Red River Valley Local Section
American Chemical Society
Next Meeting

Wednesday, 17 March 2010 in Grand Forks

Speaker : **Tracy Hamilton**, **University of Alabama, Birmingham**

Location: Abbott Hall 138, University of North Dakota.

- 17:30 Presentation: **Quantum Chemical Studies of NO, ONOO- and Related Compounds That May (or May Not) Cause Oxidative Damage in Cells**

5:30 PM

- 19:30 Dinner : la Bistro, Canadian Hotel

7:30 PM

- 16:30 { 4:30 pm } *EXECutive Committee meeting .*

Speaker's presentation: No details of the content have been forwarded to date.

- **Biographical Sketch.**

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).

- Tour Selections Follow: .

Zymurgy: The Art and Science of Making Beer

The talk 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 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.

The Chemistry of Coffee

The talk will present a brief history of coffee, the physical process from cherry to brewed coffee and espressos. The final product of the harvest is the green "bean", which has a characteristic odor (green coffee beans will be passed around during the presentation). The roasting of the beans is dominated by the Maillard reaction and Strecker degradation. Some of the compounds that have been identified as important flavor and aroma compounds are damascen-2-one (cooked apple), furfuryl-2-thiol (the dominant "coffee" smell of freshly brewed coffee), 2-isobutyl-3-methoxypyrazine (earthy), guaiacol (spicy), butane-2,3-dione (artificial butter), and 4-hydroxy-2,5-dimethyl-3(2H)-furanone (caramel). The stage at which roasting is stopped has traditionally been done by color (after roasting test batches). The whole roasting process takes place 8-12 minutes, followed by rapid cooling to slow further reactions. Coffee roasted by the speaker (in his office!) will be sampled. All coffee drinkers know that leaving coffee on a burner rapidly ruins the brew. This chemistry will be discussed, as will "staling" - the degradation of roasted coffee by exposure to air. The final part of the talk will be a discussion of the health issues surrounding coffee. The compounds cafestol and kahweol can raise cholesterol slightly, but are absorbed by paper filters.