Excellence in Teaching Linda Spremulli Awarded

Linda L. Spremulli, Professor of Chemistry at the University of North Carolina at Chapel Hill, received the 2012 Board of Governors Award for Excellence in Teaching. This is the most prestigious award given in the UNC system, and Linda was honored at the spring graduation ceremony, when a Board of Governors member along with Chancellor Thorp presented her with an engraved bronze medallion and award check. Teaching is the University’s primary obligation and proudest accomplishment of its faculty.

The Board of Governors established this award in 1993 with the following resolution: “To underscore the importance of teaching and to encourage, identify, recognize, reward, and support good teaching within the University, the Board of Governors shall create annual system-wide teaching awards with monetary stipends which are designated the Board of Governors Awards for Excellence in Teaching.”

“Linda clearly stands out as one of the finest teachers in our department’s long history,” said Professor and former Chair Matthew Redinbo. “I often meet alumni who praise Linda specifically regarding courses they took some twenty years ago. —Talk about making an impact.”

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More than Cilia Carolina Chemistry in Science

With each breath, we inhale life-sustaining, oxygen-rich air. But that same air is also riddled with germs that threaten our health. Now, in collaboration between the College of Arts and Sciences and the School of Medicine, scientists at Carolina Chemistry reveal evolution’s design for keeping our lungs clean and healthy. The discovery, published in the journal Science, not only revamps previously held beliefs on how the human airway functions, but also provides a unifying theory for how to treat seemingly different airway diseases, ranging from cystic fibrosis to asthma.

“The air we breathe isn’t exactly clean, and we take in many dangerous elements every minute,” says Michael Rubinstein, Ph.D., UNC’s John P. Barker Distinguished Professor of Chemistry. “We need a mechanism to remove all the junk we breathe in, and the way that is done is with a very sticky substance called mucus, which lines the airways and catches these particles before they reach the epithelial cells in the lungs. Hair-like extensions of epithelial cells called cilia then propel the mucus out of our airways and get rid of these dangerous particles.”

But if mucus is so sticky, why doesn’t it stick to the cilia that get rid of it?

Until now, researchers believed that the answer was water, which bathed the cilia and shielded them from the mucus. However, the researchers, including Postdoctoral Associate Liheng Cai from the Rubinstein group, now show that the water model is fundamentally wrong.

Instead, a mesh of molecules is tethered to each hair-like cilium resembling a brush; and as each cilium sways back and forth, the brush collectively propels the mucus forward. This brush-like layer keeps the sticky mucus from reaching the cell membrane, ensuring the normal flow of mucus out of the airways.

Continued on page 10
From the Chair

Greetings from the Chair’s office on a crisp and perfect fall day in Chapel Hill. First, please join me in thanking Matthew Redinbo for his commitment, service and leadership as the Chair of our Department for the last three years. Matthew’s exemplary management record, while still maintaining a stellar research program, includes the hiring of a team of outstanding junior colleagues during one of the most difficult fiscal times the University has ever experienced.

I assumed the role of Chair in July, and am deeply honored to serve in this new position. I started as an undergraduate in the Department in 1984 and was privileged to join the faculty in 2003. Ever since, I am humbled to be part of this department’s rare combination of excellence and collegiality.

With those of you who had the privilege to know him, I share in mourning the loss of a significant contributor to Carolina Chemistry. Professor Frances Nash Collier, affectionately known as “Papa Collier,” passed away on October 26th. His dedication to the undergraduate laboratories and its thousands of students in the basement of Venable Hall is unmatched.

I am daily reminded of the extraordinary caliber of the faculty, staff and students in our department. I am delighted to include in this Carolina Chemistry tradition, the arrival of Dr. Jillian Dempsey, an inorganic and materials chemist; Dr. Alexander Miller, a mechanistic inorganic chemist; and Dr. Eric Brustad, a biochemist and protein engineer. This fall, we also welcomed a new class of 40 graduate students, bringing our total graduate enrollment to over 230, while we currently have 715 declared undergraduate majors.

Some of this year’s outstanding achievements, highlighted in this issue of the newsletter, include the receipt of the 2012 Board of Governor’s Award for Outstanding Excellence in Teaching for the entire University of North Carolina system by Professor Linda Spremulli, the election into the National Academy of Sciences by Professor Joseph DeSimone, and the receipt of the Latino Diamante award for excellence in higher education advocacy for Latino students by Dr. Brian Hogan. Additionally, we are all elated over the award of a Packard Fellowship to Professor David Nicewicz, one of our outstanding young faculty colleagues. Our students continue to excel, as exemplified by graduate student Sarah Brosnan, a member of Phi Beta Kappa, a Robinson Scholar, a merit-based scholar from Chapel Hill. He is a Colonel Bacanu is a physics and mathematics major from Chapel Hill. He is a Colonel Bacanu, an undergraduate researcher in the Rubinstein lab, who is the recipient of a prestigious Goldwater Scholarship.

I am delighted to share data for 2010 academic R&D spending recently reported in C&E News. Carolina Chemistry moved up from 16th to 9th in the ranking of total chemical R&D spending. Even more impressive is that for federal dollars attracted and spent in fiscal 2010, Carolina ranked 4th in the nation with over $23M coming to Chapel Hill. We intend to keep up the great work.

You make it possible for us to enhance our mission of providing our students with the absolute best education possible. We rely on, and are deeply grateful for, your continued support. Private support is vital to help attract and retain many of the faculty members who are bringing in the research grants mentioned above.

I encourage you to contact me – I would love to hear from you. Please write me or come visit us in the Chemistry City of Kenan, Morehead, Caudill, New Venable, Murray, and as of this summer, the Genome Sciences Building just across South Road.

Warmest Regards,

Valerie Sheares Ashby

Sarah Brosnan  Wins IUPAC Competition

Sarah Brosnan, a graduate student in the Ashby Group, was selected as one of three winners at the 2012 World Polymer Congress poster competition. Sarah was chosen from a field of over 400 competitors from all over the world.

Sarah’s work, titled “Monodisperse Shape-Specific Shape Memory Particles,” explains how the size, shape, and surface characteristics of micro- and nanoparticles are of critical importance for determining their ultimate distribution throughout the body, their delivery, and bioactivity. These properties are particularly important for nanomedicine, therapeutics, and bio-imaging applications.

Sarah’s research has led to the development of the first example of shape memory polymer particles that can have any starting shape, have a large variety of temporary shapes, return to the original shape at biologically reasonable and tunable temperatures, display no cytotoxicity, and have a surface chemistry that can be trivially modified.

Alexandru Bacanu  Earns Goldwater Scholarship

Alexandru Bacanu, a junior doing research in John P. Barker Distinguished Professor Michael Rubinstein’s lab, has been awarded a 2012 Goldwater Scholarship. This award goes to outstanding college sophomores and juniors who intend to pursue careers in mathematics, the natural sciences or engineering.

The scholarship provides up to $7,500 per year for educational expenses. Sophomores receive two years of support; juniors, one year. Scholars are chosen for intellectual curiosity and intensity and potential for significant future contributions in their fields.

Bacanu is a physics and mathematics major from Chapel Hill. He is a Colonel Robinson Scholar, a merit-based scholar from UNC. He is also a National Merit Scholar and a member of Phi Beta Kappa. His career goals are to earn a doctorate in theoretical and computational physics, conduct research in polymer physics and teach at the university level.

Sarah Brosnan

S

Alexandru Bacanu

A
Joseph Templeton  Honored by the General Alumni Association

Francis Preston Venable Professor of Chemistry Joseph L. Templeton has been awarded the General Alumni Association’s Faculty Service Award. The award was established in 1990 and honors faculty members who have performed outstanding service for the University or the association. Templeton was the faculty representative on the GAA board for 2009-10.

As Templeton — who served as Chair of the Chemistry Department from 1990 to 1995 — has continued to teach a full course load, mentor graduate students, apply for grants and run his own research projects, he also has taken on several high-profile administrative assignments. Among other duties, he served as chair of the Faculty Council from 2006 to 2009, served as chair of the Summer Reading Program Book Selection Committee, and the Chancellor’s Advisory Committee, and the Faculty Executive Committee. He is also serving as Special Counsel to the Chancellor.

Joseph DeSimone  Scholar, Innovator, Entrepreneur

Where to begin in describing all that Chancellor’s Eminent Professor of Chemistry Joseph DeSimone has accomplished this past year? To start with, he was elected into the National Academy of Sciences, one of the highest honors that a U.S. scientist or engineer can receive.

He was also awarded the 2012 Walston Chubb Award for Innovation. This recognition is awarded by the Scientific Research Society Sigma Xi to recognize research into new areas of potential scientific importance, novel approaches to a long-standing problem in science or engineering, or research that may create a new methodology of importance to science or engineering.

Professor DeSimone can also add one more to his many titles and distinctions. In June he was made the Director of the Frank Hawkins Kenan Institute of Private Enterprise succeeding John Kasarda, who stepped down after serving as the director of the Kenan Institute for 22 years.

As a world-renowned scholar, innovator, and successful entrepreneur, DeSimone was chosen to build on Frank Kenan’s vision and Jack Kasarda’s legacy. “The Kenan Institute is central to UNC’s continued leadership as an entrepreneurial university in the 21st century,” says DeSimone. He also feels that UNC is “uniquely positioned to leverage the intellectual capital we have right here on campus, join it with some of the best and brightest minds from around the globe, and develop innovative market-based solutions to some of the most pressing global challenges of our time, including poverty, health, education, energy, sustainable development, and economic growth.”

DeSimone will continue to lead his research group here at Chemistry.

David Nicewicz  Receives a Packard Fellowship

Assistant Professor David Nicewicz has received a 2012 Packard Fellowship for Science and Engineering. The fellowship is worth $875,000 over five years. Nicewicz is one of 16 scientists to be awarded the unrestricted grants from The David and Lucile Packard Foundation this year.

Through the design and development of novel organic dyes, Nicewicz and his laboratory team seek to invent new and important chemical reactions. The organic dyes that they develop act as catalysts to harness sunlight and convert it to chemical energy. The harvested chemical energy stored in the catalyst enables previously difficult or impossible chemical reactions to take place. These new catalysts and chemical reactions have the long-term goal of creating more cost-effective processes to produce the materials and medicines that are critical to modern society.

The Packard awards are among the nation’s largest nongovernmental fellowships, designed with minimal constraints on how the funding is used to give the fellows freedom to think big and look at complex issues with a fresh perspective. Packard Fellows have gone on to receive additional awards and honors, including the Nobel Prize in Physics, the Fields Medal, the MacArthur Fellowships, and elections to the National Academy of Sciences and the National Academy of Engineering. By supporting highly innovative professors early in their careers, the foundation hopes to further their promising work in science and engineering, and encourage their efforts to train the next generation of scientists.
The American Chemical Society has named Carolina Chemistry professors Royce Murray and Joseph DeSimone as ACS Fellows. The new class of ninety-six fellows were honored at the society’s fall national meeting in Philadelphia this past August. The ceremony was hosted by ACS Immediate Past-President Nancy B. Jackson.

"ACS is especially proud to honor these chemists, who have given so much to the community and the profession," said Jackson in announcing the 2012 class of ACS Fellows. "They are leaders whose work is having a lasting beneficial impact, not just on science but also on the ACS community." Their contributions include "outstanding and creative scientific research, superior achievements in the teaching and learning of chemistry, managerial excellence, and volunteer service through meetings and communication with the public," she noted.

The fellows program began in 2009 as a way to recognize and honor ACS members for outstanding achievements in and contributions to science, the profession, and ACS.

Mary Napier  Earns C. Knox Massey Award

Mary Napier with the DeSimone Group was selected by Chancellor Holden Thorp to receive one of six C. Knox Massey Distinguished Service Awards for this year. This award is one of the most coveted distinctions the University gives faculty and staff.

Napier manages the DeSimone Research Group, a team of almost fifty, that focuses on learning how to bring aspects of nanotechnology into the field of medicine, specifically for fabrication and delivery of vaccines or other medicines for the prevention and treatment of diseases. The group, one of the largest at Carolina, conducts its research in 4,500 square feet of lab space and generates about $3.5 million in annual grant support. Napier has several formal and informal responsibilities that add up to coordinating the lab’s multifaceted role.

Colleagues say Napier’s presence and commanding capabilities serve as the glue that holds many collaborations together, and she is the compass that keeps each project on track to yield significant research outcomes.

Matthew Detter  Multiple Undergraduate Awards Winner

Matthew Detter, a chemistry major who studied in the DeSimone group, graduated with Highest Honors and Highest Distinction in May. In addition, he was one of two recipients of the prestigious Venable Medal.

The Venable Medal was established by Frances Venable Gardiner in recognition of Francis Preston Venable, who was Dean of the Department of Chemistry from 1880 to 1900 and President of the University of North Carolina from 1900 to 1919. Awardees are selected based on outstanding academic work, character, and outstanding contributions to the University of North Carolina at Chapel Hill, not only in chemistry but throughout the university community.

Furthermore, Matthew received the award for best undergraduate poster in chemistry at the Annual Meeting & Research Conference of Sigma Xi. The award consists of a certificate, a medal, and the opportunity to join the society as an associate member.

Matthew’s research focuses on magnetically targeting a nanomedicine vector to deliver a steroidal hormone. This technique could facilitate the delivery of an anti-inflammatory steroid to a very specific and targeted site. Potentially, this would allow medications to collect in the point in the body where they are needed, without having to subject the entire system to the drug.
Brian Hogan  “A Crazy Scientist Building a School in Guatemala”

In his own words, Carolina chemist Brian Hogan calls himself a “crazy scientist who wanted to build a school in Guatemala.” This is a story of how one man with an idea really can change the world. It’s also a story about how Carolina is helping him to do just that.

It all started in 2006 with a beautiful, spunky, 5-month-old baby girl named Lexi. Brian and his wife Kelly, a UNC biologist, decided to adopt a daughter from Guatemala — a little sister for their son, Jake. In June of that year, Brian and Kelly flew to Guatemala City to pick up the new addition to their family.

“I knew I was going to see some poverty, but I wasn’t prepared for what I saw. I knew I needed to do something. So, I gave me everything I have. If I’m going to espouse how important education is, then I better put my money where my mouth is.” Both he and Kelly received their Ph.D.’s from Carolina.

But after Brian returned home, he just couldn’t get the images of poverty out of his mind. The couple got involved with a local nonprofit, Guatemalan Student Support Group, GSSG, that brings high-school-age Guatemalan students to the Triangle area to study at local schools. They provided support to a student named Byron at St. Thomas More School in Chapel Hill. Today Brian serves on the board of the student support organization. He also serves as academic director of the Scholars’ Latino Initiative, a program of UNC’s Center for Global Initiatives that works to improve access to higher education for Latino high school students.

Still, Brian longed to do more to help Lexi’s country. And that’s where UNC stepped in, specifically the Institute for the Arts and Humanities in the College of Arts and Sciences. In spring 2011, Brian was awarded a Chapman Family Fellowship, a $10,000 award that recognizes outstanding teaching of undergraduates. Through his connection to GSSG, Brian decided to visit the remote rural village of Nueva Esperanza, located in the indigenous Izabal region not far from where Belize and Honduras meet. About 1,000 people live in Nueva Esperanza, where there is no clean water, no electricity, and 90 percent of the population speaks Q’eqchi. The illiteracy rate is very high.

With the Chapman Fellowship, Brian brought a collection of unbound, stapled books translated into English, Spanish and Q’eqchi, and he took them to the village whose name translated into English means “new hope.”

“One of the girls walked three hours for a book and a pencil,” Brian said. “I gave her two.”

And then the village elders came to him with a very special request. They wanted a new school to replace the existing, 40-year-old concrete school, which was falling apart. “It seemed like such an astronomical task. How am I going to build a building in the middle of nowhere?” said Brian. “There were some lean financial times in my childhood, but education gave me everything I have. If I’m going to espouse how important education is, then I better put my money where my mouth is.”

Both he and Kelly received their PhD’s from Carolina.

In the meantime, Byron, the GSSG student that Brian and Kelly mentored, graduated from high school and moved back to Guatemala. He would become a key, on-the-ground liaison in helping Brian, who used Chapman money for the project, to build a new school for the village. The school was dedicated on the 7th of January this year.

“ixmap of poverty is a critical part of keeping girls in school, a mission of the new organization. “The average distance that women and children have to walk every day to get water is over three miles. And so it’s really hard to have time to go to school when you have to spend time getting water and supporting your family,” she said. Also, “increasing literacy will help with poverty and long-term progress for the village.”

“I knew I was going to see some poverty, but I was not prepared for what I saw”

But the UNC connection doesn’t stop there. Brian decided he wanted to form a nonprofit organization to support indigenous villages in Guatemala. He ran his proposal by chemistry colleague Joseph DeSimone, an established entrepreneur who connected Brian with University Entrepreneur-in-Residence Buck Goldstein. A five-member team of students in Goldstein’s first year seminar on entrepreneurship are now acting as consultants to the project.

Kat Summerton, a first-year student from Colorado, is a member of the team that has already created an official student organization, A Little Bit of Promise. She and team members Lily Rolader, David Ortiz, Jenny Sun and Felicia Zbarcea are working this semester on setting up a 501(c)(3) nonprofit organization. They will create a logo, a website, determining how best to raise money — and, most importantly, working on making the organization sustainable in the long term.

“Dr. Hogan teaches here, and he loves it. He has his life here, but he’s so excited all the time about the work he’s doing in Guatemala,” Summerton said. “It’s cool that we can provide the other side and give him the support he needs.”

On that front, Brian just received a $4,000 grant from the UNC Center for Global Initiatives to develop a course on water chemistry and poverty in Guatemala called “Water: Properties, Pollution, Potability and Poverty.” Beginning in fall 2012, UNC will commit to a two-year academic theme centered around water.

“Today every problem that comes across my desk is a first-world problem. I have clean drinking water and Internet access,” Brian says. “Every time I go to Guatemala and look into the dark brown eyes of those girls, I see my daughter. This inspires me to keep pushing forward.” —Kim Spurr

Congratulations to Professor Brian Hogan on winning the Latino Diamante Award in the Advocacy Category. Diamante, Inc., of North Carolina is one of the largest Hispanic philanthropic societies in the state. The Latino Diamante Award is a statewide program created to recognize outstanding achievements and honor people, like Brian, who are making significant contributions to the Hispanic community of North Carolina.

Brian Hogan was selected from a group of over one thousand nominees statewide, because of his demonstrated commitment to increasing access for Latinos in higher education through his directorship and leadership in the Scholars’ Latino Initiative. The committee was impressed with Brian’s continuing efforts to work with the Latino community to promote greater participation in math and science in an effort to prepare the next generation of Hispanic scientists. Further, Brian’s global efforts to bring impoverished Guatemalan youth to the United States for High School while simultaneously working in Central America to build schools and improve women’s literacy are truly laudable and worthy of this prestigious recognition.

Brian Hogan  Wins Latino Diamante Award
Chemistry at the Genome Sciences Building

Finished in the fall of 2012, across South Road from Kenan Laboratories, the seven-story, 228,000-square-feet UNC Genome Sciences Building, GSB, is designed to serve as a center for interdisciplinary research by creating an inviting space that facilitates the transfer of ideas and knowledge. The GSB is part of the Bell Tower master plan, which was initiated in 2004, and was conceived to strengthen connections between the academic, medical, and student-housing districts of the campus. This plan transformed the Bell Tower surface parking lot into a central campus “crossroads” hub that includes enhanced pedestrian access, a campus green, and a parking garage, all centrally focused on the new GSB.

The GSB is bringing together approximately 45 faculty in the College of Arts and Sciences in the fields of chemistry, biology, bioinformatics, statistics, and computer science. Open laboratories shared by diverse faculty are interwoven with space for computational scientists, a key combination to drive discovery and innovation in genome research.

From the Chemistry Department, the Erie, Brustad, Pielak, Redinbo, Thompson, and Weeks research groups have already moved from Kenan Laboratories to the GSB. These groups are all focused on Biochemistry and Chemical Biology research. Ongoing renovation of vacated laboratory space is currently creating modern facilities in Kenan Laboratories for new and existing research teams.

Chemistry faculty are excited about the new facilities. Matthew Redinbo, Professor and former Chair says that he is “delighted to be in the new Genome Sciences Building.” For him “it feels like a scientific playground because it brings together cellular, molecular, organismal and genome scientists.” Kenan Distinguished Professor, Kevin Weeks, feels that the GSB is “a beautiful building, built with a strong eye towards facilitating interactions among faculty and students.” He already is seeing how “students in [his] lab are contributing to and benefiting from interactions with nearby groups with expertise in cell biology and next-generation genome technologies.”

The GSB also houses a high-performance research computing cluster in the basement, and is topped by an entire floor devoted to the greenhouse for plant genomics research. In addition to three levels of research space, the building features 250- and 450-seat lecture halls and several smaller class and seminar rooms housed on the lower level, satisfying the university need for large classrooms in a central campus location. Pedestrians can choose from multiple paths that cross the plaza, passing under and through the new building. Landscaped and shaded areas, a grand stair to the classrooms and a café make the plaza a pleasant central campus gathering place.

Charlie Twine Chemistry Alum - Master Photographer

My memories of UNC-Chemistry start with Dr. Tyree’s Chem 51 class, where I met my future wife Mitzi. After graduation we both went to the Research Triangle Institute where we worked with other Carolina Chemistry alumni such as Ed Cook, Ivy Carroll and Jack Kepler. I did synthetic organic work for 35 years with my speciality being the preparation of labelled compounds, usually with carbon-14 but also tritium, deuterium, and others. Mitzi did drug metabolism studies in animals and humans using both in vitro and in vivo methods, and also isolated and identified a number of compounds from natural products.

Treasured memories from Carolina are the morning breaks in the Pine Room with Dr. Bob McKee. He was a truly interesting man, always able to find a bottle of the reagent that I needed and also very helpful with waste disposals in “Sodium Creek” behind Venable. I also remember many talks with Bill Little, some intensely scientific, some about the latest wine he had sampled. Bill was a man of many passions and deep intellect. Many years later, after we had both retired I would meet Bill at Whole Foods where we would catch up with what was happening in our lives. Also, who can forget Dr. Jaragin’s Chem 181 class which met at 8AM on Tuesday, Thursday and Saturday?
Research in the Allbritton Laboratory focuses on the development of novel methods to answer fundamental questions in biology. Much of our work is technology-limited in that leaps in knowledge follow closely on the heels of new discoveries and inventions in the physical and engineering sciences. Consequently, groups that bridge these different disciplines are increasingly important in biomedical research. The Allbritton Lab has expertise in areas of chemistry, physics, medicine and engineering, and has extensive collaborations with other labs to design, fabricate, test, and utilize new tools for biomedical research. This work encompasses the creation of strategies and instrumentation to investigate enzymatic networks in single cells, development of array-based technologies for cell isolation and cloning, miniaturized systems for replicating tissues, and new methods for creating micron-scale 3D structures. Many of these projects are directed at cancer and stem cell research.

One focus area is the group’s effort to address a critical issue in preclinical and clinical drug discovery, namely how to accurately monitor drug action and identify the patient who will respond to new therapies, either under development or already in the clinic. The goal of this research is to produce instrumentation and chemical tools needed to make direct and accurate measurements in living cells from disease models and cancer patients. Current efforts are directed at the design and development of sensors using peptide and lipid chemistry to create reporters of enzymes known to drive cancer and other diseases. The ability to identify improper activity of multiple enzymes simultaneously in a patient’s tumor would enable individualization of specific therapies and offer the hope of improved therapies to supplant the existing standard of care.

The Lab has also pioneered the development of novel microfabricated devices to enable the analysis and isolation of cells while they remain in culture. These technologies possess a number of advantages over current cell separation methods as cells can be monitored over time and selected based on a wide range of characteristics. The devices are made in almost any size for use with small samples obtained from needle biopsies to large-scale arrays with millions of sites for high-throughput screening.

Numerous applications of these microfabricated devices are being pursued, including efficient cloning of mouse stem cells, purification of circulating tumor cells and cancer stem cells from patient samples.

Recent advances in mating living cells with microfabricated systems may make it possible to create miniaturized devices that function like organs. These so-called “organ-on-a-chip” platforms enable the establishment of cell populations necessary for organ function. The lab is pursuing development and application of these devices to mimic the intestine and bone. Ongoing studies are aimed at stem cell biology, cancer stem cells and metastatic disease. The group’s goal is to establish functional intestinal or bone tissue within a tightly controlled and readily manipulated environment. In the future, there is the very real possibility of isolating and culturing human tissue from biopsy specimens to develop models of and therapeutics for human disease.

The Allbritton Lab Analytical Chemistry

To see more of Charlie Twine’s award-winning photography, go to:

chem.unc.edu/alumni/

Or use your pad or smartphone to scan this code.
I give to Carolina Chemistry to recognize and honor my father’s more than fifty-year contribution and dedication to the practice of medicine. Emmett Gladstone Rand was born on February 22nd, 1901, and was raised in Garner, North Carolina. He entered UNC taking a pre-medical course of study. As was the case in those years, you had to complete your medical education elsewhere, after your undergraduate studies. Emmett and his next-in-line brother, Cecil Holmes Rand -Big Doc and Little Doc- entered and later graduated from the University of Pennsylvania and started independent practices. Big Doc in Raleigh and Little Doc in Fremont.

My father was licensed to practice in North Carolina in 1926, and practiced internal medicine until World War II broke out. He closed his office and entered the Medical Corps on May 26th, 1942. After some stateside duty assignment, he was sent to England to put together the 2nd Evacuation Hospital and later he served as the Executive Officer of the 4th Convalescent Hospital. His unit was in the second wave of the chaotic Normandy D-Day invasion and Dad remained with General Hodges’ First Army for the balance of the European campaign. He was discharged with the rank of Colonel on March 9th, 1946. His awards included the WWII Victory Medal, Bronze Star, American Campaign Medal, European, African, and Middle Eastern Campaign Medal with five battle stars.

Dad returned to solo private practice in Carlisle, Pennsylvania, and also assumed command of the 341st General Hospital, and Army Reserve Hospital Unit. He was honored by the Pennsylvania Medical Society for fifty years of medical service, and by the Cumberland County Medical Society as past president. He died on March 6th, 1984, and is interred in a family plot in Garner with his parents.

My father was always loyal to his native North Carolina and a devoted University of North Carolina graduate. He credited Carolina for preparing and launching him into his lifetime beloved practice of the healing arts. The Rand family has continued to enter Carolina over the succeeding generations with many more becoming physicians and remaining to practice in the state. I wish to be a small part of this family record, and am proud to contribute to the Department of Chemistry. In memory of my father, the annual Emmett Gladstone Rand Premedical Scholarship is presented by the department to an exceptionally talented graduating senior intending to pursue a career in medicine.
The Johnson Lab Organic Chemistry

Many students come to a sudden stop when they hear the words "organic chemistry." Some of them even turn around and head in the opposite direction. As you walk the corridors of Caudill Laboratories on your way to Professor Jeffrey Johnson’s office, it is easy to feel sympathetic to those reactions. One is surrounded by walls covered with posters displaying titles, illustrations, chemical formulas and structures beyond normal human comprehension. Behind floor-to-ceiling glass dividers you see teams of white-coated students wearing purple rubber-gloves and protective eye wear, manipulating equipment looking like it came straight out of a Ray Bradbury novel. But for the individuals working in the Johnson laboratories, very little is too complex, hardly anything is beyond the possible. Professor Johnson and his students prove on a daily basis that organic chemistry is not only a fascinating and important field. For them it is a passion.

Dr. Johnson’s group is made up of ten graduate students and one postdoctoral associate, all focusing on the topics of organic synthesis and chemical reactivity. Together, they study how chemical reactions work, what steps molecules go through to get to a final desired product, and how to create reactions and molecules never seen before. Dr. Johnson describes the process as making a molecule navigate a maze, with the scientist nudging it along the correct path in order for it to reach a desired end product.

Organic chemists research the possibilities to synthesize their own versions of molecules found in nature by developing reactions to create them. Sometimes the molecules they come up with are even better than the original! Their task is accomplished by a procedure known as retrosynthesis. To essence, the scientists are working backward from the desired molecule to something that can be bought in bulk and easily handled in a laboratory. To then successfully complete a retrosynthetic analysis, they constantly use and add to their encyclopedic knowledge of chemical reactions. The walls in professor Johnson’s office are covered with shelves brimming with books describing unique chemical reactions, any one of which could nudge a molecule from one place in the maze to another.

One aspect of organic chemistry that fascinates the members of the Johnson group is natural product synthesis. Nature produces myriad structurally complex organic molecules that exhibit interesting and compelling bioactivity profiles; however, these promising therapeutic applications are sometimes tempered by unwanted side effects. Chemical synthesis allows the chemist to develop routes to natural product targets and then modify them in an attempt to retain the desired bioactivity while minimizing, for example, toxicity or poor solubility. A representative complex natural product that has been targeted by the Johnson group is zaragozic acid C, which has the potential to lower cholesterol and to serve as an anti-inflammatory agent, but is yet too toxic. Pactamycin is another molecule that the laboratory is working on synthesizing. It exhibits antitumor, antimalarial, and antimicrobial properties but initially also appears to be too toxic to be of use in clinical trials. The group is hopeful that related congeners prepared through de novo synthesis can be advanced for biomedical applications.

Creating molecules never seen before is a complicated process, as demonstrated by a graduate student in the Johnson group who has been working for two years on the single step of adding two nitrogen atoms to a molecule. Not until he has worked backwards from the complicated molecule to a small starting material, can he begin to work in the forward direction. This part of the process involves taking the starting material and slowly adding on to it the different molecules determined in the retrosynthetic analysis until the desired end product is reached. In this regard, the Johnson group is involved in fundamental research directed toward creating tools that will be used in multiple applications that involve the creation of small molecule building blocks.

Organic chemistry is a unique field, organic chemists are unique people. In their line of work, the thought, “I have no idea how to make that” is actually extremely exciting. Because the discipline is so complex and multifaceted, a practitioner often encounters failure. However, although new reactions work only about five percent of the time, the successes become that much more rarefied. “What I really like about my job,” says Professor Johnson, “is how we in collaboration, as a team, are creating new knowledge, new compounds, things no one has ever seen before. To me, that is what makes organic synthesis unique.”

Hannah Aichelman

Rycel Uy Outstanding Poster Award Winner

Rycel Uy’s research poster, titled “Design and Synthesis of a Thienothiazole-Based Polymer for Organic Solar Cells,” won the Polymer Chemistry Outstanding Poster Award with a cash prize, at the national meeting of the American Chemical Society, held in Denver in August.

Rycel is a fourth year graduate student in the You Group, and her research focuses on developing donor polymers for use in higher efficiency organic solar cells by studying structure-property relationships. She has investigated the different synthetic routes to thienothiazole and compared it against thienothiophene to determine the effect of backbone modification. In essence, the scientists use the highest occupied molecular orbital level. Rycel is currently studying the utility of thioketyl chains and selenophene in order to enhance short circuit current and open circuit voltage in solar cells.

Rycel was able to travel to Denver thanks to support from donations to the Department of Chemistry.
CHEMISTRY

More than Cilia Carolina Science in Science

Continued from front page

But in some lung diseases, like cystic fibrosis or chronic obstructive pulmonary disease, the brush becomes compressed and actually impairs the normal beating of cilia and healthy flow of mucus. Rubinstein says that “whenever the mucus layer gets too dense, it can crash through the brush and stick to cells.” He explains that “the collapse of this brush is what can lead to immobile mucus and resulting infection, inflammation, and eventually severe disease.”

This discovery may guide researchers to develop novel therapeutic strategies to treat chronic lung disease, such as using drugs to make the mucus less sticky.

Rubinstein and colleagues next plan to design ways to treat chronic lung disease, such as using drugs to make the mucus less sticky.

A major in chemistry is not the easiest road to an undergraduate degree at Carolina. As a matter of fact, it is arguably the most difficult degree offered on campus. You must have a running start from year one, then jump through countless hurdles such as four semesters of calculus, a year of physics, biology, and a whole lot of chemistry classes. Many students take courses, such as organic chemistry, during summer school in order to fit in all degree requirements.

With such a hectic schedule, it is understandable that studying abroad may not be on top of chemistry majors’ agendas. However, as the study-abroad experience is so enriching and rewarding, the Chemistry Department, in collaboration with UNC’s Study Abroad office, has launched a Summer Science program in Sevilla, Spain. Students take a semester of organic chemistry taught in English by a UNC professor, while also attending an advanced Spanish class taught by a professor from Sevilla. Each of these classes is worth three credits. In addition, students get ample opportunities to speak Spanish as they live and eat with their host families. Complementing the academic courses, the program includes group outings to local historical sites in Córdoba and Granada.

This next summer will be the fourth time this program is offered, and students are already planning their course schedules to take advantage of this opportunity. Professor Wei You, a 2011 Tanner teaching awardee, will teach the chemistry class. The program draws between 12 and 20 students every year and has been very successful. The intimate setting in a beautiful location makes learning organic chemistry almost painless. It is ideal for rising sophomores who have completed their first year of chemistry and want to get a head start on organic chemistry, while experiencing the excitement of living in a foreign country.

The home stay is a key ingredient of this program because it is here students get to interact intimately with Spanish life. As Megan, a 2012 participant, says, “I loved staying with my host family! That gave me a perfect opportunity to practice my Spanish without feeling embarrassed for making mistakes. My señora would talk to me as often as she felt like I wanted, and I felt like I gained the true Spanish experience by staying in a family.” This also “included waiting till 10 pm, the traditional Spanish mealtime, to eat dinner,” says Megan with a smile.

Sevilla is a major city in the south of Spain, which not only has its own rich history, but is part of a wider region that contains numerous world heritage sites, including the nearby great mosque of Córdoba, the Alhambra in Granada, and of course the Alcázar in Sevilla, all of which comprise some of the world’s finest examples of Muslim architecture.

A challenge for the students is to find the right balance between studying chemistry and Spanish, experiencing a bull fight, enjoying the night life in Sevilla, learning about the incredibly intense Flamenco dance, the possibility to travel to cities all over Europe, and taking advantage of the cultural offerings of Spain. So much to do, so little time!

Brittany, another student from the 2012 group, said “studying abroad in the Sevilla summer program enriched my experience at Carolina by allowing me to make friends with a wonderful group of students, immerse myself in a new culture, and complete important coursework for my major.”

Faculty members are also eager to participate. It takes them away from the many responsibilities at home and allows them six weeks to think about their research, write papers, or give some talks at nearby European Universities.
Teaching Excellence: Spremulli wins UNC’s Highest Teaching Honor

Continued from front page

Linda Spremulli has been a faculty member at this university for 35 years, and during that time she has been, in the words of one colleague, “a teacher who is revered by her students for her dedication, clarity, and enthusiasm.” Despite her seniority in the department, she regularly teaches General Chemistry II to over 200 undergraduate students and Introduction to Biological Chemistry to approximately 170 undergraduates. To achieve these goals, she condenses large amounts of information into a manageable body of knowledge and presents it in a clear and logical way “so that my students can understand the basic principles and how they lead to a logical pattern of thought.”

Linda’s colleagues in the Chemistry Department admire her skills as a teacher. Our Department Chair, Professor Valerie Sheares Ashby, says that Linda is “simply the finest teacher I have encountered in my career, including all my undergraduate and graduate studies, and my time as a Professor at this outstanding institution.” She notes that a talented undergraduate student said that she would miss Dr. Spremulli the most of all of the people she had encountered at Carolina and that she even learned from Dr. Spremulli’s exam questions. Two of her colleagues remarked on Dr. Spremulli’s accessibility to her students. One said that she “is incredibly generous with her time.” Another noted that she holds “what seems like never ending office hours” and that she had “never seen [Dr. Spremulli] turn a student away or say that she cannot answer a question after class.”

“Linda is simply the finest teacher I have encountered in my career…”

Professor Spremulli’s teaching philosophy is based on the recognition that “teaching and learning go hand in hand.” She has put much thought into how to facilitate learning in a large class setting, and seeks to demonstrate for her students how one thinks in the field of chemistry and expose them to the information they will need to master in order to proceed to the next level. To achieve these goals, she condenses large amounts of information into a manageable body of knowledge and presents it in a clear and logical way “so that my students can understand the basic principles and how they lead to a logical pattern of thought.”

Dr. Spremulli’s students echoed this praise. A current student, who is not a chemistry major, said that Dr. Spremulli “does a great job explaining difficult concepts in easily understandable terms.” A former student, now a graduate student in biological and biomedical science at Harvard, said that Dr. Spremulli was definitely the best teacher he had at Carolina and that her courses led him to become a scientist rather than a physician. Other students praise her for being able to connect with all of her students, even in a large class, and to teach in ways that reach students regardless of their learning styles. Another noted that Dr. Spremulli “is always excited about the material in spite of her many years of teaching.”
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