



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



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THE WELCOME BACK EDITION

Welcome back to another exciting year at the University of Pittsburgh!

I hope summer treated everyone well and that you are well rested and prepared for this coming academic year. To the freshmen, we hope to see you involved soon in the fun, informative activities American Chemical Society has to offer.

Before I go any further, I should introduce myself and my co-editor. My name is Katie Hammer and my co-editor's name is Rich Miller. We are both senior chemistry majors here. We hope you enjoy our new voices in the American Chemical Society newsletter and our slight change in style.

We also look forward to new faces joining us each Friday at noon for our ACS meetings in Chevron room 132! Joining the club is a great way to meet people, make new friends, hear from professionals working in chemistry fields, enjoy food together, and have some fun! ACS also provides its members chances to volunteer with fellow chemistry students, make a difference for young students in our area, and network with past Pitt alumni.

On another note, Rich and I need your help to diversify the newsletter and make it interesting for you to read. Any suggestions for article topics or willingness to submit articles would be greatly appreciated. You can e-mail me at klh29@pitt.edu or contact Rich at rbm10@pitt.edu. Positive comments or constructive criticism helps us too.

We wish everyone the best year possible in all of their academic pursuits and hope to see you Fridays at noon for ACS!

Katie L. Hammer

2006-2007 ACS-SA Officers and Staff

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CHEM MAJOR NEWS

CHEMISTRY IN DA' BURG

This is the first article in a series highlighting local chemical companies written by our Pittsburgh chemical industry editor, Andrea Cuda.

Greetings Pitt Scientists!

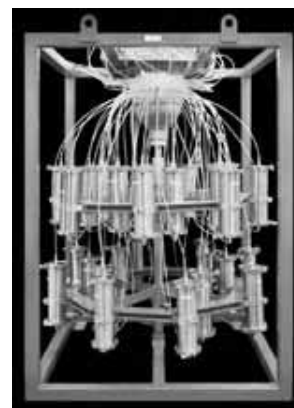


For our first article, we take a look at the Calgon Carbon Corporation (NYSE: CCC) which is headquartered here in Pittsburgh and employs roughly 1,000 people. *Calgon* is a world leader in providing methods and services to make water and air safer and cleaner, and for purifying food, beverage, and industrial process streams. They are a global manufacturer and supplier of granular activated carbon, innovative treatment systems, value added technologies and services for optimizing production processes and safely purifying the environment. Calgon Carbon is the world's largest manufacturer of granular activated carbon with production and operations in North America, Europe, and Asia. Calgon Carbon offers products and services through four technology platforms. These platforms include: Ion-exchange and chromatography, odor control, UV oxidation and disinfection, as well as solvent recovery, VOC abatement, and distillation.¹

Although continuous ion exchange and chromatographic separations can be accomplished with essentially the same piece of equipment, the chemical processes are entirely different. Ion exchange is a reversible chemical process in which one type of ion (electrically charged atoms or molecules) is exchanged for another. During the process, a solution containing the ionic materials to be separated is exposed to an insoluble solid. When contact is made, an exchange of ions takes place. Chromatographic separation, while also a polarity process, is not an exchange. Chromatography is a method for separating components of mixtures at the molecular level. In a simplified example, a mixture of materials to be separated is dissolved in a liquid and passed through a vertical column filled with a solid adsorbent. Depending on the adsorbent and degree of attraction, molecules travel at different rates, leading to a physical separation. When the liquid carrier is extracted at designated exit points, targeted molecules are readily captured.¹

The technology of ion exchange resins has been used in separation applications ranging from soluble material recovery to the purification of process or wastewater streams since the early 1900's. This process was later improved upon by Calgon with the development of a continuous process system – ISEP and then further stretching its application capabilities, Calgon developed CSEP. This system enhances process flexibility and performance providing a less expensive option to large fixed bed ion exchange systems and other downstream processes like membrane separation and vacuum distillation. The ISEP/CSEP system gives higher yield, purity, and concentration for treated material.²

The technology of this ISEP/CSEP system involves the use of a single, 360 degree rotating distributor containing 10, 20, or 30 inlet and outlet ports. The stationary component of the distributor manages and directs fluids moving in and out of the fitting treatment zones and ports of the rotating component. The rotating component transfers the fluid from the stationary component to cells containing any type of media ranging from ion exchange resins, to silica gels, to activated carbon, to molecular sieves. The feeding cells are mounted on a turntable that rotates along with the distributor. With every bed passing through the process in a sequential order (adsorption, wash, regeneration, rinse) with no media becoming latent, use of the short bed maximizes the media operation. Some common applications include: Groundwater remediation of nitrate and perchlorate, purification of pharmaceuticals, vitamin manufacturing, recovery and purification of amino acids from fermentation broths, recovery of metals in metal processing, production of potassium nitrate.³



Calgon's Sentinel UV Disinfection System controls cryptosporidium, giardia, and other waterborn pathogens, bacteria, and viruses for municipal drinking water. The company is continues to innovate their medium and low pressure high output designs through DVGW W294 and other validation protocols, as well as employing sophisticated CFD (Computational Fluid Dynamics) modeling techniques. The CFD tool assists in validating reactors performance, showing to have strong correlations to their reactors' performance.²

Calgon's Rayox Oxidation System utilizes UV energy and an oxidant to destroy many organic compounds found in water and wastewater. It is currently used in the following industries: Drinking water treatment, for destruction of perchloroethelene, total organic carbon, and color; Groundwater remediation of organics such as trichloroethelene; Industrial wastewater treatment, for destruction of alcohols, phenols, acetone, and methylethylketone.²

CCC is a worldwide leader in municipal wastewater and sewage odor control. Using technology that enforces their activated carbon systems, they provide services such as: acid scrubbing systems ideal for removing ammonia odors, biofilter integration, caustic wet scrubbing modules that reduce high H₂S levels to ones which are manageable.²

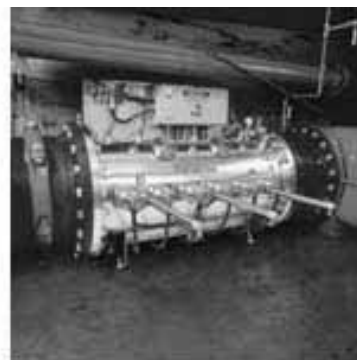
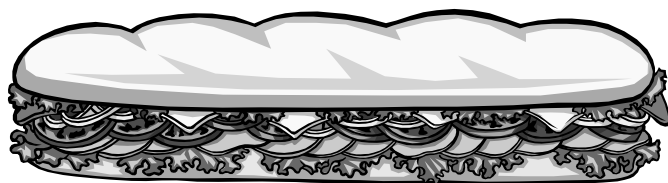
Using regenerative carbon adsorption technology, Calgon's custom Solvent Recovery Systems allows customers to recover and reuse up to 99% of their solvents allowing them to save money. Water insoluble solvents can be recovered and directly reused following mechanical decantation while water soluble solvents have to be further separated, dehydrated, and purified before reuse. A feasible alternative to solvent recovery is a process that controls and removes large volumes of Volatile Organic Compounds (VOC's) in gas and air. The CADRE Series VOC Systems remove compounds such as chlorinated and non-chlorinated hydrocarbons, including paraffins, aromatics, ketones, and esters. CADRE combines the technologies of fixed bed carbon adsorption, thermal regeneration with hot gases, as well as controlled thermal oxidation into a single system. For complete VOC destruction, Calgon also offers custom Thermal Oxidation Systems. The company's Advanced Distillation Systems separate and recovers soluble solvents in a pure form suitable for reuse, batch, or continuous Advanced Distillation Systems.²

As one can see, the technology and services offered by the Calgon Carbon Corporation provide the resources to purify the air and the water that we drink. It also provides its customers modes to save time, money, and resources. The Calgon Carbon Corporation would definitely be a great company to work for!

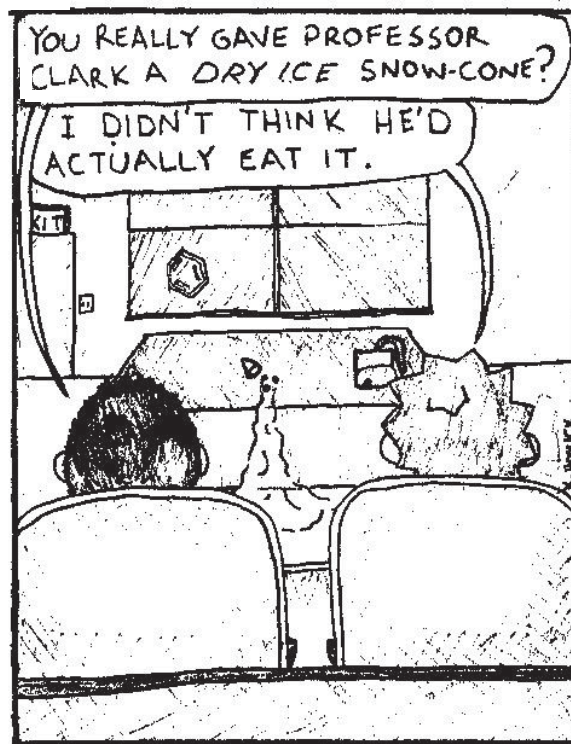
- 1 www.catalyticcarbon.com
- 2 www.admin.cces.h2web.com
- 3 www.ionexchangeseparation.com

ATTENTION!!!!

The ACS-SA will be selling hoagies every Tuesday at lunchtime in the lobby of Chevron Science Center. This year they will be from Uncle Sam's! Details to follow soon....



COMEDY CORNER...



What is an Autopsy?

by Kelly Forney

This is the first in our on-going series that shows how our students explore the many options available to science majors.

What do you think of when I say autopsy? You probably think of a crime investigation show, where they work in dark little rooms to determine how the victim was murdered. Actually most autopsies are done in hospitals. Pathologists perform autopsies almost 365 days a year to determine more than just the cause of death. Most autopsies are done for medical research, medical education, organ donation, the discovery of genetic diseases and sometimes to determine if malpractice was involved. An autopsy isn't easily done. After all of the paperwork required just to authorize body dissection, the actually cutting of the body and retrieval of organs entails hours of hands on dissecting followed by hours of examining under microscopes.

The autopsy is done in a bright well lit room that has a strong musty odor. The body is taken from its solid white body bag, usually stained with blood, and harshly placed on a cold hard metal table. The table surface has several quarter sized holes that lead to an incinerator.

This way excess bodily fluids and tissue can be easily disposed of.

To begin, the autopsy technician makes a Y incision on the chest, going from each shoulder, meeting at the upper chest and continuing down to the bottom of the abdomen. This keeps the neck area clear of marks so the incision will remain undetectable at the funeral and jewelry can be adequately displayed. Any fluid from the incision is suctioned off using a tube connected to a vacuum system. The rib cage is removed first, using an oscillating saw and giant clippers that look like something a gardener would use to cut heavy branches from a tree. This gives easy access to the organs, which are removed with careful cutting, so not to make any unnatural marks. The organ blocks are quickly placed into a large silver basin, fluid sloppily spilling over the sides.

Next the brain is removed. An incision is carefully made in the lower back of the head so that the pillow in the casket will hide any marks. The skin from the bottom of the head is rolled up and over the forehead to reveal the skull. Again, the oscillating saw is used and the brain is revealed. It is gently maneuvered out of the skull, weighed and suspended in a large bucket of formaldehyde to be examined by the neuropathologist. Finally, the spine is taken out and the body is quickly sewn back up and put in the cooler for the funeral director to take, if there is a funeral.

Next to the body is another metal table, waist high, where all the organ dissection, also called the gross examination, is completed. The pathologist begins by weighing each organ and describing the outer appearance. The organs are cut like slices of bread and pieces of tissue from each organ are saved to make into slides for microscopic analysis. The rest of the organ is either discarded or saved in formaldehyde. Nothing is put back into the body.

Depending on the patient's medical history, specific organs are analyzed more closely than others. The heart takes the longest since it is the most complicated organ. Problems with the heart are also the most likely cause of death, so every area must be examined and measured. After the gross examination, the pathologist must write up a report about everything that was found or not found. Slides must be examined by microscopic techniques to further conclude the findings.

The best time to do an autopsy is immediately after the patient has deceased before the organs begin to degrade. Although the overall process of an autopsy sounds brutal the results from autopsies give closure to families and help further knowledge in the medical field.

Tentative ACS Fall Schedule

- September**
- 01 Welcome to the New Academic Year with Pizza
- 08 How to Apply To Professional Schools
with Ray Mizgorski, Pre-professional Advisor
- 15 Just What Does Career Services Do?
with Erin Bridgen, Career Services Counselor
- 22 So You Want to Go to Graduate School
*with Dr. Steve Weber, Director of Graduate Studies
Department of Chemistry*
- 29 Bayer Corporation a Global Industry
*with Dr. C. Karakatsanis
2006 Chemistry Distinguished Alumnus*
- October**
- 06 Registration Already!
with George
- 13 Preparing for National Chemistry Week 2006
“Your Home-It’s All About Chemistry”
with Neil and Chris
- 20 Pumpkin Painting and Halloween Extravaganza
- 27 Meet One of Our New Faculty Members
- November**
- 03 Chemistry Is Interdisciplinary!
- 10 Green Chemistry Here at Pitt
- 17 Fall Term Awards Ceremony
- 25 Happy Thanksgiving!!!
- December**
- 01 Preparing for Saturday Science
This year Saturday Science will be held on December 2, 2006
- 08 NO MEETING--Good Luck with Finals!





The Chemistry of Summer Celebrations




By: *Rich Miller, Co-editor*

For me, summer just wouldn't be complete without watching fireworks on the Fourth of July. People have always been fascinated by fireworks. The Chinese are accredited with their invention roughly 1000 years ago (2). The first fireworks in Europe were brought back by traders who traveled to the east (1), and since that time; fireworks have been used around the world. I am fortunate enough to have probably the coolest summer job. I am a pyrotechnician for Zambelli Fireworks. Basically, I get paid to travel all over the country and set off fireworks. It's a blast! (no pun intended). It is a dangerous job, but it is well worth the risk when you hear a huge crowd of people cheering after a show is over. It's funny though, at every show that I have done I always seem to be asked the same question: "What gives the fireworks their characteristic colors?" Well it's lucky that I am a chemistry major, because the answer is a piece of cake.

The fireworks themselves consist of three basic parts: a shell, a charge, and a wick. The shells range from 3 to 12 inches in diameter. Inside the shell is a smaller charge that explodes when the shell is at its highest point in the sky, releasing a mass of small pellets that give off different colors when ignited. The 'charge' or propellant used in fireworks is black powder. Black powder is a mixture of potassium nitrate, sulfur, and charcoal (1). Leading from this charge is a length of safety wick. These three components are all wrapped together with thick paper. When assembled, a complete firework is referred to as a bomb. When ready to fire, the bomb is loaded into a mortar; this is usually a piece of thick PVC piping with the same diameter as that of the shell. Once the mortar loaded, the wick is ignited. When the burning wick reaches the charge, there is a small explosion inside the mortar. The resulting rapid expansion of gasses ejects the shell high up into the air where it explodes to yield a beautiful display of colors.

So what makes the colors you ask? Actually, you may already know the answer. Remember back in general chemistry when you were learning about the properties of elements? Did you or your professor ever perform a flame test? The procedure involves submerging a nichrome wire into an unknown solution and holding it into the flame of a Bunsen burner. The flame would then change colors, and depending on which color the flame turned, you could identify the cation present in the solution. This is because the energy states of an atom are quantized. The color observed is caused by the excitation and relaxation of valence electrons in the unknown metal. Fireworks exploit the physical properties of elements to their advantage. By burning different combinations of metal salts, spectacular visuals can be created. The showers of sparks are caused by igniting magnesium, iron and aluminum. Salts of barium are burned to produce green. Red is created by lithium and strontium. The blue color comes from copper, and purple from potassium (3). So there you have it! Now that you know the secrets behind these stunning summer spectacles, the next time you watch a fireworks show you can impress your friends with the science behind the show!



Sources: http://footguards.tripod.com/06ARTICLES/ART28_blackpowder.htm
<http://www.fireworks.com/safety/fireworks-history.asp>
<http://www.fireworks.com/safety/chemistry-fireworks.asp>

