**BIOGRAPHICAL**

Richard Woodward is the Principal/Senior Microbiologist for Sierra Environmental Services, Inc. an environmental consulting firm specializing in environmental remediation strategies, remedial process optimization, industrial microbiology applications and litigation support. He has more than 30 years of experience with the biological transformation of organic chemicals, bioremediation, and microbial process optimization. Mr. Woodward was a major contributor and presenter of Lyondell Chemical Company’s international fuel oxygenate (MTBE) product stewardship program that focused on the management, and biological fate and transport, of fuel oxygenates in the environment. Previously Mr. Woodward was Senior Technologist, environmental operations, at CH2M Hill, a full-service, multinational engineering, construction and operations firm. Mr. Woodward also served as Senior Scientist for environmental remediation at Terracon Consultants and as Vice President for bioremediation at ENSR/AECOM.

Mr. Woodward has a Masters degree in Botany/Plant Physiology from the University of South Florida and PhD-ABD in Plant Pathology /Microbiology from the Pennsylvania State University. His professional certifications include Certified Hazardous Materials Manager (CHMM), Certified Environmental Trainer (CET), Corrective Action Project Manager (CAPM) and HAZWOPER certification under 40 CFR 1910.120. He has published or presented more than 64 formal papers on environmental issues in technical journals or at professional meetings and public forums.

Mr. Woodward has eclectic interests in biology/ microbiology

* Biological diapause in killifish, killifish genetics, implications for astrobiology
* Microbial enhanced oil recovery (MEOR) and other mechanisms of tertiary production
* Microbiology of machine cutting fluids, occupational hazards to cutting fluid biocide exposure
* Genetically modified agricultural crops; roundup ready, ethanol corn, vitamin enhanced
* Implications of GMO and unanticipated affects for ecosystems at large
* Examples of observable/ongoing, present day evolution in prokaryotes and eukaryotes
* Theme and variations of the endosymbionts process, creation of new endosymbionts
* The impact of marginal micronutrient deficiency on phenotypic expression in agricultural crops
* Determinants of specificity in plant disease, portability of the hypersensitive response, plant immunity
* In situ bioremediation of aquifer systems using alternative electron acceptors/donors
* Managed wetlands for tertiary treatment of waste water
* Regulation of Hox genes
* Transgenic and cisgenic organisms
* Recycling waste water to drinking water, assimilative properties of streams and reservoirs
* Yogurt cultural methods and strains

**Richard Woodward, MA, CET, CHMM**

**Curriculum Vitae**

Richard Woodward

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**Education**

* Ph.D.-ABD Plant Pathology/Microbiology, Pennsylvania State University, PA 1979
* M.A. Botany/Plant Physiology, University of South Florida, Tampa, FL 1975
* B.S. Sec.Ed./Biology, Millersville University, Millersville, PA 1969

**Teaching Experience**

* Adjunct Faculty Biology, Houston Community College 2011, Biol 1406
* Adjunct Faculty Biology, Wharton County Junior College 2005, Biol 1406 & Bio 1407,
* Product Stewardship: Directed international fuel-oxygenate, technical program for LyondellBasell Co. 2000-2003, 120 technical workshops, professional papers, seminars.
* Adjunct Faculty, University of Texas School of Public Health; Fall Semesters 1998 & 2000.

Course: Hazardous and Solid Waste Management

* Invited lecturer, USAF School of Bio-engineering, Brooks AFB; The Institute of Environmental Technology, 1992-1998; PEMEX-USEPA Environmental Training Villahermosa, Mexico.

**Professional Experience**

* Sierra Environmental Services, President/Principal Scientist, Houston, TX 1990-present
* CH2M Hill, Senior Technologist, Houston, TX 2007-2009
* Terracon Consultants, Senior Scientist, Houston, TX 2005-2007
* ENSR, Vice President, Houston, TX 1985-1990

**Professional Certifications**

* Certified Hazardous Materials Manager (CHMM #13931)

Alliance of Hazardous Materials Professionals

* Certified Environmental Trainer (CET # 4403)

National Environmental, Safety & Health Training Association

* Corrective Action Project Manager (CAPM # 338)

Texas Commission on Environmental Quality)

* OSHA Hazwoper 40+8 hr trained and certified 29 CFR 1910.120
* Behavior Based Loss Prevention Systems, DNV training program
* Texas Education Association (TEA) Teaching Certificate 8-12

**Professional Affiliations**

* American Chemical Society
* American Society for Microbiology
* National Association of Biology Teachers
* Texas Community College Teachers Association

**Professional Achievements and Publications**

Author, co-author, presenter of over 64 professional papers, seminars or workshops to regional, national or international meetings of professional societies: ACS, AEHS, AGU/EGU, ASM, GSA, IPEC, HGS, NGWA, NICOLE, SWCS, SETAC, SIM, TCEQ, WEF. Representative, publications, proceedings, presentations:

Woodward, R.E., R. Goodman and D. Downy, 2008. Remedial Process Optimization (RPO) and Long Term Monitoring Optimization (LTMO). Selected clients workshop on remedial strategies, Brady’s Landing, CH2M Hill Fall 2008.

Horsak R. D. and R. E. Woodward, 2008.Fipronil residues remaining in heavy clay soils seven years after application affect non-target arthropods. AEHS annual meeting, Mission Valley Marriott, San Diego, CA March 13-15, 2008 *and* 234th American Chemical Society National Meeting, Boston, MA August 19-23, 2007 Abstract #144.

Woodward, R. E. 2007. Passive Enhanced In Situ Bioremediation Polishing of Subsurface Soils Achieves Texas Protective Concentration Limits. ACHMM 2007 National Conference, August 12–15, 2007, Hyatt Regency Crystal City, Arlington, VA.

Woodward, R. E. 2007. Application of Lessons Learned From Shallow Subsurface Bioremediation to Microbial Enhanced Oil Recovery. ACHMM 2007 National Conference, August 12–15, 2007, Hyatt Regency Crystal City, Arlington, VA.

Woodward, R.E. and C. Siess. 2006. Microbial Enhanced Oil Recovery (MEOR) Case Studies From India's Oil And Natural Gas Corporation, Ltd. Abstract No: 111529 Poster Presentation, Geological Society of America National Convention, Philadelphia, PA October 22, 2006 *and* Abstract No. 80, International Petroleum Environmental Conference, San Antonio, TX October 17-20, 2006

Woodward, R.E. 2006. Lessons Learned from Bioremediation and Their Implications for Microbial Enhanced Oil Recovery. Abstract No. 83, International Petroleum Environmental Conference, San Antonio, TX October 17-20, 2006

Woodward, R.E. 2006. Fitting Analytical Effort and Data Management to Project Objectives. Lab Practices and Date Reporting section of Texas Commission on Environmental Quality, Environmental Trade Fair, May 9-11, 2006 Austin, TX.

Woodward, R.E. 2006. Some Environmental Issues Surrounding the Fuel Additive MTBE (methyl t-butyl ether). ASCE March 21, 2006, Technical Presentation, Houston, TX.

Woodward, R.E. 2006. Enhanced In Situ Bioremediation. Terracon Internal Training Workshop via WebEx, January 17, 2006.

Woodward, R.E. 2005. MTBE and TBA: Fact or Artifact? Lab Practices and Data Reporting. Texas Commission on Environmental Quality (TCEQ), Annual Environmental Trade Fair, Austin, TX, Paper presentation.

Woodward, R.E. and R.L.Sloan. 2003. Misconceptions Concerning the Behavior, Fate and Transport of the Fuel Oxygenates TBA and MTBE. Geological Society America Joint SCS and SES Annual Meeting, Memphis, TN, Paper presentation.