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# 2011

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS®

# THE 2011 KAPPE LECTURER

## JAMES W. PATTERSON, PH.D., BCEEM

Principal, Patterson Environmental Consultants, Inc.

### EDUCATION

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|---|---|---|---|
| Auburn University | 1964 | BS | Civil Engineering |
| Auburn University | 1967 | MS | Sanitary Engineering |
| University of Florida | 1970 | Ph.D. | Environmental Engineering |

### PROFESSIONAL ASSOCIATIONS

American Water Works Association
Association of Environmental Engineering & Science Professors
Water Environment Federation

### PROFESSIONAL AWARDS

Outstanding Service Award, WEF, 2004
Certificate of Appreciation, NRC, 1990
Certificate of Appreciation, US EPA, 1990

Dr. James Patterson is an internationally recognized expert on industrial pollution control. He is Principal of the environmental engineering consulting firm, Patterson Environmental Consultants, Inc. The firm specializes in industrial wastes management, including wastewaters, and solid and hazardous wastes. Dr. Patterson previously served as Professor and Chairman of the Pritzker Department of Environmental Engineering at the Illinois Institute of Technology (IIT) in Chicago for 20 years, and as Director of the EPA-sponsored Industrial Waste Elimination Research Center of Excellence at IIT for 8 years. He received his Ph.D. in Environmental Engineering in 1970 from the University of Florida, and his B.S. and M.S. degrees in 1964 and 1967 respectively, from Auburn University.

Dr. Patterson is the author of two books on industrial wastewater treatment, the editor of a three-volume series on industrial pollution prevention, co-editor of a nine-volume series on water quality management, and has authored more than 100 other book chapters and technical papers. He was Chair of the WEF Journal *Water Environment Research Board* of Editors. He has served as an international consultant and advisor to numerous industries and government agencies, including the U. S. Congressional Office of Technology Assessment, the USEPA, Department of Defense, and Department of Justice, the Illinois Pollution Control Board and Illinois EPA, the Kentucky Department of Natural Resources, the New York State Hazardous Waste Center, and the Ohio EPA.

During 1983-84, Dr. Patterson served as Executive Director of the State of Illinois Hazardous Wastes Task Force. He has served as Chair of the International Joint Commission Expert Committee on Engineering and Technological Aspects of Great Lakes Water Quality, and as Chair of the State of Illinois Effluent Standards Advisory Panel. Dr. Patterson was appointed a Charter Member of the USEPA National Advisory Council for Environmental Technology and Policy. In addition, he chaired the Fourth International Conference on Environmental Engineering Education, sponsored by AEESP and convened in Toronto, Canada. His Bibliographic Listings include:

American Men and Women of Science,
Directory of Distinguished Americans,
Who's Who in America, and
Who's Who in Science and Engineering

# ABSTRACTS OF LECTURES OFFERED

## Remediation of Contaminated Sediments: Technical Options and Environmental Consequences

According to the USEPA, contaminated sediments continue to be a significant environmental problem that, due to release of contaminants from the sediments back into the ecosystem, impairs the beneficial uses of many waterbodies and is often a contributing factor to the thousands of fish consumption advisories that have been issued nationwide. Cleanup of contaminated sediment "megasites" cost in excess of $50 million. There are often similarities among contaminated sediment sites. For example, at half of 60 Tier 1 sites tracked by the EPA, polychlorinated biphenyls ("PCBs") were the primary contaminant of concern, while metals drove the risk at a third of the sites and PAHs at a fifth of the sites. There are a limited number of remedial approaches for such sites, including monitored natural recovery ("MNR"), sediment capping, fixation of pollutants within the sediments, or physical removal of the sediments by excavation or dredging. Each remedial approach has advantages and, often serious, disadvantages and environmental consequences.

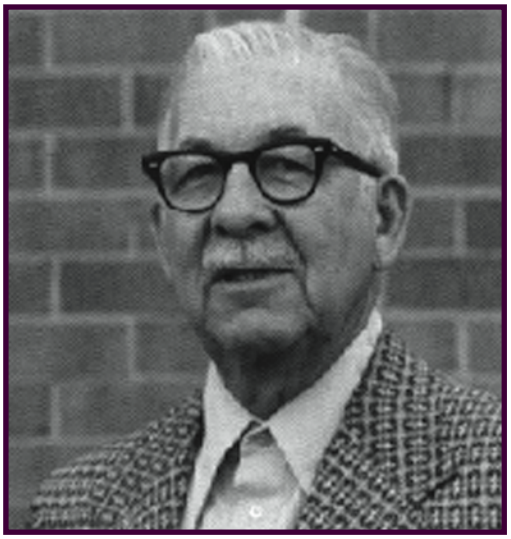
This Seminar addresses the pros and cons of alternative contaminated sediments remedial approaches, and considers the utility of multiple approaches within individual sites. The presentation focuses on the Lower Fox River, Wisconsin, which flows from Lake Winnebago northeast to Green Bay, and drains into Lake Michigan. The Lower Fox River ("LFR") megasite includes approximately 39 miles of the LFR as well as the Bay of Green Bay, one of the major bays of Lake Michigan, and is one of the nations' largest sediment remediation sites. River bottom sediments throughout the 39-mile length of the River and extending into Green Bay are contaminated by historical discharges of wastewaters containing PCBs from paper mills and Publicly Owned Treatment Works (POTWs) located along the River. The PCB wastewater discharges resulted from the manufacturing, de-inking, and recycling of carbonless copy paper. It has been estimated that between 279,000 to 881,000 pounds of PCBs were released to the River, almost entirely prior to 1972. The PCB contamination persists today. The contamination has led to excessive body burdens of PCBs in fish, to the point that only a catch and release fishery is advised on the River. The sediments of the LFR and to a lesser extent, the Bay, have been the focus of investigation and remediation efforts for decades. This presentation overviews the remedial options evaluated for the contaminated sediments of the River, and the consequent environmental advantages and risks associated with each remedial approach.

## Control of Industrial Metals: Conventional and Advanced Technologies

Many industrial and combined industrial-municipal wastewaters contain excessive concentrations of metals pollutants. Technically efficient and cost-effective control of such pollutants is dependent upon and accomplished within a complex matrix of wastewater and treatment technology variables. These variables include aspects such as:

- The target metal, or combination of metals, requiring control;
- The initial raw wastewater and required effluent concentrations of the target metal(s);
- The speciation (oxidation state, types and concentrations of complexing agents, organic vs. inorganic nature, etc.) of the target metal(s);
- Aspects of the wastewater matrix which might suppress, or enhance, the efficacy of a candidate treatment technology;
- The kinetics of a specific treatment technology, for a specific wastewater matrix and treatment technology configuration;
- The reliability and stability of performance of alternative candidate treatment technologies; and
- The cost-effectiveness (for the treatment of the liquid phase, and for the management of the treatment residuals [e.g., sludge, regenerant brine, filter backwash, etc.]) of the candidate treatment technologies.

Simplistic equilibrium modelling is rarely adequate for reliable technical prediction of complex industrial wastewater behavior. As a consequence, bench-scale and/or pilot-scale treatability studies are typically necessary in order to evaluate alternative treatment options, and their associated advantages and disadvantages. However, an understanding of wastewater treatment chemistry is essential in designing such treatability studies including in specifying their associated experimental variables, in properly interperting the results of those studies and, most importantly, in translating those results to full-scale application. This Seminar presents an introduction to technical options, and some permutations of approaches in application of such technologies, to effective control of industrial metals pollutants.



"A man's debt
to his profession
is to help
those that follow"

**STANLEY E. KAPPE, P.E., DEE**, a successful environmental engineer, believed he owed a debt to the profession that rewarded him so well. During his life, he gave of himself to his university and to his profession through countless hours of volunteer activity. And, through this Lecture Series, he continues to share his good fortune with tomorrow's environmental engineers.

He graduated from Pennsylvania State University in 1930 with a bachelor's degree in sanitary engineering. He served with the Pennsylvania State Health Department and the U.S. Army Corps of Engineers before joining the Chicago Pump Company as its Eastern Regional Manager in 1935. In 1945, he founded Kappe Associates, Inc., a water supply and wastewater equipment company headquartered in Rockville, Maryland, and continued as its Chief Executive Officer until his death in 1986.

His peers recognized his contributions to the profession by numerous awards, including the AWWA Fuller Award, the WPCF Arthur Sidney Bedell Award, the WPCAP Ted Moses and Ted Haseltine Awards, and the AAEE Gordon Maskew Fair Award. In 1985, Pennsylvania State University named him Outstanding Engineer Alumnus.

Stanley E. Kappe was an activist member and leader in several national and Chesapeake region professional societies. He served as the Executive Director of the American Academy of Environmental Engineers from 1971 to 1981.

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