CHEM MAJOR NEWS

In Conjunction with the American Chemical Society
Student Affiliates at the University of Pittsburgh

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Some Incredibly Important Dates to Know...

November 8 Deadline for undergraduates to apply for April 2018 graduation in 140 Thackeray Hall

November 22-November 25: Thanksgiving Recess-No Classes! Have a great Holiday!

Congratulations!

On Friday, November 16, 2018, the American Chemical Society-Student Affiliates at the University of Pittsburgh will host the annual Fall Term Awards Ceremony. This year's award winners include the following students:

Zemeng Wei	*Undergraduate Analytical Chemistry Award*
Samuel (Ben) Koby	*Undergraduate Inorganic Chemistry Award*
Conrad W. Stoy	*Undergraduate Organic Chemistry Award*
Hanna Brubaker	*Undergraduate Physical Chemistry Award*
Jennifer M. Rutkowsky	*Silverman Award*

Four of our awardees are ACS-SA members and we are very proud to have them in our gang. We extend our sincere congratulations to all of our awardees for a job well done!

Everyone is invited to attend the awards ceremony in Room 150 Chevron Science Center on November 16th. Come join us as we celebrate undergraduate achievements with our awardees!

2018-2019 ACS-SA Officers and Staff

Eric McElhinny-*Co-President*
Shelby Szott-*Co-President*
Hanna Brubaker-*Co-Vice-President*
Jennifer Rutkowsky-*Co-Vice-President*
Charu Arora-*Co-Secretary*
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Conrad W. Stoy-*Outreach Coordinator*
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Luke Persin-*Newsletter Co-Editor*
Seth Brody-*Green Chemistry*
Justin Maier-*Technical Wizard*
Sammi Mike-*Senior Affairs Committee*
Sujata Sigdel-*Senior Affairs Committee*
Angela G. Partridge-*Senior Affairs Committee*
Sasha K. Walbridge-*Senior Affairs Committee*

Visit us at http://www.chem.pitt.edu/acs-sa/

Our November Schedule

November 2 Fall Term Birthday Celebration

9 Preparation for Saturday Science *to be held on December 1, 2018*

16 Fall Term Awards Ceremony

23 Thanksgiving Break

Everyone is welcome to attend our weekly ACS-SA meetings. Every Friday at noon we get together in 150 Chevron Science Center to hear interesting talks, learn more about science and enjoy each other's company. Come join us for all of the above mentioned meetings.

Saturday Science Academy

Looking for something fun to do on December 1, 2018? Try Saturday Science! It is an opportunity to help ambitious area high school students learn both general and organic chemistry in the lab. With your help, the students get to make crystal gardens, do a simple thin layer chromatography experiment, witness an acid base reaction with dry ice, measure the pH of some favorite soft drinks, and synthesize slime. Volunteers will play the role of a teacher: demonstrating the experiments, helping the students perform them, and finally, answering their questions. Saturday Science is a fun and rewarding volunteer experience in chemistry. So, are you still looking for something fun to this year? Join us for the ACS-SA meeting on Friday, November 9, 2018 at NOON in 150 CHVRN to plan for this great day. If you cannot be there on Friday, e-mail John Bielamin (jpb9@pitt.edu), our Outreach Coordinator and let him know you're interested in helping out and then join us on Saturday, December 1, 2018 at 9:00 a.m. in the Chevron Lobby.

Happy Thanksgiving!!

Green Chemistry

by: Seth Brody, *ACS-SA Topic Newsletter Editor*

Currently, synthetic techniques have yielded greater than 130 million non-natural chemical species, increasing by approximately 1 million species per year. These largely *xenobiotic* compounds, foreign to natural metabolic processes, therefore represent a significant source of environmental pollution.[1] However, toxicity is not inevitably inherent, when mitigated by the green chemistry principle of *rational molecular design* (RMD). As defined by the ACS, this standard of safer chemical production is informed by empirical, mechanistic, and computational methods.

The practical basis for RMD is the principle of *industrial metabolism*, defined as an ideally closed economy of materials and energy conversion, minimizing waste to the external environment. However, industrial metabolism is essentially based on *conservative evolution*, in which fundamental chemical constituents (e.g. atoms, water, catalysts, amino/nucleic acids) persist under evolving natural conditions and processes.[1]

Evidence of RMD was recently established in the selection of native *γ-valerolactone* (GVL), a demonstrably sustainable compound for synthetic application.[1] Commercially, GVL acts as a broad platform molecule for many routes of organic syntheses (Figure 1). As a robust material in these production conditions, it is liquid over a large temperature range, with high flash point, good ether-peroxide (i.e. oxidation) stability, perceivable odor, and is distillation-separable. However, this fruit-derived compound is a source of low acute mammal toxicity, produces low vapor pressure for limited atmospheric emission, and biodegrades through complete water-miscibility.[1]

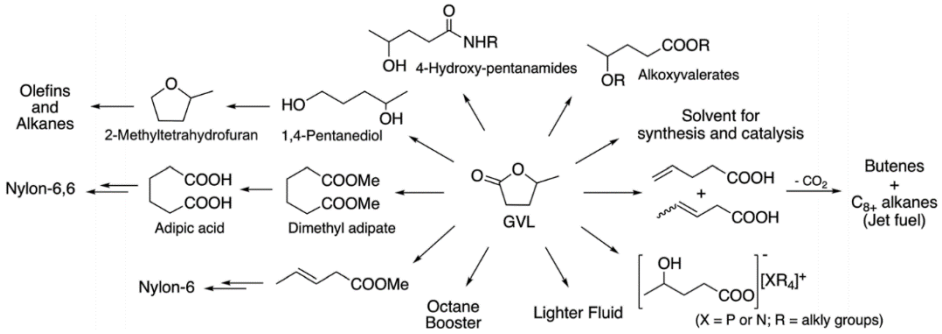

Figure 1. GVL-platform synthetic routes for renewable, organic commercial products[1]

In addition to prevention of chemical toxicity by design, RMD has been applied to sustainably eliminate chemical pollutants formerly released into the environment. Aquatic biota, contaminated by heavy metal ions (e.g. arsenic, lead, mercury) in surface and industrial waste water sources, are subjected to various degrees of exposure and developmental toxicity. Recently, these ions were adsorption-purified from such conditions, through selective *metal organic framework* (MOF) compounds, as shown in the header (right) of this newletter.[2]

MOFs are tunable inorganic-organic hybrid solid materials, synthetically self-assembled through coordination bonds between metal-containing units and organic linkers to produce open crystalline networks, for porosity and thusly internal surface area. To date, more than 20 thousand different MOFs have been characterized, with comprehensive application (e.g. luminescence, sensing, biomedical imaging), but environmental remediation is limited by water instability of metal-organic coordination, in terms of acid-base hardness. Stronger coordination of modern MOF materials has allowed inherent porous adsorption, as well as photocatalytic transformation, of metallic pollutants in aqueous environments, for effective removal motivated by the RMD principle.[2]

1. Náray-Szabóa, G. et al. *Green Chem.* **2018**, *20*, 2171.
2. Feng, M. et al. *Chemosphere* **2018**, *209*, 783-800.

Just What Can You Do With That Chemistry Degree?

by: Kaila Simcoviak, Part 3 in a series

A Bachelor of Science degree in Chemistry can connect you to all areas of science! One of the most well connected areas is pharmacy! So, are you interested in working with pharmaceuticals in a pharmacy or hospital setting? Or even working in a manufacturing setting to help develop a particular drug? If so, then consider applying your chemistry degree towards going to pharmacy school!

A pharmacist is a health professional, who not only dispense prescription medication to patients but also provide information about the drug to doctors. The pharmacist is responsible for providing instructions to both doctors and patients about the medication and also how to safely and effectively take the medicine.

A chemistry degree is great for a career as a pharmacist. Prerequisites for admission into pharmacy school, for example at the University of Pittsburgh, include general biology I and II with lab, general chemistry I and II with lab, organic chemistry I and II with lab, a calculus course, a statistics course, two courses of English composition, and twenty-four electives combined of humanities (twelve credits) and the social sciences (twelve credits). Almost all of these courses are again met through the chemistry degree at Pitt, and they can all be met through the addition of the bioscience option to your chemistry degree. Pharmacy school would be an additional four years after the completion of an undergraduate degree.

According to the bureau of labor statistics, the employment opportunities as of 2016 for pharmacy was 312,500, with the expectation to grow by 6% between 2016 and 2026. The median annual salary was $122,230 as of 2016. California employs the highest number of pharmacists with 28,670 jobs and their annual mean wage being $136,100. Alaska is the top paying state for this occupation coming in at $137,650 for an annual mean wage, but they only have 470 employment opportunities in this field.

Maybe retail or hospital pharmacy is not where you see yourself, but you still want to work in researching and developing new drugs, then maybe medicinal chemistry is the field for you! Medicinal chemists apply their chemistry knowledge to the process of synthesizing new pharmaceuticals. These chemists are focused on drug discovery with the isolation of medicinal agents found in plants and the creation of new synthetic drug compounds. A background in biology, microbiology, and biochemistry are recommend for this field, so consider pairing your chemistry degree with the bioscience option at the University of Pittsburgh! So, with this option one would take Foundations of Biology I and II with Lab and then two other biology courses of their choice, but recommend would be taking biochemistry and microbiology for this field! The median annual wage for this field of medicinal chemistry is $82,240 as of 2015.

So, are you willing to devote yourself to a lifetime of service to others by considering the welfare of humanity and relieving suffering of patients? Then consider a degree in chemistry to help pursue you dreams by either attending pharmacy school or going into the field of medicinal chemistry. Both of which can be obtained by majoring in chemistry!

Sources:

http://pages.pharmacy.pitt.edu/pharmdhandbook/the-pharmd-student-handbook/admissions/pre-professional-requirements/
https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/medicinal-chemistry.html
http://www.chem.pitt.edu/undergraduate/degree-options/bioscience-option
https://www.bls.gov/ooh/healthcare/pharmacists.htm

Fisher-Chemist-Golfer Guy

by: *Andrew Dewar*

Close your eyes for a second and imagine this scene. You are standing on the deck of a fishing boat, either trawling or setting nets, with a particular catch in mind. It could be fish, shrimp, or even crabs. After you lower the nets into the water you wait for an unspecified amount of time. It could be anywhere from thirty minutes to three hours, but when they are brought back up they are filled to the brim. This is great, until they get dumped on deck and it is your job to get that half-ton of product cleaned up before it spoils or the next round gets dumped on top. This is a good problem to have, it most likely means you are making a profit, but it also means you are exhausted and responsible for properly handling a large amount of seafood.

There are numerous ways seafood can spoil or become contaminated. More than I had the time or mental capacity to wrap my head around while working. After dozens of hours of intense physical labor it can be difficult to stay motivated to get things done quickly to mitigate a multitude of risks you don't fully understand. I sometimes found myself asking, "Does it really matter if I take a quick break before I finish picking this up?" One way I found to keep myself motivated was by trying to educate myself on some of the outcomes of handling seafood poorly. One case I found to be interesting was scombroid poisoning.

The name comes from the family of fish named scombridae which include tuna, mackerel, and some other commonly consumed fish that were originally believed to be solely responsible for the problem. The name is a bit of misnomer though, since fish from other families have been found to cause poisoning as well. The name should be histamine poisoning since that is what is actually occurring after consumption. You might be wondering though, how does a toxic amount of histamine end up in a fish that was just alive? Would not it too have experienced some type of symptoms? This is where I thought this became an interesting topic, but first we need to cover a few basic ideas.

We need histamine to survive, but only very small amounts. Too much can cause illness or eventually death. Humans get their histamine by consuming foods that contain its precursor, L-histidine, which is an essential amino acid of great biological importance. Once ingested, our body uses a specific enzyme to convert the desired amount of histidine to histamine. One good dietary source of histidine is seafood. Certain finfish contain large amounts of histidine, which is a good thing since we need it in our diet. Sometimes that seafood can also be contaminated with small amounts of bacteria, which on its own does not pose a big threat.

The problem begins when you allow the fish to get warm while lying on the deck of a boat in the sun, or while processing them in a fish house. This small amount of bacteria can start to propagate in the flesh. As the bacteria grow in population some of them produce the enzyme L-histidine decarboxylase (HDC) as a byproduct. This just so happens to be the same enzyme present in our body that converts histidine to histamine, except now there is nothing present to deactivate the enzyme once the right amount of histamine is produced. While the bacteria will stop producing the enzyme once the fish is chilled, the enzyme already present will continue to produce histamine even at very cold temperatures (albeit more slowly).

So, during the time between catch and consumption HDC is allowed to churn away at a huge supply of histidine, in turn creating dangerous levels of histamine. The seafood may even appear to be fresh and unspoiled since the histamine is odorless and colorless. Some might try to down play the importance of this issue by citing low numbers of reported cases. It is important to consider though that the effects of histamine poisoning are generally mild, making this illness very likely to be vastly underreported. Regardless, the symptoms are miserable and people have died from it, making it a valid concern for those with a conscience. While histamine poisoning may not be incredibly common or lethal, I found my knowledge of it to be a great way to keep myself going until everything was put on ice. It is very unlikely for it to occur if everything is handled right.

DEPARTMENT OF CHEMISTRY

2019 Undergraduate Summer Research Fellowships in Organic & Biological Chemistry

- We are pleased to offer Undergraduate Summer Research Fellowships for Pitt students sponsored by *the Organic and Biological Chemistry Divisions*.
- These Fellowships are intended to support a 10-week full-time organic chemistry or chemical biology research project, including stipend & supplies, in the summer of 2019 at the Department of Chemistry in Pittsburgh.

Please submit applications consisting of a current resume, course records, and a letter of recommendation by a suitable Faculty Sponsor with details of the planned research project (not exceeding 1 page) by

February 20, 2019 to Desirae Crocker, CHVRN 757.

- The Award will be presented at the Undergraduate Award Ceremony in April 2019.
- The Awardee and Faculty Sponsor(s) are strongly encouraged to present a poster on their research at Science 2019 in Pittsburgh in the fall of 2019, and/or actively participate in an equivalent departmental, regional or national scientific conference.

PITTSBURGH CHEMISTRY

by: *Max Bair, Class of 2018*
University of Pittsburgh

Second in a series

Hey friends! I'm back with the second article in my series, and I present to you the largest and most renowned chemical corporation in Pittsburgh: PPG Industries. You may know them from their elaborate, glass headquarters building in Market Square, or the PPG Paints Arena downtown (Go Pens!!). Founded in 1883, PPG has since grown into rank 183 of the Fortune 500 companies and the second largest coatings company in the world with $14.7 billion in net sales for 2017. PPG Industries employs close to 50,000 people in 70 different countries. The company is dedicated to beautifying and improving the communities that it has a presence in, donating millions to the betterment of neighborhoods through color and beautification.
In the United States, PPG Industries employs about 18,500 people. They boast competitive benefits, such as a variety of healthcare options, 401k contributions, and up to three weeks of vacation time for new employees. PPG Industries has shown promising growth and is actively looking to fill positions from entry level, all the way up to PhD. This makes PPG Industries a great choice for any applicant, especially graduates fresh from the University of Pittsburgh looking for a job without prior, professional experience.

PPG Industries goes beyond manufacturing, as they also have multiple facilities where they perform extensive research into coatings and related materials. There are three main research facilities associated with PPG: the PPG Coatings Innovation Center in Allison Park, Pennsylvania, the Monroeville Business and Technology Center in Monroeville, Pennsylvania, and the Fiber Glass Science and Technology Center in Shelby, North Carolina.

PPG Industries is not only committed to providing innovative and quality products to its customers, but also works to better the lives of its employees and surrounding communities. Some of the goals that they intend to reach by the year 2020 include: implementing wellness plans at all of their facilities, reducing injury rates by 5% each year, incentivizing employees to volunteer through the Colorful Communities Program, achieving 40% of total sales from environmentally beneficial products, employing alternative energy sources at their facilities, reducing total waste disposal intensity by 10%, and eliminating lead from all remaining non-consumer coatings.

Thanks for reading and keep up the hard work everybody! Look out for my next article, coming to you in January.

H2P,
Max Bair

COMEDY CORNER...