

DIVISION OF ENVIRONMENTAL CHEMISTRY

238th ACS National Meeting

Washington, D.C.

August 16-20, 2009

MONDAY MORNING

Environmental Science and Technology: A Tribute to William “Bill” Glaze

J. L. Gardea-Torresdey, *Organizer, Presiding*

8:30 — Introductory remarks by Dr. Joseph Sulfito.

8:40 — Tribute by Dr. Michael D. Aitken.

9:00 —**23.** Bill Glaze: A legend, a teacher, and a gentleman. **S. D. Richardson**

9:25 —**24.** Catalytic production of HO during Fe(II)/Fe(III) redox cycling in aqueous systems: A combinatorial strategy for evaluating scavengers and promoters. **J. L. Ferry**, J. M. Burns, P. S. Craig, T. J. Shaw

9:50 — Intermission.

10:05 —**25.** Growing role for economics in environmental research. **G. W. Characklis**

10:30 —**26.** Impact of open air/ambient desorption ionization mass spectrometry on environmental chemistry. **O. D. Sparkman**, P. R. Jones, M. Curtis

10:55 —**27.** SATURN collaboratory: Closing disciplinary gaps in coastal-margin observations and simulations. **A. M. Baptista**

11:20 —**28.** Green chemistry and engineering enabled by new concepts in fluoropolymers. **J. M. DeSimone**

ABSTRACTS

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Bill Glaze: A legend, a teacher, and a gentleman

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Bill Glaze is legendary for his pioneering work on drinking water disinfection by-products, particularly for newer disinfectants, such as ozone. I was fortunate enough to collaborate with Bill early in my research career, and while I was never 'officially' a student of his (at least at the University of North Carolina), I really was a student in every other sense. Much of what I have learned about disinfection chemistry, I have learned from Bill. I have also learned much about how a scientist should conduct him/herself from Bill—including not being afraid of presenting 'strange' results that you can't explain (but you know are solid) and also how to treat others with respect and gentility, even if they might be criticizing your own work. As evidence of Bill's gentility, he recently honored other 'Legend' speakers in a special ACS symposium by encouraging the audience to call out words to describe them. At the end, before questions were asked, people spontaneously began to call out words to describe Bill. How about: A Legend, a Teacher, and a Gentleman...

ENVR 24

Catalytic production of HO during Fe(II)/Fe(III) redox cycling in aqueous systems: A combinatorial strategy for evaluating scavengers and promoters

John L. Ferry, *ferry@mail.chem.sc.edu*, **Justina M. Burns**, *fisherj@mail.chem.sc.edu*, **Preston S. Craig**, *craig@mail.chem.sc.edu*, and **Timothy J. Shaw**, *shaw@mail.chem.sc.edu*, Department of Chemistry and Biochemistry, University of South Carolina, 631 Sumter St., Columbia, SC 29208, Fax: 803-777-9521

This work reports the concentration of hydroxyl radical generated during Fe(II) oxidation in waters containing variable levels of bromide, Fe(II), chloride, iodide, natural organic matter, and bicarbonate. Hydroxyl radical production is sustained in the presence of these electron donors by the redox cycling of Fe(II)/Fe(III). The steady state concentration of hydroxyl radical was determined using the method of initial rates for 1,3-dicyanotetrachlorobenzene oxidation. The steady state concentration (~10-13 M) was a function of the matrix variables acting as promoters of Fe(II) oxidation and/or their reaction with hydroxyl radical. The system was probed through the addition of selective scavengers including benzoate (hydroxyl radical), aniline (carbonate and hydroxyl radicals), superoxide dismutase (superoxide), peroxidase and *p*-hydroxyphenylacetic acid (hydrogen peroxide) and catalase (organic peroxides). The relative effectiveness of scavengers at reducing Fe(II) oxidation was aniline>benzoate>superoxide

dismutase=peroxidase>catalase; benzoate and aniline were the most effective at reducing the steady state concentration of hydroxyl radical.

ENVR 25

Growing role for economics in environmental research

Gregory W. Characklis, *charack@email.unc.edu*, Department of Environmental Science and Engineering, University of North Carolina at Chapel Hill, Rosenau Hall CB# 7431, Chapel Hill, NC 27599-7431, Fax: 919-966-7911

Decisions regarding society's most challenging environmental problems are made with attention to both scientific and economic arguments, with economic criteria playing an ever larger role. Economic terms and concepts are now ubiquitous in environmental policy debates, with discussions over climate change mitigation often revolving around "discount rates," while concerns over "equity" frequently play a significant role when considering activities designed to promote sustainability. Even when discussing more traditional regulatory themes (e.g., drinking water standards), cost-benefit analysis has become a common (and federally mandated) part of the decision making process. Economic principles also play an increasing role in the development of new regulatory schemes, with market- or incentive-based approaches receiving more attention. As a result, an awareness of economic principles, and an ability to incorporate economic considerations into environmental research, will become increasingly important to environmental scientists/engineers who seek to use their work to inform society's debate on how to best manage the most pressing environmental challenges. This discussion will involve a description of several areas in which work at the interface of environmental engineering/science and economics can provide valuable insights, as well as ideas on future opportunities for interdisciplinary exploration.

ENVR 26

Impact of open air/ambient desorption ionization mass spectrometry on environmental chemistry

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Since open air/ambient desorption ionization mass spectrometry burst onto the scene in later 2004 and early 2005 with the development of desorption electrospray ionization (Cooks *Science* 2004, **306**, 471) and direct analysis in real time (Cody *Anal. Chem.* 2005, **77**, 2297), the impact on many aspects of analytical chemistry has been widespread. The environmental sciences are no exception. This presentation will

highlight aspects of these technologies to the advancements of environmental sciences. In addition, some of our research in the development of quantitative methods and use of hydrogen-deuterium exchange will be presented.

ENVR 27

SATURN collaboratory: Closing disciplinary gaps in coastal-margin observations and simulations

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Sustainable development and function of coastal margins under pressures from climate and anthropogenic forcing requires science-based understanding of ecosystem state, variability and change. Coastal margin 'collaboratories'—enhanced observatories that extend beyond data collection—enable such understanding by integrating sensors, platforms, models, data, analyses and collaboration/social processes. However, collaboratories have privileged physical variables and processes, the easiest to observe and simulate. We describe the evolution of the SATURN collaboratory (started 1996, as CORIE) from exclusively physical focus to broad interdisciplinary scope. Geographically centered on the Columbia River coastal margin, SATURN anchors the “genes-to-basins” science of the NSF Science and Technology Center for Coastal Margin Observation and Prediction. Real-time biogeochemical stations are designed to collect long-term time series of observations on planktonic communities, in physical and geochemical context. Observations will offer direct insight into ecosystem function, while also enabling the modeling system—extensive in its representation of circulation—to address ecological processes.

ENVR 28

Green chemistry and engineering enabled by new concepts in fluoropolymers

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Fluoropolymer manufacturers are under a lot of scrutiny for the use and release of a persistent organic pollutant known as PFOA or perfluorooctanoic acid. PFOA is used by many companies as a surfactant in the manufacture of many different grades of fluorinated materials by heterogeneous polymerization methods in water. Our laboratory has pioneered a PFOA-free process based on using liquid or supercritical carbon dioxide. The carbon dioxide technology platform has opened up new possibilities for using “dry” CO₂-based processes instead of water and organic solvents in a number of

commercially relevant processes ranging from dry cleaning of garments to the development of advanced photoresists for EUV lithography. Beyond these advances, CO₂ polymerization processes have triggered new materials and new concepts that enable green chemistry opportunities in high performance fuel cells, photovoltaics, solvent-free imprint lithography, microfluidics, and solvent-free nano-particle molding called particle replication in non-wetting templates, or PRINT. The PRINT technology is now leading the way towards major improvements in the delivery of therapeutic, detection and imaging agents for the diagnosis and treatment of disease. PRINT illustrates the synergy between green technologies and the design criteria associated with many life sciences technologies.