AlasChemist

University of Alaska Fairbanks Department of Chemistry & Biochemistry

June 2013 Volume 34

A Note From The Department Chair ~ William Simpson

The 2012-13 academic year was an exciting one for our department and our students, staff, and faculty. We welcomed Assistant Professor Sarah Hayes to Fairbanks to start her tenure-track position following her year completing a USGS Mendenhall Postdoctoral position. Professor Hayes settled into teaching and research well and is getting her programs established. Professor Cheryl Frye joined our department as a professor in a joint appointment with the Institute of Arctic Biology as well as the new director of the Alaska INBRE biomedical research program. It is exciting to have Professor Frye's research excellence plus her leadership expertise added to our department. We had a great opportunity to enhance general, analytical, and physical chemistry by hiring Assistant Professor Chris Iceman into a tenure-track position that is focused on improving general chemistry, making instrumentation / computers more functional, and enhancing undergraduate research. Professor Iceman is off to a great start with a number of grant successes that will improve computers and laboratory equipment around the department. We hired Libby Miles into our new graduate program coordinator position. Libby has done an amazing job improving graduate student community, recruiting, smoothing paperwork, and improving our departmental website. In exciting news, Libby was accepted into a teacher education program in California, so she will be departing this summer; however, she has left a great impact upon our department and we wish her the best. Professor Marvin Schulte also got a great offer for a position on the East Coast and decided to take that offer. Professor Schulte left a legacy in the creation of the University of Alaska Biomedical Research Conference, which continues today and is an excellent showcase for students and time for faculty to collaborate on programmatic issues.

This year was an amazing one for awards for our people. We always knew we had excellent undergraduate students, and the ACS Diagnostic of General Chemistry (DUCK) exam again proved they are well above national norms. However this year, two of our students won two of the three campus-wide outstanding graduating student awards. **Theresia Schnurr** won the Frances Marion Boswell Award for outstanding graduating senior woman, and **Paul Tschida** won the Joel Wiegert Award for outstanding graduating senior man. Congratulations to them and their excellence! Theresia is going to continue to study with us, entering the M.S. program and working with Professor Kriya Dunlap. Paul is going to the University of San Francisco. We wish both the best in their future careers. Professor Cathy Cahill was both promoted to the rank of full professor and was selected as the Usibelli Award winner for public service. Congratulations to Professor Cahill for her excellent service and selection in this prestigious award. We honored many of our students through awards and scholarships, as are listed in the awards section of this AlasChemist. Way to go you all. In addition, this year had a number of research successes with major grants funded, publications in highly prestigious journals, and participation in review panels and study sections. See the publications sections of this AlasChemist to see a flavor of the research excellence going on in the department.

During this year, we invested in the seminar series by bringing in external speakers during the showcase periods of the first half of the Fall semester and after Spring break in the Spring semester. We had six great external talks during that period in addition to departmental "speed rounds" where each faculty member described their research in a few minutes. The speed rounds were a lot of fun and very informative to graduate and undergraduate researchers as well as faculty learning more about other research excellence around the department. We look forward to a vibrant seminar during these showcase periods, which are on Tuesdays at 4PM and are catered, so we hope to see you there! In our undergraduate program, we saw growth in our majors and had a bumper crop of students learning general chemistry. We invested energy in telling these entering Science, Technology, Engineering, and Mathematics students about Chemistry and Biochemistry and hope to see many of them around the department in the near future. Particular kudos go to Jacy Pietsch for leading the Chemistry Learning Center and our Supplemental Instruction (SI) program. Jacy trained our excellent SI leaders who did a great job helping more than a hundred students to excel in these difficult courses. We also continued our collaboration with UAF Honors house to offer special sections of general chemistry laboratory for honors students and declared chemistry majors. These Chemistry Honors sections introduced students to research in their first semesters, starting these students in a great direction.

We capped off the year with a departmental retreat where we worked on definition of our departmental mission. This was an really enjoyable event, where we found broad agreement on what the department is doing. We are continuing the process and will refine and adopt our new mission this summer; look for it in the Fall. Looking forward to the 2013/14 academic year, we seek to strengthen our programs and fill the vacancies left by Professor John Keller and Professor Marvin Schulte so as to provide more capacity to educate graduate and undergraduate students.

Brian Rasley ~ Analytical and Inorganic Chemistry

As usual, the past year was very busy with teaching, service and research projects. I taught distance delivered CHEM 103 and 104 chemistry classes for the College of Rural and Community Development and a CHEM 106 class for the Department of Chemistry and Biochemistry. The CHEM 104 course had an in person lab that was held at the Dillingham campus. The lab was a great success and it was nice to meet all my distance students in person. As always, teaching is a challenging but very rewarding experience.

With regard to research, I am currently mentoring two Ph.D. students, **Spencer Giles** and Jeff Lundeen as co-chair of their committees. Both students are attending George Mason University in Virginia and both are working at the Naval Research Laboratory on various aspects of coatings research. **Mary Curry** is currently trying to finish her masters degree on work related to hibernation. My former student **Jon Nigg** is working in the midwest as an analytical chemist and he presented some of the work he did in my lab for his masters degree at the Spring 2013 ACS meeting. During the past year, I published a paper with **Tulasi Ram Jinka** and Kelly Drew and helped author a book chapter on microdialysis methods. In addition to the publications, I was awarded a patent (along with several other people) for work related to silicone based biocides that I carried out at the Naval Research Laboratory in 2007; it always takes a few years for the patent process to work itself out. I also presented research results on electrospun fibers that have self-decontaminating properties at a conference in Las Vegas. Overall, it was a fairly productive year with regard to research.

With regard to service, I attended more than half of the faculty senate meetings as one of the alternate representatives for CNSM. I am also continuing as the director of the Fairbanks Chapter of the Alaska Native Science and Engineering Program (ANSEP). As the faculty advisor for the student chapter of the American Chemical Society, I was pleased to see that **Paul Tschida**, **Terilyn Lawson** and **Emily Westbrook** stepped up and provided some really active leadership for the organization. The club did the annual outreach at Salcha in the fall and five elementary school outreach activities over the course of the school year. The club also helped with Science Potpourri in the spring. If was really nice to see the club so motivated and I am looking forward to more activities next fall.

Undergraduate Student Spotlight ~ Kjersten Williams

Kjersten Williams is a senior Chemistry major at UAF and is working towards a Bachelor's of Science in Chemistry (with a concentration in Biochemistry/Molecular Biology), as well as an Associate of Applied Science in Dental Hygiene. She was born in Fairbanks and has lived in the region her entire life. Her college education began in the Fall of 2007, after graduating from the IDEA (Interior Distance Education of Alaska) program.

Her interest in chemistry was sparked when she began taking introductory chemistry courses for her associate's degree, and was fascinated to learn that many processes in nature can be explained through chemistry. She decided to change her major to Biochemistry after thoroughly enjoying her first semester of organic chemistry, realizing that she held a keen interest in the chemistry of living organisms.

Through her college experience thus far, Kjersten has learned that academic success and greater learning is obtained through hard work, dedication, and collaboration with both teachers and classmates. After completing both of her degrees, Kjersten plans to work as a Dental Hygienist in the Fairbanks/ North Pole area for a time, with the possibility of later going on to dental school or becoming involved in medical research.

Lawrence K. Duffy ~ Biochemistry and Neuroscience

My appointment as Interim Dean of the Graduate School ended in 2012 and I was appointed Director of the Resilience and Adaptation Program (RAP). RAP is an interdisciplinary graduate program, focused on global-to-local sustainability in times of rapid change. Resilience and adaptation serve as a central concept in exploring the challenges of sustainability by transcending disciplinary boundaries and focusing on real -world issues. There is a growing demand by students to integrate their science education with a more holistic (and realistic) world view around issues that include policy, economic, medical and other human dimensions.

In August 2012, UAF hosted the 15th International Congress of Circumpolar Health. **Dr. Anna Godduhn** presented her study on the Northway Health Project, which was received well by the congress. Many of UAF biochemistry and neuroscience students participated in the meeting, which was recognized as "meeting of the Year by the Fairbanks Convention and Visitors Bureau. Anna was also integral to the development of the online CHEM 100 course which uses the ACS developed Chemistry in Context textbook. Each semester, this course is fully enrolled. Of course, I continue to teach CHEM 100 each summer for RAHI. I am working with **Linda Nicholas-Figueroa**, recently promoted to Assistant Professor, during the summers, to develop and deliver a Climate Change Science Camp for rural students at Ilisagvik Tribal College in Barrow. Our effort to improve and reform science education in Alaska through the Keck Foundation SciWestNet is growing and the "Alaska Node" has been invited to a national NSF/AAAS meeting in Washington, DC to present our results.

Last year, with the departure of Professor Marvin Schulte, who was named the Department Chair of Pharmaceutical Sciences at University of the Sciences in Philadelphia, I had the opportunity to teach the undergraduate biochemistry sequence of CHEM 450, General Biochemistry-Macromolecules and CHEM 451, General Biochemistry-Metabolism. The department hopes to develop an additional upper level nutritional biochemistry course for next year. We are also working with Effie Kokrine Charter School to incorporate a biochemical activity screening component into their summer Ethnobotany course. We will focus on the bioactivity of traditional Alaska Native subsistence plants like blueberries and integrate research activities into the summer component of Effie Kokrine's innovative four year "spiral" curriculum.

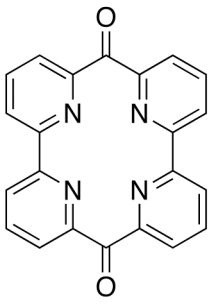
I would again like to thank Alzheimer's Resources of Alaska for their support of Chemistry and Biochemistry graduate students and faculty members. Public and alumni contributions are extremely important as national and state resources dwindle.

My research is still moving in the same directions, but it has been greatly enhanced by **Jinghui Zheng** in developing methodological improvements in the lab. Jing's research program studies the interaction of nanoparticles with neuronal cells. She has developed methods that will allow the flow cytometer to monitor the cells after exposure to toxicants and neuroportective agents. Jing will defend her thesis this summer before moving on to Long Island University where she will begin their Physician Assistant's Program.

Fenton Heirtzler ~ Organic and Materials Chemistry

This academic year marks the arrival of the first Interdiscplinary Ph.D. student into my group, **Anil Kumar Reddy Damarancha**. He has started work on the synthesis of a macrocyclic pyridine compound, which has the potential to provide an electron-deficient analogue to porphyrins, phthalocyanines and other p-type semiconductors. An undergraduate volunteer researcher, **Matthew Vanagel**, has also made significant progress towards the synthesis of a sterically hindered dipyridylpyrazine derivative, which will form topologically interesting coordination complexes with potential use in supramolecular recognition studies. I am furthermore co-P.I. on a proposal with Professor M.-B. Leigh, which concerns the synthesis of isotopically labeled natural products, and the National Science Foundation has recommended this proposal for funding.

Finally, I myself am active in the laboratory. The object of my work is the preparation of absolutely chiral ligands for transition metal complexes. These complexes are predicted to function as extremely potent solid-state frequency doublers.



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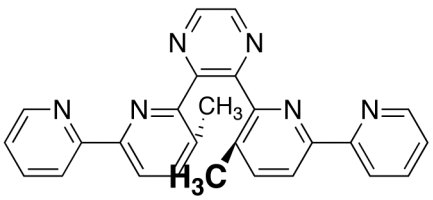

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Current synthetic target molecules

Cathy Cahill ~ Physical and Atmospheric Chemistry

This year has been an incredible year for me. The two highlights of my year were: 1) I received the Emil Usibelli Distinguished Service Award, and 2) I was promoted to the rank of professor. I could not have accomplished either of these achievements without the support of my students and colleagues. Thank you!

My graduate students are doing well. I am delighted to have such a nice bunch of students working with me! **Taryn Lopez** and **Trang Tran** are both receiving their Ph.D.'s in Environmental Chemistry this year. **Sean Egan** was hired into his dream job by the Alaska Department of Environmental Conservation, so he will complete his doctorate from Anchorage. **Jennifer Bell**, **Jennifer Chambers**, and **Tara Craft** are all on track to graduate in the upcoming year. Way to go students!

Chris Iceman, my former postdoctoral fellow, has been hired as an Assistant Professor of Chemistry. Congratulations, Chris!

This year I taught the first semester of Physical Chemistry (CHEM 331) and the second semester of General Chemistry II (CHEM 106). I really enjoyed the students in both classes and getting to blow things up in General Chemistry.

My research continues to go well. My work on the concentrations and compositions of particulate matter in the air in the Middle East continues. In addition, we are working on a sampler that will warn aircraft if they encounter volcanic ash so they can change their routes to avoid getting deep into an ash cloud. I am also characterizing wildfire smoke using unmanned aircraft, mining historical data sets for Denali National Park and Preserve, and conducting several other efforts. Overall, it has been a productive research year.

In addition to everything listed above, I chaired the University of Alaska Faculty Alliance, served as a member of the Statewide Academic Council, chaired the Fairbanks North Star Borough Air Pollution Control Commission, conducted school outreach, and performed other service activities.

Alaska Range looking south from Fairbanks
Photo by Cathy Cahill

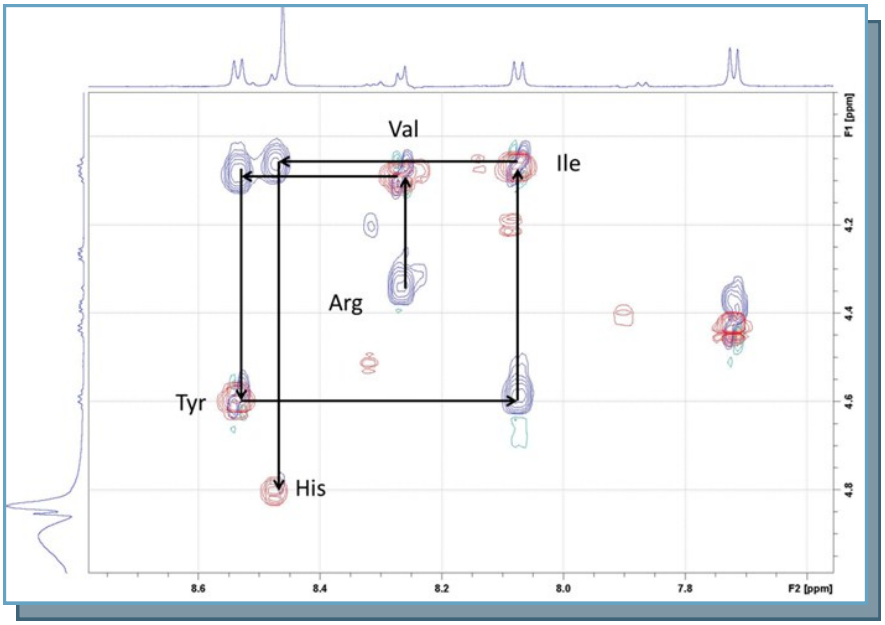
Thomas Trainor ~ Environmental Chemistry and Geochemistry

The primary project in the lab continues to be an investigation of lead and antimony in soils. This DoD project is focused on understanding the rates of weathering and alteration of these metals in soils, particularly in association with spent munitions from training operations. This project is being done in collaboration with Dr. Tom Douglas from the Cold Regions Research and Engineering Lab (CRREL) located at Ft. Wainwright. Tom is one of the departments affiliate faculty. During the past one of our core group members, **Dr. Anastasia Ilgen,** moved on to a permanent position at Sandia National Laboratory. While we were sad to see her it go, it was a great opportunity for her, and hopefully the start of a long lasting collaboration with a desert connection. The principle lab group members currently are Ph.D. students **Amanda Barker** and **Jackey (Canrong) Qiu** and postdoctoral research associate **Dr. Franta Majs**. They all have had a busy year of research, with numerous trips to various synchrotron facilities for data collection. I am pleased to say this is a great group of very dedicated individuals, and we look forward to a busy and productive summer.

Carl Murphy ~ Nuclear Magnetic Resonance (NMR) Facility

We've had a good second year here in the NMR facility. On the 600 MHz NMR, we have been expanding our basic set of parameters, so now we are set up to look at ^{33}S, ^{51}V, ^{125}Te, and ^{127}I with no additional instrument preparations. We are making good use of the computer controlled probe tuning. There are many other nuclei that we can run; if the nucleus is NMR active we can study it.

In an effort to showcase our NMR enabled science, posters were presented at this year's UABRC (University of Alaska Biomedical Research Conference). The main NMR poster (presented by me) focused on different biomedical related applications that we've done during the past year. These include NMR on plasma and tissue samples for metabolomics, looking at steroids including progesterone and structural confirmation of a novel drug compound. The NMR was also used for some interesting class projects: sequencing an eight amino acid peptide (figure 1), which was part of a final project from Tom Green's NMR class and identification of sugars in a bottled soft drink, part of a project from the analytical instrumentation class taught by Sarah Hayes.



Partial peptide sequence as determined by NMR (Arg-Val-Tyr-Ile-His).

In early July, we hosted a mini-symposium on NMR and several of its applications. This included a tour of the NMR facility, an overview of where the facility is and where it hopes to go in the future, some talks from UAF NMR users, and a couple of outside speakers.

We have begun talks with research groups that would be interested in using the NMR as part of their work, including some groups at UAA. We plan to be expanding our capabilities as more research projects start making use of the instruments. To this end, we are looking into bringing the NMR instruments into AIL (the Advanced Instrumentation Laboratory). Our goal is to keep the NMR Facility functioning when the grant that purchased the 600 MHz NMR expires.

Graduate Student Spotlight ~ Carla Frare

Carla Frare just completed her first year in the Biochemistry and Molecular Biology Ph.D. program. She is an international student from Italy who is working in Professor Kelly Drew's research laboratory along with collaborations with the Professors Edmonds and Frye.

Carla has just started her academic career at UAF and is off to a great start. In February 2013, she attended the 7th International Meeting on Steroids and the Nervous System in Torino, Italy. Carla presented a poster that was awarded an "excellent poster award". Carla also wrote and was funded on a travel grant and a summer research fellowship. In addition, Carla was an exemplary teaching assistant in General Chemistry, helping a number of students to succeed in this difficult course.

We look forward to hearing more successes from Carla and wish her best of luck in her graduate studies and research.

Kriya Dunlap ~ Biochemistry and Nutrition

This was another fantastic year. **Theresia Schnurr** graduated in December 2012 with her B.S. and received the Marion Boswell award for most outstanding graduating senior. She also received an INBRE undergraduate award for the fall semester and presented her research at the 2012 International Conference of Circumpolar Health. This spring she officially started her M.S. program in biochemistry and has already completed her field work in March and submitted her first manuscript. This summer she has a lot of statistics and writing to do… lucky gal! Now if you could all lend me a hand in convincing her to stay for her Ph.D., I would be very grateful.

In the Fall semester we were also joined by a visiting senior undergraduate researcher from Montana State, **Alyssa Komac**. Alyssa was a pre-vet student who works in the summers on the glaciers leading sled dog expeditions, so naturally she was interested in sled dog research. Theresia, Alyssa and I all had entirely too much fun with the Purina lab in Salcha, Alaska. Alyssa was featured in UAF's 'Naturally Inspiring' campaign. Although it's sad to see Alyssa move on, I am extremely excited for her to begin Veterinary School in Colorado State in the Fall of 2013. Congratulations Alyssa! Lucky for all of us, she has fallen in love with Alaska and will be back to this great state as often as possible.

In the spring semester I taught CHEM 674, Membrane Biochemistry and Biophysics for the first time. I took a course offered through UAF's Office of Information Technology (OIT) on iPads for instructional use and wrote a proposal to OIT. Each student was awarded an iPad to use for the entire semester. It was a fantastic learning experience for all of us as we learned more integrated methods for presenting and visualizing molecular concepts. This model is likely to be featured as an advertisement for technology use in the classroom. And possibly most exciting, Gary Bender from OIT is working with us on opportunities to publish our experience in an education journal, together as a class. This experience was positive mostly because of fantastic students, who were so eager, forgiving and helpful in making this work.

As we go into this summer, our lab is expanding. I'm excited to welcome a new Ph.D. student in June, **Aline Collin**. Also, **Jinghui Zheng** and **Swarup Mitra** will be dabbling in the lab with us this summer too. I'm looking forward to all the great energy that the students bring with them as we head into the days of the midnight sun!

Theresia Schnurr

Kriya and Theresia collecting fish samples on the Yukon River, Alaska

Kriya Dunlap

Theresia and Arleigh Reynolds a Purina Senior Scientist, with a dog team in Salcha.

Commencement Class of 2013 May 12, 2013

Photo by C. Iceman

Front Row (left to right) holding their decorated mortarboards:
Terilyn Lawson, Emily Westbrook and Emily Olson
Middle Row: Zachary Pickett, William Simpson, Paul Tschida, Cathy Cahill, Velva Combs and Kelly Drew
Back Row: Simeon Schum, James Simmerman, Tom Green and Brian Rasley

Doctor of Philosophy Degrees

Lori Kristine Bogren
Ph.D. Biochemistry and Molecular Biology
B.A.S., University of Colorado-Boulder, 2000; M.S., Colorado State University, 2004

Dominick Joseph Lemas**
Ph.D. Biochemistry and Molecular Biology
B.S., University of Vermont, 2006

Taryn M. Lopez
Ph.D. Environmental Chemistry
B.S., University of Wisconsin-Eau Claire, 2003; M.S., Michigan Technical University, 2006

Sam Harrel/News-Miner

University of Alaska Fairbanks Commencement

A chemistry graduated during the University of Alaska Fairbanks Commencement on Sunday, May 12, 2013, at the Carlson Center.

Master's Degrees

Vela Maria Combs
M.S., Veterinary Neuroscience: Interdisciplinary Program. B.S., University of Alaska Fairbanks, 2008

Michael Jaramillo
M.S., Chemistry. Golden Key Honor Society. B.S. University of Alaska Fairbanks, 2006

Zachary Nathaniel Pickett*
M.S., Chemistry. B.S., University of Alaska Fairbanks, 2005

* Summer 2012 degree recipient
** December 2012 degree recipient

Celebrating Excellence

Baccalaureate Degrees

Terilyn Koehler Lawson
cum laude, B.S., Chemistry: Biochemistry/Molecular Biology. Golden Key Honor Society

Emily Kay Olson
B.S., Chemistry: Forensic Chemistry

Eyal Jonathan Saiet
magna cum laude, B.S., Chemistry. University Honors Scholar

Theresia Maria Schnurr**
magna cum laude, B.S., Chemistry: Biochemistry/Molecular Biology

Simeon K. Schum
cum laude, B.S., Chemistry

James Micah Simmerman**
cum laude, B.S., Chemistry; Biochemistry/Molecular Biology

Melanie Sue Sindorf**
B.A., Chemistry

Matthew R. Smith
cum laude, *B.S., Chemistry*

Coleen Gatzlaff Thompson**
B.S., Chemistry

Paul William Tschida
summa cum laude, B.S., Chemistry: Biochemistry/Molecular Biology. Golden Key Honor Society. Phi Kappa Phi Honor Society

Emily Grace Westbrook
B.S., Chemistry

Marion Frances Boswell Memorial Award for outstanding graduating senior woman
Theresia Schnurr

Joel Wiegert Award for outstanding graduating senior man
Paul Tschida

Outstanding Chemistry Student
Paul Tschida

Elaine Jacobson Scholarship
Kjersten Williams

Freshman Chemistry Award
Dakota Emery

Undergraduate Award in Analytical Chemistry
Yu Miao

Undergraduate Award in Inorganic Chemistry
Tavia Casados

Outstanding Teaching Assistants in Chemistry
Amanda Barker & Spencer Hirt

Alaska Chapter American Chemical Society Award
Emily Westbroook

American Institute of Chemistry Undergraduate
Terilyn Lawson & Simeon Schum

American Institute of Chemistry Graduate
Sean Egan & Jinghui Zheng

HyperCube Scholar Award
James McKee


Yu Miao


Amanda Barker


Dakota Emery


Jinghui Zheng

Sarah Hayes ~ Soil and Water Science/Analytical Chemistry

The Hayes lab has really started to set up shop at UAF in the last year. I arrived in Fairbanks July 2013 and my new students, **Nicole Knight** (Ph.D.) and **Amy Skidmore** (M.S.), followed in August. We also have an undergraduate, **Kjersten Williams**, join in the research fun during the fall semester on an honors contract. Our group has spent a lot of time getting the lab set up, washing dishes, learning techniques, collecting data at the synchrotron, and getting ready to start experiments in earnest in the summer of 2013.

Our efforts this year have moved our research on tellurium (Te) geochemistry steadily forward. Tellurium is important because it is used in inexpensive, highly efficient solar panels. However, widespread use of these solar panels has been hampered by questions of long-term Te supply and price volatility. Te is mined as a byproduct of copper, thus Te supply depends directly on copper demand, not the demand for Te. Our goals are both to assess efficiency of current extraction techniques at liberating Te and assess the potential health impacts of geographic concentration of Te in population centers.

Tellurium is recovered as a byproduct of copper mining, and Amy and I have been working to unravel Te behavior during the copper extraction process in an effort to find ways to optimize Te extraction. In cooperation with ASARCO (Tucson, AZ) and Paul Spry at Iowa State, I visited the ASARCO mines and smelter to obtain samples from throughout the extraction process. Amy has completed mass balance calculations and determined that only 26% of the Te is currently being recovered. We are currently working on a more detailed understanding of Te speciation (atomic scale bonding environment, oxidation state, mineral association) that should enable us to understand why Te is being lost and hopefully point to ways tweak the processing to recover more Te.

Nicole is studying Te-bearing historic mine tailings at Delamar, NV to examine the weathering of telluride (Te^{2-}) phases under earth-surface conditions. While her immediate goal is to assess the bioaccessibility and transportability of the oxidized forms of Te found at the site, her results will also lend insight into fundamental Te behavior under environmental conditions. This can be applied to predict the potential health impacts of widespread use of CdTe-based solar panels and other Te-containing devices.

I have been continuing my postdoc research examining Te sorption to ferrihydrite, a common soil mineral with high sorption capacity for toxic metal(oid)s. Preliminary experiments have demonstrated that current models significantly under-predict the affinity of Te for ferrihydrite. Thus, additional experiments are underway that will be used to improve current sorption models. These are essential first steps to understanding the behavior of Te in natural systems, like at Nicole's site.

University of Alaska Fairbanks Department of Chemistry and Biochemistry

The Department of Chemistry and Biochemistry is on Facebook. Connect with us today. http://www.facebook.com/UAFChemistryBiochemistry

Department at a Glance

- American Chemical Society (ACS) approved programs (only such program in Alaska)
- 1 B.A., 9 B.S., 3 M.S., and 3 Ph.D. graduates in 2012-13 academic year
- 15 faculty, 3 staff, 3 postdoctoral associates, 2 technicians
- 35 graduate students
- 16 publications in 2012-13 academic year
- 72 Undergraduate majors and pre-majors
- 13 entering undergraduate students
- 10 entering graduate students
- 905 students taking introductory (100-level) chemistry offerings in the 2012-13 academic year

Thomas Green ~ Organic Chemistry

Last summer I had the opportunity to spend a week in beautiful Eugene, Oregon attending a National Science Foundation workshop about introducing Green Organic Chemistry into the undergraduate curriculum. I felt like an undergraduate student again as I tried out several types of new experiments. I've already implemented a number of the experiments into the organic lab. Not only do they illustrate principles of green chemistry, but they are innovative and teach modern concepts in organic chemistry.

Speaking of the curriculum, our course offerings in organic chemistry laboratory have undergone some changes here at UAF. In Fall 2013, we will be offering laboratory with the first-semester organic chemistry lecture (CHEM 321). I think it will be a good change, since it will get students into the lab earlier, learning techniques and seeing first-hand how much fun organic chemistry can be. The second semester lab with be either a 1-credit lab (CHEM 323) for non-chemistry majors, or a 3-credit writing-intensive lab (CHEM 324) for the chemistry majors.

On the research side, we are continuing to develop the analytical technique for adenosine detection. This research is supported by the National Institute of Health. Adenosine is an important neuromodulator related to a wide range of neurological processes and diseases. Kelly Drew, a neuropharmacologist in our department, has a keen interest in the role of adenosine in hibernation, and we hope our technique will prove useful for studies in her lab. Undergraduate students **Moriah Hunstiger**, **Terilyn Lawson**, and **Paul Tschida** worked on the project last summer and made good progress. They all traveled to the ACS meeting in Denver last October to present posters. Terilyn Lawson is starting her M.S. research this summer on the same project, to be joined by undergraduates Moriah Hunstiger and **Kate Guillemette**. We look forward to a productive summer!

Zhipeng Dai, Ph.D. candidate in Biochemistry, has completed his research on a stereospecific synthetic route to sphingosine analogues. This research is important since there is evidence that sphingosine and related metabolites are thought to control various aspects of cell growth and proliferation in cancer. He has written and submitted two manuscripts on his research with more to come.

Jamie McKee, Ph.D. candidate in Environmental Chemistry, is synthesizing nanoparticles with cyclodextrins on the surface. Cyclodextrins are capable of forming inclusion complexes with organic aromatic substrates, so these high surface area nanoparticles might be useful for environmental clean-up of contaminated waters. He made some excellent progress recently on the synthesis of new types of cyclodextrins to be used in nanoparticle formation.

Michael Jaramillo completed his M.S. degree this past semester. He developed some new synthetic pathways to highly charged cyclodextrins for possible use in chiral capillary electrophoresis (separate enantiomers). Michael also developed some liquid chromatography techniques for characterization of the cyclodextrins, and he is submitting a manuscript to Journal of Chromatography.

I've been here at UAF for twelve years now. I find both teaching and research to be as exciting as ever. I've been fortunate to be surrounded by so many talented colleagues and students in the Department of Chemistry & Biochemistry.

Thank You for Your Support

We are pleased to thank you for your kind support to the Department of Chemistry and Biochemistry. Your generous gift allows the department to support things that might not otherwise have been funded to enhance the learning experience for our students. Examples of such things include student travel, student research projects and much needed equipment.

Your contribution is extremely important to the department and college. Thank you for your generosity!

If you wish to donate to the department, please contact our department, UA Foundation, or use the secure contribution form for donations by credit card at:

http://www.uaf.edu/giving/gift/giving-form/

The form includes a place to specify that your gift is to be designated to the Department of Chemistry and Biochemistry (Fund ID 20372). Thanks for your support!

Jacy Pietsch ~ Department Outreach Activities

Another year has flown by!?! The sun is back and I keep hoping that the snow and ice will eventually give way to mud puddle season, so it must be true. That means it is time for me to look back over the year and reflect on all of the wonderful things we have accomplished.

The biggest news from my corner is also the item that I am the most proud of. With lots of help from Bill Simpson and Chris Iceman, the chemistry department has started up the Chemistry Learning Center (CLC). The goal of this program is to increase student success while maintaining the integrity of the courses. There are two strategies that we use to achieve this goal. The first strategy is one-on-one coaching, or, basically tutoring. The second strategy is Supplemental Instruction (SI). In SI, students meet for regularly scheduled sessions to review and digest the material that was presented in lecture. The sessions are led by an undergraduate that was previously successful in class. We were only offering SI for CHEM 105 during the fall semester but in the spring, we expanded to cover CHEM 106 as well. I was lucky to have **Stacey Krepel**, **Kate Guillemette**, and **Carlie Bailey** as SI Leaders/ coaches. They all have great attitudes, care about student success and generally make my job of supervising them a walk in the park.

While coordinating the CLC has kept me pretty darn busy, we still have managed to do a fair amount of outreach in the department. We started off in September with the Kids Science Expo on Ft. Wainwright. Sarah Hayes, **Arianna Demmerly**, **Amanda Barker**, **Amy Skidmore**, **Nicole Knight**, **Tara Craft** and **Jennifer Bell** made the trek out to the army base. Fun was had by all and I heard a lot of positive reviews when they got back.

Later in the fall, Chinook Charter School came to visit us again. Cathy Cahill dazzled them with an explosion show that went off without a hitch but with several loud bangs. All the kids loved it, including Cathy. After Cathy finished with her explosions, Kelly Drew brought in a hibernating ground squirrel and talked to the kids about her research. There were a lot of very thoughtful questions. The kids were impressed with Dr. Drew and Dr. Drew was equally impressed with the kids.

The UAF student Chapter of the American Chemical Society has been busy, too. As usual, several students accompanied Brian Rasley out to Salcha for their annual Fall Carnival. Slime, inflating Peeps, memory wire and UV beads were just a few of the items on the list of activities that they brought with them. However, the students weren't satisfied with just doing the one outing. They made visits to Anne Wein Elementary, University Park Elementary, and Nordale Elementary, as well. They brought slime and an enthusiasm for chemistry that was sure to spark the imagination of more than a few students. A big thank you goes out to **Terilyn Lawson**, **Paul Tschida**, **Paula Martin**, **Emily Westbrook**, **Madison Wilson**, **Simeon Schum**, **Caitlin Barron**, **Kjersten Williams**, **Julia Duncan**, **Michael Hooper**, **Victoria Bills**, **Trevor Sherrill**, and **Brendan Kern**.

Of course, a year cannot go by without a big mention of Science Potpourri. This was our 20th year and it just may have been out biggest year as well! The auditorium was packed for the Chemistry show, led by Sarah Hayes and **Lori Bogren**. Tom Green supervised the chemistry tables. He had a ton of help, though. Brian Edmonds took on the Liquid Nitrogen Ice Cream, Fenton Heirtzler handed out balloons, and Chris Iceman inflated little marshmallow men. Lots of undergraduates, graduate students and a sprinkling of postdoctoral associates volunteered to fill out the ranks. As usual, the chemistry demo table was well represented and everyone had a good time.

That brings us to the close of another year. Is it wrong to admit that I am a little exhausted? That is okay. Summer will eventually arrive and I will reenergize for another year. And with all the wonderful people in the department to work with, I am not lying when I say that I am looking forward to it.

Faculty & Staff Awards

Mist D'June-Gussak

10 Years of Service to UAF

Usibelli Award for Service
Cathy Cahill

Outstanding Teaching Award from CNSM
Tom Green

Christopher Iceman ~ General / Chemical Education

It has been a very exciting academic year! I began this year very much looking forward to working with our undergraduates as a new visiting assistant professor. What an awesome opportunity to work with the dedicated students here at UAF as they learn chemical concepts in genchem and forge their own research projects as graduating majors. On top of that I was additionally fortunate to be invited mid year to join the faculty as an assistant professor. I can't describe what an honor this is and how pleased I am to become part of what is already such an outstanding department.

Throughout the year it has been a great joy to watch my students in class improve themselves and their understanding of chemistry. I know this has been due in large part to their own efforts as well as those of all our SI leaders and teaching assistants. Much thanks go to Jacy Pietsch and Emily Reiter for their above and beyond efforts to make learning fun and enjoyable for our students. We're all very excited for the continuation of the Chemistry Learning Center and excellent student success in the classroom and laboratory.

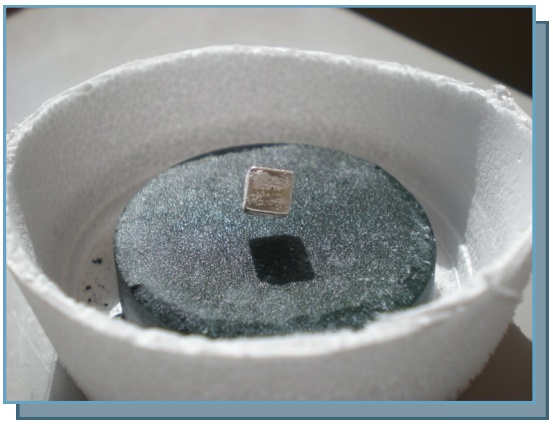
Major highlights from this year include getting to play on the Alaska Native Science and Engineering Program (ANSEP) intramural basketball team and the opportunity to join the Undergraduate Research & Scholarly Activity (URSA) advisory board to help with UAF Research Day. In both of these cases I was excited to work with new people and students from across campus. Internal to the department we are also extremely fortunate to have received funding from Provost Henrichs to get a new mass spectrometer system this summer to enhance our undergraduate lab experience, as well as funding from the Technology Advisory Board to upgrade our instrumentation and analysis software. What a great time to be a chemistry major!

Many thanks go out to all of my colleagues for their advice, mentoring and friendship this year. I'm so thrilled to get the new Iceman Lab (or "Lair" as it is more affectionately known) up and running next year. I also look forward to continued work with undergraduates in class as well as participating in the high quality research environment our department is so well known for. I excitedly await another great year next fall!

William Howard ~ Inorganic Chemistry

I enjoyed the privilege of mentoring the research of two undergraduate chemistry majors, **Tavia Casados** and **Cicely Shankle**, this past year. Tavia's project was concerned with the synthesis and characterization of new cyclotriphosphazene derivatives, and Cicely's project was concerned with preparing and characterizing new transition metal complexes related to our diabetes research.

I have continued to serve as the Chair of the Alaska Local Section of the American Chemical Society (ACS). In this role, I select two ACS speakers each year, who tour Fairbanks, Anchorage, and Juneau and give high quality research seminars. In the 2012-2013 academic year, Dr. Paul Helquist (Department of Chemistry & Biochemistry, University of Notre Dame) and Mr. Bob Blackledge (Naval Criminal Investigative Service, forensic chemist, retired) visited Alaska and gave excellent seminars at UAF, UAA, and UAS. We eagerly anticipate a visit by Dr. Julia Brumaghim (Department of Chemistry, Clemson University) in the Fall 2013 semester, who will give a bioinorganic-related seminar at UAF, UAA, and UAS. Dr. Brumaghim will be our guest speaker for our 2013 National Chemistry Week celebration!



A small magnet floats over a black superconductor disk ($YBa_2Cu_3O_7$), cooled to 77 Kelvin using liquid nitrogen. The disk was prepared by students in Basic Inorganic Chemistry F202 in the spring 2013 semester.

It was my pleasure to teach Physical Chemistry II CHEM 332 for the first time ever in the spring 2013 semester. Moreover, this past spring, I introduced a new experiment for the laboratory component of Basic Inorganic Chemistry CHEM 202. The students prepared the known high temperature superconductor $YBa_2Cu_3O_7$.

William Simpson ~ Atmospheric and Environmental Chemistry

The 2012-13 academic year was very busy, but we got a lot done. At home, Maggie had a successful year with her CSA and will have sixteen families this year, although the wacky cold weather of Spring 2013 has not been very easy to deal with. Layla (age 5) and Amelia (age 11) are doing great in preschool and elementary school. Next year, they will both be in University Park Elementary School and then Amelia will be on to middle school.

This was a busy teaching year, with the mega section of General Chemistry I (CHEM 105) in the Fall and then Atmospheric Chemistry, Undergraduate Research, and Seminar in Spring. It took me a lot of time to re-learn what to stress in General Chemistry, but I really enjoyed working with so many bright starting students and telling them how much I like chemistry. It is always enjoyable to discuss current topics in Atmospheric Chemistry with graduate students and a few advanced undergraduate students. The students in Undergraduate Research are always inspiring and it is great to catch up with their successes weekly and then to read their reports. In Seminar, we focused on giving productive criticism to each other and I think helped students to hone their oral communication skills.

Research has been good with a lot of analysis and exciting new results coming from last year's major spring field intensive study of halogen chemistry in the vicinity of Barrow, Alaska (the BROMEX campaign). We published a high-profile article led by Purdue University Postdoctoral Associate, Kerri Pratt, in Nature Geoscience (see publications). This article reinforced the non-linear relationship between snow/ice bulk composition and atmospheric chemistry that we have been stressing from our group in the past years and found that acidity was also a key driver of springtime halogen chemistry. We also completed two papers on intercomparisons between our nocturnal nitrogen oxide measurements and others in the field. This work comes from **Randy Apodaca's** Ph.D. thesis and it is good to have them all published. **Steve Walsh**, a graduate student, worked on our BROMEX analysis and presented work at the AGU

and a data meeting. **Peter Peterson**, who advanced to Ph.D. candidacy in Spring, made good progress on mathematical techniques measuring vertical profiles of halogen gases over sea ice and is discovering what controls the vertical extent of halogen chemistry.

Erin Gleason, a M.S. student, has made progress in viewing microscopic details of how aerosol particles that stick to ice spread their ionic components onto the ice surface. This work is particularly motivated by the field findings in the Pratt et al., 2013, paper mentioned above, which highlights the role of atmospherically influenced surface snow on halogen chemistry. **Simeon Schum**, an undergraduate student, also worked with visualizing ice surface properties, in this case using pH sensitive dyes. Simeon goes on to graduate school at Michigan Technological University.

Eyal Saiet completed his UAF Honors thesis, where he adapted a spectrometer from our laboratory to mobile use and measured gaseous pollution (nitrogen dioxide) in relationship to particulate pollution in Fairbanks. Great job by Eyal, who will be working this summer on adapting instruments to unmanned aerial systems. Congratulations to Eyal and Simeon, both of whom graduated with their B.S. degrees this spring, and best wishes in your future

Alumni Notes ~ Out & About News Wanted

Department of Chemistry & Biochemistry graduates, where are you? We would like to hear from you. Please send us your update via email to: **chemistry.uaf@alaska.edu** with the subject line ALUMNI UPDATES. All news will be published in the next issue of AlasChemist unless otherwise stated.

Visit our web site at: www.uaf.edu/chem

Brian Edmonds ~ Biochemistry and Biophysics

Chemistry students, particularly those enrolled in lower division courses, now have access to a large number of online learning resources. Many of these resources are excellent; however, aside from the ones that are specifically used for the course, they're rarely aligned with class discussions, and in past years I had noticed that for many students they were more distracting than helpful. A student might, for example, spend time browsing for YouTube videos about gas laws instead of reading their textbook. Acknowledging that few students have much spare time to devote to chemistry, this year I articulated a "less is more" philosophy in my Basic General Chemistry (CHEM 103) course, emphasizing the importance of completing primary assignments before browsing for other resources. By frequently reminding students to prioritize their activities outside of class, it was my impression that many students had better learning outcomes. My observations of "distracted students" also served as a reminder to me to carefully consider the relevance/value of a resource before adopting it for use in a course.

In addition to CHEM 103, I also taught a stacked undergraduate/graduate course in cellular and molecular neuroscience (CHEM 470/670) for the second time. A primary emphasis of this course is to understand how the unique features and spatial arrangements of molecules and cells give rise to the fast signaling events that ultimately govern behavior. This course was more highly attended, with ten students this year. and CHEM 670 will be adopted as a core course in the Biochemistry and Molecular Biology (BMB) graduate curriculum.

The research of our group is focused on the properties of nicotinic acetylcholine receptors (nAChRs). Acetylcholine (ACh) is a neurotransmitter that is periodically released from upstream neurons. nAChRs, located on a downstream neurons, can then "catch" or bind the released ACh and initiate a signal. Properly functioning nAChRs are required to maintain the properties of neuronal circuits that mediate cognitive processing, and disruptions in signaling at nAChRs are associated with disorders such as Alzheimer's disease, autism, and nicotine addiction. We use methods to study the properties of isolated nAChRs in order to obtain a detailed understanding of how they work, and how they contribute to signaling in a variety of neuronal circuits.

We are currently working on two nicotinic receptor projects. The first is an ongoing study to determine the mechanism of action of a novel class of compounds that modulate the activity of nAChRs in response to binding of ACh. These modulators are of potential use for the pharmacotherapy of disorders of cholinergic signaling disease e.g. (Alzheimer's), as well as nicotine addiction. An understanding of their mechanism will facilitate the development of better, for example less toxic, modulators. **Arianna Demmerly**, a Ph.D. candidate, has recently completed an exciting set of single-molecule studies showing that the compound desformylflustrabromine (dFBr) acts by destabilizing a desensitized (inactive) state of the receptor. Arianna has submitted an abstract of this work for the 2013 Society for Neuroscience Annual meeting in San Diego, and she is currently writing a manuscript to be submitted this summer. **Spencer Hirt**, an M.S. candidate, also contributed to this work via specialized "concentration jump" experiments in which he examined the effects of dFBr on nAChR activation in response to fast application of ACh. Spencer moved his family to Athens, Ohio in May where he will enter Ohio University Heritage College of Osteopathic Medicine in the fall. Spencer plans to complete his M.S. degree this summer.

We are also now working on a collaborative project with Dr. Edgar Buttner (McClean Hospital/Harvard Medical School) to determine the nature of the interaction between the drug clozapine, a powerful anti-schizophrenic, and nicotinic receptors. The molecular target for clozapine was unknown; however, using the nematode *C. elegans*, Buttner and coworkers have now shown that the target for clozapine is a nicotinic receptor. Two talented undergraduates, **Jonathan McMahon** and **Alfred Wright**, joined my laboratory in May of 2013 and both are working on this project. Jonathan and Alfred received Undergraduate Research & Scholarly Activity (URSA) awards to characterize the action of clozapine on human nAChRs expressed in a mammalian cell line. This collaborative project is critical for the development of less toxic alternatives to clozapine for treatment-refractory schizophrenia. We are looking forward to continued progress on both projects!

Cover photo by S. Hayes - Anna Liljedahl and Amanda Barker conducting field work near Delta, Alaska measuring water depth and flow rate in rivers.

Cheryl Frye ~ Behavioral Neuroscience

This year has been an exciting one for the Frye Lab as we transitioned to our new home at UAF. The focus of my work has been on transitioning to the role of the Director of the INBRE program, in its fifth year of support. We have had major successes this year, with our Alasks BioPREP (SEPA) and INBRE projects being funded, despite the funding sequestrations. A focus has been on preparing the application for our third INBRE program project award, and, in doing so, I continue to be impressed as I am reminded of the many accomplishments of our bright and hard-working students, faculty and staff over the last year. In addition to the INBRE project, there have been successes with my NIMH-funded research project on the novel sources and mechanisms of steroids for behavioral-induced plasticity. I presented some of our latest findings on novel sources and targets of the neurosteroid, allopregnanolone, at the *7th International Meeting of Steroids and the Nervous System* in Torino, Italy. This is arguably the most important meeting for my lab, due to the relevance and high-quality of the science presented there. I was joined by Alicia Walf (who presented our clinically-relevant work on behavioral and growth effects of androgens and metabolism inhibitors), Carolyn Koonce (who presented work on circadian rhythms in neurosteroids among mice), Julianne Power (who presented the collaborative project with Brian Barnes and Øivind Tøien on steroid, metabolism, and neuroplasticity factors in plasma of black bears at different points of the year), and **Carla Frare**, a graduate student in Kelly Drew's lab (who presented our collaborative project on steroids, metabolism, and a marker of brain plasticity in artic ground squirrels in different stages of arousal). These presentations received much attention. Kudos to Carla for winning a poster award at the meeting for her well-done presentation of this novel work! The first aim of the work on the pregnane xenobiotic receptor (PXR) as a homeostatic regulator of behavioral-induced steroid production was published this year and other reports on the role of neural plasticity markers, such as brain-derived neurotrophic factor, for these effects have been submitted for publication. These studies have focused on using a pharmacogenetic technique to knock down PXR and assess capacity for steroid production and behavioral and neural plasticity. This work will be augmented by use of PXR knockout rats and mice, with studies beginning this summer. To our knowledge, there has been no behavioral or hormonal characterization of these strains, and we are excited to begin this work. To this end, my long-time research associate (Alicia Walf) and post-baccalaureate technician (Carolyn Koonce) will be on-site this summer to set up the lab and begin these research projects with these strains. I have been invited to present a talk about our work on dopaminergic mechanisms in the ventral tegmental area underlying natural reward processes at the Dopamine 2013 meeting in Sardinia this summer. There are many additional things to look forward to in the coming year. Two new graduate students, **Malabika Maulik** and **Jennifer Moore**, will be joining the lab. I will be presenting our work on non-traditional mechanisms of steroids at the *Rapid Responses to Steroid Hormones* meeting in Erie, PA in the Fall. Another big meeting for our group is the *Society for Neuroscience* meeting, held in San Diego, CA this November. We will be presenting 8 posters at this meeting on our work on educational outreach, research on PXR and aging in rat models, and our collaborative projects with Brian Barnes, Kriya Dunlap, and Kelly Drew. All in all, I predict that the next year will likely prove to be as exciting and productive as the last.

Meeting of the UAF Torpor/Hibernation Group

Front row left to right: Brian Rasley, Lucy Moore, Tulasi Ram Jinka, Zachary Carlson, Melissa Pietila

Back row left to right: Saurav Bhowmick, Velva Combs, Carla Frare, Lori Bogren, Kelly Drew, Jeanette Moore, Carl Murphy, Isaac Bailey, Erin Johnston and Larry Duffy

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Alumni Out & About

Tim Brayman (M.S. 1993) is currently a senior scientist at Sigma-Aldrich Inc.

Brittany Dykstra Davies (B.S. 2007) received her MD degree from the University of Washington School of Medicine in June 2012. She is a resident of internal medicine at the Mayo Clinic in Rochester, Minnesota.

Chris Eversman (B.S. 2009) is currently working at UAF's Community and Technical College as a financial aid advisor. He also placed first in the 39th annual Mayor's Half Marathon in Anchorage, Alaska.

Todd Fortun (M.S. 2012) is an Air Quality Scientist at AECOM in Anchorage, Alaska. AECOM is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water, and government.

Zachary Hill (B.S. 2006) has received the Helen Hay Whitney Fellowship for training at the University of California, San Francisco with Dr. James Wells. Affinity-directed post-translational modification for identifying the protein targets of small-molecule drugs.

Mary Hogan (M.S. 2012) has relocated with her family to Gatesville Texas and has been teaching Biology online for Liberty University. She is also enjoying life on their newly purchased farm raising chickens, ducks, donkeys, and goats.

Anastasia (Tranbenkova) Ilgen (Ph.D. 2011) has relocated with her family to New Mexico and is an Experimental Geochemist at the Geochemistry Department at Sandia National Lab in Albuquerque, New Mexico.

Cathryn Jelinek (B.S. 1970) is still living in Vienna Austria and enjoying life in her new sleeker and simpler apartment.

Tulasi Jinka (Ph.D. 2010) is a Research Fellow working with Dr. Sara Aton at the Department of Molecular Cellular and Developmental Biology at the University of Michigan, Ann Arbor Michigan.

Roy Loewenstein (B.S. 1994) works at the Tucson Internal Medicine in Tucson Arizona practicing internal medicine.

Anshul Pandya (Ph.D. 2009) is teaching chemistry at UAF's Chukchi Campus in Kotzebue Alaska.

Raena J. Rowland (B.S. 2004; M.A. 2008) has stared a part-time photography business here in Fairbanks and is enjoying her days raising her family.

James Micah Simmerman (B.S. 2013) is working as an EPA Emissions Compliance Analyst in Grand Junction, Colorado.

David Wilkinson (B.S. 2009) graduated from Seattle University School of Law in 2012 and is a Law Clerk at the Alaska Supreme Court.

We would like to hear from you. Please send us your update via email to: **chemistry.uaf@alaska.edu** with the subject line ALUMNI UPDATES. All news will be published in the next issue of AlasChemist unless otherwise stated.

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