



# AlasChemist



## A Note From The Department Chair

I am happy to report that the Department of Chemistry and Biochemistry is healthy and moving ahead this year. The news this year comes under the following headings: American Chemical Society accreditation (or approval); faculty and staff positions; public relations efforts; and awards to faculty and staff.

**ACS approval.** Every five years we submit a long report to the ACS Committee on Professional Training (CPT) with details about the undergraduate chemistry major curriculum, courses, faculty workloads, facilities, student graduation rate, and even examples of student research reports. We sent in ours last June, and finally heard back from the CPT in January that our undergraduate major program, which includes emphases in chemistry, biochemistry/molecular biology, environmental chemistry, and forensic chemistry, has been approved for another five years. ACS approval is a sign of our commitment to quality in chemistry and biochemistry education, and is a testament to the outstanding work

done by UAF students and professors in recent years.

**Faculty and staff.** There were a number of important developments this year, the happiest being welcoming a new assistant professor of biochemistry and biophysics, **Brian Edmonds**. This year Brian did an outstanding job teaching two freshman chemistry courses, which admittedly took a lot of time and effort on his part. Courses like this make vital contributions to the health – scientific, educational, and economic – of the University, and his contributions were much appreciated by students and faculty.

Despite six months of herculean efforts by a search committee of **Bill Simpson, Tom Clausen, and Tom Trainor, and Rainer Newberry** of Geology, we were not able to fill the analytical/environmental chemistry faculty position vacated by Todd Gouin last year. I guess it is tough to attract outstanding chemistry faculty who also like to snowmachine and ski! Next year the search committee will be reformed and we will try to fill this important position again. **Tom Trainor** will chair that search committee, since **Bill Simpson** will be taking over as Department Chair after my current two year term.

Another search committee will be formed this year to find a replacement for **Tom Clausen**, who announced that he will retire in 2011. Tom's service to the department as chair, organic chemistry prof, and research mentor has been exemplary. This will be another challenging search.

Still another loss for the department will come with the July departure of stock clerk **Natalie Monacci**. Natalie came on board two years ago as a replacement for Marlys Schneider, and now Natalie, who has an M.S. degree in Oceanography, will be leaving to work on ocean research with UAF's School of Fisheries and Ocean Sciences.

**Public relations.** During the past year we have been trying to increase public awareness of the Department of Chemistry and Biochemistry by various means. One way is through the variety of outreach functions the department offers the public, such as the ACS National Chemistry Week celebration each fall and the Science Potpourri each spring. Natalie Monacci has done a great job helping to organize these and many other functions. A new approach by the faculty this year was to make donations to radio station KUAC for several on-air announcements extolling the virtues of the department. I hope you heard our tagline on the radio: "KUAC is supported by the UAF Department of Chemistry and Biochemistry. Serving Alaska and the Nation with research and scholarship in chemistry, and in the environmental and biomedical sciences."

**Awards and Kudos.** Congratulations go out to **Tom Trainor** who was the recipient of the 2009 Mineralogical Society of America Award. This prestigious award is given once per year to recognize outstanding published contributions to the science of mineralogy by individuals near the beginning of their professional careers.

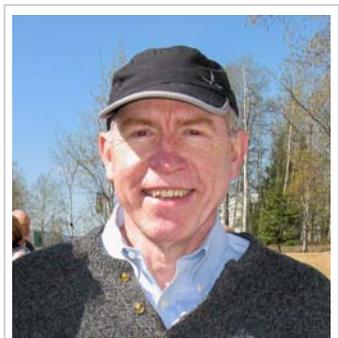


Photo by MADIG

**John Keller**

*Continued on page 2*

## Thomas Green ~ Organic Chemistry

Last year, I was writing from the Rhône-Alpes region in France while on sabbatical. My time in France gave me a wonderful opportunity to recharge and to generate a couple of new ideas. I collaborated with Luc Denoroy and Sandrine Parrot at the Laboratoire de Neuropharmacologie, Université Claude Bernard in Lyon, and we have an article currently in press in the *Journal of Organic Chemistry*. The research focused on the inclusion of an adenosine derivative into a cyclodextrin, which causes a dramatic increase in adenosine fluorescence. Adenosine is an enormously important neuromodulator in the brain. The study focused on the kinetics and thermodynamics of the inclusion process using NMR spectroscopy. We anticipate developing a new analytical technique for adenosine detection based on our discovery of enhanced fluorescence, and are currently writing a grant to NIH.

My research lab these days is all graduate students, with **Michael Jaramillo** leading the way in the area of modification of cyclodextrins for phase-transfer catalysis. Michael will be receiving an M.S. degree this summer. Michael will be sorely missed by the department when he departs. He has been a strong leader in my research lab, as well as a phenomenal teacher for the department. **Jim Warner** a Ph.D. candidate in Biology, is continuing to work on hibernation research of arctic ground squirrels. Jim is also mentored by Brian Barnes of the Institute of Arctic Biology, is examining low molecular metabolites and lipids in the serum/plasma of hibernating ground squirrels by  $^1\text{H}$  NMR spectroscopy. **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 and hopes to have it completed by the end of this summer.

**Jamie 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. The particles have potential application in the area of environmental remediation and as



Photo by MADIG

### Tom Green

stationary phases for chiral analysis using liquid chromatography. **Daniel Kirschner**, who received his Ph.D. last year, is now employed by Nektar Therapeutics in Huntsville, Alabama, as an analytical chemist. Nektar Therapeutics is a leading biopharmaceutical company developing a robust pipeline of novel therapeutics. Daniel tells me he loves his position. Another former student of mine, **Kristian Swearingen** (M.S. 2005), obtained his Ph.D. in Analytical Chemistry from the University of Washington in 2009. Kristian worked under the guidance of Professor Norm Dovichi, a world-leader in bioanalytical chemistry. He is now a post-doctoral fellow at the Institute for Systems Biology in Seattle, performing mass spectrometry of proteins.

I continue to enjoy teaching organic chemistry here at UAF. My CHEM 324 Organic Lab students presented interesting posters on various research projects at the departmental spring potluck this year. **Peter Knight**, a talented undergraduate student in the class, will be joining the lab this summer to continue his research on sphingosine synthesis. One of my teaching goals for next year is to write a laboratory manual for the Undergraduate Organic Chemistry Laboratory. I envision a manual that encompasses a series of hypothesis-driven experiments from the literature that focus on stereochemical principles. We already do most of these experiments here at UAF. I also want to integrate the principles of good scientific writing from the perspective of an organic chemist.

## A Note From The Department Chair - *continued from page 1...*

Locally, the College of Natural Sciences and Mathematics hands out several awards each year. This year the department faculty and staff garnered two: **Tom Kuhn** won the Outstanding Graduate Mentor award, and **Natalie Monacci** won the Service Award for her many outreach activities. Tom mentored three Ph.D.'s through to completion this year (Sally Gustafson, Brian Barth, and Max Kullberg), which must be some kind of all-time record for a single UAF faculty member. Finally, **Kelly Drew** and **Tom Green** snagged a \$1.7M grant from the Department of Defense which includes funding for a new 600-MHz NMR spectrometer to be installed in the department. They will use it for metabolomics studies related to stroke-related disorders, and it will also be used by students and faculty for protein, natural

products, and other projects requiring the enhanced sensitivity and resolution of a high-field NMR spectrometer.

**Thanks.** On those positive notes, I will sign off, saying it has been a good year, and looking forward to our continued success in the world of chemistry and biochemistry! I would especially like to thank **Mist D'June-Gussak**, our department Administrative Assistant, and **Emily Reiter**, our Lab Coordinator, for making the past year working for the department so enjoyable. They are hard-working and knowledgeable, yet remain the friendliest, and yes sweetest, persons who are our best public relations assets.

## William Howard ~ Inorganic Chemistry

In 2009, **Ashley Anderson** prepared and characterized two dichlorobipyridyl complexes, namely  $[\text{Ru}(\text{bipy}-\text{Cl}_2)_3](\text{PF}_6)_2$  and *cis*- $[\text{RhCl}_2(\text{bipy}-\text{Cl}_2)_2](\text{PF}_6)$  (bipy-Cl<sub>2</sub> = 4,4'-dichloro-2,2'-bipyridyl).

Recently, Ashley modeled these compounds by density functional theory, and the computational results match the experimental results very well. Ashley and I are currently preparing a manuscript describing this research, to be published in the *Journal of Molecular Structure*. Moreover, this research will form the basis for Ashley's M.S. Thesis, which she will write and defend in the summer of 2010.

In January 2010, **Zachary Pickett** and I published an article in a special edition of *Polyhedron*, which featured the research of young chemists. This article described the synthesis and characterization of  $\text{Na}_2(\text{VO})_2(\text{ttha}) \cdot 8 \text{H}_2\text{O}$  (ttha = triethylenetetraamine - N,N',N'',N''',N''',N'''' - hexaacetate), and the modeling of this compound by density functional theory. This research was a major part of Zach's M.S. project and was the topic of a research seminar given by me in June 2009 at the 64<sup>th</sup> Northwest Regional Meeting of the American Chemical Society in Tacoma, WA.

**Arianna McCandless** has completed her first year as a Ph.D. student in my laboratory. Much of this past year was

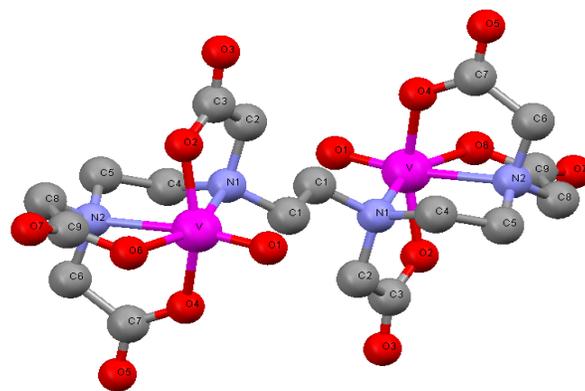
spent in coursework and in serving as a TA for general chemistry and for Basic Inorganic Chemistry F202. However, Arianna did manage to synthesize a few new amino acid complexes of zinc, which serve as models of some zinc enzymes involved in cellular glucose consumption. In the summer of 2010, Arianna will completely characterize these new compounds, with the assistance of **Gwynn Pruce**, a **West Valley High School** chemistry student whose lab work is funded through the American Chemical Society's Project SEED program.

In the Fall 2009 semester, **David Phillips**, an advanced undergraduate chemistry major, worked on a project involving nucleophilic substitution at the polypyridyl ligands of  $[\text{Ru}(\text{bipy})_2\{\text{bipy}-\text{Cl}_2\}]^{2+}$  and  $[\text{Ru}(\text{terpy})(\text{terpy}-\text{Cl})]^{2+}$  (bipy = 2,2'-bipyridine; terpy = 2,2':6',2''-terpyridine; terpy-Cl = 4'-chloro-2,2':6',2''-terpyridine). In a series of competition experiments with the nucleophile  $\text{NaOCH}_3$ , David found that substitution occurs faster in  $[\text{Ru}(\text{bipy})_2\{\text{bipy}-\text{Cl}_2\}]^{2+}$  than in  $[\text{Ru}(\text{terpy})(\text{terpy}-\text{Cl})]^{2+}$ . David graduated in December 2009.

Thanks to some funds received from the Technology Advisory Board (TAB), some much needed repair work will be done on the glovebox in the Howard laboratory during the summer of 2010.

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 give high quality research seminars at UAF, UAA, and UAS. In the 2009-2010 academic year, **Dr. Thomas P. Fehlner** (Dept. of Chemistry, University of Notre Dame) and **Dr. David F. Wiemer** (Dept. of Chemistry, University of Iowa) visited Alaska and gave excellent seminars at UAF, UAA, and UAS. We eagerly anticipate a visit by **Dr. Ned Heindel** (Dept. of Chemistry, LeHigh University) in the Fall 2010 semester, who will give a lecture entitled "An Approach to Anti-Alzheimer's Therapeutics: Inhibitors of Acetylcholinesterase".

In addition, the Alaska Local Section of the American Chemical Society collaborated with the Sustainability Task Force to hold a Chemists Celebrate Earth Day event on the UAF Campus on April 24, 2010. **Jennifer Bell**, a graduate student in the Cahill lab, organized this event. I appreciate Jennifer's hard work, and the excellent job she did. The Earth Day celebration featured live music, educational posters, and fun chemical demonstrations, and drew in approximately 200 people.



**Molecular Structure of the  $[(\text{VO})_2(\text{ttha})]^{2-}$  Anion from the X-ray Structure of  $\text{Na}_2[(\text{VO})_2(\text{ttha})] \cdot 8 \text{H}_2\text{O}$ , a Compound Isolated and Characterized by Zach Pickett.**

## Brian Rasley ~ Analytical & Inorganic

The past year has been very busy with teaching and research projects. I taught two distance delivery 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. I also managed to attend the ACS national conference in San Francisco and the NORM regional ACS conference in Pullman Washington where I presented posters. The chemistry department had a booth at the NORM conference with the aim of recruiting potential graduate students. With regard to research, I have two graduate students and several undergraduates working in my lab. **Jonathan Nigg** is working on an analytical chemistry M.S. degree project that is partially sponsored by the USDA and **Spencer Giles** is working on a synthetic chemistry M.S. degree project funded by the Office of Naval Research (via the Naval Research Laboratory). I also have several undergraduate students, **Daniel Widner**, **Mary Curry** and **Kyung Kim**, working on hibernation research and **Bronwyn Harrod** working on a computational/molecular modeling project. Between teaching and research, I manage to keep myself occupied.

## Tom Clausen – Organic and Natural Products

I read once that the average person undergoes five major shifts in their career path. My initial reaction to this statistic was that it would never apply to me. As my tenure at UAF approaches its end, however, I am not so certain that it does not. My research alone has spanned 6 major topics: nonclassical carbonium ions (cations having 5 or more bonds to carbon), plant animal interactions, moose pheromones, a couple of famous alleged poisonings, blueberry nutritional work, and a number of chemical education experiments. My major service has included nearly a decade of being department chair and now director of the Alaska Native Science & Engineering Program (ANSEP) at UAF. Only with teaching has my workload been fairly consistent with assignments ranging from General Chemistry to Organic (and Organic Lab) and Biosynthesis of Natural



Photo by MADIG

Tom Clausen

products. I am now convinced that five major changes to a career over a lifetime may be an underestimate!

This last year's research has been particularly productive. Since the start of 2009 I have been fortunate in being part of 6 publications. **Bryan Young**, a graduate student mentored by Diane Wagner (Institute of Arctic Biology) took the lead in two of these. Two other publications focused on the chemical defense of Alaska paper birch and were the result of too many coauthors to name here. Another paper was coauthored by past chemistry students **Brian Englund** (M.S. 2005) and **Loda Griffeth**. The final paper was the result of an Alaska High School Science Symposium student's (**Janice Chen**) project I mentored way back in 1996! I also have a 7<sup>th</sup> manuscript currently under review with the *Journal of Chemical Education*.

My plan this summer (besides fishing) is to tie up loose ends that will lead to the publication of a project led by my graduate student **Colin McGill** (Ph.D. 2010) with help from an outstanding undergraduate student, **Jennifer Chambers**. Colin isolated several novel compounds from Alaska Bog Blueberry that have beneficial biological properties (via collaboration with Dr. Kuhn's lab). One of these new compounds (we named blueberric acid) is in very elevated levels

(about 10% dry weight of the berry) which is nearly an order of magnitude higher than what we found in a preliminary screening of commercial blueberries (and probably contributes greatly to the renowned tartness of our berries). While Colin did the initial isolation and characterization of blueberric acid, Jennifer developed an HPLC/ELSD method for quantifying it as well as an improved method to isolate it.

Teaching was particularly productive this last semester. I tried a unique approach to my second semester general chemistry course by requiring students to submit daily notes of reading assignments from the text on material to be covered. Student success in my class has increased dramatically from that of past years which I attribute to this one simple change! In addition, my Organic laboratory students obtained some interesting results on a purported hetero Diels-Alder reaction which we plan to write up for submission to the *J. Chemical Education* with the TA, **Michael Jaramillo** (MS 2010), being the first author.

Much of my service has been directing UAF's Alaska Native Science & Engineering Program (ANSEP). This has been a very rewarding experience. To learn more about the program, visit its web page at [www.uaf.edu/ansep](http://www.uaf.edu/ansep).

## Lawrence K. Duffy ~ Neurochemistry & Biochemistry

**Linda Nicholas-Figueroa** completed her Masters degree and is now developing a research program to investigate the relationship of uranium exposure to neuro-inflammation. **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. Anna expects to complete her thesis for a May 2011 graduation. **Greg van Doren** is finishing his Ph.D. thesis, too, 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.

Along this line, last summer I taught CHEM 100 for RAHI and this summer I will again teach for RAHI as well as CHEM 100 in Summer Session.

On the research side, our studies on mercury in fish are moving forward as realization of food security in rural Alaska gains state and national attention. I will be mentoring a new graduate student as we expand the blueberry research into biotechnology and combinational therapies.



Photo by MADIG

## Department Outreach Activates ~ Natalie Monacci

Our department has had a packed year of outreach and recruitment activities, with about twenty different events of various sizes and scopes. The KUAC Fall Fundraiser was a great opportunity to support our community's public radio station again.

The second annual Teaching and Research Open House was a success on October 24, 2009, in celebration of National Chemistry Week. Students came from multiple high schools throughout the area to tour labs and have discussions with faculty and graduate students about the classes we offer and ongoing research projects. The American Chemical Society student group traveled south to Salcha for the Fall Carnival. We were not able to attend last year, so it was good to be back and see all the eager (and painted) faces.

Science Potpourri was the usual blast on April 10, 2010. We estimated approximately 600 visitors, enlightened and entertained by nearly 100 volunteers in 2010. The first floor was filled with excitement from kid molecules, x-ray microscopes, hibernating ground squirrels, and multiple physical forces on display. The second floor was the place to be for liquid nitrogen ice cream, slicing rocks, planting seedlings, and many others. Outside, volcanoes were rupturing, diet coke was exploding, and Rip the Reindeer was assisting parking.

Other outreach events included visits to schools, visits from schools, and a celebration of Earth Day. We extend many thanks to all of our volunteers, without whom we would not be able to educate our community and future members about our great department. In particular, we would like to thank our top outreach advocate, John Keller, for constantly promoting this department and encouraging us to extend knowledge to the public. We would also like to thank Kate Pendleton, the outreach coordinator for the College of Natural Sciences and Mathematics, who always has answers, ideas, and an extra hand.



Photo provided by Salcha School

**Salcha Fall Carnival**  
**Natalie Monacci, Daniel Weidner, Mary Curry, Bradley Weis, and Josh Bennett**

## Thomas Trainor ~ Environmental Chemistry & Geochemistry

The past year has been focused to a great degree on bringing several large projects to a close, and with that a number of group members are wrapping up their respective projects. Ph.D. student **Anastasia Ilgen**, M.S. students **Vanessa Ritchie** and **Ashley Jaramillo** are all on track to finish up their projects this coming summer, or early in the fall. Anastasia has made great progress on her thesis with a focus on antimony and arsenic redox chemistry in clay dominated systems. Her work has shown an unexpected acceleration of redox processes, likely driven by structural iron in clay minerals. She presented her work at this year's Goldschmidt conference in Knoxville Tennessee.

Ashley's work looking at the fate of TNT and RDX explosives in soil systems has also resulted in some interesting findings. She has observed a rapid dissolution of residues from detonated soils followed by slower adsorption of these compounds, with certain clay minerals

having a greater affinity likely related to their structure and composition.

Vanessa's project has produced some great field data looking at the fate of antimony (and arsenic) in mine tailings environments local to interior Alaska. The correlation of a number of geochemical variables is leading us to some generalizations and interesting hypothesis about controls on antimony chemistry in aquatic systems.

Research associate **Dr. Chris Iceman** has been hard at work this past year using computational methods to develop models of mineral-water interfaces. These models allow us to predict how the chemical structure of these environmental interfaces controls reactivity in the environment. Chris has done a great job balancing his research duties while he has also been teaching for the department, and serving as a mentor for undergraduate students **Jose Figueroa** from the University of Puerto

Rico who worked with us as an intern last summer, and **Charlie Stark** (UAF undergraduate) who worked with us this spring. Both Jose and Charlie were helping to develop some new software for interface modeling. While several projects are wrapping up, we have some new projects just getting under way and are looking forward to several new graduate students joining us in the fall.



Photo by MADIG

**Tom Trainor**

# William Simpson ~ Physical and Atmospheric Chemistry; Laser Spectroscopy

This year has had a lot of developments in the Simpson Lab and in the Department of Chemistry and Biochemistry. Our family is doing well. Maggie is continuing to develop her work as an illustrator and artist and has sold work at many local bazaars and her online store. Maggie also produces a lot of our food now with her expanding garden and our root cellar. Amelia graduated from 2<sup>nd</sup> grade and is having a lot of fun reading and playing inside and out. Layla (now age 2) is doing great and is very social having started daycare.

I taught molecular spectroscopy in the fall and the quantum mechanics section of physical chemistry in the spring. The physical chemistry course was great, but a tremendous amount of work because we added twelve new laboratory experiments to the course. I believe that this work was a great success because it really connected the concepts of the lecture with the practice of the laboratory. We also experimented with new delivery techniques, including using a user-editable webpage (a wiki) to deliver the lecture notes and recording (both audio and video) the lectures and posting them on the web. Many students remarked positively on having this material easily available to them, and it turned out to not be much extra work. I plan on using these methods in the future.

I was elected to be the new chair of the Department of Chemistry and Biochemistry. I appreciate the hard work that John Keller has done on this and thank him for his service. I'm sure I'll be talking with him a lot in the next couple years. I look forward to this challenge and hope to lead the Department forward. I have also been serving on the campus-wide accreditation committee for UAF, and this service has given me an opportunity to understand the broader campus and CNSM and the Chemistry and Biochemistry Department's place in it. I believe that our department is doing very well in living up to the standards set by our regional accrediting body.

We continue to work on arctic springtime halogen chemistry and nighttime nitrogen oxide chemistry. **Deanna Donohue**, our excellent postdoctoral associate has led the halogen chemistry field work related to the Arctic Research of the

Composition of the Troposphere from Stircraft & Satellites (ARCTAS) and Aerosol, Radiatim, and Cloud Processes affecting Arctic Climate (ARCPAC) field missions. She is completing two manuscripts on the comparison of our observations and the satellite measurements during spring 2008. In May, Deanna completed her work at UAF and moved to a second postdoctoral associate position at the University of East Anglia, UK. This position combines her graduate work on mercury with her work in our laboratory on halogens and adds a modeling component. We are sorry to see her go, but wish her the best of luck. **Dan Carlson** completed his M.S. degree and graduated in February 2010. He decided to enter medical school to become a doctor, and I wish him luck with his continued schooling. **Dea Huff** performed two very successful field campaigns in Fall 2009 and Spring 2010 studying nitrogen chemistry downwind of Fairbanks and is now writing up her Ph.D. thesis, completing late this summer or early Fall. **Peter Peterson**, a Ph.D. candidate in Physics, continues his joint project with the Trainor group studying how impurities segregate from ice in frozen systems and how these impurities may then affect atmospheric chemistry. Peter got some great data from a recent visit to the Argonne National Laboratory and is writing up his first paper. **Patrick Joyce** has joined Dea in the nighttime chemistry project and got a great start. This summer, he will begin modeling the atmospheric impacts of the chemistry that Dea Huff has been observing.



Photo by L. Alvarez-Aviles

**Bill Simpson**

## N<sub>2</sub>O<sub>5</sub> High Latitude Field Studies



Photo by Ben Huff

**Dea Huff**

N<sub>2</sub>O<sub>5</sub>-Ice is a project in studying the fate of pollution in the high latitudes. The field site for this project is located on the roof of the Geophysical Institute at the University of Alaska Fairbanks. We are measuring N<sub>2</sub>O<sub>5</sub>, which is an intermediate in the removal of nitrogen oxides (emitted by cars and other combustion processes). Reactions of N<sub>2</sub>O<sub>5</sub> produce nitric acid, which can acidify the snow and fertilize soils where it lands. In the March 2010 study, we measured how rapidly N<sub>2</sub>O<sub>5</sub> reacts with atmospheric particles.

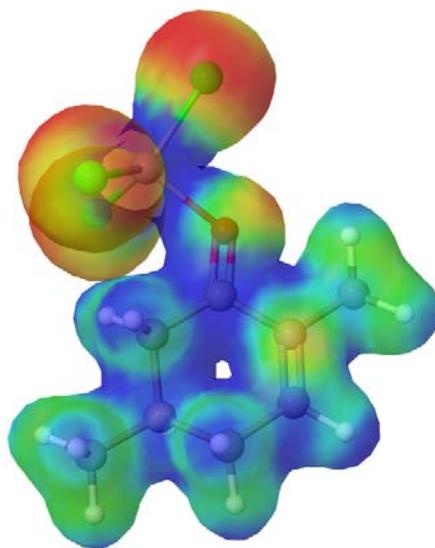
## John Keller ~ Organic and Biochemistry

The 2009-2010 school year started out in June with a bang literally at the Northwest Regional Meeting of ACS at Pacific Lutheran University where the highlight was the “Wizards of Chemistry” show put on by Herb Bryce and Tim Hoyt of U. of Puget Sound. Imagine “Dumbledore with safety glasses” and you have the picture. **Tom Green, Bill Howard, and Mike Jaramillo** also attended the meeting and we all gave talks and posters highlighting our students’ research. Former West Valley High School student **Cary Fristoe**, who is now a chemistry major at University of Oregon, presented a poster on our work on metal catalyzed Diels-Alder reactions of (R)-carvone. We had fun manning an information table for the UAF Chemistry and Biochemistry grad programs, and we attended an “All-Alaska dinner” organized by **Bill and Cheri Howard**.

Another highlight of 2009 was installing *Gaussian 03* and the *WebMO* computational chemistry interface on departmental servers. We now have two rather powerful servers (dual quad-core Xeon processors with 32 gb ram) that are as fast as individual nodes on the Pingo cluster at the Arctic Region Supercomputing Center. Granted, that machine contains more than 400 such nodes, but for teaching and small research

jobs our *WebMO* installation is much easier to use. Everyone is invited to take it for spin using the “guest” login at [www.uaf.edu/chem/webMO/](http://www.uaf.edu/chem/webMO/).

The WebMO servers were heavily used in the Molecular Modeling course CHEM 623 which I taught in the spring 2010 semester. The was a new course for the department, and emphasized electronic structural and MO methods using *HyperChem* and *Gaussian* software, either at ARSC or in the department. The course was populated mainly by students doing synthesis or computational chemistry thesis projects, these were



**AlCl<sub>3</sub>-carvone –type complex showing the electrostatic potential 3D-mapped isosurface (blue = positive, and red= negative). Theory shows that attachment of AlCl<sub>3</sub> to the c=O polarizes the C=C bond, increasing its reactivity as a dienophile in Diels-Alder reactions.**

## Brian Edmonds ~ Biochemistry & Biophysics

This has been an exciting first year for me at UAF. I taught introductory chemistry & biochemistry (Chem-103 and Chem-104 for non-majors) to an enthusiastic group of undergraduates, many of whom will go on to pursue careers in allied health. Both courses have associated labs that give students hands-on experiences that help put the chemistry into context. Thanks to the work of graduate teaching assistants **Mary Hogan, Spencer Giles** and **Shane Rideout**, the labs this year were a hit with the students.

Activity in the lab centered around set-up, which is nearly complete, and some changes in personnel. **Bjoerg Edberg** graduated with an Interdisciplinary Master’s in Neuroscience for her critical analysis of the role of membrane lipids in the

structure and function of voltage- and ligand-gated ion channels. Bjoerg recently moved to Tennessee to take a position as a laboratory technician at Vanderbilt University. Two undergraduates, **Sitara Chauhan** and **Llian Breen**, joined the group in spring. Both Sitara and Llian were awarded INBRE Undergraduate Fellowships to develop cell culture methods to support the primary research focus (mechanisms of modulation of neuronal nicotinic acetylcholine receptors) of the group. Sitara moved to Dr. Marvin Schulte’s lab for a summer appointment. Llian is staying on for the summer, and he is now making excellent progress learning the methods used to investigate the functional properties of nicotinic receptors. We’re anticipating a productive summer!

featured in their end of the semester projects, papers, and posters at the departmental potluck/poster session in May.

This year my research projects focused on organic and computational chemistry, and chemistry education issues. Undergraduate **Sean Egan** began working on the synthesis of a new 4-keto-2-alkyl amino acid. This compound is isosteric with substrates of the bacterial 2,2-dialkylglycine decarboxylase and may prove to be the first of a new class of vitamin B-6 enzyme inhibitors. I also have a paper in press in *The Chemical Educator* which is a distillation of ideas regarding retrosynthetic analysis that have arisen during quite a few years teaching Organic CHEM 321 and 322.

The most non-chemistry fun I had this year was driving the Alcan Highway from Fairbanks to Bozeman, MT in January with my son Andrew, then going skiing with him at the nearby Big Sky Resort. I didn’t ride the tram to the top of Lone Pine Peak, but the 9000’ elevation at the base of the ridge was still enough to require an interesting ski-breathe-ski-breathe sequence just to get down the hill! Let it snow!

# Commencement Class of 2010 May 16, 2010

## Doctor of Philosophy Degrees

Brian M. Barth \*

*Ph.D. Biochemistry and Molecular Biology: Neuroscience Option*  
B.S., Colorado State University, 2004

Sally J. Gustafson

*Ph.D. Biochemistry and Molecular Biology: Neuroscience Option*  
B.S., University of Alaska Fairbanks, 2007

Max P. Kullberg

*Ph.D. Biochemistry with an emphasis on Drug Delivery: Interdisciplinary Program*  
B.S., California Institute of Technology, 2000

Colin Michael McGill

*Ph.D. Biochemistry and Molecular Biology*  
B.S., University of Alaska Fairbanks, 2001. M.S., University of Alaska Fairbanks, 2005

Anshul Pandya \*\*

*Ph.D. Biochemistry and Molecular Biology: Neuroscience Option*  
B.O., University of Pune (India), 1999



Photo provided by S. Hummel

**Front Row:** T. Kuhn, S. Hummel, B. Rasley, C. McGill, J. Keller, R. Stolzberg, S. Gustafson, B. Edberg

**Back Row:** T. Green, W. Simpson, C. Cahill, B. Edmonds, T. Clausen, L. Duffy

## Master's Degrees

Daniel A. Carlson

*M.S. Environmental chemistry. Golden Key Honor Society.*  
B.S., Loyola University of Chicago (Michigan), 2005

Bjørng H. Edberg

*M.S., Neuroscience: Interdisciplinary Program. B.A., St. Olaf College (Minnesota), 2006*

Linda Nicholas-Figueroa \*\*

*M.A., Chemistry. B.S., University of Alaska Fairbanks, 2000*

Heather Ann Slater

*M.S., Environmental Chemistry. B.S. University of Denver (Colorado), 2006*

## Correction for AlasChemist 2009

Emma Mayfield

*M.A. Chemistry: Interdisciplinary Studies, 2009. B.S. University of Alaska Fairbanks 2007*

## Baccalaureate Degrees

Zachary Carlson \*\*

*B.S., Chemistry; Biochemistry/Molecular Biology*

David R. Phillips \*\*

*B.S., Chemistry*

Shane Rideout

*B.S., Chemistry: Biochemistry/Molecular Biology. Golden Key Honor Society*

Charles William Stark

*cum laude, B.S., Chemistry. Golden Key Honor Society*

Kimberly A. Stephens \*

*B.S., Chemistry: Biochemistry/Molecular Biology*

Joseph Wenzel \*

*B.S., Chemistry*



\* Summer 2009 degree recipient  
\*\* December 2009 degree recipient

## Cathy Cahill ~ Physical and Atmospheric Chemistry

This has been an extremely busy but very interesting year. My teaching, research and service components were all going full bore.

I taught Physical Chemistry I (CHEM 331) and Environmental Fate and Transport (CHEM 631) this year. I had wonderful students in both classes! I am especially grateful for the P-Chem students for putting up with me as I was developing the new laboratory section for 1<sup>st</sup> semester P-Chem!

This year, my doctoral graduate students, **Taryn Lopez** (Environmental Chemistry) and **Peter Rinkleff** (Geology), who are both making good progress researching volcanic emissions, were joined by another doctoral student, **Jennifer Bell** (Environmental Chemistry), who is working on aerosols that are produced in Iraq and Afghanistan. My Masters students, **Mitali Patil** (Biochemistry), who is researching bioaerosols, and Ashley Wallace (Environmental Chemistry), who is researching visibility in Denali National Park and Preserve, are both

making good progress towards their degrees and should graduate soon.

My research is going very well. I now have air samplers in Iraq, Afghanistan and the Horn of Africa that are collecting aerosol samples to help determine the potential health effects of atmospheric aerosols on the health of US troops in the regions. I am about to have a UAV-mounted aerosol sampler for determining the spatial and temporal composition. I can't wait to fly the instrument on a UAV! The study examining the particles potentially causing haze in Denali National Park and Preserve is almost done and we have some excellent results. I have gotten more involved in analyzing volcanic aerosols and determining their impacts on aircraft and human health. It was very timely research this year as an Icelandic volcano shut down European airspace. I also have been helping the Fairbanks North Star Borough deal with the PM<sub>2.5</sub> non-attainment and wood smoke issues. Lastly, I have been working on characterizing wildfire emissions for the Japan Aerospace Exploration Agency. It has been a very

busy research year!

In addition to my normal busy teaching and research schedule, I was also President-Elect for the UAF Faculty Senate. I now know far more about how UAF works than I ever thought I would.

It has been a great year for me and my group. I hope the next year is even better, but hopefully, a little calmer!



Photo by M.A.D.I.G.

### Celebrating Excellence

#### Outstanding Chemistry Student

Bronwyn Harrod

#### Elaine Jacobson Scholarship

Dawn Holt

#### Freshman Chemistry Award

Joshua Dunn

#### Undergraduate Award in Analytical Chemistry

Emily Hummel

#### Alaska Chapter American Chemical Society Award

Charles Stark

#### American Institute of Chemistry ~ Undergraduate

Talal Ahmed & Eyal Saiet

#### American Institute of Chemistry ~ Graduate

Zhipeng Dai & Mary Hogan

#### HyperCube Scholar Award

Ashley Anderson

#### Outstanding Teaching Assistants in Chemistry

Michael Jaramillo & Ashley Wallace

## Marvin Schulte ~ Biochemistry & Neuropharmacology

As I sit down to write this, I am again reminded of the impact UAF faculty, administration and students have had on shaping my experiences. With all the challenges that every year brings as we all work to develop the Biomedical and Biochemical programs, I find there are also many successes and reasons to celebrate.

The 2009-2010 school year began with a focus on my laboratory and our ongoing research efforts. We were fortunate to receive another grant from the National Institutes of Health last fall aimed at developing novel modulators of the neuronal nicotinic receptors. This work has been a focus of my laboratory for the past few years and has been spearheaded by two excellent graduate students, **Maegan Weltzin** and **Anshul Pandya**. Anshul graduated with a Ph.D. in May 2010 and obtained an excellent post-doctoral position at the National Institute of Environmental Health Science at the NIH. My congratulations to Anshul and best wishes for continued success. Maegan is now in her last year and will likely complete her Ph.D. in the 2010-2011 academic year. The research Anshul and Maegan have worked hard to develop could result in a completely new class of drugs for treatment of several neurological disorders including Alzheimer's disease and Autism. Last summer, undergraduates **Kelsi Evans** and **Dawn Holt** contributed to this project. Recently, Dr. Yilong Ma, a research professor at UAF, joined us in this effort.

A second project in the laboratory is also making rapid progress. This research team is being led by another excellent graduate student in the lab, **Yeganeh Ataian**. Yeganeh's project is focused on engineering proteins for use in

constructing biosensor devices for high throughput drug screening applications. This is a collaboration with Drexel University and the laboratory of Dr. Haifeng Ji. This unique Biochemistry/Chemical Engineering project was funded two years ago by NIH. Since it was funded, four publications have resulted from this work with two additional manuscripts coming from our laboratory within the next six months.

In addition to research, I have also had the opportunity to see success in other areas. As in research, this success is also highly dependant on the work of others. One project that I have been extremely focused on over the past several years has shown some movement. With the help of Dr. Kuhn, we have been attempting to move Alaska and UAF towards the establishment of a College of Pharmacy. Like all states, Alaska is experiencing a Pharmacy shortage and Alaska is the only state in the country with no local Pharmacy school. This past year, Dr. Arthur Nelson, the founding Dean of the College of Pharmacy at Texas Tech. University was hired by UA to conduct a feasibility study on Pharmacy education in Alaska. His report is currently under review by university administration. While we have a long way to go, this is movement in the right direction and the administration of UA should be congratulated for taking this step. The focus of administrators across the UA system on developing a direction and focus for Biomedicine via the recent Biomedical Summit is also something I have been anxiously awaiting. As I have had many discussions with administrators over the past year regarding this direction, I applaud their efforts.

Teaching is always an exciting and rewarding aspect of my year. I became a

university professor because I enjoy interacting with students. During the spring semester, I again had the opportunity to teach the graduate level Protein Structure and Function Course. As always, a fine group of graduate students participated in this class. The students read nearly 40 primary source articles and prepared research proposals and reviews on their research areas. The participation in this course is always outstanding and produces a stimulating learning environment for everyone involved. At the same time, I also taught CHEM 451, Introductory Biochemistry, Metabolism. This course is also among my favorites because it gives me the opportunity to work with undergraduates with a variety of career interests. The class seemed to work even better than usual this year with the introduction of a larger nutrition component. Discussions and case studies in class were active and students were actively engaged. I appreciate the participation of both undergraduate and graduate students in these classes. Without the level of active participation I saw this past semester, teaching would be far less enjoyable. Thank you for a great year.

As I said earlier, what makes a good year often comes back to the interactions with the many people that make up a university community. This includes not only students and other faculty but also the administration. While relationships within the university can often seem difficult and stressful, it is the give and take and constant discussion of opportunities that makes working at the university exciting. In addition to those individuals I mentioned earlier, I would like to acknowledge the many others throughout the UA community with whom I have had the opportunity to interact with over the past year.

**Save the Date:**  
**National Chemistry Week: October 17-23, 2010**  
**Science Potpourri: April 9, 2011**

## Tom Kuhn ~ Cellular/Molecular Neuroscience

It seems as though every year can be distilled with one caption. Most appropriate for this past year would be “A Lesson in Life”, a mixture of highlights interspersed with somber moments. I will open with the most important highlights.

My research theme focuses on the molecular mechanisms underlying inflammatory processes pivotal to the phenomena of aging and chronic degenerative CNS diseases and the tremendous health benefits derived from a nutritious diet rich in fruit and vegetables, particularly Wild Alaska Bog Blueberries. We have made significant progress in identifying and characterizing individual natural compounds that potently inhibit molecular, biochemical events in inflammatory signaling. A manuscript accepted by ‘Cellular and Molecular Neuroscience’ demonstrated our findings that inflammatory signals cause chronic harm to the neuronal actin cytoskeleton, implicated in numerous fundamental biological processes. We have several more manuscripts in process.

During the last year I graduated three Ph.D. students. **Brian Barth** is a postdoctoral fellow at Penn State, College of Medicine (Hershey, PA). **Max Kullberg** finished his research on drug delivery to target breast cancer and is now a postdoctoral fellow in the Department of Pharmaceutical Science at the University of Colorado Denver. **Sally Gustafson** carried the burden of our blueberry research and oxidative stress while she prepared for her medical school exam. Let us all keep our fingers crossed. **Kriya Dunlap** established her research avenue linking nutrition, exercise, inflammation and obesity and is now an independent research faculty member.

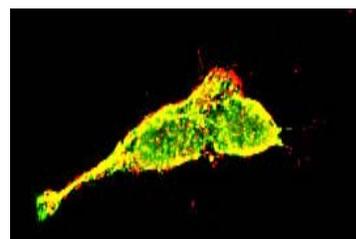
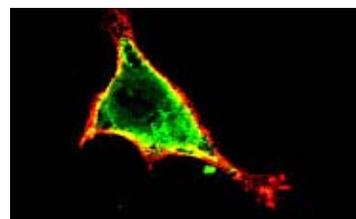
Congratulations! Last fall **Mary Hogan** joined my lab and I am blessed with yet another fantastic graduate student. She has made tremendous progress in the past month and aside from excelling in core graduate courses, and TA responsibilities, she also finished an independent study ‘the neurobiology of the cerebellum.’ Oh did I mention that she also has three kids and their extracurricular activities and a house full of pets! She finished this year with a detailed plan for her thesis research which culminated in two grant proposals (greatly accelerated by a graduate course taught by my colleague and good friend Marvin Schulte), a complete thesis introduction, an impressive data set, and the successful culturing of purkinje neurons from the cerebellum.

On the teaching side, I was able to develop a new graduate course focusing on ‘Cellular Signaling’ with the help of some of our best graduate students. We read a huge stack of papers (somewhere around 40) ranging from review articles to research articles covering the structure-function relationships underlying signal transduction. Three of our students will soon take the Ph.D. comprehensive exam and I know they will do great.

As every year, working with my good colleague and friend Marvin Schulte is a highlight. In the process of accreditation, we were ‘forced’ to review our progress in shaping the Graduate Program in Biochemistry and Molecular Biology (BMB). Not only were we pleased with all the program improvements, but

more so with the high caliber students enrolled in the BMB program. Together we have worked out a detailed strategic plan of how to further develop the BMB program with respect to research and teaching. In the coming fall, we will start a BMB colloquium where we hope to teach our students the necessary skills (aside from research and teaching) to excel in the real world – the world where you have a job and have to perform. I think of this as an opportunity to pass on the “secret handshake.” Lastly, efforts on a pharmacy school caught the attention of UAF and UAA and a feasibility study was conducted. You will find more details in Marvin Schulte’s section.

Now back to the beginning – a lesson in life. This year I was forced to say farewell to two good colleagues. Sean Esslinger, a faculty at the University of Montana, and a good friend of mine passed away at 42 after a traffic accident. And then one of my best friends in science and most influential mentor, James Joseph, also passed away. Jim left a huge mark in my life and in that of many young scientists. Both left this world way too early and are dearly missed. Now it is up to me and many others to continue their legacy, which we will do so proudly. On the other hand, Kriya Dunlap had a baby boy just before Christmas, who is thriving and keeping his parents on the move. And no, this event does not qualify me as “science grandpa” (ouch!). So this year just showed me yet again how tenuous our hold is on life and the need to make the most out of it. I very much look forward to the next year and all its challenges and surprises.



**Neuroblastoma cells stained for neutral sphingomyelinase (nSMase) (green) and lipid rafts (red). Colocalization of nSMase with lipid rafts is shown in yellow. Under control conditions, there exists a basal level of nSMase associated with lipid rafts (upper panel). After exposure to an inflammatory stimulus, there is dramatic increase of nSMase association in lipid rafts (lower panel) in conjunction with increased enzymatic activity. This nSMase activation reflects the earliest molecular process of inflammatory signal transduction leading to neuronal degeneration.**

## Biochemistry and Molecular Biology ~ Tom Kuhn & Marvin Schulte

In the wake of the current accreditation process and the past 5 years of program development undertaken us, we would like to take this opportunity to reflect on the academic and research growth of the program. First, we would like to welcome Dr. Brian Edmonds to our Program. His biophysics expertise and research on synaptic transmission will greatly enhance our education and research aspirations. Dr. Edmonds obtained his PhD under the guidance of nobel laureate Dr. Eric Kandel, Columbia University, and postdoctoral training at the prestigious University College London in ion channel biophysics and at UCAL in synaptic physiology.

Presently, our program is home to 21 graduate students (spring 2010 enrollment) of which 11 are Ph.D. students and 10 are M.S. students. In the fall, three new graduate students will join our program. This year alone we graduated 5 students: Sally Gustafson (Ph.D.), Bjorg Edberg (M.S.), Anshul Pandya (Ph.D.), Max Kullberg (Ph.D.), and Brian Barth (Ph.D.). Congratulations to these graduates!

With respect to academic training, we have implemented many improvements. Our undergraduate curriculum builds upon the chemistry core requirements with a restructured two-semester sequence of 400 level courses. The first half of this sequence focuses on the “life” of three key macromolecules: DNA, RNA and Proteins. The second half explores the metabolic pathways and their role in homeostasis and disease. Next, we plan to develop a good training venue for technological skills and are exploring several options including restoration of a Biochemistry lab course or a revitalization of undergraduate laboratory research opportunities. We have also begun thinking of ways to enhance course offerings in Biochemistry with the rather limited faculty available to our program. One solution may be the introduction of short 1-credit modules of undergraduate courses in topics related to our core graduate curriculum. We envision these courses to be offered adjacent to graduate courses, but strictly at an introductory level. This could create a diverse course selection for undergraduates, particularly since our graduate course offerings have continued to develop. In recent years, we have developed core courses in Biochemistry to enhance the graduate program and provide a theoretical basis for students participating in the burgeoning Biomolecular research of faculty throughout the UA system. Our core curriculum now includes *Protein Structure and Function*, *Gene Expression*, and *Membrane Biochemistry*. This past spring, we developed a fourth graduate course “*Cellular Signaling*” that fills a gap we identified through our improved skills assessment for graduate students. We also have plans to establish a graduate course with a focus on “*Pharmacology and Receptor Kinetics*”. Lastly, we have initiated an accelerated education track, a combined B.S./M.S. option. A newly structured, very stringent Ph.D. comprehensive exam forms part of our new assessment strategy and has proven to be a highly effective measure of student ability and programmatic strengths and weaknesses. The increased stringency of the program has produced a dramatic improvement in overall student performance including quality of laboratory research, and student publications. We are very pleased that this

approach is bearing fruit. Our students typically move on to excellent postdoctoral positions. Recent graduates are currently working at NIEHS, UCLA, UC Denver, or Penn State, in the pharmaceutical industry/biotech (Pfizer, Xoma), or succeeded in acceptance to Medical Schools. One exciting development for the coming year will be the introduction of a *colloquium* for all BMB students and faculty. Within the colloquium we intend to prepare our students for future success by emphasizing critical professional skills including writing and reviewing of grants and manuscripts, research presentation, mentoring, obtaining research positions, successfully navigating graduate school and many other important topics. We think of this as passing on the “secret handshake” and we hope it will provide our students with a more complete and well-rounded experience at UAF. Our goal is to create a program that produces researchers with the skills necessary to be active, independent scientists. The changes observed in our students have convinced us we are on the right track.

In regard to research, all BMB faculty members run externally funded research programs, including R01 and R15 support through the NIH. Much of the research conducted by BMB faculty is focused proteins that operate within the context of the lipid bilayer. Current research encompasses Molecular Pharmacology, Protein Structure and Function, Biophysics and Membrane Neurochemistry, Neuroinflammation, Drug Development and Natural Products Chemistry. The scope of research has continued to expand as collaborations inside and outside of UAF have increased. BMB faculty and their research represent an integral part of the fledging biomedical research endeavor at UAF. It is important to note that the majority of research in these areas, while led by faculty, is actually performed by graduate and undergraduate students. We believe continued growth and development of the BMB program and the increasing high quality of our students make them a valuable and essential component to the future success of Biomedical and Biomolecular research within the UA system.

Last but not least, the BMB program aspires to advance molecular research and education across departments at UAF as well as UAA in collaboration and synergy with other programs. we developed a detailed strategic plan for the future growth and expansion of Biochemistry at UAF. This strategic plan calls for increased interactions with other biomedical efforts including CANHR (Center for Alaska Native Health Research) and INBRE (IDeA Network of Biomedical Research Excellence). One of our most successful initiatives was the founding and organization of the University of Alaska Biomedical Research Conference (UABRC). Next year we will mark our 7th successful UABRC (University of Alaska Biomedical Research Conference)! This conference is the only statewide effort bringing together UA biomedical students and faculty throughout Alaska to exchange ideas and technologies. Student presentations, excellent external speakers and social contact make this a highly anticipated event in our academic year. BMB faculty members have also been active at pursuing

*Continued on page 13*

## Kelly Drew ~ Neuropharmacology

**Tulasi Ram-Jinka** is finishing his Interdisciplinary Ph.D. in neuroscience and is planning his thesis defense for fall semester 2010. Tulasi has made a significant discovery that a seasonal change in sensitivity to the effects of adenosine in the brain of arctic ground squirrels plays an essential role in hibernation. Tulasi is in the processes of preparing a report of this work. In collaboration with **Zac Carlson**, Tulasi also published a related paper this year showing that rats fed a restricted diet display some of the same changes in sensitivity to the effects of adenosine as noted in arctic ground squirrels during the hibernation season (Jinka et al., 2010). This work was funded by the US Army Research Office W911NF-05-1-0280 and by the National Institute of Neurological Disorders and Stroke NIH R15NS070779.

**Zac Carlson** began collaborating on these projects with Tulasi as an undergraduate student which then inspired him to set up a GTP binding assay to characterize changes in adenosine receptors. Zac finished his B.S. degree in chemistry and biochemistry and is now working towards an M.S. in chemistry. **Lori Bogren**, a first year Ph.D. student in the Biochemistry and Molecular Biology Program, is leading our DOD funded effort to investigate resistance to multiorgan failure following cardiac arrest or hemorrhagic shock in arctic ground squirrels. This work is the basis of our proposal to bring a new 600 MHz NMR to the department. **Joel Vonnahme** is another first year student in the Biochemistry and Molecular Biology Program. Joel served as a TA for the department last year and is studying neurogenesis in arctic ground squirrel neural stem cells.

**Velva Combs** is wrapping up her Interdisciplinary M.S. degree this summer. Velva worked tirelessly to set up a rodent cardiac arrest model in collaboration with the University of Miami School of Medicine. Velva succeeded in setting up the model and is currently wrapping up data analysis from an experiment

designed to test the hypothesis that stimulating NMDA glutamate receptors after a cardiac arrest will attenuate progressive brain injury.

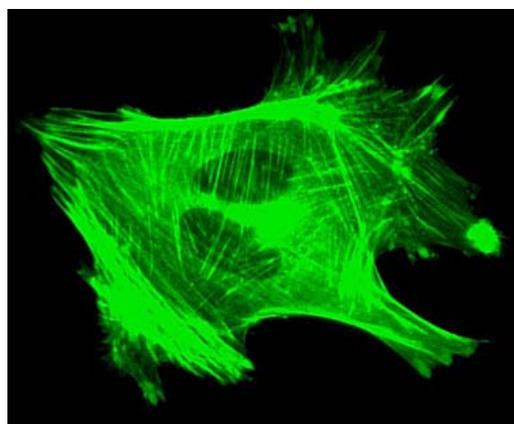
We have also been fortunate to host a number of undergraduate and high school students in the lab this year. **Jasmine Davis** led an effort with **Lindy Smith** and **Jeff Danielson** in collaboration with **Tulasi Jinka** to test the hypothesis that lower resting body temperature is a biomarker of sensitivity to adenosine signaling. This group also investigated whether changes in voluntary food consumption is related to changes in sensitivity to adenosine. They found that lower body temperature does indeed predict sensitivity to an adenosine agonist. This work has led to the hypothesis that increases in adenosine sensitivity lowers metabolism and resting body temperature and leads to a decline in food consumption prior to hibernation. Jasmine was supported by a undergraduate research fellowship from the UAF Vice Chancellor for Research and presented her results at the UAF Undergraduate Research Symposium. **Dan Widener**, another undergraduate student has been working under Brian Rasley's supervision in a collaborative effort to analyze adenosine in biological samples from the arctic ground squirrel. Both Dan and Jasmine have been supported by an NIH INBRE grant that includes a program for undergraduate research.

None of this work would have been possible without the dedicated effort of our lab manager and technician **Jeanette Moore**. Jeanette provides an essential presence in the lab where she demonstrates an unflinching work ethic, exceptional organizational skills and an ability to guide and nurture students. Jeanette has also taken the lead in continuing work started by Daniel Kirschner. Daniel joined Nektar Therapeutics last October after finishing his Ph.D.

## Biochemistry and Molecular Biology - *continued from page 12...*

new opportunities and initiatives for the university. This past year BMB faculty, in collaboration with others in Chemistry, were able to obtain funds to expand the NMR facility. Additional efforts to move towards the development of UA's first clinical doctorate were recently rewarded when a feasibility study was conducted regarding the development of a School of Pharmacy in Alaska.

As we move forward into the future, we see many opportunities and challenges. Economic woes continue to assault higher education and the BMB program is not immune. As a small program our gains are at risk. However, we are confident that continued perseverance and success will gain the support of administrators who will recognize the quality of our students, the skills of our faculty and the bright future ahead for this program. We appreciate the support of our students and their continued lobbying on behalf of the BMB program. In return, we promise our students to continuously advance and improve this program.



**The actin cytoskeleton: an intracellular dynamic network organizing fundamental biochemical and cellular processes (expression of green fluorescent protein engineered onto actin).**

## Selected 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<sub>3</sub>(Me<sub>2</sub>pzH)<sub>3</sub>] (Me<sub>2</sub>pzH = 3,5-Dimethylpyrazole); Interpreting the Results with Density Functional Theory Calculations. *Journal of Chemical Crystallography* **40**:583-590.
- Carlson, D., D. Donohoue, U. Platt, and W. R. Simpson.** 2010. A low power automated MAX-DOAS instrument for the Arctic and other remote unmanned locations. *Atmospheric Measurement Techniques* **3**:429-439.
- Clausen, T. P., J. Chen, J. P. Bryant, F. D. Provenza, and J. Villalba.** 2010. Dynamics of the Volatile Defense of Winter "Dormant" Balsam Poplar (*Populus balsamifera*). *Journal of Chemical Ecology* **36**:461-466.
- Dave, K. R., R. Anthony Defazio, A. P. Raval, O. Dashkin, I. Saul, K. E. Iceman, M. A. Perez-Pinzon, and K. L. Drew.** 2009. Protein kinase C epsilon activation delays neuronal depolarization during cardiac arrest in the euthermic arctic ground squirrel. *Journal of Neurochemistry* **110**:1170-9.
- Domine, F., S. Houdier, A. S. Taillandier, and W. R. Simpson.** 2010. Acetaldehyde in the Alaskan subarctic snowpack. *Atmospheric Chemistry and Physics* **10**:919-929.
- Duffy, L. K., C. H. Middlecamp, A. Godduhn, and C. E. Fabbri.** 2009. Using Culture, Policy and Traditional Knowledge to Improve Engagement in Science Courses. *American Journal of Applied Sciences* **6**:1560-1566.
- Duffy, L. K., M. W. Oehler, Sr., R. T. Bowyer, and V. C. Bleich.** 2009. Mountain sheep: an environmental epidemiological survey of variation in metal exposure and physiological biomarkers following mine development. *American Journal of Environmental Sciences* **5**:295-302.
- Englund, B. M., L. Griffeth, and T. P. Clausen.** 2009. A 9,13-epoxylabdane from *Colophospermum mopane*. *Phytochemistry Letters* **2**:144-147.
- Ghose, S. K., G. A. Waychunas, T. P. Trainor, and P. J. Eng.** 2010. Hydrated goethite ([alpha]-FeOOH) (1 0 0) interface structure: Ordered water and surface functional groups. *Geochimica et Cosmochimica Acta* **74**:1943-1953.
- Hazai, E., P. Joshi, E. C. Skoviak, A. Suryanarayanan, M. K. Schulte, and Z. Bikadi.** 2009. A comprehensive study on the 5-hydroxytryptamine(3A) receptor binding of agonists serotonin and m-chlorophenylbiguanidine. *Bioorganic & Medicinal Chemistry* **17**:5796-805.
- Jinka, T. R., Z. A. Carlson, J. T. Moore, and K. L. Drew.** 2010. Altered thermoregulation via sensitization of A1 adenosine receptors in dietary-restricted rats. *Psychopharmacology (Berl)* **209**:217-24.
- Kirschner, D. L., and T. K. Green.** 2009. Separation and sensitive detection of D-amino acids in biological matrices. *Journal of Separation Science* **32**:2305-2318.
- Kirschner, D. L., A. L. Wilson, K. L. Drew, and T. K. Green.** 2009. Simultaneous efflux of endogenous D-ser and L-glu from single acute hippocampus slices during oxygen glucose deprivation. *Journal of Neuroscience Research* **87**:2812-20.
- Knepp, T. N., J. Bottenheim, M. Carlsen, D. Carlson, D. Donohoue, G. Friederich, P. A. Matrai, S. Netcheva, D. K. Perovich, R. Santini, P. B. Shepson, W. Simpson, T. Valentice, C. Williams, and P. J. Wyss.** 2010. Development of an autonomous sea ice tethered buoy for the study of ocean-atmosphere-sea ice-snow pack interactions: the O-buoy. *Atmospheric Measurement Techniques* **3**:249-261.
- Ma, Y., S. Wu, B. Rasley, and L. Duffy.** 2009. Adaptive response of brain tissue oxygenation to environmental hypoxia in non-sedated, non-anesthetized arctic ground squirrels. *Comparative Biochemistry and Physiology, Part A: Molecular & Integrative Physiology* **154A**:315-322.
- Mason, S. E., C. R. Iceman, K. S. Tanwar, T. P. Trainor, and A. M. Chaka.** 2009. Pb(II) Adsorption on Isostructural Hydrated Alumina and Hematite (0001) Surfaces: A DFT Study. *Journal of Physical Chemistry C* **113**:2159-2170.
- Mason, S. E., C. R. Iceman, T. P. Trainor, and A. M. Chaka.** 2010. Density functional theory study of clean, hydrated, and defective alumina (1 1 0<sub>2</sub>) surfaces. *Physical Review B* **81**:125423.
- McLean, S., S. M. Richards, S.-L. Cover, S. Brandon, N. W. Davies, J. P. Bryant, and T. P. Clausen.** 2009. Papyriferic Acid, An Antifeedant Triterpene From Birch Trees, Inhibits Succinate Dehydrogenase From Liver Mitochondria. *Journal of Chemical Ecology* **35**:1252-1261.
- Mölders, N., S. E. Porter, C. F. Cahill, and G. A. Grell.** Influence of ship emissions on air quality and input of contaminants in southern Alaska National Parks and Wilderness Areas during the 2006 tourist season. *Atmospheric Environment* **44**:1400-1413.
- Petitto, S. C., K. S. Tanwar, S. K. Ghose, P. J. Eng, and T. P. Trainor.** 2010. Surface structure of magnetite (111) under hydrated conditions by crystal truncation rod diffraction. *Surface Science* **604**:1082-1093.
- Pickett, Z. N., W. A. Howard, and K. Pang.** 2010. Spectroscopic and structural characterization of Na<sub>2</sub>[(VO)<sub>2</sub>(tta)].8H<sub>2</sub>O (tta = triethylenetetraamine-N,N',N'',N''',N''''-hexaacetate): Interpreting the results with density functional theory. *Polyhedron* **29**:521-529.
- Sundset, M. A., P. S. Barboza, T. K. Green, L. P. Folkow, A. S. Blix, and S. D. Mathiesen.** 2010. Microbial degradation of usnic acid in the reindeer rumen. *Naturwissenschaften* **97**:273-278.
- Weltzin, M. M., and M. K. Schulte.** 2010. Pharmacological Characterization of the Allosteric Modulator Desformylflustrabromine and its Interaction with  $\alpha_4\beta_2$  nAChR Orthosteric Ligands. *Journal of Pharmacology and Experimental Therapeutics*.
- Wynne, J. H., C. T. Lloyd, J. P. Buckley, R. R. Pant, and B. T. Rasley.** June 22, 2010. Mobile Self-Spreading Biocides. Patent 7,741,503.
- Yarker, M. B., D. PaiMazumder, C. F. Cahill, J. Dehn, A. Prakash, and N. Molders.** 2010. Theoretical investigations on potential impacts of high-latitude volcanic emissions of heat, aerosols and water vapor and their interactions with clouds and precipitation. *Open Atmospheric Science Journal* **4**:24-44.
- Young, B., D. Wagner, P. Doak, and T. Clausen.** 2010. Induction of Phenolic Glycosides by Quaking Aspen (*Populus tremuloides*) Leaves in Relation to Extrafloral Nectaries and Epidermal Leaf Mining. *Journal of Chemical Ecology* **36**:369-377.

## Alumni Out & About

**Laurie (Martin) Kemp** (B.S. 2002, M.S. 2005) and **Scott Kemp** (B.S. 2003, M.S. 2005) have moved from Mesa, Arizona to Northport, Alabama and have bought a house in the lake Tuscaloosa area. Scott graduated from medical school in May of this year and has accepted a residency position at the University of Alabama. He will be dually boarded in both Family Medicine and Emergency Medicine. They are expecting their second child in late October. Scott Jr. is excited about having a little brother or sister.



**Kriya Dunlap** (M.S. 2003, Ph.D. 2007) and her husband Scott Campbell are the proud parents of a baby boy Dax Campbell born in December 2009. Kriya finished up a post-doc with Tom



Kuhn and has started as a research assistant professor at UAF's Engineering, Science and Technology Experiment Station (ESTES). She is working on a pilot study funded by Nestle-Purina looking at the Glut4 glucose transporter

protein in white blood cells of sled dogs. She is also busy writing grant proposals to the American Diabetes Association and NIH, and manuscripts on the lipid content of subsistence-fed sled dogs along the Yukon River and the protective effect of Alaskan bog blueberry compounds on neutral sphingomyelinase (nSMase) activity in neuroblastoma cells. The latter was a project carried out in collaboration with Tom Kuhn. Kriya is also doing some teaching including Chem 100 Chemistry of Complex Systems this summer, and a 300-level independent studies course on polar biology for the Liberal Arts and Sciences program this fall.

## Current Student Updates:

**Robert Gorsline**, a former chemistry major and chemistry tutor at UAF, has been accepted to the Doctor of Pharmacy program at the University of Montana. Robert said getting into this program is very competitive and he has no doubts that his chemistry training at UAF helped further his academic career. "Over the last three years I have had a chance to take classes in many departments on campus, and I am convinced that the chemistry department is the best of them all." He said he especially liked how the teachers and staff in the department care about students. Amen, and bon voyage, Robert!

**Daniel Kirschner** (B.S. 2004, Ph.D. 2009) is employed at Nektar Therapeutics (www.nektar.com) in Huntsville, Alabama as a Method Development Scientist. He works with a diverse team of scientists down there developing methods for analyzing PEGylated compounds in Nektar's raw materials, intermediates, and active pharmaceuticals. PEGylation is the attachment of polyethylene glycol chains to bioactive compounds, which increases their water solubility and residence time in vivo. Nektar has several patents in this area. Dan says he is "grateful for the unique perspectives I gained in analytical and organic chemistry while working with Tom Green in cyclodextrin research," and he sends thanks to all at UAF who helped him along the way.



**Kristian Swearingen** (B.S. 2003, M.S. 2005) successfully defended his Ph.D. dissertation at the University of Washington in January, 2010. His thesis title was "Proteomic Analysis of Proinflammatory Cell Death by Capillary Electrophoresis and Mass Spectrometry." Kristian reports that he and his mentor Norm Dovichi have a paper on capillary electrophoresis in the press at the journal *Talanta*, and another paper on protein mass spec under review at the *ACS Journal of Proteome Research*. Currently, Kristian is a post-doc in Rob Moritz's lab at the Institute for Systems Biology in Seattle. His message: "Thanks for everything! My experience at UAF was excellent preparation for my Ph.D. work and my development as a scientist."



Photo by MADIG

**John Keller,  
Tom Clausen, and  
Richard Stolzberg**



Department of Chemistry & Biochemistry  
 College of Natural Science & Mathematics  
 University of Alaska Fairbanks  
 P.O. Box 756160  
 Fairbanks, Alaska 99775-6160



Volunteers at KUAC's annual fundraiser October 2009.  
 Bill Simpson, Brian Edmonds, John Keller and Richard Stolzberg

## 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: [fychem@uaf.edu](mailto:fychem@uaf.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](http://www.uaf.edu/chem)

Name: \_\_\_\_\_  
Please include maiden name if applicable

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Year Graduated: \_\_\_\_\_ Degree Received: \_\_\_\_\_

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

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



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

*AlasChemist is a publication of the Department of Chemistry & Biochemistry*  
 Editor John Keller  
 Managing Editor Mist D'June-Gussak



**UNIVERSITY OF ALASKA FAIRBANKS**

America's Arctic University

The University of Alaska Fairbanks is accredited by the Northwest Commission on Colleges and Universities. UAF is an affirmative action/equal opportunity employer and educational institution.