MOLECULAR SIEVE Andrews University

Department of Chemistry & Biochemistry

An American Chemical Society Approved Program since 1976

Fall 2015

75th Department Anniversary 50th Chemistry Seminar Anniversary

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Faculty:

Lisa Ahlberg, PhD Ryan Hayes, PhD Getahun Merga, PhD Desmond Murray, PhD David Nowack, PhD David Randall, PhD

Staff:

Roshelle Hall, BS Dana Johnston, MS John Rorabeck, MS Established in 1937, the major in chemistry was offered within the Department of Physical Chemistry & Mathematics at Emmanuel Missionary College. Dr. Herwarth Halenz served as the first chair of the separate Department of Chemistry which was formed in 1939-1940 school year.

This, then is our 75th year—and we invite you to celebrate with us and reflect on all the blessings the years



Dr. Herwarth Halenz

have brought. Dr. Bob Wilkins, chair of the department from 1971-1988, has put together a detailed history, which is posted on our website, andrews.edu/ cas/chemistry/history. Just click on the 75th-50th Anniversary Celebration link to read all the details.

Fifty years ago, in 1965, Dr. Dwain Ford, who chaired the department from 1963-1971, introduced our chemistry seminar program. The requirement for students to prepare and present a lecture over some



Chemistry Department circa 1965

research or aspect of chemistry has helped to shape effective chemists for five decades now.

Dr. Desmond Murray continues to lead in this program—and this year he has put together an especially distinguished roster of guest speakers. Now you can tune in every Thursday via our live-streaming video to watch and learn with us.

Go to our website to see all the videos posted at andrews.edu/cas/ chemistry/chemistry_seminar. A complete listing of all the future speakers can also be found there.



Chemistry Faculty circa 1976

Nowack Research Group

Dr. Nowack's current research examines the interaction of enzymes and dendrimers. Specifically, do dendrimers inhibit the enzyme mushroom tyrosinase? Preliminary results were promising, as student researcher Andrew Hong used a PAMAM dendrimer to inhibit the tyrosinase in a mixed-inhibition mechanism. However when controlling the pH in the small volume of the reaction vessel, the inhibition could no longer be considered to be attributed to exclusively dendrimer. The next step will be to characterize the pH effect.

We hope you enjoy the candid photos of our wonderful Chemistry, Biochemistry and Biotechnology majors throughout the pages of this year's Molecular Sieve! We are so proud of each and every one of them, and praise God that they have chosen to study here with us.



Merga Research Group

Dr. Merga continues his research on the Characterization of Naked Noble Metal Nanoparticles Before and After Binding to **Specific** Organic **Molecules** and **Biomolecules**. Manipulation of the NP surfaces by attaching antibodies or other ligands (such as allows vitamins, amino acids) the NP to preferentially target cells which express receptors that correspond to the NP surface ligand.

Contributing to the project, student Noah Chun's role is to synthesize silver nanoparticles by reduction of Ag₂O using molecular hydrogen and or acetylacetonate and then to clean the particles.

The clean or "naked" nanoparticles of silver are assembled using sulfur-containing organic molecules and selected amino acids. The resulting conjugated NGNP will be characterized by transition electron microscope (TEM), pH meter, inductively coupled plasma atomic emission spectroscopy (ICP-OES), and UV-VIS spectra.

Participation in research allows the student to become acquainted with research journals through literature survey, learn modern scientific techniques using various instruments we have within the STEM departments. This exposure, deepens a student's understanding of science and is excellent preparation for further study in the field of chemistry.

Part of this work was covered in a Poster presentation at **the Michigan Academy of Science, Arts & Letters conference** that was held at Andrews University in March 2015.



The Molecular Sieve is produced annually by the Andrews University Department of Chemistry and Biochemistry,

and is distributed to alumni and friends.

Editor—D. Johnston Editor-in-Chief—D. Nowack

Quant Lab Coats



Back: Brenden Mutz, Jason Grellmann, Gabe Butlin, Abraham Lee, Noah Chun, Nicholas Chun, Dr. Randall Front: Alastair Acre, Hyelin You, Yewon Kim, Adriana Delgado, Lauren Bitterman, Tammy Leong, Kaydra Bailey, Emory Dent

We continue the tradition of awarding lab coats to our majors who take **Quantitative Analysis**. Each coat is embroidered with the name of the courageous student unafraid to tackle some serious chemistry.

ChemClub Officers



From Left to Right: Victoria Kim, Social Vice-President; Noah Chun, President; Hyelin You, Religious Vice-President; Abraham Lee, Media Coordinator; Adriana Delgado, Treasurer/Secretary; Greg Zdor, Outreach Coordinator

Randall Research

In the past year, Dr. Randall has initiated a project using cobalt(II) tetraphenylphorphyrin(ate) to quantitate the concentration of nitric oxide (nitrogen monoxide) dissolved in solvents.

The **importance of nitric oxide in biological systems** is becoming increasingly clear. To help understand various aspects of the chemistry, chemists are developing small-molecule, inorganic chemistry "model complexes." Part of the chemical understanding can come from reacting known amounts of "model complex" with a known amount of nitric oxide.

The practical challenge is that precisely delivering small quantities of gas is difficult compared with the simple tools available for solids and liquids. However, the volume of liquids that are saturated with gas can be precisely measured.

We are working toward quantitating the saturating concentration of NO in various common organic solvents. When we learn the saturating concentration of NO in these solvents we can help researchers know the number of moles of NO delivered in a precisely measured volume.



2015 Graduates & Awards

2015 Undergraduate Degrees Awarded

Samantha Chang, BS Biochemistry, Cum Laude Swanieka Choy, BS Biochemistry Jordan Holzschuher, BS Biochemistry Andrew Hong, BS Biochemistry, Summa Cum Laude Alanna James, BS Biochemistry, Summa Cum Laude SungJun Kim, BS Biochemistry Gideon Nyakundi, BS Biochemistry Betsy Quetz, BS Chemistry Seth Stacey, BS Biochemistry, Magna Cum Laude* Satoshi Thiele, BS Chemistry, Summa Cum Laude[†] Rosanne Thornhill, BS Biochemistry, Magna Cum Laude* *J N Andrews Honors Scholar

[†]American Chemical Society endorsement

2015 Class Awards

ACS General Chemistry Award ACS General Chemistry Award ACS General Chemistry Award ACS Organic Chemistry Award ACS Analytical Chemistry Award

Greg Zdor Donn Latour Yuna Han Hyelin You Emily Bankes

2014 Scholarships

- Lois K. Mutch Scholarship Tait Family Scholarship Dwain Ford Scholarship Halenz Scholarship Richard Cook Scholarship Ralph Scorpio Scholarship Mutch, Scorpio, Wilkins Award Richard Minesinger Scholarship Robert Wilkins Scholarship Max & Linda Taylor Scholarship Hall-Miller Scholarship
- Noah Chun Seth Campbell Emily-Jean Bankes Hyelin You Victoria Kim Adrianna Delgado James Butlin Abraham Lee Irene Hwang Kaydra Bailey shared by**

**Lauren Bitterman, Jason Grellmann, Greg Zdor

Become a Chemistry Partner

Send checks to: Department of Chemistry and Biochemistry 4270 Administrative Drive, HH225 Andrews University Berrien Springs, MI 49104

Hayes Research Group

The Dr. Hayes' research group is focused on three major areas: identifying a new class of carcinogens, characterizing novel sensors, and developing PAMAM dendrimers for research applications. We have made significant progress in the past year in these areas.

Many students are interested and working on the **new class of carcinogens** project which seeks to find and determine the molecular structure of arginine-based heterocyclic amines. We have recovered microgram quantities of three lead candidates to characterize. At least one of these compounds is mutagenic as identified by the Ames test which is indicative of a possible carcinogen.

We need to isolate more of this material for NMR analysis which is why we arranged funding and obtained a new prep-scale HPLC instrument. We have enough material for GC-MS work so method development is underway to determine the molecular structure with mass spectrometry. This work has important implications for the cooking of foods high in plant proteins (e.g. soy protein isolate) where arginine levels are high.

In the PAMAM dendrimer front, students and faculty have developed and implemented a General Chemistry **capstone laboratory experiment** that explores one of the interesting chemical cargo features of dendrimers. An octyl-surface dendrimer was synthesized and used as a phase-transfer catalyst to dissolve copper(II) ions in the nonpolar dichloromethane solvent. This is highly unusual since copper(II) salts with traditional anions will mainly dissolve in highly polar solvents.

We can reverse this process by lowering the pH which forces the copper(II) ions back into the water layer. This experiment is good to perform at the end of the freshman chemistry sequence to review a number of concepts from the year (pH, solubility, color), to explore transition metal chemistry, and to experience an organic chemistry extraction technique using solvents of different polarity. We are planning to make lab-kits and sell these to other colleges and universities while writing up our results for a chemical education journal.

There have been 12 students working in the Hayes group over the past year. Dr. Hayes is thankful for the enthusiastic and consistent involvement of students from the chemistry and biology departments.

For the *Arginine Heterocyclic amine* (*HCA*) *Identification and Characterization* project, the following students have contributed over the past year: Zach Reichert, Michael Plantak, Irene Hwang, Gabriel Stanier, Kyle Gordon, and Andrew Krause. Collaborators include Dr. Robert Zdor (Biology at Andrews) and Dr. David Alonso (Leco, St. Joseph, MI).

For the **PAMAM Dendrimers Manufacturing, Analysis, and Product Development**, the following students have contributed time and effort over the past year : Seth Campbell, Jesse Gray, and Greg Zdor. Collaboration with Andrews ChemServices (Berrien Springs, MI).

In the **Stabilization of Vitamin C utilizing PAMAM Dendrimers** project, student, Hyelin You has contributed this past year with Dr. David Nowack collaborating.

For the *Copper(II) Ions Sensor* project, student, Eric You has contributed this past year with Dr. Desmond Murray collaborating.

During the summer of 2015, Anthony ,a student from England helped perform research for the project in the **Optimization of Starch-Iodine Clock Reactions for General Chemistry Kinetics Lab**.



Bradley Tait (BS, Chem. '81)

Before obtaining my chemistry degree from Andrews in 1981, I graduated from Cedar Lake Academy (now GLAA) in 1977. I then worked with Carl Johnson at Wayne State University where I received my PhD in organic chemistry in 1986. I did a post-doc at Yale with Fred Ziegler.

My career includes over 20 years of experience in the pharmaceutical industry at Schering-Plough, Parke-Davis, Pfizer and Proteostasis Therapeutics. I was vice-president of chemistry at PTI and **led the cystic fibrosis team that delivered a clinical candidate for development.**

My experience spans many therapeutic areas: antibacterials, antivirals, antipsychotics, asthma, rheumatoid arthritis, cholesterol-lowering agents, antihypertensives and cystic fibrosis. I have delivered 18 compounds into clinical development and have completed 30 patents and 29 publications.



Our chair, Dave Nowack, poses with newlyweds Courtney (née Tait) Basit (BS Biochem., '12) and Walross Basit, with Chantelle (née Krym) Koch (BS Biochem., '11)

I serve the broader chemistry community in various ways including: providing an interviewing presentation the last four years at Andrews called "Marketing You," chairing the Medicinal Chemistry GRC in 2016, SAB for GTC Drug Design & Medicinal Chemistry (Europe) Conference, and as a reviewer for NIH grant evaluations.

Currently I'm a drug discovery consultant in the Cambridge, MA area. My wife Jill (née Curry) is a nurse, and we have two daughters who also work in the medical field. Courtney (Andrews BS, Biochem. 2012) is a Physician Assistant from working with Nebraska Heart and engaged to be married. Krista (née Tait) Price (Andrews BS, Nursing, 2013) works with Bronson Healthcare Cardiology in Kalamazoo, MI and is married to Matthew Price.

I enjoy barefoot water-skiing, snowboarding, running and traveling in New England with Jill.

Richard Yukl (BA, Chem. '67)

I graduated from Andrews with a chemistry major and a math minor in 1967. Following college, I attended Loma Linda School of Medicine and I practiced as a surgeon in Denver, CO until retirement. It would seem that my career steered well clear of chemistry, but I was involved in trauma research while in practice.

We identified a compound in the cerebral-spinal fluid of trauma patients with spinal cord injuries, which we could find in no other patients. Characterization of the compound determined it to be the terminal four amino acids of albumin, and they chelated copper, a metal which initiates a number of inflammatory pathways in the body.

We formed a pharmaceutical company to develop the compound as an anti-inflammatory agent to treat osteoarthritis of the knee. We are currently in the midst of a **final human clinical trial prior to FDA approval.**

I recall that I delivered a presentation on chelation to the chemistry department as part of my chemistry course requirements. I thank Dr. Dwain Ford for the academic rigor required of me.

Bob Stringer (BA, Chem. '65)

I graduated from Andrews in 1965 with majors in chemistry and biology, took medicine at Loma Linda and did a tour in mission service at Tokyo Sanitarium Hospital. I returned to Richmond, VA, to begin private practice in internal medicine.

I'm still at it, and **still get a kick out of getting up in the morning** and going to work, so it's been a great life. I left the church a couple of decades ago, evolving into a Baptist, a Presbyterian, an atheist and presently an agnostic. I carry with me a truly warm spot inside for the Adventist church what a great bunch of people—and it made me who I am.

My first memories of Andrews. Brrr! What awful, cold winters! At least, until my senior year, when I discovered the network of steam tunnels on campus. And what beautiful days in the spring, birdwatching down along the St. Joseph River and along the old inter-urban right of way through the woods. Here's your trivia for the day. Did you know that Berrien Springs once boasted the country's longest inter-

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urban railway bridge? Or so I'm told.

I remember chemistry in the old wooden building, dating to the earliest days of EMC. Standout memories in the department were the brash, can-do enthusiasm of Bruce Powers, the gentle, easygoing helpfulness of Don Halenz, and the steady, unflappable direction of Dwain Ford. I particularly enjoyed my stint as a lab instructor for the introductory chemistry course, which was a mandatory pre-requisite for nursing students. We chemistry majors lovingly called it Kiddie-Khem.

Students at Andrews were great. What I truly carry with me, though, is the incredible faculty there—teachers who really took teaching seriously, who cared about their students, who made the whole thing interesting and, yes, fun. They represented the best of a small college experience, and I can never thank them enough for the experience thy gave me.

Being at Andrews was being a member of a tightknit family. I realized that at the beginning of my 2nd, 3rd and 4th years on the first Friday nights. I sat down for vespers at Pioneer Memorial Church, the organ played quietly, and I felt like I'd come home.

There was the romantic side of Andrews, of course. The cute server (Joyce Larcom) in the cafeteria line always asked, "What would you like?" I finally told her—and here she is still with me. We raised two kids, and now are raising two grandchildren.

David Love (BA, Chem. '61)

I have good memories of Andrews—especially waiting to come back south so my feet would be warm again. I graduated from Loma Linda School of Medicine in 1965. During my residency, I was **"invited" to spend two years in the army**, including a year in Vietnam.

I began private practice of OB-GYN in 1971 in Fletcher, NC. John Nerness (Andrews, 1965) joined me in 1973 until he went into emergency medicine in 1988. I retired at the end of 2013.

I had the opportunity of working with Bert Keppler at Park Ridge Hospital until his passing some four years ago. I have also seen Wilber Snyder, my roommate, who came and took pictures at my wedding five years ago.

Unfortunately, my wife Joanne and daughter Renee were killed in an auto accident in 1987. I married my wife Nita in 2005. Together we have four children, nine grandchildren and 1 great grandson. Because of a fractured hip and subsequent replacement, I'm not as active as I'd like to be. I have few hobbies, but have been active in Rotary activities and in the Arden SDA church, where I am an elder and Sabbath School teacher. I especially enjoy Biblical history.

Beverly Giebel (BA, Chem. '52)

After graduating from Andrews, I attended Loma Linda School of Medicine and received an MD in 1956. I have spent more than thirty years in mission service—in **Pakistan**, **Ethiopia**, **Papua New Guinea**, **India**.

I have three living children, Rita Giebel, JD (California); Herbert Giebel, MD (India); Arthur Giebel, MD (Walla Walla, Washington)

My husband, Dr. Harald Giebel, passed away in India on November 29, 2011, and I retired from medical practice in 2004, in Papua New Guinea. I now live in Ukiah, CA.

My hobbies keep me busy: playing the organ and piano, sewing, reading, studying, helping others.

My memories at Andrews include H.F. Halenz, John Christenson, Thiele, V.P. Lovell—if I had my annual, I could list more!

Raymond Mayor (BA, Chem. '51)

I graduated from Adelphian Academy in 1947 and then from Andrews (EMC) in 1951. I married Wilma (née Cesario), who graduated from Loma Linda as a Medical Technician. We were married June 14, 1951 in the nurses' chapel.

I attended Loma Linda School of Medicine from 1951 to 1955. After graduation, I interned at Pontiac General Hospital in Michigan. The army drafted me for two years during that time, and I worked in OB—GYN at Fort Lawton, near Seattle.

I practiced in Pontiac till 1994, when I retired and we moved to Berrien Springs. I have been on many short-term medical/dental mission trips.

We had two children—David Lee attended Andrews for two years, and then graduated from La Sierra followed by Loma Linda School of Medicine in 1981. He is practicing emergency medicine at Hinsdale Hospital. His wife, Judy (née Joseph) and my daughter, Laura, both graduated from Loma Linda with degrees in occupational therapy. Laura married Dan Walter who attended Andrews and graduated from La Sierra. Dan is now teaching technology in Hudson Falls, NY.

Wilma died on November 15, 2003 from breast cancer. **God gave her a good life** after her cancer diagnosis in June of 1992.



Message from the Chair

I have the best job in the world.

1. I enjoy teaching wonderfully talented and motivated students. <u>Plus</u>, we have the largest <u>number of chemistry and biochemistry</u> <u>majors in the last five years</u>. Our department is bucking the trend of lower enrollments here and across the country!

2. My departmental colleagues, faculty and staff, are among the best in Adventist chemistry education. They are wonderfully talented, well educated, highly motivated and deeply committed. Each is an expert in their field and communicates their expertise effectively.

3. Our facilities and instrumentation are in great shape. Ten years from installation, the 400 MHz superconducting NMR is still producing excellent spectra. The renovated organic labs are safer for the students and environment. Other instrumentation is up-to-date and operating efficiently. (Thank you to our generous alumni for your support)

We are only lacking in a few areas, such as two student-level FT-IRs and a desk-top (yes, they have those) 60 MHz FT-NMR for rapid analysis of organic samples. We also need an ultra-speed centrifuge for biochemical lab and research.

So, you see, I have the best job in the world. And note, I did not say it was the *easiest*, just the best.

~ D. David Nowack, Chair

D. David Nowack

Forensic Lab Report

We have had an eventful year in the forensic lab. Submissions are up, and trends show a shift away from cocaine toward heroin, reflecting a national trend fueled by cheaper prices for heroin and increased penalties and safeguards against the recent rise in prescription opioid abuse.

The marijuana landscape is changing as well. In 1972, when the Berrien County Forensic Lab began operations, "street grade" marijuana typically contained 4% THC. Today, advances in horticulture have pushed that up to nearly 20% THC in the dried flowers and buds of *Cannabis Sativa*.

Chemists are creative on both sides of this issue. We are seeing an increasing amount of concentrated marijuana products known as hemp oil, butter, wax or resin. These can have up to 80% THC and are typically confiscated with vaporizing pipes. A good analogy is the comparison of beer, with about 6% ethanol, to vodka, at about 50% alcohol.

Complicating the picture for both users and analysts is that **these concentrates can be added to scores of different food products**. We have seen a variety of baked goods, candies, tea and even beef jerky laced with THC.

I am very thankful for the sensitive and selective nature of the LECO Time-Of-Flight gas chromatograph/ mass spectrometer leased by the Prosecutor's office. Small samples can be extracted and introduced with micro-syringes yielding great confirmation of these compounds in complex mixtures.

Operating a drug identification lab at Andrews is not only a good contribution to our community's wellbeing. It also introduces our student to another way that chemists can combine knowledge and technology in real-world applications.

> ~ John Rorabeck Director BCFL



E-mail alumni updates and pictures to David Nowack at chemistry@andrews.edu



Pictured from left to right: *SungJun Kim* is contemplating dental school; *Seth Stacey* is at Loma Linda School of Dentistry; *Rosanne Thornhill* and *Alanna James* are at Loma Linda School of Medicine; *Betsy Quetz* is at University of North Texas for a master's degree in chemistry; *Satoshi Thiele* is an MSE student at Purdue University studying chemical engineering; *Jordan Holzschuher* is working near home while studying for the MCAT; *Swanieka Choy* is pursuing a master's degree in applied anatomy at Case Western Reserve Medical School; *Andrew Hong* is preparing for medical school; *Gideon Nyakundi* is working at a pharmacy and considering pharmacy or medical school.

Not pictured: Samantha Chang is working for the Foundation for International Medical Relief of Children in Peru.



