Newsletter for the Kalamazoo Local Section of the American Chemical Society

September 11, 2017

Vol. 7 – Issue 5

2017 KACS Executive Officers

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Issue Highlights…

Chair's Comments

Dihydrogen monoxide. The presence of this relatively simple chemical in liquid form is essential for the existence of life as we know it. It also provides major recreation as rivers, lakes and oceans (preferably with beaches). However, as Hurricane Harvey reminded us, it can also cause loss of life and severe destruction. This tragic event demonstrates in classic form that all chemicals can be both beneficial and harmful, depending on factors like concentration, degree of reactivity and application. It reinforces the important need for chemists, maybe now more than ever, to help us understand how to maximize the benefits of all chemicals and chemical products, while minimizing their potential for doing harm. Our deepest condolences and hopes for successful recovery go out to the victims of Hurricane Harvey. A number of relief websites are available for donations (the Google donation site will match funds).

Locally, a number of KACS members spent part of this summer learning about the ACS National Historic Chemical Landmark program. This is an interesting ACS program that recognizes historic chemistry-related achievements, mainly via installation of a bronze plaque (similar to the roadside historic event markers seen across the country). Eighty-some landmarks have been granted since the program began in 1993.

Read about the program and the landmarks here:

https://www.acs.org/content/acs/en/education/whatischemistry/landmarks.html?_ga=2.269150513.1507079022.1504019808-1658144557.1491248589.

In thinking about this program and the notable history of chemistry in Kalamazoo, some of us decided to put together a nomination team and package, which was submitted to ACS in August. The subject of the proposed landmark is: Steroids and Upjohn – a Profile of Innovation. A short narrative provided as part of the nomination package is included in this month's newsletter. It really is an excellent story, describing work very worthy of historic landmark designation. Thanks to the nomination team: Tom Runge, Bill Kovats, John Manski, Ken Ball and Jeremy Winkworth. We hope to hear back from ACS soon regarding our nomination.

Heading into fall now, a number of KACS activities are coming up with opportunities for involvement, information about which is provided in this newsletter. Read about the need for members to help John Stodola with a project, to be mentors for a speed-networking event, and to volunteer to help with the National Chemistry Week Museum Day. Also included in this newsletter is the first call for nominations for open 2018 KACS Officer positions. And welcome to Bill Schinzer, joining the KACS Executive Committee as Treasurer. There are plenty of opportunities to get involved with the KACS local section, to get the most out of our ACS membership, why not choose one and join in.

Meet our new KACS Treasurer

Bill Schinzer will be taking over the KACS Treasurer duties as Andre Venter begins his sabbatical in Paris this month. Bill earned his Ph.D. in physical chemistry from Indiana University and worked for the Upjohn Company and its successor companies of years past. He worked with analytical R&D groups, developing methods and solving interesting problems for both drug product and drug substance support. Bill is a veteran of several Boy Scout Chemistry Merit Badge days. In 2006 he started work for Eurofins, a small contract research organization in Portage, serving as their Director of Method Development. In late 2010 he started his own firm, Arrow Pharma Services LLC. He currently works with large pharmaceutical firms as well as startups developing new drugs, generally helping them solve chemistry and pharmaceutics problems. Bill and his wife, Martie, live in Portage and enjoy driving along in their 1974 VW Bus. Their children, Eric and Chris, are not as fond of the bus, perhaps because it used to honk its own horn occasionally.

KACS Lab Coat Initiative

Earlier this year KACS applied for and received an ACS Innovative Grant to obtain KACS-logoed lab coats for use by members and students. The crux of the approved grant proposal was to have lab coats labeled with the KACS logo for use by members and to be loaned to local chemistry students, as a means of advertising KACS, promoting a sense of identity.

We now have the lab coats available. So, are you a member who does chem demonstrations at local schools and events? Or a local student taking lab courses? Then please consider using one of our new lab coats, and show your KACS pride.

These lab coats, property of KACS, are available for long-term, honor-system loan to all members and affiliates. For more information and to request a lab coat, please contact Steve Secreast (chair@kalamazooacs.org).

Report: Project Seed

This summer, Victor Plascencia, who will be a senior at Comstock High School in the fall, worked with Professor Dwight Williams at Kalamazoo College on a research project titled The Synthesis of Novel Candidate Serotonin Receptor Ligands. Victor performed his work as a participant in the American Chemical Society's Project SEED program and presented his findings alongside those of Kalamazoo College chemistry students at a departmental poster session on August 25.

Victor was nominated for a Project SEED research fellowship last spring by his high school chemistry teacher, Ms. Charlene Dailey of Comstock High School. Project SEED provides fellowships for high school rising juniors and seniors to participate in summer research at academic, government or industrial laboratories. The program emphasizes career development and motivation of students to pursue higher education in the natural sciences.

This was Professor Williams' first time to serve as a mentor for Project SEED. Victor expresses his thanks to Professor Williams and the ACS for the opportunity to develop his interest in chemistry and research.

Call for KACS Officer Nominations

Here is your opportunity to become more involved in your local ACS section. We need candidates to run for the following positions for 2018:

- Chair-elect (1 year term, followed by 1 year as Chair, then 1 year as Immediate Past-Chair)
- Chair (1 year term, followed by 1 year as Immediate Past-Chair)
- Secretary (2 year term)
- Councilor (3 year term)

If you are interested in running for any of these positions, know of someone who might be interested, or have any questions regarding the responsibilities involved, please contact Steve Secreast (chair@kalamazooacs.org) or Lydia Hines (lemhwgh@gmail.com).

To learn more, all are also encouraged to visit the "Executive Committee Officers and Chairs" and "Bylaws" pages of KACS website: www.kalamazooacs.org.

Plan Ahead: GLRM 2019

Mark your calendars for the 2019 Great Lakes Regional Meeting! It will be co-hosted by the Chicago and Joliet Sections (both in our Region) and is scheduled for May 1- 4 in Lisle, IL, at the Sheraton Hotel. Co-general chairs are Barbara Moriarty (Chicago Section) and Jason Kelleher (Joliet Section) and the theme is "Chemistry Connections – Careers. Education. Sustainability"

Chemistry Day at the Museum!

Please consider participating in Chemistry Day at the Museum - our National Chemistry Week (NCW) 2017 outreach on Saturday, October 14, 12 noon to 4 pm.

It will be our 31st year of offering this popular outreach event, and we look forward to having **YOU join us** as a presenter of a hands-on activity for the ~1000 attendees. The **theme** for this year's celebration is **"Chemistry Rocks"** with a particular focus on gemstones, rocks and minerals, but our activities need not be limited by that designation.

This event is our highly-anticipated and well-received hands-on program for the Southwest Michigan community and it is held annually at the **Kalamazoo Valley Museum** with the able help of Annette Hoppenworth. To present the large number of activities (usually ~30) we depend primarily on **YOU, our members** to volunteer as leaders at each of the tables so that young people, and those who bring them, will get a taste of the excitement of chemistry in everyday life. Consider this as your contribution to our patrons' STEM education.

If you are willing to give time on **October 14** we have ideas of hands-on activities from which you may select, or you may lead an activity of your own choosing; all you need to do is to identify yourself to our NCW coordinator, Lydia Hines, at lemhwgh@gmail.com or 269-375-7349, and let her know your availability to help, or let her know what activity you would like to lead. Many thanks.

P3 Award Winner

Our Kalamazoo Section was the recipient of the P3 (Partnership for Progress and Prosperity Award) at the 2017 Great Lakes Regional Meeting in Fargo, North Dakota, for our "Sustainable Science – Recycle a Poster" activity each November. What impressed the selection committee specifically were (a) the opportunity afforded by this event to bring science into the public eye since the event is open to all, (b) the benefit of connecting future scientists with today's professionals through networking in an informal setting, and (c) the fact that the event provides a forum for posters to be given a "second lease on life", thus reinforcing the theme of sustainability – i.e., they are presented after having already been presented at other conferences. We appreciate the effort made by Elke Schoffers to submit our nomination. The Award consists of a medallion and a framed certificate for each of the three partners in the award (in our case the KACS, Zoetis and Bell's Eccentric Café') as well as a cash award of $333 for each. The Award ceremony was on June 29 and Lydia Hines was present to receive the award in the Section's behalf.

Volunteer Opportunity

This is a call for volunteers to assist Schoolcraft High School students with a project looking into how wastewater (sewer, septic, storm) is treated, transported and transformed. John Stodola will be working with Josh Willoughby's (chemistry teacher) class on this project during the upcoming school year. We would very much like to have more mentors/advisors. Please contact John (269-377-5378, jdstodola@mac.com) or Josh (269-370-6918, willouj@schoolcraftcs.org) if you are interested and available to help. Experience with wastewater handling would be nice, but not necessary. THANKS!

John Stodola
South County Sewer and Water Board
KACS Past-Chair

Speed Networking Event

Local American Chemical Society (KACS) members and students interested in Chemistry are invited to attend a fun and interactive networking event. Co-hosted by the Center for Career and Professional Development, Kalamazoo College Chemistry Department and the American Chemical Society Kalamazoo Chapter.

The premise for this event is to connect local chemistry college students (WMU, K Col, KVCC) with local working chemists for information sharing. The set up will be like that for speed dating, with participating chem students rotating through 5 minute (or so) sit downs with participating working chemists, the students asking questions related to chem careers, the working chemists providing answers/information based on personal experience. KACS has been asked to provide members to serve as a diverse working chemist panel. This is a great, painless, low time commitment opportunity for us to share our knowledge and experience with chem university students looking to start their careers.

Whether you are a potential mentor (experienced individual who can advise & guide on potential career paths) OR a student interested in meeting with chemistry professionals, please join us for this gathering!

Tuesday, October 10, 6-9pm,
Kalamazoo College, Hicks Student Center, Banquet Rooms: http://www.kzoo.edu/map/KCollegeCampusMapOct2016.pdf
Parking available in the open lot behind Hicks Student Center and on nearby streets.

6:00pm Check-in:
Student Check-in Banquet Room West
- Pre-event pointers
- Light dinner-subs and salad

Mentor Check-in Banquet Room East
- Pre-event gathering, ACS mentor mingle
- Light dinner-subs and salad

6:45pm Welcome and event introduction, Banquet Rooms
7:00-8:00pm Networking Activities
8:00-9:00pm Wrap up and student prize drawing

KACS members interested in participating as mentors, please contact Steve Secreast, chair@kalamazooacs.org.

General event questions? Please contact Jackie Srodes, jsrodes@kzoo.edu.

Climate Change Symposium at ACS National Meeting

KACS supported a climate change symposium at the 254th ACS Fall National Meeting. Here is a thank-you note and a report from the organizers.

> Dear All,
>
> I would like to thank KACS for continued support in the amount of $300 for the Division of Environmental Chemistry at the recent ACS meeting in Washington, DC, which took place on Tuesday morning on August 22, 2017. We had an exciting lineup of speakers (see below), including a scientist, Chris Avery, from the U.S. Global Change Research Program.
>
> Elke Schoffers
> Symposium Co-Organizer
> KACS Past-Chair

Division of Environmental Chemistry Symposium:
ENVR 049, 254th ACS National Meeting & Exposition in Washington, DC. August 22, 2017
TUESDAY MORNING, Aug. 22, 2017, **Renaissance Washington, DC Downtown hotel**
Science & Perception of Climate Change (Oral)
S. O. Obare, E. Schoffers, *Organizers, Presiding*
8:00 Introductory remarks.
8:05 Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming's Six Americas. **J. Kotcher** (George Mason University)
8:35 4th National Climate Assessment and Beyond: Informing decisions across sectors and scales. C.W. Avery, D. Reidmiller, K. Reeves (U.S. Global Change Research Program)
8:55 Climate science literacy, educational tools for the lifelong learner. **G.P. Foy**, K.E. Peterman, R.L. Foy, L. Conrad (York College of Pennsylvania)
9:15 Why do students respond favorably to attempts to teach climate change? **G.M. Bodner** (Purdue University)
9:40 Intermission.
9:50 Response to a warming world. If not us, who?. **J.A. Bell (**Chemistry, Wisconsin Initiative for Science Literacy)
10:10 Global warming is unequivocal: From Arrhenius to Keeling...facts are not enough to influence public sentiment. **B.Z. Shakhashiri (**University of Wisconsin-Madison, Madison)
10:30 Can science be translated to the public? How popular media and other stakeholders frame the climate change debate. **E. Schoffers** (Western Michigan University)
10:50 How culture shapes the climate change debate. **A.J. Hoffman** (University of Michigan)
11:30 Panel Discussion: "When facts don't matter" - **Separating Fiction & Rhetoric from Climate Science Focusing on the Science of Science Communication**

Our Nomination for Historic Chemical Landmark Nomination

Steroids and Upjohn: A Profile of Chemical Innovation

By the end of the 1940's various steroid compounds of the androgen, estrogen, progestogen and adrenocortical classes had been isolated from animal tissues, structurally characterized, and studied for medicinal properties. As the decade closed out a chemistry breakthrough discovery that stood out was Russell Marker working out chemical synthesis of progesterone from diosgenin extracted from Mexican yams, obviating the need for animal tissues. On the medical front, a major breakthrough that shone through was the discovery by Mayo Clinic researchers that the corticosteroids like cortisone were effective as anti-inflammatories treating the debilitations of diseases like rheumatoid arthritis.

At the dawning of the 1950's an overwhelming demand for cortisone arose. However, cortisone was still being manufactured almost entirely as an extract from animal adrenal glands, making the supply very low and the cost very high. Merck had a synthetic process for manufacture of cortisone, but the process involved over 30 chemical steps, a complexity that also limited supply and came with a high cost. Other attempts at synthesizing cortisone had hit dead ends. Percy Julian was able to synthesize the related compound Reichstein's Compound S, but could not find a way to carry out a key oxygenation step needed to carry the process all the way to cortisone. Similarly, Russell Marker could not find a way to oxygenate progesterone to convert it to cortisone (Carl Djerassi following up on Marker's work did work out a chemical process for converting progesterone to cortisone, but the process was too complex to be commercially feasible).

Concurrent with the growing cortisone demand and lack of supply, The Upjohn Company was in the midst of a head first plunge into the sea of steroid chemistry. The company had been working with steroids during the 1930's and 1940's, the work of scientists George Cartland and Marvin Kuizenga being most sited during that period. The two developed processes for extraction of steroid fractions from animal adrenal glands (marketed as a product named ACE), and invented an analytical unit for adrenal hormone potency, the Cartland-Kuizenga Unit, becoming the worldwide standard. In the mid-1940's in a bold future-looking move, The Upjohn Company took on expansion of their R&D organization, creating interdisciplinary steroid discovery and development teams consisting of chemists, biochemists, microbiologists, engineers and production managers. The company also expanded their fermentation and chemical synthesis manufacturing facilities targeting the ability to manufacture steroid medicines with a volume capacity well in excess of expected demand. When the new unmet need appeared in 1949-1950 then, for chemical synthesis and mass production of cortisone, The Upjohn Company was in position to take on the challenge.

Due to this unprecedented focus on steroid chemistry, positive results were achieved relatively quickly. In 1950 the Upjohn R&D team led by Herbert Murray (a microbiologist) and Durey Peterson (a biochemist) discovered that a type of fungus that could be grown in fermenters could efficiently do the steroid chemistry that had been elusive to lab chemists around the world, selectively oxygenate progesterone to hydroxy-progesterone, which could be chemically converted to hydrocortisone and cortisone. This was a major chemistry breakthrough of the time. In addition to opening the door to a relatively simple, inexpensive and commercially scalable synthesis of cortisone, the discovery brought to life the chemistry of steroid microbiological transformations, and more generally the use of fungi (as an addition to bacteria) for chemical transformations. The team's success was also a testament to the strategy of using multi-disciplinary R&D teams, a practice that became standard for all pharmaceutical companies.

At almost the same time, a second Upjohn R&D team led by Haines discovered a bacterium that could selectively oxidized Julian's Reichstein's Compound S directly to hydrocortisone. This second major discovery confirmed the importance of using microbial transformations for performing complex steroid chemistry like selective oxidations. The discovery also meant that Upjohn had the option of having two potential synthesis routes to make cortisone. The progesterone route was selected to take forward based on expect availability and cost of materials.

From here, Upjohn chemists took the hydroxy-progesterone obtained from the microbial transformation of progesterone, and developed an elegant five step synthesis to end up with hydrocortisone, which in one additional step could be converted to cortisone. The process was refined, scale-up and moved to production, and by 1953 Upjohn was marketing low-cost, high-quality cortisone (Cortef) and hydrocortisone (Neocortef) products, which were very well received.

This alone would be a very good ending to a historic chemistry story, a team of scientists in the early 1950's apply a newly discovered mix of synthetic chemistry and microbiological biochemistry to bring a much needed medicine to patients in need. But what makes this story worthy of historic chemical landmark designation is that even more chemistry breakthroughs followed.

Having a process in hand for making cortisone from progesterone, Upjohn focused on the source of progesterone. In 1953, the progesterone was being supplied by Russell Marker's company Syntex, and was synthesized from diosgenin extracted from Mexican yams. Upjohn chemists Milton Herr, Heyl, Centolella and team had developed process for a four-step converting stigmasterol from soybeans to progesterone in 1950, and by 1955 they had refined the process so that Upjohn was able to start making its own progesterone. Soon stigmasterol from soy replaced diosgenin from Mexican yam as the primary plant-based starting material for steroid synthesis being conducted by most pharmaceutical companies.

To go with the switch to stigmasterol as a starting material, Upjohn scientist J. Ward Greiner and team developed an innovative leaching and counter-current process for recovering stigmasterol from the soy sterol mix produced as a by-product of soybean food processing,

truly becoming a classic example of using a sustainable source for a chemical starting material. Greiner's process for recovery of stigmasterol also recovered as a by-product, the related compound sitosterol. The chemistry for utilizing sitosterol as a starting material for steroid synthesis was not understood at the time, but rather than discarding the sitosterol byproduct, the company in a conservationist move starting stockpiling the very stable, water insoluble sitosterol. This stockpile grew for over ten years until a use was found for it.

During the late 1950's with corticosteroid production well in hand, the Upjohn scientists turned research toward discovery of next generation analogs of cortisone. Using the established approach of combining synthetic chemistry and microbial biochemistry, a number of new compounds were discovered and marketed, including prednisolone, methyl-prednisolone (Medrol), fluoroprednisolone (Alphadrol) and Oxylone, which showed for various anti-inflammation indications, better efficacy and safety profiles than did cortisone. Keeping manufacturing needs in mind, the chemistry processes developed used whenever possible, intermediate compounds from the main line cortisone process, a strategy, the use of common intermediates, that became standard for the pharmaceutical industry. The next generation discovery work also branched to include discovery of progesterone analogs including acetoxyprogesterone and melengesterol acetate for contraception applications in the veterinary area, and medroxyprogesterone acetate (Provera) as a human contraceptive. As Motown became Hitsville USA in the music world, Kalamazoo also in Michigan, became Hitsville USA in the steroid medicine world due to Upjohn's long-term innovative approach to medicinal chemistry and manufacture.

Then in the 1970's already having a rapidly growing steroid medicine portfolio, another major microbiological transformation discovery was made. Upjohn scientist Merle Wovcha and team discovered a bacterium that selectively transformed sitosterol into a compound (hydroxyandrostendione), which could with additional slight chemical modification be plugged into the main line manufacturing processes for existing products. With this breakthrough the sitosterol stockpile that had been growing for over ten years as a byproduct of stigmasterol recovery from soy sterols, became a valuable starting material in its own right. With this discovery Upjohn was now not only sourcing starting materials from a sustainable source, it had found a way to utilize multiple materials from a single source, sustainability and conservation practices that were to become key principles of green chemistry. The discovery also opened up a whole new area for chemical exploration involving androstenedione compounds, including the application of novel silicon (SNAP) chemistry.

During the 1980's the work continued including the discovery of additional analogs and new sterol starting material sources, and improving production synthetic chemistry and microbiology biochemical step efficiencies and costs. By 1990, having strung together an unparalleled series of chemistry and manufacturing discoveries and developments, Upjohn had become the premier steroid medicine producer in the world. The company had a portfolio of over 30 medicinal steroid products and supplied steroid intermediates to a number of other pharmaceutical companies for synthesis of additional steroid medicines,

The significance of this chemical landmark achievement continues to be felt today. The Kalamazoo production facility, now as part of Pfizer Inc. continues today manufacturing steroid

medicines and intermediates for global markets. The Kalamazoo steroid manufacturing site was lauded in a 2017 Investor's Business Daily article as an example of how U.S. manufacturing can be made efficient and low cost enough to compete in today's global economy. This is a testament to the historic importance of The Upjohn Company's 1950-1990 steroid chemistry work

COUNCILOR REPORT
254th ACS National Meeting
Washington DC, CA
August 21-24, 2017

Lydia E. M. Hines

- The Council **defeated** a proposal from the Committee on Divisional Activities that it establish a **probationary Division of Space Chemistry**, effective January 1, 2018.

- **Ballots for the 2017 fall national election** will be distributed on September 29, with a voting deadline four weeks later, on October 27. In a change of procedures, all members with an email address on file and eligible to vote will receive an **electronic ballot with the option to request a paper ballot. Those members with no email address on file will be sent a paper ballot with the option to still vote electronically**. The ACS election vendor, Survey & Ballot Systems, will send three email reminders during the voting period to those who have not voted as of the reminder date.

- Information about ACS finances can be found at www.acs.org, at the bottom of the page, click 'About ACS', then 'Financial'. There you will find several years of the Society's audited financial statements and IRS 990 filings.

- The theme of the 254th ACS National Meeting was "Chemistry's Impact on the Global Economy." As of Tuesday evening, August 22, attendance was **12,904 (**2,268 being international**)**

- Membership in AACT continues to grow and now stands at 4,500, with 88% being K-12 teachers

- The annual Leadership conference for new officers will be held in Dallas, TX, January 19-21, 2018.

- Starting at the **Spring meeting in 2021 there will be no scheduled Thursday sessions**.

- Beginning in 2017 Chemists Celebrate Earth Day (CCED) will be celebrated as Chemists Celebrate Earth Week (CCEW).

- The Board voted to **approve the advance member registration fee for national meetings held in 2018 at $475**; and **to authorize two new program funding requests: (a) an *ACS Online Course in Laboratory Safety*, and (b) a *New Faculty Workshop Series*.**

• As part of his report, the Executive Director emphasized that membership recruitment is everyone's responsibility, and that an increase in the recruitment of members from the industrial sector must be a priority; mention was made of increasing efforts in cyber-security, with specific mention of the unacceptable activities of SciHub and ResearchGate.

Note: I appreciate the opportunity to serve our Section as your councilor and am always available to facilitate your contact with ACS.- Lydia

Visit our website www.kalamazooacs.org

Do you have questions, comments, or would like to contribute to this newsletter? Send an email to Christine Pruis, Communication Chair at ACSkzoo@gmail.com