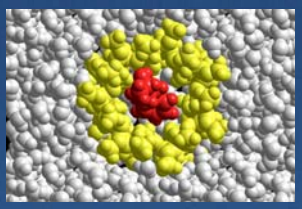
AlasChemist



University of Alaska Fairbanks Department of Chemistry & Biochemistry

June 2011 Volume 29

A Note From The Department Chair

This is my first year as the chair of the Department of Chemistry and Biochemistry, and I'm excited about what we have done as well as grateful for the positive efforts of faculty and staff at making the department a great place. The help of past chairs, John Keller and Tom Clausen, has been instrumental in surviving this first year. I truly am grateful to them.

Sadly for the department, Tom Clausen is going to be retiring in summer 2011. We will miss his contributions to all areas of the department but look forward to seeing him around often in the future. We conducted a search for an organic chemist and hired Dr. Fenton Heirtzler, who will start in the Fall of 2011. We also searched for an environmental / analytical chemist and hired Sarah Hayes, who will complete another year of her Mendenhall (USGS) postdoctoral fellowship and join us in Fall 2012.

We began a new search for a biochemist, joint with the Institute of Arctic Biology, and that search continues this summer.

We made major changes to our department website, increasing information that we put forward and allowing students to express interest in our programs through an online system, which we hope will help recruiting efforts. We also sought to highlight research efforts and successes of the department. We have been trying to serve students better by streamlining the laboratory sections of general chemistry, allowing students to register for any lab/lecture combination, as opposed to a very complex system that we had earlier. We also created a new organic chemistry laboratory that simplifies enrollment for students and better serves pre-professional students.

In May 2011, we held a departmental retreat, facilitated by former Provost, Dean, and Department Chair Paul Reichardt. The retreat helped us to understand better our current department state and where we want to be in the next years. I think it was a great success in identifying where to focus efforts.

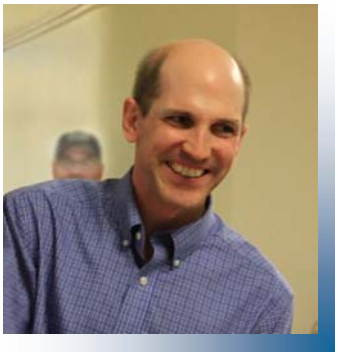


Photo by MADJG

Bill Simpson

Lawrence K. Duffy ~ Neurochemistry & Biochemistry

My appointment as Interim Dean of the Graduate School continues and I continue to expand my research interests. **Dr. Anna Godduhn** has finished her data analysis for the "Northway Health Project" and found a correlation between proximity to the old Haines – Fairbanks Pipeline area and past history of illness in the community. Anna completed her Ph.D. thesis and graduated May 2011.

Dr. Greg van Doren also finished his Ph.D. thesis in which he compared student learning gains related to cultural and local issues in chemistry courses for non-majors. He demonstrated that previous knowledge of topics like pH and the location of instruction are important factors in student retention and synthesis of the information. Greg is now the Academic Dean at the White Earth Tribal and Community College in northern Minnesota.

Last summer I taught CHEM 100X in RAHI and in the second summer session co-instructed CHEM 100X with Dr. Dunlap. Dr. Dunlap, over the last year, has developed a distance delivery lab for CHEM 100X. This summer I will again co-instruct in the RAHI program.

On the research side, our studies on mercury in fish is moving forward as realization of food security in rural Alaska gains state and national attention. I developed an environmental justice independent study course and will teach it again to engineering graduate students in Fall 2011 along with the "Macromolecules" course for biochemistry and biomedical science students.

In the area of service, I am working with Mary van Muelken of the Alaska Basic Neuroscience Program to incorporate summer research in neuroscience and biotechnology into the Effie Kokrine Charter School. We will focus on the bioactivity of traditional Native Alaska subsistence plants like blueberries and integrate research activities into the summer component of Effie Kokrine's innovative four year "spiral" curriculum. Ph.D. candidate **Linda Nicholas-Figueroa** is teaching at the Ilisagvik Tribal College in Barrow. She is designing a program that examines community knowledge of radar health effects and exposure on Alaska's North Slope. In Anchorage, **Lisa Schwarzburg** is beginning to write her thesis on the social impacts of pre-natal policies on tribal culture.

Tom Clausen ~ Organic and Natural Products

Well in a few weeks I will be riding into the sunset and start spending more time with Dawn in retirement. My years at UAF have undergone quite an evolution from being a student, safety officer with risk management, instructor for both mathematics and chemistry, post doc, safety officer and lab coordinator for the department, faculty, department chair and finally director of ANSEP. It has been a fun and rewarding trip and I owe a great deal to others that preceded me in retirement. These include my first organic professor at UAF, Warren Smith, who talked me out of choosing another major and who encouraged me in research and graduate school. Paul Reichardt who was one of my most outstanding professors and a great mentor during my post doc years and a great administrator during many of my years as a faculty member. John Bryant who is a world leader in plant-animal interactions and an outstanding friend. Claron Hoskins who was possibly the best supervisor I have ever seen. And Don Locken and Richard Stolzberg who instilled into me the idea that teaching is a rewarding endeavor to be pursued.

Success as a professor requires the support of many people and graduate students are on top of the list. I was blessed having some outstanding students that made my lab productive. These include Dr. Edward Treadwell, Emily Reiter, Dr. Trent Volz, Chance Riggins, Dr. Chris Whittle, Brian Englund and Dr. Colin McGill.

I also need to acknowledge some of my role models from my growing up years including Leo and Agnes Schlofeldt, Bill Stroeker, Pat and Gene Rogge, Jim (Hutch) Hutchison, Alden and Jack Wilbur, and my father, Edgar (Cy) Clausen. All of these folks are now passed but they will forever be a huge and positive influence on my life.

Photo by MADJG

Tom Clausen & Paul Reichardt

Most of all I want to thank Dawn who not only has saved me from a bee sting gone horribly wrong and an angry bear getting a bit close and personal, but also from my own faulty judgment. She has been my compass and has never failed me.

So as I ready to clean up my office to make space for my replacement, I think a lot of my accomplishments over the last three plus decades at UAF. Is it my publications that measure my worth? I hope not. The half life of publications, as measured by their citations, is very short. Rather I hope that there are a few students or faculty who will view me as I remember those who have so greatly influence me. I certainly can hope so but I don't know, my heroes have pretty big shoes!

Good luck to all of you! For those who are early in their careers- hang in there; life tends to get better with time. I now look forward to spending more time with Dawn, my spouse and true companion of 30 plus years.

Photo Provided by Trainor Research Group

Environmental Chemistry Ph.D student, Amanda Barker, working in the Trainor Lab. She has been working on analyzing water samples from the North Slope of Alaska to study the geochemical effects a warmer climate in the arctic has on permafrost active layer thaw depth.

Department Outreach Activities ~ Jacy Pietsch

It has been a very exciting first year for me in the department. My family returned to Alaska in the summer of 2010 and I joined the Chemistry team in mid-August. My predecessors left some very large shoes to fill, but, with assistance and support, I have become familiar with the multiple and varied roles that I play in the department.

The Department of Chemistry and Biochemistry continues to view outreach events as an important part of its mission. We started off the year by participating in the KUAC Fall Fundraiser. Bill Simpson, John Keller, Emily Reiter, Brian Edmonds, Tom Clausen and Tom Green all earned a huge 'thank you' for helping out by answering phones during the What'd Ya Know program.

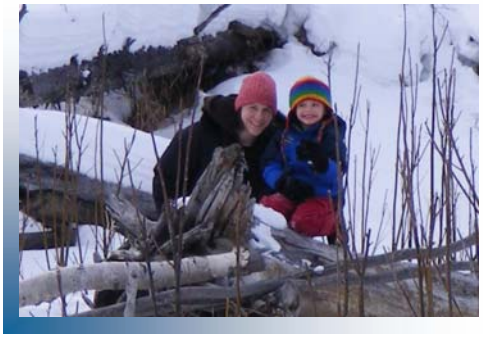


Photo Provided by J. Pietsch

Jacy Pietsch & her son

The next event took place over Halloween weekend. Brian Rasley headed down to Salcha to participate in their Fall Carnival again this year. He was assisted by **Zac Carlson**, **Mary Curry**, **Sigourney Walker**, **Kyung Ha Kim**, **Micah Simmerman** and **Talal Ahmed**. This group entertained the Salcha crowd by making slime, handing out UV beads, and demonstrating Memory Wire, among other things.

We rounded out the year with our biggest event, the 18th annual Science Potpourri. Kate Pendleton and I joined forces to pull this one off. On the first floor, there was the always popular liquid nitrogen ice cream, slime, and the superconductivity demonstration as well as the all of the Physics Department's hands-on activities. Activities on the second floor included a touch tank, a planetarium, rock slicing, and a demonstration of 'Red Hot Magma'. This is just a fraction of the activities that delighted the young and young at heart. There was a huge community turn out and we couldn't have done it without all of our enthusiastic volunteers. Thank you. Despite some frazzled moments, we did it! I am looking forward to working with you all again next year.

This year has held some exciting outreach successes. It has been an honor to work with a group so dedicated to the community that we serve. Next year will hold even more events and I am looking forward to it. Thank you!

Brian Rasley ~ Analytical & Inorganic

The past year has been very busy with teaching and research projects. I taught two distance delivery chemistry classes for the College of Rural and Community Development and two classes for the Department of Chemistry. As always, teaching is a challenging but very rewarding experience.

With regard to research, I have three graduate students and several undergraduates working in my lab. **Jonathan Nigg** is working on an analytical chemistry masters degree project that is partially sponsored by the USDA and **Spencer Giles** is working on a synthetic chemistry matsers degree project funded by the Office of Naval Research (via the Naval Research Laboratory). **Mary Curry** is now working on a masters degree in the area of hibernation research. Jon and Spencer should graduate with M.S. degrees by the end of summer. Jonathan already has several companies interested in hiring him based on his master's research while Spencer has been accepted into a Ph.D. Program at George Mason University in Virginia. I also had several undergraduate students, **Kyung Ha Kim**, **Bronwyn Harrod** and **Emily Westbrook**, working on hibernation research and computational/molecular modeling projects.

I will also be going through the tenure process this coming year and I have also accepted the directorship of the Fairbanks Chapter of the Alaska Native Science and Engineering Program (ANSEP). All in all, it should be a very busy year.

Photo by MADJG

Brian Rasley

Brian Edmonds ~ Ion Channel Biophysics

This year I taught the general chemistry & biochemistry series (CHEM-103X & 104X) for non-majors. I was fortunate to have a good group of motivated students and excellent teaching assistants for both courses. In the spring I developed and taught a stacked graduate/ undergraduate course in cellular and molecular neuroscience (CHEM-470/670). The focus of the course was on the molecular underpinnings of excitability and synaptic transmission, fundamental processes that form the basis of fast signaling in the nervous system. There is a growing, research-active neuroscience community at UAF, and my hope is that this course will stimulate interest in neuroscience among undergraduates, and provide essential training to students already engaged in neuroscience research.

The focus of our research is on the mechanisms of activation and modulation of neuronal nicotinic acetylcholine receptors. We use patch-clamp methods to investigate the functional properties of isolated receptors (single molecules) in response to binding of the endogenous neurotransmitter, acetylcholine. There have been a number of exciting developments in the laboratory over the past year. With the help of **Max Hesser-Knoll** (undergraduate), **Shailesh Khatri** (BMB Ph.D. student who rotated fall 2010) and **Stephen Wall** (technician on loan from Professor Schulte's group), we obtained some useful data sets with acetylcholine in December. In March, we received an INBRE (NIH/NCRR) award to support this work, and we recently prepared a second, expanded proposal (for submission to NIH) to investigate the single-channel basis of modulation of nicotinic receptors by desformylflustrabromine (dFBr), a new class of allosteric modulators that are functionally similar to the benzodiazepine class of modulators acting at GABA receptors. dFBr and related compounds are candidates for treatment of Alzheimer's disease, nicotine addiction, and other disorders of cholinergic signaling. For this project, we will work closely with Professor Schulte's group, who has provided an excellent macroscopic characterization of the functional properties of dFBr.

Photo by MADJG

Brian Edmonds

Looking forward to next year, **Max Hesser-Knoll** has decided to continue his undergraduate research experience in our group, and I am delighted to report the addition of two new graduate students. **Arianna McCandless** (BMB Ph.D. program) joined us as a second year BMB student in May, and **Spencer Hirt** (BMB M.S. program) will officially begin his graduate studies as a member of our lab in the fall of 2011. Both Arianna and Spencer will work on aspects of the nicotinic receptor modulation project. With these terrific students I feel we have the talent and resources for another fun and productive year!

Undergraduate Student Spot Light ~ Amy Rogan

Amy Rogan is a freshmen chemistry major at UAF. She graduated in May 2010 from Kodiak High School, Kodiak Alaska. While in high school she fell in love with chemistry when she had to take it for general credit her sophomore year. She later took AP Chemistry in her junior year, from that time on she states that she was crazy about chemistry and it became her favorite subject. She has learned that Chemistry is a very important and essential subject in science, and everyday life in general. After she completes her B.S. degree in Chemistry at UAF she plans on attending pharmacy school. It is her goal to become a Pharmacist someday and hopefully have many opportunities to educate and inform students about how chemistry affects their everyday lives.

Photo Provided by A. Rogan

Amy Rogan onboard the Tustamena, a sailing vessel that is part of the Alaska Marine Highway System.

William Howard ~ Inorganic Chemistry

In the summer of 2010, **Ashley Anderson** wrote and defended her M.S. thesis. I am still in the process of writing a paper that describes her research. I hope to finish and submit this paper for publication in the summer of 2011.

Furthermore, in the summer of 2010, **Gwynn Pruce**, a West Valley High School chemistry student, carried out a ten-week research project in my lab that was funded by the **American Chemical Society's Project SEED** program. Gwynn's work was featured in an article published in the August 27, 2010 edition of the Fairbanks Daily News-Miner. I am pleased to announce that Gwynn will return to my lab in the summer of 2011 as a SEED student again.

In the summer of 2008, three undergraduate chemistry majors – **Zachary Carlson**, **Bronwyn Harrod**, and **Dan Widener** – worked in my laboratory on completing a project that was begun in the Basic Inorganic Chemistry F202 laboratory course in the spring. This work was published this past year in the peer-reviewed *Journal of Chemical Crystallography*.

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 2010-2011 academic year, Dr. Ned Heindel (Dept. of Chemistry, Lehigh University) and Dr. Daniel Rabinovich (Dept. of Chemistry, University of North Carolina Charlotte) visited Alaska and gave excellent seminars at UAF, UAA, and UAS. We eagerly anticipate a visit by Mr. Keith Butler (Milan Army Ammunition Plant, American Ordnance) in the Fall 2011 semester, who will give a seminar on military explosives at UAF, UAA, and UAS. Mr. Butler will be our guest speaker for our 2011 National Chemistry Week celebration!

Photo Proved by W. Howard

William Howard

I am very pleased to announce that the **Alaska Local Section** of the ACS was awarded **1st place in the 2010 Hospitality award** ceremony that was held at the Spring 2011 National ACS Meeting in Anaheim. There are 187 local sections in the ACS, and the Alaska section was voted by former tour speakers as the most hospitable in 2010! This honor belongs to all the Alaska ACS members who attend the speaker seminars and serve as kind and gracious hosts. Thank you!

I also enjoyed a rare opportunity to share the wonders of inorganic chemistry with the general public during a science café that was held in November 2010 at our local Barnes & Noble Bookstore. Sponsored by the American Chemical Society, this science café was the first to be held in Fairbanks in a number of years. I spoke on the chemistry of high temperature superconductors for approximately 20 minutes to an audience of 69 persons, and I demonstrated the Meissner Effect with a small superconductor disc, a magnet, and some liquid nitrogen. I look forward to conducting more of these fun and worthwhile science cafés in Fairbanks in the near future!

Photo by Cheri Howard

Professor Howard discusses the chemistry of high temperature superconductors at a science café in November, 2010, at the Fairbanks Barnes & Noble Bookstore.

John Keller ~ Organic and Biochemistry

My 32nd year as a UAF faculty member was, superficially anyway, similar to my 1st year. Back then, fresh from a post-doc position at UW-Madison, I taught four courses: General CHEM 105X and Organic CHEM 321 in the fall, and Organic CHEM 322 and Organic Lab 324 in the spring. This year I taught CHEM 105X and F324W in the fall, and CHEM 106X and two sections of Chem 324W in the spring.

Some things never change. In 2010, CHEM 105X students make the same "significant figures" errors they did in 1979. This is in spite of the fact that we now can anticipate what the errors will be, and we try to correct them in homework, labs, and in class using real-time quizzes with instant feedback. I am concluding that some erroneous concepts are impossible to erase or correct, perhaps because they are hard-wired into human brains. In CHEM 324, the aroma of alkyl acetates still hangs in the air (briefly) as we do our Fischer esterification reaction.

Of course, there also have been large changes since 1979 in the tools available for chemists, the vastly improved facilities for doing chemistry, and the expanded academic programs in chemistry.

Present-day general chemistry students at UAF use GC-MS to analyze isotope ratios, and molecular modeling with quantum chemistry software to investigate the mysterious concept of "resonance stabilization." Organic lab students now study their chiral alkyl acetate products using 2D-NMR spectra using a high-field superconducting magnet, rather than a Varian T-60 equipped with a manual CAT scanner. Back then, there were six faculty members in the department (Genaux, Hoskins, Keller, Lokken, Reichardt and Stolzberg) teaching mainly an ACS-accredited B.S. chemistry program. This year I count 13 chemistry and biochemistry faculty offering Ph.D., M.S., B.S. and B.A. degrees in several areas of chemical science.

In the area of research, the size of the molecules my students and I are studying has declined precipitously: for a number of years I studied an 18-kDa-molecular weight bacterial enzyme; and now, as retirement approaches in 2012, we are moving into the small molecule domain. I developed an interest in hydrogen-bonded systems during years of studying hydrogen bonds in enzyme active sites. Now we are using computational chemistry and vibrational spectroscopy to study hydrogen bonds in small multi-dentate molecular complexes, such as those formed by formic acid with trifluoroacetic acid and sulfur dioxide. Chemistry major Bronwyn Harrod and then West Valley H.S. student Sifat Chowdhury are co-authors on a 2010 paper in the Journal of Physical Chemistry on this subject. These studies are continuing, and are being extending to small molecule-cyclodextrin systems in a new collaboration with Tom Green. Biology major Tessa Johnson will be helping us the fall using GC-MS to study small molecule-cyclodextrin binding interactions.

This fall I look forward to a roomful of shining faces in CHEM 105X, where I will have one more chance to teach *all* the students how to handle significant figures!

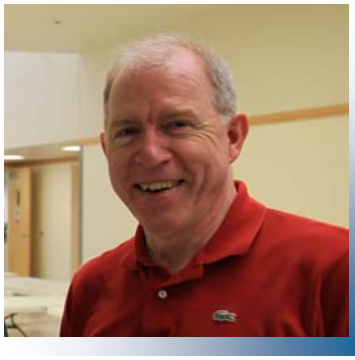
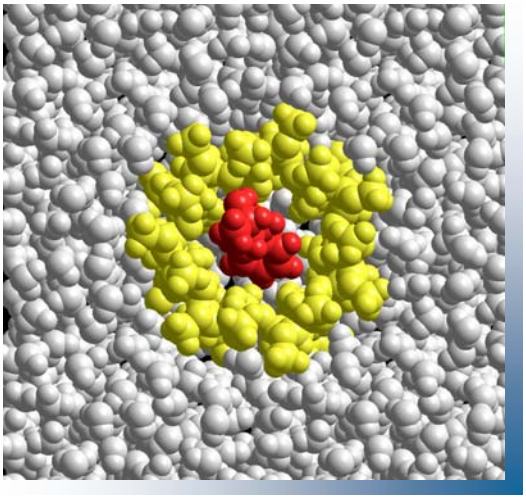


Photo by MADJG

John Keller



A space-filling model of a cyclodextrin-organic guest complex in water solvent (cyclodextrin, yellow; guest molecule, red; water, white). Molecular dynamics calculations by John Keller and Tom Green show that water molecules are excluded from the inside surfaces of cyclodextrin-guest complexes.

Commencement Class of 2011 May 15, 2011

Photo Proved by Jaya Jinka

Front Row:
Tulasi Ram Jinka, Kyung Ha Kim, Bronwyn Harrod, Sitara Chauhan, Anna Godduhn, Thomas Clausen, John Keller
Back Row:
William Simpson, Marvin Schulte, Jennifer Chambers, Larry Duffy, Thomas Trainor, Thomas Green, Kelly Drew

Baccalaureate Degrees

George Joseph Bernt **
B.S., Chemistry: Biochemistry/ Molecular Biology.

Jennifer Sara Chambers
cum laude, B.S., Chemistry. University Honors Scholar. Golden Key Honor Society

Sitara Devendra Chauhan
B.S., Chemistry: Biochemistry/ Molecular Biology. Honors Thesis Scholar. Leadership Distinction. Student Ambassador

Mary Curry *
B.S. Chemistry: Biochemistry/ Molecular Biology

Sean Egan **
B.S., Chemistry

Bronwyn Lee Harrod
magna cum laude, B.S., Chemistry. University Honors Scholar. Student Leadership Honors. Phi Kappa Phi Honor Society. Student Ambassador

Kyung Ha Kim
cum laude, B.S., Chemistry

Carla Ann Nelson
B.S., Indigenous Biochemistry: Interdisciplinary Program

Amber Elizabeth Thompson
B.S., Chemistry

* Summer 2010 degree recipient
** December 2010 degree recipient

Master's Degrees

Ashley Karen Anderson *
M.S. Chemistry. B.S., University of Alaska Fairbanks, 2007

Ashley Marie Jaramillo *
M.S., Environmental Chemistry. B.S., University of Alaska Fairbanks 2007

Julieanna I. Orczewska
M.S., Biochemistry and Molecular Biology. B.S., University of Alaska Fairbanks 2008

Vanessa Jean Ritchie
M.S., Environmental Chemistry. B.S., University of Alaska Fairbanks 2005

Doctor of Philosophy Degrees

Elvin Brown **
Ph.D. Biochemistry and Molecular Biology
B.S., University of California-Berkeley, 1974

Anna Godduhn
Ph.D. Environmental Health: Interdisciplinary Program
B.S., University of Alaska Fairbanks, 1996. M.A., University of Alaska Fairbanks, 2003

Deanna M. Huff
Ph.D. Environmental Chemistry
B.S., Michigan Technological University, 1996

Anastasia G. Ilgen **
Ph.D. Environmental Chemistry
M.S., Kamchatka State Technical University (Russia), 2001

Tulasi Ram Jinka **
Ph.D. Veterinary Neuroscience and Animal Research Compliance: Interdisciplinary Program
B.S., Acharya N.G. Ranga Agricultural University (India), 2000

Gregory Scott Van Doren *
Ph.D. Indigenous Science Education: Interdisciplinary Program
B.S. Washington State University, 1981. M.S., Washington State University, 1983. M.A.T., Heritage University (Washington), 2008

Celebrating Excellence

Outstanding Chemistry Student
Talal Ahmed

Elaine Jacobson Scholarship
Amy Rogan

Freshman Chemistry Award
Katherine Guillemette

Undergraduate Award in Analytical Chemistry
Kyung Ha Kim

Outstanding Teaching Assistants in Chemistry
Zhipeng Dai & James McKee

Alaska Chapter American Chemical Society Award
Jennifer Chambers

American Institute of Chemistry ~ Undergraduate
Joshua Dunn & Theresia Schnurr

American Institute of Chemistry ~ Graduate
Steve Walsh & Julieanna Orczewska

HyperCube Scholar Award
Bronwyn Harrod

Photo by Kyung Ha Kim

Front Row:
Tulasi Ram Jinka, Amber Thompson, Kyung Ha Kim, Sitara Chauhan, Jennifer Chambers, Thomas Clausen, (*kneeling*) Anna Godduhn,

Middle Row:
William Simpson, Marvin Schulte, Bronwyn Harrod, Anastasia Ilgen, Brian Rasley

Back Row:
Thomas Trainor, Thomas Green, Kelly Drew, John Keller

Photo by Kyung Ha Kim

Talal Ahmed, William Simpson, Amber Thompson, Thomas Trainor and Kyung Ha Kim

Thomas Green ~ Organic Chemistry

I continue to enjoy teaching organic chemistry here at UAF. My organic lab students presented interesting posters on various research projects at the Departmental Spring Potluck this year. I also taught a graduate course on nuclear magnetic resonance (NMR) spectroscopy this past semester, which is always a lot of fun. Speaking of NMR, we're looking forward to the arrival of our new Bruker 600 MHz NMR spectrometer this fall. This powerful instrument will be capable of analyzing liquids, tissues and solids with high resolution and sensitivity, with many new applications possible. Don't worry, our existing Varian 300 MHz NMR, a reliable workhorse for the Department for over 10 years now, will be maintained. We've hired a new Post-Doc, **Dr. Carl Murphy** (Ph.D. Purdue) to operate and maintain our new NMR facility in Reichardt room 136.

My graduate students are making good progress in their research. **Zhipeng Dai (Adai)** is pursuing a Ph.D. in Biochemistry. His research focuses on the stereoselective synthesis of D-*erythro* sphingosine, a common base structure of sphingolipids, a major class of biological lipids in plant and animal cells. He made great progress on the synthesis this past year. He is finding that the Mukaiyama aldol condensation, with titanium as catalyst, is an excellent stereoselective reaction. He was awarded an IAB Director's Summer Fellowship for his research so the summer should bring even greater progress. **James McKee** is a graduate student pursuing a Ph.D. in environmental chemistry. His research focuses on the synthesis of self-assembled cyclodextrin-modified nanoparticles by emulsion polymerization. He was able to demonstrate, for the first time, that modified cyclodextrins could be used as surfactants in emulsion polymerization of styrene. We can now make stable polystyrene nanoparticles (90 nm) with cyclodextrins on the surface. We're pursuing their potential applications in environmental remediation and as sensors. Both James and Adai will present their research at the American Chemical Society Meeting in Denver this coming August.

Photo by MADJG

Tom Green

Three undergraduate students, **Kyra Brown**, **Sitara Chauhan** and **Scott Hummel** all worked with me on various research projects during the spring semester. Kyra studied the enantioseparation of chiral aromatic alcohols using our own charged sulfoalkyl cyclodextrins. Our cyclodextrins are excellent chiral selectors, and her research is giving us mechanistic insight. Sitara continued a project that originated in the organic lab course involving the synthesis of a serotonin dimer that exhibits atropisomerism. Atropisomers are stereoisomers that result from hindered rotation about single bonds. She was able to resolve the stereoisomers using capillary electrophoresis with, you guessed it, a cyclodextrin in the buffer. This serotonin dimer has been implicated in some neurodegenerative diseases. Scott continued a study on the derivatization of adenosine to a fluorescent Meisenheimer complex. This fluorescent complex may be useful in the development of a sensitive capillary electrophoresis assay for adenosine, an important neuromodulator. All of the undergraduate students presented posters at the Campus Research Day session in the Wood Center this spring, as well as at the Departmental potluck.

Bronwyn Harrod, Amber Thompson, Kyung Ha Kim, Talal Ahmed, and David Ayotte standing outside the Reichardt Building May 2011

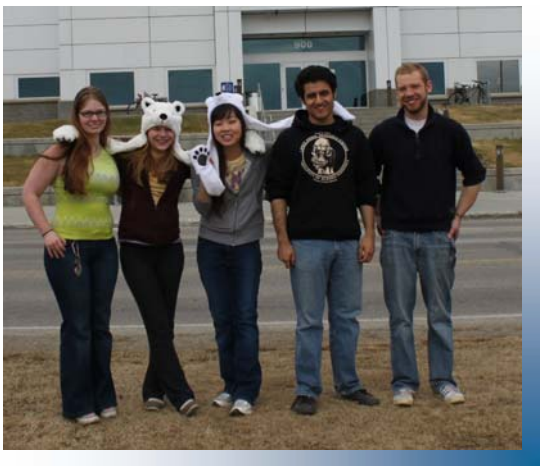


Photo by Kyung Ha Kim

William Simpson ~ Physical & Atmospheric Chemistry; Laser Spectroscopy

This year has had a lot of progress and preparation in the Simpson Lab. I have learned a lot through my new position as the department chair, which is described in another section of the AlasChemist. In family news, Maggie has always been growing a lot of our food in the summers and this year began selling produce under a community shared agriculture (CSA) model. She has about half an acre in cultivation producing all kinds of vegetables and root crops. Amelia (age 9) had a great time in third grade and made major progress in reading and math, also learning cursive. She continues to have a great time with friends and playing with her animals and plants. Layla (age 3) is in preschool at Bunnell house on campus, which has been great for her. She loves interacting with lots of people and has boundless social energy.

I taught the senior-level physical chemistry capstone laboratory in the fall and Atmospheric Chemistry in the spring. We had a great set of students in the lab and I really enjoyed working with them. Those students were also a great resource for ideas on improving our curriculum and I appreciate their input. Atmospheric chemistry is always fun to teach, and we had a very large class, with 17 graduate students and four undergraduates in the stacked course. In addition to these classroom teaching experiences, I facilitated the CHEM 488 undergraduate research course. I'm always impressed with the great work that our students do in this course and tried to find ways to showcase their efforts and successes. In the spring, we implemented weekly group meetings of all the students who are taking CHEM 488 and that was great fun for me to see student successes and to give ideas and encouragement. I also think that the students could see each other's successes and that helped to increase the critical mass of undergraduates doing research. We also began highlighting the students' work on the departmental webpage in the research area. I had a great opportunity this year to participate in UAF's academic leadership institute, a monthly professional development course, in which I learned more leadership skills. These skills have been very useful for me in the position as the department's chair, as well as the connections to the other participants in the class.

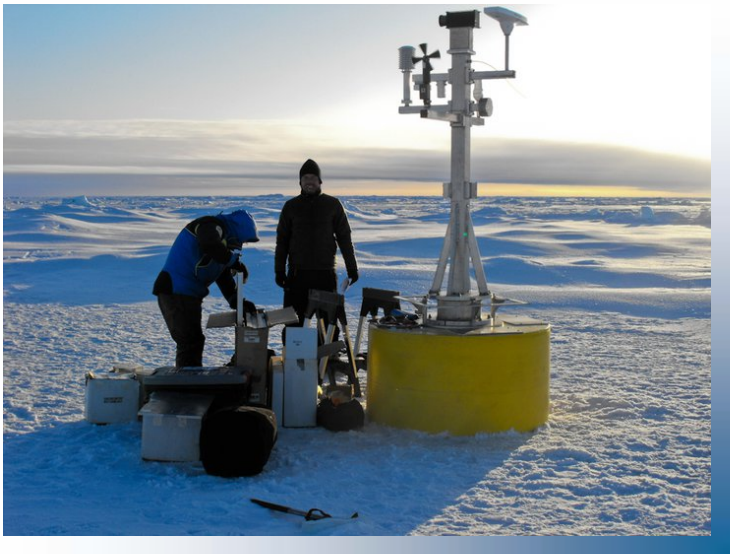


Photo Provided by C. Rauschenberg

Carlton Rauschenberg and Peter Peterson unpacking solar panels during the 2010 Beaufort GYRE Deployment

Our research has been moving along well, with completion of some projects and moving towards major field efforts in Spring 2012. We have continued to study the fate of wintertime nitrogen oxide pollution in Fairbanks and have expanded the work to relate to particulate pollution problems that Fairbanks is having. **Dr. Deanna Huff** completed her thesis in November 2010 and graduated with her Ph.D. We also published a manuscript describing the first measurements of the deposition velocity of dinitrogen pentoxide, a key intermediate in nighttime nitrogen oxide chemistry. Deanna took a position with the state Department of Environmental Conservation in Juneau and is liking it a lot. **Patrick Joyce**, a M.S. candidate, has worked with our collaborator Dr. Roland von Glasow from University of East Anglia to model nighttime nitrogen oxide chemistry in the Fairbanks plume. His work is going very well and is contributing to our understanding of the role of chemistry in particulate pollution in Fairbanks. **Steven Walsh**, a Ph.D. candidate, is doing great heading up the halogen oxide project field work. We were funded by NSF to build a dozen autonomous instruments to study atmospheric chemistry as a part of the "Arctic Observing Network" (AON). Steven and I have had to work a lot to adapt our instrumentation to the rapid pace of component obsolescence of electronics. This summer, Steven is also working with **Eyal Saiet**, an undergraduate researcher, to build most of the components of the AON instruments. We are also preparing for a major helicopter and fixed-wing aircraft field campaign out of Barrow in March 2012. **Peter Peterson**, a Ph.D. candidate in Physics, continues studying how impurities segregate from ice in frozen systems and how these impurities may then affect atmospheric chemistry. Peter has also been working on analysis of the BrO data from our network of instruments.

Kelly Drew ~ Neuropharmacology

2010-2011 will be remembered as the year **Dr. Tulasi Jinka** defended his Ph.D. thesis and got a picture of a hibernating Arctic ground squirrel on the cover of the Journal of Neuroscience (July 27, 2011). It will also be remembered for the hard work and productivity of an amazing group of students coordinated by the master of all, our lab manager Jeanette Moore. We waved good-bye to **Jasmine Olson** and wish her luck in dental school at the University of Washington. **Zachary Carlson** enjoyed his first experience as a TA for the chemistry department and is now spending the summer on his research to investigate changes in adenosine receptors that could cause ground squirrels, and maybe rats to hibernate. **Lori Bogren** is finding that the Arctic ground squirrel survives blood loss as well as cardiac arrest. **Velva Combs** is putting the final touches on her M.S. thesis in which she established the asphyxia cardiac arrest model of global cerebral ischemia in our lab at UAF. **Levi Wegner** is tackling his own research project to investigate the role of neuroglobin in the Arctic ground squirrel's resistance to ischemia. We welcome undergraduate student **JoAnna Carpluk** back to the lab this summer as well as our new undergraduate students **Sigourney Walker** and **Hassan Kaplan**. We acknowledge support from the Department of Defense and the National Institutes of Health.

Photo Providde by K. Drew

Drew lab fall 2010: (From left to right): Tulasi Jinka, Kelly Drew, Velva Combs, Zachary Carlson, Lori Bogren, Jasmine Olson, Jeanette Moore, Levi Wegner. Not pictured is Joel Vonnahme.

Thomas Trainor ~ Environmental Chemistry & Geochemistry

The lab saw a big turn over this past year. **Dr. Anastasia Ilgen** completed her Ph.D. degree in the fall semester. Fortunately she is staying on in the lab/department as a post-doctoral Research Associate. **Vanessa Ritchie** and **Ashley (Jones) Jaramillo** both completed their M.S. degrees this past year.

We also have some new projects and students/people that are all just spinning up. The project is supported by the US Department of Defence (DoD) and is focused on studies of Lead and Antimony in soils. The DoD is interested in 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, and co-advisor for several students now within the department (including **Ashley Jaramillo**).

The new folks working on this project are **Amanda Barker** and **Jackey (Canrong) Qiu**, both seeking Ph.D. degrees, **Sean Egan** an M.S. student and **Dr. Franta Majs** who is a new post-doctoral associate. We are lucky to have them all on board.

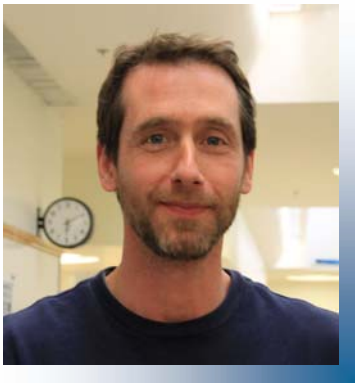


Photo by MADJG

Tom Trainor

Cathy Cahill ~ Physical and Atmospheric Chemistry

I have had a wild year! I had some wonderful high points: my research on particulate matter in Iraq and Afghanistan was mentioned in a front-page article in USA Today and made the front page of the Science News website for 5 days. I also had some very low points, especially the death of my friend, Kevin Engle, while we were travelling to Japan for a meeting.

This year I taught the full year of Physical Chemistry (CHEM 331 and 332). My great class and teaching assistant **Sean Egan**, made the class a pleasure to teach.

This year, my graduate students (**Jennifer Bell**, **Todd Fortun**, **Taryn Lopez, Mitali Patil**, **Peter Rinkleff** and **Ashley Wallace**) all made good progress on their research. **Dr. Christopher Iceman**, my postdoctoral fellow, also made great progress our research. He also helped the Department by teaching the second semester of General Chemistry in both Fall and Spring semesters. I am very pleased with my research group's efforts.

My research is going very well. My work on the concentrations and compositions of particulate matter in air samplers in Iraq, Afghanistan and the Horn of Africa continues. In addition, we have a prototype of an unmanned aerial vehicle-mounted aerosol sampler for determining the vertical and horizontal concentration and composition of particulate matter in the atmosphere. This information is very important for determining the potential hazard of a particulate matter cloud, such as a volcanic ash plume, to human health and aircraft. I have several other research projects that are progressing as well. It has been a busy, but successful, research year.

In addition to my normal busy teaching and research schedule, I have participated in many service activities. Some of these activities included being President-Elect for the UAF Faculty Senate for the second time; doing fun chemistry demonstrations for Science Potpourri, and serving on the Fairbanks North Star Borough Air Pollution Control Commission.

Overall, in spite of some low points, it has been a good year for me and my group. I hope the next year is even better!

Photo by MADJG

Fireweed
Epilobium angustifolium

Photo Provided by Trainor Research Group

Trainor Lab Research Goup
Front: Canrong Qiu (Jackie), Franta Majs
Back: Anastasia Ilgen, Amanda Barker, Tom Trainor, and Sean Egan.

Publications:

Abrahams, M. M., G. W. Cushing, Z. N. Pickett, W. A. Howard, and K. A. Wheeler (2010), Structural and Spectroscopic Characterization of Mer-[$RhBr_3(Me_2pzH)_3$](Me_2pzH = 3,5-Dimethylpyrazole); Interpreting the Results with Density Functional Theory Calculations *J. Chem. Crystallogr.*, *40*, 583-590

Barth, B. M., S. J. Gustafson, M. M. Young, S. S. Shanmugavelandy, J. M. Kaiser, T. E. Fox, M. C. Cabott, M. Kester, and T. B. Kuhn (2010), Inhibition of NADPH Oxidase by Glucosylceramide Confers Chemoresistance, *Cancer Biology and Therapy 10*(11), 1126-1136

Barth, B. M., S. Stewart-Smeets, and T. B. Kuhn (2009), Proinflammatory cytokines provoke oxidative damage to actin in neurona cells mediated by Rac1 and NADPH oxidase, *Mol. and Cell. Neurosci.*, *41*(2), 274-285

Cahill, C. F., P. G. Rinkleff, J. Dehn, P. W. Webley, T. A. Cahill, and D. E. Barnes (2010), Aerosol Measurements from a Recent Alaskan Volcanic Eruption: Implications for Volcanic Ash Transport Predictions, *J. Volcan. Geotherm. Res.*, *198*(1-2), 76-80, doi:10.1016/j.jvolgeores.2010.08.012.

Carlson, Z. A., B. L. Harrod, D. Widener, W. A. Howard, and K. Pang (2010), The X-Ray Structure and Spectroscopic Characterization of $[Zn(H_2O)_6][\{Zn(H_2O)\}_2(ttha)] \cdot 4\ H_2O$ (ttha = Triethylenetetraamine-N,N-N',N",N"',N"'-hexaacetate), *J. Chem. Crystallogr.*, *40*, 863-866

Douglas, T. A., M. E. Walsh, C. J. McGrath, C. A. W. Jr., A. M. Jaramillo, and T. P. Trainor (2011), Desorption of nitramine and nitroaromatic explosive residues from soils detonated under controlled conditions, *Environ. Toxicol. Chem.*, *30*, 345-353

Drew, K. L., R. C. McGee, M. S. Wells, and J. A. Kelleher-Andersson (2011), Growth and differentiation of adult hippocampal arctic ground squirrel neural stem cells *J. Vis. Exp.*, *47*, e2199, doi:10.3791/2199.

Duffy, L. K., A. Godduhn, L. Nicholas-Figueroa, C. E. Fabbri, C. H. Middlecamp, and M. van Muelken (2011), Engaging Students in Science Courses: Lessons of change from the Arctic, *Interchange*, *42*

Dunlap, K. L., L. K. Duffy, A. J. Reynolds, S. Gerlach, L. P., M. Cleroux, and J. P. Godin (2011), Selected plasma fatty acid levels in subsistence fed sled dogs along the Yukon river: a pilot study for biomonitoring, *Polar Record*, Available on CJO 2011, doi:10.1017/S0032247411000350

Green, T. K., L. Denoroy, and S. Parrot (2010), Fluorescence Enhancement of a Meisenheimer Complex of Adenosine by γ-Cyclodextrin: A Thermodynamic and Kinetic Investigation, *J. Org. Chem.*, *75*, 4048-4055

Heberling, F., T. P. Trainor, J. Lutzenkirchen, P. Eng, M. A. Denecke, and D. Bosbach (2011), Structure and reactivity of the calcite-water interface, *J. Colloid Interf. Sci.*, *354*, 843-857

Huff, D. M., P. L. Joyce, G. J. Fochesatto, and W. R. Simpson (2011), Deposition of dinitrogen pentoxide, N_2O_5, to the snowpack at high latitudes, *Atmos. Chem. Phys.*, *11*, 4929-4938, doi:10.5194/acp-11-4929-2011.

Jaramillo, A. M., T. A. Douglas, M. E. Walsh, and T. P. Trainor (2011), Dissolution and Sorption of Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) and 2,6,6-trinitrotolnene (TNT) Residues from Detonated Mineral Surfaces, *Chemosphere*, *84*(8), 1058-1065, doi:10.1016/j.chemosphere.2011.04.066.

Keller, J. W. (2010), Using curved arrows for retrosynthetic analysis, *Chem. Educ.*, *15*, 331-333

Keller, J. W., B. L. Harrod, and S. A. Chowdhury (2010), Theoretical Study of Formic Acid−Sulfur Dioxide Dimers, *J. Phys. Chem. A.*, *114*, 13182-13188, doi:10.1021/jp1076214.

Loring, P. A., L. K. Duffy, and M. S. Murray (2010), A risk benefit-analysis of wild fish consumption for various species in Alaska reveals shortcomings in data and monitoring needs, *Sci. Tot. Environ.*, *408*, 4532-4541

Ma, Y., S. Wu, and L. Duffy (2011), Effects of hyperoxia on brain tissue oxygen tension in non-sedated, non-anesthetized arctic ground squirrels: An animal model of hyperoxic stress, *Am. J. Anim. Vet. Sci.*, *6*, 7-17, doi:10.384/ajavsp.2011.7.17.

Mason, S. E., T. P. Trainor, and A. M. Chaka (2011), Hybridization-Reactivity Relationship in Pb(II) Adsorption on a-Al_2O_3-Water Interfaces: A DFT Study, *J. Phys. Chem. C.*, *115*, 4008-4021

Pickett, Z. N., W. A. Howard, and K. Pang (2010), Spectroscopic and Structural Characterization of $Na_2[(VO)_2(ttha)] * 8\ H_2O$ (ttha = Triethylenetetraamine-N,N,N',N,N"',N"'-hexaacetate); Interpreting the Results with Density Functional Theory, *Polyhedron*, *29*, 521-529

Salawitch, R. J., et al. (41 authors, including W. R. Simpson) (2010), A new interpretation of total column BrO during Arctic spring, *Geophys. Res. Lett.*, *37*, L21805, doi:10.1029/2010GL043798.

Weltzin, M. M., and M. K. Schulte (2010), Pharmacological characterization of the allosteric modulator desformylflustrabromine and its interaction with α4β2 neuronal nicotinic acetylcholine receptor orthosteric ligands, *J. Pharmacol. Exp. Ther.*, *334*, 917-926.

Alumni Out & About

Heather Slater (M.S. 2010) happily welcomed her daughter Ivy T. Slater on July 26th 2010. Heather is currently an Adjunct Faculty member teaching at Northwest Vista College in San Antonio Texas.

Danielle LaVictoire (B.S. 2006) has earned her M.S. degree in Forensic Chemistry from Southeast Missouri State University in 2009 and is currently working as a Forensic Chemistry for the Drug Enforcement Agency in Maryland. "The faculty at UAF were extremely encouraging when I expressed an interest in forensic science and I am grateful for being allowed to conduct my undergraduate research on latent prints even though it was outside the realm of usual chemistry topics for the department".

Benjamin Myer (B.S. 2009) has spent the last several years working as wild land firefighter in Alaska. Currently he is employed with the U.S. Forest Service at the San Dimas Technology and Development Center in California. He enjoys working with a diverse group of scientists and engineers who deal with technical issues related to wild land fire. Research experience in environmental chemistry at UAF sparked interest in a project that is currently underway investigating occupational health hazards of smoke exposure. He is planning to pursue graduate school in the near future.

Cantwell School Visits UAF for a Day of Science May 2010

Photos to the right: Brian Rasley demonstrates Lester's Forbidden Experiment. First he pours liquid nitrogen into a plastic bottle and caps the bottle. Then he tosses the closed bottle into a bucket of warm water. The explosion caused by the expanding nitrogen is quite impressive and the reason why this experiment is only demonstrated outside.

Photos to the bottom: Brian Rasley makes liquid nitrogen ice cream with the assistance of **Joel Vonnahme**. First they mix together the ingredients for vanilla ice cream and they add liquid nitrogen to cool the ingredients to produce a creamy soft-serve style ice cream. A delicious way to demonstrate some basic principles of chemistry.

Department at a Glance

- American Chemical Society (ACS) approved programs (only such program in Alaska)
- 8 B.S., 4 M.S., and 5 Ph.D. graduates in 2010-11 academic year.
- 13 faculty, 3 staff, 3 postdoctoral associates, 2 technicians
- 34 graduate students
- 21 publications in 2010-11 academic year.
- 59 Undergraduate majors and pre-majors
- 89th percentile average score of our graduating seniors on the ACS Diagnostic of Undergraduate Chemical Knowledge exit exam.
- 863 students taking introductory (100-level) chemistry offerings in the 2010-11 academic year

Photo by MADJG

Overlooking the Savage River in Denali National Park

Photo by MADJG

Thank You for Your Support

The Department of Chemistry and Biochemistry thanks donors from the past year. These donations assisted our department in improving programs and supporting our students. We used funds to fund student fellowships, give awards to excellent teaching assistants, and support the departmental retreat.

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!

Alumni Notes ~ Out & About News Wanted

Department of Chemistry & Biochemistry graduates, where are you? We would like to hear from you. Please feel free to clip out this form and send it to us or 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.

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

Department of Chemistry & Biochemistry
University of Alaska Fairbanks
P.O. Box 756160
Fairbanks, Alaska 99775-6160
Phone 907-474-5510 Fax 907-474-5640

Name: _____
Please include maiden name if applicable

Address: _____

City: _____ Sate: _____ Zip: _____

Year Graduated: _____ Degree Received: _____

News for *AlasChemist Out & About* *(education, employment, travel, or family news)*

_____

_____

_____

_____

AlasChemist is a publication of the Department of Chemistry & Biochemistry
Editor William Simpson
Managing Editor Mist D'June-Gussak

UNIVERSITY OF ALASKA FAIRBANKS
America's Arctic University