SPRING 2015

AUGUSTANA

DEPARTMENT OF CHEMISTRY

NEWSLETTER

AUGUSTANA COLLEGE
SIOUX FALLS, SD 57197
www.augie.edu

THE DEPARTMENT CHAIR

Barrett (Barry) Eichler

This has been a good year for me. I have been on sabbatical during the academic year. I also achieved the rank of Full Professor this year.

As I have been away from Augie most of the year, I have missed most of the construction noise and dust on the work for the Froiland Science Center. I am very excited for the future finished product, but next year will be very difficult as I will be Chair again and we will be nomads for at least a semester (Spring 2016). There will be many challenges, but we will get through them, mostly because we don't have any choice!

Most people that have dealt with Augie know what sabbatical means, but for those that don't, it is a year to pursue knowledge in your field that you wouldn't normally have time for during the busy academic year. I have been working on developing a new lab with our latest COOL instrument, the X-ray fluorescence spectrometer (XRF). This instrument can tell you very easily which element(s) you have in a sample, at least anything heavier than neon. I plan to use this instrument to expand my Advanced Inorganic Chemistry class to touch on geochemistry and for the students to be able to identify the minerals that have been in drawers in the Freshman Lab for years. I hope to write a paper about this lab for the Journal of Chemical Education after running it once or twice. Also, I have been working on two papers from my research. The first is about a crystal polymorph (a different crystal structure than what has been previously reported) of a molecule I have been studying for a few years called dianthracenylacetylene. I have been collaborating with Andy Sykes and Grigoriy Sereda from USD on this paper. I am also working on a paper about the chemical (pyridine) spill that occurred last year in the stockroom to report in a chemical safety journal.

I worked mainly with 5 students last summer, 2 (Kevin Dolge and Katarina Klumper) on a solar cell dye project and 3 (Abby Malmanger, Anna Tims and Lexie Mohror) on a quantum dot cancer detection project. They all presented their work at the Sioux Valley ACS poster competition and at the Midwest Regional ACS meeting. Abby, Anna and Lexie also presented at the USD Biomaterials Day

Continues on page 3

Barry Eichler's research group

Continued from page 1

poster competition.

My wife, Kathy, continues to work as Division Coordinator in the Humanities Division here at Augie. My daughter, Maddie, is in first grade this year in Brandon. We fished a lot last summer, but the ice has been too thin to predictably be safe in South Dakota, so we haven't been ice fishing yet. We took a trip to San Francisco in August, where I presented my quantum dot research at the National ACS Meeting. We also visited my brother and his family out there. Our big trip of the year was a Disney cruise in January to St. Maarten, Puerto Rico and the Bahamas – a great trip!

Duane Weisshaar

The most exciting news is that Froiland Science Center construction has finally started on the new wing and renovation activities begin soon. The basement is empty with Math offices temporarily in Sioux Falls Seminary. The north wing renovation begins in June 2015, the new wing is to open in December 2016, and the west wing in January 2016. The facility is to be fully open for classes in Fall 2016. We are looking forward to the new space while we scramble to maintain our programs including labs during the construction phase.

This year we started a two semester general chemistry sequence, Chem 116 and 117, for non-chemistry majors. The lecture part this fall went well, but labs took a little more work, especially those we had not used in Chem 120.

Barry is on sabbatical this year, and I am the Chair during his leave. That means I have the 'joy' of the planning effort to get us through construction. I am also on the Curriculum Council where we have been spending extra time shepherding the development of a new general education proposal. The new proposal was adopted by the faculty in December, so this spring the Council will begin the work of implementation.

Last summer I worked with four students on three projects. Trevor Sandgren (rising Sr - Redwood Falls, MN), returning as the Viste Research Fellow, attempted to use HPLC and the multiangle light scattering detector (MALS) to characterize the cationic polymer Barry's students synthesized the previous summer. He was successful in getting the detector to work, but Barry's polymer was not soluble enough to detect by MALS. He was able to detect the polymer with the UV detector and determined a molar mass by comparison to dextran standards.

Kaylynn Erlandson (rising Jr - Brandon, SD) revisited the analysis of Jetty's polymers from the previous summer focusing efforts on increasing solubility via extended mixing on a shaker table and ultrasonication. She was able to increase solubility, but for one polymer it was through degradation. The other polymer exhibited a small rise in molar mass as solubility increased confirming our suspicion that the smaller components were more soluble.

Duane Weisshaar's research group

Kim Stallings (rising Sr - Sioux Falls, SD) and Jacob Dancler (rising So - Tea, SD) continued work on the elemental analysis of Barry's quantum dots. Kim had been frustrated by this project the previous summer. At the end of that summer we thought we had identified the chemistry that was creating the headaches, so testing that theory was our focus this summer. Our theory proved to be correct, and as a result, Kim and Jacob developed a nice method for determining Zn and Cd in the quantum dots by Atomic Absorption Spectroscopy. Now I need to find the time to write the paper describing the chemistry and the procedure that works with it.

We also obtained a new instrument - X-Ray Fluorescence Spectrometer (XRF). Qualitative analysis is fast, nondestructive, with no sample prep. However, quantitative analysis requires attention to lots of details. Developing a method for analyzing the solid quantum dots is the next major project for my group. The XRF has found lots of applications identifying all sorts of unlabeled things that we have encountered around the department.

Next year I have been approved for a sabbatical leave. I am planning to get the AA paper written, and hoping that I will have lab space somewhere to work with the XRF and to revise my Analysis lab manual. January 2016 will be moving time for Chemistry so I will put my leave on hold and help with the move and make sure the instruments are up and running in our new instrument room.

In the summer I still like to ride my bike to work and play softball with the church team. Throughout the school year and summer I still play with electrochemical recovery of some metal ions generated in labs, primarily copper from a Chem 116/120 synthesis lab and silver from the gravimetric lab in Analysis. The XRF has helped to identify the residues left after plating - a variety of trace metals including lead, zinc, tin, and others.

FROM THE FACULTY

Jared Mays

Greetings from Augustana! The past year of life in the Department of Chemistry has been especially eventful and chock full of things to keep all of us on our toes. Of course, one of the biggest things on all of our minds has been the renovation and expansion of the Gilbert Science Center, a project that has been many years in the making. Early last summer, the Program Steering Committee completed its work, architectural blueprints were constructed, and the project began to move toward active construction. In preparation for the final phase of the anticipated construction plan (renovation of the West Wing of GSC, including the current space used by the Department of Chemistry), we started the process of going through all the goodies hidden in nooks, crannies, and various corners of the department. Needless to say, it has been both fascinating and more-than-a-little humbling to witness the history and legacy of everything we have uncovered (and there's still more to do in the coming months)!

Sadly, to preserve the integrity of our 400 MHz NMR during construction, we were forced to quench its magnet in August and place the instrument in storage. While we all mourn its (temporary) loss and our ability to utilize it in both courses and research, we look ahead to the day when it will be restored in the 1st floor (formerly the basement) of the renovated West Wing. This past September included the official groundbreaking ceremony, a final GSC Open House, and the start of foundation work for the new wing. Now, over 6 months later, the steel support structure is partially in place and it is becoming much easier to visualize the wonderful facility we will have upon completion!

This past fall represented a particularly important milestone in my career at Augustana. In December 2014, I was granted tenure and promoted to the rank of Associate Professor. Although it's hard to believe that I am now in my 6th year of appointment at Augustana, I truly look forward to the next several decades of being a part of the Augustana family!

Outside of my normal instruction in General Chemistry, Survey of Organic and Biochemistry, Organic I-II, and Biochemistry & Medicinal Chemistry, this past interim, I offered a new course for Civitas, Augutana's Honors Program. This course was designed to address Bonhoeffer's theme of "pertinence" and was titled, "Taking Our Medicine?: An Evaluation of Drugs and the Pharmaceutical Industry." In this course, (prescription) drugs were the central

Jared Mays' Research Group

focus and class topics provided the platform to understand and evaluate 1) the history of drugs, 2) drug development strategies and approaches, 3) considerations relating to the pharmaceutical industry (e.g. pricing, marketing, generics), 4) the nature of diagnosis and prescription, and 5) factors affecting drug use and abuse. This intentionally-interdisciplinary course was reliant on examining the multiple perspectives and considerations relating to the science of drugs, their role as a product or commodity, and the way(s) in which they reach patients and affect their behavior.

Building on the past five years of work conducted at Augustana, my research group continues to investigate novel glucosinolates and isothiocyanates and their potential uses in combating cancer. These two classes of compounds are naturally found in cruciferous vegetables (e.g. broccoli, cauliflower, Brussels sprouts) and are some of the primary agents responsible for the anticancer effects which result from diets rich in these foods. Although this topic serves as the overarching theme to the work conducted in my laboratory, individual student researchers have worked on a variety of specific sub-projects that contribute to the larger goal.

This past summer, research projects conducted by members of my group were successful in advancing several distinct sub-projects. Sarah Fisher '15 (Chamberlain, SD) returned to my laboratory for a second summer and made substantial progress toward the evaluation of two recently-described synthetic methods to prepare select glucosinolates. Given our interest in preparing and evaluating synthetic, non-naturally-occurring glucosinolates (some of which are not amenable to established synthetic preparation methodologies), Sarah's work represents a substantial advance in our ability to achieve the larger goals of this project! Work conducted by Ellen Voigt '17 (Rapid City, SD) involved a relatively new project in my group, the photochemical generation of isothiocyanates from non-glucosinolates. Although additional studies need to be conducted in the coming years, Ellen made wonderful progress and generated initial data that will likely lay the foundation of a new research platform in the years to come. Lastly, Justin Brown '16 (Littleton, CO) and John Klecker '16 (Hopkins, MN) were able to successfully complete a large-scale preparation of a noteworthy, non-natural glucosinolate. We anticipate using this material over the next couple of years in a variety of in-house procedures and evaluations.

This past fall, the first original research manuscript from my laboratory was accepted for publication! This paper, titled, "High performance liquid chromatography-based method to evaluate kinetics of glucosinolate hydrolysis by Sinapis alba myrosinase," describes several years of work toward the validation of a new method by which to evaluate reaction kinetics and was published in Analytical Biochemistry: Methods in the Biological Sciences (2014, 465, 105–113). Of course, this accomplishment would not have been possible without the

Continues on page 5

Continued from page 4

combined efforts of its three undergraduate authors, Kayla Vastenhout '12 (Dell Rapids, SD), Elle Tornberg '14 (Harrisburg, SD), and Amanda Johnson '14 (Sioux Falls, SD).

On a personal note, life outside the confines of Augustana continues to keep me busy! My wife, Jennifer, and our three children, Elliot (almost 6), Aurelia (almost 4), and Rosalind (15 months) love spending time outside (much easier in the 5-6 months every year without snow on the ground), doing various craft projects, and enjoying the time that 'dad' gets to be home and not playing chemist.

Jetty L. Duffy-Matzner

I hope that the 2015 year finds all of our readers in good health and bright spirits. I have been in the department for 16 years this January. Wow, how the time has flown with lots of new faces in the department and lots of equipment updates. In that time we upgraded our 60 MHz NMR to an Anasazi FTNMR, we bought a 300 MHz and then finally the 400 MHz. Of course now that construction has started in earnest for the new building addition the 400 MHz is in storage and we are back to using the 60 MHz – I guess times haven't changed that much…

My research group is currently looking at three major projects. This past summer I was fortunate enough to work with six delightful young undergraduates. Joe Stevens (ACS Chem major) and Emily Kaufman (ACS Biochem major) worked together on a collaborative project with Arlen Viste and myself finishing up the work started by Matthew Grandbois, and then Shik Ki Li and Katie Hassebroek. Unfortunately a really high teaching load as kept me from writing. The department has made some new assessments about addressing teaching loads and we hope that will help us in the future. Katie Smith (ACS Chem major) who will be graduating this spring came back for another year on the production of some novel thiophene alkyne polymers that will be useful for hybrid solar cells. Delaney Schara (ACS Chem major) and Kellan Klubben (ACS Biochem) joined her on this research. Delaney and Kellan were this year's winners of the Sioux Valley Local Section Undergraduate Poster Contest. Andres David Morales (ACS Chem major), an international student from Equador also joined the group to work on a chemical education project that involved updating our freshman chemistry labs. All of these students and myself attended the 49th Midwest Regional Meeting of the American Chemical Society in Columbia, MO on November 12-15. Joe, Emily, Katie, Delaney and Kellan presented their findings in poster presentations among the organic and polymer groups. I was also part of a book chapter as were many of us in the department in a project headed by Gary Earl "Developing and Sustaining a Research Program at a Traditionally Undergraduate Liberal Arts College: Research, it's our thing! Experiences in establishing a research culture at Augustana College" ACS Symposium Series 1156 (Developing and Maintaining a Successful Undergraduate Research Program). I also found out recently that one of our papers with collaborator Wayne Jones at Binghamton University was accepted for publication. This project involves graduating senior Trevor Sandgreen (ACS Chem major) from Augustana and graduate student Megan Fegley from Binghamton University and will be published in the Journal of Polymer Science.

Jetty Duffy-Matzner's Research Group

I am also keep busy as chair of the Awards Committee for the Midwest ACS Regional Executive Board and a member of that Board's Steering Committee. I am keeping Augie involved at the national ACS level with my role as member of the Meeting and Exposition Committee, in that role I serve on two workgroups as well: the Meetings Abstracts Programming Systems Working Group and the Steering Committee for ACS Regional & National Meeting Registration & Planning. One involves how we are incorporating the use of recording national talks and the other on the use of technology (for example mobile phone aps to replace meeting booklets. I am also keeping busy reviewing and writing proposals.

My husband (Steven Matzner, Chair of Biology) is amazingly supportive of my work here at Augie and as a volunteer with the American Chemical Society. We have been taking ballroom dancing lessons for a couple of years now and our enjoying the second Friday of every month with a big band at the Shrine (downtown Sioux Falls). Two of our sons will be undergraduates attending Augustana next year and our youngest son will be a freshman in high school.

If you are ever in town and would like to visit our department, I would be more than delighted to meet with you and show you how the department is growing. With all the construction going on, it is a loud but exciting time to be in the chemistry department at Augie – come give us a chance to share that excitement with you!

FROM THE FACULTY

Brandon Gustafson
What does a Stockroom Manager, Lab Prep Coordinator and NMR Coordinator do when all three areas begin a radical transformation? Seriously, if anyone knows please tell me!

It is no secret that the Froiland Science Center construction is underway and with it comes a transformation the Chemistry Department hasn't seen in quite some time and certainly the largest in my 7-year career here. For me, the process started early on as I became involved in many planning discussions ranging from instrument needs and requirements to stockroom design. It became apparent that every aspect of my job would be affected and it started first with the stockroom. This summer, I coordinated an effort with the rest of the Chemistry Department (and Bio Department to some extent) to purge our inventory of old and unwanted chemicals. In the end, we removed nearly 1000 individual bottles of chemicals that weighed over 2700 pounds after they were packed up. We literally got rid of a ton of stuff. The Stockroom Manager flexed some muscle over his kingdom stockroom.

I also spent this Interim reorganizing and cleaning dark, dusty corners of the stockroom in anticipation of the move. It is my goal to get the stockroom to its smallest workable footprint as soon as possible so we know what the minimum operating requirements are while we temporarily run labs during construction and have as few moving pieces as possible. A couple years ago, I implemented a barcode system on every chemical bottle so that should help tracking them as we go. I eagerly await the chorus of angels when the new stockroom is done and we can move in. I have put a great deal of thought into its organization and I thank my predecessors for the good ideas they left behind on the current system.

The next largest change, one we have trouble talking about in open forums without getting overcome, is the temporary shutdown of the 400MHz NMR. The utility and capability of this instrument is nearly immeasurable to our department, but it is also a fickle mistress (it has been demoted to 'machine' a couple times) and as such is very particular about its environment. The inner magnet core is kept at 4K (-452°F for those keeping score at home), which makes the metal inside very brittle. Since we were told there might be some (read: shelf-shaking, glass-rattling, vertigo-inducing) vibration, I thought it best to box the NMR up for storage while we endure construction rather than risk cracking the metal. Besides, the instrument is designed to read vibrations--something it does quite well and is very sensitive to so the construction vibration would have introduced a few "artifacts" and been unusable anyway (for those familiar with NMRs they get ornery when they aren't used regularly).

Lastly, the lab prep will present a challenge as we transition to a new space (through a much smaller space in the meantime). We added a second semester of Gen Chem so there's an extra lab in addition to all the others we offer. Fortunately we will be offering "one of everything" this spring so we can prepare the labs for the transition as we go rather than all at once on the eve of a move. Again, the organization in place before my arrival has proven to be quite future-proof so the adventure should proceed fairly well with some forethought and attention to detail.

When I'm not chasing highly elusive and mobile chemical bottles (seriously…here one minute, gone the next), scratching my head at how students can use so much of a reagent when the procedure calls for half of what I prep, or wistfully staring into an empty NMR room, I spend my time with my wife Ann and kids Daniel (almost 5) and Abigail (2). We're starting the process of finishing our basement so it seems I will be immersed in construction everywhere I go!

Andrew J.G. Strandjord

I was hired this last fall as an Assistant Professor to come to Augustana College and teach chemistry. This is the first time I have ever taught anything in my career. In the fall I taught Organic Chemistry 201, along with a number of organic chemistry labs. In January, I had the privilege to introduce chemistry to students who were neither science nor math majors. We studied some of the basic chemistry principles and then went on quickly to organic and biochemistry. We also took several field trips during interim to Sanford Research, Poet Ethanol, the pathology and blood labs at the hospital, and to the water purification plant in Sioux Falls. This spring I am teaching Organic/Biochemistry to mostly nursing and sport science majors. It has been both exciting and a lot of work.

I received my undergraduate degree from Luther College in Decorah, IA, and a Ph.D. in Physical-Organic Chemistry from the University of Minnesota. My thesis focused on proton transfer kinetics on the picosecond time frame. I spent a lot of time building a laser-based instrument in the basement of an old building.

During the 80-90s, I worked for Dow Chemical in Midland, MI. In this position, I did process development work on new dielectric polymers for the semiconductor industry. In 1998, I left Dow Chemical to form a startup company in Colorado Springs called IC Interconnect. This company provided backend wafer processing services to the semiconductor industry. Much of my time was spent travelling the world to work with customers or set up manufacturing facilities in California, China, Europe, and Malaysia.

I currently live east of Sioux Falls within a stone's throw of Iowa. My wife and I are fixing up an older home and getting use to the South Dakota winters. We have three daughters, one who graduated from Augustana with a degree in Nursing, and the other two graduating from Luther College. My oldest daughter just received her Ph.D. in molecular biology from the University of Minnesota, and my youngest is in graduate school at Purdue studying aeronautical engineering (rocket science).

Peter Adcock

I feel so blessed to be at Augustana. What a great community of learners! Let me tell you about my background.

My formal education all happened in my native Australia, which has an education system along the lines of the British one. Generally a Bachelor's degree took only 3 years, except for some special courses like Engineering, which were 4 years. However, the 3 year degrees had the option of a 4th year for Honours. So I got to graduate twice with undergraduate degrees. In my third year, I had Electrochemistry and Analytical Chemistry lectures from Prof. Alan M. Bond who graciously traveled about 2,000 miles one way to visit our campus each year. Honours was an intensive introduction to laboratory research along with other independent study type components. My Honours supervisor was a coordination chemist, Dr. F. Richard Keene, who had done a post-doc at University of North Carolina, and was working on ruthenium complexes. I so much enjoyed synthesizing and characterizing these colorful complexes, that I made a T-shirt with the slogan "Use more ruthenium complexes".

Alas, there was not a great job market in Australia in synthetic ruthenium complex chemistry, in spite of the promise of some of them as photosensitizers for solar cells or as solution phase electrocatalysts. So I joined the zinc industry, where I worked in industrial research for several years, eventually getting to work on such exciting things as spouted bed electrowinning cells and evaluating proton-blocking anion exchange membranes. I had a federal scholarship (Australian Postgraduate Award) and industry support for my doctoral studies at University of Western Sydney under Prof. Samuel B. Adeloju, now well-known in Environmental Chemistry, Analytical Chemistry, Electrochemistry, and Nanomaterials circles. In those days, Dr. Adeloju had a Center for Electrochemical Research and Analytical Technology (CERAT), but he later moved to Monash University.

Meanwhile, I worked in research positions at Murdoch University with Prof. Mike Nicol and at the Australian National University in the solar energy group under Prof. Andrew Blakers and Dr. Klaus Weber. There I worked on making and assembling, connecting and "packaging" thin sliver cells which yielded a high active area from a single wafer. Drilling holes in silicon wafers with a laser was pretty exciting! Well at least the first day or two.

Partly for financial reasons and also for professional development, I took a post-doc at Los Alamos National Lab, coming to the US on a J-class visa and expecting to stay in the US for only 2-3 years. I was working in the fuel cells research team, and it was a "hot" area at the time. Unfortunately, the main project I was given yielded about 2 data points per month towards plots or tables for dissemination at conferences or in publications. That did not stop them from sending me to about a dozen conferences around the US and one in Canada, for which I am very grateful.

Eventually, I came to see teaching as a more noble profession than spinning stories to attract research dollars. So my next step was to seek teaching experience, just in case my green card application failed and I was sent back to Australia! I taught at Campbellsville University in Kentucky for 7 years. Like Augustana, it was also a Liberal Arts college with many pre-professional students pursuing studies usually majoring in Biology, but some in Chemistry or with the double major. There were even Chemistry-Math double majors from time to time. I taught General Chemistry, Physical Chemistry, and occasionally electives (Materials Chemistry, Electrochemistry). Other faculty members in the small department had a grip on things like Analytical Chemistry, Environmental Chemistry, and Inorganic Chemistry. I taught Qualitative Inorganic Analysis as my General Chemistry II lab course at least once a year.

For the three years before coming to Augie, I taught mostly General Chemistry in an 11 or 12 person department at Rose-Hulman Institute of Technology, in Terre Haute, IN. This has been the top chiefly-undergraduate engineering school in the nation for about 15 years. My colleagues there convinced me that Analytical Chemistry would be the most suitable area for my future teaching track beyond General Chemistry, and they graciously gave me a section of Analytical Lab to teach in my last regular term there. Here at Augie, I am pleased to help get the new CHEM 116 and CHEM 117 courses established this year, and to have the opportunity of involvement in CHEM 222, before I take the place of Dr. Weisshaar next year in the two Analysis classes.

Chemistry Staff Contact Information

Peter Adcock
Chemistry
peter.adcock@augie.edu
605.274.4712

Jetty Duffy-Matzner
Organic
jetty.duffy@augie.edu
605.274.4822

Barry Eichler
Inorganic & Department Chair
barrett.eichler@augie.edu
605.274.4814

Brandon Gustafson
Stockroom Manager &
NMR Coordinator
brandon.gustafson@augie.edu
605.274.4827

Jared Mays
Medicinal & Biochemistry
jared.mays@augie.edu
605.274.4815

Andrew J.G. Strandjord
Organic Chemistry
andrew.strandjord@augie.edu
605.274.5496

Marlys Vant Hul
Natural Science Division Coordinator
marlys.vanthul@augie.edu
605.274.4710

Duane Weisshaar
Analytical
duane.weisshaar@augie.edu
605.274.4812

AUGUSTANA COLLEGE
2001 South Summit Avenue
Sioux Falls, South Dakota 57197
Department of Chemistry

2015 CHEMISTRY ALUMNI FILE UPDATE

What's ν (nu) With You? Fill us in on what's happening in your life. If you find that any of the information mentioned in this newsletter is inaccurate, please let us know.

Name: _____
FIRST MAIDEN MARRIED

Year Graduated: _____ Phone: _____

Address: _____

_____

Email: _____

Occupation/Place of Employment: _____

_____

Graduate/Professional School Preparation in Progress or Completed: _____

_____

Personal News/Professional News you want us to know:

_____

_____

If you know of potential students for Augustana College, please provide us with their name, address and phone number so that we may contact them.

Name: _____

Address: _____

_____

Phone: _____

Name: _____

Address: _____

_____

Phone: _____

Mail to: **Department of Chemistry**
Augustana College
2001 S. Summit Ave.
Sioux Falls, SD 57197

Or email information to: *marlys.vanthul@augie.edu*