



Alumni Spotlight

Dr. Sarah Elsea was born and raised near Buckner, MO, ~20 miles east of Kansas City. She grew up on a farm, surrounded by cows and dogs and cats and enjoyed fishing with her Dad in the evenings. Her mother was a speech pathologist in the local schools and was often seen driving Sarah from one activity to the next. Sarah graduated from Fort Osage High School in 1986 and received a Presidential Scholarship to attend what was then Southwest Missouri State University. She worked on undergraduate research projects with Dr. Tammy Jahnke and Dr. Clif Thompson and believes those experiences truly sparked her interests and prepared her for a career in research. She credits Dr. Jahnke with turning her toward graduate school.



Dr. Elsea is currently an Associate Professor of Pediatrics and Human & Molecular Genetics at Virginia Commonwealth University School of Medicine. She received a B.S. in chemistry with a minor in biology from Missouri State University (class of '90), followed by a Ph.D. in biochemistry at Vanderbilt University School of Medicine in 1994. She then did post-graduate training in human molecular genetics and clinical biochemical genetics at Baylor College of Medicine. She is board certified in clinical biochemical genetics by the American Board of Medical Genetics.

She accepted her first faculty position at Michigan State University in East Lansing, MI in 1998 in a joint appointment with the Departments of Zoology and Pediatrics & Human Development, where she focused on teaching and research and directing a molecular diagnostics laboratory. She then accepted a faculty position at Virginia Commonwealth University in Richmond, VA in 2004, where she is today. At VCU, she teaches introductory and advanced human genetics, trains graduate students, provides clinical consultations for metabolic disorders, and continues her research efforts.

Sarah married Dr. Michael Grotewiel in 1992, having met him while in a cooperative education internship in 1989 at then Marion Laboratories in Kansas City. The two attended Vanderbilt for graduate school, married, and now have 2 daughters, Madeleine, age 12 and Katherine, age 9. They enjoy life in Richmond and take advantage of the great weather to hike and camp and enjoy trips to the beach, mountains, and Washington, D.C. Dr. Elsea is actively involved with the local United Way, Girl Scouts, the Virginia Genetics Advisory Committee and Newborn Screening Program, and the national Smith-Magenis syndrome support group, PRISMS (www.prisms.org). She also enjoys playing slow pitch softball and baking. Her pies and cookies have won awards.

Dr. Elsea's scientific career began with epoxides and polymers at MSU and then moved to enzymes (topoisomerase II), anti-cancer drugs, and molecular biology while working in the lab of Dr. Neil Osheroff at Vanderbilt University. With great interest and curiosity about the Human Genome Project and human genetic disease, she left the cancer field and headed to Baylor College of Medicine, which was the 'Mecca' for human genetics research during the 1990s, to work with Dr. Pragna Patel toward characterizing the genomic landscape of a recently identified microdeletion syndrome, called Smith-Magenis syndrome (SMS). SMS is a complex disorder that involves developmental delays, behavioral problems, sleep disturbance (including an inversion of the circadian rhythm of melatonin), obesity, significant self-abusive and aggressive behaviors, and a variety of visceral and skeletal anomalies. It is associated with a small deletion involving chromosome 17. During those days of the Human Genome Project, it was a novel strategy to use fluorescent in situ hybridization (FISH) to detect chromosomal deletions and duplications. Utilizing classical genetics procedures and FISH, their research group delineated the genomic region encompassing the chromosome 17p11.2 deletion

and mapped the genes deleted in the disorder. This process improved diagnostics for the syndrome, supported the Human Genome Project goals, and helped define the clinical and diagnostic criteria for the syndrome. In addition to gaining a thorough training in human genetics while at Baylor, Dr. Elsea also completed a clinical biochemical genetics fellowship under the direction of Dr. William O'Brien, culminating in certification by the American Board of Medical Genetics.

After joining the faculty of the Michigan State University as an assistant professor in 1998, Dr. Elsea continued her research on Smith-Magenis syndrome with the help of very talented and dedicated undergraduate and graduate students. These students were instrumental in the identification of the causative gene for SMS, called retinoic acid induced 1 (RAI1), that had eluded researchers for almost 20 years. After a successful research and teaching career at MSU, Dr. Elsea moved her lab and graduate students (along with her husband's lab and his students) to the Medical College of Virginia at Virginia Commonwealth University. Her lab at VCU has been able to successfully characterize dosage-sensitivity of the RAI1 gene using mouse models, with current research now focused on potential effects of RAI1 on other molecular and functional pathways, particularly in obesity and behavior, identification of potential SMS-like variants in the genome, and identification of a possible another locus for SMS.

While most of the work in Dr. Elsea's lab has a molecular basis, her work with the children and families living with Smith-Magenis syndrome has focused some recent studies on the effects that caregivers, typically mothers, experience due to caring for individuals with SMS. While these studies have revealed a high risk for depression and anxiety in this population, they have also shown that the families, particularly mothers, are dedicated, focused, and determined in the care of their children. Her research has been funded by the NIH, the Jerome Lejeune Foundation (France), the Michigan State University Foundation, the A.D. Williams Foundation, and the Jeffress Trust. She has over 50 peer-reviewed scientific publications, reviews, and book chapters.

Dr. Elsea was recently selected to participate in a national effort to improve genetics education in secondary classrooms, an effort sponsored by the National Science Foundation and administered by the American Society of Human Genetics (GENA, Geneticist-Educator Network, www.ashg.org). She is currently working with a high school biology teacher in the Richmond City Schools to improve understanding of inheritance, family history, and genetic differences. She enjoys the challenges this task provides and feels it has made her a better educator overall.

"My experiences at MSU really prepared me for graduate school. The undergraduate research opportunities were great. They were instrumental in focusing my goals. I have tried to continue that type of training with my students, encouraging research at an early stage in high school and college and getting students excited about science, being creative, and having a goal."

NOTE FROM THE HEAD - Dr. Eric Bosch

A little more than a year ago I agreed to serve as Acting Department Head for the 2008/2009 academic year. I started that year with a rather naïve view of the responsibilities and tasks of the Department Head. As that year draws to a close I can say that I will leave the position with a better appreciation for the challenges of the position and a clear understanding that the department is really a team and, as such, is only as good as its students, faculty and staff. In this regard we are indeed blessed with a wonderful group of students, faculty and staff, and I would like to take this opportunity to thank everyone for helping me over the past year.

In the fall of 2008 we began a national search for a new Department Head. This search was successful and we are now eagerly awaiting the arrival of Dr. Alan Schick who is scheduled to assume his duties as Department Head on July 1.

INTRODUCING OUR NEW DEPARTMENT

HEAD - Dr. Alan Schick

My formal training, ending with a PhD, was completed in 1984 in California within the University of California system (Riverside campus). I then served as a postdoctoral researcher at Penn State for a year and as postdoctoral researcher/instructor at Carnegie-Mellon for three years. I have held full-time academic positions at Virginia Tech and Eastern Kentucky University, where I have risen through



the tenure-track ranks and accumulated over 20 years of teaching experience in higher education. At EKU, I have become acquainted with the demands of administration within the department by serving as Academic Advisor to our chemistry majors, then as Graduate Coordinator, and most recently as Department Chair. I have enjoyed

my career in higher education and working with students, and I have actually enjoyed much of what I have come to know as a Department Chair.

I look forward to joining the Chemistry Department at Missouri State University and participating in the various activities as the department moves forward. The department has an impressive faculty, and I am lucky to be given the chance to be a part of it.

My wife Lynn and our five-year old twin sons hope to get settled in to the Springfield area in June. In addition to my academic duties at the university, I hope to find time for my hobbies, which include photography and fencing, as well as my musical interests.

FACULTY NEWS

Dr. Bryan Breyfogle received a Missouri State Faculty Research Grant, "Electrochemical Band Gap Measurements for Fluorenone Derivatives," for spring 2009, in the amount of \$6,518.

Dr. Bhaskar Datta and G. B. Schuster published, "DNA-Directed Synthesis of Aniline and 4-Aminobiphenyl Oligomers: Programmed Transfer of Sequence Information to a Conjoined Polymer Nanowire," 2008, *J. Am. Chem. Soc.*, **130**, 2965-2973. (Featured in *Nature Chemical Biology*, 2008, 4(5), 272-273.) He also co-authored a paper with W. Chen, M. Josowicz, G. B. Schuster, and J. Janata, "In-Situ Electropolymerization of DNA-Templated Aniline Assemblies on a Gold Surface," *Electrochemical and Solid State Letters*, 2008, 11(6), E11-E14. Dr. Datta received a Missouri State University Faculty Research Grant, "Building a DNA-Antibody "Double-Sided Tape" for Sticking Disease-Causing Agents," for spring 2009, in the amount of \$7400.

Dr. Nikolay Gerasimchuk received a Missouri State University Faculty Research Grant, "Detailed Photoluminescence Studies of Nano-size Pt(II) Complexes That Show Cytotoxicity," for spring 2009, in the amount of \$6,877. He had the following publications:

Garrett Glover, Nikolay Gerasimchuk, **Richard Biagioni**, and Konstantin V. Domasevitch, "Monovalent K, Cs, Tl, and Ag Nitrosodicyanomethanides: Completely Different 3D Networks with Useful Properties of Luminescent Materials and Nonelectric Sensors for Gases," *Inorg. Chem.* 2009, 48 (6), 2371-2382, DOI: 10.1021/ic801364w.

G. Glover, N. Gerasimchuk and K. V. Domasevitch, "Monovalent K, Cs, Tl and Ag Nitrosodicyanomethanides: Completely Different 3D Networks With Useful Properties," *Inorg. Chem.*, 2008, manuscript # ic-2208-1364w.R1.

At the 13th Midsouth Inorganic Chemists Association meeting, March, 2009, in Beebe, AR, Dr. Gerasimchuk

presented, "Application of Solid State Photoluminescence for Development of Gas Sensors," and he co-authored, "Uneasy Route to Some N-substituted Acetamide-Cyanoximes and Their Metal Complexes," which was presented by Matthew Keene.

Dr. Gerasimchuk will be on sabbatical leave from July 25th until January 3rd of 2010, in Heidelberg, Germany. His work will be focused on the study of interactions between highly-colored metallo-oximates with the DNA. He will also try to observe Laser Induced Excited State Spin Transitions (LIESST effect) in some of his complexes prepared here at MSU by Travis Owen, who did undergraduate research with Dr. Gerasimchuk.

Dr. Mark Richter coauthored a paper with Angela Bolin, "Coreactant Electrogenated Chemiluminescence of Ruthenium Porphyrins," *Inorganica Chimica Acta*, 362, 2009, 1974-1976.

Dr. Chad Stearman coauthored a publication with M. Wilson, A. Padwa, "Conjugate Addition-Dipolar Cycloaddition Cascade for the Synthesis of Benzo[a]quinolizine and Indolo[a]quinolizine Scaffolds: Application to the Total Synthesis of (\pm)-Yohimbenone" *J. Org. Chem.* Article ASAP (2009), <http://pubs.acs.org/doi/abs/10.1021/jo9003579>.

Dr. Diann Thomas was promoted to the rank of Senior Instructor.

Dr. Adam Wanekaya co-authored a paper with S. Tolani, M. Craig, R. Delong, and K. Ghosh, "Towards Biosensors Based on Conducting Polymer Nanowires," *Analytical and Bioanalytical Chemistry*, 2009, **393**, 1225-1231. Dr. Wanekaya, Robert Delong, and Kartik Ghosh received an NIH grant entitled, "Anti Cancer RNA Nanoconjugates," for the period June 2009 - May 2012, in the amount of \$204,111.

INDIVIDUAL FACULTY RESEARCH

Dr. Reza Herati

Over the past two decades, our research has been centered around the poly(ethylene glycol) (PEG) chemistry. Poly(ethylene glycol) (PEG) and its derivatives have been (and are) the focus of much interest in biotechnical and biochemical communities. This is due to the fact that PEG possesses an array of useful properties. Key properties are: solubility in water and many organic solvents, lack of toxicity and immunogenicity, and FDA approval for internal consumption. These properties have led to many applications including the attachment of PEG (pegylation) to proteins (i.e., enzymes, antibodies,



antigens) and low molecular weight pharmaceuticals. Pegylation of proteins reduces their immunogenicity while increasing their circulation lifetime. Pegylation of small drug molecules results in an enhancement of their properties such as decreased toxicity and an increase in water solubility. For many years we were involved in making various PEG derivatives necessary for pegylation processes. As a result of our work as well as other, many different PEG derivatives are now available and are in use for various biomedical applications. The results of our work have been published in several articles and with our undergraduate and graduate students as co-authors.

Over the past few years, we have become interested in the synthesis and applications of dendrimers, including those which contain PEG chains. Dendrimers are highly branched, monodispersed synthetic macromolecules with a large number of reactive terminal groups all emanating from a central core. Among dendrimers, poly(amidoamine) (PAMAM) have received most attention as potential transfection agents for gene delivery. In a collaborative study we have recently investigated the effects of poly(amido amine) dendrimer (PAMAM) and its pegylated version, PEG-PAMAM, on human serum albumin (HSA). Using various spectroscopic methods we have analyzed the effects of dendrimer complexation on HSA stability and conformation. Structural analysis showed that dendrimers bind HSA via polypeptide polar groups and the HSA conformation was altered by dendrimers with a major reduction of α -helix and an increase in random coil and turn structures, suggesting a partial protein unfolding. The synthesis and characterization of the PEG-PAMAM dendrimer was carried out by Cammie J. Jennings, an undergraduate student at MSU. A manuscript based on these studies will soon appear in the Journal of Physical Chemistry, Part B. We are planning to study the effects of dendrimers on other biomolecules such as DNA and RNA.

Synthesis, characterization and applications of new biocompatible dendrimers (biodegradable and nonbiodegradable) are a major goal of our research. Efforts are currently underway in my laboratory to make these compounds and use them in applications such as drug delivery. For example, we have recently synthesized a biodegradable polymer consisting of a poly(ethylene glycol) chain and a poly(ester sulfide) dendron. The work has been carried out by a couple of undergraduate students. A manuscript describing synthesis of the above polymer with students as coauthors, has been accepted for publication in Tetrahedron Letters, on conditions that we address the reviewer's comments.

Over the past nineteen plus years that I have had the opportunity to serve as a teacher and researcher, I have enjoyed working with many undergraduate and

undergraduate students. Their hard work and dedication has enabled me to make contributions to poly(ethylene glycol) chemistry. Currently four students work in my laboratory. Jonathan Fury is a graduate student, who is working on the synthesis and characterization of dendrimers. He plans to develop nanoparticles containing gold for various biomedical applications such as drug and gene delivery. Erich Altenhofer is an undergraduate student who is involved in making a PEG-polyamide dendrimer. Jacob Robison is an undergraduate student working to develop a new PEG dendrimer. Stephan Kramer, an undergraduate student, is involved in making PEG-PAMAM dendrimer for various applications. We also collaborate with a number of colleagues on various projects dealing with applications of dendrimers; at MSU, we collaborate with colleagues from the Department of Biomedical Sciences and with another colleague in Canada.

GRADUATE INTERDISCIPLINARY FORUM

The following presentations were made at the Graduate Interdisciplinary Forum held on April 18, 2009:

“Synthesis of Metal Ligand Compounds for the Extraction of Heavy Metals from Waste Water,” Nathan Brennan.

“ ^{31}P NMR Study of Oxidative Lesions in DNA,” Mallory Clark.

“Toward a Greener Tomorrow: Polymerization and Characterization of Novel Non-silicon Based Photovoltaic Materials,” Robert Lee.

“Local Dynamics of Neutralized Phosphate Sites on the DNA Backbone,” Jeffrey Maskrod.

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FALL 2008 GRADUATES



BS Degree:

Randolf Dunn	Cory Mihalik
Garrett Glover	Nichole Wheaton
Keith Henry	Woo Joong Yang
Jeffrey Hill	

MS Degree:

Carl Cheadle, "Synthesis And Studies Of N1,N2-Piperazine Bis-(2-Oximino-2-Cyano) Acetamide And Its Several Metal Complexes."

Wesley Robinson, "The Effects of Surfactants and 2,2,2-trifluoroethanol on Electrogenenerated Chemiluminescence."

ALUMNI NEWS

Clay Dodson, (BS '05) finished is Masters in Environmental Science in December, 2008. He is

currently working for a large consulting firm by the name of URS Corporation in Portland, OR.

Dr. Fattaneh Tavassoli Jabbari (BS '68) is the Director, Women's Health Program/Gynecologic and Breast Pathology, at Yale University School of Medicine.



David Vinyard, BS ('07, MS '08), who is currently pursuing a PhD in chemistry at Princeton University, was recently awarded a prestigious National Defense Science and Engineering Graduate (NDSEG) Fellowship. At Princeton David works for Prof. G. Charles Dismukes and studies

photosynthetic water splitting using Fast Repetition Rate Fluorescence (FRRF). FRRF uses microsecond-scale flashes of light to induce single turnover electron transfer events in the water oxidizing complex of Photosystem II. By monitoring the resulting chlorophyll-a variable fluorescence, we can accurately measure in vivo water splitting kinetics, energetics, and efficiencies.

As a means of increasing the number of U.S. citizens and nationals trained in science and engineering disciplines of military importance, the Department of Defense (DoD) awards three-year graduate fellowships to individuals who have demonstrated ability and special aptitude for advanced training in science and engineering. NDSEG Fellowships are awarded to applicants who will pursue a doctoral degree in, or closely related to, an area of DoD interest. The fellowship covers full tuition and fees and provides a generous stipend. In addition, David was also awarded a National Science Foundation Graduate Fellowship. NSF Fellows are expected to become knowledge experts who can contribute significantly to research, teaching, and innovations in science and engineering. These individuals will be crucial to maintaining and advancing the nation's technological infrastructure and national security as well as contributing to the economic well-being of society at large. The NSF Fellowship partially covers tuition and fees, provides a stipend and a one-time travel award.

SAVE THE DATES

October 30, 2009 - Fall meeting, Chemistry Board of Advisors

October 31, 2009 - Homecoming

**Faculty:**

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Molecules & Moles

The Newsletter of
Missouri State University
Department of Chemistry

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