FROM THE DEAN’S DESK – NOVEMBER 18, 2016

THE RADFORD UNIVERSITY COLLEGE OF SCIENCE AND TECHNOLOGY NEWSLETTER

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RADFORD UNIVERSITY’S FIRST FAA-CERTIFIED PILOT IN COMMAND

There is a buzz in the air around the Radford University campus, both literally and figuratively. Unmanned aerial vehicles, also known as UAVs or drones, are rapidly becoming a regular feature of the Radford academic experience. They were featured at the dedication of the Center for the Sciences in October, they are a highlight of Science Days with regional K-12 students, and they are becoming essential to research in Geology, Physics, and Geospatial Science.

To safely and effectively control these wonderful new tools, the campus must have people with experience and training. As of this fall, Radford University has its first Federal Aviation Administration (FAA) -certified Pilot-in-Command for remote-controlled vehicles in Mr. George Stephenson, faculty member and lab coordinator in the Department of Geology.

“The regulations are quite complicated and they are very different for state-owned UAV's (which would include the ones at Radford University) than they are for commercially-owned UAV's” said Dr. Skip Watts, Professor of Geology. “The FAA also issued a separate Memorandum of Interpretation on May 4, 2016 covering the Educational use of Unmanned Aircraft Systems.”

Mr. Stephenson took note of the requirements and took aim at a specific date: August 29, the first day that testing would be available to receive certification. He passed with flying colors, allowing Radford University to leap forward with work toward a Geohazards Research Center.

Mr. George Stephenson, Radford University’s first FAA Certified Pilot-In-Command with several of the RU Aircraft
He explained that there are many responsibilities and privileges that come with certification from the FAA. “I have to be aware of the National Airplane System (NAS) in areas such as airspace classifications and communicate, when appropriate, with Airport Air Traffic Control” he said.

“Being in command of these flights means I am responsible for preparing all legal applications for our flights and any Certificates of Waiver if they are needed.”

Communication will be key as the requests are mounting for the services of the center. “RU-Geology has already initiated FAA-approved geohazard aerial studies on behalf of VDOT in collaboration with industry and on behalf of Charleston West Virginia’s Yeager International Airport, where a landslide has severely impacted one of its runways” stated Dr. Watts. “The U.S. Forest Service is requesting services related to the Cascades Trail and waterfall in Giles County and several corporate partners are requesting training and services.”

Another project is taking place in Buchanan County at the site of a reclaimed Mountaintop Mine. “They have plans for a number of great projects there” stated Mr. Stephenson “and we are helping them reach their goals.”

There is almost an overwhelming volume of requests coming in for the research capabilities of this program which is being established in cooperation with the Departments of Physics & Geospatial Science. Not only does the team have the ability to conduct missions in the air, but also using robotic unmanned submersibles as well. One such device has been deployed at Mountain Lake in Giles County to help find leaks in the lake bed.

Current and future research opportunities include:

Rock anchor safety testing, Highway landslide inventory & research, Airport runway emergency run-out-zone stability, U.S. Forest Service public safety investigations, Quarry & mine: safety & material inventory, Pipeline safety, Flood mapping, Gigapan digital imagery, and Emergency response.

Mr. Stephenson explains the use of the robotic submersible at Mountain Lake in a video produced by the resort explaining the disappearing body of water and the research being conducted to mitigate the change.
HANDS-ON EXPERIENCE BRINGS A SMILE TO RADFORD UNIVERSITY PRE-DENTAL STUDENTS

Radford University students looking for a career in dentistry have a good reason to smile as the efforts of the Pre-Dental club on campus are moving them toward their dreams. From charity to real-world experiences, this organization is working hard to keep members in the know.

“Our goal is to help students who are interested in the dental field become familiar with the application process, prepare for the Dental Admission Test (DAT), compile their resumes and eportfolios, find volunteer opportunities around campus and in the community, and obtain shadowing hours from local dentists” said Rebecca Sandlin, Club Vice President. “We are committed to making everyone the best applicant they can be!”

The club goes beyond the career programming needs of future dentists by engaging in special events to help others. “Every year we host a charity 5K in April where all proceeds are donated to Bradley Free Clinic in Roanoke, an organization committed to providing free medical, dental, and pharmaceutical services to those in need” Rebecca said. “Last year we had a fantastic turn out and were able to raise over $4,000.”

In addition to the 5K, club members participate in Missions of Mercy (MOM) projects which are free dental days run by volunteers. Since 2000, over 60,000 people have benefited from these events. The largest project on the east coast takes place in July in Wise County, and we had a few members attend this year. In 2016 1,232 patients were seen and $1.3 million worth of procedures were completed. “These projects really allow us to connect with the community and gain experience, as well as observe the huge impact dental care can have” Rebecca added. “Dentistry is actually a very social profession, and listening to attendees tell their stories is very moving. You don’t always realize how much a seemingly-simple service can change a life.”

The first step in becoming a dentist and changing lives is gaining experience and training. On October 21, members of the club participated in a pre-dental day at the Medical University of South Carolina in Charleston.

“Some schools’ ASDA chapters host yearly pre-dental days so undergraduates can tour the school, speak with faculty and current students, and complete some sort of hands-on activity” said Rebecca.

Five students from Radford University participated and experienced presentations from the school in areas such as class size, tuition costs, and interview tips. The highlight of the day was the hands-on experience where students had the opportunity to wax a tooth and practice drilling and filling.
“We were given a fake mouth to practice drilling on with a hand piece, then we filled our cleaned tooth with amalgam, a mercury mixture sometimes used in fillings,” said Rebecca. “It was definitely harder than expected, but it was an invaluable experience.”

“For the second activity, one of the fake teeth in the mouth was replaced by a smaller nub that fit in the same space” she added. “We had to use tools heated in a Bunsen burner to deposit wax onto the nub until it was build up to the right size, then we shaped it to fit into the mouth the way the actual tooth would.”

The students had an opportunity to rate their performance on the assigned tasks. “We were able to have our attempts scanned into a computer and compared to an ideal preparation to show how well, or poorly we did” said Rebecca. “The purpose of this activity in dental school is to teach the anatomy of the individual teeth so you can recreate them on the job where necessary.”

One fun fact that Rebecca added about the day: During a lecture that explained how and why we get cavities, she learned that you’re actually not supposed to rinse your mouth out with water directly after brushing because it removes the fluoride you just put on your teeth.

The pre-dental club at RU is helping students learn the basics and beyond as they continue their journey toward their prospective careers.
NUCLEAR CHEMISTRY

With the opening of the Center for the Sciences in 2016, chemistry faculty and students have a new tool in understanding the spatial orientation of chemical bonding of compounds. The Nuclear Magnetic Resonance Spectrophotometer (NMR) is the focus of a recent publication by Radford University Assistant Professor of Chemistry Dr. Amy Balija that was featured in the American Chemical Society (ACS) Symposium Series Volume 1225.

Titled “C NMR Spectroscopy in Teaching Structure and Stereochemistry of Compounds in Introductory and Advanced Organic Chemistry Courses” the article outlines the use of this machine for educators. Dr. Balija explained the general content of her publication in her introduction.

“Nuclear Magnetic Resonance (NMR) is a powerful tool for assigning the structure of organic compounds. By examining how organic compounds absorb radio frequency pulses within a magnetic field, NMR produces chemical ‘fingerprints’ which can be used to piece together the structure of an unknown substance. In most contemporary sophomore-level organic chemistry textbooks, the topic of NMR spectroscopy is introduced half-way through the 2-semester course. Furthermore, organic chemistry courses heavily emphasize NMR spectroscopy of the protons (hydrogen) within a compound, while NMR involving carbon and other atoms receives little attention. NMR is taught as such due to the perception of proton NMR as being more informative.

In this book chapter, we advocate for a different approach. We argue that, from a chemical education perspective, NMR should be introduced very early in the sophomore organic chemistry course, and carbon NMR should be receive more emphasis than proton NMR. Early in the first semester of organic chemistry, students learn fundamental concepts about chemical structure, including topics such as isomerism and stereochemistry. Carbon NMR gives simple lines. Each line corresponds to a unique carbon in an organic compound. Thus, carbon NMR can be easily interpreted by students and it reinforces concepts such as structural isomerism and stereochemistry. Carbon NMR thus fits naturally into the beginning of the organic chemistry sequence.
Several examples are provided in the chapter which highlight how carbon NMR illustrates the concepts of structure and bonding. These examples may be used as discussion problems in a classroom setting, or they could provide the basis of teaching laboratory experiments. As the organic chemistry class advances during the semester, NMR is continuously integrated into the class. By using this approach, we propose that students in the long run will have a better understanding of organic structure and bonding. As an additional benefit, NMR will not seem like a foreign concept later in the semester. Educational outcomes for both organic structure and bonding should improve.

The NMR is an invaluable tool for organic chemistry classes at Radford University and helps students move more efficiently in their understanding of complex structures.

RADFORD UNIVERSITY HOSTS REGIONAL IOTA SIGMA PI CHAPTER INITIATION

On Sunday, November 13th, Members of the Radford University Department of Chemistry hosted a new member induction for the Argentum Chapter of Iota Sigma Pi, a national honor society for women in chemistry. The chapter welcomed 13 new members from partner schools within the region: Bridgewater College, James Madison University, Mary Baldwin College, and Radford University.

In addition to the ceremony and business meeting, the group received keynote remarks from Radford University Assistant Professor of Chemistry, Dr. Amy Balija, who was also the 2016 Winner of the National Iota Sigma Pi Award for Excellence in Teaching. Dr. Balija shared her work on “Preparing pollutant eating macromolecules that remove organic compounds from water.”
SIMPLE MODELS FOR COMPLICATED SCENARIOS? NSF HELPS BIOLOGY STUDENT STUDY EBOLA

Ebola led news reports throughout many recent years as outbreaks seemed to be an increasing cause for concern. Populations around the globe were impacted and the need to learn more about the disease was evident. Radford University biology major Sarah Rainey spent part of her summer in 2016 at a nine-week, National Science Foundation funded, experiential learning program at the University of Georgia. The program is designed to train undergraduates in scientific methods at the intersections of quantitative and experimental studies in infectious disease biology. Ebola was at the center of her work.

“I had an amazing time at the University of Georgia, where I attended the Population Ecology REU program this summer” stated Sarah. “The program was conducted by Dr. John M. Drake who also happened to be my PI.”

Sarah studied how well simple models accurately account for complicated scenarios involved in infectious disease outbreaks, such as Ebola, using statistical software “R”.

“I found that, in the case of the 2014 Ebola outbreak in West Africa, the simple model (Legrand et al., 2007) had more structural uncertainty and was not ideal for accurately depicted the outbreak trajectory” she added.

“During my internship, I gained more experience with coding in R, met researchers and communications employees from the CDC and veterinarians and surgeons from the Georgia Aquarium, as well as other students from various universities across the country.”

Sarah learned of the project through interaction with faculty. “My research professor here at Radford, Dr. Fleming-Davies, was the person who informed me of the opportunity and encouraged me to apply” Sarah recalled.
BIOLOGY MAJOR HELPS SPEARHEAD SUCCESSFUL FOOD DRIVE THROUGH CSAT COMPETITION

Miracle Davis, a junior majoring in Biology at Radford University and President of the Scholar-Citizen Student Club, helped organize a food drive competition as a part of the Radford University Day of Service in October.

“After a club meeting with guest speaker Lee Stewart, leaders of the Scholar-Citizen Student Club (known to those in the know as ‘SCI’) decided that the best way for Scholar-Citizens to contribute to the Day of Service was to connect people and encourage involvement” stated Miracle. “They decided to host a friendly competition amongst clubs, organizations and departments on campus.”

Each SCI member was asked to go back to their department or club and began to spread the word. Miracle was pleased with the reaction to her request.

“I received an overwhelmingly positive response from the College of Science and Technology, and was able to get a departmental competition going between the Biology, Chemistry and Anthropology Departments” she recalled.

Radford University’s student clubs RU Hype, Biology Connections and Honors Academy Student Organization also participated. Resulting in a grand total of 749 food items collected from the competition and donated to Highlander Helpers Backpack Program and the Bobcats Backpack Program.

“A special thank you to all the many students, staff, and faculty who participated and helped the SCI Club affirm the Scholar-Citizen motto: Create. Connect. Contribute” stated Miracle. “Together, we can contribute to the greater good through connecting people, ideas, and resources to create innovative solutions. Go Highlanders!”
CSAT FUNDRAISING MOONSHOT IN FINAL STAGES

The College of Science and Technology (CSAT) has the opportunity to have a million dollar year, but additional support is needed to reach the final goal.

If the College can raise $700,000, The Mary Morton Parsons Foundation of Richmond will donate an additional $350,000 to help enhance the academic and outreach facilities in Radford University's new Center for the Sciences. That's $1 million for science education and outreach!

There is still approximately $140,000 left to raise in order to reach the $700,000 goal and "unlock" the additional $350,000 challenge grant.

Any gift geared toward the Center for the Sciences (CFTS) can count. Displays in the new building, support for programs that conduct research or teach in the CFTS, programs that utilize the new facility, and more can count toward the total.

The College has never had an opportunity quite like this before and the results could provide for many new prospects among students and faculty in the future. The real challenge is in spreading the word and encouraging people connected to the College to participate.

Faculty, staff, students, and alumni are encouraged to consider this opportunity to expand the impact of a gift and help CSAT have a million dollar year. A gift of $10 becomes $15 if the $700,000 goal is met, securing the $350,000 challenge grant.

Questions can be directed to David Horton at 540-831-6277 or rhorton@radford.edu.