



AlasChemist

Newsletter of the Department of Chemistry & Biochemistry, UAF
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A Note From The Department Chair:

It has been both a year of advances and setbacks for the department. Professor Rafail Khairoutdinov, a good friend and a very talented scientist, succumbed this spring to a long battle with cancer. Dr. Kelly Drew, another strong talent within the department, has accepted a position with the University of Nebraska and will hence be leaving the department this year. We have finished one academic year without Professor Stolzberg's vast contributions to our curriculum due to his recent retirement. Finally, this will be Sheila's last academic year with us since she will be exercising a well deserved retirement starting the summer of 2007. The challenges facing the department to replace these extraordinary people are going to be immense.

Still, we have had a number of benchmarks that I take as evidence that we remain a strong department. Some of the most noticeable achievements of our students are seen in the following bulleted list:

- **Anna Godduhn** (PhD student) received a Cooperative Institute for Arctic Research (CIFAR) award.
- **Sayali Kulkarni** ((MS student) has received support from Idea Network for Biomedical Research Excellence (INBRE).
- **Rodney Guritz & Grant Wright** received undergraduate research awards from EPSCoR
- **Mike Jaramillo & Ben Warlick** (undergraduates) presented results to the 11th Annual Conference on *in vivo* Methods held in Villasimius, Italy this May.
- **Ann Wilson** (undergraduate) presented results of her summer research project at Stanford at the Annual Biomedical Research Conference for Minority Students (ABRCMS) in Atlanta, Georgia.
- **Dan Kirschner** (MS student) presented his research this May at the XIII Cyclodextrin Symposium held in Italy.
- **Njideka Chukwu, Sreepurna Malakar & Kunal Jeet Tanwar** (PhD students) received fellowships from the graduate school.
- **Tania Deisher** (undergraduate) received the Outstanding UAF graduating female (Marion Frances Boswell Memorial) award along with the prestigious Brina Kessel Medal for Excellence in Science (Chemistry students have taken this latter award five times in the last seven years!)
- **Abe Tsigonis & Adam McMahan** (undergraduates) have accepted offers from Medical Schools
- **Kriya Dunlap** participated in a 15 day skijoring race in Spain, France and Andora and placed 5th.
- **Emily Glowacki, Shane Rideout, and David Wilkinson** (undergraduates) are participating in foreign exchange programs in Sweden, Korea and Puerto Rico respectively.
- **Mike Wilkinson** will be participating in a medical internship in India fall 2006.
- **Joy Gonzales, Tiffany Larson, Patrick Tomco, & Greg Cushing** (Graduate students) have or will be serving as adjunct faculty to help the department deliver our curriculum. I consider these teaching assignments as a reflection of our trust in these students' character and abilities.
- **Tania Deisher** and **Richard Hallock** participated in an NSF funded project (Teaching Alaskans...Sharing Knowledge; TASK). Her duties were to form a bridge between the science resources at UAF and a local grade school class.

- This May commencement listed 12 baccalaureate, 5 master, and 4 doctorate degrees.

Several faculty within the department were also recognized for their accomplishments. **Kelly Drew** was the recipient of this year's Usibelli award for Excellence in Teaching. This is perhaps the highest award given at UAF and it is remarkable that in much less than a decade, our department has had four faculty receive Usibelli Awards (**Clausen, Benner, Duffy and Drew**). She also is the recipient of this year's Sven Ebbesson Award for Excellent in Neuroscience. The Athletic department also recognized two faculty (**Clausen & Green**) and one instructor (**Gonzales**) for their support for athletes involved in our courses. Finally, **Clausen & Keller** were presented awards from Dr. Gary Larsen for their continued support of the Alaska High School Science Symposium (AHSSS) competition.

The department continues to improve its instrumentation resources with other units. We recently purchased (thanks to an NSF grant written by **Green**) new HPLC and capillary electrophoresis instruments that have already been assimilated into our curriculum and several research projects. Very recently, we have ordered a laser scattering detector for the HPLC which will enable us to analyze substances with weak chromophores as well as an ion chromatograph that will nicely complement our existing Atomic Absorption and ICP MS facilities. Indeed, our laboratory instrumentation has increased to the point that it is becoming a challenge to find space for new additions.

The department's collaborative associations with other units remain strong. Through joint appointments, we continue to have ties with the Geophysical Institute (GI), Institute of Arctic Biology (IAB), and the College of Rural and Community Development (CRCD). We have a number of affiliate faculty from other departments (biology) and campuses (UAA and UAS). We are currently pursuing offering a pre pharmacy degree through CRCD. Finally, several faculty (**Duffy, Kuhn, and Clausen**) have established ties with the School of Natural Resources and Agricultural Science (SNRAS) through a collaborative research project on blueberry antioxidants.

The department continues to strive to use new technologies to deliver our courses. **Brian Rasley** is very active in delivering distance courses through his joint appointment with CRCD. **Thomas Kuhn** has had so much success in delivering courses between UAF and Montana State University via the Grid Node that he is working on establishing a formal Grid Node Classroom within the Natural Science Facility. A few years ago we led the University in adopting Web-Based On-line homework in our courses (including Basic

General Chemistry (103X), General Chemistry (105X/106X) and General Chemistry (321/322). We are now, once again, leading the University by adopting "clicker" technology in several of our classes. This technology allows students to use clickers (similar to TV remote controls) to answer questions in class that provides both the students and instructors immediate feedback on student grasp of new material.

So while career path changes, retirements, and mortality have challenged our department, the above examples of excellence and growth clearly shows that the department remains very strong and continues to grow to meet our new students' needs. I am convinced this is because our faculty and staff are outstanding scientists, teachers, and citizens that are able to inspire our talented students. It is wonderful to be associated with all of them.

Tom Clausen

Program in Biochemistry and Molecular Biology

Our Program in Biochemistry and Molecular Biology (BMB) is continuously gaining momentum and expanding due the contributions of all affiliate faculty. I have the pleasure to coordinate the BMB program together with Dr. Marvin Schulte. The BMB program is an interdepartmental program administered by the UAF Chemistry Department and includes new faculty from UAF, UAA, and UAS. Many of our efforts and successes would not have been possible without the support from the AK Specialized Neuroscience Research Program and the AK INBRE. Our BMB faculty are well funded from various federal and non-federal sources (NSF, NIH, DOE, USDA) and research efforts cover a wide spectrum ranging from environmental (neuro)toxicology, to neuronal degeneration and regeneration, regulation of neuronal systems, ion channel regulation, DNA repair, gene expression, intracellular signaling, metabolic suppression, and energetics of microorganisms. Our program has now 11 faculty with active research labs and a total of 24 graduate students. This year, the BMB graduate program received a total of 20 applications. We admitted 11 applicants with funding, 4 applicants without funding, and had to decline 5 applicants. Unfortunately, we are receiving many more outstanding applications than we can accept. Clearly, expanding our capacity to fund graduate students is a continuous challenge for the BMB program.

Tom Kuhn

Environmental Chemistry Program

The 2005-06 academic year saw the start of the Environmental Chemistry Group meeting. The group meetings, attended by members of the Simpson, Cahill and Trainor labs, were intended to serve as a venue for the E-Chem grad students to present their research results and ideas to a “friendly” but diverse audience. The group meetings were organized by Ph.D. student **Randy Apodaca** and included presentations by Dr. **Sarah Petitto**, Ph.D. student **Laura-Alvarez-Alviles**, Ph.D. student **Kunal Tanwar**, Ph.D. student **Ted Wu**, MS student **Kristen Williams**, Ph.D. student **Dan Carlson**, Ph.D. student Randy Apodaca, Ph.D. student **Anastasia Ilgen**, MS student **Joy Gonzales** and Ph.D. student **Dea Huff**. The presentations spanned numerous aspects of environmental chemistry – from snow-pack chemistry, tropospheric NO_x, aerosol transport, and the structure and reactivity of the mineral-water interface – and were accompanied by great discussions and interactions among the group members. The faculty mentors for the group (Simpson, Cahill and Trainor) have chosen to recognize the student who gives the years best presentation. The Environmental Chemistry Seminar Award for 2005/6 goes to **Kunal Tanwar** for his talk on “Effects of Fe(II) on the Structure and Reactivity of Iron-Oxide Surfaces”. We hope this is the beginning of a long standing tradition of joint group meetings.

The environmental chemistry graduate program continues to expand. For the upcoming 2006-07 academic year we have four new graduate students joining the program (out of a pool of 9 applicants). Our current limitation on further program expansion is largely a result of faculty vacancies. We hope to have a new Environmental/Analytical chemist on board soon to expand the size and scope of the program. The curriculum changes made to the graduate program in 2004-05 (including the creation of the new CHEM 605 Fundamentals of Environmental Chemistry, and CHEM 609/GEOS 631 Environmental Geochemistry) have been well received and are starting to mature into well established courses. Our next target will be a revamping of the undergraduate curriculum and (we hope) expansion of the number of undergraduate E-Chem majors.

Tom Trainor, William Simpson and Cathy Cahill

GRADUATES

Austin Ross	Aug	Ph.D.
Ted Wu		Ph.D.
Huiwen Zhao	Dec	Ph.D.
Xiaoming Zhao	Dec	Ph.D.
Bongchu Chi	Dec	M.S.
Greg Cushing		M.S.
Andrew Krohn	Aug	M.S.
Roger Nelson-Rothschild	Dec	M.S.
Kristian Swearingen	Dec	M.S.
Collette Garrison		B.S.
Jolie Crow		B.S.
Tania Deisher		B.S.
Emily Glowacki		B.S.
Danielle Harris		B.S.
Zach Hill		B.S.
Michael Jaramillo		B.S.
Danielle LaVictoire		B.S.
Vanessa Ritchie	Dec	B.S.
Abraham Tsigonis	Dec	B.S.
Ben Warlick		B.S.
Maegan Weltzin		B.S.
Wally Drumhiller	INDS Aug	B.A.
Scott Kawasaki	INDS	B.T.



1st: Collette Garrison, Jolie Crow, Tania Deisher, Abe Tsigonis, Maegan Weltzin; 2nd: Mike Jaramillo, Zach Hill, and Greg Cushing (photo by Cathy Cahill).

AWARDS

Outstanding Chemistry Student

Zachary Hill

Elaine Jacobson Scholarship

Chloe Howe

Freshman Achievement Award

**Heather Neal
David Wilkinson**

Undergraduate Award in Analytical Chemistry

Grant Wright

Alaska Chapter ACS Award

Chelsea Paskvan

Quinton Costello Memorial Scholarship

Richard Hallock

Brina Kessel Award - Excellence in Science

Tania Deisher

Marian Francis Boswell Memorial Award
(Outstanding Graduating Senior Woman)

Tania Deisher

Tilly, Gray & Lola C. Scholarship

Zachary Pickett

American Institute of Chemists

**Greg Cushing
Elvin Brown
Michelle Russell
Angela Largen**

HyperCube Scholar Award

Greg Cushing

Schlumberger Engineering

Amy Rask

Harriet Hess Scholarship

Ann Wilson

David Luchini Memorial Scholarship

Grant Wright

OUT & ABOUT

Jolie Crow (B.S. 06) is moving to Germany with her family

Vanessa Ritchie (B.S. 05) has been admitted to the MS Environmental Chemistry program at UAF.

Ted Wu (Ph.D. 06) is a postdoc with USDA Agricultural Research Service on the UAF campus as a Research Chemist.

Greg Cushing (M.S. 06) has been accepted into the PhD program in Physical Chemistry at Univ of Virginia, Charlottesville.

Ben Warlick (B.S. 06) has been accepted into the PhD Program in Molecular and Cellular Biology at University of Illinois Urbana-Champaign.

Zachary Hill (B.S. 06) has been accepted into the PhD Program in Chemistry at the University of Washington.

Abraham Tsigonis (B.S. 05) has been accepted into the WAMI Program at the University of Washington.

John Rowley (B.S. 05) has been accepted into the PhD Program in Chemistry at Johns Hopkins University.

Austin Ross (Ph.D. 05) is a technical writer for the Blood Bank of Alaska in Anchorage.

Bongchu Chi (M.S. 05) is working in Quality Control at Flint Hills Refinery.

Andrew Krohn (M.S. 05) is a Biological Science Technician, Plant Pathology USDA Ag Research Service, Subarctic Research Unit, UAF.

Kristian Swearingen (B.S. 03; MS 05) is at Univ of Washington in their PhD in Chemistry program.

Huiwen Zhao (Ph.D. 05) is a postdoc at UC San Diego.

Aporn Stein (B.S. 02) is receiving her PharmD from Oregon State in June. She will be working at Harry Race Pharmacy in Sitka, AK.

Lonita Lohse (B.S. 05) worked as a lab technician at Stanford for the past year. She will be entering the PhD Neuroscience Program at the Mayo Graduate School in Rochester, MN this fall.

Mark Angerhofer (M.S. 03) is working for the State of Colorado in the Department of Public Health and Environment.

Lee Ann Smith (M.A. 98) has been hired as an Instructor at Western Kentucky University.

Yunny Na Dang (B.S. 96) was married June 3, 2005. She is a Financial Planner for Lincoln Financial Advisors in Portland, OR.

Yancy Bodenstein (B.S. 94; M.S. 97) went back to school and completed his Masters in Public Health in Epidemiology. He now works for NIH at the National Center for Complementary and Alternative Medicine in the Science Policy Office.

Mike McCarthy (B.S. 86) received the Broida Prize from the International Symposium on Free Radicals. This award honors young scientists who have made an outstanding contribution to the field of molecular spectroscopy, in Mike's case the rotational spectroscopy of reactive molecules, including free radicals, carbenes, etc. He is a Senior Research Scientist at the Harvard-Smithsonian Center for Astrophysics in Cambridge, MA.

Matt (B.S. 97) and Erin (B.S. 97) Narus are the proud parents of Maureen, born March 13, 2005. Matt works for Jacobs Engineering and Erin is one of two pharmacists at the Tomah VA Medical Center in Tomah, Wisconsin.

Steve LePage (M.S. 99) and Amy are the proud parents of Mitchel Raymond LePage born May 20, 2006.

FACULTY

Cathy Cahill - My group and I have had another exciting and productive year. The highlight of the year is that **Ted Wu**, one of my graduate students, received his Ph.D. in Environmental Chemistry. Way to go Ted! He is already gainfully employed as a postdoctoral fellow with the USDA. **Joy Gonzales**, my other graduate student, is making good progress towards her doctorate as well. It was a good year for my graduate students.

Once again I had two excellent cadres of students in my classes. My CHEM 434W, Instrumental Methods in Physical Chemistry, students always impress me with their hard work and dedication. This year's class was no exception; they were great! My CHEM 631, Environmental Fate and Transport, students were also a pleasure to teach. Every semester I am reminded of what amazing students we have and why I enjoy teaching.

This year ended up being an exceptionally exciting research year due to the eruption of Mt. Augustine on top of everything else I had planned. I sampled the volcanic ash that reached Homer. The preliminary size and mass results are very exciting so I can't wait to see the chemical analysis results! I also learned how to spot volcanic ash and steam clouds from satellites and how to identify explosive eruptions from seismic station data. Apparently you can teach an old dog new tricks! In addition to researching volcanic emissions, I am working with the Alaska Department of Environmental Conservation to improve air quality in Alaska, helping the National Park Service establish a long-term air monitoring site for its Arctic parks, examining the smoke emitted by masonry heaters and forest fires, analyzing the aerosols over the Bering and Chukchi Seas and creating battery powered, portable air samplers for use around the world. It's been a very busy and successful research year.

Looking back on the past year reminded me why I love working at UAF. Where else can an Associate Professor be setting up an air sampler while volcanic ash is falling one week, teaching awesome students the next and schmoozing in Washington D.C. or Montenegro the week after that? I love my job and look forward to many more happy and successful years in the Department of Chemistry and Biochemistry at UAF.

Tom Clausen - I have four research projects that have either been recently completed or are ongoing. **Brian Englund** completed his MS work a year ago last spring in which he isolated and characterized the structure of a new compound that we predicted would be present in a plant based on biosynthetic reasoning. I have submitted a paper with him and **Loda Griffeth** in

the Journal of Natural Products. Another project headed by **John Bryant** (Emeritus Professor from IAB) has recently been completed in which we demonstrated a strong link between wildfire history and plant (birch) defense. The results of this work have been recently submitted to Nature. **Patrick Tomco** is an MS student who in only one semester has managed to isolate and identify a new triterpenoid from Mountain Birch. This summer I hope to have his results submitted to the Journal of Natural Products. Finally, **Colin McGill** has just started this last semester on a funded blueberry antioxidant project. I have been extremely pleased by his progress which is now at the stage where we will begin collaboration with biochemists (Tom Kuhn & Marvin Schulte) to help guide our fractionating process.

I remain very happy with my teaching and service roles at UAF. It is very gratifying to attend commencement and see students I have worked closely with walk across the stage to receive their diploma. It is a much larger accomplishment than most of our successful students realize and I am very proud of them for it.

I continue to try to recharge my batteries over much of the summer. Last summer I made a boat trip with John Bryant and Joseph Williams (University of Tennessee) from Circle, AK to Old Crow, Canada as a joint research / pleasure trip. We went in a boat I had just built and covered about 800 miles on the round trip. We saw some amazing country! **Ed Treadwell** (University of Illinois) also came to visit and we attempted another long boat trip. While I did see some new country, mechanical troubles forced us to return early. My wife Dawn and I made a number of other river trips (including a bunch with my homemade canoe) followed by spending a week on the Kenai. It was probably my best summer ever! This spring I just had my 25th wedding anniversary with Dawn. I am a little chagrined to admit we didn't make much of an occasion of it (though I did take the day off with her). Still we have committed to making last summer the *second* best summer of our life and we are well on our way to this goal.

Kelly Drew – I am grateful for this opportunity to express my gratitude to the Department of Chemistry and Biochemistry for the many years of student centered support. I was humbled this year by receipt of two unanticipated awards, the Usibelli teaching award and the first, Sven Ebbesson award in neuroscience. Neither of these awards would have been possible without the nurturing environment and exceptional role models in the chemistry department at UAF. I have had the pleasure of working with a number of talented, motivated students at UAF and am especially proud of several of our Alaska Native students including **Allison Kelliher**, who completed her MD degree this past

spring, **Nikoosh Carlo** who advanced to candidacy for her Ph.D. degree in neuroscience at UCSD, **Adrienne Orr** who has successfully completed the 2nd year of her Ph.D. program at Stanford and **Lonita Lohse** who will be starting a Ph.D. in neuroscience at the Mayo Clinic in July after completing an internship at Stanford this past year.

Indeed, Adrienne and Lonita made such positive impressions at Stanford that my Stanford colleagues have requested more UAF students! **Ben Warlick** who has done undergraduate research with Dr. Rasley and I, will begin his Ph.D. at the University of Illinois this fall. I would also like to congratulate Dr. Sherri Christian on the birth of her 2nd child, Owen, and for receipt of the first, N.E.U.R.O.N. award at our national SNRP neuroscience meeting this spring. Sherri will be moving with her husband, Andrew Lang, to Newfoundland this summer. Meanwhile, I am lucky to have chemistry student **Ann Wilson** in the lab this summer (and hopefully throughout next year) and Jeanette Moore, an excellent technician/lab manager. Dr. Rasley and I are also lucky to have **Zach Hill** and **Grant Wright** to take over the adenosine HPLC from Ben. We appreciate the generous and continued support from NINDS and from recent support from DOD.

Lawrence K. Duffy – A year goes by quickly. Besides teaching Chem 100, I had the opportunity to teach Research Ethics as well as Introduction to Biochemistry. This was fun because these courses fit nicely into my involvement in two new initiatives: the development of an Arctic Bioethics Program and the biochemical research associated with the birth of a statewide nutraceutical industry based on blueberries. As President of the American Institute of Chemists, I get to interact with the leaders of our countries growing biotech industry. Hopefully, some of this experience will help in developing a more diverse industry base in Alaska.

The students in my lab are also moving forward. **Kriya Dunlap** finished her courses and published a paper on the protective effect of blueberries. **Anna Godduhn** developed an environmental health partnership with the village of Northway and is presenting her results at IUCH13 – an international health meeting in Novosibirik Russia this summer. **Richard Hallock** is finishing a project on mercury in reindeer on the Seward Peninsula. Richard and I were also involved in UAF's TASK program "Teaching Alaskans ... Sharing Knowledge".

On the health side, **Elizabeth Hankinson** is compiling her data on the use of cancer therapies in Fairbanks and **Alicia Porter** has completed a literature review for her research on effects of psychotropic

drugs on birth outcomes. **Micki Koblyk** is continuing her work on development of immunochemical methods. Happily on May 15, we received word from NIH that our Alaska Special Neuroscience Research Program was funded for another five years. This award will be announced at the national neuroscience program, Arctic Peoples and Beyond: Decreasing Health Disparities, that we are hosting at UAF May 31-June 2.

Tom Green - My research group is small but we have made significant progress this past year. **Daniel Kirschner** is an MS student working on the synthesis of new, modified cyclodextrins (macrocycles containing glucose units). We initiated collaboration with Eric Monflier's group of the Universite' d'Artois, France to use our cyclodextrins in aqueous organometallic catalysis. Our newly synthesized cyclodextrins show great promise as mass transfer reagents in some important industrial processes. We published an initial paper in a leading journal describing our results. **Elizabeth Wookey**, an undergraduate student, also helped on the cyclodextrin synthesis this past semester. Both Daniel and I plan to visit the Universite' d'Artois in the next year to learn more about the organometallic catalysts from the Monflier group.

Daniel Kirschner has demonstrated his versatility by also performing research on enantioseparation of DL-amino acids neurotransmitters using capillary electrophoresis and laser induced fluorescence detection. **Michael Jaramillo**, a talented undergraduate who just received his B.S. degree in Chemistry, is also working on this project, which is a collaborative effort with **Kelly Drew** of our department. Both students traveled recently with me to Italy to attend two international conferences (Cyclodextrin Symposium and *In Vivo* Methods in Neuroscience), where they both presented posters on their research. The island of Sardinia was beautiful with palm trees and warm Mediterranean waters, quite a contrast to Alaska!

Adelia Falk, a Ph.D. student working with Perry Barboza of the Institute of Arctic Biology, has been collaborating with me on the analysis of lichen metabolites by capillary electrophoresis. We have analyzed over 100 lichen samples from all over Alaska for compounds such as usnic and perlatolic acid. These secondary metabolites may have an influence on the grazing/migration patterns of caribou, which use these lichens as a principle food source, especially in the winter.

I continue to teach the Chem 324 Organic Laboratory, which is always exciting, especially when the student research projects roll around. This year, the students presented a total of seven excellent posters at

the end of the semester. Two students, **Jennifer Dukette** and **Pamela Meadors**, will continue on their research projects this summer.

Finally, **Kristian Swearingen** graduated from my group with an MS in Chemistry this past December. He is presently pursuing a Ph.D. at the University of Washington in Seattle, studying under Norm Dovichi, a leading expert in bioanalytical chemistry.



Ben Warlick, Brian Rasley, Dan Kirschner, Tom Green & Mike Jaramillo in Villesimius, Sardinia, Italy (photo by Tammie Kirschner).

William Howard - After completing his first year of graduate study, **Zachary Pickett** has prepared and partially characterized some novel, water-soluble vanadium complexes that will be tested as possible insulin mimics. Some of Zach's compounds remain stable and soluble in acidic and mildly basic solution – a necessary prerequisite for commercial development of orally administered hyperglycemic drugs. Much more work is required, however, for accurately assessing the importance of Zach's results, and so Zach and I will stay very busy this summer!

Two of my publications appeared in print over the past year. The first was an intellectual exercise concerned with considering the stoichiometry of radioactive decay reactions that occur naturally in minerals; and the second reported the synthesis, characterization, and stability of some novel vanadium compounds. Furthermore, I presented the results of our research involving the vanadium chemistry in a seminar at the American Chemical Society's 60th Northwest Regional and Small Chemical Businesses Meeting in Fairbanks, and in a poster at the 2005 PacificChem Conference & Exposition in Honolulu.

Over the past year, I enjoyed the privilege of teaching General Chemistry F105X and F106X, Basic Inorganic Chemistry F202, and Inorganic Chemistry F402. In the general chemistry courses, the students participated in classroom problem-solving exercises using hand-held, radio frequency clickers, and this past

year marked our initial experience using these devices. As we learn to use the clickers more effectively, this technology will become indispensable for teaching general chemistry and the upper level inorganic courses as well.

I have also enjoyed my work as a faculty advisor in the Academic Advising Center, and as an advisor to chemistry majors during the past year.

John Keller -. This 2005-2006 school year has had its interesting moments! As a “full-time chemist”, that is, a faculty member with 100% appointment in the department of chemistry and biochemistry, I taught my usual assignment of four courses, including the first and second semester organic chemistry lecture courses (321 and 322), a semester of organic chemistry lab (324), and a graduate course in enzymology and bioorganic chemistry (621). The most interesting event was the introduction of “clickers” in the lecture courses. In most of our larger lecture sections we have begun to use radio-frequency response cards that students use to answer quiz questions in class. A clicker is packaged with each student’s chemistry textbook. To use the clickers in class, I first install a small R_f receiver in my laptop’s USB port. Then, using a Microsoft PowerPoint add-on, I can display a quiz question on the classroom computer projector, record each student’s answer in real time (and in a database keyed to the student name), and immediately display the class responses in bar graph format. We count the responses as a small percentage of the total grade, and so students have an extra added incentive to come to class, and come prepared. We hope that the clickers will lead to increased student learning in chemistry, but this will be very difficult to prove statistically.

In the research realm, we are continuing to pursue the genes and enzymes responsible for metabolism of α -methylalanine (Aib) in soil microorganisms. Last summer **Megan Conley**, a UAF biology major, used PCR to clone two genes from *Mycobacterium smegmatis* that may encode such proteins. During the school year chemistry major **Zachary Hill** sequenced DNA from several unidentified soil bacteria that seem to be able to utilize Aib. His data reinforces the conclusion arrived at two years ago by **Jeff Bickmeier**, an M.S. student from my lab, that the Aib metabolism genes are widespread in the biosphere and of ancient evolutionary origin. Zach Hill is quite versatile: this year he also helped me in developing a new organic chemistry lab experiment dealing with the Diels-Alder reaction between carvone, a common spice component, and isoprene. The paper, recently published in the online journal *The Chemical Educator*, shows teachers how to analyze the 1-D and 2-D NMR spectra of the 15-carbon product ketone. Naturally, there is a molecular modeling component to the experiment. (It is

said that JK sees a semi-empirical calculation behind every rock and tree!)

Tom Kuhn – While writing these lines, I realize that already another year has past filled with challenges yet also rich with rewards. The hard work of all graduate students and undergraduate students solely accounts for this statement. My research interests encompasses intracellular signaling mechanisms underlying degenerative and regenerative processes in the central nervous system in particular the redox regulation of cellular motility with respect to the dynamics of the actin cytoskeleton in neuronal cells. **Brian Barth**, a first year PhD student, demonstrated that inflammatory mediators cause an irreversible and detrimental oxidation of the neuronal actin cytoskeleton through increased production of the lipid ceramide and oxygen radicals through an NADPH-oxidase. He presented his research at an international Gordon Conference in San Diego, the UA Biomedical Research Conference and at the national meeting of the Specialized Neuroscience Research Programs (SNRP). Brian receives support through an USDA grant. We have just started a new collaboration with Dr. Clausen’s laboratory as a result of the USDA support. Turns out that natural products chemistry and biomedical research can be seamlessly combined. **Sayali Kulkarni**, a first year M.S. student, is investigating the effects of actin oxidation on the kinetics of actin interactions and the consequences for cellular motility. She is working together with **Jestina Kusina** in Dr. Schulte’s laboratory, where they develop surface plasmon resonance technology to study actin interaction parameters as a function of oxidation. This joint effort represents a successful and enjoyable collaboration between Dr. Schulte’s laboratory and my laboratory. Sayali’s research presentation on this project was ranked as one of the top five presentations during the national SNRP meeting held in Fairbanks, June 2006. She received an Alaska INBRE fellowship for next year supporting her research. **Njideka Chukwu**, a first year Ph.D. student, has started her investigations into the effects of chronic, sub lethal arsenic exposure on neuronal survival and the potential benefits of dietary polyphenols in blueberries. She is funded through a fellowship from the UAF Graduate School. Lastly, I had the pleasure to work with two undergraduate students, **Sally Brown** and **Irina Mueller**. Sally helped immensely to establish a colorimetric, high throughput assay to assess neuronal survival as a function of arsenic and other toxic transition metals. Irina took on an ambitious project developing a spinal cord injury paradigm in the developing chick embryo both in the regeneration permissive and non-permissive phase. All these tremendous efforts underscore the excellent quality of everyone affiliate with the UAF Chemistry

Department. The collaborations with Dr. Schulte's laboratory, Dr. Clausen's laboratory, and the engagement in a multi-disciplinary USDA grant stand out as the most rewarding research experiences this year.

My teaching activities were no less challenging than the research. I taught Chem 451 General Biochemistry of Metabolism in the fall and was rewarded with a class full of hard-working students. I further coordinated and lectured in the joint neuroscience course with the University of Montana in the fall (cellular and molecular neuroscience) and in the spring (systems neuroscience) using Access Grid Node technology (AGN). With funds from the UAF graduate school and the Technology Advisory Board, we have now our own operating AGN and we plan to utilize this technology for our core graduate courses in our biochemistry program with the University of Alaska Anchorage. All the curricular revisions in the biochemistry graduate and undergraduate program are implemented.

Of all my services, I enjoyed the most coordinating our Program in Biochemistry and Molecular Biology (BMB) together with my colleague Dr. Marvin Schulte. Through the effort of all BMB affiliate faculty, our BMB program is not only gaining momentum but is further expanding. Chairing the Alaska Chapter of the Society for Neuroscience provided me with the chance to invite Dr. Fulton Crews, University of North Carolina at Chapel Hill, supported through UAF and the Grass Foundation. His public lecture at the Wedgwood focused on the neurobiology of alcohol addiction and recovery, which attracted over 170 people from our community. With all this successes, I am looking forward to another year of surprises.

Brian Rasley - The past year has been very busy with teaching and undergraduate research projects. I taught 2 distance delivery classes for the College of Rural and Community Development and two classes for the Department of Chemistry this past year. The overall experience was challenging but very rewarding. This summer I am continuing to work with Kelly Drew and undergraduates **Grant Wright** and **Zach Hill** on projects related to Arctic ground squirrel research. Zach will be headed to graduate school at the University of Washington this fall and Grant has EPSCoR funding for a hibernation project starting in the fall 2006 semester. As a result of my ongoing research activities with Tom Green and Kelly Drew I traveled to Italy to present research results obtained by **Ben Warlick** related to the performance of microprobes that we manufacture for hibernation research. Overall, the past year has been a busy but gratifying experience.

Marvin Schulte – This past year has been particularly rewarding in many ways. In the laboratory, I have had the opportunity to continue working with two talented researchers **Anshul Pandya** and **Abe Smyth**. Anshul is just completing his 2nd year of graduate work and is focusing on nicotinic receptor structure. Abe is in the middle of his 2nd year and is working to engineer human receptor proteins for biological sensor surfaces. Both projects are moving along well and are poised to make significant progress in the next year. Abe and Anshul both applied for fellowships from Alaska INBRE and receiving funding to support their work. **Chelsea Paskvan** is completing her bachelor's degree in chemistry and will be joining my lab as an MS student this fall. Chelsea has been instrumental in helping establish our *Xenopus* frog colony and animal care and use protocols for my laboratory. Her research project is just beginning but will focus on developing pharmacophore models for a new nicotinic acetylcholine drug class. We have also had the opportunity to work with undergraduate and high school students. **Angie Largen** developed a new assay for evaluating synthetic compounds on acetylcholinesterase. This project is part of Anshul Pandya's work on nAChRs. **Maegan Weltzin** has been developing new cell lines that will be used to evaluate new acetylcholine drugs provided by our collaborators. Three high school students also did research in my laboratory over the past year. **Brian Guritz**, **Katya Ellson** and **Charlie Stark**, all from West Valley High School worked exceptionally hard in many capacities in the laboratory. The hard work of all these graduate students, under-graduates and high school students is a testament to the quality of people associated with the UAF chemistry department.

This has also been a year of new collaborations. **Jestina Kusina** began working with **Sayali Kulkarni**, a graduate student in Dr. Kuhn's laboratory, on a project to study the affects of oxidation on actin dynamics. They have been developing a plasmon resonance assay designed to study, for the first time, direct interactions between unmodified actin monomers and actin regulatory proteins. Jestina is a post-doctoral fellow in my laboratory. She is also working closely with **Abe Smyth** to evaluate the proteins he produced using plasmon resonance. We also established a new collaboration with Dr. Richard Glennon at West Virginia Commonwealth University. Dr. Glennon will be synthesizing compounds for use in both Anshul and Chelsea's projects. I am very excited to have Dr. Glennon as a collaborator. He is a well established medicinal chemist known for his work on acetylcholine and serotonin ligands. A third collaboration has also begun with Dr. Brian Edmunds from UAS. Dr. Edmunds is a biophysicist with significant experience in single channel recording. His expertise completes a

research team that I have been trying to establish over the past two years. This team will be focusing on nAChRs and now includes a Computational Chemist (Dr. Zsolt Bikadi, Hungarian National Academy of Sciences), a Medicinal Chemist (Dr. Richard Glennon), A Biophysicist (Dr. Brian Edmunds) and a Protein Biochemist (myself). Establishing this team provides a strong base for developing our research projects focusing on the molecular structure and function of ligand gated ion channels. My ability to put together a team with this scope of experience is the result of support provided by the Alaskan INBRE program. My mentor for the INBRE program, Dr. Larry Pinto at Northwestern University, has also been extremely valuable in providing guidance and moral support for my research. Dr. Pinto visited UAF this past year and offered many insightful suggestions for improvements in my laboratory and in a recent NIH grant proposal.

In addition to research, my teaching and service activities also provided many challenges. I taught two graduate courses this past year – Molecular Structure and Function of Proteins and Membrane Biochemistry and Biophysics. These courses are now core courses in the BMB curriculum and were well attended by graduate students. Both courses were taught in the Socratic style and, according to the students, were quite challenging. For the first time in the Protein Structure course, I was able to incorporate laboratory exercises and demonstrations in Ciphergen SELDI, Plasmon Resonance, and Homology Modeling of proteins. This course will be taught again Fall of 2007 and will likely incorporate more proteomics instrumentation.

One of the most satisfying areas of my service at UAF concerns the expansion of the Biochemistry graduate program. With Dr. Tom Kuhn, I help coordinate this program. The success of the BMB program is evident in the increased numbers of affiliated faculty and students and the very successful UA Biomedical Research Conference (UABRC). In addition to acting as Co-coordinator of this program, I am also the Program Coordinator for Alaska INBRE. As program coordinator for INBRE, my role is to build relationships between researchers within the UA system. This is complimentary to my role as co-coordinator of the BMB program. Through these two jobs I am able to address both the academic and research components of biomedical research. Alaska INBRE provides research funding, infrastructure and administrative support for many biomedical researchers and is essential to the continued growth of research in Alaska. In a similar way, Dr. Kuhn through his association with the Specialized Neuroscience Research Program (SNRP) is also able to help facilitate the development of neuroscience research and education. The SNRP program provides research support for neuroscience faculty and sponsored the plenary speaker

at this years UABRC conference. Collaborating with Dr. Kuhn on the development of the BMB program helps provide a nexus for interaction between INBRE, SNRP and BMB.

William Simpson – This year was a busy one with many teaching and research activities. I was glad to get settled back into the department following my sabbatical leave. I taught both of my classes for the year in the fall semester because the department had a need to offer the graduate-level Molecular Spectroscopy class. That class was very enjoyable to teach, especially because students from many sub-disciplines of chemistry and physics took the class and broadened the range of applications. I also taught the physical chemistry first semester class, covering primarily thermodynamics. In the spring semester, I didn't teach, but still enjoyed being in the department and was busy with the Analytical chemistry search and a number of conferences / research trips.

In this year, I co-organized a special session at the fall meeting of the American Geophysical Union on snow-air chemical interactions. The special session was a major success with three oral sessions and one poster session. I also went to the Atmospheric Chemistry Gordon conference and a couple smaller meetings. This year included the major time to submit grants for the International Polar Year (IPY), and we submitted three grants and should hear about their success soon. We have been busy in the laboratory building next-generation instrumentation. In the fall, we built a new scan head for our differential optical absorption spectroscopy (DOAS) bromine monoxide sensor that is used in our snow chemistry project. We deployed the scan head successfully in Barrow, although other parts of the system were damaged in shipment. We then shipped the scan head to colleagues in Germany to be installed on a sailboat called TARA. TARA will be involved in a cross-Arctic trip where it is frozen into the ice in Fall 2006 then drifts with the pack ice for two years, eventually exiting the icepack near Fram Strait. Our instrument will report about halogen chemistry across the Arctic Basin from this cruise. We completed construction of the new dinitrogen pentoxide (N_2O_5) sensor using off-axis cavity ring-down spectroscopy (CRDS). In the spring, **Randy Apodaca** and I compared this new instrument to a more established instrument operated by Steve Brown of the National Oceanic and Atmospheric Administration (NOAA) chemical sciences division.

The group has grown to four graduate students with the addition of two younger students on each of the established projects. On the CRDS project, **Randy Apodaca** is heading our research efforts and was instrumental in the intercomparison in Boulder. On the snow chemistry project, **Laura Alvarez-Aviles** is

completing her chemical analysis and heading into an analysis and writing stage. Both Randy and Laura passed their oral comprehensive exams and have advanced to Ph.D. candidacy. Two new students, **Dea Huff** and **Dan Carlson**, joined the group and will join Randy and Laura, respectively, on their projects. While in Boulder, I ran into **Kristen Schultz**, who was an undergraduate in our group. Kristen is employed at NOAA in Seattle studying aerosol chemistry. Also in Colorado, **Mark Angerhofer**, a M.S. graduate of the group, is now employed at the Colorado Department of Environmental Conservation. **Brad Flowers**, who completed his Ph.D. in collaboration with our group, is now doing a postdoc at the University of Colorado.

On the home front, Maggie and Amelia (age 4) continue to do well. Amelia is in preschool at the Bunnell house on campus, which is a great experience for her. Maggie and I enjoy her increasing independence, unique insights into things, and her joyful nature. Maggie is happy to be finding more time to do things outside the critical job of motherhood.

Tom Trainor - Its been a busy academic year, and the upcoming summer schedule looks pretty booked as well. Immediately after finishing the spring semester I was in California teaching a component of the Stanford Synchrotron Radiation Laboratory Workshop on X-ray Scattering Techniques in Materials and Environmental Science. This workshop was designed to give graduate students and post-doctoral researchers an overview of the principles and applications of X-ray scattering and some practical tips about working at synchrotron X-ray facility. The workshop was great fun, and a wonderful opportunity for me to be teaching part of the course alongside some of the world's experts in synchrotron based diffraction methods.

That was the last trip a very busy year of travel. Last summer included trips to Washington DC for a Department of Energy proposal review panel, and a visit to our collaborators at the National Institutes of Standards and Technology (NIST); field work in Denali National Park; Several trips to Argonne National Laboratory for experimental work, another trip to Washington DC for a principle investigator meeting at NSF; trips to Stanford for data collection and meetings with our collaborators; a week traveling to several Universities as part of an NSF site review panel for the Environmental Molecular Sciences Program; and a trip to Atlanta for the Spring National American Chemical Society (ACS) Meeting. The ACS meeting was a particular highlight since four members of our extended research group were accepted to present talks. **Kunal Tanwar**, a UAF environmental chemistry Ph.D. student, gave a talk titled "Structural modification of α -Fe₂O₃ (1-102) by Fe(II) reaction", Sarah Petitto, UAF

post-doctoral research associate, gave a talk titled "Structure and reactivity of hydrated magnetite (111) surface, Cynthia Lo, UAF post-doctoral research associate and NIST, gave a talk entitled "Adsorption of Pb(II) to α -Fe₂O₃ and α -Al₂O₃, studied via Density Functional Theory", and Sanjit Ghose, a post-doctoral research associate at the University of Chicago and supported by a grant through UAF, gave a talk entitled "Surface structure determination of an elusive oxide: Goethite (FeOOH)". Following the presentations, one of the organizers mentioned to me that the talks presented by our group were among the best of the session.

The summer schedule includes a few more trips – another beamtime run at Argonne National Lab, more field work in Denali, and a trip to Australia at the end of the summer for a conference. We also have a high school student, **Eleanor Olanna** from Brevig Mission, Alaska, working in the lab during June and July, and a visit from our USGS collaborator Seth Muller in July. Seth is working with MS student **Vanessa Ritchie** on a project looking at antimony speciation and transport in central Alaska (the project was recently funded by the USGS) and Ph.D. student **Anastasia Ilgen** on metals transport and speciation in areas impacted by geothermal waste fluids on the Kamchatka Peninsula, Russia. Seth and Anastasia will be spending a few weeks in Russia doing field work in August.

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MEMORIAL

Dr. Rafail Khairoutdinov passed away in Pullman, WA on April 4, 2006 after fighting a two year battle with pancreatic cancer.



(photo by Larisa Doubova)

Alumni

We are in the midst of compiling a list of our graduates (all 390 of you since 1936) together with where you went from UAF and where you are now. We would appreciate any information you are willing to share with us. If you have information on fellow classmates, we'd love to hear. Many we no longer have good contact information for. This information will be used for program assessment.

University of Alaska Biomedical Research Conference (UABRC)

A year ago last spring we held the first UA Biomedical Research Conference (UA-BRC, pronounced 'UA-bark') at UAF with the goal to communicate biochemical and biomedical research efforts and technologies to faculty and students both at UAF and UAA. This year, our colleagues at UAA hosted the 2nd annual UA-BRC and did an outstanding job. Conference attendance had doubled compared to 2005 with approximately 75 participants from UAF, UAA, UAS, the WWMAI program and non-UA guests from the AK State Public Health Laboratory. Research presentations included topics in environmental (neuro)toxicology, neurodegeneration/protection, biomedical aspects of protein structure-function, DNA repair, gene expression, cancer, intracellular signaling, infectious diseases, and biomedical teaching approaches. The plenary speaker was Dr. Amy Bernard from the Allen Institute for Brain Science focusing on the refinement of neuroanatomy through genome-wide gene expression analysis. The student presentations were outstanding and of very high quality. Graduate student **Oya Yazgan** (UAA, advisor Dr. Jocelyn Krebs) received an award for best podium presentation and undergraduate student **Irina Mueller** (UAF, advisor Dr. Kristin O'Brien) received an award for best poster.

Next year's UA-BRC will be sponsored by UAF and we continue our efforts to expand the scope of the meeting involving more basic research and clinical perspectives pertinent to biomedical issues. The success and expansion of our annual UA-BRC reflects the impact of the BMB program statewide as a result of all the hard work by faculty and students. The UA-BRC strives to contribute to establishing, organizing, and expanding biomedical infrastructure and research efforts in the state of AK. I am curious what the next year brings.

Tom Kuhn



Joy Gonzales with home schoolers, April 2006.

Our e-mail address is: fychem@uaf.edu

Meet us on the web:

<http://www.uaf.edu/chem/index.html>

ALUMNI NOTES

Graduates, where are you! We would like to hear your comments and ideas regarding the AlasChemist. We would appreciate a few minutes of your time to fill out the following and mail it back.

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