

VITA
CALVIN H. (HERB) WARD, Ph.D., P.E., BCEE

OFFICE

Department of Civil and Environmental Engineering
George R. Brown School of Engineering
Rice University, Mail Stop 316
Houston, Texas 77005
Phone: 713-348-4086; Fax: 713-348-5948; E-mail: wardch@rice.edu

PERSONAL DATA

Military: U. S. Air Force Reserve 1955-68; Active Duty 1960-63; Honorable Discharge

EDUCATION

M.P.H.	The University of Texas, Environmental Health Science	1978
Ph.D.	Cornell University, Plant Pathology, Physiology and Genetics	1960
M.S.	Cornell University, Plant Pathology and Genetics	1958
B.S.	New Mexico State University, Agriculture and Biology	1955

LICENSURE

Professional Engineer, State of Texas License No. 89596

Board Certified Environmental Engineer (BCEE), American Academy
of Environmental Engineers (Recertified 2012) Member No. 04-E0001

POSITIONS

1993-Present	Foyt Family Chair of Engineering, Professor of Civil and Environmental Engineering and Ecology and Evolutionary Biology
1981-2011	Founding Editor-in-Chief, <i>Environmental Toxicology & Chemistry</i> , An International Journal; Co-Editor-in-Chief 2012
2003-2005	Chair, Department of Civil and Environmental Engineering
1993-2000	Director, Advanced Applied Environmental Technology Demonstration Facility (AATDF), U.S. Department of Defense
1991-2001	Co-Director, Hazardous Substance Research Center/South and Southwest (HSRC/S&SW), LSU, Rice, and Georgia Tech, U.S. EPA Superfund Research Center
1992-2001	Director, Energy and Environmental Systems Institute, Rice University

- 1981-1999 Director, National Center for Ground Water Research (NCGWR), Rice University (Co-Director 1979-81), U. S. EPA Exploratory Research Center of Excellence
- 1989-1997 Director, Superfund University Training Institute (SUTI), Rice University, U. S. EPA Office of Solid Wastes and Emergency Response
- 1975-Present Adjunct Professor of Environmental Health, The University of Texas School of Public Health, Houston TX
- 1970-1992 Professor and Chair, Department of Environmental Science and Engineering, Rice University; joint appointment in Department of Biology (1970-88) and Ecology and Evolutionary Biology (1989-1993)
- 1973-1974 Visiting Professor of Environmental Health, The University of Texas School of Public Health, Houston TX
- 1966-1970 Associate Professor, Department of Chemical Engineering (1966-68) and Environmental Science and Engineering Program (1968-70), Rice University; joint appointment in Department of Biology
- 1963-1966 Physiologist and Director, Bioregenerative Life Support Systems Research, USAF School of Aerospace Medicine, San Antonio TX
- 1960-1963 Research Scientist, USAF School of Aerospace Medicine, San Antonio TX

HONORS AND AWARDS

Charles Thom Award, 2011, for outstanding research in industrial microbiology. Society for Industrial Microbiology and Biotechnology

McKee Medal, 2007, for best groundwater paper published in Water Environment Research in 2006. Water Environment Federation

Frederick George Pohland Medal, 2006, for Outstanding Contributions to Bridging Environmental Research, Education, and Practice, 2006. Awarded jointly by the Association of Environmental Engineering and Science Professors and the American Academy of Environmental Engineers

Lifetime Achievement Award for (environmental) Remediation, 2006. Sponsored by Brown and Caldwell at the Fifth International Battelle Conference on the Remediation of Chlorinated and Recalcitrant Compounds

Board Certified Environmental Engineer (BCEE), Certification by Eminence, American Academy of Environmental Engineers, 2004. Recertified in 2011

National Associate of the U.S. National Academies of Science and Engineering, awarded in recognition of contributions to the National Research Council, 2004

National Distinguished Lecturer, Association of Environmental Engineering and Science Professors (AEESP), 2000

Herb Ward Distinguished Service Award, Created by the Society of Environmental Chemistry and Toxicology, November 2000

Founders Award, for distinguished contributions to environmental science, Society of Environmental Toxicology and Chemistry, 1998

WASTECH Award, in recognition of extraordinary contributions to the profession, American Academy of Environmental Engineers, 1998

Fellow, American Academy of Microbiology, 1994

Controlled Ecological Life Support Systems (CELSS) Award, National Aeronautics and Space Administration (NASA), 1993

Distinguished Service Award, Society of Environmental Toxicology and Chemistry, 1990, recognition as founding Editor-in-Chief of the Society's international research journal

Charles Porter Award, in recognition of distinguished contributions to industrial microbiology, Society for Industrial Microbiology, 1986

Correspondent in Gravitational Physiology, International Union of Physiological Sciences, 1985

Fellow, Society for Industrial Microbiology (SIM), 1984

Achievement Award, National Aeronautics and Space Administration (NASA), 1981, in recognition of distinguished performance in analysis and preparation of the Space Shuttle Environmental Impact Statement

Guest Clinician, Houston District Dental Society, 1967

Outstanding Civilian Performance Award, U. S. Air Force, 1965

Shell Foundation Graduate Fellowship, Cornell University, 1957-59

Regents Graduate Fellowship, Cornell University, 1956-57

Phi Kappa Phi, 1958

Sigma Xi - 1957; President, Rice University Chapter, 1970

B.S. Degree with Honors, 1955

Distinguished Military Student, 1955

Cadet Commander, Air Force ROTC, 1954-55

Alpha Zeta - 1953; President New Mexico Chapter, 1953-54

Bausch and Lomb Award in Science, 1951

Roger Boles Scholarship, 1951

PROFESSIONAL/SCIENCE ADVISORY ACTIVITIES

NATIONAL ACADEMY OF SCIENCE, NATIONAL ACADEMY OF ENGINEERING,
NATIONAL RESEARCH COUNCIL COMMITTEES

- Peer Review Coordinator, NRC Report on “Sediment Dredging at Superfund Megasites,” 2008
- Committee on Superfund Site Assessment and Remediation in the Coeur d’Alene River Basin, Board on Environmental Studies and Toxicology, BEST, 2003-05
- Report Review Coordinator, Division of Earth and Life Studies, Board on Life Sciences, 2002, 2004, 2005
- Committee on Environmental Management Technologies, Board on Radioactive Waste Management, BRWM, 1995-97
- Chair, Committee on Subsurface Contaminants, BRWM, 1996-99
- Chair, Peer Review Committee, BRWM, 1996-99
- Chair, Committee on Landfills, BRWM, 1995-96
- Committee to Evaluate the Science, Engineering, and Health Basis of the Department of Energy’s Environmental Management System, Subcommittee on Utilization of Science, Engineering, and Technology, BRWM, 1995
- Committee on Alternatives for Ground Water Cleanup, Board on Water Science and Technology, 1991-94
- Committee on Waste Disposal Options, Marine Board & Ocean Studies Board, 1991-93
- Hazardous Waste Study Planning Committee, BEST, 1988
- Multiagency Hazardous Wastes Research, BEST, 1987
- Multimedia Approaches to Pollution Control, BEST, 1986-87
- Effects of Gravity on Manned Space Flight, Space Science Board, 1975

U. S. ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA),
SCIENCE ADVISORY BOARD COMMITTEES

- Board of Scientific Counselors (BOSC), National Center for Environmental Research Subcommittee, 2001-02
- Chair, Science and Technological Achievement Awards Committee, 1998-2003
- Office of Research and Development (ORD), Small Business Innovative Research (SBIR) Program, Peer Reviewer, 1998-99

- Environmental Engineering Committee (EEC), 1987-95; Consultant 1995-present
- Retrospective Study Committee, 1998-99
- Environmental Technology Innovation and Commercialization Enhancement Program (EnTICE) Subcommittee, 1995
- Technology Innovation Strategy Review Subcommittee, 1994
- Environmental Engineering Futures Committee, 1993-94
- Chair, Contaminant Leachability Subcommittee, 1990-92
- Chair, Bioremediation Research and Technology Subcommittee, 1991-95
- Environmental Fate/Effects Subcommittee on Expert Systems for Chemical Fate & Transport, 1991
- Environmental Fate/Effects Subcommittee, Bioremediation of Alaskan Oil Spill, 1989
- Chair, Toxics Treatability and Toxicity Reduction Subcommittee, 1989-90
- Mission and Functioning of the EPA Science Advisory Board, 1989
- Research Strategies Committee (Future Risk Report), 1987-88
- Vice Chairman, Pollution Prevention Subcommittee, 1989
- Underground Storage Tanks Subcommittee, 1987-88
- Mine Wastes Risk Screen Subcommittee, 1987-88
- Land Disposal Research Subcommittee, 1987
- Unsaturated Zone Code Subcommittee, 1987-88

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

SCIENCE ADVISORY COMMITTEES

- Life Sciences and Microgravity Advisory Committee, 1994-97
- Aerospace Medicine Advisory Committee, 1988-93
- Bioregenerative Life Support Systems Working Group, 1988-97
- Chair, Regenerative Life Support Systems Waste Management Panel, Kennedy Space Center, 1986-90; Member, Program Coordinating Board
- Space Biology Panel, 1978-84
- Life Sciences Committee, 1971-77

STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM (SERDP)

- Series Editor, SERDP and ESTCP Environmental Remediation Technology Monograph Series, 2007 to present
- Chair, Scientific Advisory Board (SAB) 1998-2005 Member 1997-2005
- Chair, Science Working Group, SERDP/ESTCP Chlorinated Solvents Expert Panel Workshop, 2001
- Technical Advisory Committee (TAC), Explosives Thrust Area, Federal Integrated Biotreatment Research Consortium (FIBRC), 1997-99
- Chair, Transformation Work Group, Workshop on Environmentally Acceptable Endpoints, 1998
- National Environmental Technology Test Sites (NETTS) Demonstration Program Review Panel, 1994-2000

U.S. DEPARTMENT OF DEFENSE (DOD)

- Science Advisor and Peer Reviewer, Basic and Applied Research, Environmental Research and Development Command, US Army Corps of Engineers, 2008, 2009, 2011, 2012
- Director, Advanced Applied Technology Demonstration Facility, 1993-2000
- Peer Review Board, Government Performance and Results Review, U.S. Army Engineer Waterways Experiment Station, 1996, 1997, 1999
- Dedication Speaker for Environmental Chemistry Center and Hazardous Waste Research Center, U. S. Army Engineer Waterways Experiment Station, 1999
- Air Force Office of Scientific Research, Peer Review Board, 1978, 1980

U. S. DEPARTMENT OF ENERGY (U.S. DOE)

- Chair, Science and Technology Advisory Committee, Risk Reduction and Environmental Stewardship Division (RRES), Los Alamos National Laboratory (LANL), 2000 to 2003
- Chair, Division Review Committee, RRES, LANL, 2003-2005
- Member, Division Review Committee, Earth and Environmental Sciences Division, LANL, 2005-2010

EDUCATIONAL TESTING SERVICE

- Graduate Record Examination Board, Technical Advisory Committee, 1988-92
- Graduate Record Examination Board, Subject Matter Test Committee, 1986-87

AMERICAN TYPE CULTURE COLLECTION

- Board of Directors, 1987-90

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES (AIBS)

- Chair, Committee on Special Science Programs, 1978-83, 1985-90 (Science advisory services to DOE, DOD, NASA, EPA, DOA)

LOUISIANA STATE UNIVERSITY

- Science Advisory Committee, EPA/OER Hazardous Waste Research Center, 1982-85

UNIVERSITY OF NEW ORLEANS

- Consultant, Environmental Sciences Program, Institute organization, 1995

GULF COAST UNIVERSITIES RESEARCH CONSORTIUM

- Water Task Force, 1982-84

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

- U.S. Department of Health and Human Services
Peer Reviewer/Consultant—Toxicological Profiles for Superfund

UNIVERSITY OF WASHINGTON

- Science Advisory Board, Superfund Research Center, National Institutes of Environmental Health Sciences, 1991-97, 2010

ASSOCIATION OF ENVIRONMENTAL ENGINEERING AND SCIENCE PROFESSORS

- Awards Committee, 2008-2011

RICE UNIVERSITY

- Vice-Chair, United Way Campaign, 2010-2011
- Co-Chair, De Lange Conference Organizing Committee, 1999-2000 and 2008-2009
- Graduate Marshall, 2005
- Alumni Honors Committee, 2004-2006, 2009-2010
- Faculty Council, 2001-2005; Chair, Faculty Titles Committee, 2001-02, Athletics Committee 2002-2005, Chair, Faculty Salary Committee, 2003-2005
- University Council, 2001-2005; Promotions and Tenure Committee, 2001-05
- Chair, Research Council, 1999-2002
- Committee on Public (President's) Lectures, 1996-99
- Ad Hoc Committee on the Environment, 1994-95
- Research Council, 1988-91
- Rice University Fund Council, 1982-84, 1992-95
- Institutional Biosafety Committee, 1979-2009
- Graduate Council, 1978-80
- Committee to Nominate the Dean, George R. Brown School of Engineering, 1975, 1988
- Chairman, Committee to Evaluate the Rice University Summer School Program, 1978
- Science and Engineering Research Council, 1971-74
- Faculty Associate, Will Rice College, 1969-76
- Undergraduate Admission Committee, 1968-72; Chair, Science and Engineering Subcommittee, 1970-72
- Science and Engineering Research Council Subcommittee for Administration of the NASA Sustaining Grant, 1968-71
- Rice University Representative, Texas System of Natural Laboratories, Inc., 1967-68

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS (AAEE)

- Organizational Committee, Fredrick Pohland Award, 2004-2005
- Judge, Excellence in Environmental Engineering, Competition, 1998
- Steering Committee for preparation of Phase II WASTECH Monographs on design and application of environmental technologies, 1995-99; Committee liaison to Bioremediation Task Group, Phase II
- Chair, Transformation Work Group, Environmentally Acceptable Endpoints Workshop, 1998
- Chair, Bioremediation Task Group (Phase I Monograph Preparation), 1993-95

CITY OF HOUSTON

- Steering Committee for the Mayor's Regional Summit on Clean Air, 1998

PROFESSIONAL/SCIENTIFIC ORGANIZATIONS

American Society for Engineering Education
American Society of Civil Engineers

Association of Ground Water Scientists and Engineers
Association of Environmental Engineering and Science Professors
International Water Resources Association
Society of Environmental Toxicology and Chemistry-**Founder**
Society for Industrial Microbiology-**Fellow**
American Society for Microbiology
American Association for the Advancement of Science
American Institute of Biological Sciences
American Society of Plant Physiologists
American Phytopathological Society
American Academy of Microbiology - **Fellow**
Texas Ground Water Association
Houston Philosophical Society

ELECTED POSITIONS

President, Houston Philosophical Society, 2010-2011, Vice President, 2009-2010
Treasurer, Houston Philosophical Society, 2006-2007
Chair, Scientific Advisory Board, Strategic Environmental Research and Development Program (SERDP), 1999-2005
President, American Institute of Biological Sciences, 1984-85; Executive Committee, 1982-86; Governing Board Member-at-Large, 1977-82
President, Society for Industrial Microbiology (SIM) 1983-84; Secretary, 1979-82; Board of Directors, 1979-85
Vice President, U.S. National Committee, International Water Resources Association, 1977-96
Chair, Board of Directors, Southwest Center for Urban Research, 1977-79; Treasurer, 1974-75; Member, 1969-82
Member, Board of Directors, Society of Environmental Toxicology and Chemistry, 1979-82
Chair, Board of Directors, Rice University Faculty Club, 1977-78; Member, 1976-82

EDITORIAL POSITIONS

Series Editor, SERDP/ ESTCP Environmental Remediation Technology Monographs, 2007-present
Editor-in-Chief, *Environmental Toxicology and Chemistry*, 1981- 2011. Co-Editor-in-Chief, 2012
Editorial Board, *Bioremediation Journal*, 1997-present
Guest Editor, *Journal of Industrial Microbiology and Biotechnology*, Special issue on Bioremediation, 1997
Editorial Advisory Board, *Journal of Hazardous Substance Research*, 1992-95
Senior Editor, *Journal of Industrial Microbiology*, 1985-91
Guest Editor, *Journal of Hazardous Materials*, Special Issue, December 1992
Senior Editor, *Developments in Industrial Microbiology* 1985-91
Associate Editor, *SIM News*, 1979-90
Editorial Board, *Houston Engineer*, 1979-83
International Advisory Board, *Enzyme and Microbial Technology*, 1994-2005

Reviewer, research papers submitted for publication in *Water Research, Applied and Environmental Microbiology, Journal of Industrial Microbiology, and Environmental Science and Technology*

PEER REVIEW/RESEARCH PROGRAMS AND GRANT APPLICATIONS

National Science Foundation
National Aeronautics and Space Administration
Department of Energy
Environmental Protection Agency
Air Force Office of Scientific Research
National Institute of Health
Department of Defense
Department of the Army, Corps of Engineers, Environmental Research & Development Command (ERDC)

FUNDED RESEARCH

Reductions in DNAPL Longevity through Biological Flux Enhancement, Environmental Security Technology Certification Program, U.S. Department of Defense, 2004-2006, total funding \$249,998

Bioremediation of DNAPL Source Zone, Advanced Technology Program/Technology Development and Transfer Program, State of Texas, 2004-2006, total funding \$163,860; Regenesys \$50,000

Quantitative Demonstration of Source-Zone Bioremediation in a Field-Scale Experimental Controlled Release System (ECRS), Gulf Coast Hazardous Substance Research Center, U.S. EPA, 2000-2001, total funding \$82,000; Regenesys \$22,000.

Establishment of an Advanced Applied Technology Demonstration Facility for Environmental Technology, U.S. Department of Defense, 1993-1999; total funding \$19,315,000.

Superfund University Training Institute, U.S. EPA, 1994-98; total funding \$500,000.

Bioremediation of Contaminated Sediments and Dredged Material, EPA Hazardous Substance Research Center/South and Southwest, 1992-95; total funding \$365,679.

Research, Training, and Technology Development for Ground Water Quality Protection and Restoration, U.S. EPA, 1992-95; total funding \$3,024,459.

Ground Water Research, E. I. du Pont de Nemours and Co., Inc.; 1989-90; total funding, \$200,000.

In Situ Bioremediation of Contaminated Aquifers and Hazardous Waste Sites, Brown Family Fund, 1989-91; total funding, \$400,000.

Optimization of *In Situ* Bioremediation of Contaminated Subsurface and Aquifer Materials. EPA/National Center for Ground Water Research, 1988-91; total funding, \$350,000.

Microbial Ecology and Restoration of the Subsurface and Ground Water at Hazardous Waste Disposal Sites, 1985-88; EPA/National Center for Ground Water Research; total funding, \$407,000.

Bioremediation of Contaminated Ground Water, Union Carbide, 1985-89; total funding, \$78,000.

National Center for Ground Water Research, EPA Cooperative Agreement No. CR806931-01-0, 1979 to 1992, 12-year program with the University of Oklahoma and Oklahoma State University. Approximate total funding \$12.5 million.

Environmental Fate and Attenuation of Gasoline Components in the Subsurface, American Petroleum Institute, 1985-87; total funding \$78,300.

International Travel Grants. National Science Foundation, 1978-85; approximate funding \$16,000: International Botanical Congresses: Moscow, USSR, and Sydney, Australia; World Congresses on Water Resources: New Delhi, India; Buenos Aires, Argentina; and Brussels, Belgium.

Linkages Between Sewage Treatment Plant Discharges, Lake Houston Water Quality, and Potable Water Supply During Storm Events. Public Health Department, City of Houston, 1984-85 (with P. B. Bedient); total funding \$42,000.

International Travel Grant. National Aeronautics and Space Administration, \$1,000. International Commission on Gravitational Physiology, Lausanne, Switzerland, September 18-21, 1984.

Training in Water Supply and Pollution Control; amended to include Engineering Review of Oil Spill Prevention, Control and Countermeasure Plans; amended to include research on hazardous materials. EPA Training Grant Nos. T900175-07-4, T900175-07-5, T900966-01, 1970-82. Approximate total funding \$882,668.

Movement and Fate of Viruses and Organic Pollutants in Ground Water during Land Treatment of Wastewater. EPA Grant No. R-805292-01 and -02, 1977-79 (with M. Tomson); total funding \$274,500.

Effects of Chronic Low-Level 1,450 MHz Illumination on Plant Growth and Development. NASA Contract No. NAS2-9552, 1977; total funding \$22,000.

Maximum Utilization of Water Resources in a Planned Community. EPA Grant No. S802433-01-5, 1974-76 (Assistant Project Director with W. G. Characklis); total funding \$642,243.

Eutrophication Studies in a Planned New Community. EPA Grant No. S802433-01-5, 1974-76; total funding \$60,341.

Study of Metabolism and Energetics in Hypogravity; Respiration, Photosynthesis, and Pigmentation of Plants Exposed to Hypogravity. NASA Contract Nos. NAS2-6614 and 8676, 1971-74; total funding \$142,689.

Studies at the Cellular Level on the Mechanism of Oxygen Toxicity. USAF Contracts F416709-68-C-0024, -69-C-0070, and -70-C-0018, 1968-71; total funding \$79,437.

Studies on the Mechanisms of Oxygen Toxicity. NIH Biomedical Support Grant, 1968-69; total funding \$6,400.

Study on the Mechanisms of Oxygen Toxicity. NASA Sustaining Grant for Space Science and Technology, 1966-67; total funding \$8,700.

A Study to Determine the Effects of Prolonged Weightlessness on Growth and Gas Exchange of Photosynthetic Plants. Contract AF41(609)-3053, 1966-67; total funding \$12,000.

Ecological Relationships between Bacteria and Algae in Photosynthetic Gas Exchangers. NASA-Defense PR R-99, 1963-66 (with J. E. Moyer); total funding \$61,200.

INVITATIONAL/PLENARY/KEYNOTE ADDRESSES

Keynote Lecture, 3rd China Internat'l Eco-City Forum, "Green Remediation Technology for Urban Redevelopment" Binhai Tianjin, PRC, September 22, 2012

Charles Thom Award Lecture, "Deep Down and Dirty: Microbial Processes for Subsurface Remediation", Society for Industrial Microbiology and Biotechnology, New Orleans, LA, USA, July 28, 2011

Invited Lecture, "Remediation of Chlorinated Source Zones in Groundwater" Politecnico di Milano, Milan, Italy, September 25, 2009

Keynote Address, "Emerging Technology for the Remediation of Soils and Groundwater," RemTech Expo, Ferrara, Italy, September 22-24, 2009

Keynote Lecture, "Groundwater Remediation: Then and Now," Society for Industrial Microbiology, Toronto, CAN, July 30, 2009

Beyer Distinguished Lecture, "Remediation of Chlorinated Source Zones." Department of Civil and Environmental Engineering, University of Houston, Houston, TX, USA, April 17, 2009

Keynote Lecture. "DNAPL Source Zone Bioremediation." RedoxTech Conferences, Niagara Falls, NY, USA, September 24, 2007

Chair, All-Conference Panel Discussion on DNAPL Source Treatment: Lessons Learned and Implications for Future Applications. Fifth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, USA, May 22, 2006.

Keynote Address, "The Journals of SETAC: Environmental Science Reaching the World," 1st Annual Desert Southwest Society of Environmental Toxicology and Chemistry Meeting, University of Texas at El Paso, El Paso, TX, USA, June 25-26, 2004.

Session Chair, "Enhanced Bioremediation of DNAPL Source Zones," 7th International In Situ and On-Site Bioremediation Symposium, Orlando, FL, USA, June 2-5, 2003.

Invited Platform Address, "Bioremediation/Natural Attenuation," U.S. EPA/TIO GWRTAC Advances in Innovative Ground-Water Remediation Technologies Conference, Boston, MA, USA, June 6-7, 2000.

Invited Lecture, "Overview on In Situ Treatment Technologies" and Organizer, NATO Advanced Study Institute on Innovative Approaches to the On-Site Assessment and Remediation of Contaminated Sites, Prague, Czech Republic, May 24-June 2, 2001.

Co-host, "The Cutting Edge Technology Report on Hazardous Waste," Information Television Network and CNBC, April 2000

Association of Environmental Engineering and Science Professors (AEESP) Year 2000
National Distinguished Lecture Series:

- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” March 2-3, 2000, University of Nevada—Las Vegas
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” March 7-8, 2000, University of Missouri—Columbia
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” March 13, 2000, University of Delaware
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” March 16-17, 2000, University of Pittsburgh
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” March 21-22, 2000, Tennessee Technological University
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” March 23-24, 2000, University of Florida—Gainesville
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” March 30-31, 2000, Johns Hopkins University
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” April 5-6, 2000, North Carolina State University
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” April 6-7, 2000, University of Cincinnati
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control,” April 11, 2000, University of Toronto
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” April 13, 2000, Michigan Technological University
- “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” April 18, 2000, University of Alabama at Birmingham
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control” *and* “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” April 20, 2000, Clemson University
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control” *and* “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” May 2-3, 2000, University of California at Los Angeles and California Technological Institute
- “Bioattenuation of Contaminants in the Subsurface: Strategies for Engineering Control” *and* “Environmental Remediation Technology Development: National Needs, Opportunities, and Challenges,” May 4-5, 2000, Utah State University

Plenary Address, “Enhanced Bioattenuation for Subsurface Remediation,” *In-Situ* and On-Site Bioremediation, The Fifth International Battelle Symposium, San Diego, California, April 19-22-1999

Keynote Address, “Bioremediation: Emerging Technology or Intellectual Sandbox,” Bioremediation for Industry Conference, Society for Industrial Microbiology, University of Notre Dame, South Bend, Indiana, USA, March 8-11, 1998.

Invited Seminar, “Remediation Technology Development for Soil and Ground Water Cleanup: Results of DOD/University Initiative,” Los Alamos National Laboratory, Los Alamos, New Mexico, USA, January 16, 1998.

Invited Course, “Bioremediation Technology,” Beijing Municipal Research Academy of Environmental Protection, Beijing, People’s Republic of China, August 1997.

Invited Platform Address, “Risk Modeling for Hazardous Waste Characterization: Criteria for Consideration,” Risk Assessment Symposium, Southern California Coalition for Pollution Prevention and Cal-EPA Department of Toxic Substances Control, Sacramento CA, USA, May 16, 1997.

Invited Seminar, “Advanced Subsurface Remediation Technology Development,” Biotechnology Research Institute, National Research Council of Canada, Montreal, Quebec, Canada, April 11, 1997.

Keynote Address, “Where Are We Now? Moving to a Risk-Based Approach,” Symposium on Natural Attenuation of Chlorinated Organics in Ground Water, U.S. EPA ORD, Dallas, TX, USA, September 11-13, 1996.

Keynote Address, Superfund University Training Institute, Transport and Fate of Contaminants in the Subsurface, Richmond, VA, USA, June 19-21, 1996.

Invited Platform Paper, “Industrial R&D - Status, Needs and Direction,” Bio '96 International Biotechnology Conference and Exhibition, Philadelphia, PA, June 9-13, 1996.

Keynote Address, “Technological Challenges to Remediating Ground Water,” NGWA Outdoor Action Conference, Las Vegas, NV, USA, May 13-15, 1996.

Invited Seminar, “Contaminated Ground Water Resources: Current Approaches for Assessment and Remediation,” Clemson University, School of the Environment, Clemson, SC, USA, April 19, 1996.

Invited Seminar, “Advanced Technology of Environmental Restoration,” City of Houston, Department of Public Works and Engineering, Wastewater Quality Control Laboratory, Houston, TX, USA, March 18, 1996.

Invited Platform Paper, “Technological Solutions for Ground Water,” NGWA Ground Water 2000 Conference, Orlando, FL, USA, March 4-5, 1996.

Invited Seminar, “Advanced Technology Development Program for Contaminated Ground Water,” Vanderbilt University, Nashville, TN, USA, February 19, 1996.

Invited Platform Address, “Groundwater Bioremediation,” Engineering Foundation Conference on Bioremediation of Surface and Subsurface Contamination, Palm Coast, FL, USA, January 21-26, 1996.

Keynote Address, “Living in Space: A Look to the Future,” Black River Technical College, Dedication of New Science Complex, Pocahontas, AR, USA, November 22, 1995.

Invited Platform Address, “Status and Directions of the DOD/AATDF Program for Environmental Technology Development,” National Ground Water Association Convention, Indianapolis, IN, USA, October 28-30, 1995.

Invited Moderator, “Alternatives for Groundwater Cleanup II,” American Society of Civil Engineers, 1995 National Conference on Environmental Engineering, Pittsburgh, PA, USA, July 23-26, 1995.

Keynote Address, “Bioremediation Technologies: Fundamentals, Processes, and Applications,” New Mexico Environment Department, Underground Storage Tank Bureau, Bioremediation Conference, Santa Fe, NM, USA, June 22-23, 1995.

Keynote Address, “Intrinsic Bioattenuation for Subsurface Restoration,” Third International Symposium on In Situ and On-Site Bioreclamation, San Diego, CA, USA, April 24-27, 1995.

Invited Lecture, “Advanced Environmental Technology Development,” The National Institutes of Environmental Health Sciences (NIEHS) conference, “Transfer of (Superfund) Basic Research to Waste Site Remediation,” Mare Island, Vallejo, CA, USA, March 22-24, 1995.

Invited Lecture, “Technological Solutions for Ground Water,” Ground Water 2000, National Ground Water Association, Orlando, FL, USA, March 4-5, 1995.

Keynote Address, “Ground Water Bioremediation,” The Geoenvironment 2000, American Society of Civil Engineers, New Orleans, LA, USA, February 24-26, 1995.

Invited Moderator, “Alternative Technology for Ground Water Remediation,” National Academy of Science Seminar, The Association of Ground Water Scientists and Engineers, Las Vegas, NV, USA, October 9-12, 1994.

Invited Address, “Research for New Technology,” Innovative Technology Roundtable, Texas National Resource Conservation Commission, Austin, TX, USA, April 14, 1994.

PUBLICATIONS

C. H. Ward has authored or co-authored over 200 publications which have appeared in peer reviewed journals, as chapters in books, and in proceedings of conferences, symposia,

etc. He has also helped write and/or has co-edited 30 books and monographs. Recent publications include:

BOOKS

Stroo, H.F., A. Leeson and C. H. Ward (Eds.). *Bioaugmentation for Groundwater Remediation*, Springer US, 2012, 389 pp.

Stroo, H. F. and C. H. Ward (Eds.). *In Situ Remediation of Chlorinated Solvent Plumes*, Springer US, 2010, 786 pp.

Stroo, H. F. and C. H. Ward (Eds.). *In Situ Bioremediation of Perchlorate in Groundwater*, Springer US, 2008, 248 pp.

Ward, C. H., and Academy Committee. *Superfund and Mining Megsites: Lessons From the Coeur D'Alene River Basin*, The National Academies Press, Washington, D.C., 2005, 484 pp.

Schmandt, J. and C.H. Ward (Eds.), *Sustainable Development: The Challenge of Transition*, Cambridge University Press, UK, 2000, 231 pp.

Balshaw-Biddle, K., C.L. Oubre, and C.H. Ward (Eds.), *Steam and Electro-Heating Remediation of Tight Soils*, Lewis Publishers, Boca Raton, FL, US, 2000, 403 pp.

Fiorenza, F., C.L. Oubre, and C.H. Ward (Eds.), *NAPL Removal: Surfactants, Foams and Microemulsions*, Lewis Publishers, Boca Raton, FL, US, 2000, 552 p.

Lowe, D.F., C.L. Oubre, and C.H. Ward (Eds.), *Soil Vapor Extraction Using Radio Frequency Heating (Resource Manual and Technology Demonstration)*, Lewis Publishers, Boca Raton, FL, US, 2000, 328 pp.

Lowe, D.F., K.L. Duston, C.L. Oubre, and C.H. Ward (Eds.), *Remediation of Firing-Range Impact Berms*, Lewis Publishers, Boca Raton, FL, US, 2000, 379 p.

Lowe, D.F., C.L. Oubre, and C.H. Ward (Eds.), *Reuse of Surfactants and Cosolvents for NAPL Remediation*, Lewis Publishers, Boca Raton, FL, US, 2000, 314 pp.

Balshaw-Biddle, K., C.L. Oubre, and C.H. Ward (Eds.), *Modular Remediation Testing System*, Lewis Publishers, Boca Raton, FL, 1999, 276 pp.

Balshaw-Biddle, K., C.L. Oubre, and C.H. Ward (Eds.), *Subsurface Contamination Monitoring Using Laser Fluorescence*, Lewis Publishers, Boca Raton, FL, 1999, 160 pp.

Fiorenza, S., C.L. Oubre, and C.H. Ward (Eds.), *Sequenced Reactive Barriers for Groundwater Remediation*, Lewis Publishers, Boca Raton, FL, 1999, 730 pp.

Fiorenza, S., C.L. Oubre, and C.H. Ward (Eds.), *Phytoremediation of Hydrocarbon-Contaminated Soil*, Lewis Publishers, Boca Raton, FL, 1999, 164 pp.

Lowe, D.F., C.L. Oubre, and C.H. Ward (Eds.), *Surfactants and Cosolvents for NAPL Remediation (A Technology Practices Manual)*, Lewis Publishers, Boca Raton, FL, 1999, 412 pp.

Ward, C.H. and Academy Committee, *Groundwater & Soil Cleanup: Improving Management of Persistent Contaminants*, National Research Council, National Academy Press, Washington, DC, 1999, 285 p.

Ward, C.H. and Academy Committee, *Peer Review in Environmental Technology Development*, National Research Council, National Academy Press, Washington, DC, 1999.

Ward, C.H., J. Cherry, and M.R. Scaif (Editors), *Subsurface Restoration*, Ann Arbor Press, Chelsea, MI, 1997, 491 p.

Ward, C.H. and Academy Committee. *Environmental Management Technology-Development Program at the Department of Energy*, National Research Council, National Academy Press, Washington, DC, 1996.

Ward, C.H. and Academy Committee. *Improving the Environment, An Evaluation of DOE's Environmental Management Program*, National Research Council, National Academy Press, Washington, DC, 1995.

Ward, C.H. and Task Group, *Bioremediation*, American Academy of Environmental Engineers, Annapolis, MD, 1995.

Ward, C.H. and Academy Committee, *Alternatives for Ground Water Cleanup*, National Academy Press, Washington, DC, 1994, 315 p.

Ward, C.H. (with others). *Handbook of Bioremediation*, Lewis Publishers, Boca Raton, FL, 1994, 257 p.

Knox, R.C., L.W. Canter, D.F. Kincannon, E.L. Storer and C.H. Ward. *Aquifer Restoration: State of the Art* (Pollution Technology Review No. 131). Noyes Publications, Park Ridge, NJ, 1986, 750 p.

Ward, C.H., W. Giger and P.L. McCarty (Editors). *Ground Water Quality*, John Wiley & Sons, New York, NY, 1985, 547 p.

Ward, C.H., R.C. Allison and S.M. Pier (Editors). *Hazardous Substance Resource Book*, Vol. 1-Physical, Chemical, and Environmental Properties. U.S. Environmental Protection Agency, Washington, DC, 729 p, 1983: Pergamon Press 1985. Microfiche.

Ward, C.H., R.C. Allison and S.M. Pier (Editors). *Hazardous Substance Resource Book*, Vol. 2-Physical, Chemical, and Environmental Properties. U.S. Environmental Protection Agency, Washington, DC, 831 p, 1983: Pergamon Press 1985. Microfiche.

Ward, C.H., R.C. Allison and S.M. Pier (Editors). *Hazardous Substance Resource Book*, Vol. 3-Physical, Chemical, and Environmental Properties. U.S. Environmental Protection Agency, Washington, DC, 827 p, 1983: Pergamon Press 1985. Microfiche.

Ward, C.H., R.C. Allison and S.M. Pier (Editors). *Hazardous Substance Resource Book*, Vol. 4-Handling, Storage, and Disposal. U.S. Environmental Protection Agency, Washington, DC, 824 p, 1983: Pergamon Press 1985. Microfiche.

Ward, C.H., R.C. Allison and S.M. Pier (Editors). *Hazardous Substance Resource Book*, Vol. 5-Regulations. U.S. Environmental Protection Agency, Washington, DC, 212 p, 1983: Pergamon Press 1985. Microfiche.

PAPERS

* Presented at Regional, National, or International Meeting ** Invitational Paper

Stroo, H.S., Ward, C.H. et al. 2012. Chlorinated ethane source remediation. *Environ. Sci. Technol.* 46:6438-6447

Stroo, H.S., Ward, C.H., et al. 2012. Bioaugmentation with *Dehalococcoides*: A Decision Guide. In Stroo, H.S., Leeson, A. and C. H. Ward (eds.). 2012. Bioaugmentation for Groundwater Remediation. Wiley-Blackwell, NY, pp. 117-169.

Ward, C. H. and Academy Committee. 2011. "Microbes and Oil spills", American Academy of Microbiology, Washington, DC, 13 p.

Stroo, H. F. and C. H. Ward. 2010. Future Directions and Research Needs for Chlorinated Solvent Plumes. In *In Situ Remediation of Chlorinated Solvent Plumes*, H. F. Stroo and C. H. Ward (Eds.), Springer USA, 786 p.

Stroo, H. F., R. C. Loehr, and C. H. Ward. 2008. In Situ Bioremediation of Perchlorate in Groundwater: An Overview. In *In Situ Bioremediation of Perchlorate in Groundwater*, H. F. Stroo and C. H. Ward (Eds.), Springer USA, 248 p.

Gustavson, K. L., L. B. Barnhouse, C. L. Brierley, E. H. Clark and C. H. Ward. 2007. Superfund and Mining Megasites. *Environ. Sci. & Technol* 41(8): 2667-2672.

Da Silva, M. L. B., R. C. Daprato, D. E. Gomez, J. B. Hughes, C. H. Ward, and P. J. J. Alvarez. 2006. Comparison of Bioaugmentation and Biostimulation for the Enhancement of DNAPL Source Zone Bioremediation. *Water Environment Research* 78(13): 2456-2465.

Azadpour-Keeley, A. and C. H. Ward. 2005. Transport and Survival of Viruses in the Subsurface – Processes, Experiments, and Simulation Models. *Remediation* 15(3): 23-49.

Ward, C. H. 2004. Forward to *Cost-Effective Groundwater Remediation*, Regenesis, San Clemente, CA, USA, 416 p.

Stroo, H. F., M. Unger, C. H. Ward, M. C. Kavanaugh, C. Vogel, A. Leeson, J. A. Marqusee, and B. P. Smith. 2003. Remediating Chlorinated Solvent Source Zones. *Environ. Sci. & Technol.* 37: 223A-230A.

Hughes, J. B., C. N. Neale, and C. H. Ward. 2003. Bioremediation. In *The Desk Encyclopedia of Microbiology*, Elsevier Ltd., Netherlands, pp. 194-213.

Hughes, J. B., K. L. Duston, and C. H. Ward. 2002. Bioremediation. Ground Water Remediation Technologies Analysis Center, Pittsburg, PA, USA.

Neale, C.N., A.W Holder, C. H. Ward, and J.B. Hughes. 2002. Reaeration Effects on Hydrocarbon Plumes: A Mechanistic Modeling Approach. *ASCE Journal of Environmental Engineering*, 128:1, pp. 1-20.

Ward, C. H., J. B. Hughes, G. A. Pope, M. Delshad, V. Dwaranath, J. Spain, S. Nishino, J. S. Fruchter, V. R. Vermeul, M. D. Williams, and J. E. Szecsody. 2002. In-Situ Treatment Technologies. In *Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites*, D. Reible and K. Demnerova, (Eds.), Netherlands: Kluwer Academic Publishers, pp. 183-216.

Schmandt, J. and C. H. Ward. 2000. "Challenge and response" In *Sustainable Development: The Challenge of Transition*, Cambridge University Press, Cambridge, UK, pp. 1-9.

Neale, C.N., J.B. Hughes, and C.H. Ward. 2000. Impacts of Unsaturated Zone Properties on Oxygen Transport and Aquifer Reaeration. *Ground Water* 38:784-794.

Hughes, J.B., C.N. Neale, and C.H. Ward. 2000. Bioremediation. In *Encyclopedia of Microbiology*, second ed., Vol. 1, J. Lederberg (Eds.), Academic Press, San Diego CA, USA, pp. 587-610.

Ward, C.H., M. Alexander, J.A. Ryan and J.C. Spain. 1999. Transformation. In *Environmental Availability in Soils - Chlorinated Organics, Explosives and Metals*, W.C. Anderson, R.C. Loehr and B.P. Smith (Eds.), American Academy of Environmental Engineers, Annapolis, MD, pp. 187-201.

Ward, C. H. 1999. Forward. In *Accelerated Bioremediation Using Slow Release Compounds*, S. S. Koenigsberg and R. D. Norris, Regensis Bioremediation Products, San Clemente, CA, USA, 225 p.

Kan, A.T., G. Fu, M.A. Hunter, W. Chen, C.H. Ward, and M.B. Tomson. 1998. Irreversible sorption of neutral hydrocarbons to sediments: Experimental observations and model predictions. *Environmental Science and Technology* 32:892-902.

- Jee, V., D.M. Beckles, C.H. Ward, and J.B. Hughes. 1998. Aerobic Slurry Reactor Treatment of Phenanthrene Contaminated Sediment. *Water Res.*, Vol. 32, No. 4, pp 1231-1239.
- Beckles, D.M., C.H. Ward, and J.B. Hughes. 1998. Effect of mixtures of polycyclic aromatic hydrocarbons and sediments on fluoranthene biodegradation patterns. *Environ. Toxicol. Chem.* 17:1246-1251.
- Ward, C.H. and Committee. 1997. "Peer Review in the Department of Energy -- Office of Science and Technology: Interim Report." National Academy Press, Washington DC.
- ** Pfaender, F.K., J.M. Suflita and C.H. Ward. 1997. "Introduction" to Special Issue on Bioremediation, *Journal of Industrial Microbiology & Biotechnology* 18:73-74.
- ** Fiorenza, S. and C.H. Ward. 1997. Microbial adaptation to hydrogen peroxide and biodegradation of aromatic hydrocarbons. *Journal of Industrial Microbiology & Biotechnology* 18:140-151.
- ** Thomas, J.M., C.L. Bruce, V.R. Gordy, S.R. Hutchins, J.L. Sinclair and C.H. Ward. 1997. Assessment of the Potential for Nitrate-Enhanced Bioremediation of a JP-4 Fuel Contaminated Aquifer. *Journal of Industrial Microbiology & Biotechnology* 18:213-221.
- ** Hughes, J.B., S.D. Chandra and C.H. Ward. 1997. Utilization of Bioremediation Processes for the Treatment of PAH-Contaminated Sediments. *Journal of Industrial Microbiology* 18:152-160.
- ** Thomas, J.M., J.T. Wilson and C.H. Ward. 1997. Microbial Processes in the Subsurface. In *Subsurface Restoration*, C.H. Ward, J.A. Cherry and M.R. Scalf, (Eds). Ann Arbor Press, Chelsea, MI, pp. 99-111.
- ** Fiorenza, S., K.B. Biddle, D.F. Lowe, C.L. Oubre, and C.H. Ward. 1996. Innovative Bioremediation Technologies: The DOD/AATDF Contribution. *Proceedings*, Global Environmental Biotechnology--Approaching the Year 2000, International Society for Environmental Biotechnology Third International Symposium, Boston, MA, USA.
- ** Hughes, J.B. and C.H. Ward. 1996. "Use of Bioremediation Technologies for Treatment of PAH-Contaminated Soils," American Chemical Society Conference, "Emerging Technologies in Hazardous Waste Management VIII," Birmingham, AL, September 9.
- ** Chandra, S.D., C.H. Ward, and J.B. Hughes. 1996. Biodegradation of sorbed fluorene in sediment slurries. *Haz. Waste and Haz. Matls.* 13:375-385.
- ** Rifai, H.S., R.C. Borden, J.T. Wilson and C.H. Ward. 1995. Intrinsic Bioattenuation for Subsurface Remediation. In *Intrinsic Bioremediation*, R.E. Hinchee, J.T. Wilson and D.C. Downey (Eds.). Battelle Press, Columbus, OH, USA, pp. 1-30.
- * Thomas, J.M., V.R. Gordy, C.L. Bruce, S.R. Hutchins, J.L. Sinclair and C.H. Ward. 1995. Microbial activity in Subsurface Samples Before and During Nitrate-Enhanced Bioremediation. In *Microbial Processes for Remediation*, R.E. Hinchee, F.J. Brockman and C.M. Vogel (Eds.). Battelle Press, Columbus, OH, USA, 3(8):271-280.

** Thomas, J.M and C.H. Ward. 1995. Ground Water Bioremediation. *Geoenvironment 2000: Characterization, Containment, Remediation, and Performance in Environmental Geotechnics*, Vol 2. American Society of Civil Engineers, New York, NY, USA, pp. 1456-1466.

Tsomides, H., J.B. Hughes and C.H. Ward. 1995. Effect of Surfactant Addition on Phenanthrene Biodegradation in Sediments. *Environ. Toxicol. Chem.* 14:953-959.

Thomas J.M. and C.H. Ward. 1994. Introduced Organisms for Subsurface Bioremediation. In *Handbook of Bioremediation*, Norris et al. (Eds), pp 227-244. Lewis Publishers, Boca Raton, FL, USA, 257 p.

* Thomas, J.M. and C.H. Ward. 1992. Microbial Processes in the Subsurface. *Proceedings*, Subsurface Restoration Conference, Dallas, TX, USA, pp. 18-21.

** Ward, C.H., J.T. Wilson, D.H. Kampbell and S. Hutchins. 1992. Performance and Cost Evaluation of Bioremediation Techniques for Fuel Spills, *Proceedings, In-Situ Bioremediation Symposium '92*, National Water Research Institute, Environment Canada, Niagra-on-the-Lake, Ontario, Canada, pp. 15-21.

** Thomas, J.M., C.H. Ward, R.L. Raymond, J.T. Wilson and R.C. Loehr. 1992. "Bioremediation, *Encyclopedia of Microbiology*, Vol 1, Academic Press, San Diego, CA, USA, pp. 369-385.

** Ward, C.H., J.M. Thomas, H.J. Marlow, and R.L. Raymond. 1992. Hydrogeologic Considerations for *In-Situ* Bioremediation, *Fate of Pesticides and Chemicals in the Environment*, John Wiley and Sons, New York, NY, USA, pp. 211-227.

** Ward, C.H., J.M. Thomas, K.L. Duston, and P.B. Bedient. 1992. *In Situ* Bioremediation of Contaminated Aquifers and Hazardous Waste Sites in Texas, *Proceedings, Petro-Safe '92*, 3rd Annual Environmental & Safety Conference, Houston, TX, pp. 889-898.

** Ward, C.H. and J.M. Thomas. 1992. "Subsurface Microbial Ecology and Remediation," *Proceedings*, 4th Annual Symposium, Gulf Coast Hazardous Substance Research Center, Beaumont, TX, pp. 53-66.

** Fiorenza, S., K.L. Duston and C.H. Ward. 1991. Decision making--is bioremediation a viable option? *J. Haz. Mat.* 28:171-183.

** Marlow, H.J., Duston, K.L., M.R. Wiesner, M.B. Tomson, J.T. Wilson and C.H. Ward. 1991. Microbial transport through porous media: The effects of hydraulic conductivity and injection velocity. *J. Haz. Mat.* 28:65-74, 1991.

Francy, D.S., J.M. Thomas, R.L. Raymond and C.H. Ward. 1991. Emulsification of hydrocarbons by subsurface bacteria. *J. Ind. Microbiol.* 8:237-246.

** Duston, K.L., P.G. Allen and C.H. Ward. 1990. Influence of hydrogeologic properties on microbiological transformations. In *Proceedings*, Calgary '90, IAH Conference on Subsurface Contamination by Immiscible Fluids, April 18-20, Calgary, Alberta.

- ** Thomas, J.M. and C.H. Ward. 1990. Bioremediation of contaminated aquifers. In *Proceedings*, 3rd Annual Hazardous Materials (HazMat⁹⁰) Management Conf./Central, March 13-15, 1990, Rosemont, IL, pp. 388-393.
 - * Thomas, J.M., V.R. Gordy, S. Fiorenza and C.H. Ward. 1990. Biodegradation of BTEX in sub-surface materials contaminated with gasoline, Granger, Indiana. *Water Sci. Tech.* 22:53-62.
 - * Gangadharan, A.C., T.V. Narayanan, R. Raghavan, G. Amoruso, R. Cochran, J. McArdle, F. Hall, W. Trapp, B. Locke, D. Bailey, C.d.D. Hartman, D. Henz, W. Thompson, J. Zieleniewski, J. Greber, J.M. Thomas, M.D. Lee, P.B. Bedient, R.C. Borden, L.W. Canter and C.H. Ward. 1989. *Leak Prevention and Corrective Action Technology for Underground Storage Tanks*, Noyles Data Corp., Park Ridge, NJ, USA.
 - * Wilson, J.T., D.H. Kampbell, C.H. Ward and J. Armstrong. 1989. Quantitative field evaluation of bioremediation of a fuel spill using hydrogen peroxide. In *Proceedings*, DECHEMA/Society for Industrial Microbiology (SIM) USA, May 30-31, Frankfurt, West Germany.
 - ** Ward, C.H. and J.M. Thomas. 1989. *In situ* ground water remediation. In *Proceedings*, Prevention and Treatment of Ground Water and Soil Contamination in Petroleum Exploration and Production, May 9-11, Calgary, Alberta, Canada, pp. 28.0-28.15.
 - ** Ward, C.H. and J.M. Thomas. 1989. *In situ* biodegradation of organic pollutants in ground water. In *Proceedings*, Bioremediation of Wood Treating Waste Forum, March 14-15, 1989, Mississippi State University, pp. 125-131.
 - ** Thomas, J.M. and C.H. Ward. 1989. "*In situ* bioremediation of organic contaminants in the subsurface." *Environ. Sci. Technol.* 23:760-766.
- Thomas, J.M., G.L. Clark, M.B. Tomson, P.B. Bedient, H.S. Rifai and C.H. Ward. 1988. Environmental Fate and Attenuation of Gasoline Components in the Subsurface. Final Report, American Petroleum Institute, Washington DC, p 111.
- * Ward, C.H., J.M. Thomas, S. Fiorenza, H.S. Rifai, P.B. Bedient, R.L. Raymond and J.T. Wilson. 1989. *In situ* bioremediation of subsurface material and ground water contaminated with aviation fuel: Traverse City, Michigan. In *Proceedings*, AWMA/EPA International Symposium on Hazardous Waste Treatment: Biosystems for Pollution Control, Cincinnati, OH, USA, pp. 83-96.
 - ** Ward, C.H. and J.M. Thomas. 1989. *In situ* biodegradation of organic pollutants in ground water (Appendix C). In *Proceedings*, U. S. EPA Forum on Remediation of Wood Preserving Sites, October 24-25, 1988, San Francisco, CA, PEI Associates, Cincinnati, OH, USA.
 - * Ward, C.H., J.M. Thomas, S. Fiorenza, H.S. Rifai, P.B. Bedient, J.M. Armstrong, J.T. Wilson and R.L. Raymond. 1988. A quantitative demonstration of the Raymond Process for *in situ* bioremediation of contaminated aquifers. In *Proceedings*, NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention, Detection, and Restoration, 2:723-743.

- Borden, R.C., M.D. Lee, J.M. Thomas, P.B. Bedient and C.H. Ward. 1989. *In situ* measurement and numerical simulation of oxygen limited biotransformation. *Ground Water Monit. Rev.* 9:83-91.
- * Thomas, J.M. and C.H. Ward. 1989. Remediation of contaminated aquifers using *in situ* bioremediation. In *Proceedings, 6th World Congress on Water Resources, International. Water Resources Assoc.* 2:332-341.
- Thomas, J.M., M.D. Lee, M.J. Scott and C.H. Ward. 1989. Microbial ecology of the subsurface at an abandoned creosote waste site. *J. Ind. Microbiol.* 4:109-120.
- ** Thomas, J.M., H.J. Marlow, R.L. Raymond and C.H. Ward. 1991. Hydrogeologic considerations for *in situ* bioremediation. In *Fate of Pesticides and Chemicals in the Environment*, R.W. Metcalf and W.W. Stumm (Eds.) *Proceedings, US/USSR Symposium, Iowa City IA, 1987*, Wiley Interscience, New York, NY. 1989. Trans. Russian, M.A. Novitsky (Ed.), Leningrad Press, pp. 355-370.
- ** Loehr, R.C. and C.H. Ward. 1987. "Waste treatment processes and cross-media transfer of pollutants." In *Proceedings, Symposium on Multi-Media Transport of Contaminants, February 11, National Academy Press, Washington, DC*, pp. 8-23.
- Thomas, J.M. and C.H. Ward. 1988. "Biotechnology for *in situ* restoration of ground water contaminated by the petroleum industry." In *Biotechnological In Situ Bioremediation*, Z. Filip (Ed.), Gustav Fischer Verlag, Stuttgart/New York, USA, pp. 345-365.
- ** Fiorenza, S., J.M. Thomas, V.R. Gordy, P.S. Ziegenfuss, H.J. Marlow and C.H. Ward. 1987. "Approaches and concepts for aquifer restoration." In *Proceedings, AWWA Annual Conference and Exposition, June 14-18, Kansas City, MO*, pp. 625-639.
- Ward, C.H. 1987. "Ground water research at Rice." *Rice Engineer* (Fall), pp. 9-13.
- ** Lee, M.D., J.M. Thomas, R.C. Borden, P.B. Bedient, J.T. Wilson and C.H. Ward. 1988. Bioremediation of aquifers contaminated with organic compounds. *CRC Crit. Rev. Environ. Control* 18:29-89.
- Thomas, J.M., M.D. Lee, P.B. Bedient, R.C. Borden, L.W. Canter and C.H. Ward. 1987. Leaking underground storage tanks: Remediation with emphasis on *in situ* bioremediation. Report to EPA Office of Solid Waste, EPA/600/2-87/008, Washington, DC, 143 p.
- ** Ward, C.H. and J.M. Thomas. 1987. "How clean is clean ground water remediated by *in situ* bioremediation?" In *Proceedings, 3rd National Water Conference, Academy of Natural Sciences, Philadelphia, PA*, pp. 225-233.
- Thomas, J.M., M.D. Lee and C.H. Ward. 1987. Use of ground water in assessment of biodegradation potential in the subsurface. *Environ. Toxicol. Chem.* 6:607-614.
- Wilson, J.T. and C.H. Ward. 1986. Opportunities for bioreclamation of aquifers contaminated with petroleum hydrocarbons. *Dev. Ind. Microbiol.* 27:109-116.

- Ward, C.H. and P.S. Ziegenfuss. 1987. Water quality and potential reuse of condensed atmospheric humidity in CELSS. American Institute of Biological Sciences/National Aeronautics and Space Administration Report on Bioregenerative Life Support Systems, 18 p.
- ** Lee, M.D. and C.H. Ward. 1987. Ground Water Restoration. In *Ground Water Handbook*, EPA/625/6-87/016. U.S. Environmental Protection Agency, Ada, OK, USA, pp. 35-50.
- ** Ward, C.H., M.B. Tomson, P.B. Bedient and M.D. Lee. 1986. Transport and fate processes in the subsurface. In *Land Treatment, A Hazardous Waste Management Alternative*, R.C. Loehr and J.F. Malina, Jr. (Eds.). Water Resources Symposium 13, University of Texas at Austin, pp. 19-39.
- Borden, R.C., M.D. Lee, J.M. Thomas, P.B. Bedient, and C.H. Ward. 1986. In Situ Measurement and Numerical Simulation of Oxygen-Limited Biotransformation. *Ground Water Monitoring & Remediation*, Vol.9, no.1, pp. 83-91.
- Ward, C.H. and M.D. Lee. 1985. *In situ* technologies. In *Ground Water Pollution Control*, L.W. Canter and R.C. Knox (Eds.). Lewis Publishers, Chelsea MI, USA, pp. 127-156.
- ** Lee, M.D. and C.H. Ward. 1987. *In situ* restoration techniques for aquifers contaminated with hazardous wastes. *J. Haz. Mat.* 14:71-82.
- Borden, R.C., P.B. Bedient, M.D. Lee, C.H. Ward and J.T. Wilson. 1986. Transport of dissolved hydrocarbons influenced by oxygen limited biodegradation: 2. Field application. *Water Resour. Res.* 22:1983-1990.
- * Tomson, M.B., C. Curran, S.R. Hutchins, M.D. Lee, G. Waggett, C.C. West, and C.H. Ward. 1985. Land application of municipal waste water. In *Ground Water Quality*, C.H. Ward, W. Giger, and P.L. McCarty (Eds.). John Wiley & Sons, New York, NY, USA, pp. 188-215.
- Knox, R.C., L.W. Canter, D.F. Kincannon, E.L. Stover and C.H. Ward. 1986. State-of-the-art of aquifer restoration. EPA 600/S2-84/182. U.S. Environmental Protection Agency, Ada, OK, pp. 1-8.
- ** Ward, C.H. and R.L. Miller. 1984. Algal bioregenerative systems for space life support. *The Physiologist* 27 (Suppl.): 21-24.
- Ward, C.H. 1985. AIBS looks to the future. Editorial. *BioScience* 35:5.
- * Borden, R.C., M.D. Lee, J.T. Wilson, C.H. Ward and P.B. Bedient. 1984. Modeling the migration and biodegradation of hydrocarbons derived from a wood-creosoting process waste. In *Proceedings, NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water Prevention, Detection, and Restoration*, Houston, TX, USA, pp. 130-143.

- ** Hutchins, S. R., M.B. Tomson, P.B. Bedient and C.H. Ward. 1985. Fate of trace organics during land application of municipal wastewater. *CRC Crit. Rev. Environ. Control* 15:355-416.
- Tomson, M.B., C. Curran, J.M. King, H. Wang, J. Dauchy, V. Gordy and C.H. Ward. 1984. Characterization of soil disposal system leachates. U.S. Environmental Protection Agency 600/S2-84-101, Cincinnati, OH, pp. 1-4.
- Hutchins, S.R., M.B. Tomson and C.H. Ward. 1985. Microbial involvement in trace organic removal during rapid infiltration recharge of ground water. In *Planetary Ecology*, D.E. Caldwell, J.A. Brierley and C.L. Brierley, (Eds), Van Nostrand Reinhold, New York, NY, USA, pp. 370-382.
- * Hutchins, S.R. and C.H. Ward. 1985. Microbial involvement in the removal of trace organics during rapid infiltration recharge of ground water. In *Proceedings, 5th World Congress on Water Resources*, Intl. Water Resources Assoc., Brussels, Belgium, 1:123-136.
- * Lee, M.D., J.M. Thomas and C.H. Ward. 1985. Microbially mediated fate of ground water contaminants from abandoned hazardous waste sites. In *Proceedings, 5th World Congress on Water Resources*, Intl. Water Resources Assoc., Brussels, Belgium, 1:113-122.
- * Lee, M.D. and C.H. Ward. 1985. Biological methods for the restoration of contaminated aquifers. *Environ. Toxicol. Chem.* 4:743-750.
- * Hutchins, S.R. and C.H. Ward. 1985. Microbial removal of trace organics during rapid infiltration recharge of ground water. In *Proceedings, 2nd Intl. Conf. on Ground Water Quality Research*, OSU University Printing Services, Stillwater, OK, USA, pp. 18-21.
- * Lee, M.D. and C.H. Ward. 1985. Microbial ecology of a hazardous waste disposal site: enhancement of biodegradation. In *Proceedings, 2nd Intl. Conf. on Ground Water Quality Research*, OSU University Printing Services, Stillwater, OK, USA, pp. 25-27.
- ** Lee, M.D. and C.H. Ward. 1984. Reclamation of contaminated aquifers: biological techniques. In *Proceedings, 1984 Hazardous Material Spills Conference*, April 9-12, 1984, Nashville, TN, USA, pp. 98-103.
- Hutchins, S.R. and C.H. Ward. 1984. A predictive laboratory study of trace organic contamination of ground water: preliminary results. *J. Hydrol.* 67:223-233.
- Savage, M. and C.H. Ward. 1984. Chemical characteristics of laboratory produced tarballs. *Marine Poll. Bull.* 15:174-178.
- Ward, C.H., N.N. Durham and L.W. Canter. 1984. Ground water--a national issue. Editorial. *Ground Water* 22:138-140.
- Hutchins, S.R., M.B. Tomson, C.H. Ward and J.T. Wilson. 1984. Anaerobic inhibition of trace organic removal during rapid infiltration of wastewater. *Appl. Environ. Microbiol.* 48:1046-1048.

- Hutchins, S.R., M.B. Tomson, C.H. Ward and J.T. Wilson. 1984. Microbial removal of wastewater organics as a function of input concentration in soil columns. *Appl. Environ. Microbiol.* 48:1039-1045.
- Hutchins, S.R., M.B. Tomson, J.T. Wilson and C.H. Ward. 1984. Fate of trace organics during rapid infiltration of primary wastewater at Fort Devens, Massachusetts. *Water Res.* 18:1025-1036.
- Klaine, S.J. and C.H. Ward. 1984. Environmental and chemical control of vegetative dormant bud production in *Hydrilla verticillata*. *Ann. Bot.* 53:503-514.
- Lee, M.D. and C.H. Ward. 1984. Microbial degradation of selected aromatics in a hazardous waste site." *Dev. Ind. Microbiol.* 25:557-565.
- * Hutchins, S.R., M.B. Tomson and C.H. Ward. 1983. Trace organic contamination of ground water from a rapid infiltration site: a laboratory-field coordinated study. *Environ. Toxicol. Chem.* 2:195-216.
- Klaine, S.J. and C.H. Ward. 1983. Growth optimized algal bioassays for toxicity evaluation." *Environ. Toxicol. Chem.* 2:245-249.
- Klaine, S.J. and C.H. Ward. 1982. The use of aquatic macrophytes for evaluation of phytotoxicity. In *Water Pollution and Management Reviews*, C.K. Varshney (Ed.), South Asian Pub. Pvt. Ltd., New Delhi, India, pp. 57-64.
- * Ward, C.H. and S.J. Klaine. 1981. Obtaining an axenic culture of hydrilla. *J. Aquat. Plant Manage.* 19:59-650.
- Tomson, M.B., J. Dauchy, S. Hutchins, C. Curran, C. Cook and C.H. Ward. 1981. Groundwater contamination by trace level organics from a rapid infiltration site. *Water Res.* 15:1109-1116.
- Ward, C.H. and J.M. King. 1980. Maximum utilization of water resources in a planned community: eutrophication potential of surface waters in a developing watershed. U.S. EPA 600/2-80-127, 82 p.
- Tomson, M.B., S. Hutchins, J.M. King and C.H. Ward. 1980. A nitrogen powered continuous delivery, all-glass-teflon pumping system for ground-water sampling from below 10 meters. *Ground Water* 18:444-446.
- * Hsieh, Y.P., M.B. Tomson and C.H. Ward. 1980. Toxicity of water-soluble extracts of No. 2 fuel oil to the freshwater alga *Selenastrum capricornutum*. *Dev. Ind. Microbiol.* 21:401-409.
- * Curtis, M.W., C.M. Curran and C.H. Ward. 1980. Aquatic toxicity testing as fundament for a spill prevention program. In *Proceedings, 1980 Natl. Conf. on Control of Hazardous Material Spills*, pp. 284-288.
- Tomson, M.B., C.H. Ward, et al. 1979. Groundwater. In *Transport and Fate of Toxic Chemicals in the Aquatic Environment, A Report Submitted to the Office of Air, Land*

and Water Use and the Office of Research and Development. U.S. EPA, Washington DC, pp. 24-32.

Bender, M.E., D.J. Reish and C.H. Ward. 1979. Re-examination of the offshore ecology investigation. In *The Offshore Ecology Investigation*, Rice University Studies, 65:35-116.

Ward, C.H., M.E. Bender and D.J. Reish, eds. 1979. *The Offshore Ecology Investigation*, Rice University Studies, 65:600 p.

- * Armstrong, E.L., J.D. Priscoli, W.S. Butcher and C.H. Ward. 1979. Advances and achievements in water resources utilization and management in the United States of America. *Water International* 14:7-16.
- * Sharp, J.M., S.G. Appan, M.E. Bender, T.L. Linton, D.J. Reish and C.H. Ward. 1979. Natural variability of biological community structure as a quantitative basis for ecological impact assessment. In *Proceedings*, Ecological Damage Assessment Conference, Society of Petroleum Industry Biologists, pp. 257-284.
- * Ward, C.H. 1978. "Statement on Environmental Monitoring." Hearing of the Subcommittee on Environment and Atmosphere of the Committee on Science and Technology, U.S. House of Representatives, 95th Congress, 2nd Session, June 27, 28, 29; July 21, 1978 [No. 93], pp. 33-39.
- * Ward, C.H. and J.M. King. 1979. Effects of simulated hypogravity on respiration and photosynthesis of higher plants. In *Proceedings*, 21st Meeting of the Committee on Space Research (COSPAR), 17:291-296.
- * Tomson, M.B., S.R. Hutchins, J.M. King and C.H. Ward. 1979. Trace organic contamination of groundwater: methods for study and preliminary results. In *Proceedings*, 3rd World Congress on Water Resources, Intl. Water Resources Assoc., 8:3701-3709.
- * Waggett, W.W., R.C. Allison, S.M. Pier and C.H. Ward. 1979. The protection of water resources through spill prevention management of hazardous materials. In *Proceedings*, 3rd World Congress on Water Resources, Intl. Water Resources Assoc., 8:3710-3717.
- * Welch, M.O. and C.H. Ward. 1979. Phytoplankton community structure and primary productivity in a semitropical cooling reservoir. In *Proceedings*, 3rd World Congress on Water Resources, Intl. Water Resources Assoc., 5:2425-2434.
- * Curtis, M.W. and C.H. Ward. 1979. Aquatic toxicity of forty industrial chemicals: testing in support of hazardous substance spill prevention regulation. In *Proceedings*, 3rd World Congress on Water Resources, Intl. Water Resources Assoc., 8:3664-3672.
- * Bender, M.E., J.M. Sharp, D.J. Reish, S.G. Appan and C.H. Ward. 1979. An independent appraisal of the Offshore Ecology Investigation. In *Proceedings*, 11th Annual Offshore Technology Conference, Paper No. 3606, pp. 2163-2172.

- Sharp, J.M., M.E. Bender, D.J. Reish, S.G. Appan and C.H. Ward. 1979. Ecological monitoring and its application to offshore drilling and production. In *Proceedings*, 10th World Petroleum Congress, 9-14 Sept., Bucharest, Romania, PD14:1-20.
- Characklis, W.G., C.H. Ward, J.M. King and F.L. Roe. 1979. Rainfall quality, land use, and runoff quality. *J. Environ. Engr. Div., ASCE* 105:416-419.
- Curtis, M.W. and C.H. Ward. 1979. Acute toxicity of twelve industrial chemicals to freshwater and saltwater organisms. *Water Res.* 13:137-141.
- Charlton, T.J., R.C. Allison, J.L. Breyette, L.K. Holder and C.H. Ward. 1978. Relating handling of hazardous materials to spill prevention. In *Proceedings*, Natl. Conf. on Control of Hazardous Material Spills, pp. 32-35.
- Pier, S.M., R.C. Allison, E.M. Cunningham and C.H. Ward. 1978. Methods for categorization of hazardous materials. In *Proceedings*, Natl. Conf. on Control of Hazardous Material Spills, pp. 27-31.
- Curtis, M.W., T.L. Copeland and C.H. Ward. 1978. Aquatic toxicity of substances proposed for spill prevention regulation. In *Proceedings*, Natl. Conf. on Control of Hazardous Material Spills, pp. 99-103.
- * Ward, C.H., J.M. King and W.G. Characklis. 1978. Chemical and algal studies of urban lakes. *Dev. Ind. Microbiol.* 19:477-487.
- Welch, M.O. and C.H. Ward. 1978. Primary productivity: analysis of variance in a thermally enriched aquatic system. In *Energy and Environmental Stress in Aquatic Systems*, J.H. Thorpe and J.W. Gibbons (Eds.), DOE Symposia Series (CONF-77114), pp. 381-391.
- Ward, C.H., K.L. Dickson, J.R. Duthie, A.R. Isensee, W. Johnson, E.E. Kenaga and R.A. Kimerle. 1978. Criteria and rationale for decision making in aquatic hazard evaluation. In *Estimating the Hazard of Chemical Substances to Aquatic Life*, ASTM, pp. 241-273.
- Ward, C.H., R.J. Olsen, J.M. King and S.M. D'Orsie. 1979. System performance of wastewater stabilization ponds at Exxon's Baytown petrochemical facilities, U.S.A. In *Proceedings*, 3rd World Congress on Water Resources, Intl. Water Res. Assoc., 7:3070-3080.
- Raef, S.F., W.G. Characklis, M.A. Kessick and C.H. Ward. 1977. Fate of cyanide and related compounds in aerobic microbial systems. II. Microbial degradation. *Water Res.* 11:485-492.
- Raef, S.F., W.G. Characklis, M.A. Kessick and C.H. Ward. 1977. Fate of cyanide and related compounds in aerobic microbial systems. I. Chemical reaction with substrate and physical removal. *Water Res.* 11:477-483.
- * Stagg, C.H., C. Wallis, C.H. Ward and P. Gerba. 1978. Chlorination of solids-associated coliphages. In *Progress in Water Technology*, 10:1-2, pp. 381-387.

- * Coffey, J.C., J.M. King and C.H. Ward. 1977. Effects of petroleum hydrocarbons on growth of freshwater algae. *Dev. Ind. Microbiol.* 18:662-672.
- * Coffey, J.C., C.H. Ward and J.M. King. 1977. Effects of petroleum on the growth of freshwater algae. In *Proceedings, 31st Ann. Purdue Ind. Waste Conf.*, pp. 885-893.
- * Olsen, R.S., C.H. Ward, J.M. King, and S. Novak. 1976. Biological waste stabilization ponds at Exxon's Baytown refinery and chemical plant: system performance and algal activity. In *Proceedings, 31st Annual Purdue Ind. Waste Conf.* pp. 863-875.
- Stagg, C.H., C. Wallis and C.H. Ward. 1977. Inactivation of clay-associated bacteriophage MS-2 by chlorine. *Appl. Environ Microbiol.* 33:385-391.
- * King, J.M. and C.H. Ward. 1977. Distribution of edaphic algae as related to land usage. *Phycologia* 16:23-30.
- * Ward, C.H. and S.M. Pier. 1975. Oil Spill Prevention Control and Countermeasure Plan Review. *Training Manual* prepared by The Pace Company Consultants and Engineers, 378 p., App. A-G.
- * Ward, C.H., J.M. King, W.G. Characklis and F.L. Roe. 1975. Evaluation of eutrophication potential of stormwater runoff. *Dev. Ind. Microbiol.* 17:337-343.
- ** Ward, C.H. and J.M. King. 1976. Fate of algae in laboratory cultures. In *Ponds as a Wastewater Treatment Alternative*, E.F. Gloyna, J.F. Malina, and E.M. Davis (Eds.). Water Resources Symposium No. 9:87-103, Univ. Texas Center for Res. In *Water Resources*.
- * Ward, C.H. and J.M. King. 1975. Eutrophication studies in a planned community. In *Proceedings, 2nd World Congress, Intl. Water Res. Assn.*, 5:425-429.
- * Raef, S.F., W.G. Characklis, M.A. Kessick and C.H. Ward. 1974. Fate of cyanide in aerated microbial systems. *Dev. Ind. Microbiol.* 15:294-302.
- * Raef, S.F., W.G. Characklis, M.A. Kessick and C.H. Ward. 1974. Fate of cyanide and related compounds in industrial waste treatment. In *Proceedings, 29th Annual Purdue Ind. Waste Conf.*, p. 832-840.
- * D'Allessandro, P.L., W.G. Characklis, M.A. Kessick and C.H. Ward. 1974. Dissimilatory sulfate reduction in anaerobic systems. *Dev. Ind. Microbiol.* 15:294-30.
- ** Ward, C.H. 1972. Ocean Dumping: Gulf Practices and Effects. Testimony before the President's Water Pollution Control Advisory Board, New York, NY, USA, 27 Sept.
- Pulich, W.M. and C.H. Ward. 1973. Physiology and ultrastructure of an oxygen-resistant *Chlorella* mutant under heterotrophic conditions. *Plant Physiol.* 61:337-344.
- * Ward, C.H. and E.M. Davis. 1972. Biological basis for water quality standards. In *Proceedings, 27th Annual Purdue Ind. Waste Conf.*, pp. 438-446.

- ** Busch, A.W. and C.H. Ward. 1971. Carbon Analysis in pollution assessment-concepts vs. applications". In *Proceedings*, Internat. Symposium on Identification and Measurement of Environmental Pollutants, Ottawa, Canada, pp. 341-346.
- Ward, C.H. 1971. Reckoning with our refuse. *Panhandle Magazine* 5:6-10.
- * Schaezler, D.J., A.W. Busch and C.H. Ward. 1970. Kinetic and stoichiometric limitations of phosphate in pure and mixed microbial cultures. *Dev. Ind. Microbiol.* 11:256-275.
- * Ward, C.H., S.S. Wilks and H.L. Craft. 1969. Effects of prolonged near weightlessness on growth and gas exchange of photosynthetic plants". *Dev. Ind. Microbiol.* 11:276-295.
- * Schaezler, D.J., A.W. Bush and C.H. Ward. 1969. Kinetic and stoichiometric limitations of phosphate in pure and mixed bacterial cultures. In *Proceedings*, 24th Annual Purdue Ind. Waste Conf., pp. 507-533.
- * Zintgraff, G.C., C.H. Ward and A.W. Busch. 1969. Cyanide inhibition of mixed microbial populations. *Dev. Ind. Microbiol.* 10:253-270.
- Miller, R.L., D.W. Smith, C.H. Ward, D.L. Dyer and R.D. Gafford. 1968. A solar-illustrated algal photosynthetic exchanger. USAF School of Aerospace Medicine Technical Report 68-66, 19 p.
- * Smith, H.C., H.E. Brown, J.E. Moyer and C.H. Ward. 1968. Utilization of excretory products of *Chlorella pyrenoidosa* by selected bacteria. *Dev. Ind. Microbiol.* 9:363-369.
- * Smith, H.C., H.E. Brown, J.E. Moyer and C.H. Ward. 1968. Some excretory products of *Chlorella pyrenoidosa*. *Dev. Ind. Microbiol.* 9:355-362.
- * Ward, C.H. and J.N. Phillips. 1968. Stability of *Chlorella* following high-altitude and orbital space flight. *Dev. Ind. Microbiol.* 9:345-5354.
- ** Ward, C.H. and J.E. Moyer. 1968. Ecologic relationships between bacteria and algae in mass culture". In *Bioregenerative Systems*. NASA Scientific Publ. 165:117-127.
- ** Ward, C.H. 1968. Bioregenerative systems. In *Human Ecology in Space Flight* (D. H. Calloway, Ed.). *New York Acad. Sci., NY*, 3:179-188.
- ** Ward, C.H. 1967. Effects of environmental pollution on ecological systems. In *Environ. Poll., a Challenge to Science and Technology*, A.W. Busch (Ed.). Rice Univ. Studies 53:25-33.
- ** Ward, C.H. 1966. Plant processes and application. In *Water Technology, a Multidisciplinary Perspective*, A.W. Busch (Ed.). Rice Univ. Studies 52:13-20.
- ** Ward, C.H. and R.L. Miller. 1966. Algal systems for biological food synthesis. In *The Closed Life-Support System*. NASA Scientific Publ. 1245, pp. 213-224.

** Miller, R.L. and C.H. Ward. 1966. Algal bioregenerative systems. In *Atmosphere in Space Cabins and Closed Environments*, K. Kammermeyer (Ed.). Appleton-Century-Crofts, New York, NY, USA, pp. 186-222.

** Ward, C.H., J.E. Moyer and G.R. Vela. 1964. Studies on bacteria associated with *Chlorella pyrenoidosa* TX 71105 in mass culture. *Dev. Ind. Microbiol.* 6:213-222.

** Ward, C.H., S.S. Wilks and H.L. Craft. 1963. Use of algae and other plants in the development of life support systems. *Amer. Biol. Teacher* 25:512-521.

Ward, C.H. and C.N. Guerra. 1962. Growth of Photosynthetic microorganisms following orbital space flight. In *Biologic Systems of Discoverer Satellites XXIX and XXX*. USAF School of Aerospace Medicine Report 62:37-38.

Ward, C.H. 1959. The detached leaf technique for testing alfalfa clones for resistance to black stem. *Phytopathology* 49:690-696, 1959.

Roberts, D.A., R.E. Ford, C.H. Ward and D.T. Smith. 1959. Colletotrichum anthracnose of alfalfa in New York. *Plant Disease Reporter* 43:352.

Roberts, D.A. and C.H. Ward. 1956. Diseases of forage crops before the first harvest of hay in New York. *Plant Disease Reporter* 40:807-809.

CONSULTANTSHIPS

US Army Corps of Engineers

Science Advisor and Peer Review, Basic and Applied Environmental Research,
2007-present

HydroGeoLogic, Inc

Remediation Technology Monograph Series, 2007 to present

Marlin Atlantis White LTD

Texas Pollutant Discharge Elimination System Permit, 2007-2008

Lockheed Martin/Tallevast

Groundwater contamination, 2007 to present

Teval Corporation

Passaic river risk assessment and remediation, 2006 to 2009

Methanex Corporation

Arbitration on damages from MTBE regulations, 2002-2004

Crystal Chemical Company

Ground water contamination and remediation, 1998-2002

D. A. Stuart Company, Inc.

Biofouling, 2002

Los Alamos National Laboratory
Environmental technology development; risk reduction and environmental
Stewardship, 2001 to 2007

Citgo Petroleum Corporation
Ground water contamination, 2002 to 2004

Conoco
Biodegradation of petroleum hydrocarbons, 2001

Methanex Corporation
NAFTA Arbitration (Methanex Corporation –v- United States of America), 1999 to
2005

Union Pacific Resources Corporation
Arbitration on sale of oil and gas properties, 1999

Amoco Chemical Company
Remediation of Casper, Wyoming Refinery, 1999

Regenesis, San Juan Capistrano CA
Science Advisory Board, 1992-present

Cooper Industries, Houston TX
Chemical handling, disposal, transport, fate, and effects at Superfund manufacturing sites,
Dispositions, trial testimony, arbitration, 1990-2000

Remediation Technologies, Inc., Concord MA
Technical Advisory Board, 1990-2005

Beezer/Koppers, Inc.
Chemical handling-creosote, 1997-99

Duke Energy, Denver CO
Gas processing plant contamination, 1997

Environmental Waste Management Associates
Patent infringement, 1997

Samsung, Inc.
Chemical handling, disposal, transport and fate, 1996-97

Sterling Chemical Company, Texas City TX
Ammonia release/toxicity, 1995-96

PRP Superfund Site Consortia
Brio-site analysis, chemical transport and fate, 1995
Combustion Engineering-site analysis, chemical transport and fate, remediation, 1992-96

Phillips Petroleum, Sweeney TX
Chemical migration from land treatment, 1991

3D/Environmental, Inc., Houston TX
Technical Advisory Board, 1989-1993

Aristech Chemical Corporation, Pittsburgh PA
Chemical transport from deep well injection, 1990-91

Sunstrand Corporation, Denver CO
Ground water contamination (solvents), 1990-1992

Industrial Health Foundation, Pittsburgh PA
Chromium contamination and risk assessment, 1989-90

Calgon Corporation, Hawthorne NJ
Subsurface migration of chlorinated solvents, 1989

Sequa Corporation, Dublin Borough PA
Ground water contamination with chlorinated solvents, 1988-89

Murray State University, Murray KY
Science Advisory Board, Center for Reservoir Research

State of Missouri Coordinating Board on Higher Education
Graduate and undergraduate curriculum review

The Earth Technology Corporation, Long Beach CA
Hazardous waste management and reclamation

Educational Testing Service, Graduate Record Examination Board, Princeton NJ
Subject matter test and Technical Advisory Board

Chambers-Liberty Counties Navigation District, Anahuac TX
Permit hearing, location of hazardous wastes disposal site

Southwest Research Institute, San Antonio TX
Aquatic toxicology research

Crown Plaza Group, Houston TX
Permit hearing, water pollution control

Air Force Office of Scientific Research, Washington DC
Review and evaluation of environmental toxicology research program

U. S. Home, Inc., Galveston TX
Water pollution control-permit application and hearing

Orgain, Bell & Tucker, Attorneys at Law, Beaumont TX
Environmental microbiology

Amoco Production Company, Houston TX
Petroleum microbiology

JACA Corporation, Fort Washington PA
Biorestitution of contaminated aquifers

Llewelyn-Davies Sahni, Inc., Houston TX
Urban lake design and management

Eastern Research Group, Inc., Arlington MA
Sludge landfill risk assessment methodology

American Petroleum Institute, Washington DC
Microbiology of land treatment of hydrocarbons

Mitchell Energy and Development, Houston TX
Urban lake eutrophication management

J.R.B. Associates, Reston VA
Microbial aquifer restoration

Union Carbide, Institute WV
Ground water contamination problems at a manufacturing plant

State of South Carolina, Commission on Higher Education
Review of curricula in public universities

Procter and Gamble, Cincinnati OH
Transport and fate of NTA in the environment, risk assessment for consumer products,
and transport and fate of ground water contaminants

Sandia Laboratories, Albuquerque NM
Environmental evaluation of nuclear waste isolation pilot project (WIPP)

Pemex, Mexico
Ixtoc I oil well blow-out; designed plan for protection of estuaries and for evaluation of
the effects of petroleum on marine biota

Operations Research, Inc., Silver Spring MD
Co-authored report of research plan for a joint US-USSR Shuttle/Salyut Space Mission

Lawrence-Allison and Associates Corporation, Los Angeles CA
Participation in a proposed program for management and operation of underground oil
storage sites

Stanford Research Institute, Palo Alto CA
Collection of bottom samples of the Houston Ship Channel Turning Basin for
toxicological evaluation

Gulf Universities Research Consortium, Houston TX
Analysis and reevaluation of the Offshore Ecology investigation

Olin Chemicals Group, Lake Charles LA and Joilet IL

Algal solids problems in industrial wastewater treatment and water reuse
Castleman and Company, Houston TX
Preparation of ecological analyses of sites for new housing developments

Ecosciences Div., Henningson, Durham & Richardson, Santa Barbara CA
Preparation of a proposal to the Bureau of Land Management for environmental assessment of the SOHIO pipeline job

Baker and Botts, Attorneys at Law, Houston TX
Assessment of vegetation damage due to ammonia spill

Radian Corp., Austin TX
Preparation of ecological analysis of new petrochemical plant siting

Bernard Johnson, Inc., Houston TX
Environmental Impact Statement for expansion of Houston's Hobby Airport and Houston Intercontinental Airport

Eastex, Inc., Silsbee TX
Industrial water pollution control-N.P.D.E.S permit requirements and procedures

Espey, Huston and Associates, Austin TX
Monitoring of thermal pollution

Diamond Shamrock Company, Houston TX
Control of biological solids in wastewater treatment lagoons

Continental Oil Company, Lake Charles LA
Control of biological solids in wastewater treatment lagoons, industrial water pollution control

Exxon Corporation, Baytown TX
Control of biological solids in wastewater treatment lagoons, preparation and presentation of statement in support of N.P.D.E.S. permit from EPA

Bexar County Commissioners Court, San Antonio TX
Technical consultant and expert witness on water pollution control and pollution of the Edwards Aquifer

Edwards Underground Water District, San Antonio TX
Technical consultant and expert witness on water pollution control and pollution of the Edwards Aquifer

Texas Air Pollution Control Board, Austin TX
Diagnosis and evaluation of damage due to industrial air pollutants

Olson Laboratories, Inc., Dearborn MI
Preparation of Environmental Impact Statements

Houghton Mifflin Company, Boston MA
Review new texts in environmental science

National Aeronautics and Space Administration, Washington DC

Research proposal and program review; Viking project evaluation; member NASA Life Sciences Committee; Aerospace Medicine Advisory Committee

American Institute of Biological Sciences, Washington DC

Various assignments from grant proposal review to determine environmental impact of the NASA Space Shuttle program

Panhandle Eastern Pipeline Company, Houston TX

Preparation of article on environmental pollution for company magazine

American Oil Company, Chicago IL

Preparation and presentation of technical testimony on proposed water quality standards in Illinois

Amoco Chemicals Corporation, Chicago IL

Preparation of Environmental Impact Statement on disposal of waste activated sludge in the Gulf of Mexico

Gulf Environmental Systems, San Diego CA

Waste oil disposal techniques

Petroleum Associates of Lafayette, Lafayette LA

Microbial problem with bipolymer used in drilling fluids

Hudson Engineering Corporation, Houston TX

Environmental control of greenhouse; culture and propagation of orchids