

# THE MIDLAND CHEMIST

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## Chair Column

*Hunter Woodward, Chair, Midland Section ACS*



“Find your Eternity in each Moment”

A snippet of Henry David Thoreau (full quote at the bridge below) highlighting the importance of appreciating every accomplishment. This month I have two accomplishments to appreciate, and will separate them by a bridge to avoid comparing them against each other. The bridge is nonsense, full of scientific inaccuracies, and uses the word “slinky” too much. Enjoy!

Our first accomplishments of note involve the recipients of the Midland Section American Chemical Society Scholarship, which is presented by the Midland Area Community Foundation each year to college students seeking academic degrees in the chemical sciences at Michigan colleges and universities. Applicants must have attended high school in one of the five counties of this Local Section (Midland, Bay, Saginaw, Gratiot, and Isabella). This is an amazing opportunity for burgeoning local scientists, in which you can help support (<https://www.midlandfoundation.org/fund/midland-section-american-chemical-society-endowed-scholarship-fund-399/>). Thank you for your consideration, and if you decide to donate please let me know ([chair@midlandacs.org](mailto:chair@midlandacs.org)) as there are matching opportunities! In 2023 the recipients of this scholarship are Mackayla Pirie and Karlee Szafranski. I had the pleasure of meeting Karlee at the Foundation’s Open House. The one thing that struck me about her and Mackayla’s applications was the amount of community involvement that they participate in, even at this early stage in their careers. It highlights the interwoven relationship between philanthropy, scholarships, and awards, and hopefully incentivizes other students to consider volunteering for their local nonprofits (perhaps including the ACS).

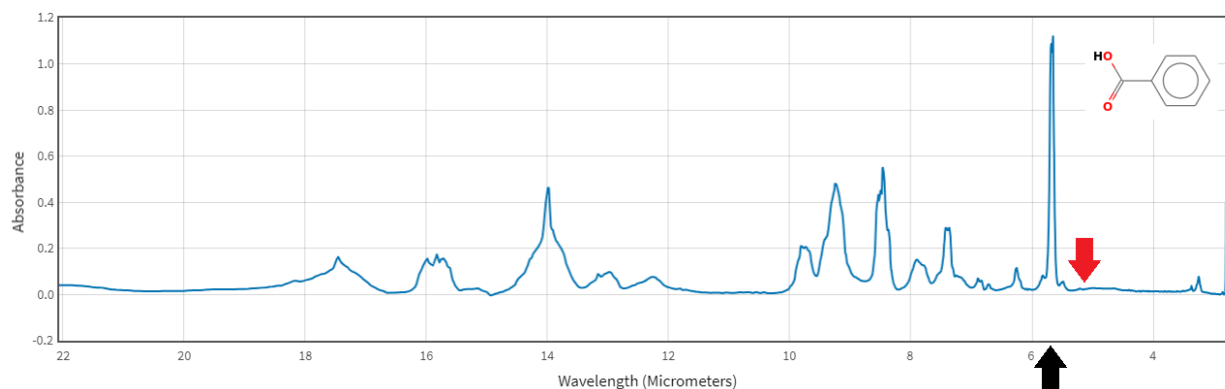


**Figure 1.** Picture from the Midland Community Foundation Open House. From left to right: Financial sponsor Wendell Dilling, scholarship recipient Karlee Szafranski, and your humble Chair Hunter Woodward.

“You must live in the present, launch yourself on every wave, find your eternity in each moment.”

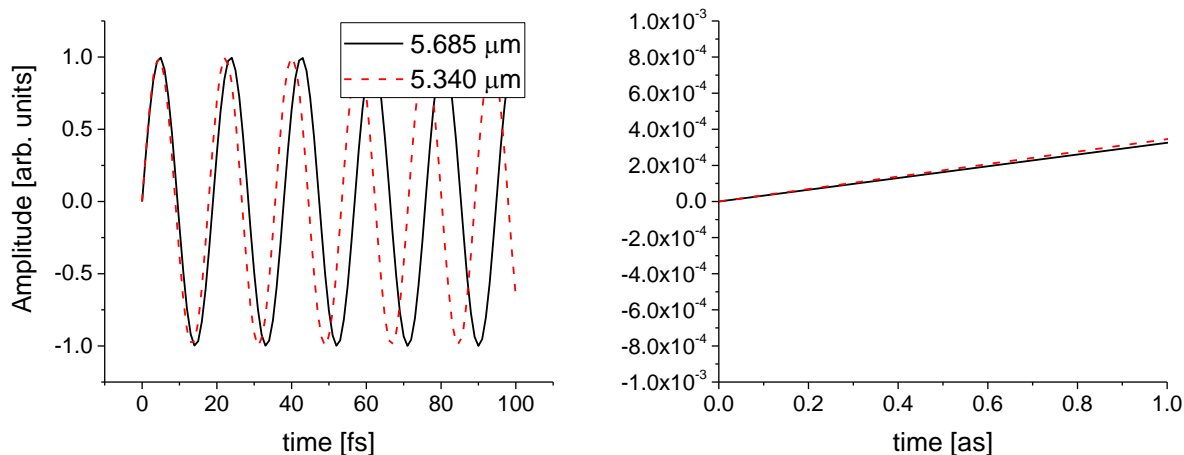
– Henry David Thoreau, from his journal entry on April 24, 1859

For the bridge of this dual-appreciation column I want to throw something completely random at the wall to see if it sticks. How do molecules ever see light? I know they don't “see” in the literal sense, but I will temporarily anthropomorphize molecules to make my point. Let's pretend there is a benzoic acid molecule in the gas phase, wandering through the ether without a care in the world. Suddenly, “zap!” A photon with exactly  $3.494 \times 10^{-20}$  J strikes the molecule. This energy excites the carbonyl group on the molecule, causing the carbon-oxygen double bond length to oscillate. Suddenly, another photon comes along, at exactly the same speed, but this time with  $3.720 \times 10^{-20}$  J. *That* photon passes through completely unnoticed. The two photon energies are highlighted by arrows in the infrared spectrum for benzoic acid (Figure 2).



**Figure 2.** IR absorbance spectrum of benzoic acid, with the photons of note pointed out via arrows. The colors match those in Figure 3. Spectrum and molecular structure taken from the NIST Chemistry WebBook.

Why does one photon interact with the molecule yet the other does not? Or perhaps more puzzlingly, how could the molecule possibly tell the difference between the two photons? The photon is moving at  $2.998 \times 10^8$  m/s. The length of the molecule is about 6 Å, and really the length of the carbonyl group is 1.23 Å, so the molecule has about  $4.10 \times 10^{-19}$  seconds to decide whether to absorb the light or to ignore it. Illustrated in Figure 3 are the two sine waves, with half of the x-axis on the zoomed-in plot (right) equal to the time the molecule has to make this decision.



**Figure 3.** (Left) Two sine waves representing the absorbing frequency (black solid line) and the ignored frequency (red dashed line). (Right) Zoomed-in graph where half of the x-axis is the time the molecule has to make a decision whether or not to absorb the photon. Note the change in the units from femtoseconds to attoseconds.

How? How could it possibly decide? The answer is that the molecule doesn't care about the sine wave like we do. It instead cares about the amount of energy absorbed in that short period of time. I keep a metal slinky toy in my desk drawer to demonstrate what I mean. If you take a slinky, which is obviously a circle, and stretch it out sideways in front of you, you can see a perfect sine wave. Stretching the toy out gives you a longer wavelength, which means for an equal length of toy you have less metal. Squishing the toy together gives you a shorter wavelength, which means the opposite (more metal). The amount of metal in a given length of toy is therefore equal to the "energy" of the photon. As light moves along in a wave pattern, it has perpendicular electric and magnetic waves which give the impression of this circular, corkscrew shape.<sup>1</sup> The molecule is interested in how much energy the photon has, which is to say how much metal in the slinky it is exposed to in that  $4.10 \times 10^{-19}$  seconds. With this crucial bit of information the molecule can therefore make an informed decision. *Only* an exact amount of energy will cause the carbon-oxygen double bond to oscillate. Any more or less and the absorption is forbidden. Even alternative steps in the  $E_0$  energy diagram will be unfavorable thanks to the Franck-Condon principle. So, typically, there is only one option.

As we sit at our desks or on our couches thinking about how any amount of philanthropy or scientific contributions could make a difference, we must constantly prevent ourselves from thinking about a sine wave of effort when really we need to start thinking about the "energy" absorbed by a young mind as we pass by. Sometimes the energy sticks and a new scientist is created or a new idea is generated. Sometimes we continue to move through the ether, unnoticed for now. My argument, dear reader, is that the effort is worth it, it is impactful, and even if we sometimes need to change frequencies, we still are driven to be absorbed. We must live in the present, launch ourselves on every wave, find our eternity in each moment.

With the bridge aside, I will now provide the thrilling news that one of our local ACS members has been selected as a 2023 Fellow of the American Chemical Society. The Fellows program has existed since 2008 to recognize outstanding achievements in and contributions to science, the profession, and the Society. Our newest Fellow is Michelle Rivard, who exemplifies these traits (Figure 4).



**Figure 4.** Michelle Rivard, 2023 Fellow of the American Chemical Society.

It would be difficult to outline all of Michelle's contributions here, but I will try to summarize them. Michelle is recognized as an expert in gas chromatography for siloxane characterization, including the mentorship of countless technicians on key analyses and the perks of a fulfilling career in the chemical industry. She has served for two decades as an officer in the Midland Local Section, the Mid-Michigan Technician Group, the Committee on Technician Affairs, Project SEED, and the Analytical Division. Michelle has won 11 awards related to her volunteer efforts for the ACS, and I look forward to collaborating with her both in the lab and at ACS events for decades to come!

I will finish this column by saying "thank you!" to all of our volunteers. Thank you for everything you do: this is a not-for-profit, volunteer-led, volunteer-run organization that benefits students, teachers, and scientists in our community by championing chemistry, its practitioners, and our members.

W. H. Hunter Woodward, Ph.D.  
Complaisant Chemist

<sup>1</sup>To actually achieve a slinky shape we would need to be talking about circularly polarized light. The slinky demonstration is simply to accentuate "wavelength" → "amount of metal" → "energy."

## Diana Deese Recognized with E. Ann Nalley Award at CERM 2023

Vickie Langer, Co-Editor, *The Midland Chemist*



Diana Deese was recognized with the E. Ann Nalley Award at the CERM Conference and Awards Banquet on June 22, 2023, in Detroit.

The history and purpose of this award is describe at the following link, [E. Ann Nalley Regional Awards for Volunteer Service to the American Chemical Society - American Chemical Society \(acs.org\)](https://www.acs.org/education/programs-and-services/awards-and-recognition/american-chemical-society-regional-awards-for-volunteer-service-to-the-american-chemical-society), and summarized below.

The E. Ann Nalley Regional Award for Volunteer Service to the American Chemical Society was instituted in 2006 by ACS Past President E. Ann Nalley as part of her presidential initiative to recognize ACS volunteerism. The purpose of the award is to recognize the volunteer efforts of individuals who have served the American Chemical Society, contributing significantly to the goals and objectives of the Society through their regional activities. A nominee for the award will have made significant contributions to their region of the American Chemical Society. The volunteerism to be recognized may include a variety of activities, including but not limited to the initiation or sponsorship of a singular endeavor or exemplary leadership in the region.

Diana is well known as the long-time chair of the ACS Midland Section Awards Committee. She has planned and organized the very entertaining annual awards banquet for many years. Diana is also chair of the Mid-Michigan Technicians Group, and in 2021 she took on the task of providing 365 Days of Science where she explained a personal science observation, every day, based on her question “I Wonder”... on the Mid-Michigan Technicians Group Facebook page.

In May, she received the 2023 Midland Section Science Education Volunteer award in recognition of her volunteer service to the ACS Science Coaches program, since 2010. She works with teachers at area schools on monthly classroom science demos and provides STEM presentations to local organizations such as the Girl Scouts Heart of Michigan. Volunteering over 400 hours of her time each year, she has a passion for science that she loves to share!

Congratulations on this well-deserved recognition, Diana!



## 19th Annual MSU ChEMS Department Research Forum, August 25

### *MSU ChEMS Department, East Lansing*

The Department of Chemical Engineering and Materials Science (ChEMS) at Michigan State University invites you to join us at the 19th annual ChEMS Department Research Forum on Friday, August 25, 2023. The forum is a full-day event, running from 8:30 AM to 5:30 PM, and will be held at the Spartan Stadium Tower, 325 West Shaw Lane, East Lansing, on the campus of MSU.

The 19th annual ChEMS Research Forum will showcase department research advances in the areas of:

- Energy and Sustainability
- Nanotechnology and Materials
- Biotechnology and Biomedical Engineering

The one-day program will feature invited plenary speakers, oral presentations from faculty and students, and an extended poster session describing the latest department research results. While the oral presentations of the program can be joined remotely via Zoom, all poster presentations are in-person only.

If you or your company shares an interest in chemical engineering and materials science, then this event offers a uniquely personal and informal view into the general research directions of the ChEMS department, its current research projects, and, most importantly, an opportunity to get to know the many talented graduate students that are at the heart of it all. Parking next to the Spartan Stadium is free and we hope to welcome you to MSU on August 25!

### Keynote Speakers:



- **David Hickey** – Chemical Engineering & Materials Science, Michigan State University
- **Monica Olvera de la Cruz** – Materials Science & Engineering, Northwestern University
- **Daniel Woldring** – Chemical Engineering & Materials Science, Michigan State University

### Keynote Topics:

- **There's still room at the bottom: Molecular engineering in battery design and lignin valorization**

Despite more than 60 years since Richard Feynman's 1959 lecture, titled "There's Plenty of Room at the Bottom," and numerous advances in the fields of nanotechnology and molecular engineering, there remain substantial opportunities to utilize a wholistic understanding of chemical systems for

designing chemicals and materials on the molecular scale to influence a macroscale property. One such opportunity is related to the dramatic increase in applications and developments of electrochemical approaches to address global challenges, ranging from grid-scale energy storage and desalination to commercial production of commodity chemicals and environmentally friendly pharmaceutical synthesis. The success of many such promising technologies depends on an ability to control electron flow near the interface between a liquid solution and electrode surface. This is accomplished by utilizing small electrochemically active molecules that can act as either “electron shuttles” for electrocatalysis, or as “energy reservoirs” for energy storage applications depending on their reactivity in the electrochemically activated state. Despite their ubiquity in emerging green energy technologies, critical relationships between structure and properties of electrochemically active small molecules remain poorly understood. Consequently, discovery/implementation of new redox molecules has been slowed by a reliance on the top-down (or “guess and check”) approach.

The Hickey Group utilizes molecular engineering principles to identify, synthesize, and tune electroactive small molecules and polymer materials for a variety of applications related to energy storage, catalysis, and biosensing. I will describe our recent efforts to design redox active molecules for two disparate areas of research: grid-scale energy storage and electrochemically recyclable biomimetic coenzymes. By studying electrochemical mechanisms and understanding molecular interactions at electrode interfaces, we aim to elucidate universal molecular design principles that can be applied across a wide range of cross-cutting research topics.

- **Structure and function of nanocontainers**

Various heterogeneous molecules co-assemble into nanocontainers that mimic bacterial microcompartments, which sequester toxins in bacteria to be able to survive in harsh environments. We describe their assembly by modifying interactions among the different components to design and assemble specific mesoscale organizations that imitate biological nanostructures and functions. Regarding functions that mimic bacterial microcompartments, we describe chemotaxis in microcompartments of different sizes and compositions including hydrodynamic interactions.

- **Antibody engineering against carbohydrate antigens using virus-like particle conjugate immunization and high throughput selection**

This talk will discuss a new method of evolving monoclonal antibody (mAb) binding affinity to solve the notorious challenge of developing therapeutic mAbs against tumor-associated carbohydrate antigens (TACAs). We apply our directed evolution method to develop lead candidate mAbs against TACAs selective to multiple cancers (e.g., pancreatic, ovarian, breast) with strong interactive forces (dissociation constant,  $K_D < 10$  nM), making these engineered mAbs ideal for biomarker discovery and molecular imaging.

Pre-registration for the forum is requested. Please register for the event at [2023 ChEMS Research Forum](https://www.chems.org/2023-chems-research-forum). For more information, call the MSU ChEMS Department at 517-355-5135, or send an inquiry by email to [chems@egr.msu.edu](mailto:chems@egr.msu.edu).

## 2023 Joint Midwest–Great Lakes Regional Meeting

Steve Keinath, Co-Editor, *The Midland Chemist*

Editor's note: The material included within this article was provided, in part, in an email message, dated Monday, July 3, 2023, to members of the American Chemical Society.



Abstracts are now being accepted for the **2023 Joint Midwest–Great Lakes Regional Meeting of the American Chemical Society (MWGLRM)**. The MWGLRM will be held from Wednesday to Saturday, October 18-21, 2023, in St. Louis, Missouri. Co-hosts for this meeting are the St. Louis and East Central Illinois Sections of the ACS. The venue will be the St. Charles Convention Center in St. Louis.

The theme for the meeting is “**Scale Up Your STEM,**” and will feature plenary speakers, exciting technical sessions and special symposia, poster sessions, regional awards, social events, and a large vendor expo. In addition, there will be special undergraduate programming, chemistry education workshops for high school teachers, and events sponsored by the local Younger Chemists Committees and the Minority Affairs Committees. It is a great opportunity for undergraduate and graduate students to present their research and get to know the Midwest and Great Lakes chemistry communities.

Please visit the [MWGLRM website](#) to find a list of the programming divisions and planned symposia. Note that the deadline to submit an abstract was Monday, July 17, 2023.





**Midland Section ACS Scholarship Fund Update and Encouragement to Give**  
***Gina Malczewski, Director and Scholarship Committee, Midland Section ACS***

In May of 2021, Dr. Wendell and Marcia Dilling issued a challenge relative to growing the Midland Section ACS Scholarship Fund. At that time, they committed \$18,000 of matching money to grow the fund to \$100,000 by matching dollar for dollar all contributions made to the fund until it reached the target goal.

To date, there have been six contributions amounting to \$1,980.76, and Wendell and Marcia honored their matching donation commitment by submitting a check in the amount of \$2,000 to the Midland Area Community Foundation, the entity that holds and manages the Midland Section ACS Scholarship Fund.

Wendell and Marcia have recommitted to their original pledge and will continue to provide matching money until their contribution reaches \$18,000, or perhaps a little more upon future reflection. The long-rang goal remains the same, to increase the Midland Section ACS Scholarship Fund principal balance to \$100,000 to enable offering additional and perhaps larger year-by-year scholarships to well-deserving students across the greater Midland Section ACS region.

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The Midland Section ACS has been proud to offer scholarships to deserving undergraduate students majoring in a chemical science since 2002. Annually, two to four scholarships are awarded to candidates who have graduated from a high school in one of the Section's five counties (Bay, Midland, Saginaw, Isabella, and Gratiot), are studying at a Michigan university, and are ideally intending to pursue a career in some aspect of chemistry or chemical engineering. Selections are made by a committee and are based on academics, service and extracurricular contributions, and an essay on the student's sources of motivation as well as future plans. Past scholarship recipients are often highlighted in issues of the *Midland Chemist*.

Awards usually range from \$1,000-2,000, depending on the financial performance of the Midland ACS Scholarship Fund (#399) administered through the Midland Area Community Foundation. A long-standing goal of the Midland Section ACS has been to raise the base amount to \$100,000 to serve more students.

Wendell and Marcia Dilling, both chemists and long-time supporters of the Midland Section ACS, are prepared to continue to help us reach that goal by donating up to \$18,000 as part of a challenge grant to the scholarship fund. **They will match 1:1 any new contributions to the fund at the Midland Area Community Foundation over the next couple years.**

Please consider contributing to this worthwhile cause. **Your donations will help shape the future of chemistry!** If you have any questions about contributing to the Midland Section ACS Scholarship Fund, please call the Midland Area Community Foundation at 989-839-9661. Thank you.

An online donation form can be found through the following link:

[Midland Section American Chemical Society Endowed Scholarship Fund #399](#)

## Upcoming Dates, Events, and Other Updates

- August 7 (7:00 – 8:00 PM) – Hybrid Midland Section ACS Board meeting, MSU St. Andrews, Midland (in person), and via a WebEx conference call connection at [Webex Board Meeting - August 2022](#), Meeting number: 126 651 0648, or by phone at Phone number: 415-655-0001, Access code: 126 651 0648.
- August 13-17, 2023 – ACS Fall 2023 National Meeting & Exposition, San Francisco, CA. This meeting is being planned as an in-person and virtual hybrid meeting. Meeting theme: *Harnessing the Power of Data*. For more information, please see [ACS Meetings & Expositions - American Chemical Society](#).
- August 25 (8:30 AM – 5:30 PM) – 19th Annual MSU ChEMS Department Research Forum, Spartan Stadium Tower, 325 West Shaw Lane, East Lansing. Pre-registration for the forum is requested. Please register for the event at [2023 ChEMS Research Forum](#). For more information, call the MSU ChEMS Department at 517-355-5135, or send an inquiry by email to [chems@egr.msu.edu](mailto:chems@egr.msu.edu).
  
- September 11 (7:00 – 8:00 PM) – Hybrid Midland Section ACS Board meeting, MSU St. Andrews, Midland (in person), and via a WebEx conference call connection at [Webex Board Meeting - September 2022](#), Meeting number: 126 651 0648, or by phone at Phone number: 415-655-0001, Access code: 126 651 0648. **Please note: This Board meeting is being held on the second Monday of September, not the usual first Monday of most months due to the Labor Day holiday.**
  
- October 2 (7:00 – 8:00 PM) – Hybrid Midland Section ACS Board meeting, MSU St. Andrews, Midland (in person), and via a WebEx conference call connection at [Webex Board Meeting - October 2022](#), Meeting number: 126 651 0648, or by phone at Phone number: 415-655-0001, Access code: 126 651 0648.
- October 18-21 (Save the Date) – 2023 Joint Midwest–Great Lakes Regional Meeting, St. Louis, Missouri. Meeting theme: *Scale Up Your STEM*. Visit the [MWGLRM website](#) for more information. Note that the deadline to submit an abstract was July 17, 2023.
- October 21 (10:00 AM – 3:00 PM) – **Note: event date has changed from September to October.** ACS Sustainability Event: *How Can You Make a Difference?* Panel discussion at Delta College Midland Campus, 10:00 to 11:30 AM; pizza lunch, 11:30 AM to 12:30 PM; and volunteering opportunity at Midland Recycling Center, 1:00 to 3:00 PM. For more information, please contact Erin Vogel at [EVogel@dow.com](mailto:EVogel@dow.com).
  
- November 3 or 10 (Tentative – Save the Date) – 2023 Midland Section ACS Fall Scientific Meeting, all day, at Central Michigan University. For more information, please contact Dale LeCaptain, General Chair, at [dale.lecaptain@cmich.edu](mailto:dale.lecaptain@cmich.edu).
- November 6 (7:00 – 8:00 PM) – Hybrid Midland Section ACS Board meeting, MSU St. Andrews, Midland (in person), and via a WebEx conference call connection at [Webex Board Meeting - November 2022](#), Meeting number: 126 651 0648, or by phone at Phone number: 415-655-0001, Access code: 126 651 0648.
  
- December 4 (7:00 – 8:00 PM) – Hybrid Midland Section ACS Board meeting, MSU St. Andrews, Midland (in person), and via a WebEx conference call connection at [Webex Board Meeting - December 2022](#), Meeting number: 126 651 0648, or by phone at Phone number: 415-655-0001, Access code: 126 651 0648.

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**Volunteer Staff**

Vickie Langer  
Steve Keinath  
Mike Malczewski

Editor ([vlanger@dow.com](mailto:vlanger@dow.com))  
Editor ([skeinath54@charter.net](mailto:skeinath54@charter.net))  
Webmaster ([web@midlandacs.org](mailto:web@midlandacs.org))

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