



The Catalyst

PITTSBURGH CHAPTER
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS



Volume 17 Issue 7



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www.aichepgh.org

APRIL MEETING NOTICE

Topic: Ammonia and NOx Pollution Control

Where: Tambellini Bridgeville Restaurant
413 Railroad Street
Bridgeville, PA

When: Thursday, April 24, 2003

Time: 6:00 PM Registration and Networking
6:30 PM Dinner
7:45 PM Presentation

Menu: Buffet featuring the following items:

- ❖ Pork Marsala – sautéed with sliced mushrooms, marsala wine, and bordelaise sauce
- ❖ Chicken Malibu – stuffed with broccoli, cheddar and bacon and served with two delicate sauces
- ❖ Pasta Calabrese – imported pasta with tomatoes, fresh basil, white wine, shallots & romano cheese

Served with dinner salad, vegetable, fresh rolls and butter, beverage, and dessert.

Cost: \$25.00 Members
\$20.00 Students / Unemployed Members
\$30.00 Non-members

**FOR THE APRIL MEETING,
RSVP NO LATER THAN
FRIDAY APRIL 18TH, 2003**

TO: Mr. Nathan Peters, Vice-Chair
Tel: 412-889-7833

Email: npeters@larocheind.com
PLEASE PAY AT DOOR

Name _____

Email _____

Phone _____

CANCELLATIONS: If you must cancel your meeting reservation, please do so no later than 48 hours prior to the meeting. If you do not provide a cancellation notice, you will be invoiced for the cost of your meal.

~ About the Speaker ~

Otto C. Gaus is a Market Manager for LaRoche Industries of Atlanta, GA. His focus is on the developing market for the company's nitrogen oxide abatement products and services. He is responsible for developing marketing strategies and identifying and capturing growth opportunities for LaRoche's ammonia business.

Mr. Gaus earned his Bachelor of Science degree in chemical engineering in 1986 from Washington University (St. Louis) and a Master of Science degree in chemical engineering in 1989 from Iowa State University. He began his career as a process engineer with Koch Engineering Company and later held several business development positions including director of finance and business development for Koch Nitrogen Company. He joined LaRoche Industries in March of 1999, and lives in Roswell, Georgia, with his wife Tammy and their three children.

LaRoche Industries Inc. is headquartered in Atlanta, GA, and is a privately owned industrial ammonia distribution and chlor-alkali manufacturing chemicals company. Its operations include the largest U.S.-based industrial ammonia distribution network and two leading European electrochemical manufacturing companies.

LaRoche's U.S. network consists of 23 ammonia distribution, field service and office locations. The company is a primary supplier of ammonia to the fast-growing market segment of power plants, oil refineries and other manufacturing facilities nationwide who require ammonia for nitrogen oxide removal. LaRoche has over a decade of experience in supplying ammonia, ammonia equipment, and ammonia services and expertise for DeNOx (nitrogen oxide abatement) applications. The company also serves the metal treating, refrigeration, chemical processing and water treatment industries - as it has for over 100 years.

MORE INFORMATION CAN BE FOUND AT WWW.LAROCHEIND.COM

**FOR DIRECTIONS TO THE RESTAURANT,
PLEASE SEE PAGE 2.**



LETTER FROM THE CHAIR

Hello everyone!

I hope everyone is enjoying what has finally turned out to be some nice weather (well at least warmer weather).

Many thanks to Dr. Winston Everelles and Jennifer Parsons of Robert Morris University for hosting last month's meeting, and providing AIChE members with a tour of RMU's new Learning Factory facility. Dr. Everelles gave an excellent talk on the RMU Engineering program, and Jennifer deserves recognition for all of her work behind the scenes to help bring the meeting together.

And a special thanks to all who have shown interest in the AIChE Pittsburgh Chapter officer positions for 2003-2004. The chapter depends on the involvement of its membership to be successful!

I'd like to remind everyone that there is still time to submit nominations for the McAfee Award. Please remember that the deadline for nominations is April 14th. (See page 3 for details.) Mark your calendars -- May 20th is the day of the banquet.

In the meantime, I hope to see everyone at our next meeting on April 24th.

JoAnn Truchan
AIChE Pittsburgh Section- Chair

MARCH MEETING – CONT.

DIRECTIONS TO TAMBELLINI'S IN BRIDGEVILLE:

From Downtown Pittsburgh:

Take I-279 South towards Fort Pitt Bridge/Airport. Merge onto US-30/US-22 West, and continue for 6 miles. Merge onto I-79 South via exit number 1A toward Washington, and continue for another 6 miles. Take the PA-50 exit (exit #54) toward Bridgeville. Turn RIGHT onto Millers Run Road/PA-50. Continue to follow PA-50 for 1/2 mile. Turn RIGHT onto Station Street. Turn LEFT onto Railroad Street. Proceed to 413 Railroad Street.

From the North/West:

Take PA 60 South to US-30/US-22 towards Pittsburgh. Merge onto I-79 South via exit number 1A toward Washington, and continue for 6 miles. Take the PA-50 exit (exit #54) toward Bridgeville. Turn RIGHT onto Millers

Run Road /PA-50. Continue to follow PA-50 for 1/2 mile. Turn RIGHT onto Station Street. Turn LEFT onto Railroad Street. Proceed to 413 Railroad Street.

From the East (via the Turnpike):

Follow I-76 West/Pennsylvania Turnpike toward Pittsburgh /Ohio. Merge onto US-22 West via exit number 6 toward Pittsburgh. Merge onto I-79 S via exit number 1A toward Washington. Take the PA-50 exit (exit #54) toward Bridgeville. Turn RIGHT onto Millers Run Road /PA-50. Continue to follow PA-50. Turn RIGHT onto Station Street. Turn LEFT onto Railroad Street.

From the South:

Follow I-70 East towards Washington PA. Merge onto I-79 N via exit number 18 toward Pittsburgh. Take the PA-50 exit (exit #54) toward Bridgeville. Keep RIGHT at the fork in the ramp. Merge onto PA-50. Turn RIGHT onto Station Street. Turn LEFT onto Railroad Street.

TAMBELLINI'S RESTAURANT IS AT 413 RAILROAD STREET.

AIChE OFFICER ELECTIONS

Are you interested in becoming more actively involved with the Pittsburgh Chapter of AIChE? One of the many ways you can contribute to the growth and development of the Local Chapter is to become an officer.

The Local Chapter will be holding its annual election for the following positions this April:

- Vice-Chair
- Treasurer
- Secretary
- Counselor

The Vice Chair will automatically elevate to the position of Chair in the 2004-2005 program year. The Treasurer, Secretary, and Counselor each serve a two-year term that will end in May 2005.

If you would like to learn more about these positions or would like to place your name on the ballot, please contact me by **April 30th, 2003** at (724) 274-3371 or mflaherty@ppg.com.

Best regards,

Michael Flaherty
AIChE Pittsburgh Section - Past Chair



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 _____

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

Leigh Anne M. Wacker,
AIChE Treasurer
705 Chrysler Street
Pittsburgh, PA 15226

SOLICITATION FOR 2003 MCAFEE AWARD NOMINEES

This year, the Pittsburgh Section will be awarding the McAfee Award to an outstanding chemical engineer. The award is presented to a distinguished Pittsburgh chemical engineer every two years who:

1. Is widely recognized for contributing to the profession
2. Has community appreciation where she or he lives and works, and
3. Has participated in and contributed to the AIChE and the Pittsburgh Section

Nominations for this year's McAfee Award recipient are now being accepted. The nomination must include a letter from a "champion" and at least three supporting letters. Please send the letters to:

Mr. Ed Moretti
 AIChE Scholarship and Awards Chair
 1840 Tilton Drive
 Pittsburgh, PA 15241

Nominations are due by April 14, 2003

The 2003 McAfee Award Banquet will be held at the Fox Chapel Golf Club on Tuesday, May 20th. Watch the next issue of *The Catalyst* for additional details.

SPONSORSHIPS

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

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Please contact Mariangela Peters at
mariangelapeters@stargate.net
 or 724-554-7172 for more information.



STUDENT NIGHT 2003 - STUDENT POSTER PRESENTERS

Thank you again to everyone who attended AICHe StudentNight2003, especially our student Poster Presenters. Below please find the abstracts for three of the research projects that were presented that evening.

Intra-Ventricular Cardiac Pump **Donna Haworth** **University of Pittsburgh**

Due to loss of blood to the brain during cardiac arrest, an intra-ventricular cardiac pump is being designed to assist in the decrease of brain damage. The pump will consist of a catheter with 3.2mm inner diameter, and a pear shaped balloon attached that will inflate with air. The catheter is to be inserted via the femoral artery and into the left ventricle where it will inflate and deflate to pump the non-functioning ventricle to continue blood flow to the brain during cardiac arrest. Appropriate tubing diameter was determined by finding the pressure drop in the tube, and calculations were made to find an adequate balloon size based on a heart rate of 100BPM, stroke volume of 20mL, and ventricle volume of 40mL. Preliminary tests were performed to determine the pumping capability of the balloon and a live animal test was performed with a balloon of volume 20mL.

Adsorption of DNA onto PNA liposomes **Diana M. Yoon** **Carnegie Mellon University**

There has been heightened interest in developing efficient vectors for both gene delivery and biosensing applications. Uncharged, hydrogen bonding liposomal surfaces may allow us to condense DNA without vector reorganization (for gene delivery) and to amplify the signal of a desired sequence of DNA (for biosensing). DNA adsorption to these surfaces can be brought about by peptide nucleic acids (PNA). PNA is a synthetic mimic of DNA that replaces a charged sugar-phosphate backbone with a neutral peptide backbone.

For this project, DNA adsorption has been observed through qualitative measurement, such as dynamic light scattering (DLS) and zeta potential. Now, we are trying to quantify DNA adsorption through UV measurements and obtaining data on the kinetics of this adsorption process with a quartz crystal microbalance (QCM).

Development of a Novel Gene Delivery Scaffold Utilizing Colloidal Gold/Polyethylenimine Conjugates For DNA Condensation

**Jordan J. Green, Millicent M. Ow Sullivan,
and Todd M. Przybycien**
Carnegie Mellon University

A new gene delivery scaffold system was developed using polyethylenimine (PEI) and colloidal gold to complex DNA. This system's flexibility enables elucidation of the dependency of a gene delivery vehicle's physical and chemical properties on its effectiveness. Specifically, by having three components, this system allows for the independent control of complex size, charge ratio, PEI concentration, and DNA loading. Colloidal gold also facilitates ligand conjugation. PEIs with molecular weights of 2,000, 25,000, 70,000, and 750,000 Da were complexed with colloidal gold and plasmid DNA over a range of charge ratios from 2-10. The complexes' size, morphology, transfection efficiencies, and cytotoxicities were analyzed using dynamic light scattering, atomic force microscopy, flow cytometry, and the trypan blue assay respectively. A common liposomal transfection agent, LipofectAMINETM, was also studied for reference. The 25,000 Da PEI complexes had much higher transfection efficiencies than the other PEI complexes. The 25,000 Da PEI-colloidal gold complexes were found to achieve high transfection efficiencies similar to those of the lipopolyamine, but with comparatively lower cytotoxicities. Average transfection was determined to be optimal among complexes with a diameter of 200 nm and a charge ratio of 8. The average transfection efficiency with these parameters of the Chinese Hamster Ovary (CHO) cell line was 29±12% (n=4).



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STUDENT NIGHT PHOTOS



Student Poster Presenters share results of their research



Congratulations to Professional Promise Award Winners Earl Osman Solis (left) from Carnegie Mellon University and Jeffrey Martin (right) from Youngstown State University.



Thanks to speaker Larry Berger (right) for his presentation.

NEWSLETTER DEADLINE

**THE DEADLINE FOR THE MAY NEWSLETTER IS
APRIL 16, 2003.**

**Please submit information to:
Mariangela Peters at
mariangelapeters@stargate.net
724-554-7172**

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CAREER CORNER

AICHe Pittsburgh has been contacted with the following:

Chemical Engineering Positions Available

For further information contact Tina Tullberg CPS Inc at (708) 531-8390 or ttullberg@CPS4jobs.com

Recruiter specializing in Chemical Engineering. Has been recruiting Chemical Engineers for almost 12 years, placing them nationwide in Chemical, Petrochemical, Consumer Product, Pharmaceutical and Biotech Manufacturing companies. All positions are Employer Paid. Please contact me or feel free to pass my name along to candidates and/or employers.

Some Current available positions include:

Process Engineering position in New Jersey requires 4 - 10 years Chemical Engineering experience as a Process Engineer out of the Biotech Industry. Company is expanding its facility to support production of a new Cancer drug. Start-up is scheduled for summer 2003.

Senior Process Engineering position in San Diego requires 7 plus years Chemical Engineering experience as a Process Engineer using statistical analysis, troubleshooting and optimizing processes.

Plant Engineering position in Augusta, GA requires five plus years Chemical experience. This job requires Project experience (design - installation) of Chemical processes using batch &/or continuous distillation and reaction.

HS&E Engineer, Chicago suburbs. This position requires five plus years HS&E experience out of a Chemical process. The position breaks down 60% HS&E and 40% Operations support.

Six Sigma Process Engineer position in Northeast Indiana requires a Chemical Engineering degree with 5 plus years experience. Candidate must be a Six Sigma Blackbelt.



NITROGEN AND AMMONIA

The Nitrogen Cycle

All living things require nitrogen to live - it is the "amino" in "amino acids". However, few creatures can make direct use of the sea of nitrogen surrounding us all. This is because the two nitrogen atoms that make up a nitrogen molecule are held firmly together by a triple bond, which is exceedingly difficult to break. Only at extremely high temperatures (such as those found near a lightning bolt or in an automobile's engine), or through the magic of "nitrogen fixing" bacteria (who work their trick with a complex set of enzymes instead of heat), can this triple bond energy be overcome, making nitrogen gas momentarily reactive while in an excited state.

Converting nitrogen gas into more reactive (and useful) nitrogen compounds, such as ammonia, encompasses the first stage in the "nitrogen cycle". Once converted from its gaseous form, fixed nitrogen compounds allow plants to grow large and healthy. Animals gain access to this nitrogen by eating the plants, and deposit excess nitrogen in their feces. Fixed nitrogen is also returned to the soil when plants and animals die. Bacteria then decompose this organic matter first into ammonia, then into nitrites (like KNO_2), and finally into nitrates (like KNO_3), which are again used by plants. Additional bacteria return some of the fixed nitrogen back to the atmosphere (in the form of nitrogen gas), thereby regulating the whole cycle.

The State of Affairs in 1913

For thousands of years, humans had little impact on the nitrogen cycle. The strong bond found in nitrogen gas prevented its simple conversion to other, much more useful, nitrogen compounds. People were therefore entirely dependent upon bacteria for the initial nitrogen fixation. Once fixed in the cycle, nitrogen compounds could be collected.

One of the best, and largest, sources of this fixed nitrogen was found in Chile. This outcrop was due to a vast number of sea birds which nested, and went to the bathroom, along its coasts. Over thousands of years these "natural" deposits called "Guano" accumulated and became several feet thick. A huge industry developed to supply this Chilean saltpeter to the rest of the world.

With synthetic production almost non-existent, the world was entirely dependent on the Chilean resource for fertilizers and high explosives. This was a fact that military leaders did not overlook. They realized that if war broke out, the countries which lacked (or were

denied) access to the Chilean supply would quickly run out of munitions.

In 1913 if you were an up and coming nation, intent on feeding your people, or conquering your enemies, you needed as much Chilean saltpeter as possible. In short, the fate of the world depended upon who could get their hands on the most bird droppings. It is therefore no coincidence that the first major naval battle of the first World War occurred off the coast of Chile.

Synthetic Ammonia Production

The problem with using guano was that it was non-renewable. Farmers imported and used tons of it. A desperate search had begun for a replacement. For years chemists tried to remove nitrogen from the air, but it wasn't until a German chemist, Fritz Haber, found the secret: extremely high pressure. He found that he could use the nitrogen from the air and form ammonia if he did his chemical reactions in a vessel pressurized to 100 times normal atmospheric pressure. But using these high pressures presented great problems with making large quantities. That kind of pressure can be contained on a small scale, but make a vessel large enough to make tons of ammonia and pressurize it to 100 times atmospheric pressure, and you have a huge bomb if the vessel fails. This is where Carl Bosch enters the picture. When he learned of Haber's process in a meeting, Bosch said "I believe it can go. I know exactly what the steel industry can do." Using this knowledge he designed vessels to contain the pressure and created a factory that made ammonia by the ton.

The first plants using this "Haber-Bosch Process" were constructed shortly after the outbreak of World War I. Without this technology, Germany would have run out of munitions in 1916 thereby ending the war.

To compete with this, other countries copied the process and quickly scaled up their own synthetic ammonia production capabilities. When the war was over, fixed nitrogen continued to be produced in large amounts because of its use as a fertilizer. By 1934, Chile was supplying only 7% of the world's fixed nitrogen (a huge drop from the 56% supplied in 1913). Synthetic ammonia production had arrived in force.

Synthetic ammonia production eliminated the world's dependence upon guano. Chemical engineers played a large role in designing, building, and operating the ammonia plants that made this possible. Today, nitrogen from the Haber-Bosch process provides the nutrition for about 60% of the world's people.

Sources: http://www.pafko.com/history/h_toc.html
and <http://www.engineerguy.com>



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2002-2003 Monthly Meeting Schedule

Date	Topic	Location
April 24, 2003	Technical Presentation: Ammonia and NOx Pollution Control	Tambellini's in Bridgeville
May 20, 2003	The McAfee Award	Fox Chapel Golf Club

Mark your calendars!

For the Following Dates:

April 14, 2003	Award Nomination Deadline	For the May 2003 McAfee Award
April 24, 2003	Monthly Meeting	Technical Presentation - Ammonia and NOx Pollution Control
May 20, 2003	Banquet / Monthly Meeting	2003 McAfee Award Banquet



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