



# Periodic Trends

Issue 02  
October  
2017

## Old Dominion University ~ Department of Chemistry & Biochemistry

Welcome Back! The new school year has started and we have much to tell you as our department continues to grow and evolve.

One of the biggest developments over the summer was the completion of the preliminary designs for the new Chemistry and Biochemistry Building. The 110,000 square foot building is scheduled for completion during the summer of 2020 and will be located on Elkhorn Avenue overlooking the baseball field on one side and the Oceanography Environmental and Atmospheric Sciences building on the other. The building will house a state-of-the-art Digital Theater with 120 seats. The Digital Theater will serve as both a planetarium and a chemistry lecture hall, and will also be used for seminars. The building will also house all of the chemistry and biochemistry laboratories for both undergraduate and graduate studies. This includes new state-of-the-art general chemistry, organic chemistry, physical chemistry, analytical chemistry, biochemistry, inorganic chemistry, and instrumentation laboratories for undergraduate instruction and research. In addition, the building will house a Chemistry Success Center which includes an undergraduate commons, an active learning center, and a chemistry tutoring center.

Perhaps the most exciting development is that for the first time, all of the Chemistry and Biochemistry faculty will be brought together in the same building, including the extensive research labs of our graduate faculty. Our faculty have been working all summer designing their new research labs and the department is abuzz about the future impact of these spaces. Below and on the next two pages are just a few examples:

### COMPUTATIONAL CHEMISTRY

Our programs in Computational Chemistry and Biochemistry will have collaborative and synergistic research spaces. Dr. Bayse's National Science Foundation (NSF) and National Institute of Health (NIH) sponsored research in redox signaling of zinc fingers and thyroid hormone activation, all carried out using the Turing cluster, will be a direct beneficiary. The new computational space will also dramatically impact the research of Dr. Poutsma's investigations into peptide fragmentation and Dr. Greene's work in the molecular dynamics of protein folding, bioinformatics, and protein network structures, as well as the work of Dr. Pascal in using NMR to elucidate the structure of the untranslated 3' cloverleaf of the picornavirus. The space will also benefit Dr. Xu's research into live cell image reconstruction utilizing photo-stable nanoparticles.

## Old Dominion University ~ Department of Chemistry & Biochemistry

### OPTICS LABORATORIES

Expanded optics labs will allow Dr. Bernath's Department of Energy and NASA funded research program the space to setup a 3500°C gas cell furnace with high resolution FTS sampling of noble metals in an effort to better model the atmospheric composition of extra solar planets and whether they can support life.

Expanded optics laboratories will also benefit Dr. Xu's NIH funded research using silver nanoparticle therapeutics for cancer stem cells. The optics facilities will also benefit Dr. Purcell and Dr. Courson's confocal fluorescent microscopic studies for targeted antibiotic development.

### SPECIALIZED WET LABORATORIES

Our new zebrafish facility will greatly accelerate Dr. Xu's NSF sponsored research into zebrafish genetics and embryonic neuron cytotoxicity.

Although Dr. Mao has remained one of our most prolific geochemists, the new building will provide him for the first time with a dedicated wet-lab for carrying out kerogen and organic soluble extractions of raw shale in an effort to better understand chemical structure at the solid/liquid interface as part of his NSF sponsored research.

New dedicated space for Dr. Hatcher, the Batten Endowed Chair of Physical Sciences, will bring synergy to our biogeochemistry program as his group investigates the incorporation of nitrogen in black carbons, the abiotic modification of terrestrial organic matter, the fungal degradation of lignin, and the subsequent transport of organic matter into the open ocean as part of his NSF sponsored research.

Dr. Mopper will have dedicated space for his NSF sponsored research in chemical aquatics.

### SPECIALIZED BIOCHEMISTRY LABORATORIES

Our biochemistry researchers will greatly benefit from expanded and co-located facilities designed for current biosafety regulations and sterilization compliance. With a dedicated autoclave room, freezer farm, instrumentation space, enhanced in-vitro transcription facilities, culture rooms, and incubator facilities, productive and collaborative research time will increase dramatically. In addition, Dr. Lee's alternative fuels research labs for genetically modified algae will be co-located with the other biochemistry faculty.

## Old Dominion University ~ Department of Chemistry & Biochemistry

### SYNTHETIC LABS

Perhaps one of the most dramatic improvements will be in the area of synthetic research. Our current research in this area involves Dr. Wang, Dr. Ramjee, Dr. Holder, and Dr. Cooper in synthetic areas including nanodevices, multi-heteronuclear transition metal complexes, photoreactive gelators, and enzyme-triggered drug release vehicles. These research areas have greatly suffered from a lack of sufficient synthetic hood space, a problem which will no longer exist in the new building.

In addition to the increased capacity for research and teaching, the architects have designed a truly inspiring and beautiful building.

Sincerely,

John Cooper, Chair



# New Grant Funding

In addition to numerous ongoing funded research projects, the Department of Chemistry and Biochemistry received over \$1 million in new funding this Fall 2017 semester.

These funds are used to carry out research in the department at both the graduate and undergraduate levels. Congratulations to the following professors for their contributions to an unprecedented year in research activity:

National Science Foundation, Craig Bayse PI and Alvin Holder co-PI, REU SITE: UNDERGRADUATE RESEARCH OPPORTUNITIES IN CHEMISTRY FOR COMMUNITY COLLEGE STUDENTS AT OLD DOMINION UNIVERSITY, **\$188,972.40**

NASA, Peter Bernath PI, ABSORPTION CROSS SECTIONS FOR THE OUTER PLANETS, **\$145,633.00**

VA Dept. of Environmental Quality, John Donat, 2018 CHESAPEAKE BAY PROGRAM, **\$135,049.20**

Virginia Academy of Science, Lesley Greene PI, EXPLORATORY LOOK INTO THE FUTURE: INVESTIGATING ADAPTION AND EVOLUTION OF SYNECHOCOCCUS IN RESPONSE TO HIGH CO2 AT THE GENOMIC-LEVEL, **\$1,250.00**

National Science Foundation, Pat Hatcher, COLLABORATIVE RESEARCH: DISSOLVED PYROGENIC ORGANIC MATTER DYNAMICS IN THE ENVIRONMENT, **\$13,770.00**

National Science Foundation, Pat Hatcher PI, THE CHEMISTRY OF LIGNIN'S PHOTOCHEMICAL TRANSFORMATION IN THE ENVIRONMENT: IMPLICATIONS FOR GLOBAL CARBON CYCLING, **\$165,000.00**

TEXAS A&M UNIVERSITY, Pat Hatcher PI, ROLE OF MICROBIAL EXOPOLYMERS IN AGGREGATION AND DEGRADATION OF OIL AND DISPERSANTS, **\$128,199.00**

National Science Foundation, Jingdong Mao PI, AIR-OXIDATION OF BIOMASS CHARs-STRUCTURAL CHANGES AND IMPLICATIONS FOR RETENTION AND REACTIONS OF CONTAMINANTS, **\$87,000.00**

National Institute of Health, Erin Purcell PI, THE ROLE OF THE STRINGENT RESPONSE IN CLOSTRIDIUM DIFFICILE SURVIVAL AND VIRULENCE, **\$108,000.00**

National Institute of Health, Nancy Xu PI, NEW PHOTOSTABLE NANOPROBES FOR REAL- TIME IMAGING OF SINGLE LIVE CELLS, **\$89,616.00**

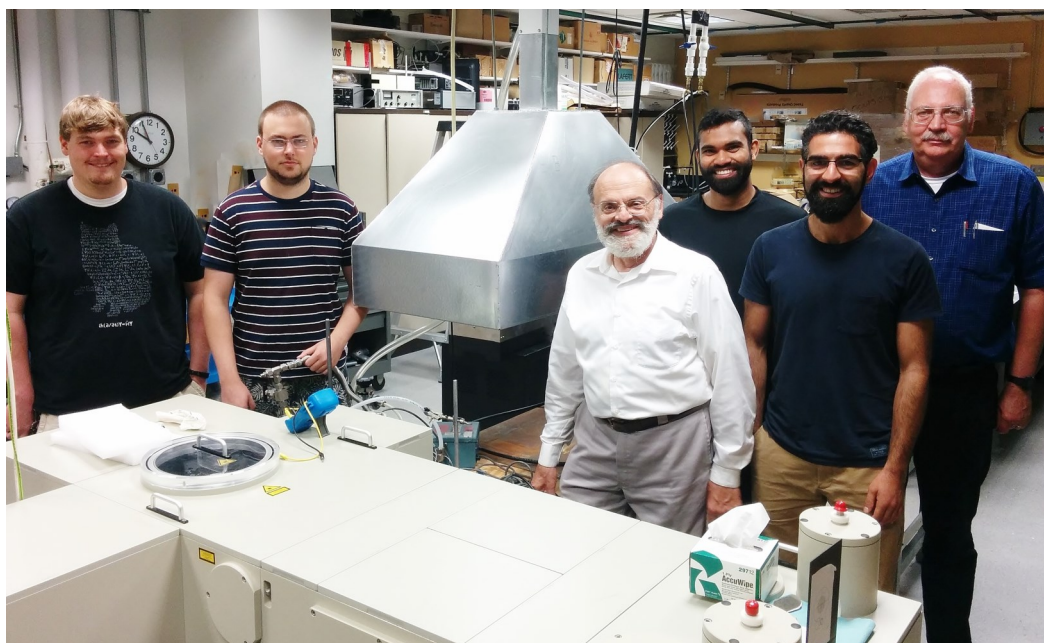
# Research Spotlight ~ Dr. Peter Bernath

The Bernath group is working on a diverse set of spectroscopic problems that include laboratory measurements and their applications in astronomy and atmospheric science. The main instrumentation in the laboratory is a high-resolution Bruker Fourier transform spectrometer that covers the spectrum from the far infrared to the near ultraviolet with a variety of detectors and beamsplitters. The molecular sources used include a high temperature furnace, electrical discharge cells and hollow cathode lamps to heat molecules to high temperatures (2500°C) and to make transient molecules such as free radicals in plasmas. For example, we are currently setting up a microwave discharge source to make the TiO free radical, which is found in cool stars and perhaps in the atmospheres of “hot Jupiter” exoplanets. Exoplanets are planets orbiting stars outside our own Solar System.

Several thousand exoplanets have been discovered. NASA is funding us to study molecules that have been detected already in the atmospheres of exoplanets such as hot methane, and that are expected to be detected soon, such as hot ammonia. We have recorded absorption spectra of hot methane and hot ammonia in the near infrared that can be used directly by astronomers to model their observed spectra of exoplanets. The spectra of hot methane and ammonia are very irregular and difficult to interpret, but we are working with two theoretical research groups (one in France and the other in England) to try to understand the energy level structure in detail.

NASA is also funding us to measure the spectra of cold hydrocarbons that are found in giant planets such as Jupiter and Saturn. In addition to recording spectra of hydrocarbons at Old Dominion University, we are using two synchrotron sources of infrared radiation and associated cold cells in Melbourne, Australia and Saskatoon, Canada.

These synchrotron sources are brighter than conventional lamps and glowers in the far infrared region, and therefore provide better spectra. Our work can be used to interpret spectra recorded by the NASA’s Cassini mission to Saturn and NASA’s Juno mission to Jupiter.

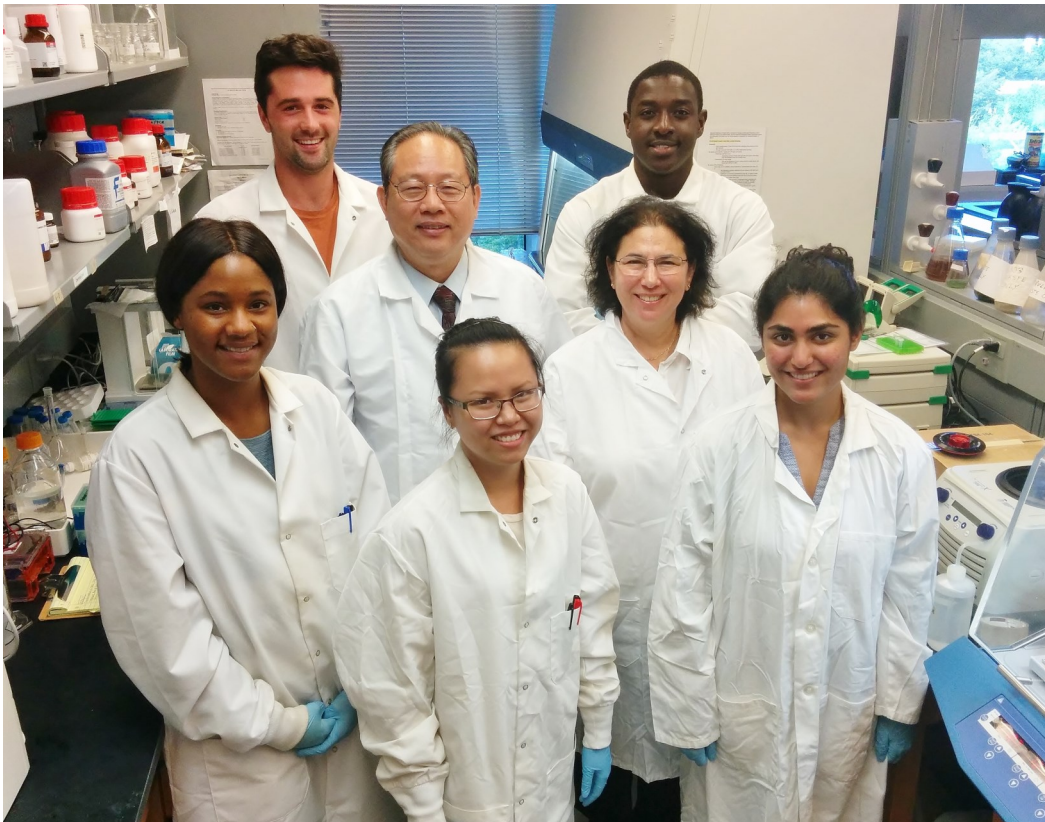


L to R: Post-docs: James Hodges & Dror Bittner; Research Associate: Dr. Mike Dulick; PhD grads (Physics): Anton Fernando & Mahdi Yousefi; and Dr. Peter Bernath

# Research Spotlight ~ Dr. James Lee & Dr. Lesley Greene

The Lee and Greene groups received a USDA grant to conduct a 'Designer Algae Biotechnology Risk Assessment'. The aim of the study is to design and construct genetically engineered cyanobacteria capable of producing select alcohols and other products. We then assess the survivability of the GE organisms in competition with wild-type organisms, monitor horizontal gene transfer, mechanisms of genetic incorporation and persistence, as well as develop genetically engineered self-containment systems.

In addition to advancing basic science research in the area of bio-risk analysis, the results of this project will help inform policy development by governmental agencies such as the USDA, EPA, DOE and the United States Congress. This work will also help in the effort to develop alternative green energy such as biofuels. Graduate students working on this exciting and cutting-edge project will gain advanced training in genomics, genetic engineering, microbiology, biochemistry and biofuels. Thus, combining computational and experimental approaches which will provide a solid foundation to build upon as post-doctoral fellows upon graduation and then in future academic or industry positions. Undergraduate students will also gain experimental scientific training which will enable them to experience authentic research.



## **USDA Research Team**

Front (left to right):  
Cherrelle Barnes, PhD  
Grad Student; Thu  
Nguyen, PhD Grad  
Student; Sana Sherazi,  
Undergraduate Student

Middle (left to right):  
Dr. James Lee (PI);  
Dr. Lesley Greene (Co-PI)

Back (left to right):  
Jason Agola, Post-  
baccalaureate researcher;  
Oumar Sacko, PhD Grad  
Student

# New Graduate Students ~ Fall 2017



**Ph.D. Student: Andrew Benedict**

Hometown: Sterling, VA

Education: B.S. Old Dominion University

Interest: Organic & Materials

**Ph.D. Student: Macey Cohen**

Hometown: Bethlehem, PA

Education: B.S. Dickinson College

Interest: Analytical



**Ph.D. Student: Sanjeeva Dodlapati**

Hometown: Hyderabad, India

Education: M.S. University of New Orleans

Interest: Organic



**Ph.D. Student: Alex Goranov**

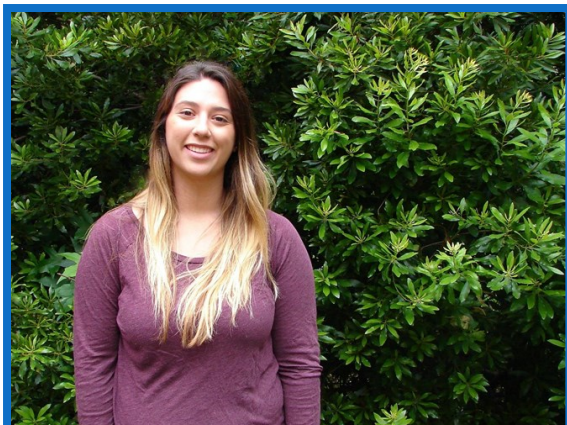
Hometown: Varna, Bulgaria

Education: B.S. Ramapo College

Interest: Analytical & Marine Geochemistry



# New Graduate Students ~ Fall 2017



**Ph.D. Student: Ashley Pullin**  
Hometown: Virginia Beach, VA  
Education: B.S. Old Dominion University  
Interest: Biochemistry

**Ph.D. Student: Rebecca Richardson**  
Hometown: Portsmouth, VA  
Education: B.S. Bluefield College  
Interest: Biochemistry



**Ph.D. Student: Brittney Ruedlinger**  
Hometown: Virginia Beach, VA  
Education: B.S. Old Dominion University  
Interest: Biochemistry

**M.S. Student: Mike Miller**  
Hometown: Virginia Beach, VA  
Education: B.S. Old Dominion University  
Interest: Inorganic



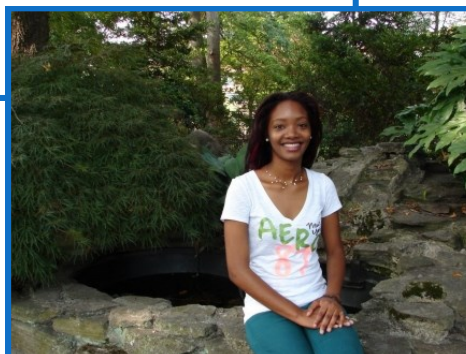
**Ph.D. Student (Biomedical): Meg Hept**  
Hometown: Chesapeake, VA  
Education: M.S. Virginia Commonwealth University  
Interest: Chemical Genetics



# Graduate Student News

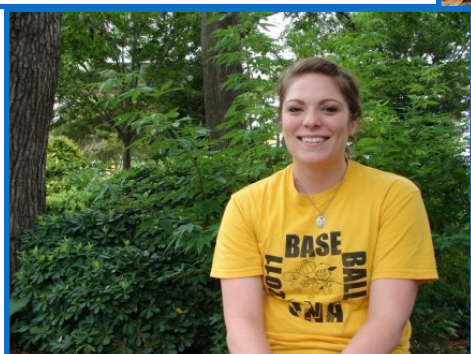
## ACS Graduate Student Travel Award

Chemistry Ph.D. student Joedian Morris, who works in Dr. Guijun Wang's group, was awarded the Fall 2017 Virginia Tech Graduate Student Symposium Graduate Student Travel Award on August 15, 2017. This award covered her travel expenses to the ACS National Meeting in Washington D.C.



## Van Norman Travel Grant

The Van Norman Graduate Travel Award provides support for two student in the Chemistry & Biochemistry Ph.D. Program to present their research at a national or international conference. The award is meant to supplement the advisor's contribution to travel expenses. Two \$450 awards are given each year. The 2017-2018 Van Norman Travel Grant was awarded to Ph.D. students John Bedford and Meghan Warden.



## Virginia Space Grant Consortium

Ph.D. students John Bedford and Ashley Shoaf were awarded grants from the Virginia Space Grant Consortium for 2017-2018.

This grant is a very competitive award which encourages STEM-related research, while recognizing high academic achievement. The students received a \$6,000 fellowship to support their research.



# 2017 National ACS Conference

This year I was delighted to attend the 254<sup>th</sup> American Chemical Society National Meeting and Exposition in Washington DC, with my fellow group members, Dr. Guijun Wang, Anji Chen, Joedian Morris, and Dan Wang. The conference lasted from Sunday, August 20, to Thursday, August 24. Other students from our program also attended including students from Dr. Nancy Xu's group, Dr. Ramjee's group, and Dr. Bayse's group. Many great things happen during your time at ACS, there are many famous scientists from around the world all in one place at one time!

During my trip I was able to network with various scientists who have done amazing research, and learn more about how people are using chemistry in their field of work. The exposition at the meeting showcases various scientific companies with their latest instrumentation and software. The caliber of science that I was able to see from around the world was so inspirational. I was able to hear two 2016 Nobel Prize Winners for Chemistry, Dr. Feringa and Dr. Stoddart. Feringa won the Tetrahedron Prize for Creativity in Organic Chemistry. Also, there was a keynote address from Dr. Phil Baran of the Scripps Institute where he presented new research findings and unveiled a new product, ElectraSyn 2.0. Although I was unable to attend the unveiling of the device I was able to attend a seminar given by Dr. Baran during our trip, and was blown away by his charisma and fantastic research.

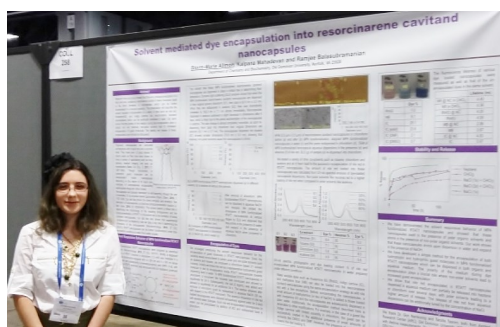
On top of research, the ACS also gave glasses for us to wear for us to watch the eclipse which was very eye-opening to me, as I have never seen something like it before!

-Kristen Bashaw, Chemistry Ph.D. Student



Left: Kristen Bashaw, Anji Chen, Joedian Morris, & Dan Wang

Right: Kristen Bashaw



Left: Storm-Marie Allmon

Right: Martha Johnson, Dr. Nancy Xu & Preeyaporn Songkiatisak



# Alumni News

## Sr. Agatha Munyanyi: My Story

I first came to the United States from Zimbabwe, Africa, in 1976 with a scholarship funded by the Benedictine Sisters of Yankton, South Dakota. I attended Hampton Institute (now Hampton University), where I earned a B.A. degree with a major in chemistry. Between 1979 and 1981, I earned a bachelor of science in medical technology degree and a Master's in clinical chemistry degree from Old Dominion University. My mentor for my Master's research was Dr. Patricia Pleban.

I returned to Zimbabwe at the end of 1981 and worked in medical laboratories for a mission hospital, as well as a private company. I conducted routine laboratory tests along with those related to tuberculosis and drug sensitivity. After several weeks of treatment, I would see patients progress from extremely ill and thin to healthy again. It was the most fulfilling time of my profession. Patients would come almost like a skeleton and one could see them changing. One saw people getting well. That was rewarding. I also helped open satellite laboratories in rural areas where simple tests could be conducted saving people long, arduous trips to larger health facilities.

After working for 25 years in medical laboratories, I decided to return to the U.S. for further education at Old Dominion. I was offered a full scholarship for a teaching assistantship. I taught laboratory classes for beginners in chemistry. It was a lot of fun and lots of work.

My doctoral research was on Experimental and Computational Analysis of the Synuclein Proteins. Dr. Lesley Greene was my mentor. This meant studying proteins, including one associated with Parkinson's disease. I graduated on May 10, 2014. In July 2014, I was offered a position with Potesta & Associates, Inc., based in Charleston, West Virginia. Potesta & Associates is an environmental and engineering consulting company.



My work at Potesta & Associates include: preparing permit applications for companies that want to construct new industrial facilities, modify their existing permits, renew their permits. These permits can be either air permits or water permits. Companies have to meet state and federal regulations pertaining to air and water pollutants. Potesta & Associates works with clients involved in businesses including coal, natural gas, concrete, asphalt and chemical industries. I have learned a lot about these various industries and equipment involved. There is a connection between my research work and the work I am doing here at Potesta & Associates.

I live in a community with two fellow Sisters (nuns) who belong to the same religious congregation as I. We belong to the Basilica of the Co-Cathedral of Sacred Heart catholic parish. My fellow community members work for the parish, and minister to the elderly, sick and home bound. Our religious congregation is called Sisters of the Child Jesus. It is based in Zimbabwe.

My work day is 7:30 a.m. to 4:30 p.m. My day begins with morning prayer and ends with evening prayer. I have an attachment to Norfolk Virginia. ODU has made me who I am today. Long live the Monarchs! I am so grateful to all who helped me achieve my academic goals.

Dr. Lesley Greene comments "We were blessed to have Sister Agatha in our department and my group. She is greatly missed. I am happy she is doing wonderfully well in Charleston, West Virginia."

Alumni - undergrads and grads - please email your story and a photo to Alicia Herr at [aherr@odu.edu](mailto:aherr@odu.edu)

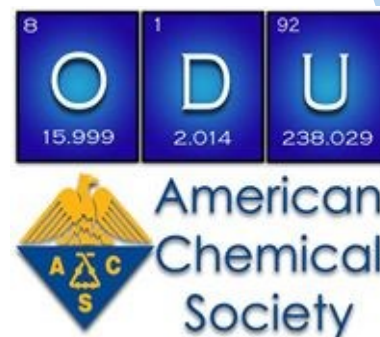
# A.C.S. Student Chapter News

The American Chemical Society is a student organization interested in “improving people’s lives through transforming the power of chemistry.” This year we are planning multiple events such as Mole day, pie a professor day, and the magic show. We encourage each of you to attend these events which are free, along with joining us for our general meetings that are held every other Thursday in the Alfriend Chemistry Building, room 404, during student activity hour.

For the first time, the ACS student chapter is putting together a research panel in which professors will display their research to undergrads. Our goal for this event is to get you excited about the world of Chemistry by showing the many divisions which will help develop your future career path.

Additionally our group is searching for Chemistry and Biochemistry faculty who are interested in hosting undergraduate researchers in their laboratory.

Watch for our new website and Facebook pages. **Chemistry is FUN!**



L left to Right: Dr. Bala Ramjee, Faculty Advisor; Christian Dean, Vice-President; Arooba Ayaz, Historian; Sara Azher, President; Jacob Grant, Treasurer; Kevin Nguyen, Secretary; Brianne Nunez, Demonstrations

# Exciting New Equipment

## **Shimadzu High-Performance Liquid Chromatograph Mass Spectrometer LCMS-2020**

There is a new Liquid Chromatograph-Mass Spectrometer (LC-MS) in the Department of Chemistry and Biochemistry. Installation and training is this month.

Liquid chromatography-mass spectrometry is a powerful technique for the separation and in situ characterization of organic compounds which is commonly employed in a wide-range of fields/industries spanning pharmaceutical chemistry and metabolomics to environmental samples and food chemistry to petrochemical industry.

The LC-MS will allow our undergraduate students to receive valuable experience on one of the fundamental hyphenated techniques. This equipment will be primarily used by our undergraduate students taking the following courses.

CHEM 138N Advanced General Chemistry I and II Laboratory  
CHEM 212 Organic Chemistry Laboratory I  
CHEM 214 Organic Chemistry Laboratory II  
CHEM 216 Advanced Organic Chemistry Laboratory  
CHEM 322 Analytical Chemistry Laboratory  
CHEM 352 Inorganic Chemistry Laboratory  
CHEM 411/511 Natural Products Chemistry in the Caribbean.  
CHEM 422/522 Instrumental Analysis Laboratory  
CHEM 452/552 Advanced Inorganic Chemistry Laboratory  
CHEM 490 Senior Thesis I  
CHEM 497 Independent Study  
CHEM 498 Independent Study  
CHEM 499 Senior Thesis II

This research grade instrument capable of ultrafast polarity switching, enhanced sensitivity, and rapid scanning speed will also support ongoing research activities in a number of research groups in the Department of Chemistry and Biochemistry.

