

# The South Texan

2003 Marx Isaacs Award for Outstanding Large Section Newsletter

Voted "Best Newsletter" at 2009 AIChE Leadership Development Conference



## Highlights

- ♦ May 6 Meeting at Brady's Landing
- ♦ PE Exam Review Course Information
- ♦ Young Professionals (YPs) News and Events
- ♦ 2010 Annual STS AIChE Houston Ship Channel Tour

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Monthly Meeting May 06, 2010

Location: Brady's Landing 8505 Cypress St. Houston

Meeting Time: 7.00 pm (Social Hour starts at 6.00 pm)

## "Using Nanotechnology to Clean Contaminated Water - A Catalytic Approach"

**Speaker:** Michael S. Wong, Associate Professor, Rice University, Department of Chemical and Biomolecular Engineering and Department of Chemistry Abercrombie Engineering Laboratory

**Abstract:** Groundwater remediation through the catalytic breakdown of the undesired contaminants is a more effective and desirable approach than the conventional physical displacement methods of air-stripping and carbon adsorption. Palladium (Pd) catalysts are known to catalyze the hydrodechlorination of trichloroethene in water, at room temperature, and in the presence of hydrogen. In this talk, I will describe how one can dramatically improve the catalytic function of Pd metal by combining it with gold, how this approach could work on real groundwater systems, and how this example can yield lessons on improving the performance of materials by controlling their structural features at the nanometer scale.

**Bio:** Michael Wong is an associate professor in the Department of Chemical and Biomolecular Engineering, and the Department of Chemistry, at Rice University. He received his B.S. from Caltech (1994), and M.S. (1997) and Ph.D. (2000) from MIT, all in Chemical Engineering. He did his post-doc with G. D. Stucky in the Department of Chemistry and Biochemistry at UC Santa Barbara, before coming to Rice in 2001. His research program lies at the interface of Chemical Engineering, Chemistry, and Materials Science, centered around the concept of engineered nanoparticles. His team of post-docs, graduate students, and undergraduates generally seeks to design and synthesize nanoparticle-based materials that address current engineering problems in environment, energy, and medicine; to develop new chemical techniques to achieve these materials; and to deepen the understanding of underlying fundamental processes at the molecular level. For example, his group has designed new nanocatalysts to treat water contaminated with chlorinated compounds, which may serve as a new approach for groundwater treatment. His group has developed a self-assembly synthesis route to materials with biomedically relevant encapsulation and delivery properties. Among other recognitions, he received an MIT "TR35" Young Innovator Award, a Young Innovator Award in the Arts and Sciences by the Smithsonian Magazine, and the Nanoscale Science and Engineering Forum Young Investigator Award from AIChE. He is Chair of the AIChE Nanoscale Science and Engineering Forum. He is also Chair of the Southwest Catalysis Society; he is an Associate Editor for "Journal of Nanomaterials" and serves on the Editorial Advisory Board of "Chemistry of Materials".



## Workshops begin at 5:30 PM (Workshops are free and open to public)

### PE/PO workshop

**Speaker: Peter Ginn**

#### What you do not know about your control valve may be losing you money!

**Abstract:** Think of one particular control valve in your plant. One whose operation you'd like to improve. Answer a multi-choice questionnaire on the performance of that one control valve. Watch a short video of a real control valve equipped with a digital positioner. Then check the performance that you have just seen in the video with your own answers in the questionnaire. Then answer the question: how much do you really know about that control valve?

*Bio: Peter Ginn undertook many process control improvement projects at Dow Chemical and at Monsanto. His measurements of actual in-the-field control valve performance led to significant and permanent process improvements. He has written a book "An Introduction to Digital Minicomputers and Process Control" and has had three papers/articles on improving understanding process control published.*

### P. E. Panel Discussion

*As STS-AIChE provides finishing touches to it's PE review course which is due to start from August 13th, we will be conducting a Panel Discussion. This panel discussion will focus on the importance of PE license from various sectors of our industry. We will have an outstanding and experienced panel who will answer your questions; we have the following panelists who will serve on the panel:*

|                           |   |
|---------------------------|---|
| <i>Operating Company</i>  | <i>– James O. Guerra, Exxon Mobil</i>       |
| <i>EPC</i>                | <i>– James Turner, Fluor</i>                |
| <i>Project Management</i> | <i>– David Silarski, Advanced Aromatics</i> |
| <i>PE Witness</i>         | <i>– Marc Lacour, Conoco Phillips</i>       |

*We are accepting questions in advance that will be discussed in the panel. You may send your questions in advance to our moderator, Gary Gildert at [Gary.Gildert@matthey.com](mailto:Gary.Gildert@matthey.com). If you are planning to take the PE exam or already have a PE, we invite you to participate in this brainstorming and exciting discussion.*

## Business Etiquette Tip of the Month

"Business Etiquette Tip of the Month" by <http://clubetiquette.com/>

In a conversation, when appropriate, try to include those around you so they do not feel left out. It is impossible to be aware of everyone's sensitivities, but it does not hurt to try a little as well. Extending the gesture of actively opening your circle to others in conversation shows character and empathy. Your courtesy just might be returned when you are in a similar situation.

## Meeting Registration Information

Membership in STS-AIChE is a bargain at \$20/year! If you wish to become a member, you may join at the registration desk at the May meeting.

|                    | Pre-Registration<br>Members | Pre-Registration<br>Non-Members | At the door<br>Members | At the door<br>Non-Members |
|--------------------|-----------------------------|---------------------------------|------------------------|----------------------------|
| Regular/Retired    | \$25                        | \$30                            | \$35                   | \$40                       |
| Student/Unemployed | \$15                        | \$20                            | \$25                   | \$30                       |

**NOTE:** You have until 4 PM CST on May 5<sup>th</sup> to pre-register online. After that, you will be required to pay the higher cost at the door.

Pre-registration for the meeting is now open through our new website at:

<http://sts.aiche.org/content/meeting-pre-registration>

*Attendees of the meeting will earn 1 PDH*

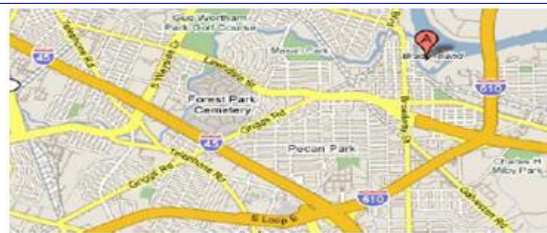
*for the Texas Professional Engineer*

*Continuing Education Programs.*

*Remember to track your hours!*

## Meeting Location—Brady's Landing Restaurant

This month's meeting will be held at [Brady's Landing Restaurant](#) (8505 Cypress St, Houston, TX - 77012) Double click on the map to the right for directions from your location.



## News from Other Professional Societies

### LinkedIn group for "Houston Process Safety"

There is a group on LinkedIn for Houston engineers called "Houston Process Safety". The main objectives is to provide a platform for exchanging loss prevention information and also help find jobs/etc. Visit the following link for more information [http://www.linkedin.com/groups?gid=2063368&trk=myg\\_ugrp\\_ovr](http://www.linkedin.com/groups?gid=2063368&trk=myg_ugrp_ovr)

### Public Process Safety Boot Camp, Houston, TX, May 10-13, 2010.

This public presentation of Process Safety Boot Camp is an intensive 4 day course which is designed to quickly bring young chemical engineers up to speed on the fundamentals of Process Safety. This public process safety boot camp will be taught by John Murphy and Adrian Sepeda. Both are highly experienced engineers who are trained presenters and can illustrate key concepts with personal experience. For more information visit website at <http://www.aiche.org/ccps/Education/BootCamp.aspx> Or call Paul Butler at 901-240-8158.

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*Engineering advanced*

## 2010 ANNUAL STS AIChE HOUSTON SHIP CHANNEL TOUR

### 6:00 PM, SATURDAY, JUNE 12, 2010 (Date subject to change)

### Register/Prepay now! [Click Here!](#) (Available after the May 6 meeting)

Once again, the South Texas Section will journey down the Houston Ship Channel in the fully air-conditioned M/V Sam Houston on the evening of **Saturday, June 12**. The M/V Sam Houston will leave the dock at **6:00 PM sharp** and return to the dock at approximately 8:00 PM. The Houston Ship Channel is the largest concentration of chemical industry in the United States with more than 50 chemical processing facilities located along either side providing their products to commerce around the world. The list of companies that are located along the Houston Ship Channel reads like a who's who of the chemical process and refining industries. The ship channel has more than 50% of the nation's basic petrochemical manufacturing capacity and nearly 50% of the capacity of first stage derivatives - almost three times larger than its closest competitor.

Barbecue and beverages will be served on the trip which is intended to be enjoyed by one and all, so please bring your spouse or significant other. Lenox Barbecue will again be providing beef, chicken and rib barbecue dinners with all the fixings including beans, potato salad, coleslaw, pickles, and lots of jalapenos plus dessert for those who are still hungry. Because the trip is intended for a technical organization, no children under the age of 16 are allowed. The cost of the trip, the barbecue, and the beverages (open bar) is \$15.00 per person. Because of the popularity of this annual trip, we regret that must impose a limit of only two (2) people per reservation. Also, people who fail to cancel their reservations by 12:00 noon on Thursday, June 10, to allow others who are on the wait-list to go on the trip will forfeit the **\$15.00 per person cost**.

Because of Port of Houston security requirements and the limited space available, reservations are required for the trip since the M/V Sam Houston can take **only 60 people**. Reservations will be accepted starting on the night of the Thursday, May 6, STS-AIChE monthly dinner meeting until 2:00 PM, Thursday, June 10. Attendees of the May 6 STS-AIChE meeting will get to sign up during the meeting. **Starting May 7**, sign up and prepay using the STS shopping cart at <http://sts.aiche.org/content/2010-annual-sts-aiche-houston-ship-channel-tour>

When the reservations list is full, a wait-list will be started. Reservations can be canceled at any time up to 12:00 noon on Friday, June 11, online on the STS-AIChE Web site. If any spaces are available, you may pay via cash or check at the dock.

Reservations are limited to members of the STS-AIChE and one guest per member for a total of two people for each reservation. We will use the contact information provided in the shopping cart to contact you in case the trip is cancelled (see the security notice below). Reservations are on a first come, first serve basis; however, we will maintain a wait list in case there are cancellations. Remember: reservations will be accepted beginning with the Thursday, May 6, STS-AIChE dinner meeting.

**All people going on the Houston Ship Channel Trip must have a picture ID to show to the guard at Gate 8 and to the crew member before boarding the M/V Sam Houston. Names will be compared to the reservations list by the guard.**

We hope to see you on board the M/V Sam Houston when we weigh anchor.

Directions: The parking lot access is through Gate 8 of the Port of Houston, 7300 Clinton Drive. Exit I-10 (Baytown East Freeway) at McCarty and proceed south on McCarty to Clinton Drive. Turn right on Clinton and proceed west to Gate 8, which has a signal light and is just before Wayside. Turn left and enter Gate 8, then proceed to the pavilion at the Turning Basin, staying to the right. Once there, park in the parking lot and join us on board the M/V Sam Houston.

DO NOT EXIT AND GO DOWN WAYSIDE; THERE IS NO STREET CONNECTION FROM SOUTHBOUND WAYSIDE TO CLINTON.

For additional information, please e-mail Dennis Griffith at [dennisgriff@sbcglobal.net](mailto:dennisgriff@sbcglobal.net) or call him at 713-656-7794 (work) or 713-465-9347 (home)

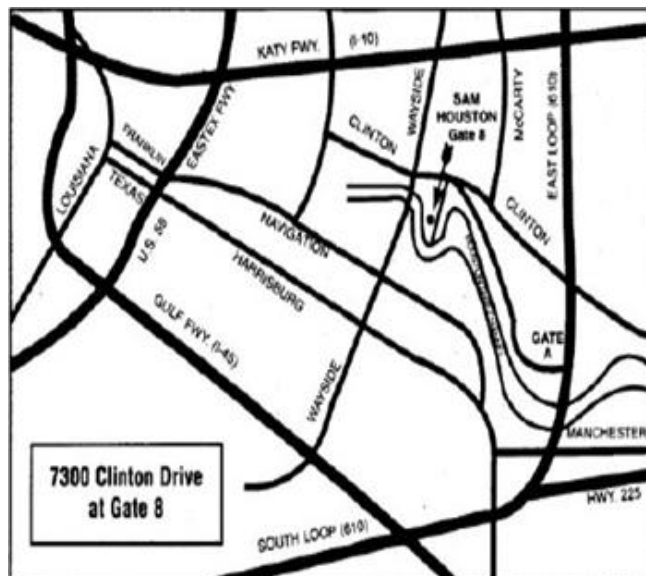
**Remember, a picture ID is required for all attendees.**

Bon voyage!

Dennis Griffith

#### SECURITY NOTICE

Because of the increased security requirements at the Port of Houston, the annual STS-AIChE Houston Ship Channel Trip is subject to cancellation at the last minute by the Port of Houston Authority. If this happens, we will notify all people with reservations and put a notice on our Web site <http://sts.aiche.org/>. Your understanding about this situation is appreciated.





## 2010 AIChE Regional Process Technology Conference, Galveston, TX

The South Texas Section of the AIChE, in partnership with AIChE National, is hosting its **2nd Regional Process Technology Conference** at the **Moody Gardens Hotel in Galveston, October 7 & 8, 2010**. This conference will attract hundreds of chemical engineers living in the Greater Houston and Gulf Coast region to provide them with both technical sessions and industry solutions in process technology. Visit <http://www.aiche.org/Conferences/2010Regional/Galveston.aspx> for more details.

## Science Fair Award Winners - Congratulations

The South Texas Section of the American Institute of Chemical Engineers presented Special Awards for "Best Projects Related to Chemical Engineering" to top students at the 2010 Science and Engineering Fair of Houston

2010 Junior Division Winner - **Chelsea D. Truong**, Title: Biodiesel Hero, Teacher: Sezgin Aydin, School: Harmony Science Academy Houston, a charter school.

2010 Ninth Grade Winner - **Allison R. Martin**, Title: A Study of Lipid Content in Algae, Teacher: Linda Costanzo, School: The Academy of Science and Technology, Conroe ISD.

2010 Senior Division Winner (1 of 2), **Neerja Aggarwal**, Title: From Algae to Energy, Teachers: Dr. John Glenn Ramon & Tina Jackson, School: Hightower High School, Fort Bend ISD

2010 Senior Division Winner (2 of 2), **Audrey Peltier**, Pump It Up, Teacher: Melissa Paul, School: Travis High School, Fort Bend ISD



Ernie Althaus (left) (head judge for STS-AIChE) with Senior Division winners Neerja Aggarwal (Center) and Ashley Peltier (right).

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## Bow Tie Master Class

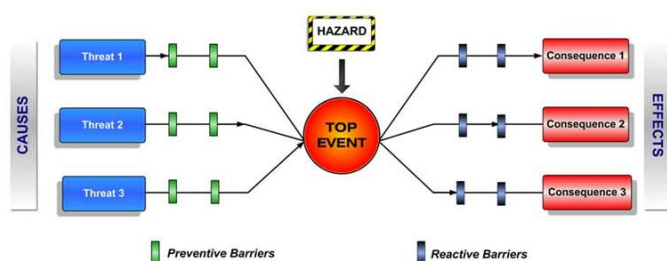
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**Tuesday - Wednesday**  
**May 25-26, 2010**  
**8am-5pm**

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- Safety Directors, Coordinators
- Compliance Coordinators
- Process Control Engineers

For registration e-mail: [bowtie@dnv.com](mailto:bowtie@dnv.com)

## AIChE South Texas Section – PE Exam Review



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August 13, 2010 – October 23, 2010. 33 hours of expert instruction from STS/AIChE lecturers at the University of Houston.

| Date   | Subject                                   | Hours |
|--------|---|-------|
| 13-Aug | Mass/Energy Balances & Thermodynamics I   | 3     |
| 20-Aug | Mass/Energy Balances & Thermodynamics II  | 3     |
| 27-Aug | Mass/Energy Balances & Thermodynamics III | 1     |
| 27-Aug | Fluid Mechanics I                         | 2     |
| 10-Sep | Fluid Mechanics II                        | 3     |
| 17-Sep | Heat Transfer I                           | 3     |
| 24-Sep | Heat Transfer II                          | 1     |
| 24-Sep | Mass Transfer I                           | 2     |
| 1-Oct  | Mass Transfer II                          | 3     |
| 8-Oct  | Mass Transfer III                         | 1     |
| 8-Oct  | Kinetics I                                | 2     |
| 15-Oct | Kinetics II                               | 2     |
| 15-Oct | Economics                                 | 1     |
| 22-Oct | Plant Design & Operations                 | 3     |
| 23-Oct | Sample Test Exam                          | 3     |

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- ◆ Review all major test subject areas on a weekly basis
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- ◆ Sample test exam on October 23<sup>rd</sup>
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**Included Course Materials - a \$300 value!**

1. Chemical Engineering Reference Manual, Lindenburg
2. PE Chemical Engineering Sample Questions and Solutions Book
3. Six-Minute Solutions for Chemical PE Exam Problems

**Online Registration (click the link below):**

<http://sts.aiche.org/content/pe-examen-review-course>

**See Next page for Mail-in Registration Form Information**

## PE Exam Review - Mail-in Registration Form

First Name \_\_\_\_\_ Last Name \_\_\_\_\_

Company \_\_\_\_\_ Email Address \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

### Shipping Address

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ Postal Code \_\_\_\_\_

**Billing Address** ☐ check if same as shipping address

Address \_\_\_\_\_

City \_\_\_\_\_ State/Province \_\_\_\_\_ Postal Code \_\_\_\_\_

**Payment Type** ☐ Visa ☐ Mastercard ☐ Discover ☐ Check (enclosed)

Card # \_\_\_\_\_ Expiration Date \_\_\_\_\_ Security Code \_\_\_\_\_

I authorize STS-AICHe to charge \$\_\_\_\_\_ for payment of the PE Exam Review Course using the above credit card information provided. For AICHe/STS members - \$595, non-members - \$795

*(if you are an AICHe National member, STS membership is only \$20 extra).*

Signature \_\_\_\_\_ Date \_\_\_\_\_

### Please mail your registration form to:

STS-AICHe, P.O. Box # 820252, Houston, TX 77282

You will receive a confirmation by email within several days of receipt.

**Limited space** - reserve your space now (cut-off for class registration - July 16<sup>th</sup>)

*Cancellation Policy -by 7/16 - full refund, 8/13 - ½ refund, after 8/13 - no refund*

---





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## Young Professionals (YPs) News

STS-AIChE YP would like to welcome the following new YP members:

Fredrik Gunawan

Maxine Madison

Alejandra Peralta

Sarah Price

Easwar Ranganathan

We hope that you will join us for our upcoming events! For additional details please visit our YP webpage.

<http://www.yp.sts-aiche.org/>



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## Young Professional Social Events, By Maxine Madison

The Young Professionals of the STS-AICHe division are not only smart, but they also know how to have fun! Additionally, the YPs are very active in the community. This article highlights some of the STS-AICHe events held so far this year in which YPs have participated.

The YPs kicked off the new year with a membership drive at Dave and Busters on Wednesday, January 20th. The YPs that attended had a great time bowling and socializing over appetizers as seen in the pictures in the previous page. The drive also attracted several new members that have remained active in the chapter.

On Saturday, January 23rd, the YPs gave back to their community by volunteering at The Beacon. The Beacon is a day center that provides meals, clothing, showers, laundry services, and case management to people living on the streets of Houston. Linton Wong is a regular volunteer at The Beacon, and he organized the event for STS-AICHe. Additional YP volunteers that helped out on January 23rd were Omar Camacho, Annie Li, Kelly Richardson, Carol Schmidt, and Nemoy Rau. The volunteers assisted with meal preparations in the kitchen and also helped in the laundry facilities. To learn more about The Beacon and how you can help, visit their website:

[www.chomhouston.org/default.aspx?name=chom.thebeacon](http://www.chomhouston.org/default.aspx?name=chom.thebeacon)

February's social event was a relaxing evening at the Mezzanine Lounge on Friday, February 26th. Several YPs attended the event after work and enjoyed listening to music, sampling tasty food, and watching the Olympic games.

March was a fun-filled and very busy month for the YPs. On Friday, March 12th, Nicole Chaplin, Jonathan Eng, Heather Gilligan, Nemoy Rau, Kelly Richardson, and Carol Schmidt volunteered at the Science and Engineering Fair of Houston (SEFH) held at the George R. Brown Convention Center. The SEFH is open to students in grades 7 – 12 and serves as the regional fair for all public, private, charter and home school junior and senior high school students in Harris County and 23 surrounding counties. Major regional fair winners are eligible to compete in the annual International Science and Engineering Fair which will be held on May 9-14 in San Jose, CA.

The SEFH is a large event that requires many volunteers. Last year there were over 1300 entries from 140 schools. Approximately 35,000 projects were entered in the preliminary school/district fair competitions. Individual project categories included animal science, behavioral/social science, chemistry, biochemistry/microbiology, chemistry, computer science, earth/space science, energy & transportation, engineering, environmental science, mathematics, medicine/health, physics & astronomy, and plant science. Team project categories focused on botany/environmental science/zoology, behavioral science/biochemistry/medicine & health, engineering/computers/mathematics, and physical and life sciences. The STS-AICHe winners from the SEFH are shown below.

| YEAR | CATEGORY                  | NAME            | TITLE (SCHOOL)  |
|------|---------------------------|-----------------|---|
| JR   | BIOCHEMISTRY/MICROBIOLOGY | CHELSEA TRUONG  | BIO-DIESEL HERO (HARMONY SCIENCE ACADEMY HOUSTON )          |
| 9TH  | ENERGY/TRANSPORTATION     | ALLISON MARTIN  | STUDY OF LIPID CONTENT IN ALGAE (ACADEMY OF SCIENCE & TECH) |
| SR   | CHEMISTRY                 | NEERJA AGGARWAL | FROM ALGAE TO ENERGY (HIGHTOWER HIGH SCHOOL)                |
| SR   | ENGINEERING               | AUDREY PELTIER  | PUMP IT UP (TRAVIS HIGH SCHOOL)                             |

The YPs showed their competitive nature by participating in games at The Kentucky Club & Zuma Fun Center on Friday March 19th. Over 20 YPs attended and enjoyed happy hour, bumper boats, miniature golf, and go-karts.

On March 21st – 25th, several YPs refreshed their technical skills and expanded their networks by participating in AICHe's National Spring meeting in San Antonio, TX. Carol Schmidt was awarded the Shining Star Award at the Local Sections Committee meeting and Brian Daly helped co-chair a Fuels & Petrochemical Division session entitled "Young Professional Tutorial: Process Control and the Environment." On behalf of the national Young Professional Advisory Board, Matt Winters, Jasmine Lee, and Brian Daly organized a Young Professional Social Mixer at the Iron Cactus on the Riverwalk that was sponsored by the Fuels & Petrochemical Division, Process Development Division, and South Texas Section Young Professionals.

On March 26th – 28th STS-YP representatives, Brian Daly and Matthew Winters, attended the Southwest Student Regional Conference hosted by Lamar University in Beaumont, TX. In addition to interacting and networking with students from Texas Tech, University of Houston, Rice University, Prairie View A&M, Texas A&M, Texas A&M - Kingsville, University of Louisiana-Lafayette, and the University of Texas, Matt was one of the poster judges for the Chem-E-Car competition while Brian checked to make sure the cars met AICHe National's safety standards. Overall, it was a great experience for both the students and professionals, and they look forward to participating in next year's conference hosted by Texas A&M.

Two YPs, Wilson Carrillo and Maxine Madison, assisted Pete Garside with the Alief Kerr Career Day on Friday, April 9th. During this event, students had a chance to hear first-hand what chemical engineers do and also learn about the requirements for getting a degree in chemical engineering. Many freshman, sophomores, juniors, and seniors visited the STS-AICHe table and received pamphlets detailing the many career choices available to chemical engineers.

On behalf of the STS-AICHe YP, we would like to extend a special thanks to all of the volunteers that helped to make these events successful. We look forward to seeing your smiling faces in the near future as we continue to support our local community events and just have fun together.

For more information on these events and future events, check out our website at [www.yp.sts-aiche.org](http://www.yp.sts-aiche.org)



## Technical Paper - Challenges of Biofuels by Maxine Madison (Young Professional)

Much has been said about biofuels - some see it as a panacea while others think of it as a plague. So, what's all the commotion about? There are many advantages to using biofuels. For example, the US government has promoted biofuels as a way to increase national security by reducing our dependence on foreign oil from unstable environments. In addition, biofuel consumption could reduce greenhouse gas emissions compared to traditional petroleum fuels because biofuels are considered low carbon fuels. Plants take in CO<sub>2</sub> to grow; therefore, if a plant is converted into biofuel which is then consumed in a motor vehicle, less CO<sub>2</sub> is released into the atmosphere compared to when petroleum fuels are consumed. The CO<sub>2</sub> is essentially recycled as shown in the figure below. Despite these advantages, challenges exist that have limited the success of biofuels so far.

The first challenge is lignocellulosic biomass, meaning biomass comprised of cellulose, hemicellulose, and lignin. Aside from biodiesel which uses oils/fats as its feedstock, lignocellulosic biomass (hereafter referred to as biomass) is the raw material for most biofuel conversion processes. There's biomass all around us - grass, trees, pond algae, agricultural crops. However, most biomass have low yields unless they have been specifically altered to produce high yields for biofuels, in which case they are termed energy crops. For example, corn stover, which consists of the stalks, leaves, and cobs left behind after harvesting corn, yields about 4 metric tonnes/acre of biomass while miscanthus, an energy crop grown on a large scale mainly in Europe, is reported as producing over 12 metric tonnes/acre (Angelini et al.) Increasing crop yield is a major research focus of biofuels. Other biomass issues arise from its low mass density and low energy density compared to petroleum feedstocks. In other words, a truckload of biomass that has not been densified would weigh significantly less and produce less usable fuel than a truckload of densified biomass. Many methods exist to address these problems and they are grouped under preprocessing/pretreatment.

Preprocessing/pretreatment is the second challenge of biofuel production. Typically, the addition of chemicals distinguishes pretreatment from preprocessing. Preprocessing prepares the biomass for feeding into process equipment and is also useful in reducing transportation and storage costs. Drying is a simple and effective preprocessing method because it dramatically reduces the moisture content of biomass which can be as high as 50% by weight to a more reasonable 10% or less. This ensures that more transportation money is actually used for transporting biomass rather than water. The drawback is that drying is very energy intensive and therefore costly. Generally for ethanol production, pretreatment accounts for about 20% of the cost, second only to the feedstock costs, which account for 30% of the cost (Sierra et al.). Size reduction or grinding is often needed for biofuel conversion to increase the biomass surface area and/or enable biomass to be fed into reactors. This, however, adds another energy intense preprocessing step. Densification is a preprocessing step that increases the mass density of biomass. Baling and pelletization are examples of densification. It's easy to see that loose hay takes up more space than baled hay; the additional space needed for biomass that is not densified adds up quickly when paying for biomass shipments by the truckload.

Energy density can be increased through pretreatment or the biofuel conversion process. Pretreatment usually involves chemicals such as acids, bases, and supercritical water. Pretreatment increases the yield of biofuels by preparing the biomass for the conversion process. For example, in biochemical conversion processes such as fermentation, which use low temperatures and pressures, pretreatment is essential in breaking down the biomass so that enzymes or microbes can access the cellulose and convert it to alcohol, which in most cases is ethanol. For thermochemical conversion processes which use high temperatures and pressures, pretreatment is not as severe and usually consists of washing to remove impurities that may harm catalysts or conversion equipment.

The third challenge in biofuel production is the conversion process itself. As previously stated, the two main types of conversion processes are biochemical and thermochemical. Biochemical conversion uses enzymes or microbes to break down biomass usually for a fermentation process. Thermochemical conversion uses severe operating conditions and sometimes a catalyst to convert biomass to fuels. Some thermochemical conversion processes include gasification, liquefaction, and pyrolysis. Fermentation is generally challenged by low product yields, expensive enzymes, high cost of maintaining sterile equipment, and expensive dewatering steps. Likewise, algae conversion processes are also characterized by low yields and expensive dewatering. Challenges in thermochemical processes are generally attributed to the high cost of the biomass (estimates range from ~\$50 - \$85/ton) coupled with the expensive high temperature and high pressure equipment relative to the product selling cost. Furthermore, some processes require catalysts, which is an additional expense.

The final challenge to greater biofuel production is infrastructure. Biofuels can be more corrosive than petroleum fuels, which leads to material of construction issues for our existing fueling systems. For example, ethanol cannot be transported in existing petroleum pipelines due to corrosion issues and its affinity for water, which is often present in petroleum pipelines. In addition, most cars have to be modified to run on biofuels. The highest blend recommended for conventional cars today is E10, which is 10% ethanol. Higher blends such as E85 require flex-fuel vehicles. The American Coalition for Ethanol is trying to increase the amount of ethanol blended into gasoline, but gas station pumps are currently only rated to handle up to 10% ethanol. Higher blends will most likely require new fueling pumps. Installing new gasoline pumps and new pipelines is extremely expensive. For instance, an 1800 mile long ethanol pipeline proposed by Poet Ethanol Products and Magellan Midstream Partners is estimated to cost roughly \$4 billion! (cnn.money.com)

These are only a few of the issues surrounding biofuels. Overall, biofuels are a promising way to increase domestic fuel production while easing environmental concerns. However, many challenges exist within each step of biofuel technology that must be overcome. Fortunately, research is ongoing to address all of these concerns and only time will tell which technology will lead the way to more sustainable fuel production.

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### About the author:

Maxine Madison obtained her BS in chemical engineering from Mississippi State University in 2002. In 2007, she completed her PhD in chemical engineering in 2007 at Texas A&M University with an emphasis on biomass pretreatment for the Mixed Alcohol (MixAlco) process under the direction of Mark Holtzapple. Maxine joined ConocoPhillips in 2006 as a research engineer in Biofuels R&D where she worked for 2.5 years in Ponca City, OK before transferring to Houston, TX. She currently works in Houston as a research engineer in the Heavy Oil Technology group.

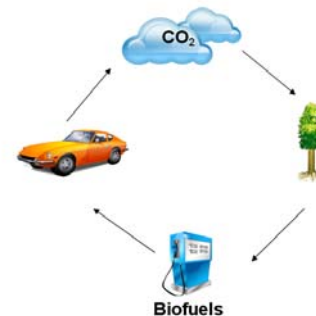


Figure 1. CO<sub>2</sub> is recycled by biofuels.

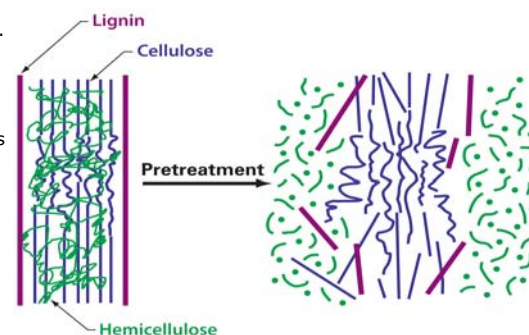


Figure 2. This schematic shows how biomass is broken apart by pretreatment allowing enzymes to more easily access the cellulose during fermentation. Source: Mosier et al.

## STS Volunteer Opportunities

**General considerations.** It would be great if AIChE had an implantable chip to distribute to members giving them instant chemical engineering expertise. Unfortunately, AIChE National says that's a long way off. Additionally, thinking back to engineering school, if we wanted to learn to be an engineer, we had to go to class and do homework. As STS members, we can benefit from attending meetings, from networking, and from reading CEP, but even greater benefits are the experience and the contacts that come from being an active volunteer.

At STS, we have a number of opportunities to volunteer and grow. You can exercise your current skills or learn new skills. You can ask for and choose a job you want (would enjoy doing). Your volunteer job can help prepare you for a paid job. Others will be happy to assist you in learning and performing it. We want you to succeed and grow. We have found that if you do something you enjoy, you'll do well. It's a win-win situation, for you and for us. This is also an opportunity to try something new, to see if you like it, and to do so without risking your current job.

**PEPO Chair** – Our PEPO Chair has been promoted to Executive Position 1 (Education), and would be happy to train his PEPO successor. An excellent opportunity for a technically oriented person. Keep up with what's hot in your field. You can develop a focus group of colleagues to help you identify the "hot topics" in your field, and the meeting topics that will yield a good turnout. This is also a good job growth opportunity, as you will meet & impress the speakers by good preparations for the talk, and most speakers are managers with hiring authority.

**K-12 Outreach Committee.** An excellent opportunity for engineers who want to work with others. You can experience different ideas and methods in educational outreach, and help AIChE plan the upcoming STS K-12 outreach program. Interface with AIChE (national) SIOC, work with other technical people, with other local societies, with students and parents, and with teachers. Other people have already developed the outreach activities. We can provide contacts in school systems, contacts with various local outreach programs, pre-developed activities, and examples of outreach in other local sections. For now, you get to show up for a day, get the experience, and report back to us at AIChE. If and when you like, you can try out some of your own ideas. The contacts, experience, and understanding you have developed will help your own program to succeed.

**Custom-Designed Opportunities.** If you'd like to get involved, but none of these opportunities is close enough to what you want, contact the STS Volunteer Recruiter (me), and we'll try to design an opportunity to meet your individual needs. It has been done successfully in the past.

**If you're interested contact our STS Volunteer Recruiter, Matt Kolodney, [mkolodne@tceq.state.tx.us](mailto:mkolodne@tceq.state.tx.us).**

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## K12 Volunteer Opportunities

AIChE and STS are working to start up K12 outreach programs. We are encouraging STS members to attend various local outreach events and report back to STS and AIChE on their experience. We are encouraging STS members to report back to Matt Kolodney ([mkolodne@tceq.state.tx.us](mailto:mkolodne@tceq.state.tx.us)) with one-page descriptions of their K12 outreach experiences, what worked well and what didn't. These will be reviewed locally and passed on to the AIChE National K12 program. Some local K12 opportunities are listed below.

HUNSTEM web site: <http://hunstem.uhd.edu/> Already has a wide range of educational resources for use by interested teachers and volunteers. AIChE (national) is encouraging cooperation with organizations such as HUNSTEM.

IEEE [http://www.ieee-houston.org/Committees/SAC/Brochure IEEE%20Houston 7 Oct 2007.pdf](http://www.ieee-houston.org/Committees/SAC/Brochure%20Houston%207%20Oct%202007.pdf) This ongoing Houston Area program assists local schools with teacher training demonstrations.

Houston Museum of Natural Science (<http://www.hmns.org>) has ongoing outreach programs and could use more volunteers.

The Houston Children's Museum (<http://www.cmhouston.org>) also has outreach programs.

For more information, contact Matt Kolodney (713-471-8956) or [mkolodne@tceq.state.tx.us](mailto:mkolodne@tceq.state.tx.us).

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## Chemical / Engineering Opportunities (C/EO)

**Are you unemployed and looking for work?** The STS provides a service that finds engineers work.

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C/EO is sponsored by South Texas Section of the American Institute of Chemical Engineers. The charter of the committee is to facilitate the re-employment of chemical engineers in the Houston area.

Chemical engineers wanting to participate in C/EO must meet the following criteria:

- \* You are unemployed.
- \* You are a member of **both** the National AIChE and the STS Local Section. When you visit our office, have your membership card available.
- \* You must volunteer a minimum of 3 hours per week in the C/EO office, helping answer the phones, indoctrinate new Volunteers and, most importantly, help in the mailing of the Profiles.
- \* Volunteers must reside in the Houston Metropolitan area. Volunteers who fail to show are delisted.
- \* Provide addresses, phone numbers and contact names of 14 companies which typically employ chemical engineers or chemists. This ensures our database remains current.

For more information, please contact the C/EO Director, Jim Murphy, at [jrmurphy2@aol.com](mailto:jrmurphy2@aol.com). The C/EO page on the STS website is: <http://sts.aiche.org/content/ceo-chemical-engineering-opportunities>.

The C/EO Office is located at:


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# South Texas Section AIChE

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