

Curriculum Vitae: David L. Freedman

PERSONAL DATA

Professor and Chair

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Worcester, Massachusetts USA

EDUCATION

- Ph.D., Cornell University, 1990, Environmental Engineering
- M.S., University of Cincinnati, 1985, Environmental Engineering
- B.S., University of Wisconsin - Green Bay, 1978, Science and Environmental Change

PROFESSIONAL EXPERIENCE

- Clemson University, 2015-2024, Chair, Dept. of Environ. Engin. and Earth Sci.
- Clemson University, 2014-2015, Interim Chair, Dept. of Environ. Engin. and Earth Sci.
- Clemson University, 2005- , Professor, Environmental Engineering
- Clemson University, 1998-2005, Associate Professor, Environmental Engineering
- Clemson University, 1996-1998, Assistant Professor, Environmental Engineering
- University of Illinois at Urbana-Champaign, 1990-1996, Assistant Prof., Environ. Eng.
- Cornell University, 1990, Post-doctoral Research Associate
- Cornell University, 1986-1990, Graduate Research Assistant
- Cornell University, 1985, Teaching Assistant
- University of Cincinnati, 1982-1985, Graduate Research Assistant
- Queens College, Center for the Biology of Natural Systems, 1978-1981, Research Assoc.

CONSULTING EXPERIENCE

- Eastern Research Group, Inc. (ERG), review of programs for the State of New Mexico and the Pentagon for wastewater surveillance of the SARS-CoV-2 virus (2020-2021).
- TRC Environmental, Greenville, SC, review of remediation efforts for a hazardous waste site (2015-2016).
- El Paso Natural Gas, Houston, TX (2007-2009), review of remediation efforts at the Statesville, NC Superfund site.
- MACTEC Engineering and Consulting, Inc., Atlanta, GA (2004-2005), review of consultant plans for monitored natural attenuation of a Superfund site in Ohio.
- McGraw-Hill Publishers, New York, NY (1998-2000), editorial review of the second edition of "Hazardous Waste Management."
- Albright and Wilson Americas, Inc., Charleston, SC (1999-2000), develop a protocol to measure nitrification rates in the Cooper River.
- Northern Illinois Water Corporation, Champaign, Illinois (1994), evaluate product water biostability following changes to second stage recarbonation.

- EnviroGroup Limited, Engelwood, Colorado (1994), remediation of groundwater contaminated with furfural, phenols, ketones, and other organics.
- CCL Custom Manufacturing, Danville, Illinois (1994), treatability study of fats, oils and grease in industrial wastewater (August - December, 1994).
- Strong Associates, Champaign, Illinois (1994-1995), bioremediation of various sites in Illinois contaminated with hydrocarbons and chlorinated solvents.
- Solar Energy Research Institute, Golden, Colorado (1980), energy and economic evaluation of biomass-derived liquid fuels.

MEMBERSHIPS

- Member, American Society for Microbiology, ASM (1987-)
- Member, Assoc. of Environmental Engineering & Science Professors, AEESP (1990-)
- Member, Water Environment Federation, WEF (1983-)
- Member, American Chemical Society, ACS (2018-)
- Board Certified Environmental Engineering Member, American Academy of Environmental Engineers and Scientists (2009-)

PROFESSIONAL ACTIVITIES

- National Research Council, Committee on Review of Biotreatment, Water Recovery, and Brine Reduction Systems for the Pueblo Chemical Agent Destruction Pilot Plant (2012-2013)
- Association of Environmental Engineering & Science Professors, elected by the membership to the Board of Directors (2005-2008)
- International Water Association
 - ❖ Environmental Restoration Specialist Committee, Newsletter Editor (1999-2001)
 - ❖ USA National Committee (2008-2011)
- Water Environment Federation, Program Committee, Research Symposium Subcommittee (1992-1997)
- Illinois Water Environment Association, Program Committee (1991-1995)
- Expert witness in four SC Administrative Law Proceedings

PUBLICATIONS

Refereed Journal Publications

- Wang, H., Yu, R., Iery, R., Murdoch, L., Falta, R., Freedman, D. L. Use of carbon-14 trichloroethene to determine degradation rate constants in rock core microcosms, *In preparation*.
- Wang, H., Yu, R., Iery, R., Freedman, D. L. Use of carbon-14 labeled trichloroethene to assess degradation potential in rock core microcosms, *In Review* (2024).
- Wang, H., Yu, R., Adamson, D. T., Iery, R., Freedman, D. L. Evaluation of passive vapor diffusion samplers to quantify acetylene, ethene and ethane in groundwater, *Groundwater Monit. R.*, **44** (3): 94-105 <http://doi.org/10.1111/gwmr.12629> (2024).
- Barreto, P., Lemes, M., Jimenez, J., Mack, E. E., Henderson, J., Freedman, D. L. Evaluation of Strategies to Remediate Mixed Wastes at an Industrial Site in Brazil, *Groundwater Monit. R.*, **43** (3): 93-107 (2023).

- Ramos García, A. A. and Freedman, D. L. Identification of formate as a principal soluble product from propanotrophic cometabolism of 1,4-dioxane, *Environ. Eng. Sci.*, <https://doi.org/10.1089/ees.2023.0060> (2023).
- Divine, C., Justicia-Leone, S., Martin Tilton, J., Liles, D., Carter, E., Zardouzian, E., Clark, K., Taggart, D.; Freedman, D. L., Laraia, S., Perrell, F., Gerber, K. Min-Trap® samplers to passively monitor in-situ iron sulfide mineral formation for chlorinated solvent treatment, *Groundwater Monit. R.*, **43** (3): 57-69 (2023).
- Palau, J., Trueba-Santiso, A., Yu, R., Mortan, S. H., Shouakar-Stash, O., Freedman, D. L., Wasmund, K., Hunkeler, D., Marco-Urrea, E., Rosell, M. Dual C-Br isotope fractionation indicates distinct dihaloelimination mechanisms of 1,2-dibromoethane in *Dehalococcoides*- and *Dehalogenimonas*-containing cultures. *Environ. Sci. Technol.*, **57**, 1949-1958 <https://doi.org/10.1021/acs.est.2c07137> (2023).
- McMahan, C. S., Lewis, D., Deaver, J. S., Dean, D., Rennert, L., Kalbaugh, C., Shi, L., Kriebel, D., Graves, D., Popat, S., Karanfil, T., Freedman, D. L. Predicting COVID-19 infected individuals in a defined population from wastewater RNA mass rates. *ACS ES&T Water*, <https://pubs.acs.org/doi/full/10.1021/acsestwater.2c00105> (2022).
- Adamson, D. T., Wilson, J. T., Newell, C. J., Strasert, B. A., de Blanc, P. C., Freedman, D. L., Lebrón, C., Danko, A. S. State of the practice worldwide: Development of a quantitative framework for evaluating natural attenuation of 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and 1,4-dioxane in groundwater. *Groundwater Monit. R.*, **42** (4), 78-84. <https://doi.org/10.1111/gwmr.12509> (2022).
- Ramos-García, A. A., Walecka-Hutchison, C., Freedman, D. L. Effect of biostimulation and bioaugmentation on biodegradation of high concentrations of 1,4-dioxane. *Biodegradation*, (2022). doi: <https://doi.org/10.1007/s10532-022-09971-4>.
- Wang, H., Yu, R., Webb, J., Dollar, P., Freedman, D. L. Anaerobic biodegradation of chloroform and dichloromethane with a *Dehalobacter* enrichment culture. *Appl. Environ. Microbiol.*, **88** (4), e01970-21 (2022). doi:10.1128/aem.01970-21
- Ramos-García, A. A., Adamson, D. T., Wilson, J. T., Lebrón, C., Danko, A. S., Freedman, D. L. Evaluation of natural attenuation of 1,4-dioxane in groundwater using a ¹⁴C assay. *J. Haz. Mat.*, **424, Part C**, 127540 (2022).
- Adamson, D.T., Wilson, J.T., Freedman, D.L., Ramos García, A.A., Lebrón, C., Danko, A.S. Establishing the prevalence and relative rates of 1,4-dioxane biodegradation in groundwater to improve remedy evaluations. *J. Haz. Mat.*, **424, Part D**, 127736 (2022).
- McMahan, C. S., Self, S., Rennert, L., Kalbaugh, C., Kriebel, D., Graves, D., Colby, C., Deaver, J. S., Popat, S., Karanfil, T., Freedman, D. L. COVID-19 wastewater epidemiology: a model to estimate infected populations. *The Lancet – Planetary Health*, **5** (12), e874-e881 (2021).
- Yu, R., Murdoch, L. C., Falta, R. W., Andrachek, R. G., Pierce, A. A., Parker, B. L., Cherry, J. A., Freedman, D. L. Chlorinated ethene degradation rate coefficients simulated with intact sandstone core microcosms. *Environ. Sci. Technol.*, **54**, 15829-15839 (2020). doi: 10.1021/acs.est.0c05083
- Zhang, X., Kim, D., Freedman, D. L. and Karanfil, T. Source characterization and removal of *N*-nitrosamine precursors during activated sludge treatment. *Environmental Science: Water Research & Technology*, **6**, 2432-2443 (2020). DOI: 10.1039/d0ew00425a
- Zhang, X., Kim, D., Freedman, D. L. and Karanfil, T. Impact of biological wastewater treatment on the reactivity of *N*-nitrosodimethylamine precursors. *Water Research*, **186**, 116315 (2020). <https://doi.org/10.1016/j.watres.2020.116315>

- Barajas-Rodriguez, F. J., Murdoch, L. C., Falta, R. W., and Freedman, D. L. Simulation of *in situ* biodegradation of 1,4-dioxane under metabolic and cometabolic conditions, *Journal of Contaminant Hydrology*, **223**, 103464 (2019).
- Wilson, J. T., Mills IV, J. C., Wilson, B. H., Ferrey, M. L., Freedman, D. L., and Taggart, D. Using qPCR Assays to Predict Rates of Cometabolism of TCE in Aerobic Groundwater. *Groundwater Monitoring & Remediation*, **39**(2), 53-63 (2019).
- Yu, R., Andrachek, R. G., Lehmicke, L. G., Pierce, A. A., Parker, B. L., Cherry, J. A., and Freedman, D. L. Diffusion-coupled degradation of chlorinated ethenes in sandstone: an intact core microcosm study. *Environmental Science & Technology*, **52**, 14321-14330 (2018).
- Ramos-Garcia, A. A., Shankar, V., Saski, C. A., Hsiang, T., Freedman, D. L. Draft genome sequence of the 1,4-dioxane-degrading bacterium *Pseudonocardia dioxanivorans* BERK-1. *Genome Announcements*, **6**(14), e00207-18, doi 10.1128/genomeA.00207-18 (2018).
- Mills IV, J. C., Wilson, J. T., Wilson, B. H., Weidemier, T. H., Freedman, D. L. Quantification of TCE co-oxidation in groundwater using a ¹⁴C-assay. *Groundwater Monitoring & Remediation*, **38**(2), 57-67 (2018).
- Barajas-Rodriguez, F. J., Freedman, D. L. Aerobic biodegradation kinetics for 1,4-dioxane under metabolic and cometabolic conditions. *J. Haz. Mat.*, **350**,180-188 (2018).
- Yu, R., Andrachek, R. G., Lehmicke, L. G., Freedman, D. L. Remediation of chlorinated ethenes in fractured sandstone by natural and enhanced biotic and abiotic processes: A crushed rock microcosm study. *Sci. Total Environ.*, **626**, 497-506 (2018).
- Palau, J., Yu, R., Shouakar-Stash, O., Hatijah Mortan, S., Yu, R., Rosell, M., Marco-Urrea, E., Freedman, D. L., Soler, A., Hunkeler, D. Hydrogen isotope fractionation during biodegradation of 1,2-dichloroethane: potential for pathway identification using a multi-element isotope approach. *Environ. Sci. Technol.*, **51**(18), 10526–10535 (2017).
- Palau, J., Yu, R., Mortan, S. H., Shouakar-Stash, O., Rosell, M., Freedman, D. L., Sbarbati, C., Fiorenza, S., Aravena, R., Marco-Urrea, E., Elsner, M., Soler, A. and Hunkeler, D. “Distinct dual C-Cl isotope fractionation patterns during anaerobic biodegradation of 1,2-dichloroethane: potential to characterize microbial degradation in the field.” *Environ. Sci. Technol.*, **51**(5), 2685-2694 (2017).
- Hall, R. J., Murdoch, L. C., Freedman, D. L., Looney, B. B., Riha, B. D. “Bench-Scale Evaluation of Aerosol Delivery for Biostimulation and Bioaugmentation in the Vadose Zone,” *Biodegradation*, **26**(2), 91-103 (2015).
- Fullerton, H., Rodgers, R., Freedman, D. L. and Zinder, S. H. “Isolation of an Aerobic Vinyl Chloride Oxidizer from Anaerobic Groundwater.” *Biodegradation*, **25**, 893-901 (2014).
- Shan, H., Wang, H., Yu, R., Jacob, P., and Freedman, D. L. “Biodegradation of High Concentrations of Halomethanes by a Fermentative Enrichment Culture.” *AMB Express* **4**(48), <http://www.amb-express.com/content/4/1/48> (2014).
- Fullerton, H., Crawford, M., Bakenne, A., Freedman, D. L. and Zinder, S. H. “Anaerobic Oxidation of Ethene Coupled to Sulfate Reduction in Microcosms and Enrichment Cultures.” *Environ. Sci. Technol.*, **47**(21), 12374-12381 (2013).

- Yu, R., Peethambaram, H. S., Falta, R. W., Verce, M. F., Henderson, J. K., Bagwell, C. E., Brigmon, R. L., and Freedman, D. L. “Kinetics of 1,2-Dichloroethane and 1,2-Dibromoethane Biodegradation in Anaerobic Enrichment Cultures.” *Appl. Environ. Microbiol.*, **79**(4), 1359-1367 (2013). doi: 10.1128/AEM.02163-12.
- Darlington, R., Lehmicke, L., Andrachek, R. G., and Freedman, D. L. “Anaerobic Abiotic Transformations of *cis*-1,2-Dichloroethene in Fractured Sandstone.” *Chemosphere*, **90**, 2226–2232 (2013) doi.org/10.1016/j.chemosphere.2012.09.084.
- Danko, S. S., Leitão, P. O., Verce, M. F., and Freedman, D. L. “Efficacy of Pentane, Toluene, and Benzene to Support the Aerobic Cometabolism of Ethylene Dibromide.” *New Biotechnology*, **30**(1), 39-43 (2012). doi: 10.1016/j.nbt.2012.05.001.
- Chen, F., Freedman, D. L., Falta, R. W., Murdoch, L. C. “Henry’s Law Constants of Chlorinated Solvents at Elevated Temperatures.” *Chemosphere*, **86**, 156-165 (2012).
- Elango, V., Kurtz, H. D., Jr., Anderson, C., and Freedman, D. L. “Use of γ -Hexachlorocyclohexane as a Terminal Electron Acceptor by an Anaerobic Enrichment Culture.” *J. Hazardous Materials*, **197**, 204-210 (2011).
- Elango, V., Kurtz, H. D., Jr. and Freedman, D. L. “Aerobic Cometabolism of Trichloroethene and *cis*-Dichloroethene with Benzene and Chlorinated Benzenes as Growth Substrates.” *Chemosphere*, **84**, 247-253 (2011).
- Shan, H., Kurtz, H. D., Jr., Mykytczuk, N., Trevors, J. T. and Freedman, D. L. “Anaerobic Biotransformation of High Concentrations of Chloroform by an Enrichment Culture and Two Isolates.” *Appl. Environ. Microbiol.*, **76**, 6463-6469 (2010).
- Elango, V., Cashwell, J. M., Bellotti, M. J., Marotte, R., and Freedman, D. L. “Bioremediation of Hexachlorocyclohexane Isomers, Chlorinated Benzenes and Chlorinated Ethenes in Soil and Fractured Dolomite.” *Bioremediation J.*, **14**, 10-27 (2010).
- Shan, H., Kurtz, H. D., Jr., and Freedman, D. L. “Evaluation of Strategies for Anaerobic Bioremediation of High Concentrations of Halomethanes.” *Water Res.*, **44**, 1317-1328 (2010); doi:10.1016/j.watres.2009.10.035.
- Henderson, J. K., Falta, R. W., and Freedman, D. L. “Simulation of the Effect of Remediation on EDB and 1,2-DCA Plumes at Sites Contaminated by Leaded Gasoline.” *J. Contaminant Hydrol.*, **108**, 29-45 (2009).
- Darlington, R., Lehmicke, L., Andrachek, R. G., and Freedman, D. L. “Biotic and Abiotic Anaerobic Transformations of Trichloroethene and *cis*-1,2 Dichloroethene in Fractured Sandstone.” *Environ. Sci. Technol.*, **42**, 4323-4330 (2008).
- Henderson, J. K., Freedman, D. L., Falta, R. W., Kuder, T., and Wilson, J. T. “Anaerobic Biodegradation of Ethylene Dibromide and 1,2-Dichloroethane in the Presence of Fuel Hydrocarbons.” *Environ. Sci. Technol.*, **42**, 864-870 (2008).
- Danko, A. S., and Freedman, D. L. “Involvement of Carbon Dioxide in the Aerobic Biodegradation of Ethylene Oxide, Ethene, and Vinyl Chloride.” *Process Biochem.*, **43**, 517-521 (2008).

- Morris, R.M., Fung, J. M., Rahm, B.G., Zhang, S., Freedman, D. L., Zinder, S. H., and Richardson, R. E. "Comparative Proteomics of *Dehalococcoides* Reveals Strain-Specific Peptides Associated with Activity." *Appl. Environ. Microbiol.*, **73**, 320-326 (2007).
- Danko, A. S., Sasaki, C. A., Tomkins, J. P., and Freedman, D. L. "Involvement of coenzyme M during aerobic biodegradation of vinyl chloride and ethene by *Pseudomonas* strain AJ and *Ochrobactrum* strain TD." *Appl. Environ. Microbiol.*, **72**, 3756-3758 (2006).
- Bzdusek, P. A., Christensen, E. R., Lee, C. L., Pakdeesusuk, U. and Freedman, D. L. "PCB Congeners and Dechlorination in Sediments of Lake Hartwell, South Carolina, Determined from Cores Collected in 1987 and 1998." *Environ. Sci. Technol.*, **40**, 109-119 (2006).
- Freedman, D. L., Lehmicke, L. and Verce, M. F. "Reductive Dechlorination of Tetrachloroethene Following Abiotic Versus Biotic Reduction of Hexavalent Chromium." *Bioremediation J.*, **9**, 87-97 (2005). (The 10th most frequently downloaded article appearing in *Bioremediation J.* in 2005.)
- Ross, C., Murdoch, L. C., Freedman, D. L. and Siegrist, R. L. "Characteristics of Potassium Permanganate Encapsulated in Polymer." *ASCE J. Environ. Eng.*, **131**, 1203-1211 (2005).
- Freedman, D. L., Payauys, A. M. and Karanfil, T. "The Effect of Nutrient Deficiency on Removal of Organic Solvents from Textile Manufacturing Wastewater During Activated Sludge Treatment." *Environ. Technol.*, **26**, 179-188 (2005).
- Pakdeesusuk, U., Lee, C. M., Coates, J. T., and Freedman, D. L. "Assessment of Natural Attenuation via *In situ* Reductive Dechlorination of Polychlorinated Biphenyls (PCBS) in Sediments of the Twelve Mile Creek arm of Lake Hartwell, SC, USA." *Environ. Sci. Technol.*, **39**, 945-952 (2005).
- Danko, A. S., Luo, M., Bagwell, C. E., Brigmon, R. L., and Freedman, D. L. "Involvement of Linear Plasmids in Aerobic Biodegradation of Vinyl Chloride." *Appl. Environ. Microbiol.*, **70**, 6092-6097 (2004).
- Freedman, D. L., Swamy, M., Bell, N. C., and Verce, M. F. "Biodegradation of Chloromethane Under Nitrate-Reducing and Aerobic Conditions by *Pseudomonas aeruginosa* strain NB1." *Appl. Environ. Microbiol.*, **70**, 4629-4634 (2004).
- Hashsham, S. A. and Freedman, D. L. "Adsorption of Vitamin B₁₂ to Alumina, Kaolinite, Sand and Sandy Soil." *Water Res.*, **37**, 3189-3193 (2003).
- Pakdeesusuk, U., Jones, W. J., Lee, C. M., Garrison, A. W., O'Niell, W. L., Freedman, D. L., Coates, J. T. and Wong, C. S. "Changes in Enantiomeric Fractions (EF) During Microbial Reductive Dechlorination of PCB132, PCB149, and Aroclor1254 in Lake Hartwell Sediment Microcosms." *Environ. Sci. Technol.*, **37**, 1100-1107 (2003).
- Pakdeesusuk, U., Freedman, D. L., Lee, C. M., and Coates, J. T. "Reductive Dechlorination of Polychlorinated Biphenyls in Sediment from the Twelve Mile Creek Arm of Lake Hartwell, South Carolina." *Environ. Toxicol. Chem.*, **22**, 1214-1220 (2003).
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- Verce, M. F., Gunsch, C. K., Danko, A. S., and Freedman, D. L. "Cometabolism of *cis*-1,2-Dichloroethene by Aerobic Cultures Grown on Vinyl Chloride as the Primary Substrate." *Environ. Sci. Technol.*, **36**, 2171-2177 (2002).
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- Freedman, D. L., Cashwell, J. M., and Kim, B. J., "Biotransformation of Explosive-Grade Nitrocellulose Under Denitrifying and Sulfidogenic Conditions." *Waste Management*, **22**, 283-292 (2002).
- Verce, M. F., Ulrich, R. L., and Freedman, D. L. "Transition from Cometabolic to Growth-Linked Biodegradation of Vinyl Chloride by a *Pseudomonas* sp. Isolated on Ethene." *Environ. Sci. Technol.*, **35**, 4242-4251 (2001).
- Verce, M. F. and Freedman, D. L. "Modeling the Kinetics of Vinyl Chloride Cometabolism by an Ethane-Grown *Pseudomonas* sp." *Biotechnol. Bioengin.*, **71**, 274-285 (2001).
- Freedman, D. L., Danko, A. S., and Verce, M. F. "Substrate Interactions During Aerobic Biodegradation of Methane, Ethene, Vinyl Chloride and 1,2-Dichloroethenes," *Water Sci. Technol.*, **43**, 333-340 (2001).
- Verce, M. F., Ulrich, R. L., and Freedman, D. L. "Characterization of an Isolate that Uses Vinyl Chloride as a Growth Substrate Under Aerobic Conditions." *Appl. Environ. Microbiol.*, **66**, 3535-3542 (2000).
- Christopher, H. J., Boardman, G. D., Freedman, D. L., "Aerobic Biological Treatment of 2,4-Dinitrotoluene in Munitions Plant Wastewater," *Water Res.*, **34**, 1595-1603 (2000).
- Tomkins, J. P., Miller-Smith, H., Sasinowski, M., Choi, S., Sasinowska, H., Verce, M. F. Freedman, D. L., Dean, R. A., and Wing, R. A. "Physical Map and Gene Survey of the *Ochrobactrum anthropi* Genome using Bacterial Artificial Chromosome Contigs." *Microbial & Comparative Genomics*, **4**, 203-217 (1999).
- Hashsham, S. A., and Freedman, D. L., "Enhanced Biotransformation of Carbon Tetrachloride by *Acetobacterium woodii* upon Addition of Hydroxocobalamin and Fructose," *Appl. Environ. Microbiol.*, **65**, 4537-4542 (1999).
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- Carlson, R., Freedman, D. and Scott, R. "A Strategy for a Non-Nuclear Future," *Environment* **21**, 6-15, 37-38 (1979).

Book Chapters (Reviewed)

- Freedman, D. L. and Yu, R. "Utility of Industrial Experimental Sites for Developing Analytical, Monitoring and Remediation Technologies." In *Consequences of Microbial Interactions with Hydrocarbons, Oils, and Lipids: Biodegradation and Bioremediation, Handbook of Hydrocarbon and Lipid Microbiology*, R. Steffan (ed.). Springer International Publishing AG, New York, NY (2019). DOI 10.1007/978-3-319-44535-9_17-1.
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- Mills, J. C., Freedman, D. L., Wiedemeier, T. H., Cutt, D., Thantu, L., Looney, B., Wilson, B., Wilson, J. T. Innovative Approach to Determine the Rate of Abiotic Degradation of TCE in a Large Diffuse Plume. Fourth International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 22-25, 2017).
- Taggart, D., Baldwin, B., Wilson, J. T., Wiedemeier, T. H., Freedman, D. L. "TCE Co-oxidation Rates and Quantification of Oxygenase Gene Abundances and Expression." Fourth International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 22-25, 2017).
- Yu, R., Freedman, D. L., Andrachek, R. G. "Use of Novel Intact Rock Core Microcosms to Evaluate Natural and Enhanced Attenuation of TCE in Fractured Sandstone." Battelle Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA (May 22-26, 2016).
- Palau, J., Yu, R., Shouakar-Stash, O., Freedman, D. L., Aravena, R., Elsner, M., Hunkeler, D. "Carbon and Chlorine Isotope Fractionation during Anaerobic Biodegradation of 1,2-Dichloroethane by *Dehalococcoides* Populations." Battelle Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA (May 22-26, 2016).
- Barajas, F., Freedman, D. L., Murdoch, L. C. "Modeling the Kinetics of In Situ Bioremediation of 1,4-Dioxane by Metabolic and Cometabolic Processes." Battelle Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA (May 22-26, 2016).
- Yu, R., Freedman, D. L., Andrachek, R. G. "Laboratory Evaluation of Biostimulation to Treat Chlorinated Ethenes in Fractured Sandstone." Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 19-21, 2015).
- Rhiner, B. L., Kunkle, A. J., Finneran, K. T., Freedman, D. L. "Anaerobic and Aerobic Biodegradation of the Oil Dispersant Components 1,2-Propanediol and 2-Butoxyethanol in Seawater." Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 19-21, 2015).
- Ramos, A., A., Arve, P., Freedman, D. L. "Propanotrophic Cometabolism of 1,4-Dioxane at High Concentrations." Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 19-21, 2015).
- Barajas, F., Freedman, D. L. "Kinetics of Aerobic Cometabolism of 1,4-Dioxane by Propane Oxidizing Bacteria." Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 19-21, 2015).

- Yu, R., Freedman, D. L., Lehmicke, L. G., Andrachek, R. G. “Biostimulation-Enhanced Reductive Dechlorination of TCE in Fractured Sandstone Microcosms.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL (June 10-13, 2013).
- Freedman, D. L., Kanitkar, Y., Jacob, P., Lehmicke, L. G. “Use of Dichloromethane as an Electron Donor for Reductive Dechlorination of PCE to Ethene.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL (June 10-13, 2013).
- Barajas, F., Lehmicke, L., Freedman, D. “Field and Laboratory Evidence for Anaerobic Biodegradation of 1,4-Dioxane.” Eighth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 21-24, 2012).
- Andrachek, R. G., Pierce, A., Parker, B. L., Aravena, R., Darlington, R., Lehmicke, L., Freedman, D. L., Bower, M. O. “Integrated Assessment of Field and Laboratory Studies on the Complete Mineralization of Trichloroethene in a Fractured Sandstone Aquifer.” Eighth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 21-24, 2012).
- Byrd, J., Hollifield, E., Freedman, D. L., and Haselow, J. “Ketone Production Resulting from Full-Scale Bioaugmentation of a PCE Plume.” Eighth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 21-24, 2012).
- Barajas, F., Lehmicke, L., Freedman, D. L. “Anaerobic Biodegradation of 1,4-Dioxane at Two Former Industrial Sites in California.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV (June 27-30, 2011).
- Yu, R., Peethambaram, H. S., Verce, M. F., and Freedman, D. L. “Kinetic Interactions During Organohalide Respiration of 1,2-Dichloroethane and Ethylene Dibromide.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV (June 27-30, 2011).
- Freedman, D. L., Yu, R., and Hickey, M. R. “Evaluation of Reductive Dechlorination of Chlorinated Ethenes at Low pH Levels.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV (June 27-30, 2011).
- Hall, R., Murdoch, L., Freedman, D. L., and Riha, B. “Aerosol Delivery for Biostimulation/Bioaugmentation of Contaminated Vadose Zones.” Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV (June 27-30, 2011).
- Shan, H., Sprinkle, C., Perlmutter, M., Wang, H., Freedman, D. L. “Evaluating the Feasibility of Bioremediation for Treating Halomethanes in Source Zones.” Seventh International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 24-27, 2010).

- Freedman, D. L., Reid, A., Fullerton, H., and Zinder, S. H. "Observations of Ethene and Vinyl Chloride Bio-Oxidation Under Anaerobic Conditions." SERDP and ESTCP Technical Symposium, Washington, DC (December 1-3, 2009).
- Shan, H. and Freedman, D. L. "Characterization of a Bioaugmentation Culture for Treating High Concentrations of Halomethanes," Tenth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 5-8, 2009).
- Elango, V., Cashwell, J., Bellotti, M., and Freedman, D. L. "Evaluation of Anaerobic γ -HCH Dechlorination by Enrichment Cultures," Tenth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 5-8, 2009).
- Elango, V., Cashwell, J., Bellotti, M., and Freedman, D. L. "Aerobic Cometabolism of Trichloroethene with Benzene and Chlorobenzene as Growth Substrates," Tenth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 5-8, 2009).
- Bone, A., Lehmicke, L., and Freedman, D. L. "Dichloromethane Inhibition of Trichloroethene Reductive Dechlorination Activity in Bioaugmentation Cultures," Tenth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 5-8, 2009).
- Freedman, D. L., High, J., Reid, A., Fullerton, H., Lehmicke, L., and Zinder, S. H. "Searching for Elusive Microbes that Anaerobically Oxidize Vinyl Chloride." SERDP and ESTCP Technical Symposium, Washington, DC (December 2-4, 2008).
- Shan, H., and Freedman, D. L. "Treatment of High Concentrations of Chloroform by Bioaugmentation." Sixth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 19-22, 2008).
- Darlington, R., Freedman, D. L., Andrachek, R. G., and Lehmicke, L. "Anaerobic Abiotic Transformation of *cis*-1,2-Dichloroethene Catalyzed by Minerals in Fractured Sandstone." Sixth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 19-22, 2008).
- Freedman, D. L., High, J., Lehmicke, L., and Zinder, S. H. "Characterization of Microbes Capable of Using Vinyl Chloride as a Sole Carbon and Energy Source by Anaerobic Oxidation." SERDP and ESTCP Technical Symposium, Washington, DC (December 4-6, 2007).
- Wood, E. A., Bagwell, C. A., Brigmon, R. L., and Freedman, D. L. "Development and Evaluation of a Chloroethene Enrichment Culture for Application at the Savannah River National Laboratory." Ninth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 7-10, 2007).
- Shan, H., Yang, Y., Cashwell, J. M., Marotte, R., and Freedman, D. L. "Evaluation of Enhanced In Situ Bioremediation to Treat High Concentrations of Halogenated Methanes." Ninth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 7-10, 2007).
- Elango, V., Yang, Y., Cashwell, J. M., Marotte, R., Belloti, M., and Freedman, D. L. "Bioremediation of Hexachlorocyclohexane Isomers, Chlorinated Benzenes and

- Chlorinated Ethenes in Soil and Fractured Dolomite.” Ninth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 7-10, 2007).
- Freedman, D. L. "Development of a Bioaugmentation Culture to Treat Chloroethene-Contaminated Groundwater at the Savannah River Site." American Society of Civil Engineers South Carolina Section Fall Seminar, Palmetto Expo Center, Greenville, SC (October 6, 2006).
- Darlington, R., Lehmicke, L., and Freedman, D. L. “PCR-DGGE Analysis of TCE Degrading Microorganisms in Fractured Sandstone Contaminated with TCE.” Fifth International Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA (May 22-25, 2006).
- Baladi, A., Lewis, C., Nakagawa, P., and Freedman, D. L. “Enhanced Bioremediation of Pesticides and PCBs at the SRS.” Eighth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (June 6-9, 2005).
- Darlington, R., Lehmicke, L., and Freedman, D. L. “Laboratory Evaluation of Chlorinated Ethene Transformation Processes in Fractured Sandstone.” Eighth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (June 6-9, 2005).
- Freedman, D. L., Gliem, J. N., and Lehmicke, L. “Dichloromethane as an Electron Donor for Reductive Dechlorination of TCE.” Eighth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (June 6-9, 2005).
- Pressley, H., Lee, C. M., Im, J., Baladi, S. M., Robert Blundy, R. and Freedman, D. L. “Evaluation of Composting to Treat PCB-Contaminated Soils at the Savannah River Site.” American Chemical Society Meeting, Division of Environmental Chemistry Symposium, Philadelphia, PA (August, 2004).
- Law, S., Lehmicke, L., Freedman, D. L., Darlington, R., Parker, B. and Pierce, A. “Evaluation of Biological and Abiotic Degradation of TCE at a Fractured Rock Site.” Battelle Fourth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, (May, 2004).
- Lehmicke, L., Cline, R., Pickens, P. and Freedman, D. L. “Anaerobic Oxidation of Vinyl Chloride in a Groundwater Plume.” Battelle Fourth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, (May, 2004).
- Lehmicke, L., Coons, K., Cline, R. M., Chin, S., and Freedman, D. L. “Enhanced Bioremediation of a Plume Containing Trichloroethene, 1,1-Dichloroethene, and Methylene Chloride.” Seventh International Battelle Symposium on In Situ and On-Site Bioremediation, Orlando, FL (June, 2003).
- Freedman, D. L., Lehmicke, L., and Verce, M. F. “The Effect of Chemically Reducing Chromium (VI) with Polysulfides on Reductive Dechlorination of PCE.” Seventh International Battelle Symposium on In Situ and On-Site Bioremediation, Orlando, FL (June, 2003).
- Danko, A. S., Luo, M., and Freedman, D. L. “Involvement of a Mega-Linear Plasmid in Aerobic Biodegradation of Vinyl Chloride.” Seventh International Battelle Symposium on In Situ and On-Site Bioremediation, Orlando, FL (June, 2003).

- Danko, A. S., Ulrich, R. L., Dautle, M. P., and Freedman, D. L. "Vinyl Chloride Biodegradation by an Isolate from a Superfund Site." Sixth International Battelle Symposium on In Situ and On-Site Bioremediation, San Diego, CA (June, 2001).
- Gunsch, C. K., Verce, M. F., and Freedman, D. L. "Biodegradation of Dichloroethylenes and Trichloroethylene by a Vinyl-Chloride-Grown Isolate." Sixth International Battelle Symposium on In Situ and On-Site Bioremediation, San Diego, CA (June, 2001).
- Verce, M. F. and Freedman, D. L. "Modeling the Kinetics of *cis*-Dichloroethene and Vinyl Chloride Aerobic Cometabolism." Sixth International Battelle Symposium on In Situ and On-Site Bioremediation, San Diego, CA (June, 2001).
- Pakdeesusuk, U.; Lee, C. M.; Coates, J. T.; and Freedman, D. L. "Reductive Dechlorination of Polychlorinated Biphenyls (PCBs) in Twelve Mile Creek/Lake Hartwell Watershed." 221st American Chemical Society National Meeting, Division of Environmental Chemistry, San Diego, CA, April 2001 (2001).
- Verce, M. F., and Freedman, D. L. "Cometabolism of *cis*-1,2-Dichloroethene by an Enrichment Culture Grown on Vinyl Chloride," Fifth International Symposium, In Situ and On-Site Bioremediation, B. C. Alleman and A. Leeson (Symposium chairs), San Diego, CA (April 19-22, 1999).
- Verce, M. F., Danko, A. T., and Freedman, D. L. "Vinyl Chloride Biodegradation in a Sequential Anaerobic-Aerobic Aquifer," Fifth International Symposium, In Situ and On-Site Bioremediation, B. C. Alleman and A. Leeson (Symposium chairs), San Diego, CA (April 19-22, 1999).
- Pakdeesusuk, U., Lee, C. M., Coates, J. T., Woolfolk, C. T., Elzerman, A. W., and Freedman, D. L. "Reductive Dechlorination of PCBs in Lake Hartwell, SC, USA" 19th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Charlotte, NC, (November 1998).
- Pascual, E. A., and Freedman, D. L. "Vitamin B₁₂ Enhanced Biotransformation of Trichlorofluoromethane under Anaerobic Conditions," 18th Midwest Environmental Chemistry Workshop, The Ohio State University (October 7-8, 1995).
- Saliga, M. P., D. L. Freedman, W. Kelly, and M. Machesky. "BTEX Biodegradation under Iron-Reducing Conditions," 18th Midwest Environmental Chemistry Workshop, The Ohio State University (October 7-8, 1995).
- Caenepeel, B., Kim, B. J., and Freedman, D. L. "Biological Reduction of Nitrocellulose by Methanol-Grown Methanogenic Enrichment Cultures," 50th Annual Purdue Industrial Waste Conference, Purdue University, West Lafayette, IN (May 8-10, 1995).
- Freedman, D. L., Huang, F., Noguera, D., Shanley, R., and Pfeffer, J. T. "Biotransformation of 2,4-Dinitrotoluene and Aminonitrotoluenes under Aerobic and Nitrate-Reducing Conditions," Specialty Conference on Environmental Engineering, American Society of Civil Engineering, Boulder, CO (July 11-13, 1994).
- Rodriguez, S., and Freedman, D. L. "Accelerated Anaerobic Degradation of Chloroform Using Cyanocobalamin," Fifteenth Annual Conference of the Illinois Water Environment Association, Rockford, IL (March 30, 1994).

- Herz, S. D., and Freedman, D. L. "Use of Ethylene and Ethane for Aerobic Cometabolism of Vinyl Chloride," Fifteenth Annual Conference of the Illinois Water Environment Association, Rockford, IL (March 30, 1994).
- Smith, C. R., and Freedman, D. L. "A Kinetic Study of Dichloromethane Biodegradation Under Aerobic and Nitrate-Reducing Conditions," Fifteenth Annual Conference of the Illinois Water Environment Association, Rockford, IL (March 30, 1994).
- Lasecki, M., and Freedman, D. L. "Biodegradation of Dichloromethane Under Sulfate-Reducing Conditions," Fifteenth Annual Conference of the Illinois Water Environment Association, Rockford, IL (March 30, 1994).
- Rodriguez, S., and Freedman, D. L. "Anaerobic Degradation of Chloroform with B₁₂," 16th Midwest Environmental Chemistry Workshop, University of Notre Dame (October 17-18, 1993).
- Smith, C. R., and Freedman, D. L. "Kinetics of Dichloromethane Biodegradation by Facultative Methyltrophs under Aerobic and Nitrate-Reducing Conditions," 16th Midwest Environmental Chemistry Workshop, University of Notre Dame (October 17-18, 1993).
- Antonoglu, J. A., and Freedman, D. L. "Biotransformation of TNT and Toluene under Denitrifying Conditions," 16th Midwest Environmental Chemistry Workshop, University of Notre Dame (October 17-18, 1993).
- Herz, S., and Freedman, D. L. "Influence of Reductive Dechlorination Products from Tetrachloroethylene on the Use of Vinyl Chloride as a Growth Substrate under Aerobic Conditions," 16th Midwest Environmental Chemistry Workshop, University of Notre Dame (October 17-18, 1993).
- Freedman, D. L., Hashsham, S., and Scholze, R. "Enhanced Biotransformation of Carbon Tetrachloride under Methanogenic Conditions," Battelle Second International Symposium, In Situ and On-Site Bioreclamation, San Diego, CA (April 5-8, 1993).
- Freedman, D. L., and Scholze, R. "Biodegradation of Polychlorinated Methanes to Nonhazardous Products under Anaerobic Conditions," 19th Environmental Symposium and Exposition, The American Defense Preparedness Association's Environmental Systems Division, Albuquerque, NM (March 22-25, 1993).
- Chennupati, S. P., and Freedman, D. L. "Variability of Henry's Constants with Temperature and the Effect on VOC Emissions during Wastewater Treatment," Fourteenth Annual Conference of the Illinois Water Environment Association, Peoria, IL (March 16-18, 1993).
- Huang, F., Freedman, D. L., and Pfeffer, J. T. "Biodegradation of Dinitrotoluene under Sulfate- and Nitrate-Reducing Conditions," Fourteenth Annual Conference of the Illinois Water Environment Association, Peoria, IL (March 16-18, 1993).
- Patel, K., and Freedman, D. L. "Biodegradation of Dichloromethane under Nitrate-Reducing Conditions," Fourteenth Annual Conference of the Illinois Water Environment Association, Peoria, IL (March 16-18, 1993).

and Trichloroethylene to Ethylene under Methanogenic Conditions"); received with Dr. James M. Gossett (School of Civil and Environmental Engineering, Cornell University).

- Second Place, Montgomery-Watson Harza Master's Thesis Award, received with Meghna Swamy (MS thesis advisee), co-sponsored by the Association of Environmental Engineering Professors (October 1, 2002).
- Nominated for participation in the National Academy of Engineering's Second Annual Symposium on Frontiers of Engineering (September 19-21, 1996).
- Included on the "Incomplete" List of Teachers Ranked as Excellent by Their Students (approximately top ten percent of faculty at the University of Illinois) for the following semesters: Spring '92, Fall '92, Spring '93, Fall '93, Spring '94, Fall '94, Spring '95, Fall '95, Spring '96.
- Best Student Paper Award, received with Steven D. Herz (MS thesis advisee), Illinois Water Environment Association Fifteenth Annual Meeting (March 29-31, 1994).
- First Place, Montgomery-Watson Master's Thesis Award received with Jennifer Becker (MS thesis advisee), co-sponsored by the Association of Environmental Engineering Professors (October 4, 1993).
- Post-Doctoral Fellowship Award, American College of Toxicology, funded by the Air Force Office of Scientific Research (1990).
- General Electric Teaching Incentive Grant, Cornell University (1988).
- Graduated *summa cum laude*, University of Wisconsin - Green Bay (1978).

SPONSORED RESEARCH (Total Award Followed by Amount to D. L. Freedman)

- "Evaluating Abiotic Processes when Transitioning to Monitored Natural Attenuation," ESTCP, co-Principal Investigator, \$721,486 (\$436,597) (2024-2027)
- "Biotic and Abiotic Degradation of 1,4-dioxane Diffusing from Clays: Mechanisms, Kinetics, and Role in Long-term Attenuation in Groundwater," SERDP, co-Principal Investigator, \$1,000,000 (\$331,243) (2024-2027).
- "Attenuation Mechanisms for Low Concentrations of 1,4-Dioxane and Related Contaminants," SERDP, co-Principal Investigator, \$974,985 (\$467,039) (2023-2026).
- "Laboratory Evaluation of Bioremediation for Groundwater at the Lane Street Superfund Site," US EPA, subcontracted via S.S. Papadopoulos & Associates, Inc., Principal Investigator, \$97,000 (2023-2024).
- "Decision Tool for Abiotic Degradation," US Navy, subcontracted via Del Mar Environmental & Construction Services, Inc., Principal Investigator, \$204,909 (2021-2023).
- "Development of Protocols to Quantify Abiotic Transformation Rates and Mechanisms for Chlorinated Ethenes in Water Supply Aquifers," SERDP, Principal Investigator, \$617,704 (\$407,762) (2020-2024).
- "Thermal In-Situ Sustainable Remediation (TISR) To Enhance Biotic and Abiotic Reactions and Accelerate Timeframes," ESTCP, subcontract to Arcadis along with R. W. Falta, \$361,924 (2020-2023).

- “Development of a Quantitative Framework for Evaluating Natural Attenuation of 1,1,1 TCA, 1,1-DCA, 1,1-DCE, and 1,4-Dioxane in Groundwater,” ESTCP, Subcontract to GSI, \$218,000 (2016-2020).
- “Abiotic Transformation of Chlorinated Ethenes in Low Permeability Formations,” SERDP, Principal Investigator, \$1,132,499 (\$592,262) (2016-2021).
- “Providing Additional Support for MNA by Including Quantitative Lines of Evidence for Abiotic and Co-metabolic Oxidation of Chlorinated Ethylenes,” ESTCP via T. H. Wiedemeier & Associates, Inc. subcontract to Clemson University, \$127,705 (\$127,705) (2016-2017).
- “Inhibitory and Synergistic Effects in Mixtures of Contaminants, and Evaluation of Hydraulic Source Isolation at the Area P DuPont Camaçari Site, \$199,776 (\$127,888) (2014-2020).
- “Microcosm Evaluation of Enhanced Bioremediation for Chlorinated Ethenes, Chlorinated Benzenes, and Benzene,” TRC Solutions, Principal Investigator, \$69,447 (\$69,447) (2014-2015).
- “Microcosm Evaluation of Enhanced Bioremediation for Halogenated Methanes,” CH2MHILL, Principal Investigator, \$49,964 (\$49,964) (2014-2015).
- “Microcosm Evaluation of 1,4-Dioxane Biotransformation,” DuPont and DOW, Principal Investigator, \$56,000 (\$56,000) (2014-2015).
- “Laboratory Evaluation of Biostimulation to Treat Chlorinated Ethenes in a Fractured Sandstone Aquifer,” MWH Global, Inc., Principal Investigator, \$225,060 (\$225,060) (2012-2016).
- “Laboratory Evaluation of 1,4-Dioxane Biodegradation Under Anaerobic Conditions,” Hargis + Associates, Principal Investigator, \$45,075 (\$45,075) (2010-2011).
- “Laboratory Evaluation of Bioremediation for Carbon Tetrachloride and Chloroform at a Georgia Site,” CH2MHILL, Principal Investigator, \$20,000 (\$20,000) (2009-2010).
- “Laboratory Evaluation of Biostimulation and Bioaugmentation for Enhanced Anaerobic Bioremediation of Chlorinated Ethenes,” El Paso Natural Gas Company, Principal Investigator, \$26,000 (\$26,000) (2008-2009).
- “Laboratory Evaluation of Methylene Chloride Toxicity to Commercial Cultures Used for Bioaugmentation of Groundwater Contaminated with Chlorinated Ethenes,” Hargis + Associates, Principal Investigator, \$10,000 (\$10,000) (2008).
- “Laboratory Evaluation of Monitored Natural Attenuation for PAHs in Karst,” MACTEC Engineering and Consulting, Principal Investigator, \$33,600 (\$33,600) (2006-2007).
- “Characterization of Microbes Capable of Using Vinyl Chloride as a Sole Carbon and Energy Source by Anaerobic Oxidation,” Strategic Environmental Research and Development Program (SERDP), Co-Principal Investigator with Stephen H. Zinder at Cornell University, \$455,759 (\$167,760 to Freedman at Clemson University) (2007-2010).
- “Laboratory Evaluation of Zero Valent Iron for Treating Hexavalent Chromium and Trichloroethene at an Industrial Site,” MACTEC Engineering and Consulting, Co-Principal Investigator, \$25,000, (\$12,500), (2005-2006).

- “Laboratory Evaluation of Bioremediation to Treat Hexachlorocyclohexane Isomers and Trichloroethene at a Chlorinated Alkali Site,” MACTEC Engineering and Consulting, Co-Principal Investigator, \$49,500, (\$24,750), (2005-2006).
- “Laboratory Evaluation of Bioremediation for Halogenated Methanes and Chlorinated Ethenes,” MACTEC Engineering and Consulting, Co-Principal Investigator, \$57,000, (\$28,500), (2005-2006).
- “Development of a Bioaugmentation Culture for Chlorinated Solvents at SRS,” SCUREF/Westinghouse Savannah River Company, Principal Investigator, \$108,144 (\$108,144) (2005-2007).
- “Laboratory Evaluation of In Situ Chlorinated Ethene Removal in the Chatsworth Formation, Santa Susana Field Laboratory,” Montgomery Watson Harza, Principal Investigator, \$71,000, (\$71,000), (2003-2005).
- “Microcosm Evaluation of Tetrachloroethene Biodegradation in Samples from a Dry-Cleaning Site,” MACTEC Engineering and Consulting, Principal Investigator, \$14,000, (\$14,000), (2003).
- “Remediation of PCB and Pesticide Contaminated Soils – CMP Ballast Area,” SCUREF/Westinghouse Savannah River Corporation, co-Principal Investigator, \$64,646, (\$32,323), (2002-2004).
- “Laboratory Evaluation of Trichloroethylene, 1,1,1-Trichloroethane, and Methylene Chloride *In Situ* Biodegradation in Mixed Electron Acceptor Environments,” Hargis + Associates, Principal Investigator, \$57,726, (\$57,726), (2001-2002).
- “Laboratory Evaluation of Chromium Reduction by Polysulfides and Biological Reduction of Tetrachloroethylene,” Hargis + Associates, Principal Investigator, \$32,000, (\$32,000) (2000-2001).
- “Enhanced Biotreatment of Textile Manufacturing Wastewater,” South Carolina Hazardous Waste Management Research Fund, co-Principal Investigator, \$53,170, (\$26,585), (2000-2001).
- “Bench-Scale Testing and Technical Support for the Creation of an *In Situ* Reactive Wall,” FRx Inc., Principal Investigator, \$55,143, (\$27,571), (2000-2001).
- “Molecular and Kinetic Characterization of Vinyl Chloride Oxidation and Corresponding Cometabolism of *cis*- and *trans*-1,2-Dichloroethylene,” Environmental Protection Agency, 98-NCERQA-EPSCoR, Principal Investigator, \$240,000, (\$120,000), (1999-2002).
- “Validation of Nitrocellulose Biodegradation,” Michigan Biotechnology Institute (IDIQ contract with U.S. Army Construction Engineering Research Laboratory), Principal Investigator, \$15,000, (\$15,000), (1999).
- “Biodegradation of Atrazine by *Ochrobactrum anthropi*,” NSF/EPSCoR training grant, with matching funds from Novartis Crop Science, Inc., \$4,000, (\$4,000), (1998).
- “Anaerobic Biological Treatment of Nitrocellulose,” Michigan Biotechnology Institute (IDIQ contract with U.S. Army Construction Engineering Research Laboratory), Principal Investigator, \$29,950, (\$29,950), (1997).

- “Wastewater Treatment Performance Evaluation,” Western Carolina Regional Sewerage Authority, co-Principal Investigator with T. Karanfil, \$13,000/yr., (\$6,500/yr.), (1996-98).
- “Thermal Decomposition of Nitrocellulose,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$24,977, (\$24,977), (1995).
- “Biotransformation of Nitrocellulose Under Anaerobic Conditions,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$62,000, (\$62,000), (1995-96).
- “Laboratory Prediction of Belt Press Dewatering Dynamics,” Michigan Biotechnology Institute (Industrial Testing Contract), Principal Investigator, \$25,000, (\$25,000), (1994-95).
- “High Rate Bio-Oxidation of Dichloromethane by Denitrifying Bacteria,” Illinois Hazardous Waste Research and Information Center, Principal Investigator, \$80,000, (\$80,000), (1994-96).
- “An Evaluation of Biotransformation Products from 2,4-Dinitrotoluene Under Nitrate-Reducing Conditions,” Department of the Army, Army Research Office, Principal Investigator, \$20,000, (\$20,000), (1994-95).
- “*In Situ* and On-Site Bioremediation of Groundwater Contaminated with Trichloroethylene,” University of Illinois Water Resources Center, Principal Investigator, \$33,000, (\$33,000), (1994-96).
- “Sequential Anaerobic/Aerobic Biodegradation of Nitrocellulose,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$37,760, (\$37,760), (1994).
- “Enhanced Anaerobic Biotransformation of a Co-Contaminant Mixture: Chlorinated Hydro-carbons and Fuel Hydrocarbons,” Department of Energy, ER/WM Junior Faculty Award Program, Oak Ridge Institute for Science and Education, Principal Investigator, \$50,000, (\$50,000), (1993-94).
- “Biodegradation of Aminonitrotoluenes and Diaminotoluene Under Aerobic Conditions,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$24,173, (\$24,173), (1993).
- “Biodegradation of 2,4-Dinitrotoluene Under Denitrifying Condition,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$24,996, (\$24,996), (1993).
- “Biodegradation of Polychlorinated Methanes Under Nitrate- and Sulfate-Reducing Conditions,” University of Illinois Water Resources Center, Principal Investigator, \$18,001, (\$18,001), (1993-94).
- “Development of Improved Methods for Determining Henry's Constants for Volatile Organic Compounds,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$10,000, (\$10,000), (1992).

- “Biodegradation of Chlorinated Methanes Under Anaerobic Conditions,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$15,500, (\$15,500), (1992).
- “Biodegradation of Polychlorinated Methanes in Methanogenic Systems,” Air Force Office of Scientific Research, through the American College of Toxicology, Principal Investigator, \$60,710, (\$60,710), (1991-92).
- “Development of Capabilities for Research on Biodegradation of Hazardous Environmental Contaminants,” University of Illinois Campus Research Board, Principal Investigator, \$25,000, (\$25,000), (1990-91).
- “Microbial Degradation Basic Research,” U. S. Army Construction Engineering Research Laboratory, Principal Investigator, \$84,999, (\$84,999), (1990).

OTHER SPONSORED ACTIVITY

- “Renovation of the Environmental Engineering & Science Laboratories, University of Illinois,” co-Applicant, National Science Foundation, \$1,018,550, (1995-97).
- “University Equipment Grant Request,” co-Principal Investigator, Hewlett Packard, \$52,150, (\$26,075), (1994).
- “Treatability of Fat, Oils, and Grease Discharged to a Municipal Treatment Plant,” CCL Custom Manufacturing, Principal Investigator, \$5,000, (\$5,000), (1994).

GRADUATE STUDENT ADVISING

Doctoral Graduates (12)

1. Wang, H. (PhD), “Abiotic Transformation of Chlorinated Ethenes in Low Permeability Formations,” Clemson University (December 2022).
2. Ramos Garcia, A. A. “Evaluation of *In Situ* Bioremediation of 1,4-Dioxane Under Aerobic and Anaerobic Conditions,” Clemson University (December 2020).
3. Yu, R. “Laboratory Evaluation of Natural and Enhanced Remediation of Chlorinated Ethenes in Fractured Sandstone,” Clemson University (August 2017).
4. Barajas, F. J. “Evaluation of 1,4-Dioxane Biodegradation Under Aerobic and Anaerobic Conditions,” Clemson University (December 2016).
5. Brotherson, T. “Identification and Characterization of Polychlorinated Biphenyl Dechlorinating Microorganisms from Lake Hartwell, SC,” Clemson University (2011); co-advised with C. M. Lee.
6. Elango, V., “Biodegradation and Bioremediation of Hexachlorocyclohexane Isomers, Chlorinated Ethenes, Chlorinated Benzenes and Benzene,” Clemson University (May 2010).
7. Shan, H., “Development of Strategies for Enhanced In Situ Bioremediation of High Concentrations of Halogenated Methanes,” Clemson University (May 2009).

8. Darlington, R. "Laboratory Evaluation of Chlorinated Ethene Transformation Processes in Fractured Sandstone," Clemson University (May 2008).
9. Danko, A. S. "Use of Vinyl Chloride as a Growth Substrate by Aerobic Bacteria: Pathways and Involvement of Linear Plasmids," Clemson University (May 2005).
10. Verce, M. F. "Cometabolic and Growth-linked Biodegradation of Vinyl Chloride Under Aerobic Conditions," University of Illinois at Urbana-Champaign/Clemson University (January 2001).
11. Hashsham, S. A., "Cobalamin-Enhanced Anaerobic Biotransformation of Carbon Tetrachloride," University of Illinois at Urbana-Champaign, (December 1996).
12. Noguera, D. R. "Biological Transformation of 2,4-Dinitrotoluene Under Denitrifying Conditions," University of Illinois at Urbana-Champaign, (May 1995).

Masters Graduates (68)

1. Costello, A. "Laboratory Evaluation of Remediation Alternatives for Groundwater at the Lane Street Superfund Site," Clemson University, (2024).
2. Dunn, O. (MS), "Evaluation the Role of Magnetic Materials in Mediating Abiotic Degradation of Chlorinated Ethenes at TCAAP-A Using a ¹⁴C-Assay," Clemson University (2023).
3. Groome, E. (MS), "Aerobic Cooxidation Rates for TCE by Low pH Methanotrophs in the Eastern US," Clemson University (2022).
4. Jimenez Garcia, J. P., "Evaluation of Strategies for Treatment of Complex Waste Mixtures at an Industrial Site in South America," Clemson University (2021).
5. Szwast, N. (MS), "Application of a ¹⁴C Assay to Quantify Aerobic Cooxidation Rates for TCE by Low pH Methanotrophs," Clemson University (2021).
6. Byrd, B. (MS), "Effect of Temperature on Transformation of Chlorinated Ethenes in Fractured Sandstone," Clemson University (2020).
7. Lemes, M. C. S. "Biodegradation of Chlorobenzenes and Nitrotoluenes at an Industrial Site in South America," Clemson University (2018).
8. Mills, J. C. IV, "Quantification of TCE Co-Oxidation in Groundwater Using a ¹⁴C-Assay," Clemson University (2017).
9. Barreto-Quintero, P. A., "Inhibitory and Synergistic Effects during Biodegradation of Mixed Contaminants at an Industrial Site in South America," Clemson University (2016).
10. Arve, P., "Microcosm Study of 1,4-Dioxane Biotransformation," Clemson University (2015).
11. Moss, C., "Microcosm Evaluation of Enhanced Bioremediation for an Industrial Site Contaminated with Chlorinated Ethenes, Chlorinated Benzenes, and Benzene," Clemson University (2015).
12. Wang, H., "Microcosm Evaluation of Enhanced Bioremediation for Halogenated Methanes at a Former Industrial Site," Clemson University (2015).

13. Rhiner, B., "Anaerobic Biodegradation of the Oil Dispersants 1,2-Propanediol and 2-Butoxyethanol," Clemson University (2014).
14. Xiao, R., "Scale-Up and Characterization of Enrichment Cultures Capable of Reductively Dechlorinating Chlorinated Ethenes at Low pH," Clemson University (2014).
15. Jacobs, P. R., "Evaluation of Anaerobic Biodegradation of High Concentrations of Halogenated Methanes," Clemson University (2013).
16. Kanitkar, Y., "Evaluation of Dichloromethane as an Electron Donor for Reductive Dechlorination of Tetrachloroethene to Ethene," Clemson University (2012).
17. Bakenne, A., "Assessing Anaerobic Bio-Oxidation of Vinyl Chloride and Ethene in Microcosms," Clemson University (2012).
18. Jiang, C., "Development of Enrichment Cultures for Anaerobic Reductive Dechlorination of Tetrachloroethene under Low pH Conditions," Clemson University (2012).
19. Wang, H., "Evaluation of Bioremediation Strategies to Treat High Concentrations of Chloroform and Carbon Tetrachloride," Clemson University (2012).
20. Anderson, C. M., "Evaluation of an Enrichment Culture that Reductively Dechlorinates γ -Hexachlorocyclohexane," Clemson University (2012).
21. Yu, R., "Biodegradation Kinetics for 1,2-Dichloroethane and Ethylene Dibromide in Anaerobic Enrichment Cultures Grown on Each Compound," Clemson University (2011).
22. Hickey, M., "Evaluation of Tetrachloroethene Dechlorination Under Low pH Conditions in Microcosms and Enrichment Cultures," Clemson University (2010).
23. Peethambaram, H., "Molecular Characterization of Enrichment Cultures That Grow on Tetrachloroethene, 1,2 Dichloroethane and Ethylene Dibromide," Clemson University (2010).
24. Reid, A., "Anaerobic Bio-oxidation of Vinyl Chloride and Ethene," Clemson University (August 2010).
25. High, J. M., "Microcosm Evaluation of Vinyl Chloride Bio-Oxidation Under Anaerobic Conditions," Clemson University (August 2008).
26. Eaddy, A., "Scale-Up and Characterization of an Enrichment Culture for Bioaugmentation of the P-Area Chlorinated Ethene Plume at the Savannah River Site," Clemson University (August 2008).
27. Baruah, M., "Laboratory Evaluation of Polycyclic Aromatic Hydrocarbon Biodegradation at a Former Tar Plant Site," Clemson University (August 2008).
28. Wood, E. A., "Development of an On-Site Enrichment Culture for Bioaugmentation Use at the Savannah River National Laboratory," Clemson University (August 2007).
29. Griner, J., "An Evaluation of Batch Tests as a Screening Tool to Predict the Performance of Zero-Valent Iron for Treating Volatile Chlorinated Solvents in Continuous Flow Columns," Clemson University (May 2005).
30. Gliem, J. N., "Evaluation of Dichloromethane as an Electron Donor for Reductive Dechlorination of Trichloroethene," Clemson University (September 2004).

31. Pressley, H. M., "An Evaluation of Composting to Treat Soils Contaminated with Polychlorinated Biphenyls at the Savannah River Site Chemicals, Metals, and Pesticides Pits," Clemson University (August 2004).
32. Pickens, E. P., "The Contribution of Anaerobic Oxidation to Natural Attenuation of *cis*-1,2-Dichloroethylene and Vinyl Chloride in Groundwater at an Industrial Site in Southern California," Clemson University (August 2004).
33. Bratt, W., "Laboratory Evaluation of Natural Attenuation and Enhanced Biodegradation of Trichloroethene, *cis*-Dichloroethene, and Vinyl Chloride under Anaerobic Conditions," Clemson University (August 2004).
34. McLaughlin, D., "Laboratory Evaluation of Biostimulation and Bioaugmentation as Strategies for Bioremediation of Tetrachloroethene," Clemson University (August 2004).
35. Cline, R. M., "Laboratory Evaluation of Natural and Enhanced Biodegradation of Trichloroethene and Dichloromethane under Anaerobic Conditions," Clemson University (August 2003).
36. Chin, S-C., "Aerobic Biodegradation of Chlorinated Ethenes in Groundwater Exposed to Sequential Anaerobic and Aerobic Conditions," Clemson University (August 2003).
37. Madl, M. D., "Aerobic Biodegradation Rates for Ethene, *cis*-1,2-Dichloroethene, and Vinyl Chloride in Sediments at the Savannah River Site Landfill," Clemson University (August 2002).
38. Payauys, A. M., "The Effect of Nutrient Deficiency on the Removal of RCRA Solvents from Textile Manufacturing Wastewater During Activated Sludge Treatment," Clemson University (August 2002).
39. Swamy, M. H., "Biodegradation of Chloromethane under Anoxic and Aerobic Conditions," Clemson University (August 2001).
40. Cashwell, J. M., "Biological Degradation of Nitrocellulose under Methanogenic, Nitrate Reducing and Sulfate Reducing Conditions," Clemson University (August 2000).
41. Steele, J. A., "The Potential for Reductive Dechlorination of Perchloroethylene and Daughter Products in Groundwater at the Savannah River Site Sanitary Landfill," Clemson University (August 2000).
42. Gunsch, C. K., "Aerobic Cometabolism of Chlorinated Ethenes by an Isolate that uses Vinyl Chloride as Primary Substrate," Clemson University (May 2000).
43. Christopher, H. J., "Biodegradation of 2,4-Dinitrotoluene in the Waste Streams of Ammunitions Plant," Virginia Polytechnic Institute and State University (January 1999).
44. Bell, N. C., "Natural Attenuation of Trichloroethylene in Rhizosphere Soils at the Savannah River Site," Clemson University, (December 1998).
45. Graham, T. M., "Predicting the Performance of Belt Filter Presses Using the Crown Press for Laboratory Simulation," Clemson University, (August 1998).
46. Sutherland, K. W., "Biodegradation of Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) Under Anoxic Conditions," University of Illinois at Urbana-Champaign, (January 1997).

47. Hwang, P., "Biodegradation of 2,4-Dinitrotoluene in Sulfate-Reducing Enrichment Cultures," University of Illinois at Urbana-Champaign, (January 1997).
48. Campbell, R. K., "Thermal Decomposition of Nitrocellulose," University of Illinois at Urbana-Champaign, (December 1996).
49. Obermeier, A. L., "High Rate Biological Treatment of Dichloromethane in Fluidized Bed Reactors Using Oxygen and Nitrate as Terminal Electron Acceptors," University of Illinois at Urbana-Champaign, (December 1996).
50. Schoeffmann, J. L., "Biological Treatment of Nitrocellulose in Methanogenic Enrichment Cultures," University of Illinois at Urbana-Champaign, (December 1996).
51. Sheehan, G. C., "Aerobic Versus Anoxic High Rate Bio-Oxidation of Dichloromethane in Fluidized Bed Bioreactors: Design, Construction and Start-Up," University of Illinois at Urbana-Champaign, (August 1996).
52. Saliga, M. P., "Enhanced Bioremediation of Toluene Under Iron-Reducing Conditions," University of Illinois at Urbana-Champaign, (May 1996).
53. Pascual, E. A., "Cyanocobalamin-Enhanced Transformation of Trichlorofluoromethane (CFC-11) Under Anaerobic Conditions," University of Illinois at Urbana-Champaign, (May 1996).
54. Galla, C. A., "Laboratory Prediction of Belt Filter Press Dewatering Dynamics," University of Illinois at Urbana-Champaign, (May 1996).
55. Williamson, A. E., "The Effect of Benzene, Toluene, Ethylbenzene, and *o*-Xylene on the Aerobic Cometabolic Biodegradation of Vinyl Chloride and Ethylene," University of Illinois at Urbana-Champaign, (May 1995).
56. Shanley, R. S., "Aerobic Biodegradation of Dinitrotoluene and its Reduced Metabolites: Diaminotoluene, 2-Amino-4-Nitrotoluene, and 4-Amino-2-Nitrotoluene," University of Illinois at Urbana-Champaign, (May 1995).
57. Lasecki, M. E., "Transformation of Dichloromethane, Chloroform, and Carbon Tetrachloride under Sulfate-Reducing Conditions," University of Illinois at Urbana-Champaign, (May 1995).
58. Caenepeel, B. M., "Anaerobic Biotransformation of Nitrocellulose under Methanogenic Conditions," University of Illinois at Urbana-Champaign, (May 1995).
59. Emery, B. P., "Predicting Belt Filter Press Performance Using Laboratory Techniques," University of Illinois at Urbana-Champaign, (May 1994).
60. Agramonte, D. E., "The Effects of Hexavalent Chromium on Dichloromethane Degradation under Denitrifying Conditions," University of Illinois at Urbana-Champaign, (May 1994).
61. Rodriguez, S. L., "Accelerated Anaerobic Biodegradation of Chloroform with Cyanocobalamin," University of Illinois at Urbana-Champaign, (December 1994).
62. Smith, C. R., "Kinetics of Dichloromethane Biodegradation under Aerobic and Nitrate-Reducing Conditions," University of Illinois at Urbana-Champaign, (May 1994).

63. Herz, S. D., "Use of Ethene and Ethane for Aerobic Cometabolic Biodegradation of Vinyl Chloride," University of Illinois at Urbana-Champaign, (May 1994).
64. Delaney, G., "Biodegradation of Halogenated Methanes under Methanogenic Conditions," University of Illinois at Urbana-Champaign, (May 1994).
65. Huang, F. Y-H., "Biodegradation of 2,4-Dinitrotoluene under Sulfate- and Nitrate-Reducing Conditions," University of Illinois at Urbana-Champaign, (August 1993).
66. Chennupati, S. P., "Temperature Variability of Henry's Constants and the Effect on VOC Emissions at Wastewater Treatment Plants," University of Illinois at Urbana-Champaign, (May 1993).
67. Antonoglu, J. A., "Biotransformation of Toluene and 2,4,6-Trinitrotoluene Under Denitrifying Conditions," University of Illinois at Urbana-Champaign, (May 1993).
68. Becker, J. G., "Biodegradation of Chloroform under Methanogenic Conditions," University of Illinois at Urbana-Champaign, (May 1992).

Post Doctoral Research Advisees

1. Dr. Kelli McCourt, (January 2024 -)
2. Dr. Ángel A. Ramos García, "Development of Protocols to Quantify Abiotic Transformation Rates and Mechanisms for Chlorinated Ethenes in Water Supply Aquifers," (December 2020-August 2021).
3. Dr. Rong Yu, "Abiotic Transformation of Chlorinated Ethenes in Low Permeability Formations," (August 2017-September 2019).
4. Dr. Ricky L. Ulrich, "Molecular and Kinetic Characterization of Vinyl Chloride Oxidation and Corresponding Cometabolism of *cis*- and *trans*-1,2-Dichloroethylene," (January 2000-February 2001).
5. Dr. Mei-Zhong Luo, "Molecular and Kinetic Characterization of Vinyl Chloride Oxidation and Corresponding Cometabolism of *cis*- and *trans*-1,2-Dichloroethylene," (March 2001-December 2001).
6. Dr. Matthew F. Verce, "Laboratory Evaluation of Chromium Reduction by Polysulfides and Biological Reduction of Tetrachloroethylene," (January 2000-December 2001).

TEACHING

Courses Taught

- CE 342 (University of Illinois at Urbana-Champaign), Water Quality Control Processes, F90, F91, F92, F93, F94, F95.
- CE 346 (University of Illinois at Urbana-Champaign), Biological Principles of Environmental Engineering Processes, S91, S92, S93, S94, S95, S96.
- CE 442 (University of Illinois at Urbana-Champaign), Processes for Water Quality Control II, S93.

- CE 443 (University of Illinois at Urbana-Champaign), Unit Operations in Environmental Engineering, S94.
- EES 2010 (Clemson University), Environmental Engineering Fundamentals I, F10-F17.
- EES 4010/6010 (Clemson University), Introduction to Environmental Engineering, S97, F98-F02, F04-F08.
- EES 4020/6020 (Clemson University), Water and Wastewater Treatment, S98, F11-14.
- EES 3050 (Clemson University), Laboratory in Water and Wastewater Treatment, F11-15.
- EES 4850/6850 (Clemson University), Hazardous Waste Management, S97-S09.
- EES 8040 (Clemson University), Biochemical Operations in Wastewater Treatment, S09-S16.
- EES 8050 (Clemson University), Laboratory in Water and Wastewater Treatment Operations, S05-06, S09-S16.
- EES 8060 (Clemson University), Integrated Design of Water, Wastewater and Hazardous Waste Treatment Systems; module on wastewater and/or bioremediation, F99, F02, F04-F16.
- EES 8370 (Clemson University), Biodegradation and Bioremediation, F96-F10.
- EES 8510 (Clemson University), Biological Principles of Environmental Engineering, Su98, F03, F08.

New Course Development

- EES 2010 (Clemson University), Introduction to Environmental Engineering I, F10.
- EES 3040 (Clemson University), Wastewater Treatment Systems, F14
- EES 4030 (Clemson University), Laboratory in Water and Wastewater Treatment, F11.
- EES 8370 (Clemson University), Biodegradation and Bioremediation, F96.
- EES 8060 (Clemson University), Integrated Design of Water, Wastewater and Hazardous Waste Treatment Systems; developed a new 1 credit hour module on Bioremediation, F99.

UNIVERSITY AND PUBLIC SERVICE

Committees (while on the faculty at Clemson University)

- Member, College of Engineering, Computing, and Applied Sciences Awards Committee (2014-present); Chair (2022-present)
- Member, Department of Environmental Engineering and Earth Sciences Advisory Committee (1996-present).
- Member, College of Engineering and Science Curriculum Committee (1998-2002); Committee Chair (2000-2002).
- Member, Graduate School Curriculum Committee (2000-2004).
- Member, Selection Committee for the McQueen Quattlebaum Faculty Achievement Award, College of Engineering and Science (2002, 2003).
- Member, Selection Committee for the Alumni Distinguished Professor, College of Engineering and Science (2012).

Committees (while on the faculty at the University of Illinois at Urbana-Champaign)

- Member, Department of Civil Engineering, Graduate Admissions, Fellowships, and Assistantships (1990-96).
- Member, Department of Civil Engineering, Environmental Engineering Admissions Screening Committee (1991-95).
- Member/Chair, Department of Civil Engineering Awards Committee (1992-96).
- Member, Ad Hoc Committee to Develop an Instructional Use Plan and Architectural Program for an Undergraduate Instructional Laboratory in Environmental Engineering (1993).
- Member, Search Committee to replace Bruce Rittmann (1992-93).
- Member, Langlier Scholarship Selection Committee (1993-96).
- Member, Search Committee to replace R. S. Engelbrecht and J. T. Pfeffer (1994-95).
- Member, Chemical Safety and Hazardous Waste Management Committee, Office of the Vice Chancellor for Administration and Human Resources (1994-96).

Other Service: Peer Review of Proposals for the Following Agencies

- Air Force Office of Scientific Research
- Army Research Office
- CALFED Science Program, University of Southern California Sea Grant Program
- Dept. of Defense Environmental Scholarships/Fellowships and Grants Program
- National Institute of Environmental Health Sciences (NIEHS), Exploratory/Development Research Applications (R21) Review Panel (50 proposals)
- National Research Council, Collaboration in Basic Science and Engineering
- National Science Foundation, Biocomplexity in the Environment
- National Science Foundation, Environmental Engineering and Technology Unsolicited Proposals Program, Panel B, chaired by Patrick L. Brezonik
- National Science Foundation, open solicitations, managed by Nara Gavini
- New York State Center for Hazardous Waste Management
- North Central Regional USGS Competitive Grant Program (4 proposals)
- Purdue Water Resources Research Center
- University of Illinois Campus Research Board
- University of Nebraska EPSCoR, pre-review of proposal submitted to NSF
- South Carolina Hazardous Waste Management Research Fund
- Stanford University Synchrotron Radiation Lightsource (SSRL)
- Strategic Environmental Research & Development Program (SERDP), 17 proposals
- U.S. Department of Agriculture, SBIR Program
- U.S. Department of Energy, Environmental Management Science Program Review Meeting for Program Notice 96-10, Panel 10B

Other Service: Peer Reviewer for Journals and Conference Proceedings (# reviewed)

- *Advances in Environmental Research* (1)
- *Anaerobe* (1)
- *Applied and Environmental Microbiology* (20)
- *Applied Microbiology and Biotechnology* (10)

- *Archives of Microbiology* (1)
- *ASCE Journal of the Environmental Engineering Division* (8)
- *ASCE Hazardous, Toxic, and Radioactive Waste Management Practice Periodical* (1)
- Battelle Symposium Papers (1st, 2nd and 3rd), “In Situ and On-Site Bioreclamation,” (4)
- *Biodegradation* (12)
- *Bioengineering & Biotechnology* (3)
- *Bioremediation Journal* (4)
- *Chemosphere* (6)
- *Environmental Microbiology* (2)
- *Environmental Engineering Science* (3)
- *Environmental Pollution* (3)
- *Environmental Science: Processes and Impacts* (2)
- *Environmental Science & Technology* (77)
- *Environmental Science & Technology – Water* (2)
- *Environmental Science & Technology Letters* (4)
- *Environmental Science: Water Research & Technology* (1)
- *Environmental Technology* (2)
- *Environmental Toxicology & Chemistry* (1)
- *FEMS Microbiology Letters* (1)
- *Global Change Biology* (1)
- *Groundwater Monitoring & Remediation* (4)
- *Hydrology* (1)
- *International Journal of Environment and Pollution* (1)
- *International Water Association*; reviewed 12 abstracts for the 3rd IWA Conference, Melbourne, Australia (1)
- *International Water Association*; reviewed 6 full manuscripts and 12 abstracts for the 4th IWA Biennial Congress, Marrakech, Morocco (1)
- *Journal of Biotechnology* (1)
- *Journal of Contaminant Hydrology* (6)
- *Journal of Hazardous Materials* (4)
- *Letters in Applied Microbiology* (1)
- *Microbiology* (1)
- *Microorganisms* (1)
- *Nature – Water* (1)
- *PLOS ONE* (1)
- *Process Biochemistry* (2)
- *Research Journal of the Water Pollution Control Federation* (2)
- *RSC Sustainability* (1)
- *Science of the Total Environment* (7)
- *Soil and Sediment Contamination: An International Journal* (2)
- *Soil Biology and Biochemistry* (1)
- *Water Environment Research* (15)
- *Water Research* (32)
- *Water Science and Technology*; IAWQ 19th Biennial Conference (1)

- *Water Science and Technology*; IWA/Paris 2000 Inaugural Conference; (3)
- *Water Science and Technology* (8)
- *Water, Air & Soil Pollution* (1)

Other Service: Peer Reviewer for the Following Textbook

- *Hazardous Waste Management*, M. D. LaGrega, P. Buckingham, and J. C. Evans, 1994, McGraw-Hill, Inc., New York, NY (reviewed 3/98, 3/99).

Other Service: External Reviewer for Tenure and Promotion

- Air Force Institute of Technology
- Arizona State University
- Bucknell University
- Clarkson University
- Iowa State University
- Lehigh University
- Michigan State University
- New Jersey Institute of Technology
- North Carolina State University
- Ohio State University
- Oregon State University
- Purdue University
- Rutgers University
- Texas A&M University
- Texas Tech University
- University of Illinois at Chicago
- University of Iowa
- University of Nebraska – Lincoln
- University of Tennessee
- University of Toledo
- University of Wisconsin – Milwaukee
- Utah State University
- Virginia Tech

Other Service: External Dissertation Reviewer

- University of New South Wales, Sydney, Australia (Miao Hu)
- University of Toronto, Canada (Sarah Bulka)

Other Service: Session Chair at National and International Conferences

- Program Committee, Sixth International Symposium on Bioremediation and Sustainable Environmental Technologies, Austin, TX (May 8*11, 2023).
- “Enhanced Methods for Biodegradation of Organic and Inorganic Contaminants,” Session D5, Fourth International Symposium on Bioremediation and Sustainable Environmental

Technologies, Miami, FL (May 22-25, 2017); co-chair with Brad Elkins, EOS Remediation, LLC.

- “Amendment Delivery Strategies,” Session F3, Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, FL (May 19-21, 2015); co-chair with Stephen H. Rosansky, Battelle.
- “Chromium Bioremediation,” Session C6, Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL (June 10-13, 2013); co-chair with Michael Jordan, P.G., AECOM.
- “Addressing the Impacts of pH on Aquifer Bioremediation,” Session A7, Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV (June 27-30, 2011); co-chair with Sam Fogel, BCI, Inc.
- “Anaerobic Biodegradation Improvements,” Session B1, Tenth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 5-8, 2009); co-chair with William A. Newman, RNAS.
- “Full-Scale Applications of Bioaugmentation for Chlorinated Solvent Remediation,” Session D5, Ninth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (May 7-10, 2007); co-chair with Dr. Leo Lehmicke, Hargis + Associates.
- “Biostimulation II,” Session C3, Eighth International Battelle Symposium on In Situ and On-Site Bioremediation, Baltimore, MD (June 6-9, 2005); co-chair with Dr. Leo Lehmicke, Hargis + Associates.
- “Enhanced Reductive Dechlorination I,” Session B3, Seventh International Battelle Symposium on In Situ and On-Site Bioremediation, Orlando, FL (June 2-5, 2003); co-chair with Dr. Leo Lehmicke, Exponent, Inc.
- “Anaerobic/Aerobic Processes for Vinyl Chloride and *cis*-Dichloroethene Biodegradation,” Session C2, Sixth International Battelle Symposium on In Situ and On-Site Bioremediation, San Diego, CA (June 4-7, 2001).
- “Aerobic/Anaerobic Processes for Chlorinated Solvent Degradation,” Session C7, Fifth International Battelle Symposium on In Situ and On-Site Bioremediation, San Diego, CA (April 19-22, 1999); co-chair with Dr. Craig Criddle, Stanford University.
- “Environmental Restoration,” International Association on Water Quality 19th Biennial Meeting, Vancouver, British Columbia (June 1998).
- “Wastewater Treatment Research: Anaerobic Processes,” Session 1, Water Environment Federation 70th Annual Meeting, Chicago, IL (October 1997).
- “Bioremediation,” Session 10, Twenty-Ninth Mid Atlantic Industrial and Hazardous Waste Conference, Roanoke, VA (July 13-16, 1997).
- “Anaerobic/Aerobic Processes for Chlorinated Solvent Degradation,” Session C4, Fourth International Battelle Symposium on In Situ and On-Site Bioremediation, New Orleans, LA (April 1997); co-chair with Dr. Craig Criddle, Michigan State University.

- “Wastewater Treatment Research Symposia: Metals,” Session 46B, Water Environment Federation 69th Annual Meeting, Dallas, TX (October 1996).
- “Research Symposium: Anaerobic Biological Treatment,” Session 17, Water Environment Federation 68th Annual Meeting, Miami Beach, FL (October 1995).
- “Aerobic/Anaerobic Processes for Chlorinated Solvent Degradation,” Session B5, Third International Battelle Symposium on In Situ and On-Site Bioreclamation, San Diego, CA (April 1995); co-chair with Dr. Craig Criddle, Michigan State University.
- “Research Symposium: Anaerobic Biological Treatment,” Session 50, Water Environment Federation 67th Annual Meeting, Chicago, IL (October 1994).
- “Research Symposium VI: Innovative Concepts,” Session 61, Water Environment Federation 66th Annual Meeting, Anaheim, CA (October 1993).

Invited Lectures

- Freedman, D. L. “Progress Towards Understanding Aerobic and Anaerobic Bio-Oxidation of Vinyl Chloride.” Presented to the Environmental Engineering & Science Program, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA (November 19, 2003). Freedman, D. L. “Bio-Oxidation of *cis*-Dichloroethene and Vinyl Chloride under Anaerobic and Aerobic Conditions.” Environmental Site Restoration Technology Transfer Symposium, sponsored by MACTEC, Inc., Atlanta, GA (February 7, 2003). Freedman, D. L. “Evaluating the Potential for Aerobic Biodegradation of Vinyl Chloride in Groundwater and Sediment Downgradient of the SRS Sanitary Landfill: Field and Laboratory Measurements.” Presented to the Groundwater Update meeting, Savannah River Site, Aiken, SC (March 7, 2001).
- Freedman, D. L. “Aerobic Cometabolism of *cis*-Dichloroethene with Vinyl Chloride Serving as the Primary Substrate: Implications for *In Situ* Biodegradation of Chlorinated Ethenes.” Presented to the Department of Civil and Environmental Engineering, Michigan State University, East Lansing, MI (March 22, 2001).
- Freedman, D. L. “In Situ Bioremediation of Chlorinated Ethylenes: Status and Prospects.” Presented to the Department of Civil and Environmental Engineering, University of South Carolina, Columbia, SC (October 26, 1998).
- Freedman, D. L. “Aerobic Cometabolism of *cis*-1,2-Dichloroethylene by an Enrichment Culture that Grows on Vinyl Chloride: Implications for In Situ Bioremediation.” Presented to the Environmental Engineering Program at the Georgia Institute of Technology, Atlanta, GA (February 23, 1998).
- Freedman, D. L. “In-Situ Biotransformation of Chlorinated Methanes and Ethenes: Challenges and Opportunities.” Symposium on Remediation of Solvents in Subsurface Environments, sponsored by the National Institute of Environmental Health Sciences and the College of Engineering and School of Public Health and Community Medicine, University of Washington, Seattle, WA (September 11, 1996).

- Freedman, D. L. “Cobalamin Enhanced Anaerobic Biotransformation of Carbon Tetrachloride.” Presented to the Environmental Engineering and Science Program, University of Iowa, Iowa City, IA (March 17, 1995).
- Freedman, D. L. “Cobalamin Enhanced Anaerobic Biotransformation of Carbon Tetrachloride.” Presented to the Environmental Engineering and Science Program and NSF Center for Microbial Ecology, Michigan State University, East Lansing, MI (February 23, 1995).
- Freedman, D. L. “Use of Cyanocobalamin to Enhance Anaerobic Biotransformation of Polychlorinated Methanes.” Presented to the Environmental Engineering and Science Program, Rice University, Houston, TX (November 9, 1993).
- Freedman, D. L. “Biotransformation of 2,4-Dinitrotoluene and 2,4,6-Trinitrotoluene under Nitrate-Reducing Conditions.” Presented to the Environmental Engineering and Science Program, the University of Cincinnati, Cincinnati, OH (October 25, 1993).

M.S. Special Projects Supervised at the University of Illinois

- 1991: Timothy O'Rourke, Minackshi Suryanarayana
- 1992: Bobby Rakes, Brian Terando
- 1993: Rebecca Rokos
- 1996: Scott Huber, Keith Ingalsbe, Kalpesh Patel
- 1997: Robert Hoffman

“Mini” Symposia Organized at the University of Illinois at Urbana-Champaign

- “Fundamental Approaches to Anaerobic Dehalogenation of Aliphatic Compounds,” sponsored by the Department of Civil Engineering and the U.S. Army Construction Engineering Research Laboratory; approximately 100 faculty and students attended (November 7, 1991).
- “The Richard S. Engelbrecht Symposium on Applications of Molecular Techniques in Environmental Engineering,” sponsored by the Department of Civil Engineering and the U.S. Army Construction Engineering Research Laboratory; approximately 200 faculty and students attended (March 17-18, 1994).

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