AIChE

The Catalyst

PITTSBURGH CHAPTER
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

Volume 20 Issue 1

September 2005

www.aichepgh.org

SEPTEMBER MEETING NOTICE

Where: ***Zambelli Internationale Fireworks Company***
Route 18
New Castle, PA 16103

When: ***Wednesday, September 14th, 2005***

Time: 6:00pm Plant Tour
7:50pm Dinner at Chuck Tanner's Restaurant

Menu: *Please select one of the entrees below. All meals include choice of soup or salad, and an ice-cream dessert.*

- ***Grilled Lamb*** *- grilled cubes of lamb served with pepper sauce and Syrian bread, and one additional side dish*
- ***Agean Vodka Pasta*** *– penne pasta in a lemon vodka sauce with cauliflower, spinach and topped with feta cheese (Vegetarian)*
- ***Shrimp Scampi*** *– Gulf shrimp sautéed with garlic, wine and butter and tossed with penne pasta*

Cost: $18.00 Members
$15.00 Students / Unemployed Members
$20.00 Non-members

RSVP NO LATER THAN
FRIDAY SEPT 9TH, 2005

TO: Mr. Gary Hall, Vice-Chair
Phone: 412-963-0303, ext. 236
E-mail: gary.hall@sauereisen.com

Your RSVP must include: **Name, Company Name, Menu Choice, Email Address, and Phone Number.**

PLEASE PAY AT DOOR

CANCELLATIONS: If you must cancel your meeting reservation, please do so no later than 48 hours prior to the meeting. Otherwise, you will be invoiced for the cost of your meal.

~ About the Company ~

Proudly known as the "First Family of Fireworks," Zambelli is one of the oldest and largest American fireworks companies. Today, the family name is synonymous with quality, creativity and safety.

The magic of Zambelli pyrotechnics has been televised around the world, on "MSNBC Investigates", the Odyssey Network, the Discovery Channel, The Learning Channel and the British Broadcasting Company.

Zambelli Fireworks' greatest asset is its long history of excellence and commitment to entertaining audiences, large and small. Over the years, the company has been involved in hundreds of thousands of shows, including many of the largest fireworks displays in history. In fact, when people look skyward and see a fireworks show, chances are it's a Zambelli production.

Even with today's technological advances, Zambelli pyrotechnicians still hand pick every shell for each show to ensure that the designed effect is achieved. As one of the world's largest manufacturers of pyrotechnics, Zambelli can provide the greatest variety of "customized" shells.

Zambelli has one of the highest safety records in the industry, with a professional seasoned staff and over 100 years of experience in all types of weather, conditions and sites.

Each year Zambelli Fireworks produces more than 3,500 shows. Fourth of July celebrations account for nearly half of the total, when more than 1 million shells are detonated.

~ About the Site Tour ~

The tour will cover several buildings where the fireworks are assembled. Our guide will discuss how the charges are made and assembled. We will also be given a description of the art and science behind making a particular display. Weather permitting, they will set off a few devices for us.

Please wear closed-toe, comfortable walking shoes.

CONTINUED ON PAGE 2

LETTER FROM THE CHAIR

Dear Members:

Fall is rapidly approaching, which means the beginning of our 2005-2006 program year is upon us.

I would like to thank Justin Filey who served as Secretary for several years, and Nathan Peters who recently finished his term as past Chair.

Let us all welcome Gary Hall, who is our new Section Vice-Chair. Gary has been active in several other Pittsburgh Technical Societies, and he brings some great experience to our Section. I would also like to welcome our new Newsletter Editor, E.G. Klein.

Finally, we're very happy to have the continued support of our re-elected officers Leigh Anne Wacker (Treasurer), and John Hauser (Counselor), as well as our new Secretary, Mariangela Peters.

I look forward to meeting you at the Zambelli Fireworks Plant Tour on September 14th!

Best wishes,

David Missenda
AIChE Pittsburgh – Section Chair

MONTHLY MEETING

CONTINUED FROM PAGE 1

For more information on Zambelli Internationale, see:
http://www.zambellifireworks.com/home.html

DRIVING DIRECTIONS TO ZAMBELLI:

Zambelli Fireworks Internationale
Route 18
New Castle, PA 16103

From Downtown Pittsburgh:

Take I-279 north to US 422 west. Follow 422 west until US 422 and PA 60 merge. When US 422 and PA 60 split, follow US 422 west.

At the end of this off-ramp, there is a light approx. 1/4 mile ahead. Go straight through the light to the blinking yellow light approx. 1/4 mile further. Turn right at the blinking yellow light and go approx. 1/4 mile to "Y". Stay to the right at the "Y". Go to top of the hill. There will be a chain link fence on your right as you go up the hill. At the top there is a gate, turn right through the gate and come down the hill into the plant. Meet at the Office.

From Pittsburgh Airport:

Take the Parkway west past the airport to PA 60 North (toll road). Go north until toll road ends and PA 60 merges with US 422 west.

At the end of this off-ramp, there is a light approx. 1/4 mile ahead. Go straight through the light to the blinking yellow light approx. 1/4 mile further. Turn right at the blinking yellow light and go approx. 1/4 mile to "Y". Stay to the right at the "Y". Go to top of the hill. There will be a chain link fence on your right as you go up the hill. At the top there is a gate, turn right through the gate and come down the hill into the plant. Meet at the Office.

If lost, call: 724-971-9675.

DIRECTIONS TO THE RESTAURANT:

Chuck Tanner's Restaurant
North Jefferson Street
New Castle, PA

Leaving Zambelli, go Southeast on Jacobsen Rd. toward East River Road, approx. 0.1 miles. Turn left on East River and travel approx. 1.5 miles to PA 551. Turn right onto PA 551 and go approx. 1.5 miles to US 224 East. Turn left onto US 224 East and travel approx. 5.3 miles. Turn left onto N. Jefferson St./US 422 BR/PA 18 and travel approx. 1.5 miles to Chuck Tanner's, which is on PA 18.

RETURNING TO PITTSBURGH:

To return to Pittsburgh, follow PA 18 South to the PA turnpike. You will meet the turnpike at exit 13. The Cranberry exit is to the East, approximately 15 miles.

If you follow PA 18 past the turnpike it will lead to Route 65.

MEMBERSHIP CORNER

Dear Members,

We are constantly updating our local membership database. Please send all change of address notifications to our Membership Chair:

Holly Gray
Michael Baker Jr., Inc.
Airside Business Park
100 Airside Drive
Moon Township, PA 15108

hgray@mbakercorp.com

If you have not already done so, please verify your updated e-mail address with us so that you will continue to receive monthly newsletters!

Thank you!

Please sign me up for the local Pittsburgh Section of AIChE

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Business Phone _____

Residence Phone _____

Email _____

Annual Dues are $16.00. Make check payable to "AIChE Pittsburgh Section" and send to our Treasurer:

Leigh Anne M. Wacker,
AIChE Treasurer
337 Quail Run Road
Venetia, PA 15367

MARK YOUR CALENDARS!

National Chemistry Week 2005 will be celebrated in Pittsburgh at the Carnegie Science Center on October 21-22.

This year, AIChE will be sponsoring a booth on Saturday, October 22nd.

This event is an excellent opportunity to foster young interest in chemistry, and to illustrate the ways in which science impacts our everyday lives. We will be looking for volunteers to help children make superballs.

Please contact Nancy Hirko at 412-826-3636 or nhirko@air-comp.com for more information.

NEWSLETTER DEADLINE

THE DEADLINE FOR THE OCTOBER NEWSLETTER IS FRIDAY, SEPTEMBER 16, 2005.

Please submit information to:

E.G. Klein
Goldschmidt Industrial Chemical Corp.
941 Robinson Highway
McDonald, PA 15057

724-796-3128
eg.klein@giccusa.com

AIChE National News

Be Counted: Vote Today for AIChE Board Leaders Now is the time to cast your vote in the 2006 Board Elections. Votes can be submitted by paper ballot or electronic proxy. Paper ballots have been mailed and electronic proxy opened on August 10. All votes must be received by September 14. For candidate statements, information on voting, and link to electronic proxy, visit: www.aiche.org/candidates/index.htm

ASME-AIChE Member Discount Members of AIChE or ASME can now take advantage of joint membership discounts. A result of a formal partnership between AIChE and ASME, AIChE Members will receive a 33 percent discount off ASME dues rate, as well as discounted offers on meetings, publications, and other products and services. For more, see: www.aiche.org/new/aicheasme.htm

AIChE Annual Meeting Packed with 17 topical conferences and over 600 sessions and special events, the 2005 AIChE Annual Meeting, Oct 30-Nov 4, Cincinnati, OH, will cover everything from advances in fundamentals, to the newest developments in emerging technologies including bioengineering, nanotechnology, and sustainability. Join more than 4,000 engineers and scientists from around the world. For program, registration, and details, visit: www.aiche.org/annual

Spring Call for Papers Is Open While it may be summer, spring is just around the corner. Submit your abstract today for the 2006 AIChE Spring National Meeting in Orlando, Florida, April 23-27. For more, see: www.aiche.org/spring/

A Brief History of Fireworks

In an 8th century work with the startlingly direct title "Book of Fires for Burning the Enemy", Marcus Graecus (a.k.a. Mark the Greek) reported on a black powder comprised of potassium nitrate, sulfur, and charcoal—the first modern high-energy composition that today we call gunpowder. The Greeks used this mixture (and a similar one that generated flames and dense fumes when ignited) almost exclusively in military applications—in both sea and land battles—and changed the face of military science.

But the history of gunpowder does not begin with the Greeks and their enemy burning fires. It is thought that thousands of years ago, some smarty in China (or perhaps India) discovered that this potassium nitrate, sulfur, and charcoal mixture burned with a bright orange flash and plume of smoke upon ignition—perfect for scaring away evil spirits.

Subsequent smarties fiddled with the black powder and discovered that particle size and mixture ratios affected the performance of the powder. They also found out that placing the powder in a paper tube would noisily explode upon ignition, a precursor to firecrackers. They also discovered that if the powder were arranged in a thin line, it would quickly burn along that trail, a precursor to fuses. And finally, if the powder were compressed in a tube with a sealed end, the hot gases from the ignited powder would propel the tube happily skyward, a precursor to fireworks.

By the 10th century, the Chinese were adept at utilizing the black powder mixture and developed rockets and other types of fireworks. By the early 13th century, the black powder mixture found its way to Europe. Roger Bacon, the English scientist, published a formula for preparing what he called the "thunder and lightning" composition.

Black powder was used as a propellant for cannons in the 14th century. During the 15th century, likely by accident, a major innovation in black powder technology occurred. It got wet. Once thought this spoiled gunpowder (because it formed hard cakes), another smarty realized that if they ground up the caked powder, it was superior to the blended, loose powder. During the same century, Russia began producing quality black powder to arm Ivan the Terrible's 200 cannons. In times of peace, Russia turned its attention to the more artistic endeavor of making fireworks. And through the centuries, advances in pyrotechnic mixtures for military purposes—cannons and rifles—progressed simultaneously with advances in fireworks.

The next major advance took place in the 1780s. Claude Berthollet, the great French chemist, prepared potassium chlorate ($KClO_3$) to use as a replacement for potassium nitrate. Although $KClO_3$ had a propensity for causing deadly explosions when blended with sulfur, metal powders, and ammonium salts, it did add color to the pyrotechnician's arsenal.

Pyrotechnic technology really, um, took off in the 19th century. Pyrotechnicians started putting metal chlorides in the fireworks to produce a dazzling array of color. Barium chloride produces a brilliant green, strontium a vivid red, and copper compounds a whitish-blue. There were some setbacks though. Beautifully named chemicals like Paris green (copper acetoarsenite), calomel (mercurous chloride), and realgar (arsenic sulfide), proved to be hazardous to the pyrotechnician's health.

And aside from tinkering with visual effects (the star, the smiley face, the sparkler, etc.) fireworks have stayed pretty much the same until recently.

In the last couple of decades, fireworks designers have used a magnesium-aluminum alloy know as magnalium in their fireworks, which brightens and deepens the colors, almost to fluorescence—which I've heard not only frightens away the evil spirits, but attracts the good ones.

Source: www.chemistry.org

FIREWORKS – WHAT'S IN THAT STUFF?

The new breeds of fireworks colors operate by the same principles as fireworks colors in general. Certainly, one would never suspect that dazzling colors can spew forth when the dull gray pellets of mixtures are set aflame. So what is that stuff, anyway?

The orangish hues of ancient fireworks are largely produced by black- or gray-body radiation--the glow of very hot solid particles. By contrast, the striking greens and reds in modern fireworks are the spectral emissions of excited gas-phase molecules. A few metal chlorides, which fluoresce strongly in the visible wavelengths, are the basis for almost all the colors in modern fireworks.

Barium chloride produces green; strontium chloride produces red; copper chloride produces blue. The problem is, these compounds are so hygroscopic that they render any mixture damp, unburnable, and even unstable. The solution to this problem has been to bring metal and chlorine together in a vapor during the burning process, where the energy from the burning can then excite the molecules' electrons, producing the colorful emissions.

A typical fireworks color burning mixture consists of, in addition to the requisite fuel and oxidizer, a compound containing one of the metals and a chlorine-donating compound. The mixture is wetted down to bind it together, then cut into flammable chunks known as stars -- the colored dots that burst from a fireworks shell into the sky.

During the early days of fireworks colors, stars were made with potassium chlorate, $KClO_3$, which serves as both an oxidizer and a chlorine donor. But $KClO_3$'s unfortunate propensity for forming friction-sensitive compounds when it comes in contact with sulfur, metal powders, ammonium salts, or moisture has caused more than a few deadly explosions. Consequently, it's rarely used in display fireworks anymore. Nowadays, most star formulas use potassium perchlorate ($KClO_4$). Such stars are harder to ignite but are not nearly as unstable.

Barium chlorate--which has its metal, chlorine donor, and oxidizer built into one compound--produces a brilliant deep green that many fireworks experts believe is unparalleled. But again, the compound suffers from chlorate's notorious instability. Now, fireworks makers rely on compounds such as barium nitrate, strontium carbonate or nitrate, sodium oxalate, and copper carbonate.

FIREWORKS – WHAT'S IN THAT STUFF?

CONTINUED FROM PAGE 5

Blue has always presented a special problem for fireworks designers, because copper chloride doesn't survive well in a hot flame. But a big advance in fireworks colors has come in recent decades, with the use of a magnesium-aluminum alloy known as magnalium. Stars made with magnalium burn electric, almost fluorescent, green, red, yellow, and comparatively decent blue and purple. By themselves, magnesium and aluminum make silvers and sparkles and act as a fuel. The high heat generated by metal fuels can also increase the intensity of the colored molecular emissions. But the incandescence from the metal particles is usually so brilliant that it overwhelms the color.

Magnalium, however, still gets the flame hot without washing the color out. How this happens isn't exactly known, Conkling says. But one possibility is that the metal somehow forms vaporous species in the gas phase, and so doesn't incandesce.

Even with magnalium, though, a great blue continues to be fireworks makers' dream, one that they'll keep chasing.

Source: www.chemistry.org

SPONSORSHIPS

Interested in placing your company's information in future AIChE Newsletters?

Full Page	$300
Half Page	$175
Quarter Page	$95
Business Card Size	$45
1/12 Page	*$30*

Place multiple sponsorships and receive a discount!
Three consecutive ads – 10% off
Eight consecutive ads – 30% off

*Please contact E.G. Klein at eg.klein@giccusa.com or **724-796-3128** for more information.*

VOLUNTEERS NEEDED AS ENGINEERING MENTORS

Engineers are needed as mentors for the Pittsburgh Regional Future City Competition!

The Engineers' Society of Western PA (ESWP) is the coordinating sponsor for the Pittsburgh Regional Future City Competition. Our AIChE Pittsburgh Section has historically had many of our members volunteer for this event. The Future City Competition asks middle school students to create -- first on computer and then in large, three-dimensional models -- their visions of the city of tomorrow.

The Pittsburgh Regional Competition will be held at the Carnegie Music Hall, on ***Saturday, January 21, 2006.*** The Future City Competition is a national program sponsored by the engineering community to promote technological literacy and engineering to middle school students.

For more information on becoming an engineer mentor or for volunteering for the 2006 Future City Competition, please contact Carl W. Schwartz at 724-374-3678, or visit the ESWP website at *www.ESWP.com* . Thank you!

SAVE THE DATE! ESWP 125TH ANNIVERSARY DINNER

This is a very special year for ESWP, because we recognize our 125th Anniversary as an organization. Officially chartered on January 6, 1880, we are one of the longest continually operating organizations of its type in the country.

Accordingly, we plan to celebrate our historic anniversary by increasing our mission in several ways over the next three years.

A commemorative dinner is being planned for ***October 26, 2005*** at the David L. Lawrence Convention Center. We are honored to announce that Rick Sebak of WQED will serve as Master of Ceremonies, and our keynote speaker will be noted author and historian, David McCullough.

For more information, please visit the ESWP website at *www.ESWP.com* or contact Carl W. Schwartz at 412-374-3678. More details to follow in the next *Catalyst!*

AIChE Pittsburgh Section
2005-2006 Officers

Executive Committee

Chair

David Missenda (david_missenda@URSCorp.com)
URS Corporation
(412) 503-4620

Vice-Chair & Program

Gary Hall (gary.hall@sauereisen.com)
Sauereisen, Inc
412-963-0303 x236

Secretary

Mariangela Peters
(mariangela.peters@bayermaterialscience.com)
Bayer MaterialScience, LLC
412-777-4195

Treasurer

Leigh Anne M. Wacker (lamwacker@msn.com)
ANSYS, Inc.
724-514-3046

Counselors

John Hauser (hauserjj@prosaf.com)
PROSAF, Inc.
724-942-3717

Dr. Douglas Price (dmprice@ysu.edu)
Youngstown State University
330-941-3019

Past Chair & Nominations

Dr. Jim Schneider (schneider@cmu.edu)
Carnegie Mellon University
412-268-4394

Additional Officers and Chairs

Membership Chair

Holly Gray (hgray@mbakercorp.com)
Baker Environmental, Inc.
412-269-6059

Newsletter Editor

E.G. Klein (eg.klein@giccusa.com)
Goldschmidt Industrial Chemical Corp.
724-796-3128

Engineers' and Chemistry Week

Nancy Hirko (nhirko@air-comp.com)
Air/Compliance Consultants, Inc.
412-826-3636

Scholarship Chair

Ed Moretti (emoretti@moretticonsulting.com)
Moretti Consulting Group, LLC
412-276-2233

Committee Chairs

Safety & Environmental: Shiaw Tseng
PE Review: Carl Schwartz

Web Master

Richard Dupree (rrd@DupreeOnline.com)
Dupree & Associates
724-775-5122

2005-2006 Monthly Meeting Schedule

Date	Topic	Location
September 14, 2005	Plant Tour - Zambelli Fireworks	New Castle, PA
October 19, 2005	Root Cause Analysis Presentation	Robinson Township, PA
November 2005	Joint Meeting with ACS	TBA
January 2006	Joint Meeting with AWMA	Penn Brewery - Pittsburgh
February 2006	Annual Student Night	Univ of Pittsburgh - Oakland
March 2006	Technical Presentation	TBA
April 2006	Plant Tour	TBA
May 2006	Last Meeting of Year	TBA

Mark your calendars!

For the Following Dates:

Sept 14, 2005	Monthly Meeting	Plant Tour – Zambelli Internationale Fireworks
Oct 22, 2005	Outreach Event	National Chemistry Week At the Carnegie Science Center
Oct 26, 2005	ESWP Event	125th Anniversary – Commemorative Dinner At the David L. Lawrence Convention Center

The Catalyst
American Institute of Chemical Engineers
337 Fourth Avenue
Pittsburgh, PA 15222-2097

Visit us on-line at **www.aichepgh.org**

PROUD TO BE AN AMERICAN!