

AMERICAN CHEMICAL SOCIETY

Division of Environmental Chemistry

Preprints of Extended Abstracts

Presented at the

224th ACS National Meeting
Boston, MA

August 18-22, 2002
Vol. 42 No.2

- General Papers
 - ▶ T. Mill
- Biogeochemistry of Organic Contaminants in Aquatic Ecosystems: Honoring Dr. James G. Quinn (Cosponsored with Division of Geochemistry)
 - ▶ T.L. Wade and J.W. Farrington
- Chemistry of EPA Contaminant Candidate List Compounds
 - ▶ M.L. Magnuson
- Deactivation (Neutralization or Detoxification) and Safe Disposal of Germicides and Pesticides
 - ▶ P. Zhu
- Electrochemical Methods for Wastewater and Potable Water Treatment
 - ▶ J.M. Farrell
- Environmental Chemistry Awards (Cosponsored with Younger Chemists Committee)
 - ▶ T.A. Anderson
- Principles of Environmental Sampling and Analysis – Two Decades Later (Cosponsored with Division of Analytical Chemistry and Committee on Environmental Improvement)
 - ▶ L. LaFleur, T. Jones, Jr. and W.H. Batschelet



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Division of Environmental Chemistry, Inc.
American Chemical Society

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American Chemical Society

The Division of Environmental Chemistry was established as a Division of the American Chemical Society in 1913, as the Division of Water, Sewage and Sanitation Chemistry. (The name was changed in 1959). The objectives of the Division are to promote research, disseminate information and improve education and public awareness regarding the chemistry of the environment, in all of its aspects. In addition, the Division provides assistance to the American Chemical Society and its committees and divisions in matters regarding the environment.

In fulfillment of the above objectives, the Division sponsors symposia at the two annual meetings of the American Chemical Society. These symposia are organized by volunteers from the Division under the guidance of the program chair. For information on upcoming symposia at national meetings or to volunteer to organize a symposia, contact the **Program Chair**:

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Extended abstracts of papers presented in symposia sponsored by the Division of Environmental Chemistry are published twice each year by the Division. These extended abstracts generally are two to four pages in length and contain data, figures and references. The extended abstracts appear in "Preprints of Extended Abstracts...", which are sent to all members of the Division as part of their benefits of membership. Copies of this volume and previous volumes are available from the **Publications Manager**:

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SYMPOSIA, SPECIAL TOPICS AND ORGANIZERS

GENERAL PAPERS

THEODORE MILL has conducted basic and applied research at SRI on environmental reactions of organic compounds for about thirty years. Recent studies include oxidation of aminodinitrotoluenes, aqueous and thin film photolysis of dinitramide ion and photoreactions of aqueous natural organic material. He has also studied oxidation pathways in hydrocarbons, lipid membranes and asphalt. In addition, Dr. Mill has studied photooxidation and hydrolysis reactions in surface waters to develop test guidelines and predictive models for environmental fate of synthetic organic compounds. He has published about 85 papers in these areas of chemistry. Dr. Mill received his Ph.D. at the University of Washington (Seattle) and came to SRI in 1960 after a postdoc year at Yale and three years at the Du Pont Experimental Station. He is a member of AAAS, ACS, AGU and SETAC and served as chair of the Santa Clara Valley ACS section in the mid 70s. He currently serves as alternate councilor to the Division.

BIOGEOCHEMISTRY OF ORGANIC CONTAMINANTS IN AQUATIC ECOSYSTEMS: HONORING DR. JAMES G. QUINN

(Cosponsored with Division of Geochemistry)

This symposium focuses on the progress that has been made in our understanding of the sources, fate and effects of organic contaminants in aquatic ecosystems. Interest in the biogeochemistry of the environment is not new, as is evident in the fact that the ACS Division of Environmental Chemistry, under various names, is more than 60 years old. Almost 30 years ago in 1973 the division assumed its present name. This symposium will honor a "lipid biochemist" who had the foresight to focus his research and academic efforts on studies of the biogeochemistry of organic contaminants in the aquatic environments starting in 1968. The efforts over the last 30 plus years by Professor Quinn, his former students, students of former students and colleagues in academe, government and business have provided a better understanding of our aquatic environment and the impact of human activities on this important resource. The availability of this high quality information has proved vital to convincing managers of the necessity to regulate some of these environmental contaminants. Challenges remain. Present and future research and monitoring seek to insure that human activities do not threaten the sustainability of aquatic environments. Former students, students of former students and colleagues of Professor Quinn will be presenting technical papers on their current research efforts.

TERRY L. WADE is the Deputy Director for Environmental Sciences at the Geochemical and Environmental Research Group at Texas A&M University and an Adjunct Professor in the Department of Oceanography. He has been active in the field of marine organic environmental chemistry for over 30 years and is internationally

respected. He has developed and validated methods for analysis of trace organics in environmental samples including aliphatic hydrocarbons, aromatic hydrocarbons, biomarkers, chlorinated hydrocarbons, PCB, coprostanol, toxaphene, dioxins/furans and butyltins. He has applied these methods to research projects involving air, rain, fresh water, seawater, surface micro-layers, soils, sediments, plant tissues and animal tissues. Dr. Wade has more than 180 publications dealing with method development, intercalibration and the effects, sources and fates of contaminants in the environment. He has had extensive field experience and has participated in nine oceanographic research cruises, as well as being a scientist on board the Navy NR-1 research submersible. Dr. Wade has extensive experience in project development and management (e.g. NOAA NS&T Program, USFWS Organic and Inorganic Contracts and EPA EMAP programs). As a member of UNESCO Group of Experts on Standards and Reference Materials (GESREM), Dr. Wade co-authored a workbook entitled "Use of Standards and Reference Materials in the Measurement of Chlorinated Hydrocarbon Residues". This workbook is intended to provide laboratories in underdeveloped nations clear examples of how to use reference materials as part of their laboratory quality management program. Dr. Wade also makes several presentations and reviews several proposals and journal articles every year.

JOHN W. FARRINGTON

(no biosketch available)

CHEMISTRY OF EPA CONTAMINANT CANDIDATE LIST COMPOUNDS

This symposium was organized to bring together researchers working with U.S. EPA Contaminant Candidate List (CCL) compounds. The CCL contains compounds which may be selected for future regulation under the Safe Drinking Water Act and represents a relatively new approach to the regulation of drinking water contaminants. The CCL contains about 50 chemicals and encompasses a broad range of compounds such as industrial solvents, algal toxins, gasoline additives, inorganic ions, metals, pesticides and pesticide degradation products (see in <http://www.epa.gov/OGWDW/ccl/cclfs.html#table1>). This symposium will shed light on some important issues relevant to the current CCL. At least two more CCL lists are planned over the next ten years, so this symposium, while designed around the current CCL, may also foreshadow issues for the next ones. One interesting aspect of CCL compounds is that many researchers are investigating these compounds not just specifically as CCL compounds, but for other reasons as well.

MATTHEW L. MAGNUSON is a research chemist at the U.S. Environmental Protection Agency's National Risk Management Research Laboratory in Cincinnati, Ohio. He received his Ph.D. in Chemistry from the University of Oklahoma in 1994. At EPA, his research is directed towards a wide range of problems in environmental analytical chemistry related to risk management research of contaminants in watersheds and drinking water. More than 35 publications document his investigations, which range from U.S. EPA contaminant candidate list compounds to arsenic to environmental

colloids, using approaches from mass spectrometry to QSPRs to field flow fractionation. He also serves on the American Water Works Association Water Quality Laboratory Committee.

DEACTIVATION (NEUTRALIZATION OR DETOXIFICATION) AND SAFE DISPOSAL OF GERMICIDES AND PESTICIDES

Germicides, pesticides and herbicides are widely used in many fields such as medical and agricultural industries. As toxic agents, proper treatment and disposal of used or expired germicides and pesticides is becoming an ever-increasing challenge for scientists. Deactivation, such as neutralization or detoxification of germicides, pesticides and herbicides, and the safe disposal of these agents by chemical, physical or microbial methods have become crucial for protection of soil, ground and surface waters and the ocean, to ensure a safe environment for human and animal life, for natural microbial ecosystems and for meeting the environmental protection codes. In this symposium, 18 invited speakers, recognized in their fields, including scientists from both academia and industry, will talk on their original research and discoveries on the topic.

This symposium will highlight recent progresses in research and application validation in decontamination and safe disposal of pesticides and germicides. The main theme throughout these presentations will be the use of benign biologically or chemically based approaches to decontaminate pesticides and germicides as wastes or contaminants in the environment. Several of the presentations will report discovery or development of innovative detoxification approaches, such as the engineering of enzyme polymers and organophosphate-degrading enzymes, the use of benign chemical reactions and the use of plant filter strips and phytoremediation. It appears that researchers will take two distinct approaches to detoxify pesticides and germicides: biochemical transformations/biological removal and benign chemical reactions. The application will cover a wide range of pesticides and germicides that are of great environmental/health concern as we understand today, and a variety of environmental substrates including wastes, wastewater, sludge and soil. The subjects covered will be of interest and value to scientists and practitioners working with pesticides, germicides and antibacterial agents in production agriculture, hospitals, healthcare industries, household products industries, agrochemical manufacturers, environmental industrials, bioremediation industries and pesticide applicators and regulators. Besides chemists, this symposium will be of interest for biochemists, microbiologists, molecular biologists, environmental engineers and toxicologists with an interest in pesticides, germicides and other organic contaminants, and practitioners in bioremediation.

PETER ZHU obtained his B.S. of Pharmacy 1981 and M.S. of Natural Product Chemistry in 1987 from Jiangxi College of Chinese Medicine, China, and his Ph.D. in Organic Chemistry in 1993 from Mississippi State University (with Prof. Charles U. Pittman). He was a postdoctoral fellow 1993-1994 in University of California, Santa Barbara (with Prof. Daniel Little). He is currently a principal scientist with Johnson &

Johnson (ASP, Biocides Research, 2000-). Before the current position, he worked for 3M for about 6 years as a senior research scientist. He has also taught two chemistry courses a few years in an adjunct position in Irvine Valley College (1997-). His Ph.D. dissertation focused on the chemistry of cyclic ketene acetals. His industry research experience includes process organic chemistry, natural product chemistry, fluorescent sensor chemistry (of potassium, sodium, glucose, oxygen, carbon dioxide and pH sensors), DNA separation, lab-on-chip and gene chip chemistry, bioconjugate chemistry, fast assays, biocide development and biocide detoxification neutralization. He has published more than 22 papers and filed 10 patents. He is a member of ACS (divisions of Biotech, Polymer, Material, Analytical, Organic, Medicinal, Inorganic and Environmental Chemistry), a member of American Society of Microbiology and a member of the editorial board of *Molecules*. His name is included in the Marquis *Who's Who in America, 2000, 75th Ed*, in *Who's Who in America, Science and Engineering, 1998/1999, 4th Ed. and 2000 5th Ed.*, also in *Who's Who in America, West, 1999, 27th Ed* and the next edition of *Who's Who in the World, 2003*. Contact information: 949-789-3848, pzhu1@aspus.jnj.com

ELECTROCHEMICAL METHODS FOR WASTEWATER AND POTABLE WATER TREATMENT

In recent years there has been considerable interest in electrochemical methods for removing both organic and inorganic contaminants from water supplies. Contaminant classes that have been treated using electrochemical methods include: chlorinated hydrocarbons, nitroaromatic compounds, azo-dyes, redox active metals, radionuclides, microorganisms and a wide variety of aliphatic and aromatic hydrocarbons. This symposium will showcase a broad range of electrochemical treatment methods for both potable and waste water treatment. The symposium includes invited talks by water treatment experts from the United States, Canada and Europe. Specific topics to be covered include: electrocoagulation for metals and colloid recovery, reductive dechlorination of solvents, oxidative incineration of organic compounds, capacitive deionization, electric gradient ion exchange processes, corroding iron filters, novel reactor concepts for metal precipitation and disinfection and novel electrode materials specifically suited for water treatment applications.

JAMES M. FARRELL has been a professor in the Department of Chemical and Environmental Engineering at the University of Arizona since 1994. Prior to his appointment at the University of Arizona, he worked as a consultant in the fields of environmental litigation and environmental engineering. He holds a B.S. degree in Engineering Physics from Miami University, an M.S. degree in Petroleum Engineering and a doctoral degree in Environmental Engineering, both from Stanford University. His research interests include grand canonical Monte Carlo and molecular dynamics simulations of phase behavior and adsorption phenomena, and electrochemical water treatment.

ENVIRONMENTAL CHEMISTRY AWARDS
(Cosponsored with Younger Chemists Committee)

The Division of Environmental Chemistry sponsors research paper awards for graduate students. These awards are competitive and judged on the basis of research and writing quality. Only five awards are granted each year. These awards represent the highest honor granted by the Division of Environmental Chemistry for students. This special symposium, held each year at the Fall ACS meeting, honors these students and provides an opportunity for them to present their research.

TODD A. ANDERSON is an Assistant Professor in the Institute of Environmental and Human Health at Texas Tech University. His teaching and research focuses on the movement of organic chemical contaminants in the environment in order to evaluate and better characterize exposure. He received M.S. and Ph.D. degrees in Environmental Toxicology from the University of Tennessee, Knoxville, and was a Postdoctoral Associate and Research Affiliate Professor at Iowa State University from 1992-1996. In 1996, Dr. Anderson received the SETAC/Roy F. Weston Environmental Chemistry Award. In ACS, Dr. Anderson is a member of the Environmental Chemistry and Agrochemicals Divisions.

**PRINCIPALS OF ENVIRONMENTAL SAMPLING
AND ANALYSIS — TWO DECADES LATER**
(Cosponsored with Division of Analytical Chemistry
and Committee on Environmental Improvement)

In 1980, the ACS Committee on Environmental Improvement (CEI) published "Guidelines for Data Acquisition and Data Quality Evaluations in Environmental Chemistry." Later, in 1983, a revision was published under the title "Principles of Environmental Analysis." Recently, the CEI Subcommittee on Environmental Monitoring and Assessment considered the need to revise and update this document. As a first step the Subcommittee decided to organize this symposium to begin to explore the topic. The objective of the symposium is to begin to examine topic areas which may need to be updated in light of current practices or insights as well as to explore new areas where guidance for sampling and analysis may be needed. The presentations will examine the general areas where revision might be warranted, new approaches to defining and determining detection and quantitation levels, innovative sampling strategies, guidance on method validation, data reporting and electronic record keeping.

LARRY LAFLEUR has worked as a Fellow of the National Council for Air and Stream Improvement (NCASI) where he provides advice and counsel to the forest products industry on matters related to environmental monitoring and analysis. Prior to this position, Mr. LaFleur served NCASI as the Organic Analytical Program Manager where from 1983 to 1996 he was responsible for managing the laboratory charged with providing analytical support for the pulp and paper industry's environmental research

program. Before that, he served as a Research Chemist (1977-1983). Mr. LaFleur received M.S. degree from the University of Oregon in 1977. Research has involved the development of analytical methods to support paper industry research, investigation of the effects of process modifications on minimization of chlorinated by-products and the assessment and evaluation of the effects of pulp mill discharges on the aquatic environment. Other work has involved the characterization of the chemical composition of pulp industry solid and aqueous wastes as well as work to characterize the fate and transformation of potential aquatic toxicants in different treatment systems. He has also developed exposure data for paper-based consumer product risk assessments. He has been a member of the ACS Committee for Environmental Improvement for six years and is Secretary of the Division of Environmental Chemistry.

TIMOTHY JONES, JR. earned a B.S. degree from Jackson State University in 1967, with a major in chemistry and minor in mathematics. He earned a Ph.D. from Kansas State University in 1975, after serving in the U.S. Army. Dr. Jones' Ph.D. research focused on photo energy transfer mechanisms, through photosensitization with mercury.

Currently, Dr. Jones is a technical project manager with the U.S. Army's Office of Product Manager for Cooperative Threat Reduction (PMCTR). PMCTR is responsible for the U.S. assistance in destroying the Russian chemical weapons. Assignments prior to the chemical weapons destruction process development included:

- Toilet goods and personal care products R&D with the Procter & Gamble Company
- Technical manager for pigment and dye applications with the Hilton Davis Chemical Company
- Pollution prevention R&D and technology demonstration with the Tennessee Valley Authority.

Dr. Jones has been a member of the ACS since 1964 and currently serves on the ACS Committee for Environmental Improvement. ACS division memberships have included Physical Chemistry, Colloid and Surface Chemistry and Environmental Chemistry. Other organizational and professional activities include the Gulf Coast Hazardous Substance Research Center Advisory Board and Technology Transfer Committee Chair; former chair of the Kansas State University Chemistry Department's Advisory Council; and former chair of the Industrial Advisory Board for the Jackson State University Alumni Association.

WILLIAM H. BATSCHELET is an Environmental Chemist in the Consultant Operations Division, Headquarters, Air Force Center for Environmental Excellence (AFCEE), located at Brooks AFB, San Antonio, Texas. As such, he serves as a chemical consultant on environmental issues, including providing technical expertise and chemical insight for restoration projects, reviewing technical reports and data packages

to ensure that they meet quality standards and reviewing contractor and laboratory operations to ensure that they provide quality services. In addition, he serves as the Air Force representative on several intergovernmental and interservice data quality workgroups. He joined AFCEE in July 1999. Prior to that, he was the Lead Environmental Chemist in the Chemical Science Section at Kelly AFB, Texas. Dr. Batschelet received his B.A. degree in Chemistry from Grinnell College, his M.S. and Ph.D. degrees in Chemistry and Inorganic Chemistry, respectively, from the University of Washington, Seattle. He is a former member of the American Chemical Society (ACS) Committee on Environmental Improvement and is a member of the ACS Committee on Technician Affairs.

DIVISION OF ENVIRONMENTAL CHEMISTRY
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General Papers

Analytical/Monitoring

T. Mill, Presiding

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