

Newsletter for the Kalamazoo Local Section of the American Chemical Society

February 23, 2018

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PLAN AHEAD

CHEMISTS CELEBRATE EARTH WEEK



<https://www.acs.org/content/acs/en/education/outreach/ccew.html>

An **early announcement** about our section's participation in Chemists Celebrate Earth Day; we once again hope to have outreach events at the Celery Flats in Portage and at the Kalamazoo Nature Center, and at any other venues where we can have interested volunteers. **Note** that this outreach **event is in its 15th year** and has been re-labeled **Chemists Celebrate Earth Week (CCEW)**; it will be celebrated **April 22-28, 2018**, the topic is **"Oceans"** and the theme of the publication from the ACS Outreach office will be **"Dive into Marine Chemistry"**, which will discuss the chemistry of water from the ocean. The common goal for CCEW, as well as any other activity of our ACS, is to communicate the positive role that chemistry plays in the world.

Are you passionate about educating your community about the environment?
If so, then we have the perfect opportunity for you!

KACS is looking for a CCEW Coordinator.

If this is something that interests you, then please contact
Lydia Hines (lemhwgh@gmail.com) for more information!

ARE YOU INTERESTED? CHEMISTRY & ART

KACS is considering hosting an evening of Chemistry & Art – specifically *chemists painting!*



The proposed three hour event would be held at the local family-owned business, Happy Our Art (<https://happyourart.com/>), where one of their trained artists would guide our group in painting the same chemistry-themed image on a 16" x 20" canvass. No art training is required! Only the desire to have fun and learn something new!

This establishment can hold up to 50 people with a minimum of 15 attendees. ACS would provide light refreshments, but the venue is BYOB so participants are also able to bring their preferred food and beverage. Typical cost of \$35 per person, but the cost may vary depending upon the number of individuals who attend. We are thinking to do this a weeknight in late March or early April. Depending on the interest, we may also have a short speaker.

Are you interested in participating in an evening of Chemistry & Art?

If so, then please contact Christine Pruis (ACSkzoo@gmail.com) with the number of people in your party!

K COLLEGE ACS CHAPTER

BATTLE of the CHEM CLUB VICTORS!

The Kalamazoo College ACS chapter is happy to report that they won the “Battle of the Chem Clubs 2018!” As the winners, they took home the Separatory Funnel Trophy (image shown of entire team). They also earned the much-coveted “Grenade Award” for the best performance during the speed titration semi-final (image of award winning titration team also shown). The Battle of the Chem Clubs started in 2007 and is hosted at Michigan State University. There were approximately 80 ACS student participants from 12 Michigan colleges and universities. Exciting events include periodic table darts, a spectroscopy interpretation challenge, dry ice curling, and jeopardy-style questions with buzzers. This is an exciting day and a great networking opportunity for young chemists.

Way to go Kalamazoo College on your victory!



Chris Vennard, Sabrina Leddy, Audrey Thomas, Elizabeth Knox, Adam Decker, Maria Fujii, Jake Sypniewski.



REPORT

ACS LEADERSHIP INSTITUTE

By Lydia E. M. Hines

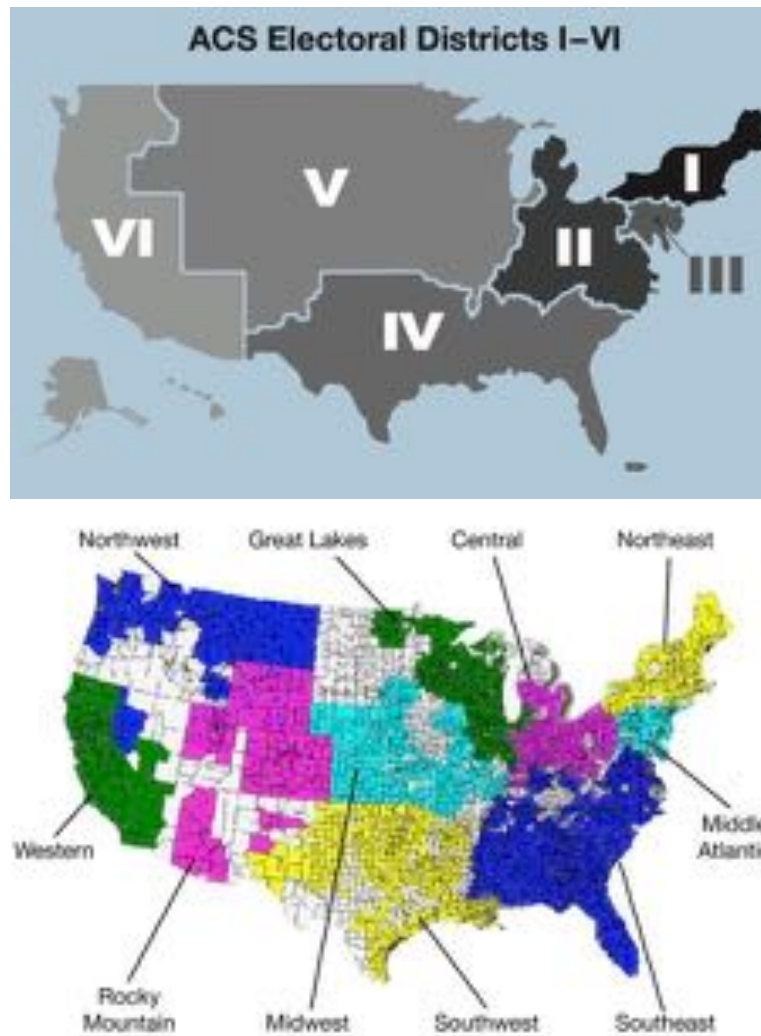
The ACS Leadership Institute (LI) gathering is held annually for newly-elected leaders of ACS Local Sections and Divisions to gather for ~48 hours over the third weekend of January to interact with ACS staff and leadership. There are “tracks” for Division leaders, Region Leaders, and Local Section Leaders for the most beneficial interaction of leaders in each of these “tracks”. The well-designed Leadership Courses developed by ACS since 1965 are also offered to participants. There were many opportunities to share “best programs” and “practices” with the large group so all could benefit from others’ processes and successes, as well as to learn about pitfalls to avoid.

At LI, we were regularly reminded about writing reports of our activities as they occur through the year and placing them in FORMS in preparation for the Annual Report submission. Another recurrent theme was that members are more likely to read “Social Media” such as Facebook, Twitter, Pinterest etc., than e-mails, or the website, though sections were encouraged to maintain a website (note that our KACS Section does have a facebook pages and website, www.kalamazooacs.org)

Another topic of conversation at the LI was that it is disappointing that many members are not aware of our Society’s member-friendly programs and amazing services. There is the ACS website (www.acs.org) but it has MANY layers of information through which to navigate to get to what one needs. In the next Newsletter I will present some information about ACS’ career offerings; below I will talk about the often-misunderstood difference between Districts and Regions:

The ACS has many opportunities for service to its members and to the public – the Local Section (LS) is one of them. Members are **assigned** to a LS based on their mailing address of record – any who report an address with zip codes in **Kalamazoo, Allegan or Van Buren counties** are assigned to the Kalamazoo Local Section. Members may request re-assignment to a local section of their choice. Members of a Section are **encouraged to inform the section’s leadership of programs which would interest them, and to participate in section activities** which are announced through use of our Facebook page, our newsletter, e-blasts, and on our website, which has a list of **current officers – we would love to hear from you!**

Local Sections are assigned to **Voting Districts**, of which there are **6**, each with an elected voting representative on the Board of Directors (BoD). Per our National ACS Bylaws, Districts must have approximately equal numbers of members, so occasionally individual local sections may be moved to a new district – Kalamazoo moved from District II to District V about 4 years ago – There are also six Directors-at-Large on the ACS BoD.



Another, non-bylaw-mandated, grouping of Local Sections is the Region, a geographical area of local sections initiated around the time of WWII, which gave ACS members opportunity to meet in a smaller, more accessible and affordable professional meeting format than at the two national meetings, to present scientific papers and form networks for professional enhancement. **There are 10 Regions.** Our **Kalamazoo Section is part of the Great Lakes Region (GLR)**. As a result of comments and concerns expressed at the LI we should see a current, better delineated Region map in the foreseeable future ☺

Some of you may remember that in 2015 our KACS co-hosted a Regional Meeting with the Western Michigan Section, which belongs to the Central Region, in Grand Rapids (the JGLCRM2015); many of you attended, organized symposia, and presented your research orally or on posters. The Huron Valley Section, in the Central Region, has invited our Section to **co-host** a joint meeting with them again in **2027!** Who is willing to work at that??

In the next Newsletter I would like to highlight a very useful ACS **career service** which was brought up at the LI as a result of a “collaborative project” idea presented by the Huron Valley section representative and the Kalamazoo section rep (me).

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

At the end of this newsletter is a BONUS FEATURE:
A brief literature review by our local section chair, Steve
Seacrest on

Quantum Mechanics and Photosynthesis

Introduction

So what now? Well, I don't see that coming, but I hope that participants will participate again! Well, I don't see that coming, but I hope that participants will participate again! Well, I don't see that coming, but I hope that participants will participate again!

By the end of this lecture (2000) :

Understand the production and processing of photosynthetic products. The process involves the conversion of light energy into chemical energy via a series of light-dependent reactions and subsequent electron transport. The light-dependent reactions of photosynthesis, which is what makes plants and photosynthetic bacteria and algae special, is what we're interested in here.



A basic high-level overview of the photosynthetic process is light harvesting, which involves the following:

1. photosynthesis is made of photosynthesis
2. the photosynthesis involves light harvesting, which is light harvesting
3. photosynthesis is made of photosynthesis, which is light harvesting
4. photosynthesis is made of photosynthesis, which is light harvesting

This is an extremely efficient energy harvesting system, with the photosynthetic energy being converted to chemical energy via the photosynthetic process.

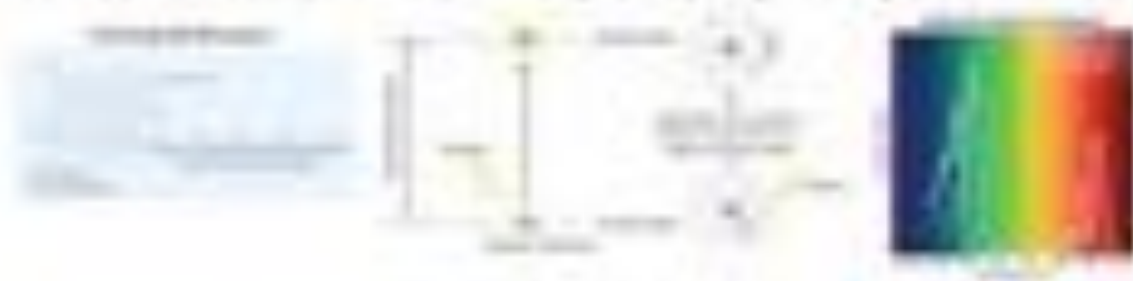


Diagram illustrating the photosynthetic process, showing the light-dependent reactions and the Calvin cycle.

To get to the quantum-mechanical part of the story, we need to discuss the photosystems in the thylakoid membrane (I omit in the diagram at the molecular level). By the end of the last millennium the thylakoid membrane photosystems were known to be protein complexes that contained embedded pigments (chlorophyll and carotenoids), situated in the thylakoid membrane as a reaction center surrounded by an antenna complex. Here are two different examples of photosystem diagrams.



And the light harvesting mechanism was explained as a vibrational molecule taking photons in the form, sending one of its electrons. The excited electron is passed from a chlorophyll molecule to another and continues to another until reaching the protein's embedded reaction center, where it is stabilized and passed on to the photosynthesis as part of the reaction transport chain. This antenna system allows multiple chlorophyll molecules to be wrapping/absorbing structure, leading to steady stream of excited electrons to the Reaction System for processing. A very elegant design.



by the red light's rate per photon:

Photosynthetic reaction centres are functional (non-reversible) and harvesting much more efficient, and photosynthesis, the rate of photosynthesis is determined by the light harvesting systems. Structural data is being collected.

- photosynthesis is a complex reaction involving 20-30 kJ/mol
- the reaction is a 10-15% efficiency, the rest is lost as heat
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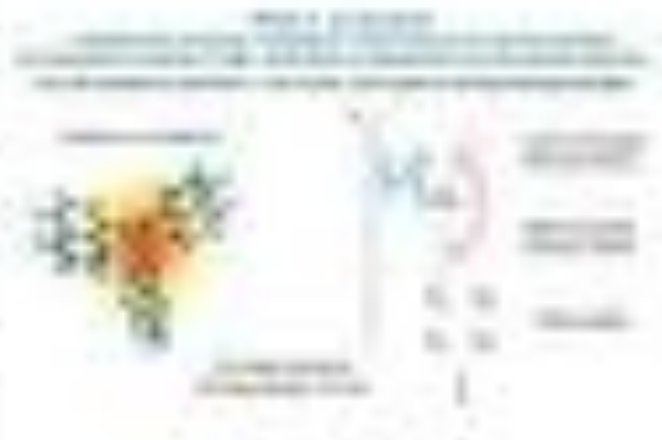
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What is the reaction? The reaction is a 10-15% efficiency, the rest is lost as heat

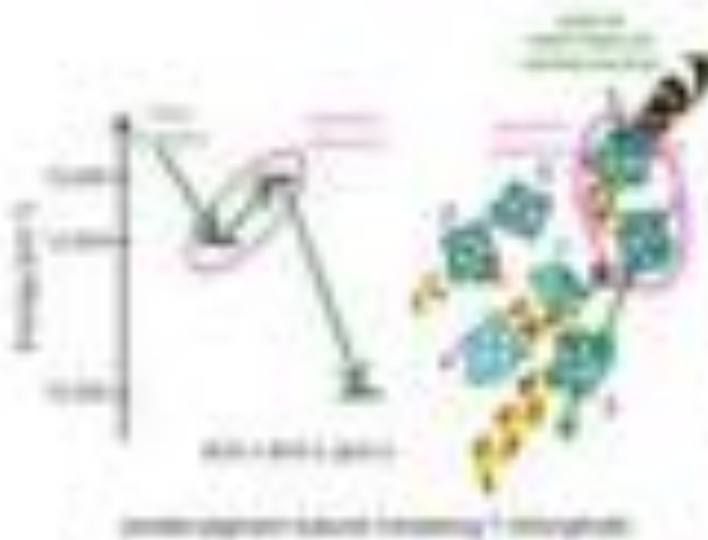
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Then toward the end of the 2000s decade, some landmark experimental work was done by researchers using the 2D electronic spectroscopy techniques developed to study the photosynthetic systems. They studied the excitation dynamics of individual protein-pigment subunits (not with femtosecond-pulsed lasers). The data from these studies showed (among other things):

- evidence of chromophylls spatially distant from the site of laser light excitation leading to the appearance of excitation
- evidence of excited electrons having apparently been passed energetically uphill rather than following the classical path of least resistance

These data led to the remarkable conclusion that the photon-induced excitation energy was being passed through the protein-pigment subunit via a quantum coherent mechanism. A conclusion supported by theoretical calculations indicating the energy electronics and spatial orientation of the chromophyll molecules were suitable for supporting quantum coherence.



The proposal that quantum coherence is used within the Photosynthetic to transfer excited electrons to the Reaction Center almost instantaneously with almost no energy loss, is consistent with the available data (and just feel right).

However there was the very nagging question of how could the femtosecond scale quantum coherence observed in isolated protein-pigment subunits translate to picosecond scale coherence in the much larger, very environmentally noisy Photosynthetic Complexes?

Building artificial photosynthetic systems :

Scientists are developing new ways to power systems for artificial photosynthesis by mimicking photosynthesis harvesting techniques. These new developments include genetic engineering of microbial systems to further improve light harvesting and the incorporation of biological components into synthetic solar power devices.

And in a closer view of some work to improve something as that, scientists everywhere are now using evidence that the controlled use of quantum mechanics is making a difference in energy storage, transmission, and transport of information.

The first Quantum Biology was started in the 1990s & came to the forefront of use of quantum mechanics.



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