimethyl-Ether Synthesis and Microwave-Based Aromatics Production Technology from Shale Gas

MAY 2021

Rebecca H. Kim (PhD)

Research Advisor: Fernando Lima
 Title: Dynamic Optimization Algorithms for Baseload Power Plant Cycling Under Variable Renewable Energy

Vitor Gazzaneo (PhD)

Research Advisor: Fernando Lima
 Title: Multimodel Operability Framework for Design of Modular and Intensified Energy Systems

Brandon Robinson (PhD)

Research Advisor: John Hu
 Title: Natural Gas Conversion to Value-Added Chemical by Microwave Processes

Sai Pushpitha Vudata (PhD)

Research Advisor: Debangsu Bhattacharyya
 Title: Dynamic Modeling and Control of Grid-Level Energy Storage Systems

Yifan Wang (PhD)

Research Advisor: Debangsu Bhattacharyya
 Title: Quantifying the Impact of Load-Following on Gas-Fired Power Plants

BIOMEDICAL ENGINEERING SENIOR DESIGN

For one full year, students majoring in biomedical engineering worked on a project to solve an unmet biomedical need. The project is being developed by clients — individuals with a specific biomedical expertise, faculty, industry, and medical professionals, in collaboration with Associate Chair for Biomedical Engineering, Professor Cerasela Zoica Dinu. Through small team, real-world, close-mentoring, prototype design and development, a multidisciplinary design experience is ensured for all our senior students.

Eight design projects were undertaken in the 2020-2021 academic year. Students under faculty mentors in chemical and biomedical engineering (Jessica Allen, Gene Cilento, Cerasela Zoica Dinu, Robin Hissam, and Shuo Wang), 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, Health Sciences Center and Scott Galster, Rockefeller Neuroscience Institute), clinical (John Hollander, Joel Palko, and James Bardes, School of Medicine) and industrial (Manoj Mittal, Alcon and John Twist, Mylan) settings developing strategies that allow implementation of biomedical engineering concepts into health care. The 2020-2021 marked also the first year when a team of students has worked with the client, faculty mentor and the Office of Technology Transfer at WVU, to develop a provisional patent.

At the end of the 2021 spring 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; the presentation was held virtually due to undergoing pandemic. One example of a health care-related project is listed below.

Controlled intraocular pressure elevation for dynamic optical coherence tomography imaging in glaucoma

Client: Dr. Joel Palko

Faculty Mentor: Jessica Allen

The objective of this project was to design a system capable of elevating the intraocular pressure (IOP) of the eye during optical coherence tomography (OCT) imaging of the optic nerve head (ONH).

Glaucoma is a disease of the eye that causes damage to the optic nerve. It is the leading cause of irreversible blindness worldwide. The cause of glaucoma however remains unknown with IOP being its only modifiable risk factor (i.e., the only factor one can change to slow its progression). It

is hypothesized that elevated IOP causes: 1) mechanical damage to the neurons of the optic nerve as they exit the eye; and 2) vascular compression leading to ischemia to the nerve. With improvements in OCT imaging and the development of OCT angiography, we are now capable of imaging the geometry of the ONH and assess its vasculature, respectively, in a static state. More recently, investigators have attempted to measure the change in ONH geometry and blood vessel architecture using OCT before and after changes in IOP. It is suggested that evaluating the tissue alterations in response to IOP changes has the potential to improve the diagnostic accuracy of OCT, individualize patient treatments and test hypotheses of glaucoma pathophysiology.

However, these studies are limited by the difficulties inherent to elevating eye pressure in a controllable, comfortable, and accurate manner during imaging.

In this project, students developed a system capable of a safe and controlled elevation in eye pressure that allowed for dynamic OCT imaging of the ONH.

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

The biomedical engineering undergraduate program was founded with design at the heart of the curriculum. Our rigorous team-based design sequence breaks down class boundaries, forms mentored relationships, actively involves each student in the evolution of the design course and in our Department and engages the students in active learning while making us all proud of the program's graduates.

CHEMICAL ENGINEERING SENIOR DESIGN

In 2020-2021 chemical engineering students worked on two year-long senior design projects similar to previous years with each team having 18 members. The teams were led by Chief Engineers, Kevin Donnelly and Madelynn Watson. The project results were presented on April 20 and 22, 2021 via zoom presentations. Presented below is an abstract for each project:

Production of BTX from Shale Gas in the Appalachian Region

Madelynn Watson, Chief Engineer

With the boom of shale gas production and increasing number of electric cars, U.S. gasoline demands are quickly dropping. This is leading to a rapid fall in the production of benzene, toluene, and xylene (BTX) that were primarily produced in the catalytic reformers used for gasoline production in refineries. On September 1, 2020, Mountaineer Aromatics Tech (MAT) was contacted by BTXTek to investigate potential routes to produce BTX products from shale gas in the Appalachian region. MAT performed a series of techno-economic studies that evaluated the profitability and the feasibility of potential designs for BTX production. The analysis was conducted in three phases.

In **Phase 1**, the team performed an extensive literature review to propose and rank potential routes by a developed criterion including factors such as novelty and economic feasibility. At the end of Phase 1, the accepted design was a BTX production process containing aromatization of methane and ethane, benzene purification, alkylation with methanol, and divided wall column separations. During **Phase 2**, models were generated that could be validated against experimental data for all units. Moving to **Phase 3**, models from Phase 2 were then expanded to have a fully simulated base case for the entire BTX production process including mass and energy balances. Economic analyses were conducted on the overall facility for both the base case and optimized case. Topological and parametric optimizations were completed for improving the economic validity and profitability of the process. Finally, selected units included a piping and instrumentation diagram, a hazard and operability study, and a sustainability analysis.

Hydrogen Utilization Process Design in the Appalachian Region

Kevin Donnelly, Chief Engineer

Because of the rise of hydrogen production by steam methane reforming of shale gas from the Appalachian region, there is an increased potential to produce high-valued chemicals from hydrogen in this region. On August 31, 2020, Mountaineer Hydrogen Tech (MHT) was contacted by H2FutureTek, Inc. to investigate economically feasible and sustainable processes for chemical products that could have a large market share – particularly in the Appalachian region. MHT conducted techno-economic studies and ranking for various products based on profitability and the feasibility of simulation. These studies were done over the course of 3 phases.

Phase 1 was dedicated towards market and process research for different products with hydrogen as a feedstock. The various products studied were evaluated based on several factors, including marketability, feasibility, and novelty. Following the work done in phase 1, H2FutureTek, Inc. accepted the proposal of a four-unit facility producing dimethyl ether from methanol, ammonia, stearic acid, and hydrogen peroxide. **Phase 2** involved the generation of simulations and models for the different units to create preliminary mass and energy balances and compare them to literature values. Methanol synthesis utilized carbon dioxide from carbon capture technology in the Appalachian region, which lead to a dehydration reactor to produce dimethyl ether. Ammonia synthesis was done using the Haber-Bosch process, and a novel adsorption separation scheme. Stearic acid was produced from the hydrogenation of linoleic acid. Hydrogen peroxide was generated through the direct synthesis of hydrogen and oxygen in a microtube reactor. Entering **Phase 3**, the simulations of all units were scaled-up after continued validation with literature. Topological and parametric optimizations were conducted for improving the economic validity of the proposal. Individual units were economically evaluated based on equivalent annual operating cost, and a plant-wide economic study was done based on net present value and discounted cash flow rate of return. Finally, all units implemented standard sizing into the process design, and selected units completed additional objectives such as the generation of piping and instrumentation diagrams, a hazard and operability study, and a sustainability analysis.



GROWING GRADUATE FELLOWSHIPS

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 Travis Finney at tfinney@wvuf.org

IN MEMORIAM

Michael Gieger (BS 1984) passed away on October 22, 2020 in Parkersburg, West Virginia. Gieger was a chemical engineer employed at Kraton Polymers. He was also a veteran of the United States Navy and the Army National Guard. He was a big WVU fan and enjoyed boating and camping.

James Patton (BS 1964) passed away on November 11, 2019. Jim was raised in Morgantown, West Virginia, and after graduating with his master's degree in chemical engineering, he began his career with Exxon. Upon retiring, the family moved to Puerto Rico where Jim enjoyed remodeling and sailing the warm waters of the Caribbean. However, after two years, Esso Puerto Rico hired him as a consultant for a job that was initially estimated to take six months, but actually took ten years. Jim is survived by his wife Georgina, and his sons David and Justin.



WOTRING

Robert Wotring (BS 1960) passed away on February 12, 2021. Bob was born in Rowlesburg, West Virginia, and attended Kingwood High School. Following graduation from WVU he joined Exxon at the Baton Rouge, Louisiana Refinery and Chemical Plant. Bob held various positions in Exxon including being appointed as president of Al Jubail Petrochemical Company in Al Jubail, Saudi Arabia and in 1990 was appointed to the dual position of president of Exxon Chemical's Japanese Affiliate in Tokyo, Japan, and general manager of Exxon Chemical's Asia Pacific Polymer business. In 1994, he returned to the U.S. to serve as president of Paxon Polymer Company, formerly a joint venture between Allied Signal and Exxon Chemical until his retirement. Wotring is survived by his wife, Billye, four children, seven grandchildren and seven great grandchildren. Bob was a member of the WVU Academy of Chemical Engineers.

CLASS NOTES

Hugh H. Felton (BS 1959) has retired from Hercules Inc. where he was a Production Superintendent at the Allegany Ballistics Laboratory. He also worked for Super Concrete Co. as a safety and quality control manager for about two years and served on the Frankfort Public Service District Board of Directors as a volunteer for 20 years. Felton sang first tenor in a gospel quartet for 26 years and was a Lay Speaker in the Methodist Church for about 40 years. He and his wife Helen have been married for 70 years. Felton states that his wife got her P.H.T. (Pushing Hubby Thru) while at WVU. He is 90 years old and still cuts and splits firewood and cuts his grass and says thanks to God for his guidance and support. Hugh and Helen reside in Ridgeley, West Virginia.

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.

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Alumni Update Summer/Fall 2021

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.

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Position Title: _____

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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 our website: 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.