CHEM MAJOR NEWS

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

Volume 23, Issue 3 November 8, 2013

Some Incredibly Important Dates to Know...

November 04: Deadline for undergraduates to apply for April 2014 graduation in 140 Thackeray Hall

November 27-December 01: Thanksgiving Recess-No Classes! Have a great Holiday!

Happy Thanksgiving!

Congratulations!

On Friday, November 15, 2013, 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:

Arion E. Ross-*Undergraduate Analytical Chemistry Award*
Autumn Blackburn-*Undergraduate Inorganic Chemistry Award*
Bret Boyle-*Silverman Award*

All 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 154 Chevron Science Center on November 15th. Come join us as we celebrate undergraduate achievements with our awardees!

2013-2014 ACS-SA Officers and Staff

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James McKay-*Co-President*
Keith Carpenter-*Co-Vice-President*
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Mark Mazza-*Newsletter Co-Editor*
Raissa Berry-*Green Chemistry Contributer*

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Our November Schedule

November

01 Towne Meeting

08 Green Chemistry

15 Fall Term Awards Ceremony
Join us as we celebrate academic excellence!

22 Preparing for Saturday Science
with Matt and Ryan

29 Thanksgiving Break--Enjoy!

Everyone is welcome to attend our weekly ACS-SA meetings. Every Friday at noon we get together in 135 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 November 23, 2013? 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 22, 2013 at NOON in 154 CHVRN to plan for this great day. If you cannot be there on Friday, e-mail Matt or Ryan, our Outreach Coordinators at rmb116@pitt.edu and let them know you're interested in helping out and then join us on Saturday, November 23, 2013 at 9:00 a.m. in the Chevron Lobby.

Comedy Corner...

"I think I figured out what's causing your narcolepsy. You're full of tryptophan."

Happy Thanksgiving!

Green Chemistry

by: Anisa Y. Mughal

Recycle—Rethink, Redo, Restart

The word "recycle" is reminiscent of the days nearly a decade ago when recycling took off and essentially…became a big deal. Right? "Reduce, reuse and recycle," we were always told, and yet there are still no recycling bins in our very dorm rooms. Okay, when it's convenient I guess we're helping save trees. But what actually happens to my empty Coke can?

Well, after you've enjoyed your carbonated beverage (and you recycle it), the can along with other comingle products (glass and aluminum) gets dropped off at a recycling facility. It is all sorted into various bins including glass, aluminum and plastic. Aluminum is shredded, melted and mixed with pure aluminum and resold to a manufacturer. Glass is cleaned and crushed into what's called cullet, and then is combined with sand, soda ash and limestone and melted. The melted glass is poured into molds and made into a new product. Polyethylene Terephthalate (PET or just plastic) is sorted by its resin code and, you guessed it: crushed, melted and resold.

It seems that the process for all of the comingle products are the same, so the real question is: Do I make a difference when I recycle? Let's let the numbers decide.

Plastic may be the hottest item of the recycling industry. Recycled plastic is used to make fabrics, outdoor decks, windows and even liquid fuel. Plastic also holds energy from fossil fuels and according to Columbia University, plastic has a higher energy value than coal. This energy is wasted if it just sits in our landfills—where about 28 million tons per year end up. The Earth Engineering Center calculated that all the plastic in our landfills comes out to about 36.7 million tons of coal—in other words, enough energy to power all the cars in LA for two years!

Aluminum cans are also one of the best things you can recycle: each ton saves 10 tons CO_2 emission and 96% of energy used to make a can from scratch is also saved. Newsprint is another biggie: we recycle 12,360,000 tons per year, saving 45% of energy costs and reducing CO_2 emission by 2.5 tons/ton of newsprint. Bottom line: these should be recycled. There are endless statistics detailing various metrics of energy conservation, but at the end of the day, it's all about energy.

That's not to say there's not a downside of recycling—there are actually processes that limit the benefits of recycling for the environment. Strong chemicals such as NaOH and chelating agents are used to remove the ink from recyclables, which bind with metal ions like Cu and Fe that are then washed out—down the river. New green chemistry techniques are being developed, however, that are trying to reduce harmful chemical uses that are toxic.

Plastic can also be quite messy: of the many plastic types, only two are recycled. The long carbon chains in plastic are difficult and cost-intensive to break down, which is why most plastic is not used to remake bottles. Research at IBM and Stanford has indicated that a molecule called a carbene increased cost effectiveness and speed of the break down.

Although the methods and benefits of recycling may have gotten lost in the past few years, it is still an important process. For my fellow chemists, recycling is a process to maximize energy output and conserve resources—and although it's not 100% efficient, it still yields favorable outcomes. Overall, however, the real benefits of recycling can't be forgotten—maybe you already use recycled paper or a recycled water bottle, and contribute to the "reuse" approach. Each small step helps conserve not only our resources, but more importantly also decreases the demand for energy generation. And as scientists, we can never forget: It's all about energy.

References

http://blogs.ei.columbia.edu/2012/01/31/what-happens-to-all-that-plastic/

http://www.recygal.com/2011/03/16/recycling-and-green-chemistry/

http://www.popularmechanics.com/science/environment/recycling/4291576

http://www.recygal.com/2011/03/16/recycling-and-green-chemistry/

Department of Chemistry

Undergraduate 2014 Summer Research Fellowship in Organic Chemistry

- We are pleased to offer an Undergraduate Summer Research Fellowship for Pitt students sponsored by *the UPitt Organic Chemistry Division*.
- This Fellowship is intended to support a full-time organic chemistry research project, including stipend & supplies, in the summer of 2014 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

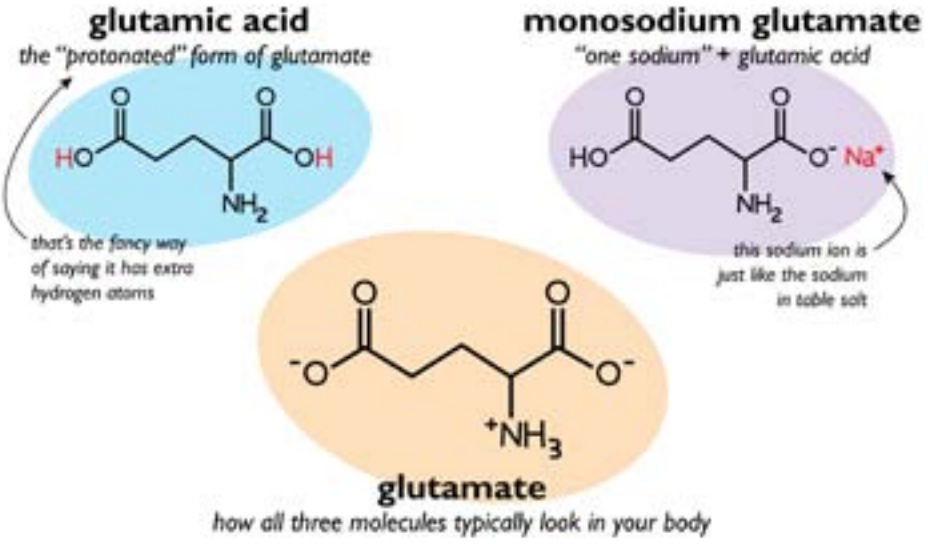
February 21, 2014 to **Kim Haas,** CHVRN 757.

- The Award will be presented at the Undergraduate Award Ceremony in April 2014.
- The Awardee and Faculty Sponsor(s) are strongly encouraged to present a poster on their research at Science 2014 in Pittsburgh in the fall of 2014.

Sleep: Who Needs It, Anyway?

by: *Mark Mazza – Co-Editor*

Oh yes, the glorious sensation of resting your eyes. At certain times in life, there is nothing better than snuggling up comfortably in a warm, luxurious bed, waiting patiently for your eyelids to feel as if they have become miniature bags filled with heavy bricks. However, during heavy exam weeks here at the University of Pittsburgh, it can often be difficult for students to attain the recommended eight hours of sleep so much needed for not just the mind to function properly, but the human body as well. In this regard, many of us have adopted a phrase that has become all too familiar within the vocabulary of the undergraduate student – "The All-Nighter!" "The All-Nighter" is a term that has been put to the test, or at least contemplated, by nearly every student on campus. "The All-Nighter" generally takes place the night before an imperative exam, consisting of hours upon hours of reading over notes, analyzing colorless diagrams, and consuming massive amounts of caffeinated Mountain Dew and salty, yet irresistible Pringles. Although "The All-Nighter" may be viewed as a lifesaver for some, statistics have continually proven that going too long without sleep increases the loss of retaining valuable information. It has also been proven that by cutting the brain off from rest, toxins have the potential to build up in the brain – leading to what has been termed "excitotoxicity," or the increase in excitatory neurons within the brain.



As synaptic connections strengthen during the wakeful state and weaken during the sleeping state, the brain is able to remain in a state of homeostasis. However, if too much synaptic strengthening occurs within the brain, excitotoxicity will inevitably result. During the strengthening of synapses, glutamate, the carboxylate anion and salt of glutamic acid and the major neurotransmitter of the brain, is released. However, it has been proven that too much glutamate can cause severe disruptions in the brain's inner-networking. As more glutamate is released within the brain, the build-up of calcium results. This large and unexpected calcium build-up ultimately leads to a rise in the levels of calcium required to cause the firing of an action potential. These high levels of calcium then create for the misfiring of an action potential, which can, if not treated, lead to lethargy, fatigue, and memory loss (the exact opposite of what you hope to do by staying up all night)! Thus, the brain, as with other body parts, must maintain a level of internal consistency; otherwise, parts of the brain will begin to shut down and cease to function. This sort of concept of homeostasis is analogous to other forms of homeostasis within the body, including the release of sweat from sweat glands to help cool the body when it is in a heated state.

So, the next time a professor barks and asks why you have decided to take a nap during his/her class, respond simply by saying, "To prevent the horrid effects of excitotoxicity!" If this does not go over well with the faculty, however, please refrain from telling them exactly where you have received such valuable knowledge.

http://scienceandfooducla.wordpress.com/2013/07/02/umami-burger/ (picture)

The Chemistry of Baking

By: Anna Powell

As November rolls in, I'm reminded of the holidays just around the corner. So even though I'm swamped studying for midterms, finishing projects, and writing papers, I cannot help but daydream about all of the treats that come with the holidays. From pumpkin pie, to sufganiyot, banana cake, and cookies—we will soon be surrounded by sugary goodness. However, none of these delectable concoctions would be possible without chemistry to transform them from "reactants" to delicious "product".

Generally speaking, the first ingredient in any baked good is flour. Although many different types of flour can be used in baking, wheat flour has a high content of gluten which makes it ideal for most baking needs. When the gluten is then combined with water, the monomeric gluten units attach to one another forming an elastic polymer. If a leavening agent, such as yeast, is added to the mixture, the gluten strands will then stretch to form a scaffold which supports the other chemical reactions occurring in the mixture.

Another important component in baked goods is some form of leavening such as baking soda or baking powder. For those who can never remember if they ought to use baking soda or baking powder, the answer comes down to acidity. Baking soda is simply sodium bicarbonate whereas baking powder is sodium bicarbonate plus an acid. Both baking soda and baking powder react to produce carbon dioxide which helps to create air pockets inside of baked goods which gives them a light, fluffy texture. However in baking soda, the base sodium carbonate is also produced which gives the baked good an unpleasant bitter taste. In contrast, the acid in baking powder neutralizes the base so that the product remains relatively neutral.

Baking Powder: $2NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$

Baking Soda: $NaHCO_3 + Acid^+ \longrightarrow Na^+ + H_2O + CO_2$

Next, a baked good needs a source of fat. Although fat is generally looked upon negatively, it is used to create a variety of different textures in baked goods. One way to achieve super thin and crispy chocolate chip cookies is to use either butter or margarine as a source of fat. Butter and margarine have a lower melting point and thus, will liquefy earlier in baking. This will give the cookies more time to spread out and reach the perfect level of crispy goodness. However, if a soft, fluffy baked good is desired, shortening is the preferred fat. This is due to the fact that shortening has a higher melting point. Thus, it will remain in its solid form for a longer period of time during the baking process preventing the cookie from spreading out.

Finally, dessert just wouldn't be the same without sugar to sweeten the treat. However, sugar also serves other roles in baking. Sugar is hygroscopic which means that it will absorb moisture from the air to keep your dessert moist during baking. Another chemical reaction observed in baking is the caramelization of sugar which is due to the Maillard reaction which oxidizes the sugar helping to produce a golden brown color.

So, when your finals are done and you can relax at home, take just a moment to savor all the chemistry that goes into baking before you help yourself to another piece of pie. In the meantime, as you wade through piles of coursework, keep in mind that an end is in sight and that the holidays are near.

For More Information:

http://highered.mcgraw-hill.com/sites/0078616-try.html