

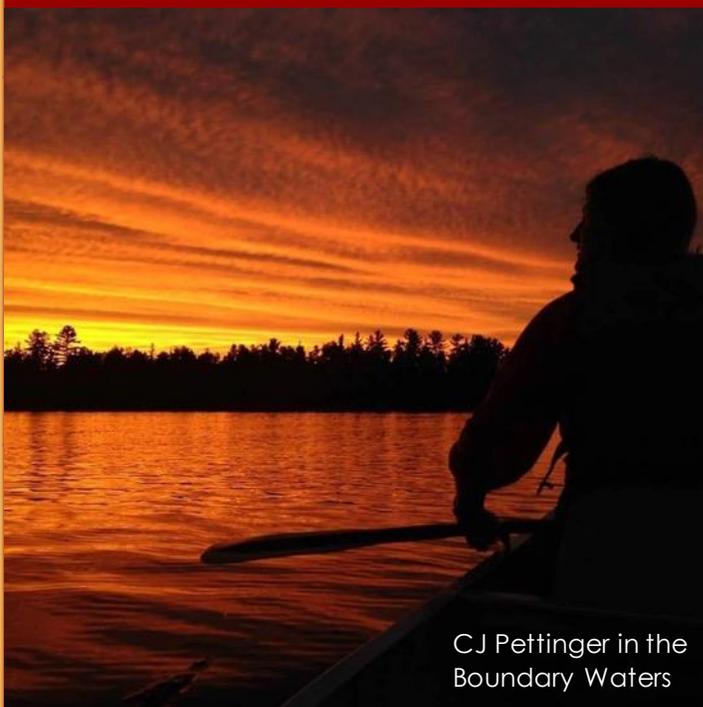


Wendy Osei-Bonsu & more --
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The Cavendish Chronicle

Volume 31, Issue 4

Summer, 2016



CJ Pettinger in the
Boundary Waters

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My Summer Vacation

Chemistry and biochemistry majors reported gaining valuable experiences over the summer. A range of jobs and internships allow students to explore what they will do after graduation, or simply allow them to be productive and help pay for college.

Several students have positions in National Science Foundation (NSF) sponsored programs, such as

Research Experiences for Undergraduates (REU). **Stephanie Jean, Chem '17** is at the CaSTL Center (Chemistry at the Space-Time Limit) at the University of California, Irvine. She is synthesizing dithiol-linked gold nanoparticle dimers to study single molecule photocatalyzed reactions using Surface Enhanced Raman Spectroscopy.

Faith Kersey-Bronec, Chem '17 and **Grace Lindquist, Chem '18** are in the University of

Oregon's REU program. **Kersey-Bronec** is studying the photodegradation of organic semiconductor materials. **Lindquist** is investigating the surface adsorption of methylglyoxal at the air-water interface using surface tensiometry and vibrational sum frequency spectroscopy. **Claire Nelmark, Chem '18** is in the REU program at University of New Mexico. She is studying the neuroprotective effect of curcumin on the interaction between lipid membranes and amyloid beta 42, found in the brains of Alzheimer's patients. **Janna Quick, Chem '19** is at the NSF-supported Materials Research Science and

(continued page 4)



Jean

All the News from Ardolf Science

National Award for Student



Mitchell-Jones

Jherian Mitchell-Jones, Chem '19 has been selected for the Overcoming Challenges Award from the American Chemical Society's Women Chemists Committee (ACS WCC). The award includes travel to the Fall 2016 ACS National Meeting in Philadelphia.

Raigoza Funded

Dr. Annette Raigoza has been awarded a Research & Engineering Apprenticeship Program (REAP) Grant, which places high school students in STEM research apprenticeships at area colleges and universities. **Mashail Moalim** (Apollo HS, '17) and **Audrey Nguyen** (Tech HS, '17) were selected to work with the Raigoza lab. Research in the lab focuses on modulating the properties of surfaces using tailored organic molecules; characterization is via scanning tunneling microscopy (STM). The project is significant for biological nanotechnology, which relies on controlling how proteins, cells, and other biological materials interact with a surface.



Nguyen (left) & Moalim



Jones & Company

Inaugural Running of Grad Camp

Seven chemistry and biochemistry students participated in CSB/SJU chemistry's first graduate school workshop in May. The workshop was developed by **Dr. Nicholas Jones** and **Dr. Kate Graham**; Jones was also the moderator. Participants included **Adrian Demeritte, Chem '16**, **Forrest Hyler, Chem '16**,

Rejene Günther, Chem '17, **Emma Bonglack, Bchm '17**, **Raymond Twumasi, Chem '17**, **Alex Vanyo, Chem '17** and **Sam Hassel, Bchm '17**. Students practiced for the GRE, wrote personal statements and developed graduate research fellowship proposals.



Maeve Ryan and GC/MS

New GC/MS Acquired in Ardolf

A new benchtop gas chromatograph-mass spectrometer was recently installed in Ardolf Science Center. **Dr. Christen Strollo** coordinated the effort with an application to

Shimadzu's Academic Equipment Support Program. **Dr. Alicia Peterson** and **Dr. Md Fazal** contributed research funds for the purchase. The

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Woodworker. Luthier. Organometallic Chemist.

Steve Bischof Finds Work
and Relaxation in
Houston

Nationally, about half of new chemistry Ph.D.'s join the labor force in industry or government labs. Steve Bischof, Chem '06, was one of them. He decided early on, while doing a couple of summer undergraduate internships at Guidant (now Boston Scientific), that a doctorate would be a useful tool for career advancement in industry.

Bischof was accepted by several graduate schools, and decided to explore the West Coast for a few years while studying at the University of Southern California. He did well in his first year, settling into a chemical biology research lab under Amy Barrios, where he hoped to design synthetic enzyme mimics. A few months later, however, Barrios announced that she was moving the lab to Utah. Bischof had a choice: leave LA behind only months after arriving, or quit his lab and find another. He decided to stay, and made the jump to the group of Roy Periana, a small molecule activation lab.

Small molecule activation seeks to develop efficient ways

to break bonds in abundant, normally unreactive compounds and put them to use. The conversion of atmospheric nitrogen into ammonia, for fertilizer, is a well-known example. Another "holy grail" of the field is methane functionalization. Subterranean methane is an explosion hazard in petroleum drilling, so enormous quantities are simply burned as waste upon emerging from the ground. Intensive studies in C-H bond activation have sought another solution through efficient conversion of methane into methanol and other useful derivatives. A branch of this research has developed into the controlled C-H activation of other organic molecules for the synthesis of valuable commodities.

That work may seem a far cry from chemical biology, but Bischof saw some natural connections with what he had already been working on.

"I also enjoyed inorganic chemistry," said Bischof. "I was continuing to enjoy the inorganic portion of my work in her (Barrios') group," he added, so

the Periana lab's focus on transition metal catalysis seemed appealing.

After Bischof had been working for a year on a C-H activation project, Periana was recruited to lead the Scripps Energy and Materials Center at the new, East Coast campus of The Scripps Research Institute in Jupiter, FL. This time, Bischof decided to move along with the group. He finished graduate work after a total of six years – a little longer than average, but moving across the country and setting up a new laboratory takes time.

About nine months before finishing his Ph.D. thesis, Bischof began applying for jobs. He eventually got a call for an interview with Chevron Phillips Chemical (CPCChem) in Houston, where he was subsequently offered a position. He later found that he had been selected from a pool of 150 applicants.

"CPCChem is a downstream chemicals company primarily focused on the production of

(continued page 9)

Summer 2016 Student Experiences

(continued from page 1)

Engineering Center at University of Minnesota. She uses UV-Vis spectroscopy to study silicon nanoparticles, used as luminescent solar concentrators to produce solar energy.



Witkowski

Augie Witkowski, Chem '19 is an REU participant at Montana State University. Witkowski is studying control of oxidation states in cysteine residues and the cellular pathways that are influenced as a result. In addition, **Allie Pybas, Chem '18**, and **Heidi Koenig, Chem '19** are working on a collaborative project involving **Dr. Nicholas Jones** and the lab of Dr. Mary Cloninger at Montana State University.



Quick

Katlin Schmitz, Bchm '17, **Serai Seymour, Chem '18** and **Mickayla DuFresne-To, Bchm '19** are all in the National Institutes of Health – funded IDeA Network at Biomedical Research Excellence program at University of North Dakota.



Buyse

Schmitz is studying levels of tryptophan hydroxylase 2, the enzyme in the brain responsible for making

serotonin, in mice that have been exposed to food allergens. **DuFresne-To** is focused on gene expression in kidney cells, with an emphasis on the onset of kidney cancer.

Taylor Graham, Chem '18 is enrolled in the Nuclear Chemistry School at Oregon State University, sponsored by the U.S. Department of Energy.

Other students are spending the summer in federal labs. **Emma Bonglack, Bchm '17** is at the U.S. Food and Drug Administration's Department of Pharmaceutical Analysis in St. Louis, MO. She is using MALDI/MS-MS/LIFT techniques for structure determination of steroids. **Claire Buysse, Chem '17** is in the NASA Student Airborne Research Program. Participants have the opportunity to work with data gathered by high-altitude aircraft, such as a modified U-2.

A number of students are working in biomedical science. **Sarah Clark, Bchm '17** and **Thomas**

O'Toole, Bchm '17 are participating in the SUR Fellowship at the Mayo Clinic. Clark is in the Clinical and Translational Sciences Department working on genetic analysis of throat cancer in patients who have Human Papillomavirus. O'Toole is in the Department of Orthopedic Surgery, looking at how stem cells differentiating into osteoblasts respond to drugs and transcription factors that modify chromatin structure. **Sam Hassel, Bchm '17** is in the regenerative medicine internship program through the Stem Cell Institute at University of Minnesota. **Wendy Osei-Bonsu, Bchm '19** is at University of Pennsylvania Perelman School of Medicine – Center for Research on Reproduction and Women's Health. She is working to understand the mechanisms of fetal growth retardation and how that impacts diabetes development and obesity in adults later on.

Tom Nilles-Melchert, Chem '17 is doing work on fistula repair and dialysis in South



Team China



Team Ardolf

Africa with a physician from Willmar. **Bridget Ebert, Chem '18** is doing research with physicians at Children's Hospitals and Clinics of Minnesota.

A few students have internships in industry or non-profit organizations. **Matt Lerick, Chem '16** has an internship at Nanopoeia in St. Paul, helping to develop a novel method of making polymer-pharmaceutical composites. **Jenny Paul, Chem '17** is working at the Minnesota Zoo, doing microbiology and water testing in the Life Support Department. **Brandon Thauwald, Chem '18** is a Quality Engineer Intern at Boston Scientific; he is assessing risks of medical device malfunction. **Megan Barta, Chem '19** is assisting with a pilot plant run on a new product in the Butter and Spreads Team at Land O'Lakes.

A number of students are getting research experiences in CSB/SJU Chemistry. **Rejene Günther, Chem '17** and **Dan Zoltek, Chem '17** of the

Raigoza lab are using tailored self-assembled monolayers to modify the properties of gold surfaces, monitoring by STM. **Alex Charbonneau, Chem '17** and **Alex Vanyo, Chem '17** are in the **Fazal** group, looking at the interactions of engineered nanoparticles with proteins through a variety of spectroscopic techniques. **Maeve Ryan, Chem '17**, **Alvin Burrows, Nats '17**, and **Hannah Holst, Chem '18** in the **Strollo** group are simulating atmospheric reactions in the lab, collecting ambient samples around campus, and analyzing samples using a variety of techniques. **Simone Creed, Chem '18** and **Josh Gavin, Chem '19** of the **Johnson** lab are synthesizing small molecules to model the triangular copper cluster in the human protein ceruloplasmin, with oxygen-binding studies to follow. **RoseMarina Armstrong, Chem '18** and **Jordan Danielson, Chem '18** of the **Adhikary** group are developing new methodologies for making carbon-fluorine bonds via nickel and palladium catalysis. **Max Olson** in the **McIntee-Jakubowski** group is developing new inhibitors and

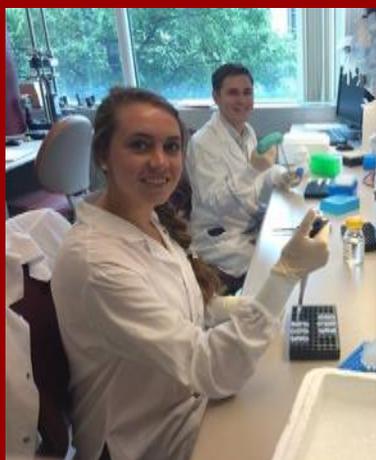
activators for the enzyme low molecular weight protein tyrosine phosphatase, with a goal of discovering new anti-cancer agents.

In the biology department, **Cody Cohout, Bchm '17** is working with Dr. Dave Mitchell studying antibiotic resistance (and also volunteering at a shelter). **Kailey Meyer, Bchm '18** is working with Dr. Katherine Furniss. She is studying genetic diversity among the Eastern White Pine trees on campus. **Alyson Welle, Bchm '18** is studying DNA repair enzymes in Archaea – single-celled microbes -- with Dr. Mike Reagan. Their approach is to insert a plasmid containing an archaea gene and into yeast that have specific repair enzymes removed.

Six CSB/SJU Chemistry and Biochemistry students are doing research at Southwest University (SWU) in Beibei, China. The program is sponsored by the Center for Global Education at CSB/SJU. Participants include **Anastacia Stubbs, Chem '16**, **Gao Yang,**



Morrey



Clark (left) & O'Toole



Ford (left) & student



Schmitz (left) & DuFresne-To



Lindquist



Hassel

Chem '17, Casey Palmer, Bchm '18, Griffin Schroeder, Bchm '18, Samantha Tinucci, Chem '18 and Zoua Pa Vang, Chem '18. In exchange, **Xin Guan** and **Wen Ren**, two students from SWU, are doing research in Ardolf.

Internship opportunities are not limited to the natural sciences. **Nick Harbeck, Chem '17** and **Ian Durbin, Bchm '17** are participating in a political science / chemistry summer internship program in Washington, DC.

Other students gained practical experience in different ways. **Alex Madsen, Chem '17** is a pharmacy tech at CVS pharmacy. **Luke Morrey, Bchm '17** is working as an ECG tech at the Mayo Clinic. **Renae Otto, Bchm '18** is an EMT/Security Officer at Canterbury Park. **Emily Linder, Chem**

'19 is at basic training camp with the U.S. Army. **Riley Swenson, Bchm '18** is volunteering in the oncology infusion care center at Woodwinds Hospital; she also shadowed an ENT surgeon. Other students found important roles to play on campus. **Joe Rabaey, Bchm '17, Lauren Hennen, Bchm '18, and Mitchell Thelen, Bchm '19** are working in the Ardolf stockroom.

A few people have found teaching and mentoring jobs. **Niesha Ford, Bchm '17** is spending her summer tutoring students in the Upward Bound Program. **CJ Pettinger, Bchm '17** is leading canoe trips in the boundary waters. **Taylor Pickthorn, Bchm '19**, was a camp counselor at SJU in June, and also found time for a European tour. **Caitlin Loeffler, Chem '19** is the summer FoCuS mentor at CSB/SJU. **Alex Messner, Chem '19** is teaching tennis. **Dominic**

Vigliaturo, Chem '19 is tutoring math.

One student took an entrepreneurial approach this summer. **Alex Miller, Chem '17** is working on starting up a telecom company.



New GC/MS (from page 2)

Shimadzu GCMS QP-2010 Plus is equipped with an ultra fast single quadrupole detector capable of acquiring scan data and single ion monitoring (SIM) data in a single analysis. It can also accommodate two capillary columns, allowing users to change the selectivity of analyses without having to modify column installation.

Chemistry in Big Sky Country

Jones' Collaboration Takes Students to Montana



Any CSB/SJU chemistry student has heard the analogy comparing the role of catalysts in chemical reactions to Sacagewea Pass in the Bridger Mountains of Montana. Now, because of a collaboration between Dr. T. Nicholas Jones of CSB/SJU, and Dr. Mary Cloninger of Montana State University (MSU), two CSB students get to see this analogy in action.

Allie Pybas, Chem '18 and Heidi Koenig, Chem '19 traveled to Bozeman for the summer to continue research on the current project of the Jones and Cloninger collaboration. The group is currently developing recoverable catalysts by attaching them to spherical polymers called dendrimers. This technique will make the synthesis of complex molecules easier and reactions more sustainable. Under the direction of senior graduate student Jessica Ennist, Pybas and Koenig are working primarily on recovery methods for the catalyst. Previous CSB students' work demonstrated that reactions using the dendrimer-bound catalysts were successful.

The collaboration between

Jones and Cloninger stemmed out of a friendship of many years. They would often discuss research projects they thought would be fun to work on, so they began to develop a project.

The environment of a large state school like MSU is very different from a small college. Pybas and Koenig cited the presence of graduate students, the separation of the general science program from the research setting, and the depth of instruments available.

“Working at a larger university in a graduate school setting allows me

to work more independently,” commented Pybas. Students are able to get this experience because of funding from a range of sources: the NSF-RUI grant funding the collaboration, the NSF-REU program at MSU, the undergraduate research program at CSB/SJU, and the Abbot John Klassen Fund.

Koenig was drawn to the program because of the career insight it presents.

“Working in a lab full time either solidifies your current career interests, or sparks your interest in other career fields,” Koenig explained. By providing this opportunity, the Jones and Cloninger collaboration proves invaluable for students looking to supplement their education with practical experiences.



Pybas in lab (above); The Jones-Cloninger Collective (Jones, Koenig, Ennist, Pybas, Cloninger)



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Spotlight on Special Events

Emma Bonglack, Bchm '17 (left) emcees at Africa Night '16



Page Maki, Chem '17 (right) taking part in Drag Night



Sarah Clark, Bchm '17; Nate Kor, Chem '16; Samantha Tinucci, Chem '18 on task at Chem Club's Demo Day



Adrian Demeritte, Chem '16 performs at Africa Night '16



Bischof at Chevron Phillips Chemical (continued from page 3)

ethylene and ethylene derivatives,” explained Bischof. Although the company produces specialty products such as odorants and race/testing fuels, most of the business is based on steam cracking natural gas to produce small olefins such as ethylene, propylene, and butene. One major emphasis is on converting ethylene to polyethylene or normal alpha olefins (NAO), such as 1-hexene or 1-octene; the NAO stream actually consists of even-numbered carbon chains all the way up to C30. These NAO fractions are utilized for a variety of products such as lubricants, waxes, detergents, and paper sizing agents.

Currently, Bischof’s position is NAO Research Chemist. He works in a group of a dozen people, a mixture of chemists and engineers with associates, bachelors, and Ph.D. backgrounds. His team’s current goal is to develop new systems to convert ethylene into 1-hexene or 1-octene, selectively. They need to synthesize organometallic complexes, then use those compounds as potential catalysts in batch reactions – just like a student would run a reaction in a chemistry lab – before moving to continuous pressure reactors, in which new material constantly flows through the catalyst system and is transformed into product. After work on determining reaction mechanisms and

processing parameters, the system is ready to be translated to a pilot scale, where commercial feasibility is evaluated.

Apart from doing chemistry in the lab, Bischof is responsible for overseeing projects at a pilot plant facility on a different site. Communication with other parts of the company is an essential part of the job; earlier this year, he gave a presentation to the company CEO and the executive board. He also works with vendors to make sure the lab has adequate instrumentation and supplies, and attends professional conferences regularly.

Given all of that, Bischof’s favorite part of the job is still doing the basic science, especially “when that homerun or critical experiment goes the way you intended.” Because so much of science is really about observing negative results, he focuses on learning from what doesn’t work so he can design the next experiment; and when the experiment does “smash the targets”, he said, it is “such an incredible high”.

Another bonus of working at CPCChem is that nine-hour workdays leave room for a three-day weekend every other week, giving Bischof plenty of time to explore Houston. He also spends time woodworking in his shop, making tables, lamps, or cutting boards (www.etsy.com/shop/crookedtreeguitars). It’s a passion he inherited from his father, but he has taken it

one step further by learning how to repair and build his own guitars – he has been playing since the age of twelve. He has finished two guitars so far, each taking about a year, and has three more in progress.

“I found that taking some time to zone out and let my mind rest from chemistry really helped my productivity in the lab,” he said. In addition, the ability to see a table develop in days or weeks, or a guitar come together over a year, is a contrast to the five or ten year time frame on a typical project at work.

Since graduating from Scripps, Bischof has been asked back to share his experience with current students, and he has thought a lot about what it takes to succeed. The key things, he thinks, all relate to immersion in the process: trying new things, asking questions, making connections, striving for excellence, learning something new every day. In a competitive job market, he thinks, an awareness of one’s own strengths and weaknesses is also crucial, because it leads to an understanding of where you will best fit within a company.

He has one last piece of advice. “It is on you to make the decisions that matter in your life. No one else can hold you back from realizing your dreams.”



Alum Notes

Checkout the archive!
<http://employees.csbsju.edu/cschaller/cavendish/Cavendish.htm>

Matt Stockinger, Chem/Math '01 is a science teacher at Apollo High School in St. Cloud.

Alicia Peterson, Chem '03 welcomed a baby boy, Ezra, who was born on May 13th.

Jeremiah Scepaniak, Chem '05 is doing post-doctoral research at Georg-August University –Gottingen, Germany.

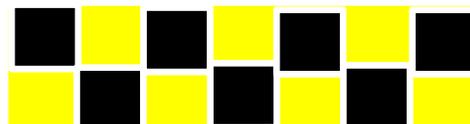
Zach Shaheen, Bchm '09 has completed Ph.D. work at Medical College of Wisconsin; his research focused on the regulation of beta cell destruction and the induction of type I diabetes. He will now spend the next two years

completing the M.D. part of his program.

Mardi Billman, Chem '11 has accepted a Visiting Assistant Professor position at Simpson College in Iowa. Billman recently finished graduate school at Colorado State University.

Redmond Fraser, Chem '12 completed the Bike MS Ride from Duluth to Minneapolis to raise money for research into multiple sclerosis.

Sean Pickthorn, Chem '14 is in medical school at the University of South Dakota.



The Cavendish Chronicle

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Story Credits: Augie Witkowski, Steve Bischof, Kate Graham, Annette Raigoza, Brian Johnson,

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The College of Saint Benedict | Saint John's University

Hogwarts School Brings Science Demos to Children

Headmistress Annette Raigoza (second from left) with Prefects Hannah Holst, Josh Gavin, and Caitlin Loeffler.



Professors Rebecka Rose, Hordofa Burka, Logan Schmidt, Savanna Nolan, Jocelyn Metz, Autumn Fuchs, Ana Grace Alvarado, Leslie Blanco, Seth Holland, Sam Hendricks, Browerti Koffah, and Nick Seiler '20