CHEM MAJOR NEWS

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

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SET DATES:

REGISTRATION

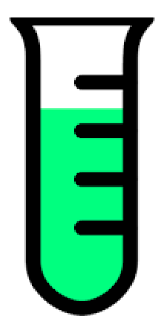
October 26:	Monitored withdrawal (2191) deadline-140 Thackeray Hall
October 29:	Registration begins for Spring Term 2194 based on earned credits. You will receive your registration appointment from the Registrar.
October 29:	Add/drop begins for Spring Term 2194.
October 31:	Happy Halloween!
November 8:	April 2019 (2194) graduation applications due in 140 Thackeray Hall.
November 22- November 25:	Thanksgiving Recess. **NO CLASSES!! Have a great Holiday!**

IMPORTANT: WHEN SHOULD YOU SEE YOUR ADVISOR?

Advisees who already have a permanent advisor should make their registration appointments with that advisor on or after October 16. Remember to bring a copy of your academic record with you to this meeting.

Advisees who (via an email to be sent October 01) were asked to select their permanent advisors should do so after October 08. See George Bandik or Regina Mahouski in 107 Chevron Science Center.

New advisees (those who have NOT registered with the Chemistry Department before) should make an appointment with George (Room 107 Chevron), Dr. Huston or Dr. Ward on or after October 15.



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

Our October Schedule

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 following meetings.

October

5 All About Registration – *with Dr. George Bandik*

12 Meet Our New Faculty – *with Professor Raúl Hernández Sánchez*

19 National Chemistry Week Preparation
"Chemistry Is Out of This World"

26 Pumpkin Painting on the Patio!

Halloween Pumpkin Fest

Come join the fun this October 26, 2018 as we drink apple cider and paint pumpkins on the patio in front of Chevron. Bring candles, dress up or do other Fall like things as the mood strikes you. BYOB (bring your own **blankets**...preferably flannel since we have a theme going and all). Come to a meeting or see George with suggestions or for more details. **Also if you have any other useful suggestions e-mail us at luke.persin@pitt.edu or dje@pitt.edu.**

Who's This BEN Guy, Anyway??!!

Benzoyl Peroxide the Free Radical Man (affectionately known as Ben) is our ACS-SA mascot. You have probably seen him around the chemistry department and on our yearly ACS-SA T-shirt. From now on when you see Ben, think of the ACS-SA. Why not come to a meeting to learn more about what we are all about. Fridays at Noon in 150 CHVRN.

SOME COURSES JUST FOR YOU...

If you are looking for something new and different this term, why not try one of the following courses being offered this coming Spring Term (2194).

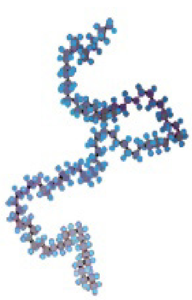
CHEM 1000
Mathematics for Chemists

THIS NEW COURSE OFFERED THROUGH THE CHEMISTRY DEPARTMENT IS RECOMMENDED IN PLACE OF MATH 240-CALCULUS 3. IT WILL BE OFFERED BOTH FALL AND SPRING TERMS. PLEASE NOTE THAT IF YOU CAN NOT FIT CHEM 1000 INTO YOUR SCHEDULE YOU MAY TAKE MATH 240. IF YOU HAVE ALREADY TAKEN MATH 240 YOU HAVE MET THE MATH REQUIREMENT FOR THE MAJOR.

Mathematical methods, in particular linear algebra and differential equations, are important in many areas of chemistry. This course provides a background in those and other mathematical methods that will be used in subsequent Physical Chemistry courses. The course will begin with a brief look at topics currently covered in Math 240-Calculus 3 that are important for chemists. It will them move on to linear algebra and look at topics such as systems of linear equations, matrices, determinants, eigenvalue problems and basis sets. The course will finish with a look at important types of differential equations (DEs), including first order DEs, linear systems of DEs, higher order DEs. The material covered in this course will better prepare our majors for their advanced work in physical chemistry.

CHEM 1600
The Synthesis and Characterization of Polymers

What makes really long molecules behave differently from short ones? How can it be that everything from your socks to your laptop is made from polymers? What changes must you make in a polymer to go from making bullet-proof vests to making teddy bear fur? Did you know that every time you paint a wall or use super-glue you are doing polymer chemistry? In this course you will get an overview of all aspects of polymer science including synthesis (you need 99.9% yields to make polymers!); purification (you can't, so you have to make them right the first time); characterization (how can you figure out if your polymer weighs 10,000 or 1,000,000 g/mol?), thermal properties (you need to know that your plastic flip flops won't melt on hot pavement) and mechanical properties (elastic polymers make skinny jeans; rigid ones make motorcycle helmets—you don't want to mix them up!). Bonus: When you make a polymer in lab, you get to play with it!



A Few Important Reminders:

Chem 1140-Preparative Inorganic Chemistry is our advanced inorganic laboratory course offered each Spring Term. **Chem 1130-**Inorganic Chemistry is a pre or co-requisite for this course. If you are working towards an ACS-Certified degree, this course is a degree requirement.

If you have wondered about what goes on the upper floors of our building you might want to consider registering for **Chem 1700**. This one credit seminar course allows two different faculty members each week to speak on their own research interests. Over 80% of our graduating seniors in Chemistry participate in our undergraduate research program and this course is a great way to learn more about your options and your department.

Finally, if you are interested in pursuing an honors degree in Chemistry the requirements students must have are:

(a) an overall QPA of 3.00 or better

(b) a chemistry QPA of 3.25 or better

(c) have completed at least 2 credits of Chem 1710-Undergraduate Research

(d) completed Chem 1711-Undergraduate Research Writing.

Good luck as you strive towards academic excellence!

INTRODUCTION TO INDUSTRY

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

Hello to all of my fellow University of Pittsburgh Chemistry majors! My name is Max Bair, and I graduated last spring, in April 2018. This article is the first in a series that will inform readers on many of the largest chemical industry employers in the Pittsburgh area. Being a recent graduate, I know firsthand how difficult it can be to find a position in this field. My goal in the coming months is to make your transition from full-time student to full-time chemist a little easier. In each article, I intend on providing a breakdown of the areas where each company shines and reasons why they could be a beneficial employer for you to seek out. I will compile the information for these articles from a wide range of internet sources and conversations with representatives from each company.

To give you some background on myself, I recently accepted a position as an Associate Scientist at Eurofins Lancaster Laboratories. This came after a whole summer worth of searching, applying, and interviewing at many companies with a limited amount of success. The key to acquiring a job after graduation is simply putting yourself out on the job market. Actively seeking out potential employers and applying to as many positions as you can will result in a successful job hunt. It can be difficult to keep your morale high through all of the rejection you will likely face, but the rejection is normal and everyone goes through it to some degree. What is most important, is that you continue putting your name and resume out to potential employers, as someone will have a position suited for you and before long, you'll be on your way to building your new career.

My second article, and first analytical article, will be coming to you in November, where I provide an in-depth look into one of the Pittsburgh titans of industry, PPG Paints. Stay positive, stay tuned, and good luck on the job hunt!

Hail to Pitt!
Max Bair

Just What Can You Do With That Chemistry Degree?

by: Kaila Simcoviak

A Bachelor of Science degree in Chemistry can take you anywhere you want to go! Chemistry is often referred to as the "central science" because of its connection to all areas of science. So, if you are interested in the healthcare fields, a degree in chemistry will provide you with a distinct background all while fulfilling the requirements needed and leading one to achieve high standardized test scores. One example of a healthcare position that is increasing is demand is the need for physician assistants, often referred to as a PA.

Physician Assistants are healthcare professionals who work alongside physicians and ultimately enhance the delivery of high quality health care. They are licensed to diagnose and treat illness and disease and to prescribe medication for patients. If you think being a physician is your calling, but the thought of going to school for four plus years, makes it sound a little less appealing, then a job as a physician assistant could be for you!

A chemistry degree is great for this career. Prerequisites for admission into PA school, for example at the University of Pittsburgh include anatomy and physiology and lab, one full year of biology and lab, one full year of general chemistry and lab, one full year of writing/English, one semester of organic chemistry with lab, one semester of microbiology and lab, two psychology courses, one semester of statistics, and one semester of medical terminology. Almost all of these courses are again met through a chemistry degree at the University of Pittsburgh and they all can be met if you add the bioscience option to your chemistry degree!

A starting salary for a physician assistant is approximately $88,000. According to the Bureau of Labor Statistics the median salary for a physician assistant is $101,480 with a projection of almost 40,000 job openings to come between 2016 and 2026. In 2014, physician assistants held 94,400 jobs, with physician's offices employing 5%, hospitals employing 22%, outpatient care centers employing 7%, government entities employing 3%, and educational services employing 3%. As you can see, every division of medicine is in need of more physician assistants!

Being a physician assistant allows you to explore different areas of medicine, unlike a physician that much specialize right after medical school. As a PA you could decide to be in surgery for one year and then the next go into the primary care setting. In the primary care setting, PA can provide all the clinical services that a physician can! These include: taking medical histories, physical examinations, order and interpret laboratory tests, diagnose and treat illness, counsel patients, assist in surgery, and set fractures. Physician assistants practice setting and hours can depend on the specific area of practice one is in, but they often are not subject to the grueling hours that a physician could be subject to. As such, physician assistants are often chosen as a field of interest because of the ability to be at home with one's family and the shorter schooling requirements!

Physician assistants are critical to increasing access to healthcare for rural and underserved patients as this is often the only healthcare providers in these areas. In 2008, nearly 300 million patient visits were made to only physician assistants.

If your dream is to be a PA and this sounds like a career for you, a degree in chemistry can help you achieve your goals! Become the next physician assistant, allowing you to work in one of the top four best health care jobs in the United States!

Sources:

https://www.payscale.com/research/US/Job=Physician_Assistant_(PA)/Salary/539a2580/Entry-Level

https://www.bls.gov/ooh/healthcare/physician-assistants.htm

https://explorehealthcareers.org/career/medicine/physician-assistant/

Green Chemistry

by: Seth Brody, *Green Chemistry Contributor*

Hello! My name is Seth Brody, the 2018-2019 ACS-SA contributor to *Green Chemistry* topics for this Pitt affiliate newsletter. I became a recent Pitt chemistry graduate in Spring 2018, participating in this program while employed by *PPG Industries*, where I continue to work in coatings and materials research and development. I previously earned a biological sciences degree from Pitt in Fall 2012.

Green chemistry represents the bridge between these fields, on which the environment chaperones the chemist's manipulation of matter through biological processes. *Polymers* characterize such manipulation broadly, as the primary vehicle for modern technologies. But, they exist in our society with proportional accountability to our environment. Substitution of *green polymers* into these synthetic applications moderates contribution to the natural carbon cycle. This diverse topic of polymer recycling may follow biodegradation, as well as material (i.e. reprocessing), monomer-feedstock (i.e. depolymerization), or final thermal (i.e. repurposed energy content) routes.[1]

Current green practices for polymers are overwhelmingly disproportionate to their application scale. In 2015, synthetic production, mostly derived from petrochemical resources, exceeded 300 million tons, for cost-effective and durable replacement of traditional materials (e.g. wood, stone, steel). Approximately half of this production was converted into short-lived products (e.g. disposable shopping bags), which significantly persist in the environment through intended application durability, and thusly low biodegradation rate by environmental agents (i.e. air, light, heat, water) or microorganisms.[1] However, reclamation efforts continue to be refined for waste polymer content. Conventional polymer reprocessing involves intensive sorting, washing, grinding, and melt-filtration steps, resulting in only low-purity recovery.[1] Therefore, responsible alternate monomer sources and more efficient recycling practices must be sought for global sustainability to be maintained, via bioplastics.

Bioplastics are biodegradable polymers generated from renewable (e.g. non-fossil), diversified feedstock sources. Current bioplastics annual production is comparatively low (1%) to that of overall plastics, but has been recently growing at minimal 20-30% rates, for high potential replacement (90%) mostly via common fossil-polyolefins.[1] Substitution of such poly(ethylene) *PE* and poly(propylene) *PP* polyolefins by bioplastic plant-polysaccharide starch, bacteria-digested poly(hydroxyalkanoate), as well as sugarcane-ethanol/ethylene biobased-PE polymers, showed overwhelming replacement potential of equivalent petrochemical-polymer properties. Additionally, biodegradation rate increases with natural content in polymer blending, opposing the bioresistant hydrophobic character, higher macromolecular weight, or crystallinity of designed synthetic polymers.[1] Industrial awareness of such benefits favoring bioplastics is growing with research interest in such green polymers.

Novel applications of polymer biodegradability are also being considered in medical research, for effective drug delivery.[2] *Amphiphilic block copolymers*, which form a hydrophobic-hydrophilic core-shell architecture, have been investigated to deliver anticancer drugs, therapeutic genes, and proteins, through increased drug water-solubility and lifetime in blood circulation, whose micellar vehicle degrades into non-toxic products *in vivo*.[2] Therefore, bioplastics may be designed to agree with stressors of many local processes, for selective degradation, applied as broadly as the intended technology itself.

1. Lackner, M. In *Kirk-Othmer Encyclopedia of Chemical Technology*; John Wiley and Sons: 2015; pp 1-41.
2. Bölgen, N. In *Stimuli Responsive Polymeric Nanocarriers for Drug Delivery Applications*; Woodhead Publishing: 2018; pp 635-651.

Fisher-Chemist-Golfer Guy

by: Andrew Dewar ***Part 2 of a continuing series.***

Raise your hand if have ever heard of a soft crab sandwich. Now raise your other hand if you know where soft crabs come from. (Just kidding you don't really have to raise your hands). A few years ago I could only raise one hand. I got to raise my second through first hand experience and it was one of the most interesting aspects of my time spent fishing.

Soft crabs are too delicate to catch on a commercial scale in the wild (they are very soft). Instead the crabs must be caught before they go through their molting cycles, while they are still hard. Blue crabs generally molt in large groups in a localized region as part of a mating cycle, which is a neat topic for another day, but what I would like to talk about is the aquaculture systems used for these crabs to live in while they molt so they can be harvested as soft crabs afterward.

Aquaculture is the practice of harvesting aquatic plants or animals under very controlled conditions; it is sometimes also referred to as aqua farming. Depending on what species you are working with and the scale of the operation it can look very different. Our set up involved several long shallow tanks, resembling high-sided tables, that were hooked into a 1,500 gallon recirculating water filtration system. At first glance it seemed like a pretty straight-forward concept to build this system, but after doing a little bit of research I learned there's is lot more to it than first meets the eye. We were not just pumping a bunch of clean water around; we were creating a small ecosystem full of complex chemical reactions. A vital role to our operation was also cultivating a healthy population of bacteria in our filter tank. This tank was full of gravel that not only acted as a physical filter but also as a substrate for the bacteria to grow on. But how do a lot of bacteria equal clean water? The answer: nitrogen.

The crabs we were harvesting produce a lot of waste while they shed their shells. This in turn creates a high concentration of ammonia in the water, which can eventually cause high crab mortality. The crabs are slightly protected from the ammonia due to these systems naturally maintaining a low enough pH to convert some into nontoxic ammonium ions. This only helps mitigate ammonia levels to a certain extent though. All of the ammonium ions have to go somewhere. The real solution is the Nitrosomonas living on the gravel. These bacteria consume the ammonium ions and oxidize it to nitrite as part of their metabolic process. Nitrite is also toxic to crabs at high concentrations. It is in turn further oxidized to nontoxic nitrate by another bacteria, Nitrobacter.

This whole process is known as nitrification, and plays a big role in biological processes. It is how nitrogen is removed from biological waste and made metabolically available again for other organisms to use. We were just mimicking the natural environment of the crabs as close as we could.

$$2\ NH^{+4} + 3\ O_2 \xrightarrow{\text{Nitrosomonas}} 2\ NO_2^- + 2\ H_2O + 4\ H^+$$

$$2\ NO_2^- + O_2 \xrightarrow{\text{Nitrosomonas}} 2\ NO_3^-$$

There are a whole host of other parameteres that went into maintaining water quality in this system such as: dissolved oxygen, temperature, pH, alkalinity, and salinity. Each one was important to keeping the crab population healthy and helping them molt successfully. Above all though this relationship between crab and bacteria is one of the most vital aspects to making a closed water system operate successfully. Most systems are turned on a month or more ahead of the shedding season to try and get a head start on cultivating bacteria before a large number of crabs are introduced. I found the whole process to be pretty fascinating. We got to watch crabs we caught back out of their shells right in front of our eyes, inside of a large system we built from scratch. It was also a great hands on way to learn a lot about marine ecosystems. If you, too, found any of this interesting and would like to read more head on over to bluecrab.info for a background on everything blue crab related, not just shedding.