



MICKEY LELAND ENERGY FELLOWSHIP PROGRAM

Sponsored by the U.S. Department of Energy Office of Fossil Energy

2015 TECHNICAL FORUM



U.S. DEPARTMENT OF
ENERGY

<http://energy.gov/fe/mickey-leland-energy-fellowship>

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FE Leadership

68 Christopher A. Smith
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Office of Fossil Energy
U.S. Department of Energy

69 Dr. Julio Friedmann
Principal Deputy Assistant Secretary
Office of Fossil Energy
U.S. Department of Energy

70 Dr. Grace M. Bochenek
Director
National Energy Technology Laboratory
U.S. Department of Energy

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Office of Management and Field Operations
Office of Fossil Energy
U.S. Department of Energy

74 Sandra Cortez
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Office of Management and Field Operations
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75 Barbara Dunkin
Project Specialist, Science Education Programs
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75 Leslie Fox
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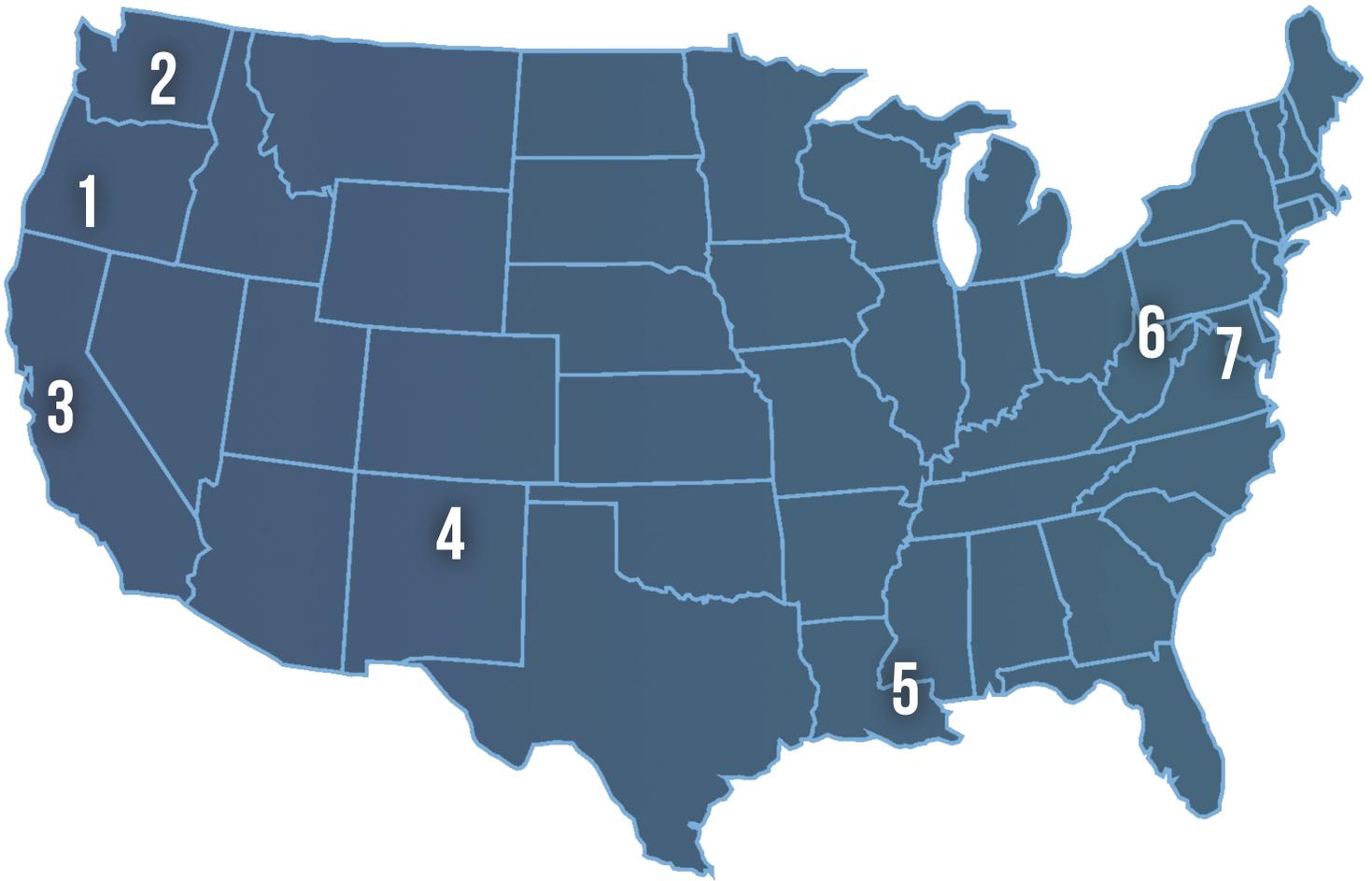
Program Staff

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Program Manager
Los Alamos National Laboratory

79 Elaine King
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Office of Work Based Learning
Pacific Northwest National Laboratory

79 Kelly Schwehm
Site Coordinator
General Engineer
Strategic Petroleum Reserve



2015 Fellow Locations:

- 1 NATIONAL ENERGY TECHNOLOGY LABORATORY, ALBANY, OR
- 2 PACIFIC NORTHWEST NATIONAL LABORATORY, RICHLAND, WA
- 3 SANDIA NATIONAL LABORATORIES, LIVERMORE, CA
- 4 LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM
- 5 STRATEGIC PETROLEUM RESERVE, NEW ORLEANS, LA
BAYOU CHOCTAW SITE, PLAQUEMINE, LA
- 6 NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA
NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV
- 7 U.S. DEPARTMENT OF ENERGY HEADQUARTERS, WASHINGTON, DC
GERMANTOWN, MD

GEORGE THOMAS “MICKEY” LELAND



Mickey Leland was a six-term U.S. Congressman and Texas state representative who was best known for focusing much-needed attention on issues of health and hunger. He was an effective spokesman for the hungry and rallied support which resulted in both public and private action to reduce hunger in the U.S. and throughout the world.

Mr. Leland was born on November 27, 1944 in Lubbock, Texas to Alice and George Leland II. He moved to Houston's Fifth Ward at a young age with his mother and brother. In 1964 he graduated in the top ten percent of his class from Houston's Phyllis Wheatley High School. While attending Texas Southern University (TSU), he became a vocal leader of the local civil rights movement and brought national leaders of the movement to Houston. He graduated from TSU's School of Pharmacy in 1970 with a Bachelor of Science. From 1972 to 1977 he served in the Texas state legislature in Austin representing Houston's 88th District. As a state representative he became famous as a champion of health care rights for the poor.

In 1978, Mr. Leland was elected to the United States Congress from the 18th Congressional District in Houston. His ability to reach out to others with innovative ideas and to gain support from unlikely sources was key to his success in effectively addressing the problems of the poor and minorities.

Congressman Leland led an eight-member House of Representatives delegation

on a tour of famine stricken areas in Ethiopia. Increasingly active in international human rights and world hunger issues, he worked tirelessly to solve the problems of hunger and malnutrition around the world. On August 7, 1989 while leading a humanitarian mission to a United Nations refugee camp, his plane crashed in a mountainous region of Ethiopia. He was accompanied on this trip by members of his staff, State Department officials, and Ethiopian nationals. There were no survivors.

In 2000, then-Secretary of Energy Bill Richardson renamed the Office of Fossil Energy's Minority Education Initiative the Mickey Leland Energy Fellowship. The more than 100 members of the class of 2000 became the first Mickey Leland Energy Fellows. Mr. Richardson stated that the ceremony to honor the late Congressman would be a way to "remember a great American who dedicated his life to expanding human potential." He added that he "could find no better way to honor [Mr. Leland's] memory than to endow his name on a program that will elevate the opportunities for future generations of minority students."

ABOUT THE MICKEY LELAND ENERGY FELLOWSHIP PROGRAM

10-Week Summer Internship Program

The Mickey Leland Energy Fellowship (MLEF) Program is headquartered in Washington, DC, and is sponsored by the Office of Fossil Energy (FE), U.S. Department of Energy. MLEF's mission is to encourage women and under-represented minority students majoring in Science, Technology, Engineering and Mathematics (STEM), to apply their academic achievements to actual research and gain hands-on experience as they prepare to enter the workforce. All eligible candidates can apply for this program.

The 10-week summer internship may place students at one of several possible FE sites including: the Strategic Petroleum Reserve site in Louisiana; the National Energy Technology Laboratory sites in Pittsburgh, Pa., Morgantown, W.V., and Albany, Ore.; and the Department of Energy Headquarters sites in Washington, D.C., and Germantown, Md. During the final week of the program, MLEF Fellows attend a Technical Forum and present their internship project to their peers, mentors, site representatives, and senior FE managers.

Selected MLEF Fellows will receive:

- A weekly stipend of \$600 for undergraduate students
- A weekly stipend of \$750 for Master's students
- A weekly stipend of \$850 for Doctoral and Postdoctoral students
- Approved temporary relocation costs to and from your host site
- Approved housing allowance based on appointment location
- Approved travel reimbursement to the Technical Forum

The Mickey Leland Energy Fellowship Program was awarded the Secretary of Energy's EEO/Diversity Best Practices Award in 2007.



CAPTAIN (RET) ERNEST R. HUNTER SR., P.E., ACP

MLEF Program Co-Founder
Former Deputy Assistant Secretary
Department of Energy

Mr. Hunter served as the Director of Physical Plant/Facilities Services for The University of Texas at Austin for six years. In this position, he was responsible for a 1000-person workforce that providing facilities services including maintenance and operations, architect and engineering services, custodial services, landscape services, and general support services to two campuses of over 50,000 students, 20,000 faculty and staff, 16 million gross square feet of space and 800 acres of grounds with an annual budget of over \$50 Million. He implemented a significant strategic restructuring of the Physical Plant organization greatly improving service delivery and organizational management all work units. Under his leadership, the University of Texas at Austin Physical Plant/Facilities Services organization became a benchmark of excellence and gained national recognition for its Custodial Services program, Landscape Service program, Preventative Maintenance program, and its strategic change management activities. He hosted numerous benchmark visits from organizations seeking to learn from his efforts.

Prior serving as Directors, Mr. Hunter served as the Assistant Director of Support Services in the Physical Plant from 1999t-2001. In this position, he was responsible for the oversight of three Physical Plant divisions - Custodial Services, Landscape Services, and General Services He was also responsible for the university's vehicle fleet operations, automotive repair shop, refuse and recycling program, pest control, surplus property operations, and transportation support.

Before arriving at UT Austin, Mr. Hunter held a wide-variety of leadership, managerial and technical positions throughout a 26-year career in the United States Navy. His final assignment as a Navy Captain was as Commanding Officer, Engineering Field Activity West, in San Bruno, California where he was responsible for over \$200 million in construction activity per year and a wide variety of engineering and facilities services. His 550-person organization provided service to five major active military bases and numerous reserve centers throughout the California, Utah and Nevada areas as well as managed the closed military base conversion program for over a half dozen closed Navy bases in the San Francisco Bay area. He made Navy history by executing the first closed Navy base "Early Transfer" to the allowing the Port of Oakland to take responsibility for the environmental cleanup and place the base into civilian use many years ahead schedule.

Among his many other Navy assignments, Mr. Hunter also served as Deputy Assistant Secretary for the Department of Energy in Washington, DC responsible for the Naval Petroleum and Oil Shale reserve. During this assignment he greatly reduced operating cost and significantly increased revenue for the Elk Hill government oil and gas fields in Bakersfield, California. He also played a major role in the sale of the oil fields generating \$3.65 billion for the U.S. treasury. It was also during this assignment when Mr. Hunter cofounded the HBCU intern program which has blossomed into the Mickey Leland Energy Fellowship program.

Mr. Hunter received many awards including the Navy Legion of Merit; the Department of Energy Gold Award; Fort Valley University Platinum Achievement Award; The University of Texas Eyes of Texas Award; and The University of Texas Employees and Campus Services SLICE Award.

His educational background includes a Masters and Bachelors of Electrical Engineering from Texas A&M University and a Masters of Science in National Resource Strategy from the Industrial College of the Armed Forces. He is also a graduate of the APPA Facilities Institute. Mr. Hunter is a registered Associate Computer Professional with the Institute for the Certification of Computer Professionals and a Microsoft Certified Office Specialist at the Expert level.

He is married to Brenda Hunter (Newton) and they have one son, Ernest R. Hunter II, and one daughter, Britney Hunter.



REGINAL "REG" SPILLER

MLEF Program Co-Founder
Former Deputy Assistant Secretary
Department of Energy

Mr. Spiller has over 30 years of oil and gas experience. He began his career with Exxon USA, Elf Aquitaine and Maxus Energy. Previously, he was COO for Allied Energy. All companies were Houston based. Currently he is CEO of Azimuth Investments, and was co-founder of Frontera Resources. At Frontera, he attracted \$200 million for an LSE AIM listing for development projects in the Republic of Georgia and Azerbaijan. Advisory boards he served on include: the National Academy of Science, the Penn State College of Earth and Mineral Science, the University of Utah Energy Geoscience Institute, and the National Association of Black Geologists and Geophysicists. From December '93 to March, '96, Mr. Spiller was the U.S. Department of Energy's Deputy Assistant Secretary for Gas and Petroleum Technologies, the highest-ranking geologist in the administration and first petroleum geologist to hold the position. He formerly served as the Honorary Consul General to Sierra Leone. Mr. Spiller holds a M.S. in Geology from Penn State University, is a recipient of the Distinguished Alumni Award, and a B.A.S.S. from the State University of New York in Geology.



2015 FELLOWS

Adit Patel
Alexander Horn
Amanda Foley
Amy Falcon
Andrew Bean
Ashley LeDonne
Azhar Ali
Brandon Mathis
Brenna Doherty
Bryce Reynolds
Carol Sadek
Claude Phan
Daniel Peluso
Daniel Schultz
Danielle J. Mathews
David Etim
Elizabeth Ritterbush
Emma Menio

Gavin Glenn
Huda Ashfaq
Jacqueline A. Elwood
Jaileen Del Valle Maldonado
Jared Carpenter
Jeremiah F. Wilson
Jeremy Gibbs
Jessica Farrell
Jessica Spears
Jessica Torres
Jordan Bordonaro
Joshua M. Kubiak
Kyle T. Stewart
Laurel Boser
Lauren Smales
Lidiya Gavrilenko
Liliia Reddy
Lucy Tang

Luke H. Macfarlan
Mack Weaver
Matthew Grasinger
Matthew Kang
Meghan Brandi
Michael LeClaire
Molina Nichols
Phillip Tilson
Samantha Martinez
Sarah Narburgh
Simone Gelinis
Thornton Wilson
Tracy Tran
Tyler Castillo
Vanessa Espinoza
Wyatt Adams
Zachary Branum





ADIT PATEL

Graduate

Major: Global Sustainability

University of South Florida, Tampa, FL

BS Environmental Science and Policy –USF 2013

Focus: Energy Concentration

Mentor: Natalie Pekney

BIOGRAPHY

Adit Patel attends the University of South Florida in Tampa, where he is earning his master’s in Global Sustainability. He is concentrating in Energy and works for the Office of Sustainability as their Sustainability Fellow. Throughout his undergraduate and graduate career, Adit has completed myriad of internships and research that have strengthened his passion for climate change and environmental science.

Mr. Patel’s career aspirations include working for the U.S. Department of Energy or industries heavily involved with sustainable energy utilization. He eventually wants to make his way to a leadership role in order to have the opportunity to spread the same passion that has driven him in his initiatives. Adit will graduate in the spring of 2016 and plans to utilize his continuously growing experiences to expand his knowledge of energy so that he can help facilitate energy management to reach its true potential worldwide.

PROJECT

FUGITIVE METHANE EMISSIONS FROM INACTIVE PRODUCTION OIL/GAS WELLS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

A multi-phased engineering evaluation of fugitive methane emissions from abandoned oil/natural gas wells was conducted in Hillman State Park in Western Pennsylvania. Hillman state park is a 3600 acre area, where many oil and gas wells were drilled from the late 1800s to the 1910s. The state maintained a list of only 30 wells; however, in August 2014, an aerial magnetic survey revealed almost 200 magnetic anomalies that could potentially be wells. Currently, researchers are conducting ground surveys to determine the location of the wells and to measure the methane emissions. By using a Dynamic Flux chamber, Bacarach high-flow sampler, portable flame ionization detector, and an infrared camera, leak locations were identified and leak rates were determined. Preliminary results based on measurements made at 11 wells revealed a methane flux ranging from 0.002 mg/(m²-min) to 0.064 mg/(m²-min). The overall objective is to generate an emission potential for natural gas from the abandoned wells, and to determine the significance related to other methane sources.

MENTOR



Natalie Pekney is an environmental engineer on the Monitoring Team in the Engineered Natural Systems Division of the U.S. Department of Energy National Energy Technology Laboratory in Pittsburgh, PA. She received her BS in Civil Engineering from Case Western Reserve University in Cleveland, Ohio and a MS and PhD in Civil and Environmental Engineering from Carnegie Mellon University in Pittsburgh, Pennsylvania. Natalie currently conducts air quality research as it pertains to fossil energy production and use. She is the Team Technical Coordinator for shale gas development fugitive emissions research conducted under NETL’s Unconventional Resources Research Program.



ALEXANDER HORN

Senior

Major: Chemical Engineering

University of Pittsburgh, Pittsburgh, PA

Mentor: Megan Macala

BIOGRAPHY

Alexander Horn attends the University of Pittsburgh in Pittsburgh, Pennsylvania, where he is earning his BS in Chemical Engineering. For two years, he has participated in undergraduate research at the school under Dr. Badie Morsi, studying ionic liquids for CO₂ capture applications. In the 2014-2015 school year, Alexander won the Paul F. Fulton Scholarship Award—given by the Swanson School of Engineering’s Department of Chemical Engineering—as well as placed on the Dean’s List for both the fall and spring semesters. Alexander is an active member of the National Society of Black Engineers (NSBE), a resident assistant (RA), Pitt’s diversity in engineering program, Pitt EXCEL, and the captain of the BROTHERHOOD male forum. Alexander will graduate in the fall of 2015 and enter graduate school, on the PhD track, in the fall of 2016.

Mr. Horn’s career aspirations are to continue research—in a national lab, or in industry—in carbon capture, toward the goal of developing technology that can produce energy with zero carbon emissions. In his free time, Alex enjoys playing tennis and other sports, reading and traveling.

PROJECT

EVALUATION OF IONIC LIQUIDS FOR SUPPORTED IONIC LIQUID MEMBRANES: APPLICATION IN PRE-COMBUSTION CARBON CAPTURE

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Mr. Horn has been conducting research on Supported Ionic Liquid Membranes (SILMs), specifically, on the interaction between the ionic liquids (ILs) and the porous polymer supports. The purpose of the research is to draw conclusions on how the selected ionic liquids affect the strength of the porous polymer supports. For this purpose, a series of ILs were synthesized, characterized, and their physical and thermal properties were determined. The ionic liquids were evaluated for CO₂ solubility and SILMs were evaluated for CO₂/H₂ selectivity.

MENTOR



Megan Macala works for AECOM and serves as a Research Scientist and Laboratory Manager at NETL in Pittsburgh, PA. She is currently designing and synthesizing ionic liquids for carbon capture applications. Megan also manages the Polymer Synthesis Lab’s day-to-day activities and collaborates with numerous teams to provide the resources that enable her colleagues to work effectively. Prior to joining NETL, Megan worked in the pharmaceutical industry as a medicinal chemist for seven years where she was responsible for planning, synthesis, purification and characterization of drug candidates on milligram to multi-gram scales. Megan obtained a BS in Chemistry from John Carroll University in Cleveland, Ohio and an MS in Chemistry from the University of Pittsburgh.



AMANDA FOLEY

Senior

Major: Chemical Engineering

Minor: Nuclear Engineering

University of Utah, Salt Lake City, UT

Mentor: Deepak Tapriyal & Isaac Gamwo

BIOGRAPHY

Amanda Foley attends the University of Utah in Salt Lake City, where she is earning her BS in Chemical Engineering with a minor in Nuclear Engineering and an emphasis in Energy Engineering. She is an alumna of the ACCESS program at the University of Utah.

Amanda is exploring career opportunities in both the public and private sector. She aspires to apply her experience and knowledge to improve the engineering community. Outside of academia, she enjoys hiking mountain trails in Northern Utah.

PROJECT

EXPERIMENTAL STUDY OF THE VISCOSITY OF
PERFLUOROPOLYETHER OIL AT HIGH-TEMPERATURE HIGH-PRESSURE CONDITIONS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

At the 2010 High-Temperature High-Pressure Viscosity Standard workshop, petroleum companies recognized the need to identify a fluid to be used as a Deepwater Viscosity standard. This is a readily available fluid that can be used to calibrate viscometers used to study petroleum fluids found in ultra-deep formations, such as those found beneath the deep waters of the Gulf of Mexico. The desired standard exhibits the viscosity of light oils at ultra-deep conditions, which is approximately 20 cP at 500°F and 35,000 psia. The NETL and collaborating scientists proposed perfluoropolyether oils, specifically Krytox GPL 102 oil, as a candidate as it approximates the industrial requirements. It has recently been claimed that different lots of Krytox GPL 102 oil may have different compositions leading to a difference in viscosity at similar conditions.

The objective of this project is to measure the viscosity of Krytox GPL 102 from a different lot using the rolling ball viscometer developed at the University of Pittsburgh. The results will be compared to previous Krytox GPL 102 oil viscosity data gathered from a different lot to ascertain the viability of Krytox GPL 102 oil as a Deepwater Viscosity standard.

MENTOR



Dr. Deepak Tapriyal is a lead scientist for AECOM working under NETL Research and Engineering Services Support Contract in Pittsburgh, Pennsylvania. He has his MS in chemical engineering from Tennessee Technology University (2004) and PhD in Chemical and Petroleum Engineering from University of Pittsburgh (2009). Dr. Tapriyal has range of research interest and expertise in Energy and green chemistry technologies. These include thermodynamics at high pressure high temperature (HTHP), material development and synthesis (polymers, surfactants) for EOR, bio-oil from biomass (wood, paper, rubber tires) and bio-Diesel from oil (soybean, used oil, algae oil) using supercritical fluids (water, methanol, ethanol, CO₂ sequestration and supercritical fluids reactions/extraction. Dr. Tapriyal has more than 10+ years of experience in designing high pressure systems for various applications. Presently he is the responsible person for the operation of Phase and Composition Analysis Facility at NETL. He has designed density cell, which is windowed, variable volume high pressure cell, capable of doing measurements up to 260°C and 275 MPa (40,000 psi). He has more than 15+ publications in peer reviewed journals and written a book chapter on “Supercritical fluid extraction of bioactive compounds from cereals” in Fruits and Cereal Bioactives Source, Chemistry and Application by Tokusoglu Ozlem.



AMY FALCON

PhD Candidate

Degree: PhD in Forest Resources Science

Previous Degree: BS Wood Science and Technology

West Virginia University, Morgantown, WV

Mentor: Ayyakkannu Manivannan

BIOGRAPHY

Amy Falcon attends West Virginia University where she is earning her PhD in Forest Resources Science. She participated in graduate research at the school under Dr. Jingxin Wang, studying the pretreatment of woody biomass for the extraction of sugars for biofuels and bioproducts. Amy will graduate in the fall of 2015.

Ms. Falcon's career aspirations include working for either government or private research laboratory. She wants to perform research on energy production and storage from various sources. Amy enjoys traveling and would like to visit Italy sometime in her life. She also enjoys any activities that take her outdoors.

PROJECT

PRODUCTION OF ACTIVATED CARBON FROM COAL VS. WOOD VIA A TWO STAGE ACID TREATMENT

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Ms. Falcon worked on the production of activated carbon from coal refuse and woody biomass. Activated carbon is made from an organic material in which all components other than the carbon have been removed to create spaces (pores) inside the particles. This results in a very porous, high surface area structure with great adsorptive properties. These attributes are ideal in the production of supercapacitors which are evaluated for their ability to store an electrical charge. The program will compare underutilized resources and evaluate the ability of using these materials for the production of supercapacitors for energy storage.

MENTOR



Ayyakkannu Manivannan is a materials scientist at the U.S. Department of Energy's National Energy Technology Laboratory (NETL). He also currently serves as an Adjunct Professor in the Physics Department at West Virginia University. He has carried out research in multidisciplinary areas in materials science for more than 28 years in academia. His research interests and expertise include materials for energy conversion and storage involving photoelectrochemical cells, solid oxide fuel cells, electrochemical energy storage devices such as Li, Na, Mg-ion batteries, super capacitors, thermoelectric materials, catalysts, etc. Dr. Manivannan has been active in performing several international research collaborations and participates as an adviser in the NRC Research Associateship Programs. He is currently on the editorial board of Materials Science and Engineering B: Advanced Functional Solid-State Materials and serve on the advisory board for Electrochemical Interface.



ANDREW BEAN

Senior

Majors: BS in Geology, B.A. in Environmental Geoscience

Minor: Geographic Information Systems

West Virginia University, Morgantown, WV

Mentor: Dustin McIntyre

BIOGRAPHY

Andrew Bean attends West Virginia University in Morgantown and is entering his senior year with dual degrees in Geology and Environmental Geoscience. As an environmental scientist, he interned with Geo-Technology Associates, Inc. in Maryland collecting field data pertaining to soils and wildlife to assist with wetland delineation. In the fall, he will be supporting research on soils of the remote Canaan Valley in West Virginia with PhD candidate and Geomorphologist Mitzy Schaney. Following graduation, he plans to further his academic education and gain research experience in the Geosciences.

Mr. Bean's career ambition aligns with geologic and environmental research in support of public science needs through the public sector such as DOE, EPA, USGS, NASA, or USACE. Ultimately, he strives to contribute to and enrich the scientific community with his research. In his free time, he desires to travel around the world, experience various cultures, and explore the best this planet, and others, have to offer.

PROJECT	ASSESSMENT OF & RECOMMENDATIONS FOR MANAGEMENT OF NETL'S PHYSICAL & DIGITAL GEOSAMPLE ASSESTS
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Andrew Bean is working with Dan Peluso, another Mickey Leland fellow, at the U.S. Department of Energy's National Energy Technology Laboratory (NETL) to assist the Office of Research & Development (ORD) with creating an inventory of the thousands of NETL onsite geo-samples and the associated datasets from analyses performed on those samples. This inventory will help ORD with a number of goals going forward, including evaluating the needs and viability of developing a geo-samples repository for NETL in the future. Also, by researching the country's top geological repositories, such as USGS Woods Hole Coastal and Marine Science Center, Scripps Institute of Oceanography, and The Marine Geology Repository at Oregon State University, Dan and Andrew will develop a comprehensive report and ideal plan for how an official NETL repository could be implemented in the future.

MENTOR



Dustin L. McIntyre received a BS in Electrical Engineering and a BS in Computer Engineering in from West Virginia University in December of 1998. He completed his masters in Mechanical Engineering in August 2000. He completed his doctoral studies in May 2007 with his dissertation titled "A Laser Spark Plug Ignition System for a Stationary Lean-Burn Natural Gas Reciprocating Engine". He is currently a team lead and researcher with the materials characterization division at the USDOE's National Energy Technology Laboratory studying various aspects of carbon sequestration with multiple CT scanner units. He also studies the use of laser induced breakdown spectroscopy for use in downhole in-situ sensing applications. Dr. McIntyre is author/coauthor of over 50 publications.



ASHLEY LEDONNE

Bachelor of Science

Major: Chemistry

Minor: Business Management

Carlow University, Pittsburgh, PA

Mentor: Evan Granite & Elliot Roth

BIOGRAPHY

Ashley graduated from Carlow University in May 2015, where she earned her BS in Chemistry and minored in Business Management. She plans to attend Chatham University for graduate school and attain a dual master's Degree in Sustainability and MBA (MSUS-MBA).

Ashley's career aspirations are to provide business and government sectors with strategic direction to improve energy efficiency and greenhouse gas reduction goals. She wants to be involved with an organization that is committed to supporting sustainable development through responsible environmental stewardship. Ashley's ultimate goal is to be a leader in the initiative to stop global climate change, and to expand the scientific community with research that will support sustainable energy, water, and air quality.

PROJECT

EXTRACTING AND RECYCLING RARE EARTH ELEMENTS FROM AQUEOUS SOLUTIONS USING LAYERED DOUBLE HYDROXIDE (LDH) ANIONIC CLAY

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Rare earth elements (REE) have been the object of considerable scientific and technological interest due to their array of applications in society, research and development, and national defense. REEs are composed of scandium, yttrium, and the lanthanide series on the periodic table. The layered structure of LDHs makes the material interesting due to the valuable and unique ion-exchange intercalation properties. This summer, Ashley will be synthesizing a variety of LDH anionic clays and studying the uptake capabilities in aqueous solutions containing REEs. These materials may have beneficial applications in extracting REEs from industrial wastewater, fracking water, and acid drainage water. If REEs could be extracted out of wastewater, it would not only have positive impacts on the environment and the economy, but would also aid in protecting the supply of REE nationally.

MENTOR



Evan J. Granite is a Research Group Leader at the U.S. Department of Energy's National Energy Technology Laboratory (NETL), USA; Technical Coordinator for NETL's in-house research on Rare Earth Detection and Recovery; and an Adjunct Research Professor of Chemical and Petroleum Engineering at the University of Pittsburgh, USA (volunteer position). He completed postdoctoral research at the U.S. Department of Energy (DOE), received a PhD in Chemical Engineering from the University of Rochester, and BS and MS degrees in Chemical Engineering from The Cooper Union. His research has focused on mercury, trace contaminant, and CO₂ removal from flue and fuel gases. He is the principal or co-investigator for projects on the capture of mercury, arsenic, selenium, phosphorus, cadmium, and antimony from coal-derived flue and fuel gases, and CO₂ separation from flue gas. He has coauthored thirtyeight peer-reviewed journal articles, eight patents/patents pending, two hundred five conference papers and presentations, and forty-nine DOE reports of invention. His research interests are in separation technologies; pollution clean-up; catalysis and surface chemistry; photochemistry; electrochemistry; energy/utility systems; capture, storage, and utilization of CO₂; and detection and recovery of rare earth elements from coal-derived streams.



AZHAR ALI

Incoming PhD Candidate

Major: Chemical Engineering

Texas A&M University, College Station, TX

BS in Chemical Engineering, 2015

Washington and Lee University

Mentor: Bhima Sastri

BIOGRAPHY

Azhar Ali graduated from Washington and Lee University with a BS in Chemical Engineering cum laude in spring 2015. He participated in undergraduate research at the school, working on producing durable and cost effective optical coatings via ionic self-assembly of nanoparticles. Additionally, he worked as a summer intern in the NSF-funded Biosystems and Biofuels Research for Undergraduates (REU) program at Auburn University where his project involved the conversion of ethanol to gasoline using zeolite catalysts. He will be pursuing a PhD in Chemical Engineering at Texas A&M University in the fall.

Azhar would like to build a career in the research and development of clean energy. He eventually wants to work in industry to develop more efficient and environmentally friendly fuels. He is passionate about using engineering to help people and volunteered to build bio-sand water filters in rural Guatemala with Engineers without Borders (EWB) during spring break of his junior year. Azhar enjoys travelling and would like to visit the Dead Sea in Jordan in the near future.

PROJECT

CFD SIMULATION OF COAL GASIFICATION IN A SPOUTED BED REACTOR

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Azhar used a multiphase computational fluid dynamics simulation program, MFIX, developed by NETL to simulate coal gasification in a spouted bed reactor to study the effects of factors such as particle size, column diameter, and operating pressure on the process. Spouted beds are capable of gasifying particles with a wide size distribution, non-spherical geometry, and coarse or adhesive surfaces, thus providing flexibility in the choice of feedstock. Studying the gasification of coal in a spouted bed reactor will enable optimization of the process to maximize efficiency and syngas yield for a given coal feedstock.

MENTOR

Bhima Sastri, General Engineer





BRANDON MATHIS

Senior

Major: Computer Science

Fairmont State University, Fairmont, WV

Mentor: Eilis Rosenbaum

BIOGRAPHY

Brandon Mathis attends Fairmont State University in Fairmont, WV, where he is earning his BS in Computer Science. He has participated as a student peer mentor and tutor at his school for Mathematics since his sophomore year. Although this is his first time conducting research, he has helped to analyze data that was collected by the Psychology department at his school. Brandon will graduate in the spring of 2016 and plans on attending graduate school in the fall for Computer Science. He is still unsure of where he would like to work and what kind of work he wants to do, but he aspires to do something that will help to better the lives of people around the world. Brandon would also like to, one day, get the opportunity to travel around the world.

PROJECT

FOAM CEMENT BUBBLE CHARACTERIZATION

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

In several well cementing applications, foam cements are often used in place of conventional cements for their lower density and for their higher ductility. This makes the study of foam cement considerably important, because little research has been published investigating the clustering and formation of structures occurring with the bubbles in foam cement. The premise of this project is to examine the distribution and flow of bubbles in foam cement slurries for indications of clustering and the formation of structures. These will be examined because the clustering and coalescence of bubbles in foam cement slurries can lead to channeling and decreased structural integrity of the hardened cement. By doing this project, we hope to gain more insight into the patterns and reasoning for the clustering and structuring of bubbles that is occurring within the foam cement.

MENTOR



Eilis Rosenbaum is a research engineer in the Materials Characterization Division within the Office of Research and Development at NETL, Pittsburgh, PA. She is a current PhD candidate in the Civil Engineering Department at Carnegie Mellon University. She earned her MS in Chemical Engineering at the University of Pittsburgh and her BS in Engineering with a concentration in Mechanical Engineering and BS Degree in Chemical Engineering with a minor in Mathematics from Geneva College. Her research at NETL has included work in methane hydrates, thermal properties, computed tomography (CT) scanning, CT image analysis, and work in quality control and safety. Her current research and interest is with foamed cements and modeling its behavior under well bore conditions.



BRENNA DOHERTY

Junior

Major: Petroleum Engineering & Computer Science

University of Wyoming, Laramie, WY

Associates Degree in Mathematics, 2014

Howard Community College

Mentor: Nicolas Huerta

BIOGRAPHY

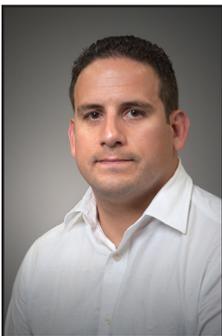
Brenna Doherty is 4.0 GPA student at the University of Wyoming in a double-major of Petroleum Engineering and Computer Science. She previously earned her associates degree in Mathematics, graduating in 2014. Currently, she is on the President's Honor Roll and is a Representative for the Society of Petroleum Engineers. Ms. Doherty also competed as an international-level figure skater for 15 years and most recently toured professionally with Royal Caribbean.

Ms. Doherty will start a dual undergraduate/graduate program next year, where she has great interest in the ORISE Pathway Program. She plans to pursue a PhD and has aspirations to work for the U.S. Department of Energy (DOE), especially in exploration of methane hydrates and research regarding wellbore integrity along sites in the Gulf Coast.

PROJECT	THE APPLICATION OF REDUCED-ORDER MODELS TO ESTIMATE THE LEAKAGE ALONG WELLS DURING GEOLOGIC CO ₂ STORAGE
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, ALBANY, OR

Depleted Oil and Gas Reservoirs have the potential to store upwards of 225 billion metric tons of CO₂ (CO₂), making them attractive candidates for long-term geologic storage and key to reducing CO₂ emissions into the atmosphere. With injecting CO₂ into depleted fields comes the risk for the CO₂ plume to contact a large number of existing wells. Ms. Doherty's research focused on the use of Reduced-Order Models (ROM) to simulate a hypothetical storage scenario in Natrona County, Wyoming, in order to assess the risk of CO₂ and brine leakage along the already existing wells. She focused on quantifying the impact that key parameters (e.g. leak-path permeability, well depth, presence of thief zones, distance from injection site and well age) would play on the amount of CO₂ and brine leaked over the life of the project. Ms. Doherty analyzed wells penetrating the Tensleep Formation in the Powder River Basin, and used the Intergovernmental Panel on Climate Change's one percent rule, to determine the maximum leakage allowance for CO₂ and brine. Using the ROM Tool, she was able identify the wells with the highest likelihood of leakage, along with quantify the long-term risks of CO₂ and brine outflow. With this approach, one can monitor the candidate fields for CO₂ storage in order to minimize the chance for leakage along the existing wells.

MENTOR



Dr. Nicolas Huerta is a physical scientist in the Predictive Geosciences Division in the Office of Research and Development within the U.S. Department of Energy's National Energy Technology Laboratory (NETL). He holds a BS and MS in Geology from The University of California at Davis and a MSE in Petroleum Engineering and PhD in Geological Sciences from The University of Texas at Austin. He is a recent full-time federal employee, having completed his doctoral degree in December 2013 and was an intern in the Pathways program at NETL during his dissertation.



BRYCE REYNOLDS

Junior

Major: Chemical and Biomolecular Engineering

University of Maryland, College Park, MD

Mentor: Regis Conrad & Dani Petrucci

BIOGRAPHY

Bryce Reynolds is a current junior attending the University of Maryland in College Park, MD. He is earning his BS in Chemical and Biomolecular Engineering. He has completed a scholar citation in Public Leadership while attending his University and graduates in the spring of 2017.

Mr. Reynolds aspires to finish earning his undergraduate degree and then move on to the professional world while simultaneously beginning work on a business related master's degree. Bryce's largest goal in his career is to aid the spread of first-world commodities such as electricity and water treatment plants to those around the globe without current access to these resources. In Bryce's free time, one passion is helping others. He has spent many hours volunteering through different outlets including mentoring inner city children, starting a club for human rights and even spending part of his summer volunteering in Kenya.

PROJECT

INDIRECT SUPERCRITICAL CO₂ POWER CYCLES

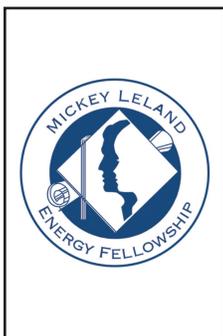
SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Mr. Reynolds worked on a closed loop Brayton Cycle which utilized supercritical CO₂ as its working fluid instead of the current industry standard of steam. His work includes a steady state model of the cycle operation along with a financial and efficiency analysis. The aim of his work is to prove the benefits of this new technological innovation and to set the foundation for further U.S. Department of Energy supercritical CO₂ research and development. He hopes to see his project have an impact of the commercialization of this technology.

MENTOR

Regis Conrad has worked in electrochemistry and materials engineering since 1978. Currently Mr. Conrad manages the research on sensor and control, computational modeling and high temperature materials research. Prior to working for the U.S. Department of Energy he worked for the Department of Navy as a materials engineer. Mr. Conrad has a BA in Chemistry and Zoology from George Washington University.





CAROL SADEK

1st Year Grad Student

Majors: Applied Mathematics and Computer Science
Emphasis in Computational Science

University of North Carolina at Chapel Hill, Chapel Hill, NC

Degrees: BS in Applied Mathematics, BA in Computer Science

Wofford College Class of 2015

Mentor: Justin Weber

BIOGRAPHY

Carol Sadek graduated from Wofford College in Spartanburg, SC in May 2015, where she received a BS in applied mathematics and a BA in computer science with an emphasis in computational science. She participated in the math research group at Wofford College from 2011 to 2014, where she examined patterns in the graphs of the Towers of Hanoi puzzle and found formulas to express the number of nodes on the graphs. In the summer of 2013, Carol interned for the U.S. Department of Energy at the Oak Ridge National Laboratory, where she examined the use of GPU-CPU hybrid computing approaches for analyzing big data using independent component analysis algorithms. In the summer of 2014, Carol participated in an REU at NC State University, where she analyzed text data including World Cup tweets and Bible verses through clustering algorithms such as singular value decomposition and non-negative matrix factorization to investigate topic extraction from large text datasets. Carol will be attending the University of North Carolina at Chapel Hill in the fall of 2015 to pursue a PhD in applied mathematics. After grad school, Carol hopes to work in a National Lab and continue research in the field of big data analysis.

PROJECT

SUPPLEMENTING A WORKFLOW INTERFACE TO THE MFiX GUI

SITE

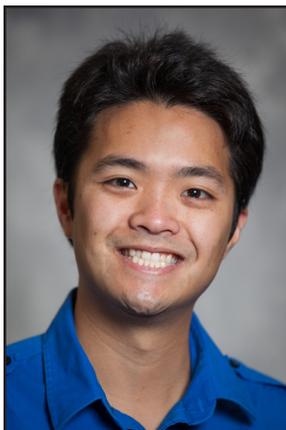
NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

MFiX (Multiphase Flow with Interphase eXchanges) is an open source software used to computationally model multiphase flows. This is especially useful at large or industrial scales where it is not economically feasible to create a physical model. MFiX has more than 3,500 registered users and has been used for a diverse number of multiphase fluid dynamics simulations. The MFiX GUI is a front end tool that allows users to run and create these simulations more easily. This research enhances the GUI by adding a workflow interface in which the user can select arbitrary keyword inputs, and using either a Factorial, Monte Carlo, or Latin-hyper Cube experimental design, launch models based on those inputs. Thus, the user can more easily study the effect of different model parameters, such as gas flow rate, on the results of the simulation. In the future, optimization algorithms will be incorporated which would change keywords based on the simulation results until a certain objective is achieved.

MENTOR



Justin Weber is general engineer at the U.S. Department of Energy's (DOE) National Energy Technology Laboratory located in Morgantown, WV. He is a graduate of The Pennsylvania State University where he earned a bachelor's degree in Mechanical Engineering. He performs research in the area of advanced fossil fuel energy systems including chemical looping combustion, electrical capacitance volume tomography, multiphase flow, computational fluid dynamics, and Python. Justin was introduced to DOE through a similar internship program back in 2007.



CLAUDE PHAN

Master Student C/O, 2016

MS Computer Science

California State Polytechnic, Pomona, CA

Mentor: Dirk VanEssendelft, Ph.D

BIOGRAPHY

Claude Phan attends California State Polytechnic in Southern California, where he is earning his MS in Computer Science. He also received his BA in mathematics at Cal Poly Pomona in 2009. After spending three years teaching mathematics at the high school level, Claude decided to continue his education and pursue a master's in another field that he is passionate about, computer science. Claude's expected graduation term is spring 2016, following a successful thesis defense.

Mr. Phan's career aspirations are still undecided. Claude defines his passion for teaching and working with students as an indescribable sense of fulfillment that will be difficult to completely give up. However, developing software that will be implemented to help tackle some of the greatest problems of the 21st century is also an option that Mr. Phan would find enjoyable. With subject level expertise in mathematics and computer science, there are many doors open for his future. We will just have to stay tuned to where the yellow brick road takes him.

PROJECT

ADVANCED COMPUTATIONAL CHEMISTRY

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Mr. Phan worked on advanced computational chemistry in computational fluid dynamics. Coding in primary C++ and python, he assisted in the development of NETL's open-source software, C3M. The primary function of C3M is to provide direct links between reliable sources of kinetic information and commonly used CFD software such as MFIX, Fluent, and Barracuda. Claude's focus was debugging and creating functionality between C3M and Barracuda.

MENTOR



Dirk Van Essendelft is the principle investigator for the Carbonaceous Chemistry for Computational Modeling (C3M) program at the U.S. Department of Energy's National Energy Technology Laboratory (NETL). He earned a bachelor's degree in Chemical Engineering from Calvin College in 2003, a master's degree in Chemical and Biochemical Engineering from the University of California, Irvine in 2005, and a PhD in Energy and Geo-Environmental Engineering in 2008. During and shortly after his doctorate, he founded a small business, Carbon Trap Technologies, and served as the Chief Technology Officer. The company developed processes to sequester carbon dioxide from large power plants. Following that venture, he took a position at the National Energy Technology Laboratory in Morgantown, WV and now develops C3M, a chemistry management software program.



DANIEL PELUSO

Senior

Major: BS Geology (main focus), B.A. Media & Professional Communications

Minor: Planetary Science

Other Degrees: Associates of Applied Science in Music Business

University of Pittsburgh, Pittsburgh, PA

Mentor: Kelly Rose, Dustin McIntyre, and Rachel Eck

BIOGRAPHY

Dan Peluso currently attends the University of Pittsburgh and in the summer of 2016 will earn a BS in Geology and a BA in Media

& Professional Communications. During the summer of 2014 he was awarded the ACCIAC Creativity & Innovation Fellowship and worked with cosmologist, Arthur Kosowsky, in the creation of the 3D computer animated short-film entitled, The Quest for Another Earth. The film spotlights exoplanet observations done at the Allegheny Observatory, as well as explores exoplanet, Kepler-186f, which is 500 light years from Earth and has been called an “Earth-cousin” by astronomers. Currently, and over the remainder of his time at Pitt he is doing independent research with planetary scientist, J. Brian Balta, studying how the chemistry of magmas change while they’re cooling off in magma chambers to Martian compositions in order to better understand the geochemistry of shergottite Martian meteorites. Peluso plans to immediately attend graduate school after graduating from Pitt. He plans to attend a university to study planetary science and astrobiology and will most likely work towards a PhD. He hopes to then work as a research scientist in astrobiology and planetary science, as well as be involved vigorously with science public outreach and education.

PROJECT

ASSESSMENT OF & RECOMMENDATIONS FOR MANAGEMENT OF NETL’S PHYSICAL & DIGITAL GEOSAMPLE ASSETS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Dan Peluso is working with Andrew Bean, another Mickey Leland fellow, at the U.S. Department of Energy’s National Energy Technology Laboratory (NETL) to assist the Office of Research & Development (ORD) with creating an inventory of the thousands of NETL onsite geo-samples and the associated datasets from analyses performed on those samples. This inventory will help ORD with a number of goals going forward, including evaluating the needs and viability of developing a geo-samples repository for NETL in the future. Also, by researching the country’s top geological repositories, such as USGS Woods Hole Coastal and Marine Science Center, Scripps Institute of Oceanography, and The Marine Geology Repository at Oregon State University, Dan and Andrew will develop a comprehensive report and ideal plan for how an official NETL repository could be implemented in the future.

MENTOR



Kelly Rose is a researcher and Geology-Geospatial Team Lead with the National Energy Technology Laboratory’s (NETL) Office of Research & Development (ORD). Her research at NETL is focused on using geologic and geospatial research to reduce uncertainty about, characterize and understand spatial relationships between energy and natural systems at a range of scales. She serves on advisory committees including the U.S. Department of Interior’s National Geologic and Geophysical Data Preservation Program, United Nations Environmental Programme’s global outlook on methane gas hydrates, New Zealand’s Gas Hydrate Resources Program, and the University of Southern California’s Induced Seismicity and Reservoir Monitoring Consortiums. She is associate editor for the Journal of Sustainable Energy Engineering, a member of NETL’s SFIRE team (Synergistic Fossil Integrations for Renewable Energy) which seeks to find hybrid energy solutions in support of sustainable and environmentally responsible energy needs, and she is also NETL ORD’s Technical Lead for their Offshore Energy Resources Research Portfolio focusing on reducing risks and impacts associated with offshore hydrocarbon development. Rose serves as the Coordinator for NETL’s Energy Data eXchange (EDX), a public and private knowledge management and online coordination/collaboration tool developed by Rose and the EDX team for NETL.



DANIEL SCHULTZ, M.S.T.E, P.E.

MSTE - University of Colorado, Boulder, CO

Electrical Engineering

Energy Systems and Smart Grid

BSEE - University of Puerto Rico, Mayaguez, PR

Mentor: Dan Oryshchyn

BIOGRAPHY

Daniel Schultz completed a BS in Electrical Engineering degree with emphasis in Power Systems and Control Systems from the University of Puerto Rico at Mayaguez. After dedicating his time for a few years to the workforce arena, he decided to extend his education to a graduate level and completed a MS in Telecommunications Engineering degree with emphasis in Smart Grid from the University of Colorado at Boulder. During his graduate studies, he had the opportunity to work with Oak Ridge National Laboratory performing a Time of Use Tariff study for the Tennessee Valley Authority and developing a graphical interphase for controlled data visualization. Moreover, as a licensed professional electrical engineer and certified solar photovoltaic systems' installer, Daniel has worked with the Puerto Rico Electric Power Authority evaluating the interconnection of solar photovoltaic systems with the distribution system and participating in the development of the interconnection and net metering regulations. His work experience and the strong academic background in the areas of power systems, control systems, telecommunications systems and smart grid enable him to attend new aspects and challenges within renewable energy technology's design, integration and reliability.

PROJECT	DEVELOPMENT OF THE ROBUST APPLICATION OF MULTIPLE POWER SOURCES & SYSTEMS – POWER FLOW TOOL
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, ALBANY, OR

Today's focus on providing a reliable electrical energy service to clients at the lowest possible cost while mitigating the environmental impact and complying with state and federal regulations, demands, more than ever, the optimization of the power system's operation. The emerging trends that are coming along will substantially increase the energy management's complexity on the electrical grid, requiring the development of software visualization, optimization, and control tools to assist grid policy design and operations in their mandate to deliver the societal benefits of improved grid performance. The purpose of his appointment with the National Energy Technology Laboratory (NETL) is to contribute with the development of the Robust Application of Multiple Power Sources & Systems – Power Flow tool (RAMPS2-PF). The purpose of this tool is to enable researchers, policy makers, and engineers to employ multi-objective optimization and understand how to leverage the benefits of renewable sources of energy to work in a collaborative way with existing power generation mix.

MENTOR



Dan Oryshchyn is a Research Mechanical Engineer in NETL's Office of Research and Development. His work has been focused on CO₂ mitigation, through development of: an approach enabling power-generation from coal, with near zero CO₂ emissions (Oxy-fuel combustion and the Integrated Pollutant Removal – IPR® – CO₂-capture process); the Synergies in Fossil Integrations with Renewable Energy (SFIRE) research effort; (via SFIRE) a hybrid power-cycle to maximize the useful work derived from a geothermal resource; (via SFIRE) in collaboration with Oregon State University, and NETL grid and generator interaction researchers (Steven Bossart and Steve Zitney) the RAMPS2-PF Power Flow tool. Dan's interest is in finding opportunities for existing knowledge and practices, in power-generation and distribution, to increase the timeliness and effectiveness of evolving technologies based on non-fossil energy sources.



DANIELLE J. MATHEWS

Senior

Design Studies and Computer Science

Historic Preservation

West Virginia University, Morgantown, WV

Mentor: William Rogers & Jonathan Tucker

BIOGRAPHY

Danielle J. Mathews is a senior at West Virginia University in Morgantown, WV currently pursuing her BS in Computer Science and Design Studies with a focus in Historic Preservation. During the school year, she is responsible for the safety and wellbeing of over 1000 students at a time as a Resident Assistant at Arnold Hall. Though she is a senior by credits, Danielle expects to graduate in the fall of 2017. Her plans after graduation include applying for either the West Virginia University Behavioral Analysis or Clinical Psychology Doctoral Program along with seeking gainful employment in either the U.S. Air Force or Government.

Following the completion of her doctorate, Danielle would like to travel nationally and abroad to offer her educated opinion and gain knowledge in specialized cases. Eventually, she would like to become a college professor, author, book store owner, and mother. Until then, her biggest aspirations in life are to help as many people as she can, live abroad, and to learn at least five languages including: Spanish, Mandarin, Japanese, Korean, and French.

PROJECT

GRANULAR MATERIAL PROPERTIES DATABASE DESIGNER

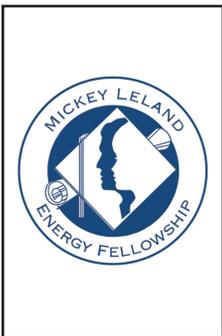
SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Ms. Mathews was assigned the task of designing and creating the Granular Material Properties Database for NETL's Multiphase Flow Science website. The purpose of the database is to make NETL's particle data accessible to the public and other NETL sites. In her design, Danielle has created a search engine, compare engine, improved Geldart fluidization chart that includes all of the current materials tested, and general data report sheet; all of which make navigating the database's many materials incredibly simple. Up until now, all of the granular material data collected has been accumulated at the Morgantown site into a single Excel file. Now, the data may be accessed and navigated by anyone who is a free registered member of the mfix.netl.doe.gov website. As a side note, Danielle has also created a macro for the minimum fluidization data collection process, which saves the team valuable time by automating the data calculations.

MENTOR

Dr. Rogers has a BS, MS, and PhD in Mechanical Engineering from West Virginia University (WVU). He also has an MBA from WVU and is a Registered Professional Engineer. In addition to industrial experience in chemical process and steel industries, Dr. Rogers has worked at NETL for 30 years in various technical and managerial roles associated with energy research and development. His research interests include computational fluid dynamics in combustion, gasification, fuel cells, and experimentation for model validation. Presently Dr. Rogers is the NETL-ORD Multiphase Flow Team Lead.





DAVID ETIM

Master's Student (2nd year)

Major: Computer Science and Engineering, BS in Computer Science

University of Connecticut, Storrs, CT

Minor: Applied Mathematics, 2013

North Carolina A&T State University

Mentor: Vyacheslav Romanov

BIOGRAPHY

David Etim attends the University of Connecticut in Storrs, CT, where he is earning his M.S. in Computer Science and Engineering. Before arriving in Connecticut, he received his B.S in Computer Science with a minor in Applied Mathematics from North Carolina A&T State University. David is on a graduate assistantship as a Multicultural Program Scholar and works during the school year as a Teaching Assistant in his department. David will graduate in the fall of 2015 and plans on pursuing his Ph.D. in Computer Science or a similar field of interest.

Mr. Etim's career aspirations include working for the government and starting a non-profit organization. David enjoys traveling, playing sports, and reading novels. One of his bucket list items is to run and complete a half marathon. His biggest goal is to use his research to improve the technology used in the scientific community of Nigeria and other parts of Africa.

PROJECT

DEVELOPMENT OF PREDICTIVE ANALYTICS AND VISUALIZATION METHODS FOR 9CR STEEL ALLOYS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Mr. Etim is under the mentorship of Dr. Slava Romanov at the National Energy Technology Laboratory site in Pittsburgh, Pennsylvania. David is working on developing a methodology that includes identifying data on steel alloys and extracting useful information for predictive analytics tools. He has specified using 9Cr as the alloy class in which he will use to test development of novel materials through the usage of information retrieval and providing data analysis methods. Within this project, David is also defining a framework for storing, preprocessing, and analyzing data, as well as preserving the model origins.

MENTOR



Vyacheslav (Slava) Romanov is a team lead in the Computational Sciences & Engineering Division of the Office of Research and Development at the National Energy Technology Laboratory. Romanov has a PhD in Physics and Mathematics from Moscow Tech, PhD in Chemistry from University of Pittsburgh, and MBA from Waynesburg College (University). He is an author of four inventions and over 50 publications. Prior to joining the U.S. Department of Energy, Dr. Romanov worked on Energy and Ecology research projects in support of the Russian space program and on development of glass-ceramic coatings with applications for automotive business, laser marking, and electronics at Ferro Corporation in Washington, PA.



ELIZABETH RITTERBUSH

First-Year Doctoral Student

Industrial/Organizational Psychology

Auburn University, Auburn, AL

MA Candidate, B.A. Psychology, 2011

Southeastern Louisiana University, Hammond, LA

Mentor: Ron Schulingkamp

BIOGRAPHY

Elizabeth is currently completing her master’s Degree at Southeastern Louisiana University with an Industrial/Organizational Psychology concentration. She will begin her doctoral studies at Auburn University during the fall 2015 semester where she expects to complete a PhD in Industrial/Organizational Psychology.

It is her goal to use her knowledge and research to improve organizational performance by improving the work environment of employees within organizations. While she has worked with several organizations in a variety industries, she ultimately hopes to specialize in complex systems design such as those found in energy and health care. It is her dream to travel globally and develop the tools needed to best improve the U.S. economic performance through the transformation of critical systems (such as energy, health care, socio-technical and political environments). Despite a busy work and academic schedule, Elizabeth still finds the time to go hiking, practice art, read, and experiment with various cooking styles.

PROJECT	A MISSION DRIVEN SYSTEMS APPROACH TO ANALYZING THE EFFECTIVENESS OF THE MLEF INTERN PROGRAM
SITE	STRATEGIC PETROLEUM RESERVE, NEW ORLEANS, LA

The most successful and visionary leaders are able to create high performing, sustainable, resilient, and responsible organizations. They must be able to view organizations as highly complex systems of interrelated parts and develop strategic plans that help fulfill the company’s mission at every level of the organization. In order to do this, regular assessments must be conducted to establish the current performance of departments and programs and make complex decisions that allow the organization to learn and change in a competitive environment. This project utilizes a compromise between higher-order, complex system analyses and more basic systems approaches by using systems dynamics to assess the effectiveness of the Mickey Leland Energy Fellowship at the Strategic Petroleum Reserve in New Orleans. Information from this project was expected to yield valuable information for future program and project decisions.

MENTOR



Ron Schulingkamp holds the position of Senior Strategic Consultant for Fluor Federal Petroleum Operations LLC, a prime contractor for the U.S. Department of Energy’s Strategic Petroleum Reserve, and is located in New Orleans, LA. His expertise is in creating high performing, sustainable, and resilient organizations. Ron is a Visiting Assistant Professor at the Loyola University College of Business and teaches MBA professionals complexity science and leadership. Since 2005, Ron has led efforts of the National Institute of Standards and Technology Baldrige Program in research projects of high performing Baldrige Award recipients. It was Ron’s leadership skills and knowledge that were the key drivers in the former Strategic Petroleum Reserve contractor, DynMcDermott Petroleum Operations Company receiving the coveted national 2005 Malcolm Baldrige Performance Excellence Award and the international 2006 Robert W. Campbell Award for Safety, Health and Environment performance excellence. Ron earned his Doctorate of Science (ScD) degree from Tulane University School of Public Health and Tropical Medicine with a focus on Health Systems Management in the Department of Global Health Systems & Development. He earned a master of quality management degree and master of business administration from Loyola New Orleans and an undergraduate degree in Petroleum Engineering from Louisiana State University.



EMMA MENIO

Earth Sciences Major
Dartmouth College, Class of 2016
Mentor: Robie Lewis

BIOGRAPHY

Emma is a rising senior at Dartmouth College in Hanover, NH, where she is pursuing a BA in Earth Sciences. Emma enjoys understanding natural systems and their responses to human activity. Through undergraduate research, she has examined stream health impacts from point sources of pollution, such as brine disposal and acid mine drainage. Currently, she is investigating the fate of Mercury contaminants in channel and floodplain sediments. Emma is interested in furthering her education in geology, hydrology, or environmental engineering.

Emma enjoys spending her time engaging with others. She throws the javelin as part of Dartmouth's varsity track and field team, in addition to holding leadership positions in community-building groups on campus. She looks forward to sharing new experiences and hopes, one day, to see the Northern Lights.

PROJECT

INNOVATIVE CONCEPTS FOR MANAGING WATER IN FOSSIL FUEL BASED ENERGY SYSTEMS: PROJECT BENEFITS AND UPDATES

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Part of the U.S. Department of Energy's mission is to ensure security by overcoming energy and environmental challenges. Recently, a strong focus has been placed on the interactions between water and energy systems, termed "the water-energy nexus". Water scarcity, variability, and uncertainty have pushed for technology development that would address water and energy management in systems using fossil fuels. In the past year, nine projects were awarded funding through NETL to develop technologies that lowered the cost of treating produced waters or utilized low grade heat within existing power generation systems. Under the guidance of Robie Lewis in the Office of Clean Coal and Carbon Management, Emma explored the benefits of each technology over existing technology and assessed each project's progress to date.

MENTOR



Robie Lewis is the HQ Program Manager for Crosscutting Research within DOE's Office of Advanced Fossil Technology Systems and has been with DOE for over 10 years. Crosscutting Research assists in developing lower Technology Readiness Level concepts able to be implemented within the other FE Programs seeking to improve fossil-based power generation. These concepts fall within varied technology areas including Sensors, Controls, Materials, Modeling, and Water Management. This is Robie's first year serving as a Mentor for the Mickey Leyland Energy Fellowship and he looks forward to continuing his involvement with the program in the years to come.



GAVIN GLENN

Junior
Major: Mathematics
Minor: Computer Science, Philosophy
University of Tennessee, Knoxville, TN
Mentor: Neal Sams

BIOGRAPHY

Gavin is working towards his BS in mathematics at the University of Tennessee, where he is involved with undergraduate research such as developing mathematical models of immune response to infectious diseases. He also works for the UT Math Department as a tutor. After finishing his BS, Gavin plans to attend graduate school, with an ultimate goal of a PhD in number theory.

Mr. Glenn’s career aspirations are to become a math professor, fulfilling both his passions for research and education. In his free time Gavin enjoys more humanistic study—like reading literature, watching films, and playing music. His central goal is to advance society intellectually through research and education in his field, but also by advocating a holistic education in general.

PROJECT

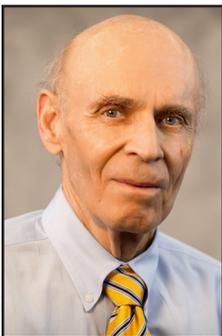
EFFECTS OF GEOLOGIC FAULTING ON GAS FLOW

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Mr. Glenn worked on simulating gas flow through layers of natural fractures by adding to existing NETL software NF Flow. He specifically looked at the effects of geologic faulting on a reservoir’s gas production. His methodology included generating a 3D representation of the faulting phenomenon, adding fault functionality to NF Flow, and then using numerical methods to solve for changes in flow equations.

MENTOR



Dr. W. Neal Sams is a fellow R&D scientist with URS at the National Energy Technology Laboratory (NETL) in Morgantown, WV. He has a PhD in physics from the University of Houston. Dr. Sams research interests are petroleum reservoir engineering and simulation. Dr. Sams is the author of NFFLOW a discrete fracture reservoir simulator meant to simulate production and storage in naturally fractured tight sand and shale reservoirs. Prior to work at NETL Dr. Sams was a senior reservoir engineer with H. J. Gruy and Associates in Houston, Texas.



HUDA ASHFAQ

Junior

Majors: Chemical Engineering (BS) and Chinese (BA)

Minor: Nanosystems

College: West Virginia University, Morgantown, WV

Mentor: Todd Gardener

BIOGRAPHY

Huda Ashfaq attends West Virginia University in Morgantown, where she is pursuing a B.S. in Chemical Engineering and a B.A. in Chinese. She is also earning her minor in nanosystems. She will be the Chinese club's Activity Committee Officer for two consecutive years. She interned with NASA in the summer of 2012 through the WISH program, which allowed women in STEM programs to have opportunities in the field. Huda will graduate in the spring of 2017.

Ms. Ashfaq's aspirations include combining her two fields of study by working as a chemical engineer on international relations between U.S. and China. She is very passionate about her majors, but is also applying her nanosystems minor to her future career. Her biggest goal is giving back to the community, and our nation. She also has hobbies of learning different languages, and outdoor activities.

PROJECT

NANOCATALYSTS FOR HIGH-TEMPERATURE, HIGH-PRESSURE SYNGAS PRODUCTION FROM DISTRIBUTED SHALE GAS RESOURCES

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Catalytic partial oxidation offers the greatest prospect for distributed syngas generation, producing a $H_2/CO = 2$ which is suitable for Fischer-Tropsch fuel production. Huda is synthesizing, testing and characterizing various nanocatalysts in NETL-Morgantown's Nano Particle Technology Laboratory. The nanocatalyst technology will improve the overall efficiency and utilization of shale gas in the upstream oil and gas industry where significant amounts of associated gas are vented, as CH_4 , or flared, as CO_2 , during extraction of the higher value crude. The novel catalysts under investigation will be used in highly compact, millisecond contact time reactors. This research area, which encompasses the subject of direct syngas production, has not been researched to a great extent and holds great potential for future applications that reduce net carbon emissions from upstream crude production using small-scale gas-to-liquid (GTL) platforms.

MENTOR



Dr. Todd Gardner is a Research Chemical Engineer with over 24 years of experience in chemical reaction engineering, catalysis and materials science with interests in the development and application of heterogeneous catalysis and nanomaterials to energy, chemicals and advanced fuels production. His recent research focuses on the efficient conversion of shale gas to syngas and fuels for application in small-scale reactors. Dr. Gardner is a recent recipient of the Office of Fossil Energy's Lean Six Sigma green belt certification. He has chaired a number of committees including the ACS George A. Olah Award Committee in Hydrocarbon or Petroleum Chemistry, the Pittsburgh Section of AIChE and the Northern West Virginia Section of the ACS. He has authored/co-authored numerous technical publications including three book chapters. Dr. Gardner conceived, developed, and commissioned NETL Morgantown's first Nano-Particle Technology Laboratory.



JACQUELINE A. ELWOOD

Senior

Major: Nanoscale Engineering

Minor: Chemistry & Mathematics

SUNY University at Albany/ SUNY Polytechnic Institute, Albany NY

Mentor: Paul R. Ohodnicki

BIOGRAPHY

Hailing from the great state of Texas, Jacqueline Elwood ventured to the vast, arctic north to attend the SUNY University at Albany and the recently established SUNY Polytechnic Institute where she will attain her BS in Nanoscale Engineering. At the prestigious UAlbany Jacqueline is the protégé of Dr. Michael Carpenter, either laboring over the development of a plasmonics-based high temperature sensor or characterizing the phonon processes of thin films using in situ Raman spectroscopy. She was nominated to represent her school for the 2015 Barry M. Goldwater Scholarship. In May of 2016, Jacqueline's undergraduate career will sadly come to a close and she will begin the pursuit of her PhD at another esteemed institution studying Electrical or Mechanical Engineering.

After procuring her PhD, Jacqueline plans to apply her skills in the private sector. There she will provide further innovation to the field of microelectromechanical systems (MEMS). Outside of her hectic life of science, Jacqueline spends a great deal of her time marathoning television shows like "24" and "Firefly." Other activities she enjoys include playing in her university orchestra and writing fiction. She dreams of one day retiring from science to open up her own food truck.

PROJECT

A STUDY IN OPTICAL FIBER pH SENSORS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Jacqueline worked on fabricating optical fiber sensors for pH sensing and testing their sensing response. Fabrication of these films was done through a simple, well-known sol-gel process. This project will allow for pH sensing or geochemical reactions in subsurface environments. The monitoring of things like wellbores and CO₂ storage sites are of paramount importance because if these environments are acidic it can lead to the breakdown of equipment or even the pollution of groundwater supplies. Unfortunately, current technologies rely on materials that break down at high temperatures. Instead, a new method needed to be explored that relied on the changing refractive index of the optical fiber with pH. Jacqueline aided in the study of these optical fiber sensors and how they react to different concentrations of materials or different salts in solution for a better understanding of how they work.

MENTOR



Paul Ohodnicki is a material scientist in the Chemistry and Surface Science Division at NETL working on high temperature sensor materials for gas sensing applications in advanced fossil energy applications. Paul received a dual bachelor's degree in Engineering Physics and Economics from the University of Pittsburgh. He then moved on to Carnegie Mellon University where he received his PhD in Materials Science and Engineering. Paul spent several years in new product development working on large area sputtered thin film coatings for energy efficient window applications. He joined NETL in early 2010 and spent a short time as a project manager for the Solid State Energy Conversion Alliance program prior to taking his current position.



JAILEEN DEL VALLE MALDONADO

Senior

Computer Science

System Administration and Web Programming

University of Puerto Rico at Arecibo, PR

Mentor: Dylan R. Harp

BIOGRAPHY

Jaileen Del Valle is an undergraduate Computer Science student in the University of Puerto Rico at Arecibo. Her date of graduation is on May 2016. In the future she plans to obtain a master’s and doctorate degree in Software Engineering or Computer Networking.

In the future, she would like to work for NASA or one of the US National Laboratories. She would like to focus on research that will help develop human consciousness and technology for the future working on innovation.

PROJECT

NATIONAL RISK ASSESSMENT PARTNERSHIP - WELLBORE INTEGRITY

SITE

LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

The project uses numerical simulators to model multiphase flow of fluids in the subsurface. The simulations are used to evaluate the environmental risks of CO₂ leakage from sequestration sites along abandoned wellbores. The goal of the project is to inform decision and policy makers about the potential risks to drinking water resources and loss of storage due to leakage. Jaileen will set up and run multiphase numerical simulations, develop python and shell scripts to run ensembles of simulations and also apply uncertainty quantification and statistical approaches to analyze results of numerical simulations.

MENTOR



Dylan Harp is a research scientist in the Earth and Environmental Sciences Division of the Los Alamos National Laboratory. He has a Ph.D. from the Civil Engineering Department at the University of New Mexico. Dr. Harp’s research focuses on groundwater modeling with applications in CO₂ sequestration, contaminant transport, nuclear waste repository performance assessment, arctic permafrost thaw and decomposition, and geothermal energy.



JARED CARPENTER

Fourth year Undergraduate
Major: Mechanical Engineering
University of Tennessee, Knoxville
Mentor: Benjamin Chorpening, PhD

BIOGRAPHY

Jared Carpenter attends the University of Tennessee in Knoxville, where he is studying Mechanical Engineering. He participated in the Mickey Leland program last year under Ronald Breault working on the oxidation of particles in chemical looping. Jared plans to graduate in 2017 with both his bachelor's and master's degree with the University of Tennessee's 5-year MS-BS program.

Jared's career aspirations include earning his doctorate, and eventually going into research. He's not entirely sure what specifically he wants to go into, so he's hoping experiences like this one can guide him.

PROJECT

ANALYSIS OF PARTICLE MOVEMENT THROUGH THE L-VALVE OF CHEMICAL LOOPING

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Mr. Carpenter will first be creating a camera set up that will synchronize LED pulses with the rate a camera records frames. Then, he will be using this set-up to record the movement of various phosphorescent particles through the L-valve. Finally, he will be creating code to analyze the movement of the phosphorescent particles.

MENTOR



Ben Chorpening is a research mechanical engineer in the Thermal Sciences Division of the Office of Research and Development (ORD) at the National Energy Technology Laboratory (NETL), in Morgantown, West Virginia. He earned his PhD from the University of Illinois at Urbana-Champaign in Mechanical Engineering. He has performed research in combustion and sensors for fossil energy applications in ORD at NETL since 2002, with a recent emphasis on sensors and diagnostics for chemical looping. He also serves as Task Technical Coordinator for Sensors & Controls work plan under Innovative Process Technologies.



JEREMIAH F. WILSON

Matriculating Graduate Student
Mechanical Engineering
Georgia Institute of Technology, Atlanta, GA
B.S. Physics, spring 2015
Tuskegee University
Mentor: Joseph Giove

BIOGRAPHY

Jeremiah F. Wilson graduated, Magna Cum Laude from Tuskegee University with a B.S. in Physics. He has participated in a number of undergraduate research opportunities. At Tuskegee University, he investigated the effects of the BP Gulf Oil Spill on beach sand, as well as engineered photo-catalysis metals for water decontamination. At Lehigh University, Mr. Wilson compared properties of novel crystals and glasses via Laser Spectroscopy. Recently, Mr. Wilson analyzed the effects of Traumatic Brain Injury at a microscopic scale. Jeremiah F. Wilson will be matriculating into Georgia Institute of Technology's Mechanical Ph.D. this fall.

Mr. Wilson's career aspiration is to work in the corporate or federal R&D sector. His personal goal is to develop and finance STEAM-focused primary education schools for underprivileged youth.

PROJECT

FINANCIAL ANALYSIS OF LNG PROCESSING PLANT

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Mr. Wilson prepared a financial profile for the development of a Liquefied Natural Gas (LNG) processing plant located in the Marcellus Shale Basin. The Pro Forma financial statement includes all of the associated models for project financing: a balance sheet, an income statement, a cash flow statement, and a sensitivity analysis. Investors and financing institutions rely on the data and information provided in a Pro Forma to determine the feasibility of investing in the development of LNG processing plant.

MENTOR



Joseph Giove currently serves as the Director of Coal Business Operations for the U.S. Department of Energy's (DOE) Office of Fossil Energy. In this capacity, Mr. Giove provides financial oversight for all Coal Procurements, Coal Budget Execution, and also leads Coal State Outreach efforts. Mr. Giove was previously the Director of the Division of Large Carbon Management Projects which was responsible for the management and oversight of the \$3.4 billion dollar program to build the next generation of carbon capture and storage (CCS) power and industrial facilities as part of the 2009 ARRA Stimulus law. Mr. Giove has represented the United States Government at over 20 bilateral/multilateral meetings and has spoken at over 30 international conferences in 18 countries, and countless domestic meetings and conferences throughout the United States. Mr. Giove was the United States' Technical Delegate to the Carbon Sequestration Leadership Forum (CSLF) from 2006-2012, representing the United States at meetings in: China, Norway, Canada, Poland, France, United Kingdom, Saudi Arabia, India, and the United States. In addition, Mr. Giove represents DOE as an official member of the National Association of Regulatory Utility Commissioners' (NARUC) Staff Sub-Committee on Clean Coal and Carbon Sequestration (2010-present).



JEREMY GIBBS

Junior

Chemical Engineering

Mathematics, History

West Virginia University, Morgantow, WV

Mentor: Mark Ackiewicz & John Litynski

BIOGRAPHY

Jeremy Gibbs attends West Virginia University, where he is earning his BS in Chemical Engineering with minors in Mathematics and History. Jeremy will graduate in the spring of 2017 and plans to begin working in the DC area.

His career aspirations include working for a chemical or power company in order to design more efficient processes. He would like to make an impact in the emissions of greenhouse gasses over the course of his career, whether in industry or government. As a Maryland native Jeremy loves crabbing on the rivers of the Chesapeake and hopes to own a house on the water in St. Mary's County.

PROJECT

RESEARCH OF LOW CONCENTRATION CO₂ CAPTURE

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Mr. Gibbs researched low concentration CO₂ capture and the companies that are currently working in this field. While examining the various capture methods currently being proposed Jeremy calculated the energy requirements and potential of the new technologies. From this the costs of the processes could be deduced, showing which methods were the most efficient and therefore the most promising for CO₂ capture at low concentrations. Typical methods for capturing CO₂ include adsorbents and solvents, usually involving an amine structure. Regenerating the capture material and releasing the CO₂ is the most energy intensive step, and many systems have been proposed to make this step more efficient. Current release methods being researched include heated decomposition of solutions and salts containing absorbed CO₂, steam heating adsorber beds coated in CO₂ and even electrolysis of solution containing dissolved CO₂. Promising amine compounds currently in the research phase were also investigated to gauge their potential for future projects.

MENTOR



Mark Ackiewicz is the director for the Division of Carbon Capture and Storage (CCS) Research and Development at the U.S. Department of Energy (DOE), Office of Fossil Energy (FE). In this role, he is responsible for planning, management, and administration of the division's nearly \$200 million annual budget and its portfolio of R&D activities related to post- and pre-combustion carbon capture, utilization, and storage. Prior to his current role, he served as DOE's Carbon Capture Program Manager and Fuels Program Manager.

Before joining DOE, Mr. Ackiewicz worked as a consultant supporting DOE technical research programs in the areas of carbon management and coal conversion. He also held research and engineering positions at various industrial companies where he was responsible for process development and new product scale-up to manufacturing.

Mr. Ackiewicz has a BS in Chemical Engineering from Johns Hopkins University, and a master's in Engineering Management from George Washington University.



JESSICA FARRELL

Senior

Mathematics and Physics

Morehead State University, Morehead, KY

Mentor: Jordan Kislear

BIOGRAPHY

Jessica Farrell is a senior Mathematics and Physics major at Morehead State University in Morehead, KY. After graduating in May 2016, Jessica plans on attending graduate school in physics, and later hopes to pursue a career in academia. Jessica currently conducts physics and statistics-based research at Morehead State University on the effects of light pollution in Morehead, KY, and has published work on her project. Jessica also works in Morehead State University’s Tutoring and Learning Center, where she tutors students in writing, math, physics, and statistics. In addition to serving as the president of the physics club, Jessica also enjoys hiking, reading, and traveling the world. One of Jessica’s “bucket list items” is to ride on a commercial space flight to experience zero gravity.

PROJECT

TO FIT OR NOT TO FIT: AN ANALYSIS OF STATE-BY-STATE COAL-FIRED POWER PLANTS AND THEIR POTENTIALS FOR CCS RETROFITS

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, WASHINGTON, DC

Coal-fired power plants across the United States, though some of the largest emitters of greenhouse gases (GHG) in the country, provide a large percentage of the nation with serviceable power. Therefore, in moving forward in legislation to reduce the amount of GHG emissions, coal-fired power plants are among the first to be targeted; however, a careful evaluation is needed to determine how to best reduce emissions. This project examined individual power plants across the country, and after determining the generating capacity, emissions, and efficiencies of each power plant, an analysis was conducted to determine which power plants would benefit most from a CCS retrofit in the framework of the upcoming EPA regulations. Specifically focusing on the state-based goals outlined by the proposed Clean Power Plan, several power plants were ranked based on their CCS and retrofitting value. Then, specific states were ranked accordingly. From this, an analysis of existing incentives per state was conducted to determine the best state-by-state plan for the Clean Power Plan.

MENTOR



Jordan Kislear is the Acting Director of Government Affairs and Analysis within the Office of Clean Coal and Carbon Management. He is responsible for outreach and engagement between his office and other federal agencies, such as the Environmental Protection Agency, and conducts outreach activities regarding carbon capture, utilization, and storage (CCS) and clean coal technology developments.

Previously, Mr. Kislear has conducted research at the National Energy Technology Laboratory, and has been detailed to the Office of Management and Budget. He has also supported the Energy Information Administration on environmental controls work.

Mr. Kislear’s primary experience is in regulatory matters affecting fossil based power generation, as well as experience in techno-economic and systems analyses of advanced power generation technologies. He earned a BS from The Pennsylvania State University in Mechanical Engineering, and an MS in Systems Engineering from Johns Hopkins University. He also holds a Lean Six Sigma Black Belt certification.



JESSICA SPEARS

Senior

Major: Petroleum and Natural Gas Engineering

West Virginia University, Morgantown, WV

Mentor: William Rogers & Jonathan Tucker

BIOGRAPHY

Jessica Spears attends West Virginia University in Morgantown, WV where she is a senior currently pursuing her BS in Petroleum and Natural Gas Engineering. Her undergraduate research at West Virginia University involves compiling an economic analysis on recycling oil and gas wells for geothermal energy extraction which was featured in the spring 2015 edition of Engineering WV. Jessica will graduate from WVU in the spring of 2016 and is considering pursuing a graduate degree in petroleum and natural gas engineering.

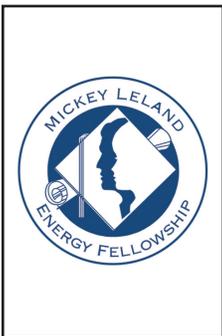
Jessica's career aspirations include working as a petroleum engineer in the near future which she hopes will allow her to eventually pioneer the way for the development of a stronger link between renewable and nonrenewable energy. Jessica hopes to one day make Forbes' List as a successful engineer so that she can donate her wealth to educational programs for children in poverty. She strives one day to be an advocate for young women in the science, technology, engineering, and mathematics fields.

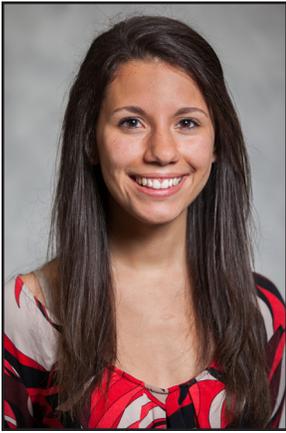
PROJECT	HOMOGENEOUS CHARACTERIZATION, COLLECTION, AND EXPANSION OF GRANULAR MATERIAL PROPERTIES FOR ADVANCED GASIFICATION
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Jessica assisted in the expansion of the current data collection for the granular material characterization database which will soon be available through NETL Multiphase Flow Science's webpage. The program will provide academia and industry a list of well-characterized laboratory-scale data which have been collected through homogeneous experimentation. The data she collected will serve as a development platform for advanced gasification research in addition to validating novel measurement techniques. Jessica conducted minimum fluidization experiments to generate additional well-characterized experimental data on cold flow test units. She also provided a fresh insight to the improvement of the design and processes involved with material characterization.

MENTOR

Dr. Rogers has a BS, MS, and PhD in Mechanical Engineering from West Virginia University (WVU). He also has an MBA from WVU and is a Registered Professional Engineer. In addition to industrial experience in chemical process and steel industries, Dr. Rogers has worked at NETL for 30 years in various technical and managerial roles associated with energy research and development. His research interests include computational fluid dynamics in combustion, gasification, fuel cells, and experimentation for model validation. Presently Dr. Rogers is the NETL-ORD Multiphase Flow Team Lead.





JESSICA TORRES

Senior

Major: Chemical Biological Engineering

Concentration: Education

MIT, Cambridge, MA

Mentor: Sofiane Benyahia

BIOGRAPHY

Jessica Torres attends the Massachusetts Institute of Technology (MIT) in Cambridge, MA, where she is earning her BS in Chemical Biological Engineering. She has participated in research in a variety of different fields from optimizing the efficiency of organic solar cells in the nano-devices lab at the National University of Singapore to performing analysis and surveillance of West Nile virus to designing drug delivery systems for the gastrointestinal system using nanoparticles as a transporter during her time at MIT. She is working on her concentration in education and is currently the director of a nonprofit called dynaMIT in which she and her team design two week-long free summer programs for children from low income families that provide hands-on experimentation and engineering experiences. Ms. Torres has aspirations to travel the world, particularly mountainous regions such as Machu Picchu and Tibet. Jessica will be graduating from MIT in the spring of 2016. Ms. Torres's career aspirations involve combining engineering with education to inspire students to pursue STEM related post-secondary education. She is considering working for a STEM education-related nonprofit for a few years and then pursue a master's or PhD in chemical engineering. Using these skills and her deep interest in entrepreneurship, she hopes to start her own engineering education service organization aimed at making a global impact in education and engineering.

PROJECT

NUMERICAL MODELING OF ROTATING FLUIDIZED BEDS IN COMPLEX STATIC GEOMETRIES

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Ms. Torres designed numerical gas-solid fluidized bed simulations of complex geometries and flow patterns using NETL's MFiX-DEM software and supercomputer. The program simulates the flow pattern in a vortex chamber designed as a rotating fluidized bed in a static geometry. This novel design allows the utilization of high gas velocities without generating unwanted gas bubbles as in conventional fluidized bed applications. In fact, she was able to simulate high slip velocities between the particles and the gas without transporting the particles out of the bed due to the high centrifugal force generated in the vortex chamber. Creating a simulation of this design gives invaluable insight into the behavior of each of the millions of particles inside the vortex chamber down to a fraction of a millisecond. This is the first time simulations of this kind have been performed. This technology has the potential to be implemented in a plethora of energy applications, for example, the chemical looping concept.

MENTOR



Sofiane Benyahia conducts research in fluidization developing physical and numerical models in computational fluid dynamics (CFD) codes that helps predict these complex flows, better understand the physics, and design/troubleshoot fluidization systems widely used in industry.



JORDAN BORDONARO

Junior

Major: Mathematics, Chemical Engineering

Minor: Physics, Chemistry

Saint Vincent College, Latrobe, PA

Bachelor of Science, 2013

Louisiana State University

Mentor: Briggs White

BIOGRAPHY

Jordan Bordonaro attends Saint Vincent College in Latrobe, Pennsylvania, where she is earning her BA in Mathematics and her BS in Chemical Engineering through a 3-2 program. She will attend Saint Vincent College for a total of three years to complete her mathematics degree and then transfer to the University of Pittsburgh where she will complete her engineering degree. Jordan is interested in pursuing her masters in Chemical Engineering after she finishes her undergraduate degrees. She is also interested in attaining an MBA as well as a project management certification.

Ms. Bordonaro has a range of career aspirations including working as an engineer in the public sector. She is also working to get her dog-walking business operational by next summer. Jordan is a musician and also enjoys traveling. She would like to spend some time in Thailand after her undergraduate education. Her biggest goal is to be a business owner and become a philanthropist so that she can give back to the community that she grew up in.

PROJECT

THE STATE OF SUPERCRITICAL CARBON DIOXIDE HEAT EXCHANGER TECHNOLOGY

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Ms. Bordonaro worked on compiling a database with the goal of identifying the state of the art in heat exchanger technology. She researched federally funded and private industry projects in order to accomplish this goal. Ms. Bordonaro analyzed the database information using a variety of performance criteria in order to provide a recommendation to the Advanced Energy Systems Division that included the most appropriate heat exchangers to use in a supercritical carbon-dioxide power cycle. However, the database is general enough that it can be used for a number of applications even after the summer is over.

MENTOR



Dr. Briggs White is a Project Manager for the National Energy Technology Laboratory where he provides technical and managerial support to the United States Department of Energy's Advanced Energy Systems programs. He provides oversight and technical direction for R&D projects by applying his knowledge of coal-based power generation and expertise in high-temperature materials. He has a BS in Materials Science and Engineering (MSE) from Alfred University, a MS in MSE from the University of Florida and a joint-PhD in MSE from both the University of Florida and the University of Rome - Tor Vergata.



JOSHUA M. KUBIAK

Senior

Major: Materials Science & Engineering; Chemistry

Carnegie Mellon University; Pittsburgh, PA

Mentor: Kyle Alvine

BIOGRAPHY

Josh Kubiak is a rising Senior and Charpie Scholar at Carnegie Mellon University pursuing dual BS degrees in Materials Science & Engineering and Chemistry. At CMU, he works in the labs of Dr. Michael Bockstaller and Dr. Krzysztof Matyjaszewski on the synthesis and application of polymer-grafted-nanoparticles. Outside of class and research, Josh is president of Carnegie Mellon Racing and Carnegie Mellon ChemE Car, organizations which build full-scale electric racecars and small-scale cars powered and controlled by chemical reactions, respectively. After graduating in 2016, Josh is interested in pursuing a master's degree abroad before beginning PhD studies in Materials Engineering. Josh's career interests are focused on working with polymers and nanomaterials, particularly as related to energy conservation and generation.

PROJECT

OPTICAL CHARACTERIZATION OF GOLD PLASMONIC FISHNET STRUCTURES AND APPLICATIONS IN POWER GENERATION

SITE

PACIFIC NORTHWEST NATIONAL LABORATORY, RICHLAND, WA

The interaction of nanostructured materials with light has been a subject of recent interest. Subwavelength materials have potential to allow for improved photovoltaic energy generation by transmitting and transforming light in new ways. In his summer project, Josh investigated gold plasmonic fishnet structures consisting of arrays of nanoscale holes in optically transparent gold films. These films could be used to selectively absorb light energy and may be capable of capturing that energy as usable electrical energy. Josh prepared and optically characterized fishnet structures and began preliminary research on their use for power generation. This technology could allow the simultaneous reduction of building cooling costs and production of usable energy.

MENTOR



Dr. Alvine is a senior research scientist at the Pacific Northwest National Laboratory in Richland, WA. He received his PhD from Harvard University in applied physics in 2006 in the field of nanoscale wetting and nanoparticle self-assembly. Prior to joining PNNL in 2008, he was a National Research Council Postdoctoral Fellow in the polymers division of the National Institute of Standards and Technology in Gaithersburg, MD, working on advancing the state of the art in Nanoimprint Lithography. He currently leads several projects focused on nano-based materials development for energy applications.



KYLE T. STEWART

Senior

Major: Mechanical Engineering / Mathematics

University of Nebraska, Lincoln, NE

Mentor: Ronald Breault

BIOGRAPHY

Kyle Stewart attends University of Nebraska - Lincoln, where he is earning his BS in Mechanical Engineering and Mathematics. Kyle will graduate in the spring of 2016 and plans on attaining his master's and PhD in Mechanical Engineering at The University of Nebraska - Lincoln.

Mr. Stewart's career aspirations include academia as well as research in the areas of non-linear dynamics, and heat transfer. Kyle enjoys reading, sports, travel, camping. His biggest goal is to help progress the scientific community.

PROJECT

ANALYSIS OF COLD FLOW CIRCULATING FLUIDIZED BEDS (CFCFBs)

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Mr. Stewart conducted analysis of Cold Flow Circulating Fluidized Beds (CFCFBs). The research was performed in order to gain a better understanding of the dynamics of multi-phase flow.

Knowledge of the behavior of the multi-phase (gas-solid) flow is crucial to building an effective fluidized bed, which will then be used in a much larger scale to aid in reduction of fossil fuel combustion pollutants as well as provide economic relief to industries seeking to dispose of environmentally damaging byproducts. Some difficulties in the analysis of this nature of flows, is that they particle behavior is wildly chaotic, thus making measurements difficult to obtain, as well as complicating the construction mathematical models.

MENTOR



Dr. Breault has over 30 years of experience in the energy and transport fields and is presently the Reactor and Process Development Team Lead within the Energy Process Innovation Division of the Office of Research and Development at the US DOE's National Energy Technology Laboratory. Presently, he leads a team focused on the development of chemical looping combustion. He received his PhD and MS in Chemical Engineering from the University of New Hampshire and a BS in Chemical Engineering from Clarkson University. Prior to joining the US DOE, he was Director of Environmental Technologies Division within a subsidiary of Thermo Electron. At Thermo he managed programs on the development of the copper oxide process, a corona based NOx control process, hydrogen production and storage programs as well as programs on gasification, combustion, emissions control and heat recovery. Prior to his tenure at Thermo he was a senior engineer at Riley Stoker Corporation and technical leader of fluidized bed technology development. Dr. Breault has been the US DOE's representative and chair to the IEA Multiphase Flow Implementing Agreement. He has numerous publications on multiphase flow dating back to 1985.



LAUREL BOSER

Senior

Major: Environmental Science

Minor: Physics

Siena College, Loudonville, NY

Mentor: Circe Verba

BIOGRAPHY

Born in Massachusetts, Laurel Boser is completing her senior year at Siena College in Loudonville, New York with a major in Environmental Science and minor in Physics. She has completed a broad range of research as an undergrad including shrub birds, XRF, and GIS. She also teaches art classes to children through the Urban Scholars program developed by her college.

Ms. Boser aspires to land a job focused in the field of renewable energies with particular interest in solar and nuclear power. In her life time she hopes to have made an impact in securing the nation's energy and protecting critical habitat/wildlife.

PROJECT

DEVELOPMENT OF THE EDX SFIRE PORTFOLIO

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, ALBANY, OR

Ms. Boser worked on the development of the EDX SFIRE webpage. SFIRE or, Synergistic Fossil Integrations of Renewables/Re-emerging Energy, is a resource in which researchers can navigate through NETL and external research projects. The webpage includes research papers, presentations, and other sources, which cover a broad range of non-fossil fuel energy sources. SFIRE is composed of three subsections: Sun&Sky, Interactions/Dynamics, and Earth. Under those subsections is a vast array of primers including PV, CS, wind, hydro, biofuel, geothermal, grid, hybridization, and cycling. Through the access of NETL's and other leading researcher groups' developments, users will easily and efficiently be able to navigate through innovations and add to future projects.

MENTOR



Dr. Circe Verba is a research geologist in the Engineered Natural Systems Division at the National Energy Technology Laboratory. She specializes in bridging together geochemistry and civil engineering. Dr. Verba specializes in microanalysis, respectively petrography and electron microscopy. She studies well integrity in carbon sequestration settings, the interaction between fracturing fluid in unconventional systems, microbial influences in wellbores, and characterizing rare earth elements. Her primary research utilizes high pressure and temperature to replicate downhole conditions to better understand geochemical and microstructural changes in both the reservoir and wells.



LAUREN SMALES

Junior

Major: Chemical Engineering, Honors
Sustainable Energy Systems Engineering
Clarkson University, Potsdam NY

Mentor: Dustin Crandall

BIOGRAPHY

Lauren Smales, a rising junior, is currently pursuing her BS in Chemical Engineering at Clarkson University in Potsdam, NY, where she is the Vice President of Engineers Without Borders, a chair for the Honors Program Service Committee, and the secretary of Bridges to Prosperity. Last summer, under Dr. Selma Thagard, she studied the production of synthesis gas from glycerol using electrical discharge plasma, with the intention of expanding the research to include the production of biodiesel using the same technology. Her career aspirations include bringing energy technology and infrastructure to developing communities around the world, through work with an organization like Engineers Without Borders. In her free time, Lauren enjoys knitting, travelling, hiking, making hummus, and currently she is working towards hiking all 46 of the Adirondack High Peaks.

PROJECT

CO₂ RELATIVE PERMEABILITY MEASUREMENTS IN ROCK CORES USING CT SCANNING TECHNOLOGY

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

This summer, Lauren worked on developing relative permeability curves of various types of sandstone when flooded with CO₂ and brine from raw CT scanner data. Building upon previous fellows had developed, she wrote supplementary MatLab functionalities that calculate and plot the saturation, porosity, and relative permeability of the core being tested. Understanding how CO₂ displaces in-place brines is critical to understanding how well geologic carbon sequestration will utilize available subsurface pore space. The development of the relative permeability curves will allow more accurate predictions of CO₂ transport through the subsurface, making carbon sequestration a more feasible and reliable technology.

MENTOR



Dustin Crandall is a research engineer at the National Energy Technology Laboratory in Morgantown West Virginia. He graduated from Clarkson University with a BS, ME, and PhD in Mechanical Engineering, working with researchers at NETL on his dissertation “Two Phase Flow in Porous Media and Fractures”. Following graduation Dustin was awarded a 2 year postdoctoral fellowship by the National Research Council evaluating multiphase transport in fractures. Since the post-doc his primary research activities have focused on simulation related to, and experimental analysis of, computed tomography derived flow in fractured geologic media, with 15 peer reviewed publications and multiple conference presentations on the topic.



LIDIYA GAVRILENKO

Senior

Major: Chemical Engineering

University of Maryland, College Park, MD

Mentor: Regis Conrad & Danielle Petrucci

BIOGRAPHY

Lidiya Gavrilenko is a senior at University of Maryland, College Park, where she is pursuing a B.S. in Chemical Engineering. She is researching behavior and aggregation of asphaltene functionalized with various moieties via molecular dynamics simulation with Dr. Klauda. Lidiya will be graduating in spring of 2016 and plans to pursue a career in the industry.

Lidiya is enthusiastic about STEM majors and promotes the chemical engineering discipline by participating in several engineering student organizations, including the student chapter of American Institute of Chemical Engineers. In her spare time Lidiya is an amateur Olympic weightlifter and enjoys spending quality time with her two dogs.

PROJECT

PROCESS ECONOMICS OF REE EXTRACTION FROM COAL SEAM UNDERCLAY FORMATIONS

SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Security of a positive economic future of our nation demands diversity and strength of the supply chain of materials critical to the continued growth of our industries. Ms. Gavrilenko worked with several engineers from the Office of Fossil Energy in Germantown, MD, to study the economic feasibility of resource extraction from coal seam underclays with a focus on rare earth elements (REE). She developed a hydrometallurgical refining process model complete with economic factors to be able to quickly predict the potential revenue of an extraction operation based on a sample input of REE content.

MENTOR

Regis Conrad has worked in electrochemistry and materials engineering since 1978. Currently Mr. Conrad manages the research on sensor and control, computational modeling and high temperature materials research. Prior to working for the U.S. Department of Energy he worked for the Department of Navy as a materials engineer. Mr. Conrad has a BA in Chemistry and Zoology from George Washington University.





LILIIA REDDY

Master’s Student

Major: Petroleum and Natural Gas Engineering

Other Degrees: Bachelor of Science in Metallurgy, 2008, Ukraine

West Virginia University, Morgantown, WV

Mentor: Ernest Lindner

BIOGRAPHY

Liliia Reddy attends West Virginia University in Morgantown, where she is earning her master of science in Petroleum and Natural Gas Engineering. She is a graduate research assistant in the Department of Petroleum and Natural Gas Engineering, where she is working under Dr. Fathi, studying multi-stage hydraulic fracturing optimization using in-house and commercial simulators. Liliia’s research focus is on the dynamic assessment of induced stresses and in-situ stress reorientation during multi-stage hydraulic fracturing in unconventional reservoirs. In April 2015, she received an “Outstanding Graduate Student based on Academic Achievement Award” from the WVU Petroleum and Natural Gas Engineering Department. She will graduate in the fall of 2015.

Ms. Reddy’s career aspirations include conducting research and development in the energy technology sector, where her skills in reservoir engineering and geomechanics will allow her to convey more efficient methods of extracting energy resources. Liliia enjoys traveling, hiking, playing tennis and other outdoor activities. Her biggest goal is to bring value to the community by discovering new technologies to produce fossil energy in an environmentally safe and efficient way, while making it more affordable and accessible for consumers.

PROJECT

AN EXAMINATION OF TWO-PHASE FLOW THROUGH A SEAL DURING CO₂ SEQUESTRATION

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Ms. Reddy worked on the examination of two-phase flow through a seal during CO₂ sequestration. She implemented a numerical model to study the importance of the parameters employed in various relative permeability models for computing a two phase flow through a seal layer. Liliia identified a representative test case, the range of applicable values for two-phase parameters available in the literature, and she applied a linear regression method to perform a sensitivity analysis and rank input parameters. Liliia examined different models and identified the importance of parameters for shallow, deep, cold, and hot formation cases. The results of her work can be applied both for modification of the NSealR model, and they can be used by the model user as a reference guide for input values and their sensitivities.

MENTOR



Ernest Lindner is a senior researcher for AECOM working under the NETL Research and Engineering Services Support Contract located in Morgantown, West Virginia. He has a PhD from the University of Minnesota at Minneapolis, and also has a master of science from the Massachusetts Institute of Technology in Cambridge, MA, and a bachelor’s of Engineering from the Cooper Union for the Advancement of Science and Art in New York, NY. Dr. Lindner’s focus is on geomechanics, fracture flow and seismic risk analyses, and he has worked on various government-related projects including the Yucca Mountain Nuclear Waste Repository, the Salt Nuclear Waste Program and the Second Repository Program for the U.S. Department of Energy. His experience includes working with AECOM and (AECOM-related firms such as Woodward-Clyde Consultants and Dame and Moore, Inc.) for over 15 years, and has worked in engineering and management for other organizations including Parsons Brinckerhoff and Battelle Memorial Institute. He is a licensed Professional Engineer in New Mexico and a member of the American Society of Civil Engineers and the International Society of Rock Mechanics.



LUCY TANG

Junior

Major: Mechanical and Aerospace Engineering

Minor: Computer Science

Princeton University, NJ

Mentor: Isaac Gamwo

BIOGRAPHY

Lucy Tang is a rising junior at Princeton University, where she is completing a bachelor's degree in Mechanical and Aerospace Engineering. She has completed summer programs in UK at Cambridge University and the University of Leicester. She has also conducted undergraduate research in robotics programming, and is highly involved in her school's Engineers Without Borders student chapter.

Lucy's post-graduation plans include graduate study. She aspires to develop infrastructure to deliver clean energy solutions to communities with energy shortages in a sustainable and environmentally friendly manner. In her spare time, Lucy enjoys reading, traveling, playing guitar and spending time with friends.

PROJECT

NUMERICAL SIMULATION OF A FALLING BALL VISCOMETER

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

The objective of this project is to use hydrodynamic model results of a falling ball in a circular column to test a new concept of simultaneously measuring density and viscosity of a fluid in one apparatus.

A computational fluid dynamic software, FLUENT, is used to simulate the falling of a spherical ball in a circular column filled with Newtonian or non-Newtonian fluids. The simulation will be conducted under different parameters. The project results will include a computer-generated movie of the simulations at various conditions, a plot of acceleration of the ball at various longitudinal points along the column in function of its velocity. This new concept may eliminate the need to measure the density and viscosity of a fluid in two different apparatuses.

MENTOR



Isaac Gamwo is a senior research chemical engineer at the National Energy Technology Laboratory-U.S. Department of Energy (Pittsburgh, PA). He was previously in academia serving as faculty at the University of Akron and at Tuskegee University. He earned his master's and PhD in chemical engineering from the Illinois Institute of Technology, Chicago, IL. Dr. Gamwo has over 100 publications and presentations to his name. He is a Fellow of AIChE and a licensed professional engineer in Pennsylvania.



LUKE H. MACFARLAN

Senior

Majors: Engineering with a Mechanical Concentration; Chemistry

John Brown University, Siloam Springs, AR

Mentor: Dr. Ronald W. Breault

BIOGRAPHY

Luke Macfarlan is a rising senior at John Brown University, working towards a BS in Engineering with a Mechanical Concentration and Chemistry. He has conducted research in artificial photosynthesis at Rice University in Houston, TX, with Dr. Isabell Thomann. Luke is passionate about energy research, particularly regarding sustainability. After graduation, he intends to pursue a PhD in Chemical Engineering.

Luke hopes to work for Exxon-Mobil, for Schlumberger, or at a national laboratory conducting research in fossil energy sustainability. He wants to visit oil plants overseas and aspires to visit half the countries in the world, particularly those in the Middle East. In his spare time, Luke enjoys running, snow skiing, and ballroom dancing. He seeks to improve fossil energy efficiency in order to make it affordable and sustainable for future generations.

PROJECT

VIDEO PROCESSING TO IDENTIFY LIGHT-ACTIVATED PARTICLE GROUPS AND MOVEMENT IN TWO-DIMENSIONAL FLUIDIZED BEDS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Luke's studies use phosphorescent particles to observe the flow in circulating fluidized beds (CFB), a device used in refinery processes and having potential to greatly reduce pollutant emissions. CFB exhibit a multiphase flow consisting of a solid phase and a gas phase. The movement of the solid particles through a small-scale fluid bed is studied by activating a portion of the particles with an LED lamp and then using a camera to observe the movement of the phosphorescent particles throughout the device. Many physical phenomena can be studied through this process, including the dispersion and velocity of solid particles. These studies will allow the flow in CFB to be better understood as well as furthering experimental techniques.

MENTOR



Dr. Breault has over 30 years of experience in the energy and transport fields and is presently the Reactor and Process Development Team Lead within the Energy Process Innovation Division of the Office of Research and Development at the US DOE's National Energy Technology Laboratory. Presently, he leads a team focused on the development of chemical looping combustion. He received his PhD and MS in Chemical Engineering from the University of New Hampshire and a B.S. in Chemical Engineering from Clarkson University. Prior to joining the US DOE, he was Director of Environmental Technologies Division within a subsidiary of Thermo Electron. At Thermo he managed programs on the development of the copper oxide process, a corona based NO_x control process, hydrogen production and storage programs as well as programs on gasification, combustion, emissions control, and heat recovery. Prior to his tenure at Thermo he was a senior engineer at Riley Stoker Corporation and technical leader of fluidized bed technology development. Dr. Breault has been the US DOE's representative and chair to the IEA Multiphase Flow Implementing Agreement. He has numerous publications on multiphase flow dating back to 1985.



MACK WEAVER

Senior

Major: Chemical Engineering

Missouri University of Science & Technology, Rolla, MO

Mentor: Bryan Roussel

BIOGRAPHY

Mack attends the Missouri University of Science & Technology and plans to graduate in the spring of 2017. He has worked a prior internship with the St. Louis County Department of Health and a co-op position with Siemens Industry in the Process Control Division.

Mack plans to pursue a career in the research and development side of chemical engineering and possibly graduate studies. He enjoys spending time outdoors and hopes to one day solo backpack one of the world’s largest mountains.

PROJECT

AUTOCAD SAP PLM INTEGRATION PILOT

SITE

STRATEGIC PETROLEUM RESERVE, NEW ORLEANS, LA

Mack worked with mentor Bryan Roussel at the Strategic Petroleum Reserve (SPR) in New Orleans, LA. The goal of the project was to develop an operational concept or “pilot” to demonstrate the integration of CAD data structures with the SAP Plant Lifecycle Management platform. This project will allow the capture and management of engineering design requirements and exchange between logistics, procurement, operations, and maintenance at the SPR. Ideally the concepts proven from this project will expand into a full leverage of SAP’s capabilities.

MENTOR



Bryan Roussel holds the position of Data Systems Project Support Manager for Fluor Federal Petroleum Operations LLC, a prime contractor for the U.S. Department of Energy’s Strategic Petroleum Reserve, and is located in New Orleans, LA. He has been with the SPR since March 1987 performing functions in Configuration Management, Data Systems Customer Support – Asset Management and IT Project and Portfolio Management. Prior to joining the SPR he has broad based experience in offshore platform construction, shipbuilding/repair, and hovercraft manufacturing. He has BS degree in Industrial Technology from the Louisiana State University.



MATTHEW GRASINGER

PhD Student

Major: Civil Engineering, Advanced Infrastructure Systems Mathematics

Bachelor of Science, 2013

University of Pittsburgh, Pittsburgh, PA

Mentor: Velimir Vesselinov

BIOGRAPHY

Matthew Grasinger is a PhD student at the University of Pittsburgh. He studies Civil Engineering, is a part of the Computational Diagnostic and Inverse Mechanics research group, and is active in the development of open source software for scientific and engineering applications. His research interests are in developing computational models for complex, non-Newtonian and multiphase multicomponent flows that occur during the cementing of petroleum wellbores.

Matthew discovered his passion for teaching through experiences as a tutor, as a teaching assistant, and as an interim instructor at the University of Pittsburgh. He hopes to one day be a professor at a research university, and to give back with the same dedication to a high-quality educational experience that he has received as a student.

PROJECT

ROBUST SITE SELECTION FOR CO₂ SEQUESTRATION USING DECISION THEORY

SITE

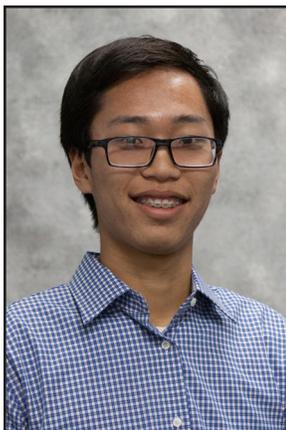
LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

Matthew worked on applying the BIG DT (Bayesian-Information-Gap Decision Theory) framework, developed at Los Alamos, to site selection for CO₂ well injection. The framework uses Bayesian statistics and info-gap decision theory to quantify the robustness of a decision against the possibility of failure; this is achieved by taking the uncertainties of site conditions and model validity into account. The effort involved developing part of the BigDT code base and interfacing it with a PFLOTTRAN, a code for subsurface flow and reactive transport. PFLOTTRAN was used to physically model the CO₂ injection process. This methodology for decision analysis can help CO₂ sequestration site selection, which has the implication of billions of dollars and potential environmental impact, be done in a rigorous way and scientifically justifiable way.

MENTOR



Velimir V Vesselinov completed a MEng degree at the Higher Institute of Mining and Geology, Sofia, Bulgaria, in 1989, and a PhD degree at the University of Arizona, Tucson, in 2000. He worked as Assistant Professor at the Department of Hydrogeology and Engineering Geology, University of Mining and Geology, Sofia, Bulgaria. Presently, he is a technical staff member of Computational Earth, Science Group, Earth and Environmental Sciences Division, Los Alamos National Laboratory, Los Alamos, New Mexico. His research interests include numerical modeling of multi-phase flow and contaminant transport in variably saturated media, high-performance computing (parallelization), stochastic inverse methods for characterization of medium heterogeneity (tomography), uncertainty quantification, risk and performance assessments, optimal design of remedial activities, and decision support. Velimir V Vesselinov is a PI of several projects targeting model development, model analyses and decision support related groundwater flow and transport in the vadose zone and the regional aquifer at the LANL site (Española Basin). He is also the technical leader of the “Flow and Transport Modeling” team under Environmental Programs Directorate (ADEP), LANL, the Task Leader of the Decision Support team within the ASCEM (Advanced Simulation Capability for Environmental Management) multi-year project funded by DOE-EM, and the LANL co-PI of the DiaMonD (An Integrated Multifaceted Approach to Mathematics at the Interfaces of Data, Models, and Decisions) multi-year project funded by DOE Office of Science.



MATTHEW KANG

Junior

Major: Computer Science

Biola University, CA

Mentor: Isaac Gamwo & Ward Burgess

BIOGRAPHY

Matthew Kang is a dean's list junior student in his university's honors program. He is pursuing a bachelor of sciences in Computer Science and a bachelor of arts in Music. Mathew has good skills in HTML, CSS, PHP, and JavaScript languages.

His love for technology is his main inspiration for majoring in computer science. His career aspirations are to work at major technology companies such as Google, Microsoft, or in energy-related areas. He has a passion for technology and media and hopes to improve everyday life through them. His post-undergraduate plans include obtaining his master's degree at Carnegie Mellon University.

PROJECT

IMPROVEMENT OF A USER-FRIENDLY PREDICTIVE TOOL FOR HYDROCARBON MIXTURES PROPERTIES AT HIGH TEMPERATURE AND HIGH PRESSURE CONDITIONS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

The objective of this project is to develop a thermodynamic calculator for high-temperature, high pressure hydrocarbon fluids along with the platform to post the calculator. This is a user-friendly calculator that can be accessed by non-technical users to predict thermodynamic properties such as density, isothermal compressibility, heat capacity, specific heat, and speed of the sound in hydrocarbons. Such data are readily needed to incorporate into reservoir simulators.

A 2013 Mickey Leland intern translated the thermophysical property program written in Visual basic to Java. Because of the recent changes coming to Chrome, Java will no longer be supported. Additionally, the program needs to have simple access to users as well. Thus, Mr. Kang's major responsibilities were to convert the program from Java to JavaScript and create a working platform on WordPress with which to upload it.

MENTOR



Isaac Gamwo is a senior research chemical engineer at the National Energy Technology Laboratory-U.S. Department of Energy (Pittsburgh, PA). He was previously in academia serving as faculty at the University of Akron and at Tuskegee University. He earned his master's and PhD in chemical engineering from the Illinois Institute of Technology, Chicago, IL. Dr. Gamwo has over 100 publications and presentations to his name. He is a Fellow of AIChE and a licensed professional engineer in Pennsylvania.



MEGHAN BRANDI

Senior
Major: Geology & Planetary Science
University of Pittsburgh, Pittsburgh, PA
Mentor: Circe Verba

BIOGRAPHY

Meghan Brandi attends the University of Pittsburgh, where she is pursuing her BS in Geology. She has been an active participant in the Pitt Geology Club and is a recipient of the Pitt UHC Merit Scholarship. Meghan will graduate in the fall of 2016 with plans to pursue a master’s degree in Geochemistry or Geophysics.

Ms. Brandi’s career aspirations include working for NASA, EPA, or NETL. She hopes to pursue field, laboratory, or planetary geology. Meghan has a strong interest in diversifying the fields of paleomagnetism and paleoclimatology. In her free time, Meghan indulges in music, art, food, and travel.

PROJECT

ELECTRON MICROSCOPY & MICROANALYSIS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, ALBANY, OR

Ms. Brandi worked on an FEI Inspect Scanning Electron Microscope utilizing INCA Energy Dispersive Spectroscopy software. In addition to gaining knowledge of SEM function, Meghan performed microanalysis and contributed scientific interpretations of rare earth elements in coal and coal-combustion byproducts, as well as shale altered by hydraulic fracturing fluids.

MENTOR



Dr. Circe Verba is a research geologist in the Engineered Natural Systems Division at the National Energy Technology Laboratory. She specializes in bridging together geochemistry and civil engineering. Dr. Verba specializes in microanalysis, respectively petrography and electron microscopy. She studies well integrity in carbon sequestration settings, the interaction between fracturing fluid in unconventional systems, microbial influences in wellbores, and characterizing rare earth elements. Her primary research utilizes high pressure and temperature to replicate downhole conditions to better understand geochemical and microstructural changes in both the reservoir and wells.



MICHAEL LECLAIRE

Senior

Major: Chemistry

Certificate in Gender, Sexuality, and Women's Studies

University of Pittsburgh, Pittsburgh, PA

Mentor: Nicholas Siefert

BIOGRAPHY

Michael is a senior at the University of Pittsburgh where he studies Chemistry and Gender, Sexuality, and Women's Studies. He serves as a teaching assistant for the Organic Chemistry I Lab and is involved in undergraduate research in the Koide group. Outside of the classroom, he is a member of the co-ed community service fraternity Alpha Phi Omega, where, on top of doing over 120 hours of community service and leadership development, he served as the treasurer during his junior year. He also serves as a peer educator for the University of Pittsburgh's Office of Sexual Harrassment and Assault Response and Education. He also enjoys Netflix, sleeping, and macaroni and cheese. After graduation from the University of Pittsburgh, Michael hopes to pursue a PhD in analytical chemistry, and eventually work in industry or for the government.

PROJECT

POST-POLYMERIZATION MODIFICATION OF COMMERCIALY AVAILABLE POLYMERS FOR POST-COMBUSTION GAS SEPARATION MEMBRANES

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Polymer membranes are widely investigated in post-combustion carbon capture for separation of CO₂ from flue gas. Because a large volume of flue gas can be treated with a relatively small amount of material, membranes have a lower materials cost when compared to other technologies such as solvents and sorbents. Membrane modules can also be readily incorporated into the existing infrastructure of coal-fired power plants, which further reduces costs associated with carbon capture. However, membrane technologies have not yet been demonstrated that can effectively separate the large volume of gas generated by full-scale power plants. This is due (at least in part) to the need to quickly permeate large volumes of gas while retaining both selectivity and mechanical integrity.

This summer, Michael chemically modified commercially available polymers to enhance permeability, selectivity, and mechanical properties of these materials. The modified polymers were then characterized to determine the extent of chemical modification, and mechanical properties were correlated with polymer composition. Thin films obtained from these materials were then tested for post-combustion gas separation performance.

MENTOR



Dr. Nicholas Siefert is a research mechanical engineer at DOE's National Energy Technology Laboratory (NETL) and a part-time instructor in the Mechanical Engineering Department at Carnegie Mellon University (CMU). After college, Dr. Siefert served at the Air Force Research Laboratory in Dayton, OH. Since 2008, Siefert has been working full-time at NETL's Pittsburgh site in the areas of solid oxide fuel cells (SOFCs), catalytic coal gasification, and pre-combustion CO₂ capture. While working at NETL in the area of integrating coal gasification reactors with SOFCs, he obtained a PhD in CMU's Department of Mechanical Engineering.



MOLINA NICHOLS

Senior

Major: Mathematics

Minors: Physics, French

University of Delaware, Newark, DE

Mentor: Seth King

BIOGRAPHY

Molly Nichols is a rising senior in the Honors Program at the University of Delaware pursuing a BS in Mathematics and minors in Physics and French. This year, she will serve as the Communications Chair of the Wesley Foundation United Methodist Campus Ministry and Treasurer of the UD Chapter of the Association for Women in Mathematics, and works in the Office of Undergraduate Admissions on campus. She participated in undergraduate research at UD during summer 2014, developing a Graphical User Interface for a computational model of the infant heart defect HLHS. She is undecided about exact plans for the future, but would like a career in the sciences in applied math. For fun, she enjoys reading, playing the piano, hunting, fishing, Disney movies, country music, and being with her family.

PROJECT	BUILDING A MACHINE LEARNING FRAMEWORK FOR CREATION OF RAPID PERFORMANCE RESERVOIR MODELS FOR USE IN CO ₂ SEQUESTRATION RISK ASSESSMENT
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Under the National Risk Assessment Partnership (NRAP), Molly is working on the development of a framework program and workflow for creation of rapid performance reservoir models. The program will take in a set of detailed reservoir simulation results over a varying set of parameters and produce a regression function estimating the reservoir performance over a continuous set of inputs. The program will then run through a series of validation tests to show the goodness of fit for the produced function. If the user deems the fit to be adequate, a portable form of the regression function, which enables faster computation, will be saved for use in systems models. These rapid performance models allow Monte Carlo techniques to be used in systems modeling.

MENTOR



Seth King is a research scientist working for AECOM supporting the National Energy Technology Laboratory (NETL) in Morgantown, WV. Seth received a bachelor of science in Mathematics from Weber State University in Ogden, UT, and masters of science and technology in Computational Sciences from the University of Utah in Salt Lake City, UT. Seth's research interests are in the applications of mathematical modeling, numerical methods, and machine learning. Seth has been supporting NETL since 2008 in the field of predictive geosciences exploring developments in reservoir simulation, systems modeling, risk assessment, and rapid performance model development.



PHILLIP TILSON

2nd Year Graduate Student

Major: Environmental and Occupational Health Sciences

LSUHSC School of Public Health, New Orleans, LA

Bachelor of Science 2012

University of Arizona

Mentor: James De Paoli

BIOGRAPHY

Phillip currently attends the Louisiana State University Health Sciences Center (LSUHSC) School of Public Health in New Orleans, LA, pursuing a master's of Public Health in Environmental and Occupational Health Sciences. He has an undergraduate degree in Environmental Science and a minor in Middle Eastern studies from the University of Arizona. Phillip has previously worked for the Louisiana Department of Environmental Quality, focusing on asbestos management plans and inspections for public and private schools throughout the southeastern region of Louisiana. After graduating this coming December, he plans to pursue a career in public health in industrial hygiene, and would like to work somewhere in Louisiana. In his free time he enjoys going to parks or the zoo, trying new restaurants, playing basketball, and traveling. One thing that Phillip would like to do before he dies is to climb to the top of one of the Egyptian Pyramids.

PROJECT

INDUSTRIAL HYGIENE AND ERGONOMICS AT THE STRATEGIC PETROLEUM RESERVE (SPR)

SITE

STRATEGIC PETROLEUM RESERVE, NEW ORLEANS, LA

Storage sites at the Strategic Petroleum Reserve (SPR) are routinely sampled for dangerous chemical and physical exposures that could cause physical or mental health damage, and possibly death. Assessing the workplace at the SPR is not only essential to protecting the health and safety of the employees but also to ensure efficient performance by removing any threats. Some of the potentially dangerous exposures at the SPR sites include volatile organic compounds, hydrogen sulfide, metal fumes, dust/mold, noise, high temperatures, and ergonomics. In order to assess the workplace for these potential stressors, monitoring will be performed during the 2015 summer at different SPR sites under the supervision of James De Paoli, the lead Certified Industrial Hygienist. Formal reports will be prepared for the monitoring sessions and reports notifying employees potentially exposed to the stressors explaining the results of the monitoring.

MENTOR



James De Paoli holds the position of Industrial Hygiene Manager for Fluor Federal Petroleum Operations LLC, a prime contractor for the U.S. Department of Energy's Strategic Petroleum Reserve, and is located in New Orleans, LA. James has served as a mentor with the Mickey Leland Energy Fellowship Program for 9 years.



SAMANTHA MARTINEZ

Senior

Major: Chemical Engineering

Florida Institute of Technology, Melbourne FL

Mentor: Regis Conrad & Danielle Petrucci

BIOGRAPHY

Samantha Martinez attends the Florida Institute of Technology (FIT) in Melbourne, FL, where she is earning her BS in Chemical Engineering. Samantha is also Captain of FIT's Division II NCAA varsity women's crew team. During the fall of 2015, and continuing throughout her senior year, she will be conducting two separate research projects at FIT. Working with Dr. Jennings she will be developing a fuel testing lab to analyze bio-based fuels, and working with Dr. Whitlow she will be performing data analysis on fossil energy statistics and reports.

Samantha is actively evaluating career opportunities, while seeking out new challenges to test her skills, gain more knowledge and solve problems. She has a love of travel and is looking for opportunities to apply her strong science and leadership skills to engineering problems around the globe.

PROJECT

SEARCHING FOR RARE EARTH ELEMENTS – A WELL LOG ANALYSIS

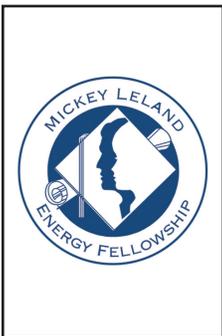
SITE

U.S. DEPARTMENT OF ENERGY HEADQUARTERS, GERMANTOWN, MD

Under the National Risk Assessment Partnership (NRAP), Molly is working on the development of a framework program and workflow for creation of rapid performance reservoir models. The program will take in a set of detailed reservoir simulation results over a varying set of parameters and produce a regression function estimating the reservoir performance over a continuous set of inputs. The program will then run through a series of validation tests to show the goodness of fit for the produced function. If the user deems the fit to be adequate, a portable form of the regression function, which enables faster computation, will be saved for use in systems models. These rapid performance models allow Monte Carlo techniques to be used in systems modeling.

MENTOR

Regis Conrad has worked in electrochemistry and materials engineering since 1978. Currently Mr. Conrad manages the research on sensor and control, computational modeling and high temperature materials research. Prior to working for the U.S. Department of Energy, he worked for the Department of Navy as a materials engineer. Mr. Conrad has a BA in Chemistry and Zoology from George Washington University.





SARAH NARBURGH

BS Chemical Engineering

MS Chemical Engineering

Minor: Nuclear Engineering

Carnegie Mellon University, Pittsburgh, PA

Mentor: Nicholas Siefert

BIOGRAPHY

Sarah Narburgh recently graduated Carnegie Mellon University with honors in May, receiving her bachelor's in Chemical Engineering. She will return in the fall to complete her master's in Chemical Engineering. Sarah has conducted research for Westinghouse through the Toshiba - Westinghouse Fellowship Program as well as for a professor in the chemical engineering department of CMU. While working for Westinghouse, Sarah researched the effect of the direction of growth on the oxide layer formed on autoclaved cladding samples. Her undergraduate research with Professor Jim Schneider involved optimizing a surfactant buffer system for increased DNA separation. After completing her master's, Sarah hopes to continue working in the energy field, possibly with nuclear power. Her goals include traveling the world and eventually retiring to volunteer with Habitat for Humanity.

PROJECT

COMPREHENSIVE EXERGY ANALYSIS OF AN IGCC PLANT WITH CARBON CAPTURE

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

During the MLEF program, Ms. Narburgh conducted a comprehensive exergy analysis of an integrated gasification combined cycle (IGCC) plant with carbon capture using a combination of AspenPlus and Excel. Exergy is defined as the maximum amount of useful work that can be obtained from a system by bringing it into equilibrium with its surroundings. An exergy analysis can determine the systems of the power plant where most exergy is being destroyed. The destruction of exergy is directly related to inefficiency, since this also means that the system is destroying useful work. Identifying inefficient systems helps target which aspect of the plant needs improving. The exergy analysis covered all of the major sub-systems with the power plant, including gasifier, air separation unit, water-gas-shift, CO₂ capture, CO₂ compression, Claus plant, gas turbine, and steam turbine.

MENTOR



Dr. Nicholas Siefert is a research mechanical engineer at DOE's National Energy Technology Laboratory (NETL) and a part-time instructor in the Mechanical Engineering Department at Carnegie Mellon University (CMU). After college, Dr. Siefert served at the Air Force Research Laboratory in Dayton, OH. Since 2008, Siefert has been working full-time at NETL's Pittsburgh site in the areas of solid oxide fuel cells (SOFCs), catalytic coal gasification, and pre-combustion CO₂ capture. While working at NETL in the area of integrating coal gasification reactors with SOFCs, he obtained a PhD in CMU's Department of Mechanical Engineering.



SIMONE GELINAS

Junior

Major: Chemical and Biomolecular Engineering

University of Maryland, College Park, MD

Mentor: Rajinder P. Singh

BIOGRAPHY

Currently, Simone Gelinás attends the University of Maryland in College Park, MD where she is earning her BS in Chemical and Biomolecular Engineering. She will graduate in the spring of 2017 and plans on getting a full-time job as an engineer. She has special interests in the fields of energy, and chemical and biological terrorism defense. She hopes to help develop and implement new technologies in these fields. Simone plans on getting her MBA after spending some time working in industry. One of her biggest career aspirations is to own her own company one day.

Simone enjoys traveling, playing sports, and spending time with her family. She hopes to run the Boston Marathon within the next few years.

PROJECT

NOVEL MIXED MATRIX MEMBRANES FOR GAS SEPARATIONS

SITE

LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

A vast amount of CO₂, a greenhouse gas, is released as a byproduct during hydrocarbon fuel (coal, natural gas) processing for hydrogen and power production. Simone's research project covers applications of gas separation membranes for energy efficient hydrogen production and carbon capture. She worked on gas permeation experiments to test the permeability of novel polybenzimidazole (PBI)-based mixed matrix membranes in the presence of different pure gases. These experiments were designed to quantify PBI mixed matrix membranes and to compare their performance to neat PBI membranes.

MENTOR



Dr. Rajinder P. Singh is a staff scientist for the Carbon Capture and Separations for Energy Applications (CaSEA) Labs in the Materials Physics and Applications Division of Los Alamos National Laboratory (LANL), NM. He has a PhD and bachelor's of Engineering in Chemical Engineering from the Colorado School of Mines at Golden, CO and Panjab University, India, respectively. His research focus is on the development of advanced gas separation membranes for clean energy applications including carbon capture and hydrogen production. Prior to joining LANL in 2009, Dr. Singh worked as Lead Engineer for Pall Corporation, Cortland, NY.



THORNTON WILSON

Senior

BS in Petroleum Engineering

BS in Mathematics, 2013, Fort Valley State University, Fort Valley, GA
Louisiana State University, Baton Rouge, LA

Mentor: Robert Murray

BIOGRAPHY

Thornton Wilson attends Louisiana State University in Baton Rouge, Louisiana, where he is earning his BS in Petroleum Engineering and will graduate in the spring of 2016. He has earned a BS in Mathematics at Fort Valley State University in Fort Valley, GA on a full scholarship in spring 2013. He is a member of the National Society of Black Engineers, the American Association of Drilling Engineers, and the Society of Petroleum Engineers at LSU. His interests include video games and sports, mainly the Dallas Cowboys and LSU Tigers football teams. Thornton's career goals include working in the oil and gas industry or federal government after graduation, focusing in either production or reservoir engineering.

PROJECT

THE IMPACT OF REGULATORY REQUIREMENTS OF THE STRATEGIC PETROLEUM RESERVE

SITE

STRATEGIC PETROLEUM RESERVE, NEW ORLEANS, LA

The Strategic Petroleum Reserve's purpose is to store petroleum to reduce the adverse economic impact of a major petroleum supply interruption to the United States. Thornton's project focuses on the new regulations and closer examination of compliance as a result of the Bayou Corne sinkhole. The Louisiana Department of Natural Resources (DNR) implemented a compliance review to be conducted every 5 years. Thornton reviewed the technical baseline drawings against historical data to verify accuracy and submitted any corrections to the Technical Data Center for processing. Then he reviewed the correct documents and prepared them for submission to the state agency. He conducted a quality check on prepared document packages and organized all items on the checklist by cavern number which will be delivered to the DNR for review by a review board. His project also includes hands-on experience with remediation workover operations at the Big Hill site in Texas.

MENTOR



Robert C. Murray holds the position of Cavern Integrity Director for Fluor Federal Petroleum Operations LLC, a prime contractor for the U.S. Department of Energy's Strategic Petroleum Reserve, and is located in New Orleans, LA. He has more than 30 years of experience as an office, program, and project manager and geoscientist in energy and environmental programs. He has worked in the U.S. and internationally, including more than 25 years in the U.S. Department of Energy's geologic storage programs, involving the long-term geologic storage and isolation of strategic petroleum reserves, greenhouse gases, and spent nuclear fuel and high-level radioactive waste. His contributions to these programs span strategic, long-range, annual, and project planning; statutory and regulatory compliance; technology development and analysis; laboratory research and development; and safe drilling and field operations. He has assessed evolving engineering and design concepts, particularly in relation to their performance in subsurface geologic systems. He earned a Master's degree in Geology from The University of Texas at Austin.



TRACY TRAN

Sophomore
Major: Computer Science
Minor: Mathematics
University of Washington, Seattle, WA
Mentor: Ram Devanathan

BIOGRAPHY

Tracy Tran attends the University of Washington in Seattle, where she is earning her BS in Computer Science with a minor in Mathematics. She is a tutor at UW’s Math Study Center and has worked on UW’s EcoCAR 3 team to redesign and rebuild a Chevy Camaro into a high-performance, eco-friendly car. Her awards include being 1 of 8 people in the world to earn a perfect score on the AP Calculus exam in 2013, a NASA Space Grant Consortium Scholar, and a National Merit Scholar. Tracy will graduate in the spring of 2018.

Tracy’s aspiration is to work on renewable energy and technology to make progress towards a more sustainable society. She enjoys traveling and would love to visit all of the national parks.

PROJECT

MODELING THE DEGRADATION OF USED NUCLEAR FUEL CANISTERS

SITE

PACIFIC NORTHWEST NATIONAL LABORATORY, RICHLAND, WA

The degradation of steel exposed to atmospheric conditions over long time scales is a significant challenge in the nuclear industry. Spent nuclear fuel canisters are known to undergo a particular mode of structural failure called stress corrosion cracking, brought about by the deposition of atmospheric contaminants such as chlorides. Predictive modeling is essential to develop mitigation strategies, prioritize inspection, and ensure the integrity structures. Tracy worked on developing a multiscale simulation approach to determine the likelihood that a steel canister would undergo through-wall cracking due to stress corrosion in a certain period of time. This task primarily centered on modeling the deposition rate of contaminants as a function of factors such as temperature, humidity and distance from the source. By improving models of transport and deposition of contaminants, this work has implications for predicting the integrity of structures used in the fossil fuel and nuclear industries.

MENTOR



Dr. Ram Devanathan is a technical group manager in the Energy & Environment Directorate at Pacific Northwest National Laboratory. He leads a group of 40 scientists and engineers with expertise in materials characterization, multiscale modeling, mechanical design, and robotics. He received a B’Tech degree in Metallurgical Engineering from the Indian Institute of Technology, a PhD degree in Materials Science and Engineering from Northwestern University, and an MBA degree from Washington State University. Dr. Devanathan’s research interests include ceramics for extreme environments, multiscale modeling of corrosion, and molecular transport through graphene oxide membranes. He is a Fellow of the American Ceramic Society.



TYLER CASTILLO

Senior

Major: Petroleum Engineering

Biological Engineering, 2014, LSU

Louisiana State University, Baton Rouge LA

Mentor: Kevin Williams & Russ Romero

BIOGRAPHY

Tyler Castillo attends Louisiana State University in Baton Rouge, LA, where she is earning her BS in Petroleum Engineering. She graduated in 2014 with a BS in Biological Engineering. Tyler will graduate in the Spring of 2016 and plans on finding a job in the petroleum/oil industry. Her career aspirations include working in the reservoir or cavern engineering fields. Eventually, she would like to go back to school to get her MS in Petroleum Engineering. Tyler enjoys traveling and would like to visit Fiji and Greece. She also enjoys spending time with her family, as well as playing volleyball and tennis. Her biggest goal in life is to make an impact or contribution to the petroleum industry through her hard work and commitment.

PROJECT	ANALYZING AND OPTIMIZING QUARTERLY PUMP RUNS WITH RESPECT TO EFFICIENCY, RELIABILITY, AND COST
SITE	STRATEGIC PETROLEUM RESERVE, BAYOU CHOCTAW SITE, PLAQUEMINE, LA

Tyler worked at the Strategic Petroleum Reserve at the Bayou Choctaw Site in Plaquemine, LA. Her goal was to determine the optimum duration of quarterly pump runs for the raw water, brine, and crude oil equipment without sacrificing reliability. She collected data from previous years to calculate power consumption and converted totals to real world cost. She then studied graphs and charts to calculate a best efficiency time for the pump runs. Ms. Castillo also analyzed the environmental factors associated with shortening the pump run time.

MENTOR



Kevin Williams holds the position of Senior Site Engineer for Fluor Federal Petroleum Operations LLC, a prime contractor for the U.S. Department of Energy's Strategic Petroleum Reserve, and is located at the Bayou Choctaw Site in Plaquemine, LA. He graduated from the University of Arkansas in Fayetteville, where he graduated in 1988 with a BS in Chemical Engineering before beginning employment in the Baton Rouge area. Kevin has extensive experience in petrochemical industry. His most notable memory during his career occurred while he was employed as a production engineer at a local area Chlor-Alkali facility. By closely monitoring produced sodium hydroxide weak liquor, Kevin provided instructions to operators to make adjustments on cell operation and to cell assembly mechanics to replace problematic cells as needed. As a result of these corrective actions, the cell efficiency of the facility achieved an all-time high. Kevin has 9 years of service as a site engineer on the SPR, with 3 years at Bryan Mound and 6 years at Bayou Choctaw.



VANESSA ESPINOZA

Junior

Major: Chemistry and Physics

Minor: Business Administration

Texas Lutheran University, Seguin, TX

Mentor: Seth King

BIOGRAPHY

Vanessa Espinoza is a junior at Texas Lutheran University in Seguin, where she is earning her BS in Physics and Chemistry. Last summer, she participated in bioinorganic undergraduate research at her university under Dr. Santiago Toledo, researching nickel acireductone dioxygenase's active site, and attempting to biomimetically model the site in order to explain its fundamental properties.

Vanessa plans on obtaining a PhD in Chemistry and continue a career in academia. She aspires to become a professor at a small university where she can have the chance to impact the lives of undergraduate students like her advisors have done for her.

PROJECT

SPECTROSCOPIC ANALYSIS OF DOPED METAL NANOCCLUSERS

SITE

NATIONAL ENERGY TECHNOLOGY LABORATORY, PITTSBURGH, PA

Nanoparticles vary between 1 and 100 nm, and can be used as catalysts or detectors in scientific processes. In particular, some metal-based nanoparticles have very unique optical and electronic properties. Ms. Espinoza has worked on explaining the photoluminescence of the doped metal nanoclusters that were previously synthesized. Specifically, these nanoclusters were gold nanoparticles that were doped with a variety of transition metals, which included, nickel, copper, and cobalt. This analysis required the use a variety of spectrometers that include photoluminescence spectroscopy, absorption spectroscopy, and Raman spectroscopy. The experiment added to our understanding of the particles' change in fluorescence and behavior under photoluminescence. With the improved understanding of this fundamental chemistry, we hope that it may be implemented into a variety of applications in the future.

MENTOR



Douglas Kauffman is a research chemist in the Molecular Science Division at the National Energy Technology Laboratory (NETL) in Pittsburgh. Douglas obtained his PhD in chemistry from the University of Pittsburgh in 2010. After completing a National Academies of Science post-doctoral research fellowship he joined the NETL as a staff scientist.

Doug's research interests center on the synthesis, characterization and evaluation of new nanocatalyst materials for clean energy applications, such as converting CO₂ into other valuable chemicals or usable fuel sources. A central theme to this research is developing relationships between the physical and electronic structure of materials and their catalytic activity. Structure-property relationships are developed by coupling catalyst performance with fundamental optical, electrochemical, and computational studies. Ultimately these efforts will allow rational design of nanocatalysts with extremely high performance and product selectivity for a variety of applications.



WYATT ADAMS

PhD Student

Major: Electrical Engineering

BA Physics, 2014, Gustavus Adolphus College, St. Peter, MN

Michigan Technological University, Houghton, MI

Mentor: Ethan Hecht

BIOGRAPHY

Wyatt Adams is a PhD student at Michigan Technological University, where he studies electrical engineering with a research focus on solar photovoltaics, plasmonics, and metamaterials. As a teaching assistant at Michigan Tech, he has instructed undergraduate students in computer programming and electrical engineering. As a research assistant, he has studied the application of plasmonic metamaterial absorbers to photovoltaics through the use of finite element analysis. In 2014, Wyatt received a bachelor's degree in Physics from Gustavus Adolphus College.

Wyatt's career goals include working in research and development at either a government laboratory or in the private sector. Through his work he hopes to make a positive impact on the way we use and produce energy.

PROJECT

RAYLEIGH SCATTERING COMBUSTION DIAGNOSTICS

SITE

SANDIA NATIONAL LABORATORIES, LIVERMORE, CA

During oxy-combustion of pulverized coal, high concentrations of carbon dioxide at high temperature can consume significant amounts of the coal (along with the oxygen). In fact, CO₂ at these high temperatures (> 2000K) reacts with (consumes) the thermocouples that we have tried to use to measure gas temperatures, critical information for extracting the kinetic gasification rates.

Wyatt is developing and implementing an accurate optical measurement of the gas temperatures of high-temperature CO₂ reaction environments. He is setting up optics to focus a laser and measure the Rayleigh scatter off of gas molecules, and developing algorithms to convert these signals to temperatures.

MENTOR



Ethan Hecht is a senior member of the technical staff at the Combustion Research Facility (CRF) of Sandia National Laboratories in Livermore, CA. He holds a PhD in Chemical Engineering from the University of Utah, a MS in Engineering Systems and a BS in Engineering Physics from the Colorado School of Mines. Ethan has worked at the CRF since 2005 and has been involved in many interesting projects over the years, generally related to sustainable energy. Two current research areas are into the oxy-combustion and gasification of solid fuels (e.g. coal, biomass), and in the safe implementation of infrastructure for fueling hydrogen fuel-cell vehicles.



ZACHARY THOMAS BRANUM

Graduate Student
Mechanical Engineering MS
Aerospace Engineering BSE
Arizona State University, Tempe, AZ
Mentor: Paolo Pezzini

BIOGRAPHY

Zachary Branum attends Arizona State University (ASU) in Tempe, where he is earning his MS in Mechanical Engineering. He has participated in undergraduate research at ASU under Dr. Timothy Takahashi, studying high-speed aerodynamics. Mr. Branum has served as a graduate teaching assistant for the past year, helping freshmen engineering students learn fundamental engineering concepts, in addition to teaching a high-speed aerodynamics lab to upper division engineering students. Mr. Branum will graduate in the spring of 2016.

Mr. Branum’s career aspirations include working as an engineer for the U.S. Department of Energy. His biggest goal is to serve his country as a federal employee and to help ensure America’s security and prosperity by addressing its energy challenges.

PROJECT	REAL TIME FUEL CELL MODEL DEVELOPMENT FOR TEMPERATURE CONTROL FOR A CYBER-PHYSICAL SIMULATION OF A HYBRID SYSTEM
SITE	NATIONAL ENERGY TECHNOLOGY LABORATORY, MORGANTOWN, WV

Mr. Branum worked on a precombustor simulation model to control temperature within a hybrid fuel cell gas turbine power plant. The model simulates the combustion of syngas before the entrance to the fuel-cell. The model quantifies the resulting temperature after combustion, the mass flow rate of the combustion products, and the concentration of each combustion product. The model was incorporated into the cyber-physical power plant and used to provide temperature control of the fuel cell. It has also been used to study the effect of a precombustor on the performance of the system.

MENTOR



Paolo Pezzini is a post-doc researcher at the Ames National laboratory in Iowa State University performing research at the National Energy Technology Laboratory (NETL) in Morgantown, WV. He is involved in the development and validation of novel sensor control strategies for complex advanced energy systems within the U.S. Department of Energy Office of Fossil Energy’s Crosscutting Research Program. He has a PhD focused on automated control for fuel cell/gas turbine hybrid systems from the University of Genoa in Italy in the mechanical engineering department, and also has a master’s degree in Computer Engineering from the same university. During his PhD program, he developed a control system architecture for the cyber-physical facility at the NETL, which represents a unique configuration that emulates a virtual fuel cell model coupled with a real gas turbine recuperated cycle. During this work, he received a best technical paper award from the cycle innovation committee of the American Society of Mechanical Engineers of the International Gas turbine Institute regarding his study focused on compressor surge during emergency shut-down operation in hybrid turbine systems. He has demonstrated experience through peer-reviewed and journal publications on innovative control strategies development applied to advanced power systems that require extensive systems integration of components, such as gasifiers, turbines, fuel cells, concentrated solar power, thermal energy storage, etc.

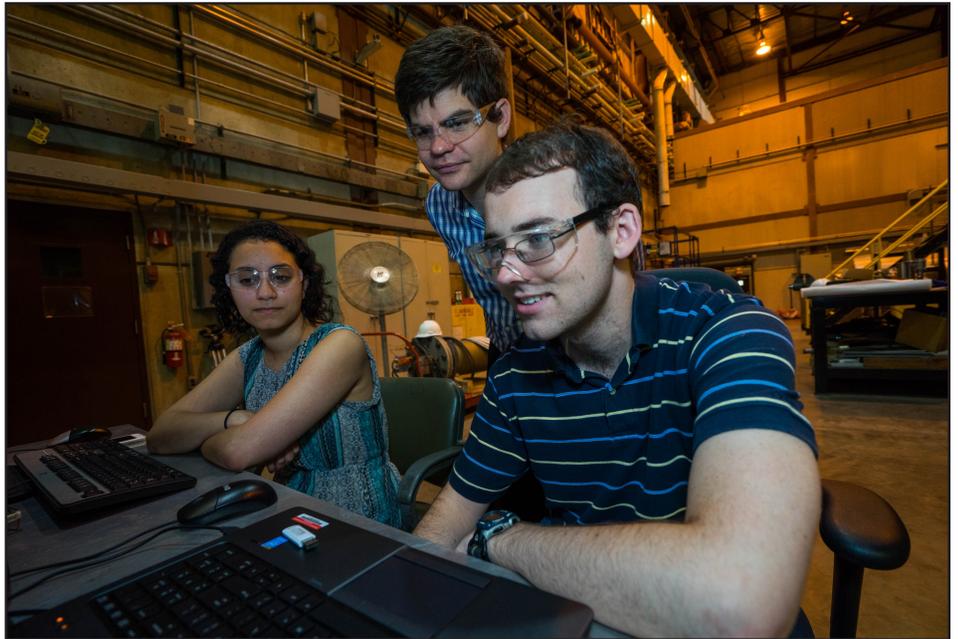
FE LEADERSHIP



Christopher A. Smith

Dr. Julio Friedmann

Dr. Grace M. Bochenek



OFFICE OF FOSSIL ENERGY

FE LEADERSHIP



CHRISTOPHER A. SMITH

Assistant Secretary

Office of Fossil Energy

U.S. Department of Energy

Christopher Smith serves as Assistant Secretary for Fossil Energy at the U. S. Department of Energy. President Obama nominated Smith for the position in November 2013. He was confirmed by the U. S. Senate and sworn into office in December 2014.

As Assistant Secretary, Smith leads the Department of Energy's Office of Fossil Energy, including scientists and engineers working at eleven sites across the United States. In this capacity, he oversees the Department's fossil energy's research and development program (coal, oil and natural gas) and the National Energy Technology Laboratory. He is also responsible for the U.S. Petroleum Reserves, the largest strategic petroleum stockpile in the world.

Prior to his Senate confirmation, Smith served as Principal Deputy Assistant Secretary for Fossil Energy and as Deputy Assistant Secretary for Oil and Natural Gas. During that tenure, he served as the Designated Federal Official for the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, established by President Obama to investigate the root causes of the Gulf oil spill.

Before his appointment in October 2009, Smith served in managerial and analytical positions of increasing responsibility in the private sector. Most recently he spent eleven years with two major international oil companies focused primarily on upstream business development and LNG trading, including three years negotiating production and transportation agreements in Bogotá, Colombia.

Smith began his career as an officer in the U. S. Army and served tours in Korea and Hawaii. He subsequently worked for Citibank and JPMorgan in New York City and London in the area of emerging markets and currency derivatives. Smith holds a bachelor's degree in Engineering Management from the United States Military Academy at West Point and an MBA from Cambridge University.

OFFICE OF FOSSIL ENERGY

FE LEADERSHIP



DR. JULIO FRIEDMANN

Principal Deputy Assistant Secretary

Office of Fossil Energy

U.S. Department of Energy

Dr. Julio Friedmann is the Principal Deputy Assistant Secretary for the Office of Fossil Energy, at the U.S. Department of Energy. His portfolio includes R&D and programs in Clean Coal and Carbon Management, Oil and Gas systems, international engagements in clean fossil energy, and inter-agency engagements within the US government. His earlier appointment as Deputy Assistant Secretary for Clean Coal and Carbon Management focused on clean coal and carbon capture, utilization, and storage.

In his prior appointment as Chief Energy Technologist for Lawrence Livermore National Laboratory, Dr. Friedmann's research included smart grid and energy systems analysis, conventional and unconventional hydrocarbons, CCS, geothermal power, renewable power prediction and integration, and supercomputing applications to energy. Earlier, he worked for five years as a senior research scientist at ExxonMobil and as faculty at the University of Maryland. Dr. Friedmann has a Bachelor of Science and Master of Science from the Massachusetts Institute of Technology and a Ph.D. in Geology from the University of Southern California.

NATIONAL ENERGY TECHNOLOGY LABORATORY

FE LEADERSHIP



DR. GRACE M. BOCHENEK

Director

National Energy Technology Laboratory

U.S. Department of Energy

As NETL Director, Dr. Bochenek manages the day-to-day execution of all aspects of the laboratory's mission. She joined the laboratory in October 2014 with more than 25 years of technical and management experience with the U.S. Department of Defense. Before joining NETL, Dr. Bochenek was the first Chief Technology Officer of the U.S. Army Materiel Command, where she served as the principal technical advisor on all engineering and scientific activities within the command; she also provided management oversight to the command's six regional centers, the Army Research Laboratory, and the Army Materiel Systems Analysis Agency, with an annual budget of more than \$2.5 billion. Prior to this, Dr. Bochenek led research, development, and engineering strategies as Director of the U.S. Army Tank and Automotive Research division. Dr. Bochenek earned a B.S. in electrical engineering from Wayne State University, an M.S. in industrial and systems engineering from the University of Michigan, and a Ph.D. in industrial and systems engineering from the University of Central Florida.



PROGRAM COORDINATORS

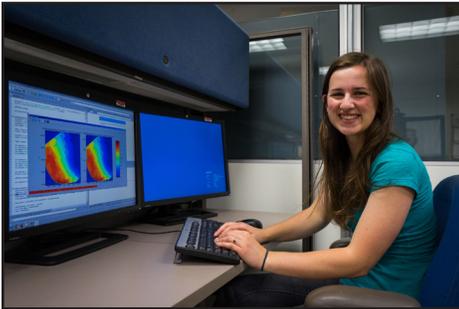


Alan F. Perry

Sandra Cortez

Barbara Dunkin

Leslie Fox



OFFICE OF FOSSIL ENERGY



ALAN F. PERRY

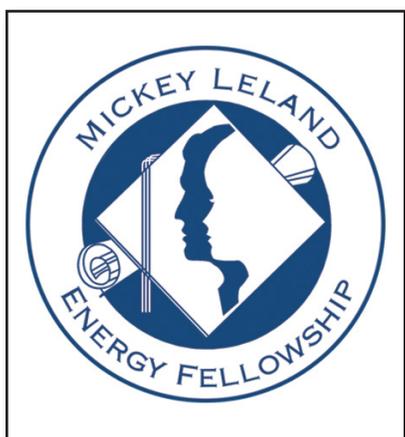
Supervisor

Office of Management and Field Operations

Office of Fossil Energy

U.S. Department of Energy

Alan Perry is a Supervisor in the Office of Management & Field Operations in the Office of Fossil Energy. In this capacity, Alan is responsible for advising the Office Director, Deputy Assistant Secretaries, Principal Deputy Assistant Secretary, and Assistant Secretary on management, policy, organizational, human resources, and other administrative issues. He leads a team responsible for workforce and succession planning, staffing, performance management, employee and labor relations, executive correspondence, travel, office space and logistics, and workforce development. Alan started his career as an intern with DOE while earning his Master's degree in Business Administration. He now has over 20 years of experience in Federal HR and business operations with an emphasis on implementing business process reforms and improving customer service. This is his third year overseeing the Mickey Leland Energy Fellowship Program for Fossil Energy. Alan grew up in the Washington, DC area, still roots for his hometown Red Sox, and attended the University of Maryland. He enjoys playing softball and volleyball and recently completed the Boston Marathon. He currently lives in Rockville, MD with his two children.



SANDRA CORTEZ

Program Specialist

Office of Management and Field Operations

Office of Fossil Energy

U.S. Department of Energy

Sandra Cortez is a Program Specialist in the Office of Management & Field Operations in the Office of Fossil Energy. Though this is her first year managing the MLEF program, she has over 15 years of experience in program management and advising students on careers in the federal sector. She earned her Bachelor's degree from the University of Maryland College Park and her Master's degree from The George Washington University. She enjoys watching football and spending time outdoors with her family.

OAK RIDGE ASSOCIATED UNIVERSITIES



BARBARA DUNKIN

Project Specialist, Science Education Programs

Oak Ridge Associated Universities

Barbara holds the position of program specialist at ORAU located in Oak Ridge, TN. For over ten years, she has assisted with the administration of a wide variety of Department of Energy programs throughout the United States, including the Mickey Leland Energy Fellowship (MLEF) Program. Barbara specializes in client service and, when not assisting interns, she enjoys spending time with her children and grandchildren.



LESLIE FOX

Project Manager, Science Education Programs

Oak Ridge Associated Universities

Leslie is a project manager for ORAU located in Oak Ridge, TN. She is experienced in business and career development, educational and corporate project management, recruiting and event planning. As an ORAU project manager, she administers appointments for multiple Department of Energy programs throughout the United States, including programs at Oak Ridge National Laboratory (ORNL) and the Mickey Leland Energy Fellowship (MLEF) Program. Prior to joining ORAU in 2010, Leslie served as the engineering career consultant for the University of Tennessee working with over 500 corporations and government agencies and was the Tusculum College director for the first non-traditional career services program in the region serving over 2,500 students on four campuses.

PROGRAM STAFF

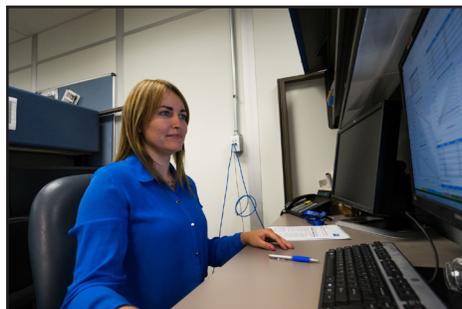
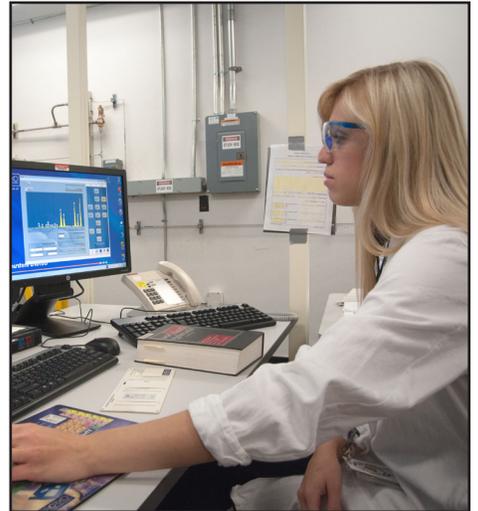
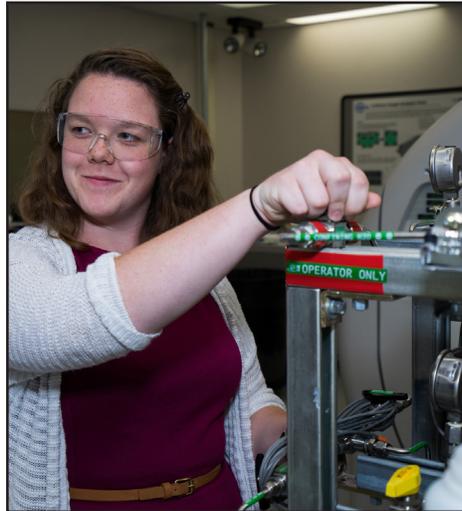


Nancy Andres

Elaine King

Kelly Schwehm

Scott A. Robbins



NANCY ANDRES



Site Coordinator

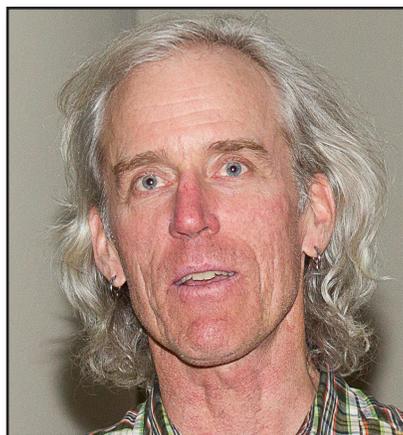
Program Analyst, ECO Team

Office of Research & Development

National Energy Technology Laboratory, Pittsburgh, PA

Nancy Andres is a member of the Education, Collaboration, and Outreach team in NETL's Office of Research and Development. She manages post-secondary education and outreach programs for NETL. She serves as the site coordinator for the Albany, Oregon; Morgantown, WV; and Pittsburgh, PA sites. This is her fifth year of involvement with the Mickey Leland Energy Fellowship Program. She is very excited that this year NETL is hosting 34 Mickey Leland Energy Fellows.

SCOTT A. ROBBINS



Site Coordinator

Program Manager for the Student Programs Office

Los Alamos National Laboratory

Since 2007 Scott has been serving as the Program Manager for the Student Programs Office at Los Alamos National Laboratory (LANL). In this capacity he supports students, mentors, and management to ensure the best outcomes for all stakeholders. Prior to this Scott worked at LANL and at Intel as a training and program evaluation specialist. As a Senior Training Specialist at LANL Scott provided specialized support in the areas of job analysis, training staff development, and training program evaluation. For over fifteen years Scott worked as a Nuclear Facility Training Coordinator, training program designer, and Team Leader in the realm of environment, safety and health training. He has taught college courses on training & human performance at both the undergraduate and graduate level. He has also provided training and evaluation consultant support for corporations and non-profit enterprises in Northern New Mexico. He earned his B.A. in Education from University of Montana, an M.S. in Instructional Technology from University of Oregon, and his Ph.D. in Program Evaluation from the University of New Mexico.

ELAINE KING



Site Coordinator

Office of Work Based Learning

Pacific Northwest National Laboratory, Richland, WA

Elaine King is an Education Consultant at Pacific Northwest National Laboratory (PNNL) in Richland, WA. She is a graduate of the University of Puget Sound in Tacoma, WA where she earned a Bachelor's degree in Psychology. She is the Relationship Owner for the Energy & Environment Directorate while managing educational enhancement opportunities for undergraduate, graduate and postgraduates. She is an advocate for those historically underrepresented in scientific and technical fields and promotes and participates in local and regional Science Technology Engineering Math (STEM) education outreach. She began her career at PNNL in 2001 following a ten-year career in community college administration, marketing and recruiting, and non-profit educational management.

KELLY SCHWEHM



Site Coordinator

General Engineer

Strategic Petroleum Reserve, New Orleans, LA

Kelly Schwehm is a General Engineer in the Site Operations & Maintenance Division of the Department of Energy's Strategic Petroleum Reserve (SPR). She received both her Bachelor of Science in Mechanical Engineering (2002) and Master of Business Administration (2007) from the University of New Orleans. She has been with the SPR's New Orleans office for 8 years (4 years in Quality Assurance and 4 years in Site Operations and Maintenance). This is her fourth year serving as a Mickey Leland Energy Fellowship Program site coordinator. She currently enjoys reading, going to see live music, and playing with her six cats.

NOTES



Mickey Leland Energy Fellowship Program

For more information please contact:

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U.S. Department of Energy

Office of Fossil Energy

National Energy Technology Laboratory

Oak Ridge Associated Universities

Los Alamos National Laboratory

Pacific Northwest National Laboratory

Sandia National Laboratories

Strategic Petroleum Reserve



U.S. DEPARTMENT OF
ENERGY

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