

Joseph B. Hughes Ph.D., P.E., DEE

Professor and Chair
School of Civil and Environmental Engineering
Georgia Institute of Technology
790 Atlantic Dr. N.W.,
Atlanta, GA 30332-0355
(404)894-2201 e-mail: joseph.hughes@ce.gatech.edu

Academic Appointments

Georgia Institute of Technology

Professor and Chair, School of Civil and Environmental Engineering,
2003-present.

Professor, School of Material Science and Engineering, 2005-present

Rice University

Adjunct Professor, Department of Civil and Environmental Engineering, 2003-present.

Professor and Chair, Department of Civil and Environmental Engineering,
2001 to 2003.

Professor and Chair, Department of Environmental Science and Engineering,
2001.

Associate Professor and Chair, Department of Environmental Science and Engineering,
1999-2001.

Associate Professor, Department of Environmental Science and Engineering,
1998-2001.

Assistant Professor, Department of Environmental Science and Engineering,
1992-1998.

Nankai University (Tianjin, China)

Guest Professor, College of Engineering, 2004-present.

Van Hall Institute (Gröningen, The Netherlands)

Visiting Lecturer, 1994.

University of Iowa

Research Assistant, Department of Civil and Environmental Engineering, 1988-1992.

Research Assistant, Department of Biochemistry, 1987.

Cornell College

Instructor, Department of Chemistry, 1986-1987.

Education

Ph.D. Civil and Environmental Engineering, The University of Iowa, 1992.

M.S. Civil and Environmental Engineering, The University of Iowa, 1989.

B.A. Chemistry, Cornell College, 1986.

Professional Registration

Registered Professional Engineer, State of Texas, license number 89083.

Honors

CH²MHill Outstanding Doctoral Dissertation Award, as Advisor, Association of Environmental Engineering and Science Professors, 2007.

John McClanahan Henske Distinguished Lecture in Chemical /Environmental Engineering, Yale University, 2007.

McKee Medal, Water Environment Federation, 2007.

Diplomate by Eminence, American Academy of Environmental Engineering, 2007.

AIChE's Best Applied Paper Award, South Texas Section, 2005.

Georgia Institute of Technology Advanced Leadership Program, 2005.

Walter P. Huber Research Prize, American Society of Civil Engineers, 2005.

Organizer, National Academy of Engineering 9th Annual Frontiers of Engineering Symposium, 2003.

Charles Duncan Award for Outstanding Academic Achievement, Rice University, 2002.

ASCE Outstanding Professor Award, Rice University, 1997 and 2002.

Invited Speaker, National Academy of Engineering and Van Humbolt Foundation 4th Annual German-American Frontiers of Engineering Symposium, 2001.

Distinguished Alumnus Address, University of Iowa, 2000.

Invited Speaker, National Academy of Engineering 1st Annual Frontiers of Engineering Symposium, 1995.

Biocatalysis and Bioprocessing Graduate Fellow, University of Iowa, 1990-1992.

Iowa Water Pollution Control Association: William Kirstin Scholarship, 1989.

Listed in International Who's Who of Professionals

Honorary Societies

Chi Epsilon

Professional Activities

Member and Chair, Cornell University School of Civil and Environmental Engineering External Review Committee, 2006.

Member, University of Missouri-Rolla Civil Engineering Advisory Board, 2005 to present

Associate-Director for Research, U.S. EPA Hazardous Substances Research Center South and Southwest, 2001 to 2006

Director, Environmental Nanotechnology Research Group, NSF Center for Biological and Environmental Nanotechnology, 2002 to present.

Member, U.S. EPA Environmental Engineering Science Advisory Board, 2003 – present.
Reviewer, Civil Engineering Department, Kuwait University, Kuwait City, Kuwait, 2004.
Director, Environmental Analysis and Decision Making Graduate Program, 2001 to 2003.

Member and Chair, West Coast Hazardous Substances Research Center Science Advisory Board, 2002-2006.

Member, Association of Environmental Engineering and Science Professors (AEESP) Strategic Planning Committee, 2002.

Member, National Research Council Committee on Bioavailability of Contaminants in Soils and Sediments, 2000 to 2002

Member, U.S. Environmental Protection Agency Committee on Monitored Natural Attenuation, 2000 to 2001.

Member, U.S. Department of Defense Strategic Environmental Research and Development Program (SERDP) Technical Advisory Committee, 2000 to 2001.

Member, U.S. Department of Energy, Evaluation Committee on Subsurface Contaminants Focus Group, 1997.

Professional Societies

American Society of Civil Engineers (ASCE)

American Chemical Society (ACS)

American Association of Engineering Education (AAEE)

Association of Environmental Engineering and Science Professors (AEESP)

American Association for the Advancement of Science (AAAS)

Reviewer

Environmental Science and Technology

Environmental Toxicology and Chemistry

ASCE Journal of Environmental Engineering

Biotechnology Progress

Applied and Environmental Microbiology

Water Research

Research Interest

The development of engineered processes that harness the novel metabolic capabilities of living organisms (bacteria and plants) for use in the remediation of media containing hazardous or anthropogenic wastes. Key Words: *Bioremediation, Environmental Biotechnology, Chemical Fate and Transport, Hazardous Waste Engineering.*

Publications and Written Works

Journals

1. Himmelheber, D., M. Tailfert, and J. B. Hughes (2007) "Spatial and Temporal Evolution of Biogeochemical Processes Following In Situ Capping of Contaminated Sediments", submitted to *Environmental Science and Technology*.
2. Tront, J., J. Fortner, M. Plöte, J. B. Hughes, A. Puzrin "Biological Sensor for Detection of Biological Degradation Activity in the Subsurface" (2007) submitted to *Environmental Science and Technology*.
3. Daprato, R. C., B. K. Amos, F. E. Löffler, and J. B. Hughes (2007) "Dechlorination of Tetrachloroethene (PCE) in the Presence of the Anionic Surfactant Steol 330: Effects on Pure and Mixed Cultures", submitted to *Environmental Toxicology and Chemistry*.
4. Pennell, K. Y. Wang, J. Fortner, J. B. Hughes, L. Abriola, and Y. Li (2007) "Transport and Retention of C60 Nano-particles in Water-Saturated Porous Media", submitted to *Environmental Science and Technology*.
5. Fortner, J. D., D. I. Kim, A. M. Boyd, J. C. Falkner, V.C. Colvin, J. B. Hughes and J. H. Kim, (2007) "Reaction of Water Stable C₆₀ Aggregates with Ozone" *Environmental Science and Technology*, (41)7497-7502.
6. Daprato, R. C., F. E. Löffler, and J. B. Hughes (2007) "Comparative Analysis of Three Tetrachloroethene to Ethene Halorespiring Consortia Suggests Functional Redundancy", *Environmental Science and Technology*, (41)2261-69.
7. Himmelheber, D., K D. Pennell, and J. B. Hughes (2007) "Natural Attenuation Processes During In Situ Capping", *Environmental Science and Technology*, (41) 5306-13.
8. Lee, J., J. D. Fortner, J. B. Hughes, and J-H. Kim (2007) "Photochemical Production of Reactive Oxygen Species by C₆₀ in the Aqueous Phase during UV Illumination", *Environmental Science and Technology*, (41)2529-35.
9. Amos, B. K., R. C. Daprato, J. B. Hughes, K. D. Pennell, and F. E. Löffler (2007) "Effect of Nonionic Surfactant Tween 80 on Microbial Reductive Dechlorination of Chloroethenes", *Environmental Science and Technology*, (41)1710-1716..
10. Hyung, H., J. D. Fortner, J. B. Hughes, and J-H. Kim, (2007) "Natural Organic Matter Stabilization of Multi-Walled Nanotubes in Water", *Environmental Science and Technology*, (41)179-184.
11. Beckles, D., W. Chen, and J. B. Hughes (2007) "Bioavailability of PAHs sequestered in sediment: microbial study and model prediction", *Environmental Toxicology and Chemistry*, (26)878-883.
12. Da Silva, M. L. B., R. C. Daprato, D. E. Gomez, J. B. Hughes, P. J. J Alvarez, and C. H. Ward, (2006) "Comparison of Bioaugmentation and Biostimulation for the Enhancement of DNAPL Source Zone Remediation", *Water Environment Research*, 78(13) 2456 - 2465. (recipient of *The McKee Medal*, *Water Environment Federation*)
13. Lyon, D. Y., J. D. Fortner, C. M. Sayes, V. L. Colvin, and J. B. Hughes. (2005). "Bacterial cell association and antimicrobial activity of a C60 water suspension." *Environmental Toxicology and Chemistry* 24(11): 2757–2762.

14. Daprato, R.C., C. Zhang, J. C. Spain, and J. B. Hughes (2005). "Modeling Aerobic Bioremediation of 2,4-Dinitrotoluene in a Bioslurry Reactor," *Environmental Engineering Science*, 22(5) 676-688 .
15. Tront, J., and J. B. Hughes (2005) "Oxidative Microbial Degradation of 2,4,6-Trinitrotoluene via 3-methyl-4,6-dinitrocatechol", *Environmental Science and Technology*, (39), 4540-4549.
16. Fortner, J D. D. Lyon, V. L. Colvin, and J. B. Hughes (2005) "C₆₀ in Water: Nanocrystal Formation and Biological Effects" *Environmental Science and Technology*, (39), 4307-4316
17. Nutt, M. O. J. B. Hughes, and M. S. Wong (2004) "Designing Pd-on-Au Bimetallic Nanoparticle Catalysts for Trichloroethene Hydrodechlorination", *Environmental Science and Technology*, (39)1346-1353. (recipient of AIChE's Best Applied Paper Award, South Texas Section)
18. Sayes C. M, J. D. Fortner, W. Guo, D. Lyon, A. M. Boyd, K. D. Ausman, Y. J. Tao, B. Sitharaman, L. J. Wilson, J. B. Hughes, J. L. West, V. L. Colvin (2004) "The Differential Cytotoxicity of Water Soluble Fullerenes", *Nanotechnology Letters*, (4)1881-87.
19. Zhang, C. and J. B. Hughes (2004) "Bacterial Energetics, Stoichiometry, and Kinetic Modeling of 2,4-Dinitrotoluene Biodegradation in a Batch Respirometer", *Environmental Toxicology and Chemistry*, (23)2799-2806.
20. Adamson, D. T. and J. B. Hughes (2004) "Flux and Product Distribution During Biological Treatment of PCE DNAPL", *Environmental Science and Technology*, (38), 2021-28.
21. Fleischmann, T.J., K.C. Walker, J.C. Spain, J.B. Hughes, and A.M. Craig (2004) "Anaerobic transformation of 2,4,6-TNT by bovine ruminal microbes", *Biochem. Biophys. Res. Comm.* (314), 957-963.
22. Fortner, J. D. , C. Zhang, J. C. Spain, and J. B. Hughes (2003) "Soil Column Evaluation of Factors Controlling Biodegradation of DNT in the Vadose Zone", *Environmental Science and Technology*, (37), 3382-91.
23. Wang, C., D. Lyon, J. B. Hughes and G. N. Bennett (2003) "Role of hydroxylamine intermediates in the phytotransformation of 2,4,6-trinitrotoluene by *Myriophyllum aquaticum*." *Environmental Science and Technology*, (37), 3595-600.
24. Adamson, D. T., J. McDade, and J. B. Hughes (2003) "Inoculation of a DNAPL Source Zone to Initiate Reductive Dechlorination of PCE", *Environmental Science and Technology*, (37), 2525-33.
25. McGuire, T. and J. B. Hughes (2003) "Effects of Surfactants on the Dechlorination of Chlorinated Ethenes", *Environmental Toxicology and Chemistry*, (22), 2630-38
26. Padda R. S., C. Wang, J. B. Hughes, R. Kutty and G. N. Bennett (2003) "Mutagenicity of Nitroaromatic Degradation Compounds", *Environmental Toxicology and Chemistry*, (22), 2293-97.
27. Watrous, M, S. Clark, R. Kutty, S. Huang, F. Rudolph, J. B. Hughes, and G. N. Bennett, (2003) "2,4,6-Trinitrotoluene Reduction by an Fe-only Hydrogenase in *Clostridium acetobutylicum*", *Applied and Environmental Microbiology*, (69), 1542-47.

28. Zhang, C. and J. B. Hughes, (2002) "Kinetics and Metabolic Pathways of Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX) by *Clostridium acetobutylicum*" *Chemosphere*, (50), 665-71.
29. Ahmad, F. and J. B. Hughes (2002) "Reactivity of Partially Reduced Arylhydroxylamine and Nitrosoarene Metabolites of 2,4,6-Trinitrotoluene (TNT) Towards Biomass and Humic Acids", *Environmental Science and Technology*, (36), 4370-81.
30. Neale, C. N., A. W. Holder, C. H. Ward, and J. B. Hughes (2002) "Ground Water Reaeration Effects on Hydrocarbon Plumes: a Modeling Approach", *ASCE Journal of Environmental Engineering*, (128) 40-50.
31. Zhang, C., R. C., Daprato, S. F. Nishino, J. C. Spain, and J. B. Hughes (2001) "Remediation of Dinitrotoluene Contaminated Soils from Former Army Ammunition Plants: Soil Washing Efficiency and Effective Process Monitoring in Bioslurry Reactors", *Journal of Hazardous Materials*, (87) 139-154.
32. Zheng, D., C. S. Carr, and J. B. Hughes, (2001) "Influence of Hydraulic Retention Time on Extent of PCE Dechlorination and Preliminary Characterization of the Enrichment Culture", *Bioremediation Journal*, (5):159-168.
33. Cope, N. and J. B. Hughes, (2001) "Biologically-Enhanced Removal of PCE from NAPL Source Zones", *Environmental Science and Technology*, (35):2014-2021.
34. Bhadra, R., D. G. Wayment, R. K. Williams, S. N. Barman, M. B. Stone, J. B. Hughes, and J. V. Shanks, (2001) "Studies on Plant-Mediated Fate of the Explosives RDX and HMX", *Chemosphere*, 44(5): 1259-1264.
35. Padda, R. S. C. Y. Wang, J. B. Hughes, and G. N. Bennett, (2000) "Mutagenicity of Trinitrotoluene and its Metabolites Formed During Anaerobic Degradation by *Clostridium acetobutylicum* ATCC 824", *Environmental Toxicology and Chemistry*, (19):2871-2875.
36. Huang, S., P. A. Lindahl, C. Wang, G. N. Benett, F. B. Rudolph, and J. B. Hughes, (2000) "2,4,6-Trinitrotoluene (TNT) Reduction by Carbon Monoxide Deydrogenase from *Clostridium thermoaceticum*", *Applied and Environmental Microbiology*, (66):1474-1478.
37. Neale, C. N., J. B. Hughes, and C. H. Ward, (2000) "Impacts of Unsaturated Zone Properties on Oxygen Transport and Aquifer Reaeration", *Groundwater*, (38):784-794.
38. Zhang, C., J. B. Hughes, S. F. Nishino, and J. C. Spain, (2000) "Slurry-Phase Biological Treatment of 2,4-Dinitrotoluene and 2,6-Dinitrotoluene: Role of Bioaugmentation and Effects of High Dinitrotoluene Concentrations", *Environmental Science and Technology*, (34):2810-2816.
39. Tadros, M.G., A. Crawford, A. Mateo-Sullivan, C. Zhang, and J. B. Hughes, (2000) "Toxic Effects of Hydroxylamino Intermediates from Microbial Transformation of Trinitrotoluene and Dinitrotoluenes on Algae *Selenastrum capricornutum*", *Bulletin of Environmental Contamination and Toxicology*, (64):579-585.
40. Carr, C. S., S. Garg, and J. B. Hughes, (2000) "Effect of Dechlorination on the Longevity and Composition of NAPL Sources under Equilibrium Dissolution Conditions", *Environmental Science and Technology*, (34):1088-1094.

41. Wang, C. Y., D. Zheng, and J. B. Hughes, (2000) "Stability of Hydroxylamino and Amino Intermediates from Reduction of 2,4,6-Trinitrotoluene, 2,4-Dinitrotoluene and 2,6-Dinitrotoluene" *Biotechnology Letters*, (22):15-19.
42. Wayment, D. G., R. Bhadra, J. Lauritzen, J. B. Hughes, and J. V. Shanks, (1999) "A Transient Study of Conjugate Formation During TNT Metabolism by Axenic Plant Roots", *Journal of Phytoremediation*, (1):227-239.
43. Bhadra, R., R. J. Spanggord, D. G. Wayment, J. B. Hughes, and J. V. Shanks, (1999) "Characterization of Oxidation Products of TNT Metabolism in Aquatic Phytoremediation Systems of *Myriophyllum aquaticum*", *Environmental Science and Technology*, (33):3354-3361.
44. Holder, A.W., P. B. Bedient, and J. B. Hughes, (1999) "Modeling the Impact of Oxygen Reaeration on Natural Attenuation", *Bioremediation Journal*, (3):137-149.
45. Carr, C. S., and J. B. Hughes, "Response to Comment: Enrichment of High Rate PCE Dechlorination and Comparative Study of Lactate, Methanol, and Hydrogen as Electron Donors to Sustain Activity", *Environmental Science and Technology*, (33):2683-2684.
46. Hughes, J. B., C. Wang, and C. Zhang, (1999) "Anaerobic Transformation of 2,4- and 2,6-Dinitrotoluenes by *Clostridium acetobutylicum*: A Pathway Through Dihydroxylamino-Intermediates", *Environmental Science and Technology*, (33):1065-1070.
47. Gerlach, R., C. Zhang, M. Steioff, and J. B. Hughes, (1999) "Hydrophobic Electron Donors for the Reduction of Nitroaromatics in Anaerobic Sediments", *Journal of Contaminant Hydrology*, (36):91-104.
48. Bhadra, R., D. G. Wayment, J. B. Hughes, and J. V. Shanks, (1999) "Confirmation of Conjugation Processes During TNT Metabolism by Axenic Plant Roots", *Environmental Science and Technology*, (33):446-452.
49. Wang, C. and J. B. Hughes, (1998) "Derivatization and Separation of 2,4,6-Trinitrotoluene Metabolic Products", *Biotechnology Techniques*, (12):839-842.
50. Pucik, L. E. and J. B. Hughes, (1998) "Fate of TNT and TNT-Transformation Products in Aerobic Mixed Cultures", *Bioremediation Journal*, (2):57-67.
51. Beckles, D. M., C. H. Ward, and J. B. Hughes, (1998) "The Effect of Mixtures of PAHs and Sediments on Fluoranthene Biodegradation Patterns", *Environmental Toxicology and Chemistry*, (17):1246-1251.
52. Carr, C. S. and J. B. Hughes, (1998) "Enrichment of High Rate PCE Dechlorination and Comparative Study of Lactate, Methanol, and Hydrogen as Electron Donors to Sustain Activity", *Environmental Science and Technology*, (32):1817-1824.
53. Jee, V., D. Beckles, C. H. Ward, and J. B. Hughes, (1998) "Bioremediation of Phenathrene-Contaminated Estuarine Sediments", *Water Research*, (32):1231-1239.
54. Hughes, J. B., C. Wang, K. Yesland, A. Richardson, R. Bhadra, G. Bennett, and F. Rudolph, (1998) "Bamberger Rearrangement During TNT-Metabolism by *Clostridium acetobutylicum*", *Environmental Science and Technology*, (32):494-500.
55. Hughes, J. B., C. Wang, R. Bhadra, A. Richardson, G. Bennett, and F. Rudolph, (1998) "Reduction of 2,4,6-Trinitrotoluene by *Clostridium acetobutylicum* through

- Hydroxylamino-Nitrotoluene Intermediates”, *Environmental Toxicology and Chemistry*, (17):343-348.
56. Wang, C. Y., R. Bhadra, and J. B. Hughes, (1997) “The Rapid Separation of Reduction Products of 2,4,6-Trinitrotoluene using TLC” *Biotechnology Techniques*, (11):519-521.
57. Tadros, M. G. and J. B. Hughes, (1997) “Degradation of Polycyclic Aromatic Hydrocarbons (PAHs) by Indigenous Mixed and Pure Cultures Isolated from Coastal Sediments”, *Applied Biochemistry and Biotechnology*, (63-65):865-870.
58. Vanderford, M., J. V. Shanks, and J. B. Hughes, (1997) “Phytotransformation of Trinitrotoluene (TNT) and Distribution of Metabolic Products in *Myriophyllum aquaticum*”, *Biotechnology Letters*, (19):277-280.
59. Hughes, J. B., D. M. Beckles, S. D. Chandra, and C. H. Ward, (1997) “Utilization of Bioremediation Processes for the Treatment of PAH-Contaminated Sediments”, *Journal of Industrial Microbiology and Biotechnology*, (18):152-160.
60. Khan, T. A., R. Bhadra, and J. B. Hughes, (1997) “Transformation of TNT and Related Nitroaromatic Compounds by *Clostridium acetobutylicum*”, *Journal of Industrial Microbiology and Biotechnology*, (18):198-203.
61. Hughes, J. B., J. V. Shanks, M. Vanderford, J. Lauritzen (1997), “Transformation of TNT by Aquatic Plants and Plant Tissue Cultures”, *Environmental Science and Technology*, (31):266-271.
62. Pucik, L. E., and J. B. Hughes, (1996) “Capillary Electrophoretic Separation of TNT and its Transformation Products”, *Journal of Capillary Electrophoresis*, (3):209-215.
63. Chandra, S., C. H. Ward, and J. B. Hughes (1996), “Biodegradation of Sorbed Fluorene in Sediment Slurries”, *Hazardous Waste and Hazardous Materials*, (13):375-385.
64. Hughes, J. B., and G. F. Parkin, (1996). “Concentration Effects on Chlorinated Aliphatic Transformation Kinetics”, *ASCE Journal of Environmental Engineering*, (122):92-98.
65. Hughes, J. B., and G. F. Parkin, (1996). “Individual Biotransformation Rates in Chlorinated Aliphatic Mixtures”, *ASCE Journal of Environmental Engineering*, (122):99-106.
66. Tsomides, H. J., J. B. Hughes, J. M. Thomas, and C. H. Ward, (1995) “Effect of Surfactant Addition on Phenanthrene Biodegradation in Sediments”, *Environmental Toxicology and Chemistry*, (14):953-959.
67. Hughes, J. B. and G. F. Parkin, (1992) “The Effect of Mixtures of Xenobiotics and Primary Electron Donor on the Anaerobic Biotransformation of High Concentrations of Chlorinated Aliphatics”, *Water, Science and Technology*, (26):117-126.

Books

68. Metabolism of Nitroaromatics and Explosive Compounds, (2000) Eds. J. Spain, H. Knackmuss, and J. B. Hughes, CRC Press, Boca Raton, FL.

Book Chapters

69. Ahmad, F., J.B. Hughes, and G.N. Bennett, (2005) “Biodegradation of Hazardous Materials by Clostridia”, Handbook on Clostridia, Peter Durre, ed. CRC Press, Boca Raton, FL.
70. Bock, C., M. Kolb, M Bokern, H. Harms, M. Mackova, L. Chroma, T. Macek, J. B. Hughes, C. Just, and J. Schnoor (2002) “Advances in Phytoremediation:

Phytotransformation” in Innovative Approaches to the On-Site Assessment and Remediation of Contaminated Sites, D. Reible and K. Demnerova, Eds. NATO Science Series, Volume 15. Kluwer Academic Publishers, Boston.

71. Ward, C.H., J. B. Hughes G. A. Pope, M. Delshad, V. Dwaranath, J. Spain, S. Nishino, J. S. Fruchter, W. R. Vermeul, M. D. Williams, and J. E. Szecsody (2002) “In-Situ Treatment Technologies”, Environmental Restoration, in Innovative Approaches to the On-Site Assessment and Remediation of Contaminated Sites, D. Reible and K. Demnerova, Eds. NATO Science Series, Volume 15. Kluwer Academic Publishers, Boston.
72. Ahmad, F. and J. B. Hughes, (2000) “Anaerobic Transformation of TNT by *Clostridium*”, Chapter 8 of Metabolism of Nitroaromatics and Explosive Compounds, Eds. J. Spain, H. Knackmuss, and J. B. Hughes, CRC Press, Boca Raton, FL.
73. Hughes, J. B., C. N. Neale, and C. H. Ward (2000) “Bioremediation”, Encyclopedia of Microbiology, Academic Press, San Diego, CA.
74. Hughes, J. B., (1999) “Fate Processes”, Chapter 7 of Groundwater Contamination: Transport and Remediation, Ed. III, by Bedient, Rifai and Newell, Prentice-Hall, NJ.
75. Reible, D., R. Chaney, and J. B. Hughes (1999) “Bioavailability”, in Environmental Availability in Soils: of Chlorinated Organics, Explosives, and Heavy Metals, Eds. W.C. Anderson, R. C. Loehr, and B. P. Smith, American Academy of Environmental Engineers, Annapolis, MD.
76. Hughes, J. B. (1996) “Biological Treatment of Hazardous Wastes”, Frontiers of Engineering, National Academy Press, Washington, D.C.

Other

77. Hughes, J. B., K. Dustin, and C. H. Ward (2002) Bioremediation, Published Electronically by the Ground-Water Remediation Analysis Center.
78. Biodegradation of 2,4- and 2,6-Dinitrotoluene in a Pilot-Scale System for Soil Contaminated with Explosive Compounds (2007), *Environmental Science (In Chinese)*,**28**(3).

Patents

79. Hughes, J. B., C. J. Newell, R. T. Fisher, “Process for *in situ* Biodegradation of Chlorinated Aliphatic Hydrocarbons by Subsurface Hydrogen Injection,” February 11, 1997, U. S. Patent Number 5,602,296.

Ph.D. Dissertation

80. Hughes, J. B. (1992) “Anaerobic Biotransformation of Chlorinated Aliphatics: Interactions with Primary Substrate Utilization and Effects of Mixtures,” Ph.D. Dissertation, University of Iowa, Iowa City, IA.

Selected Conference Proceedings

81. Newell, C. J., C. E. Aziz, P. E. Haas, J. B. Hughes, and T. A. Khan, (2001) “Two Novel Methods for Enhancing Source Zone Bioremediation: Direct Hydrogen Addition and Electron Acceptor Diversion, In Situ and On-Site Bioremediation”, Battelle Press, Columbus, OH, In Press.
82. Newell, C. J., P. E. Haas, J. B. Hughes, and T. A. Khan, (2000) "Results From Two Direct Hydrogen Delivery Field Tests For Enhanced Dechlorination," Bioremediation

- and Phytoremediation of Chlorinated and Recalcitrant Compounds, Battelle Press, Columbus, OH, pg. 21-38.
83. Bhadra, R., R. J. Spanggord, D. G. Wayment, J. B. Hughes, and J. V. Shanks (1999) "Oxidative Metabolism of 2,4,6-Trinitrotoluene in aquatic phytoremediation systems of *Myriophyllum aquaticum*", In Wetlands and Remediation, Battelle Press, Columbus, OH, p. 127-132
 84. Bhadra, R., D. G. Wayment, J. B. Hughes, and J. V. Shanks, (1999) "Conjugate Formation During the Metabolism of 2,4,6-Trinitrotoluene in Plant Roots", In Phytoremediation and Innovative Strategies for Specialized Remedial Applications, Battelle Press, Columbus, OH, p. 121-126.
 85. Ferone, W. A., S. S. Koenigsberg, and J. B. Hughes, (1999) "Chemical Dynamics Model for CAH Remediation with Polylactate Esters" Engineering Approaches for In Situ Bioremediation of Chlorinated Solvent Contamination, Battelle Press, Columbus, OH, p. 287-292.
 86. Fisher, R. T., C. J. Newell, P. E. Hass, and J. B. Hughes, (1999) "Treatability Studies of Hydrogen-Enhanced Bioremediation of Chlorinated Solvent-Impacted Media" Engineering Approaches for In Situ Bioremediation of Chlorinated Solvent Contamination, Battelle Press, Columbus, OH, p. 185-189.
 87. Bhadra, R., D. G. Wayment, J. B. Hughes, and J. V. Shanks, (1999) "Conjugate Formation During the Metabolism of 2,4,6-Trinitrotoluene in Plant Roots" Phytoremediation and Innovative Strategies for Specialized Remedial Applications, Battelle Press, Columbus, OH, p. 121-126.
 88. Bhadra, R., D. G. Wayment, J. B. Hughes, and J. V. Shanks, "Biochemical Pathways of 2,4,6-Trinitrotoluene Abatement by Phytoremediation" AIChE Symposium Series, Topical Conference on Pollution Prevention and Environmental Reduction, Miami Beach, FL, 1998.
 89. Newell, C. J., J. B. Hughes, R. T. Fisher, and P. E. Haas, (1998) "Subsurface Hydrogen Addition for the In Situ Bioremediation of Chlorinated Solvents", Designing and Applying Treatment Technologies, Battelle Press, Columbus, OH, (6):47-52.
 90. Holder, A. W., P. B. Bedient, and J. B. Hughes, (1998) "TCE and 1,2-DCE Biotransformation inside a Biologically Active Zone", Natural Attenuation of Chlorinated and Recalcitrant Compounds, Battelle Press, Columbus, OH, (3):219-224.
 91. Lauritzen, J. R., J. B. Hughes, and J. V. Shanks, "Phytoremediation of TNT: *C. roseus* Hairy Roots as a Model System." Proceeding of the Fifth World Congress of Chemical Engineers, 1996.
 92. Gerlach, R.; Steiof, M. & Hughes, J. B., Anaerober Abbau substituierter aromatischer Verbindungen in Sedimenten (Anaerobic Degradation of Substituted Aromatic Compounds in Sediments). In Kreysa, G. & J. Wiesner (eds.): In situ Sanierung von Boeden. Resuemee und Beitrage des 11. DECHEMA Fachgesprachs Umweltschutz / DECHEMA, Deutsche Gesellschaft für Chemisches Apparatewesen, Chemische Technik und Biotechnologie e.V., Frankfurt am Main, 1996.
 93. Chandra, S., Hughes, J. B., Ward, C. H., "Bioremediation of PAH-Contaminated Sediments." AIChE Spring National Meeting, New Orleans, LA, February 1996.

94. Chandra, S., Hughes, J. B., Ward, C. H., "Biodegradation of Sediment Sorbed Fluorene," *Proceedings of the 7th Annual ACS, I&EC Division Special Symposium on Emerging Technologies in Hazardous Waste Management*, Atlanta, GA September 1995.
95. Jee, V. J. B. Hughes, and C. H. Ward, "Bioremediation of Contaminated Sediments," 21st Annual RREL Research Symposium, Cincinnati, OH (1995), EPA/600/R-95/012.
96. Hughes, J. B. and G. F. Parkin, (1991) "The Effect of Electron Donor Concentration on the Transformation of Chlorinated Aliphatics", In Situ and On-Site Bioreclamation, Processes for Xenobiotic and Hydrocarbon Treatment, Butterworths, Inc. p. 55-79.
97. Hughes, J. B. and G. F. Parkin, "The Effect of Mixtures of Xenobiotics and Primary Electron Donor on the Anaerobic Biotransformation of High Concentrations of Chlorinated Aliphatics," *Proceedings of the Conference on Hazardous Waste Research*, Kansas State University, Manhattan, KS. 1991.
98. Hughes, J. B. and G. F. Parkin, "The Effect of Influent Acetate Concentration on the Transformation of Chlorinated Aliphatic Compounds in Fixed Film Anaerobic Filters," *Proceedings of the Conference on Hazardous Waste Research*, Kansas State University, Manhattan, KS. 1990.

Presentations, Invited Lectures, & Sections Chaired

99. "Fate and Transformation of Carbon Nanomaterials in Natural and Engineered Systems", The John McClanahan Henske Distinguished Lecture in Chemical Engineering, Yale University, New Haven, CT, October, 2007.
100. "The Global Water Challenge: Quantity, Quality, and Security", Georgia Institute of Technology, October, 2007.
101. "Global Warming and Sustainable Development", Oxford Round Table, Oxford University, UK, August 2007.
102. "Sustainability, Energy and Environment" Coca-Cola Enterprises Cooperate Summit, Atlanta, GA, June 2007.
103. "The Global Water Crisis: A Grand Challenge for Environmental Engineers", AAAS Annual Meeting, San Francisco, CA, February, 2007.
104. "Rebuilding the New Orleans Region: Infrastructure Systems and Technology Innovation", Organizer, New Orleans Louisiana, September, 2006.
105. "Final Report: Mangrove Decay in Cabinda, Angola", Ministry of Infrastructure and Environment, Luanda, Angola and Cabinda, Angola, July, 2006.
106. "Anthropogenic Activity and Evolutionary Response", Workshop Chair and Keynote Address, Beijing University, Beijing, China, July, 2005.
107. "Bio- and Nanotechnologies for Geoenvironmental Engineering", Institute for Geotechnical Engineering, Eidgenossische Technische Hochschule Zurich (ETH), March, 2005.
108. "A Grand Challenge for Environmental Scientists and Engineers: The Evolutionary Response to the Industrial Age", Beijing University, Beijing China, January, 2005.
109. "Out of Iowa. In to Africa: Infrastructure Needs in Developing Countries", University of Iowa, November 2004.

110. "Harnessing Novel Metabolic Processes for the Restoration and Maintenance of Environmental Systems", Nankai University, College of Environmental Science and Engineering, Tianjin, China, September, 2004.
111. "Report on Mangrove Decay in Cabinda, Angola. Phase 1: Satellite Image Analysis", Ministry of Infrastructure and Environment, Luanda, Angola and Cabinda, Angola, May, 2004.
112. "Global Challenges in Environmental Engineering" Keynote Address, AEESP Annual Conference, School of Civil and Environmental Engineering, Georgia Institute of Technology, March, 2004
113. "Harnessing Novel Metabolic Processes for the Restoration and Maintenance of Environmental Systems", Georgia State University, Department of Biology, February, 2004.
114. "Engineering Biogeochemical Processes for Applications in Geosystems Engineering", NRC Workshop on Research Opportunities in GeoEngineering, Irvine, CA, February, 2004.
115. "The Nanotechnology Age: An Emerging Challenge for Environmental Scientists and Engineers", School of Civil and Environmental Engineering, Georgia Institute of Technology, January, 2004.
116. "Environmental Biotechnology" School of Chemistry and Biochemistry, Georgia Institute of Technology, December, 2003.
117. "Exposure Routes for Nanomaterials: Developing the Science Needed for Risk Assessment", Nanodays Conference, Rice University, Houston, TX, October, 2003.
118. "TNT Bioremediation: What Happens when a Pollutant Disappears?", 25 Years of Hazardous Substance Research at Louisiana State University, Baton Rouge, LA, May, 2003.
119. "Harnessing Novel Metabolic Processes for the Restoration and Maintenance of Environmental Systems", Department of Earth and Environmental Engineering, Columbia University, New York, NY, February, 2003.
120. "Biotransformation Reactions of Explosive Compounds by Bacteria and Plants" SERDP Partners in Environmental Technology Symposium, Washington D.C., November, 2002.
121. "Environmental Uses of Nanotechnology: In Search of Widgets", Center for Biological and Environmental Nanotechnology, Rice University, Houston, TX, October, 2002.
122. "Reactive Capping Using Elemental Iron to Enhance Reductive Processes in Anacostia River Sediments", Baton Rouge, LA, October, 2002.
123. "Mineralización de contaminantes nitroaromáticos" Taller Internacional de Restauración y Manejo Sustentable del Agua, Universidad Autónoma Metropolitana, Mexico City, Mexico, September, 2002.
124. "Biorrestauración de solventes clorados en zonas DNAPL" Taller Internacional de Restauración y Manejo Sustentable del Agua, Universidad Autónoma Metropolitana, Mexico City, Mexico, September, 2002.
125. "Factor Controlling Dinitrotoluene Mineralization in Badger Army Ammunition Plant Soils" Badger Army Ammunition Plant, Baraboo, WI., September, 2002

126. Session Chair, “Bioremediation”, Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
127. “Principles of Subsurface Microbiology”, Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
128. “Bioremediation Technologies” Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
129. “Bioremediation of Hydrocarbons” Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
130. “Anaerobic Bioremediation of Chlorinated Solvents” Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
131. “Phytoremediation of Nitroaromatic Pollutants” Innovative Approaches to the In-Situ Assessment and Remediation of Contaminated Sites NSF Pan-American Advanced Study Institute, Rio de Janeiro, Brazil August 2002.
132. “Potential Strategy for Ring Fission of TNT using Clostridial Metabolism”. Bioremediation of Chlorinated Solvent and Recalcitrant Compounds, Monterey, CA., May, 2002.
133. “Physical Chemistry of Reductive Dechlorination in Aquifers”, Regenesis Symposium on Bioremediation of Chlorinated Solvents, Monterey, CA., May, 2002
134. “Twelve Billion People: What are We Thinking About”, Rice University Alumni College, Houston, TX., April, 2002.
135. “Anaerobic Bioremediation of DNAPL-Contaminated Aquifers: Potential Benefits and Existing Challenges”, Swiss Federal Institute for Science and Technology (EAWAG), Dubendorf, Switzerland, March, 2002.
136. “Enhancement of DNAPL Dissolution by Dechlorination Processes”, SERDP Partners in Environmental Technology 2001 Symposium, Washington D.C., November, 2001.
137. Member, “Expert Panel on DNAPL Source Zone Remediation Technologies”, held in conjunction with SERDP Partners in Environmental Technology 2001 Symposium, Washington D.C., November, 2001.
138. “Twelve Billion People: What are We Thinking About”, National Academy of Engineering and Alexander Van Humbolt Foundation 4th Annual German-American Frontiers of Engineering Symposium, Essen Germany, October, 2001.
139. “Role of Reduction Intermediates in TNT Metabolism”, Biofilm Engineering Research Center, Montana State University, Bozeman, MT, October, 2001.
140. “Twelve Billion People: What are We Thinking About”, Address to the George R. Brown School of Engineering, Rice University, Houston, TX, September, 2001.
141. Chair, Session on “Enhanced Bioremediation of DNAPL Source Zones”, In Situ and On-Site Bioremediation, 6th International Symposium, San Diego, CA, June, 2001.

142. "Biologically Enhanced DNAPL Dissolution: Role of NAPL Composition on Observed Contaminant Flux Rates, In Situ and On-Site Bioremediation, 6th International Symposium, San Diego, CA, June, 2001.
143. "The Effect of Dechlorinating Bacteria on PCE-Containing NAPL", In Situ and On-Site Bioremediation, 6th International Symposium, San Diego, CA, June, 2001.
144. "Explosives Compound Transformation", NATO Advanced Study Institute Program on Innovative Approaches to the On-Site Assessment and Remediation of Contaminated Sites, Prague, Czech Republic, May, 2001.
145. "DNAPL Source-Zone Bioremediation", NATO Advanced Study Institute Program on Innovative Approaches to the On-Site Assessment and Remediation of Contaminated Sites, Prague, Czech Republic, May, 2001.
146. "Earth Systems Engineering: What does it mean?" Department of Civil, Environmental, and Architectural Engineering, University of Colorado at Boulder, Boulder, CO, May, 2001.
147. "Engineering and the Environment", Department of Mechanical Engineering and Materials Science, Rice University, Houston, TX, January, 2001.
148. "Engineering and the Environment", Rice University Women's Alumni Society, Houston, TX, January, 2001.
149. "Living on the Edge: Can We Save a Few Hundred Billion Dollars?" International Symposium on Biocatalysis and Bioprocessing, University of Iowa, Iowa City, Iowa, November, 2000.
150. "Bioremediation of DNAPL Source Zones: Laboratory Confirmation and Field Evidence", Department of Civil and Environmental Engineering, Pennsylvania State University, State College Pennsylvania, October, 2000.
151. "Metabolism of Nitroaromatics: What Happens when TNT Disappears" Hazardous Substance Research Centers Research Symposium, Pacific Grove, CA, July 2000.
152. "Monitored Natural Attenuation" Johnson and Johnson International Environmental Symposia, San Juan, Puerto Rico, April, 2000.
153. "Time is Money: How to Reduce the Cost of Our Most Expensive Groundwater Problem", Rice University Department of Chemical Engineering, Houston, TX, October, 1999.
154. Co-Host of the 2nd International Conference on Nitroaromatic Metabolism, with J. Spain and H. Knackmuss, Leesburg, VA, September, 1999.
155. "Metabolism of Nitroaromatic Metabolism by *Clostridia*" 2nd International Conference on Nitroaromatic Metabolism, Leesburg, VA, September, 1999.
156. "Bioavailability of Desorption Resistant PAH's", Conference on Hazardous Waste Research: Gateways to Environmental Solutions, St. Louis, MO, May, 1999.
157. "Bioslurry Reactors", Session Chair, In Situ and On-Site Bioremediation, 5th International Symposium, San Diego, CA, April, 1999.
158. "Bioavailability of Irreversibly Sorbed PAHs in Slurry Reactors", In Situ and On-Site Bioremediation, 5th International Symposium, San Diego, CA, April, 1999.
159. "Reduction of Nitroaromatic Explosives by *Clostridium acetobutylicum*", In Situ and On-Site Bioremediation, 5th International Symposium, San Diego, CA, April, 1999.

160. "Oxygen Flux Through Various Soils and its Impact on Biodegradation", In Situ and On-Site Bioremediation, 5th International Symposium, San Diego, CA, April, 1999.
161. "Ability of Dechlorination to Influence DNAPL Dissolution Rates", In Situ and On-Site Bioremediation, 5th International Symposium, San Diego, CA, April, 1999.
162. "Hydroxylamine Formation and Fate During Anaerobic Metabolism of Nitroaromatic Explosives", Swiss Federal Institute for Science and Technology (EAWAG), Dubendorf, Switerland, March, 1999.
163. "Hydroxylamine Formation and Fate During Anaerobic Metabolism of Nitroaromatic Explosives", Air Force Research Laboratory, Tyndall Air Force Base, FL, February, 1999.
164. "Impact of Plants on the Fate of Explosives", Los Alamos National Laboratory, Los Alamos, NM, January, 1999.
165. "Electron Donor Delivery and *In Situ* Dechlorination", SERDP Partners in Environmental Technology 98 Symposium, Washington D.C., December, 1998.
166. "Integration of Natural Attenuation with Site Groundwater Management", Golder Natural Attenuation Seminar, San Fransico, CA, November, 1998.
167. "Superfund: Can We Improve Our Record?", Deans Series of Engineering Continuing Education, Rice Universtiy, Houston, TX, April 1998.
168. "Integration of Natural Attenuation with Site Groundwater Management", Golder Natural Attenuation Seminar, Princeton, NJ, April, 1998.
169. "Bioavailability of Sorbed-Phase Naphthalene", AIChE Spring National Meeting, New Orleans, LA, March, 1998.
170. "Uptake and Transformation of Nitroaromatics by Aquatic Plants", Georgia Institute of Technology, Atlanta, GA, February, 1998
171. "Uptake and Transformation of Nitroaromatics by Aquatic Plants", Beneficial Effects of Vegetation on Contaminated Soils, Manhattan, KS, January 1998.
172. "Transformation of TNT via Hydroxylamino-Nitrotoluene Intermediates", ACS Symposium on Emerging Technology in Hazardous Waste Management, Pittsburgh, PA, September 1997.
173. "Bioremediation", Remediation of NAPL Contaminated Sites: A Two Day Critical Review of the State-of-the-Art, Albany, NY, June 1997.
174. Session Chair, In Situ and On-Site Bioremediation, New Orleans, LA, April, 1997.
175. Session Chair, WERC & HSRC '97 Joint Conference on the Environment, Albuquerque, NM, April 1997.
176. "Transformation of TNT by *Clostridium acetobutylicum* through Hydroxylaminonitrotoluene Intermediates", WERC & HSRC '97 Joint Conference on the Environment, Albuquerque, NM, April 1997.
177. "Frontiers of Bioremediation" Shell Scholars Forum on Bioremediation, University of Houston, Houston, TX, April, 1997.
178. "Phytoremediation of TNT: *C. roseus* Hairy Roots as a Model System" J. Lauritzen, J. Hughes, and J. Shanks, Fifth World Congress of Chemical Engineering, San Diego, CA. July 1996.

179. "Kinetics and Fate of Transformation of 2,4,6-Trinitrotoluene by Aquatic Plants and Plant Tissue Cultures" with R. Bhadra, J. Lauritzen, J. Hughes and J. Shanks, Annual Meeting of the American Institute of Chemical Engineers, Chicago, IL., November 1996.
180. "Attenuation of TCE in the Presence of Toluene" University of Michigan, Ann Arbor, MI, September 1996.
181. "Transformation of Nitroaromatic Compounds by Plants and Bacteria," University of Iowa, Iowa City, IA, June 1996.
182. "Transformation of TNT by Aquatic Plants," International Symposium on Phytoremediation, Washington DC, May, 1996.
183. "Bioremediation of PAH-Contaminated Sediments." AIChE Spring National Meeting, New Orleans, LA, February, 1996.
184. "Advances in Anaerobic Biological Processes." City of Houston Wastewater Treatment Division, Houston, TX, October 1995.
185. "Biological Treatment of Hazardous Wastes." National Academy of Engineering 1st Annual Frontiers of Engineering Symposium, Irvine, CA, September 1995.
186. "Bioremediation of PAH Contaminated Sediments." 7th Annual ACS, I&EC Division Special Symposium on Emerging Technologies in Hazardous Waste Management, Atlanta, GA September 1995.
187. "Microbial and Plant Transformation of 2,4,6-Trinitrotoluene." Presented to representatives of the Tennessee Valley Authority, Army Environmental Center, U. S. EPA, and Army Corps of Engineers. Muscle Shoals, AL, August 1995.
188. "Transformation of TNT and Related Nitroaromatics by *Clostridium acetobutylicum*." Society of Industrial Microbiology, San Jose, CA, August 1995.
189. "Phytoremediation of TNT Contaminated Soils and Groundwaters." HSRC Five Centers Conference - From Flask to Field, Lincoln City, OR, July 1995.
190. "Phytoremediation of TNT Contaminated Soils." U.S. EPA Athens Laboratory, Athens Ga. June, 1995.
191. "*In situ* Phytoremediation of TNT-Contaminated Soils." Conference for the Bioremediation of Munitions Contaminated Soils, Kansas State University, May 22, 1995.
192. "Phytoremediation of TNT-Contaminated Soils." 3rd Annual Bioremediation Workshop, Texas A&M University, College Station, Texas, April, 1995.
193. "Bioremediation of PAH-Contaminated Sediments." Prairie View A&M, Texas, April, 1995.
194. "Bioremediation of Contaminated Sediments." 21st Annual RREL Conference, Cincinnati, Ohio, April, 1995.
195. "Phytoremediation of TNT-Contaminated Sediments." 21st Annual RREL Conference, Cincinnati, Ohio, April, 1995.
196. "Bioremediation of Explosives-Contaminated Soils." Bioremediation of Explosives-Contaminated Soils and Groundwaters: National Framework for Action, Peachtree City, Georgia; March, 1995.

197. “Analytical Methods in Bioremediation Research.” Antoine Lavoisier Mass Balance Workshop, New Orleans, Louisiana, March, 1995.

Funded Projects (P.I. unless noted)

1. Workshop on Frontier Research Directions in Civil and Environmental Engineering, Funded by the National Science Foundation, 2007, (\$47,000)
2. Biodegradation of Explosives as a Basis for Natural Attenuation, Funded by DuPont, 2004-2007 (\$250,000 per year).
3. Rebuilding the New Orleans Region: Infrastructure Systems and Technology Innovation, Funded by the American Society of Civil Engineers, 2006, (\$68,000)
4. Residual Dinitrotoluenes in Settling Ponds and Spoils Disposal Area Soils at Badger Army Ammunition Plant: Microcosm, Soil Column, and Plant Studies, Funded by the Olin Corporation, 2004 (\$75,000).
5. Potential for Biologically Mediated Reactions to Alter Fullerene Behavior in the Natural Environment, Funded by NSF, 2002-07 (\$54,000 per year).
6. Hazardous Substances Research Center, South and Southwest, Funded by U.S. EPA, Center core funding: \$5,000,000, Co-Director with D. Reible (L.S.U.).
7. Reactive Capping of Contaminated Sediments, Funded by the Hazardous Substances Research Center South and Southwest, 2002-2006 (\$50,000 per year).
8. Bench-Scale Analysis of in situ Aerobic Dinitrotoluene Bioremediation for Vadose Zone Soils, Funded by the U.S. Air Force, 2001 (\$91,620).
9. Novel Pathways of Nitroaromatic Metabolism: Hydroxylamine Formation, Reactivity, and Potential for Ring Fission, Funded by DOD’s Strategic Environmental Research and Development Program, 2000-’04 (\$466,713).
10. Foam Delivery of Hydrogen for Enhanced Aquifer Contacting and Anaerobic Bioremediation of Chlorinated Solvents, Funded by DOD’s Strategic Environmental Research and Development Program, Co-Principal Investigator with G. Hirasaki and C. Miler, 2000 to 2004 (\$722,483).
11. Low-Volume Pulsed Biosparging of Hydrogen for Bioremediation of Chlorinated Solvent Plumes Funded by DOD’s Strategic Environmental Research and Development Program, Co-Principal Investigator with C. Newell, 2000-2003, \$320,400.
12. Discovery of Novel Enzymatic Reactions and Determination of Biodegradation Mechanisms and Pathways, Funded by the U.S. Air Force, 1999 (\$36,564).
13. Biological Response and Availability of Desorption Resistant Organic Pollutants, Funded by the Defense Special Weapons Agency, 1998-’00 (\$1,400,000), Co-Director and Principal Investigator.
14. Biological Response and Availability of Desorption Resistant Organic Pollutants, Funded by the Hazardous Substances Research Center South and Southwest, 1998-’01 (\$1,115,654).
15. Enhancement of DNAPL Dissolution Rates by Dechlorinating Bacteria, Funded by the Gulf Coast Hazardous Substances Research Center, 1998-’01 (\$215,000).

16. Evaluation of Surfactant Fate in the Subsurface, Funded by the DoD's Advanced and Applied Technology Demonstration Facility, 1998 (\$175,602)
17. A Coupled Evaluation of Biotransformation Pathways and Toxicity Reduction for Explosives in Remediation Systems or the Natural Environment, Funded by the Defense Special Weapons Agency, 1997-'99 (\$1,982,500).
18. Biodegradation Processes in Contaminated Sediments: Bioavailability and Anaerobic Attenuation, Funded by the Hazardous Substances Research Center South and Southwest, 1997-'98 (\$96,000).
19. Field-Scale Application of Electron Donor Addition for the Remediation of Chlorinated Hydrocarbon-Impacted Media, Funded by the Air Force Center for Environmental Excellence 1997-'98 (\$432,000), Co-Principal Investigator with C. Newell.
20. Ability of Dechlorinating Bacteria to Enhance DNAPL Dissolution Rates, Funded by Rice University's Energy and Environmental Systems Institute, 1996-'97 (\$10,000).
21. Bioremediation of Sediments Contaminated with Polynuclear Aromatic Hydrocarbons, Funded by the Hazardous Substances Research Center South and Southwest 1995-'97 (\$210,000).
22. Anaerobic Biodegradation of 2,4,6-Trinitrotoluene and Other Nitroaromatic Compounds by *Clostridium acetobutylicum*, Funded by the Hazardous Substances Research Center South and Southwest 1995-'97 (\$216,000).
23. Quantifying Natural Solvent Degradation in the Presence of Fuels and its Potential Enhancement During Bioventing and Bioremediation Projects, Funded by the National Center for Integrated Bioremediation Research and Development, 1995-'97, Co-Principal Investigator (\$150,000).
24. Phytoremediation of Explosives-Contaminated Groundwater Using Constructed Wetlands, Funded by the Army Environmental Center, 1995-'96 (\$32,000).
25. Phytoremediation of 2,4,6-Trinitrotoluene Contaminated Soils: Biochemical Catalysts and Pathways, Funded by the Hazardous Substances Research Center South and Southwest, 1994-'95 (\$225,000).
26. Bioremediation of Contaminated Sediments and Dredged Material, Funded by the Hazardous Substances Research Center South and Southwest 1992-'95, Co-Principal Investigator in Years I & II., Principal Investigator in Year III (\$280,000).

Student Advising and Teaching

Graduate Students

Georgia Institute of Technology

Johana Husserl, Ph.D. in progress

Sung Soo Han, Ph.D. in progress.

David Himmelheber, Ph.D. in progress.

Urvi Tulsiani, M.S. 2005, Factors Influencing Natural Attenuation of Dinitrotoluenes in Surface Soils: Badger Army Ammunition Plant a Case Study

Rice University

- Rebecca Daprato, Ph.D. 2006, "Population Dynamics of Tetrachloroethene Dechlorinating Consortia for Surfactant and Bioremediation Applications".
M.S. 2001 "Interpretation and Modeling of Slurry Reactor Performance to Provide Monitoring Strategies for the Aerobic Bioremediation of Dinitrotoluene Contaminated Soils".
- John Fortner, Ph.D. 2006, "C₆₀ in Water: Aggregation Characterization, Reactivity and Behavior". (*Recipient of the CH2MHill-AEESP Best Dissertation in the field of Environmental Science and Engineering in 2006*)
- Mary Watrous, M.S. 2002 "2,4,6-Trinitrotoluene Reduction by Hydrogenase in *Clostridium acetobutylicum*".
- James McDade, M.S. 2002 "Bioaugmentation of DNAPL Source Zones with Halorespiring Cultures".
- Travis McGuire, M.S. 2002 "Effects of Surfactants on a PCE Dechlorinating Mixed Culture".
- Farrukh Ahmad, Ph.D. 2001 "The Reactivity of Partially Reduced Metabolites of 2,4,6-Trinitrotoluene in Natural Systems".
- Nathan Cope, M.S. 2001, "Laboratory Evaluation of Biologically-Enhanced Removal of PCE for NAPL Source Zones".
- Denise Beckles, Ph.D. 2000 "Bioavailability of Polynuclear Aromatic Hydrocarbon as Desorption-Resistant Sediment Contaminants", M.S. 1997, "Effects of Mixtures of PAH's on the Bioremediation of Contaminated Sediments and Dredged Materials".
- Cynthia Carr, Ph.D. 2000, "Halorespiration: Enrichment, Microbial Ecology, and Impact on Non-Aqueous Phase Contamination" M.S. 1997 "High Rate Reductive Dechlorination of Perchloroethene: Role of Electron Donor".
- Nelson Neale, Ph.D. 1999 "Impacts of Unsaturated Zone Reaeration on the Bioattenuation of Organic Contaminants in Ground Water Systems".
- Adam Richardson, M.S. 1997 "Metabolism of 2,4,6-Trinitrotoluene by *Clostridium acetobutylicum*: Pathway Identification and Lab-Scale Evaluation of Contaminated Soil Remediation".
- Lara Pucik, M.S., 1995 "The Behavior of TNT in Model Chemical Redox Systems and the Fate of Reduction Products in Aerobic Microbial Systems".
- Sirish Chandra, M.S., 1995, "Biodegradation of Sediment-Sorbed Fluorene".
- Tariq Khan, M.S. 1995, "Anaerobic Transformation of 2,4,6-Trinitrotoluene by *Clostridium acetobutylicum*".
- Mindy Vanderford, M.S. 1995, "Phytotransformation of TNT by Native Aquatic Plants and Axenic Plant Cultures"
- Joris Dyksta, Visiting Student*, 1995, "Kinetics of TNT Transformation and Uptake by *Eichornia crassipes*"
- Martin Ochoa, M.S., 1994, "Biodegradation of Trichloroethene by Ammonia-Oxidizing Bacteria: Kinetics, Effects of Mixtures, and Toxicity"
- Virginia Jee, M.S., 1994, "The Effect of Resuspension of Estuarine Sediments on the Biodegradation of Polynuclear Aromatic Hydrocarbons"

Robin Gerlach, Visiting Student*, 1994-95, "Enhancement of Anaerobic Nitroaromatic Reduction in Contaminated Sediments"

Theo Berends, Visiting Student*, 1994-95, "Characterization and Fate of TNT in Soil Microcosms"

* Visiting students conducted their thesis work under Dr. Hughes but were awarded degrees by a European University.

Post-Doctoral Fellows

R. Bhadra, Ph.D., Chemical Engineering, Rice University

S. Garg, Ph.D., Civil Engineering, University of Houston

C. Wang, Ph.D., Chemistry, Gent University

E. West, Ph.D., Microbiology, University of Washington

K. Yesland, Ph.D., Biochemistry, University of Texas

C. Zhang, Ph.D., Civil and Environmental Engineering, Louisiana State University

D. Zhang, Ph.D., Civil and Environmental Engineering, University of Illinois

D. Adamson, Ph.D. Civil and Environmental Engineering, University of Iowa

J. Tront, Ph.D., Civil and Environmental Engineering, Georgia Tech

J. Fortner, Ph.D., Civil and Environmental Engineering, Rice University

B. Zhang, Ph.D., Environmental Engineering, Tongji University

Courses Taught

Principles of Environmental Engineering

Course topics include water quality parameters, potable water treatment, wastewater treatment, air pollution control technologies, and solid/hazardous waste processing. Course was required by ABET for all civil engineering students, but is also taken by other engineering. Course Text: Introduction to Environmental Engineering and Science by G. Masters.

Chemical Transport and Fate in the Environment

Course topics include multiphase equilibrium, mass transfer, and reactivity. This course was taught at the advanced undergraduate level and is also attended by graduate students in the engineering school. Course Text: Chemodynamics: Movement of Chemicals in Air, Water, and Soil, by L. Thibodeaux.

Environmental Microbiology

Topics include cell chemistry, metabolism, metabolic diversity, genetics, cell growth, microbial ecology. This class is taught at the graduate level and was an intensive introduction to microbiology for engineering students with minimal background in the biological sciences. Course Text: Biology of Microorganisms, by Brock and Madigan.

Biological Process Engineering

Topics include biological stoichiometry, thermodynamics of growth, microbial kinetics, modeling of biological unit operations (suspended and attached growth), factors controlling operation of biological unit operations, and ancillary systems in scale-up. The course is intended for graduate students from environmental and chemical engineering with a strong background in biosciences and process engineering. Course Text: Environmental Biotechnology, by Rittmann and McCarty

Advanced Topics in Environmental Bioprocess Engineering

Advanced graduate-level classes that focus on learning from current literature, hypothesis testing, preparation of research proposals, and presentation skills (written and oral).

International Experiences for Students

Founded, sponsored and advised Rice University Engineers Without Borders Chapter. Student project focused on potable water supply in Mali.

Founded and sponsor of the Georgia Tech Engineers Without Borders Chapter. Working with students on projects focused on hazardous waste treatment, habitat destruction, and infrastructure needs in Angola.

University Service

Georgia Institute of Technology

Member, College of Engineering Strategic Planning Committee

Advisor, Chi Epsilon

Rice University

Member, President's Lecture Series Committee, 2000 to present

Member, Department of Mechanical Engineering and Materials Science Search Committee, 1999-2001

Member, Committee on Examinations and Standing, 1998 to 2000.

Member, Rice University Research Council, 1998-99.

Member, Department of Chemical Engineering Search Committee, 1998

Chair, Dean's Committee on Restructuring of the G. R. Brown School of Engineering, 1997-1998.

Member, Search Committee for the Dean of the G. R. Brown School of Engineering, 1997-1998.

Member and School of Engineering Sub-Committee Chair, University Environmental Strategic Planning Committee, 1996-to 1998.

Member, Department of Environmental Science and Engineering Strategic Planning Committee, 1995-1996.

Member, Engineering Curriculum Committee, 1994-2002.

Marshall, Rice University Commencement, 1996.

Seminar Chair, Department of Environmental Science and Engineering, 1993-1996.

Divisional Advisor – Engineering, Baker College, 1994-1996, 1997-present.

Honorary Associate, Baker College, 1996-present.

Associate, Baker College, 1994-1996.

Resident Associate, Baker College, 1993-94.