



# NEWSLETTER

## Oklahoma Section American Chemical Society

Volume 11 Number 3

13 April, 2005

### **Zymurgy: The Art and Science of Making Beer.**

Thursday – May 12, 2005  
Sequoyah Room [# 208] –Student Union  
Oklahoma State University  
Stillwater OK

***Dr. Tracy P. Hamilton***  
Department of Chemistry  
University of Alabama at Birmingham  
Birmingham AL 35294-1240

The seminar covers both the practical aspects of brewing [how to] and the chemistry of brewing. After a brief introduction of the history of beer, the steps of the process are outlined. The first step that is required is the malting of the grain. This is a complex process that even breweries do not perform themselves, leaving to specialized malting companies. The second step is mashing. This is accomplished by steeping the grain [which is crushed to allow access of the hot water to the inside, but not powdered so that intact grain husks can act as a filter] in hot water. The influence of temperature and pH on the final product is discussed. The third step is lautering [sparging]. Lautering is separation of the sugar solution from the grain. Temperature, viscosity from complex carbohydrates, and fluid dynamics are important variables to control. The fourth step is the boil, which serves several purposes: 1]sterilization 2] extract the bittering compounds from hops [flowers containing bitter olefinic acids that balance the sweetness of beer and isomerize the olefinic acids], 3] precipitation of excess protein 4] browning reactions. [Maillard - linking of amino acid and sugars] and 5] removal of excess water. The hot liquid [called wort] is cooled, and the final step [fermentation] is initiated. A discussion of important compounds in the final product is the final part of the talk. A side by side comparison of a homebrew or two with a commercial example may be possible after the talk.

**[Reservation Information on Page 2]**

#### **Schedule:**

**6:00 PM Social Hour:**      **Home of Nick Materer**  
   **1810 West Fourth**  
   **Stillwater OK**

**7:00 PM    Dinner:       Sequoyah Room  
                                 Room 208  
                                 OSU Student Union**

**8:00 PM    Speaker:    Dr. Tracy P. Hamilton.  
                                 Case Study 1  
                                 [which is Room 280]**

**Menu:        Tex-Mex Buffet:**  
Beef Tacos, Chicken Enchiladas with Sour Cream Sauce, Cheese Enchiladas with Chili Con Carne, Refried Beans, Spanish Rice, Mexican Wedding cookies, Iced tea and Water.  
**Fixings will include:**  
Flour tortillas, tortilla chips, salsa, guacamole, sour cream, shredded cheese, black olives, jalapeños, lettuce, tomatoes, and onions.

**Cost:**        \$15.00-ACS Member; \$10.00-ACS Student Affiliate.

**Deadline:        Monday, 09 May, 2005; 1:00 p.m.  
                         Allen Applett: 405.744.5943        [apblett@okstate.edu](mailto:apblett@okstate.edu)**

## **Dr. Tracy P. Hamilton**

Tracy P. Hamilton obtained a Ph.D. [advisor: Peter Pulay] from the University of Arkansas in 1987, and did four years of postdoctoral research [advisor: Fritz Schaefer] at the University of Georgia. Dr. Hamilton has been a professor at the University of Alabama at Birmingham since 1991. In graduate school, he had to make a difficult choice between theoretical and experimental chemistry, and chose theoretical. As a result, the urge to synthesize irresistibly manifested itself in 1996, when he started brewing beer at home. Dr. Hamilton has been very active in the Birmingham Brewmasters [<http://hbd.org/bbm>], a group dedicated to the appreciation of different beer styles and how to brew them. He is also a certified beer judge in the Beer Judge Certification Program [BJCP <http://www.bjcp.org>]. . . .  
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## **Councilor Report – March 2005**

The Council of the American Chemical Society met on Wednesday, March 18, 2005 in San Diego, California. Here are some of the highlights of the meeting's business.

**Presidential Candidates:** Have you ever wondered how the Society selects the presidential nominees that you vote for in the fall? The Committee on Nominations and Elections presents a slate of four candidates to the Council at the spring meeting. Each candidate has three minutes to present a brief speech to the entire Council. Bios and written candidate statements are also provided. At the end of the speeches, the councilors vote, and the top two vote-getters become the presidential candidates. This year Catherine T. Hunt from Rohm and Haas in Philadelphia and John Kozarich of a biosciences firm in La Jolla were selected as the nominees. A petition candidate, George Heinze, will also be on the ballot.

**Board of Directors:** In addition to the council, the Society has a board of directors. We're in Region V and Judith Benham represents us. In addition, there are 6 directors-at-large who are elected by councilors. In 2005, Frankie Wood-Black, North Central OK Section is a candidate for director-at-large.

**Proposal for a Committee on Ethics:** The Council voted to establish a Committee on Ethics as an Other Committee of the Council.

**Discussion of the Chemical Enterprise:** ACS President William F. Carroll presented an overview of Chemistry Enterprise 2015, asking, "Where will our students come from in the next ten years, and where will they go?" Councilors then participated in a lively discussion of this issue. The issue was framed as follows: Currently the U.S. has a strong university system and U.S. graduate education in science is widely recognized as the best in the world, but problems loom on the horizon. In addition, a variety of factors in the nation's academic infrastructure are likely to produce change in the training and careers of new chemists. The discussion intensified awareness of this issue and possibilities for solutions. Your councilor and the Wichita Falls-Duncan councilor were among those who provided comments in this discussion.

### **2006 Member Dues:**

**The Council voted to set the 2006 member dues at \$127. There is also a special \$5 assessment, making the total amount you pay in November \$132.**

**Submitted by: Cheryl B. Frech,  
Councilor, Oklahoma Section**

## **New Student Awards**

The Oklahoma Section recently created two new awards for undergraduate students. The **Terrill Smith Travel Award** is designed for undergraduates to travel to a regional or national ACS meeting to present a paper or poster. Two awards of up to \$600 will be awarded each year, one for fall travel and one for spring travel. **This award is named in honor of Dr. Terrill [Terry] Smith**, longtime Oklahoma Section officer and councilor, who retired from UCO in 1999. Terry was a strong supporter of undergraduate research and student affiliates at UCO and in the section. [Terry now lives in San Antonio.]

The **Roger Baldwin Graduate School Award** is designed for undergraduate students who have been accepted to attend graduate school in the chemical sciences. One award of \$500 will be presented each spring. **This award is named in honor of Dr. Roger Baldwin**, another longtime Oklahoma Section officer who is retired from Kerr McGee Corporation. The section is able to offer these new awards partially due to Roger's persistent fund-raising efforts associated with the Southwest Regional Meeting in 2003.

### **The following is part of a letter sent by Terry to the Section Secretary .**

"However, the purpose of this letter is to officially thank the Oklahoma Section for naming one of the new undergraduate student awards for me. It really was a surprise to be honored in this way and I am most grateful to the Executive Committee for this special and continuing recognition. The Section has long been characterized as having committed officers who consistently carry on a significant local activities program, as well as others who serve on regional and national committees and boards. Therefore, I am particularly honored to be recognized by the initiation of the Terrill Smith Travel Award and am delighted that deserving undergraduate students will be assisted financially so they can attend regional and national ACS meetings.

I am also aware that this award would not be possible without the outstanding fund-raising efforts of Dr. Roger Baldwin, and I believe the other new undergraduate award is well-named and the honor well-deserved. For more than 30 years Roger has served, and is obviously still serving, the Section in many capacities, always as a reliable and

constructive voice in its activities. The Roger Baldwin Graduate School Award is fitting recognition of his service to the Oklahoma Section.

No doubt the Oklahoma Section will continue to be recognized for all of its activities because the officer and members are committed to promoting the chemical enterprise in as many ways as possible. The new student awards are part of this promotion and I want to express my thanks again for being recognized in this way. I still think of the Oklahoma Section as my local section and this award will always connect me with the wonderful friends and colleagues who shared many years of ACS activities."

**Sincerely,**

**Terrill D. Smith**

## **Biofuels versus hydrogen**

The article "FUEL CELLS RALLY" seemed not to appreciate several realities [C&EN, Jan. 31, page 18]. Company sales staff make claims that their technology allows fuel cells to be produced today for \$2000 per kW, but the facts are that vehicle-grade fuel-cell-engines today still sell for at least \$4,000 per kW. If fuel cells were really available for under \$1,500 per kW, they would quickly put all other distributed power options out of business, and their sales would jump by two orders of magnitude within a few years. The fact that the major fuel-cell-manufacturers' stocks are trading at or under 5% of their four-year highs suggest this is not likely to happen.

Hydrogen advocates may claim that hydrogen is clean and cheap, but again, the facts are otherwise. Production of liquid hydrogen [which is required for practical distribution] from natural gas results in the release of more than 20 kg of CO<sub>2</sub> for every kilogram of liquid hydrogen produced. Liquid hydrogen from coal, which is what we'll be using within 20 years, results in the release of 30 kg of CO<sub>2</sub> per kg of hydrogen. After another decade of progress, with vehicle-grade fuel cells then getting 39% efficiency, making fuel for hydrogen vehicles will cause over three times as much CO<sub>2</sub> to be released per mile as advanced diesel hybrids, which will be getting more than 80 mpg.

The cost of pressurized hydrogen gas for the small industrial user has been rather stable at about \$100 per kg for the past half century [1 kg of H<sub>2</sub> has roughly the energy of 1 gal of gasoline]. Large industrial users today in most parts of the country are paying \$6.00 per kg for bulk liquid hydrogen delivered in 15,000-gal tankers, and realistic projections of minimum distribution and dispensing cost add at least another \$4.00 per kg to its cost for the consumer, even when at the scale of 20,000 vehicles per city.

At 5,000 psi, the volumetric energy density of H<sub>2</sub> is only 10% that of biodiesel. The mechanical energy alone stored in the hydrogen tank is five times that of a 50-caliber artillery shell. The risks associated with carrying this mechanical bomb around are probably two orders of magnitude greater than we are accustomed to accepting in our gasoline-powered cars today. For safety reasons, the recent National Academy of Engineering study concluded that both high-pressure tanks and cryogenic storage "have little promise of long-term practicality for light-duty vehicles."

The U.S. is facing a serious long-term energy crisis in the near future, but we do not prepare for it by ignoring basic scientific and engineering realities. And hydrogen hype is resulting in our limited research dollars being poorly used while real options in advanced biofuels get relatively little support.

It is true that corn ethanol is not an efficient use of food, and biodiesel from soy may make even less sense; however, Brazil is currently producing more than 5 billion gal of sugarcane ethanol per year at under 60 cents per gal, and production will likely quadruple over the next decade. There are a host of next generation biofuels that make sense in other climates. The first of these is just hitting the market here—cellulosic ethanol. The cost of producing the cellulase enzyme needed to turn waste wood into high-grade fuel has been cut by a full order of magnitude over the past decade, and another factor of two is expected within a few years. Ethanol from waste wood will soon be half as expensive [per unit energy] as gasoline.

Ethanol, methanol, and biodiesel from efficient fuel crops such as switch grass, eucalyptus, mustard, hemp, pines, algae, kudzu, and poplars will very soon be cheaper in the U.S. per unit of energy than gasoline at \$2.50 per gal. At the end of the day, the death knell to the hydrogen dream is the practicality of clean, convenient, renewable biofuels coupled with advanced high-efficiency hybrid engines.

**F. David Doty  
Columbia, S.C.**

**This letter is reprinted by permission of F. David Doty. Doty is founder and president of Doty Scientific, Columbia, S.C. Doty Scientific makes high field MRI and NMR probes. Doty's letter first appeared on page 6, Chemical & Engineering News, March 14, 2005, 83 [11].**

## **U.S. Senate introduces improvement to small ethanol producer credit**

The American Coalition for Ethanol [ACE] recently commended U. S. Sens. Jim Talent [R-MO], Tim Johnson [D-SD], John Thune [R-SD] and Blanche Lincoln [D-AR] for introducing legislation that would improve the existing small ethanol producer tax credit.

"We are incredibly grateful that legislation to modernize the definition of a small ethanol producer has been introduced in the U. S. Senate, and we commend this bipartisan team of U.S. senators for their leadership and strong support for ethanol. The legislation could result in a significant economic benefit to small, farmer-owned ethanol producers, and ACE is committed to mobilizing our grassroots members to support enactment of this bill in 2005," said Brian Jennings, ACE executive vice president.

The legislation introduced today would change the definition of a "small" ethanol producer from 30 million gallons to 60 million gallons, an adjustment that more accurately reflects modern ethanol facilities. As the technology continually improves, ethanol plants are becoming larger. Most new-generation ethanol plants are designed to produce at least 40 million or 50 million gallons annually, so the existing definition limits many producers from benefiting from the tax credit.

The bill would also extend a new small producer credit to the biodiesel industry. Small ethanol producers are currently eligible for a tax credit of 10 cents per gallon up to 15 million gallons of production annually. The credit is capped at \$1.5 million per year per producer.

"Farmer-owned cooperatives are leading the growth of the industry, now comprising nearly half of all U.S. ethanol production. These ethanol facilities have ever-increasing production capacities, and this legislation will allow them to benefit from the credit that was designed for them," Jennings explained.

The small producer tax credit was created as an incentive for farmers to invest in ethanol production facilities. Extending the tax credit for biodiesel and lifting the cap to 60 million gallons will provide an incentive to the nation's renewable fuels growth, especially in rural areas.

### **Ethanol Fast Facts:**

- Ethanol is a clean-burning, renewable fuel made from crops such as corn.
- Currently 83 ethanol plants are operating in the U.S. with 16 more under construction.
- The U. S. produced 3.4 billion gallons of ethanol in 2004, up from 2.81 billion gallons in 2003.
- Ethanol is blended into approximately 30% of the nation's gasoline.
- Nearly half of U.S ethanol comes from facilities owned by farmers and other local investors.

–Ethanol is a high-performance fuel with a 113 octane rating.

**This article is reprinted from The High Plains Journal of March 28, 2005.**

**Editor's Notes:**

1. The federal 52¢/gallon excise tax does **not** apply to fuel ethanol.
2. E85 is 85% ethanol +15 % gasoline blend. OKC has a number of E85 stations.
3. Some vehicle manufacturers produce Flex-Fuel cars & trucks. Flex Fuel vehicles run on gasoline or E85.
4. At one time, there was a tax credit for purchasing a Flex Fuel auto.

## **Texas Will See Its First Ethanol Plant**

Texas Corn Producers Board [TCPB] congratulates Panhandle Energies of Dumas, LP for beginning construction on the ethanol plant near Dumas, Texas. Once completed, the plant will process over 12 million bushels of corn into more than 30 million gallons of ethanol and 90,000 tons of distiller grains annually.

"This is an exciting development for corn growers in this area," said TCPB director Dee Vaughan, who farms near Dumas. "Panhandle Energies, the Dumas Economic Development Corporation and Texas Corn Producers Board worked extremely hard to bring the first ethanol plant to the Lone Star State."

The 30-million-gallon per year plant will incorporate a process design developed by Delta-T Corporation of Williamsburg, Virginia and has a start up date targeted at the end of the year or early 2006.

"Fuel ethanol is a product whose time has come," stated State Representative David Swinford of Dumas. "It is good for farmers, good for the environment and lessens our dependence on foreign oil."

Swinford said Panhandle Energies has formed a partnership with Dumas Co-op who will provide about 1 million bushels of corn per month and the rail service to bring grain to the ethanol plant.

The processing provided about 38 jobs inside the plant, he said, but all the movement of the commodities will create another 110 jobs for the area.

The ethanol has been sold to Eco Energy of Tennessee and will primarily go west, with possible destinations of El Paso, Albuquerque, Phoenix or California. It will be transported primarily by rail.

The by-products, wet distillers grain and CO<sub>2</sub> also have buyers. The wet distiller grain will go to feedyards within a 100-mile area and the CO<sub>2</sub> will be bought by Reliant Energy for use in the beverage, dry ice and oilfield industries.

Also, the feedyards are taking the wet digestible grains, Swinford said. "This way we don't have to run a drier which saves us about 60 percent of the total energy cost of a standard ethanol plant."

Swinford began working with the Dumas Economic Development Corporation and the Texas Corn Producers Board in 2001, both of which funded an in-depth feasibility study on ethanol.

"Ethanol has established itself as a major market for U.S. corn. Ethanol plants have been proven to raise the local price for corn, which in turn boosts farm income and bolsters rural economies," Vaughan, who also serves as National Corn Growers Association's chairman, said. "The industry continues to grow by leaps and bounds and consumers continue to demand clean-burning renewable fuels that help the environment, reinvigorate rural communities and enhance our energy security."

And as the ethanol industry continues to expand, so do market opportunities for corn growers, according to Vaughan. Nearly 11 percent of last year's corn went to ethanol, Vaughan said, and USDA expects ethanol to consume nearly 13 percent of this year's crop.

The ethanol industry set another monthly production record this past August with 225,000 barrels per day, according to the Energy Information Administration. The previous monthly record of 222,000 barrels per day was set in June. Through August, U.S. ethanol producers have generated 2.23 billion gallons of ethanol.

According to the Renewable Fuels Association, 81 ethanol plants are in operation and 14 additional plants are under construction. Although still centered in the Corn Belt, ethanol production facilities are cropping up across the country as ethanol increases nationwide.

**This article is reprinted, in part, from “the kernel”, a supplement to the Texas Farmer Stockman, March 2005. the kernel is a publication of the Texas Corn Producers Board, 4205 North I-27, Lubbock, TX 79403. [www.texascorn.org](http://www.texascorn.org)**

## **Oklahoma Section 2005 Meeting Schedule**

**September:** OBU at Shawnee [Annual Family Meeting]  
Speaker: Probably James Marshall of UNT  
Date: To Be Determined

**October:** Thursday October 13, 2005  
Speaker: J. Ernest Simpson-Chemistry of Wine  
Location: TBA

**November:** Speaker: Chemist of the Year-Daniel Resasco  
Location: Try for Ada  
Date: To Be Determined

### **May 2005 Section Meeting**

**Thursday 12 May, 2005**

**Sequoyah Room [# 208] – Student Union**

**Oklahoma State University**

**Speaker: Dr. Tracy P. Hamilton**

*Zymurgy: The Art and Science of Making Beer.*



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