



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



Volume 26, Issue 6

March 3, 2017



**It's Back!**  
REGISTRATION



## Fall Term (2181) Registration

**March 17** Deadline for applying for August 2017 graduation (140 Thackeray Hall).

**March 27** Fall Term (2181) Registration begins based on credits earned.

→ *You will be notified of your registration time on your my.pitt.edu page.*

Advisees who already have a permanent advisor should make their registration appointments with that advisor on or after **March 13** for Fall Term (2181).

Advisees who were asked to select their permanent advisors (via a letter sent Feb. 6) should schedule their Fall term registration appointment with their new advisor after **March 13**.

New advisees who have declared chemistry as his or her major within A&S should make an appointment with Dr. George Bandik, Dr. Ericka Huston, or Dr. Michelle Ward after **March 13** for Fall Term (2181) in 107 CHVRN.

### Departmental Honors? Here's How...

Students who wish to graduate with Chemistry Department honors must satisfy four departmental requirements. Students must have:

- (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!**

## 2016-2017 ACS-SA Officers and Staff

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

CHEM MAJOR NEWS

# ACS-SA Schedule for the Spring Term



## MARCH

- 03 **Spring Term Birthday Celebration**
- 10 **SPRING BREAK**
- 17 **OFFICER NOMINATIONS**
- 24 **Tissue Engineering with Dr. Kacey Marra**
- 31 **Meet our New Faculty with Dr. Jennifer Laaser**

## APRIL

- 07 **2017-2018 ELECTIONS**
- 14 **No Meeting--Good Friday**
- 21 **SENIOR FAREWELL**

## CAMPAIGN! VOTE! WIN!

Have you ever wanted to lead a nationally acknowledged award winning student group? If you aspire to such things why not consider running for an office with our ACS-SA group. We boast some 100+ members and have been recognized for the past 25 years by the national ACS for outstanding programming.

Nominations for our 4 elected positions: president, vice president, treasurer and secretary will be held on April 7th at our weekly meeting, 12:00 Noon in 150 CHVRN, and elections will be held on April 14th.

Stephanie Liu and Andrew Warburton have agreed to be Co-Editors of next year's Chem Major News, Kyle Oswald, David Pilsch and Alex Richter have agreed to serve as Outreach Coordinators. Thanks to these great folks!

Get involved and help a great group maintain its reputation! We **need** you!



## SMALL GRANTS FOR YOUR PROJECTS.

The A&S Office of Undergraduate Research, Scholarship and Creative Activity is offering small grants for your individual research or teaching projects, presentations or creative endeavors. These grants of up to \$500 are available for the following kinds of expenses:

research/project supplies  
travel if you are going to present a paper at a conference or perform in an artistic endeavor.

To apply for a research/creative endeavors or travel/presentation grant, you must:

1. Find a faculty sponsor for your project.
2. Complete the application form. Include a detailed description of your project or travel plans and budget.
3. Return the signed form to the Office of Undergraduate Research, Scholarship and Creative Activity, 209 THACK.



# Try Something Different...

Need something new and exciting in your life? Tired of the same old thing? How about some new (or not always offered) courses for the Fall term? Three elective courses being offered this fall may bring that zing back into your life! May we suggest:

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## **Chemistry 1310-"Organic Synthesis"**

This course fills in the gap between the basic undergraduate organic chemistry courses and the graduate school level. Organic synthesis is the scientific backbone of organic chemistry, and though often neglected in the undergraduate curriculum due to their complexity, synthetic tactics and strategy are among the most creative and useful expressions of scientific excellence.

The course will use modern organic synthesis as a framework to learn about advanced organic structures, organic reactions and organic reaction mechanisms. Outside class, you will learn how to critically read the original literature through periodic assignments.

The course is ideal for anyone who plans to look for a job or continue for an advanced degree in organic chemistry or any area associated with organic chemistry. A reasonable (B or better) knowledge of introductory organic chemistry is expected, but we will open each new topic with a refresher.

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## **CHEM 1620 – "Atoms, Molecules, and Materials – Introduction to Nanomaterials"**

This will be a course designed to increase students' knowledge and understanding of emerging field of nanotechnology. Nanotechnology deals with materials in nanometer scales, typically one to 100 nanometers. One nanometer is one billionth of a meter; approximately the length of five silicon atoms placed side-by-side or the width of a single strand of DNA. On nanometer scale, materials may possess new physical properties or exhibit new physical phenomena. For example, band gaps of semiconductors can be effectively tuned by adjusting their nano-dimensions. For nanomaterials, number of surface atoms becomes a significant fraction of the total number of atoms and the surface energy starts to dominate. This changes thermal stability and catalytic properties of many materials as we know them.

During the course, the students will gain a sound appreciation of different techniques and instruments involved in the preparation and characterization of nanomaterials. Current and future applications of nanomaterials in medicine, defense, energy production, and computation will be also discussed.

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## **Chemistry 1810-"Chemical Biology"**

Revolutionary transformations in chemistry and biology have led to a merging at the boundary of these disciplines where contributions from both fields impact our molecular and quantitative understanding of biology. Rapid growth in this area has been driven in part by researchers applying synthesis, quantitative analysis, and theoretical reasoning to the study complex cellular processes. This course focuses on enzyme mechanisms in biological pathways, kinetics and thermodynamics, and chemical tools to probe and screen components of the cell. Other topics that will be discussed include DNA/RNA processing, macromolecular interactions, chemical signaling, posttranslational modifications, chemical syntheses of biomolecules, and the development of assays for high throughput drug screening.

This course is ideal for students interested in the interface between biology and chemistry. You will first learn to recognize sufficient unresolved problems in biology that will benefit from a whole system chemical and molecular approach to analysis. Chemical tools from all areas of chemistry (analytical, inorganic, organic, and physical) will be employed to characterize and elucidate biological processes. This course will be taught from both a "top down" and "bottom up" approach to characterizing cellular responses. Individual interactions and mechanisms of biological pathways ("bottom up") will be discussed in addition to and in context with the analysis of a global cellular response ("top down") to chemical agents such as drugs, inhibitors, or chemical probes.

Chem 1810 fulfills one of the two elective biological courses for the chemistry bioscience option. Prerequisites include both Biosci 160 and Chem 320. Students can only receive credit for one of the following courses: Chem 1810, Biosci1000, or Biosci 1810.

**So as you can see, there is something for every chemical taste available to you this Fall!!**



# Green Chemistry

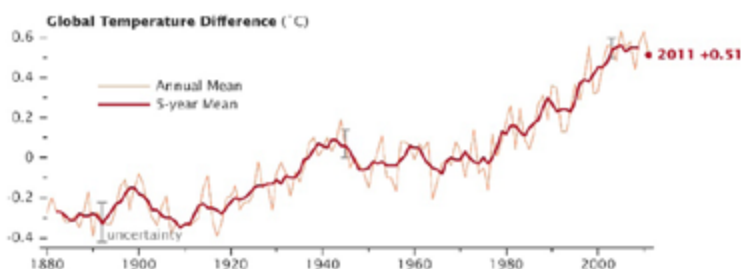
by: Andrew Warburton, *Green Chemistry Contributor*



Hey everyone! I hope your semester is going well! The tests have begun to pile up and finals are closer than you think! Despite all of the pressure, the end is near! You're almost free from syllabus deadlines and exams!

As you might have guessed, I can't write a Green Chemistry Article without mentioning the fantastic weather we're having! Hopefully, as you read this article, it's still 60 degrees and sunny outside! Although I love being able to walk around in a T-shirt, there is a much more menacing façade behind the warm air and snowless ground: climate change.

I know, I know, this is still a point of dispute between government officials (to my surprise), but it should still be addressed. In short, climate change has shown that the Earth has been continually warming up since the Industrial Revolution.



**Figure 1.** Global Temperature Differences From 1880 until 2011<sup>1</sup>

If you're not familiar with the mechanism of climate change (global warming), here's my very brief synopsis of what happens. Before the Industrial revolution, there were always small concentrations of greenhouse gasses (gasses that absorb solar radiation) such as  $\text{CO}_2$  and  $\text{CH}_4$  in the atmosphere. After the Industrial Revolution, the concentration of greenhouse gasses - mainly  $\text{CO}_2$  has skyrocketed as more and more organics such as coal and wood are burned. The more  $\text{CO}_2$  in the atmosphere, the hotter the Earth becomes.

So why is this this a pressing issue? I mean, if our winters are warmer, I get to wear my shorts in February, so how terrible can it actually be? In order to understand the magnitude of this issue, you cannot simply look at the effect you personally experience in Pittsburgh, but on a global scale (hence the name global warming)! As you can tell temperatures increase leading to more droughts and heat waves across the world. Tropical storms will last longer and be more intense. Remember Katrina and Sandy? They were not very pleasant experiences for those in New Orleans and New Jersey and it will only get worse. Arctic ice will melt and sea levels will rise as much as 1-4 feet by 2100, causing coastal flooding and damage to aquatic wildlife.<sup>2</sup>

Now that I have your attention, the question is what can I do to help prevent or at least slow climate change. One of the biggest impacts on the environment is the HVAC system in your house. Turn off the heat and open a window more and more! It's nice outside and fresh air gets the smell of old grilled cheese sandwiches out of your room! There are plenty of examples that you can find here<sup>3</sup> and I implore you to read the article can try to help preserve our beautiful planet!

## References:

1. <https://www.nasa.gov/topics/earth/features/2011-temps.html>
2. <https://climate.nasa.gov/effects/>
3. <http://homeguides.sfgate.com/top-ways-stop-global-warming-78809.html>

# Small Encounters--Large Victories

by: Emerson T. Trimble

In the previous two installments, I utilized this space to focus on the importance of medical trips and the day-to-day operations of our trip. This month, I would like to discuss some of the cases that passed through our clinic. While our resources were limited compared to the healthcare that is accessible in the United States, many people came with ailments that we could readily treat. Often, patients complained of coughing, congestion, and head colds, which were easily treated by the over-the-counter medications that we brought but which these people did not have access to. While the clinics were meant to benefit the livelihoods of the patients and inform them of their healthcare options, they also functioned to teach us valuable aspects of what it means to practice medicine, specifically the importance of diligence.

For example, we saw hundreds of patients throughout our time in Peru, but not all came in to the clinic and left with only their chief complaint treated. One such example was a thirty-two-year-old father who had brought his six-year-old son to the clinic because he was having trouble breathing. He told us that his son found it difficult to breath after playing with other kids or running around in the dusty soccer field. After performing a physical exam and asking further questions, we deduced that his son suffered from childhood asthma and provided them with the proper medication, a nebulizer and a consultation with an allergist in the city. During the child's consultation, we asked for a family history and learned that his father had torn his meniscus five years ago. He informed us that it was consistently a nine out of ten on the pain scale for the first two years but that it has been going down and is currently just a "mere" six. Although diagnosed, the surgery to repair his meniscus was too expensive at the time. He told us that he had grown accustomed to the pain, but that his job at a factory, which required him to pump a lever with his leg regularly, was incredibly painful. We talked to our doctor, who called multiple contacts in the city of Lima, and we were able to give him some information for low-cost physical therapy. While this may not seem like a great victory to the standard of care that is idealized in the United States, the relief and gratitude that this man expressed exemplified the importance this small task meant to him and his livelihood.

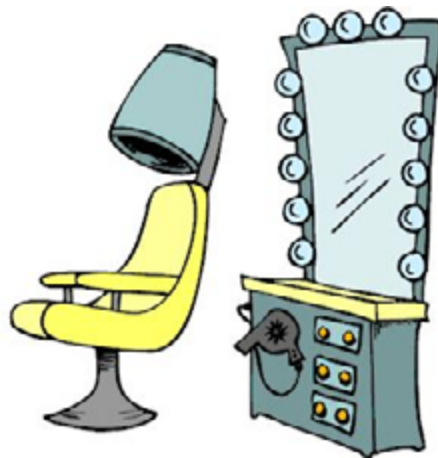
I think of this man and his son often during my final year of undergraduate study. I wonder how his meniscus is healing, if he is in less pain, if his son can run and play without wheezing. While his mend was not absolute and he may never gain full function of his leg again, I think of the importance of diligence in the healthcare field. The importance of medicine should always be placed on the patient, but with many things in life, experience is an educator of all. I learned that diligence is essential to the practice of good medicine and that asking questions and listening to people is fundamental in the relationship between the patient and the healer. If it were not for taking the time to ask for surgical history of the son's father (which may seem trivial to the treatment of asthma), we would have never learned about the pain that he suffers every day, and in turn, we would not have had the opportunity to offer him a path to healing. This encounter is a small one to the practitioner, but I think that in medicine small encounters are often large victories to those afflicted with disease and disability, a notion that is all too easily forgotten in the behemoth that is our healthcare industry.



# Safer Hair Coloring: A Puzzling Case

by: Julie Fornaciari

Synthetic hair coloring was created back in 1907. The chemistry is governed by a simple acid-base reaction – but the capabilities of the raw materials are incredible. One can easily turn the color of their hair from blonde to red to brunette with a \$10 box of hair dye and about 2 hours. But this color change comes with the price: hair splitting, hair damage, skin irritation, and absorbing chemicals. This is where the idea for a safer, less damaging hair dye came to play.



Product design is a class all chemical engineers must take. We were assigned to find a product that fulfills a gap in the market. After being sick of itchy scalps and messy formulations, my group and I decided discovering a hair dye that is more effective and safer fills a need in the hair dye market. Especially with hair lightening; currently hair lightening is the most damaging source of hair color change and it takes a lot of money and time to lighten one's hair from brunette to blonde. The chemistry behind hair color has not changed since its creation in 1907; until now (hopefully).

The project that I am working on under Dr. Bandik and Dr. Beckman is trying to understand how a synthetic peroxidase enzyme reacts with hair dye and hair cuticle. Peroxidase enzymes are able to oxidize peroxides and have been shown to remove dye from water and from clothing. The amount used to remove the dyes in previous work has been micro-molar – meaning this catalyst is robust even in the most minimal amounts that is added. The question that is unknown is can this be used with hair and can it minimize the amount of hydrogen peroxide while being a better hair bleach? These are questions I am working on. Hydrogen peroxide, although benign, has led to serious skin irritations for people who bleach their hair. Additionally, to bleach hair at home easily is really unheard of – not many people can do it correctly without causing significant damage to one's hair. This product can really help reduce the irritants in hair dye and make it more simple (and cheaper) for customers.



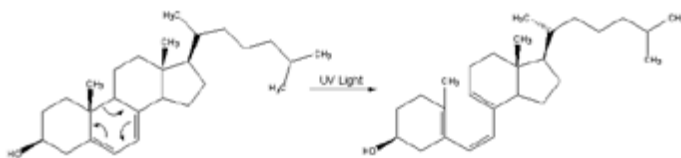
Now, the idea and literature research all seem to check out, but how can I actually test for this? With a lot of creativity. Through this process of actually prototyping this product, I have learned far more than in a normal lab. I have had to design and set up experiments and had to be meticulous on which variables I would be changing. I had to learn how to order supplies and set up a lab, something that an undergrad rarely gets to see but will help me when I progress through graduate school. This experience also has been very important in learning how to learn from failures and mistakes. When a solution you try to remove the color from turns black... you have some details to figure out. But spending time in the lab to better understand organic chemistry and for a purpose that is interesting and needed is a great way to learn and grow as a student.

# SUNNY D-LIGHT

by: Stephanie Liu, Newsletter Co-Editor

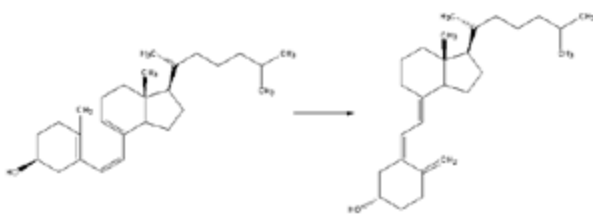
March has arrived, and with it comes the warmth and wetness of spring. I guess that's kind of an inaccurate statement, because as I'm writing this on February 24<sup>th</sup>, that Friday, I'm sure most of you guys remember, when it was 80 degrees and sunny. 80 degrees! In February! In cold and gray Pittsburgh! The entire week leading up to this day has been uncharacteristically warm, with much of the Pitt student body in shorts and skirts soaking up as much Vitamin D as possible.

Speaking of, have you ever wondered about the sun and Vitamin D production? The sunlight doesn't actually contain the vitamin D, but it does trigger the production of a vitamin D precursor in the skin. This compound called cholecalciferol is formed in the outer layers of skin from a compound called 7-dehydrocholesterol. The light, specifically UVB radiation, causes the 7-dehydrocholesterol to undergo an electrocyclic reaction and further rearrangement to form a type of inactivated vitamin D, or vitamin D<sub>3</sub>, also known as



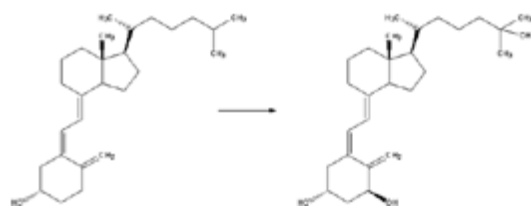
cholecalciferol. (This makes some question the validity of the classification of vitamin D as a vitamin, because classically vitamins must be ingested, not synthesized in the body.) Vitamin D<sub>3</sub> then undergoes hydroxylation in the human liver to form calcifediol, another intermediate in the synthesis of active vitamin D. This compound is actually the one analyzed by physicians to determine whether someone has a vitamin D deficiency.

Calcifediol then travels to the kidney, where an enzyme hydroxylates it to finally form the hormonally active form of vitamin D, also referred to as calcitriol.



This multistep mechanism is the source of the majority of the vitamin D for most people. Very few foods contain vitamin D, but a deficiency in vitamin D can cause inadequate absorption of calcium, potentially

affecting bone health. Beyond this, there is limited evidence of the potential health benefits of vitamin D. Furthermore, the UVB type of sunlight that begins the synthesis of vitamin D, which, as you'll obviously remember from my September article about sunscreen, is the range of wavelengths that causes the most skin damage and cancers. Therefore, while a limited time spent in the sun could be marginally beneficial to your overall health, the potential risks of sun damage are still significant.



So, I hope you all enjoy this weather, safely! Wear sun protection when basking in some rays, don't get too emotional about climate change, and I hope you have a Happy Spring!

# Happy St. Patrick's Day