

# PEDRO J. J. ALVAREZ, Ph.D., P.E., BCEE

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## GENERAL

Prof. Alvarez's research focuses on environmental sustainability through bioremediation of contaminated aquifers, fate and transport of toxic chemicals, water footprint of biofuels, microbial-plant interactions, water treatment and reuse, and environmental implications and applications of nanotechnology.

## EDUCATION

B.Eng.	1982	Civil Engineering	McGill University, Montréal
Certif.	1988	Haz. Waste Mgmt.	U. of California, Riverside
M.S.E	1989	Environmental Engrg.	U. of Michigan, Ann Arbor
Ph.D.	1992	Environmental Engrg.	U. of Michigan, Ann Arbor

## POSITIONS

2015-present	Founding Dir. NEWT ERC	Rice University, Houston, TX
2004-present	G.R. Brown Professor	Rice University, Houston, TX
2004-2015	CEE Dept. Chair	Rice University, Houston, TX
2012-2014	Founding Dir. E2i	Rice University, Houston, TX
2001-2003	Professor	The University of Iowa, Iowa City
1999	Visiting Professor	EAWAG, Switzerland
1998-2003	Associate Director	Center for Biocatalysis & Bioprocessing
1997-2001	Associate Professor	The University of Iowa, Iowa City
1993-1997	Assistant Professor	The University of Iowa, Iowa City
1985-1988	Environ. Engineer	Tetrattech Inc., San Bernardino, CA

## EDITORIAL

2007-Present	Associate Editor, <i>Environmental Science and Technology</i>
2005-2006	Associate Editor, <i>ASCE J. Environ. Engrg.</i>
2003-2006	Field Editor, <i>European Journal of Soil Biology</i>
2002-2006	Editorial Board, <i>Biodegradation</i>
1998-2002	Editorial Board, <i>Journal of Environmental Science and Health</i>
1996-2002	Editorial Advisory Board, <i>Advances in Environmental Research</i>

## SELECTED ACTIVITIES

- Registered Professional Engineer, MI License # 6201035419, IA License # 12575, TX License # 110611; Registered Groundwater Professional, Iowa # 1681
- Conference Chair, Leading Edge Technologies for Water and Wastewater Treatment, International Water Association (IWA), 7/11 (Amsterdam), 7/10 (Phoenix), 6/16 (Florianopolis).
- National Academy of Sciences: NRC CLEANER committee 12/05; Delegate to US-Iran Engagement in Science, Engineering and Health 9/09; Chemical Sciences Roundtable on Challenges in Characterizing Small Particles 10/10; Pueblo Chemical Agent Pilot Plant Committee 05/12.
- Delegate to COP15 (Global Climate Forum in Copenhagen), 12/09
- Member, Academic Relations Committee, Water Environment Federation (WEF)
- Member, Publications Committee, American Academy of Environ. Engineers (AAEE)
- Member, Hazard Assessment and Control of Toxic Substances in Water Committee, also Nanomaterials in the Environment Committee; IWA, 7/00-present.
- Panel member, NCEES Environ. Engrg. minimum competency requirements, 11/04.
- Expert Committee, Mexican Petroleum Institute, Biotechnology Program, 2/00-2/04.
- AWWARF Project Advisory Committee, 1998, 2010
- Advisor, State of Iowa Brownfields Committee, 1997; UST Committee, 1993, 1995.
- Consultant, Government of the Commonwealth of Dominica, Roseau, 1991
- Consultant, City of Ann Arbor, MI, 1991 (Designed groundwater monitoring plan)

## **SELECTED HONORS AND AWARDS**

- 2016-2019 Advisory Board, Directorate for Engineering of the National Science Foundation  
 2015 Best paper award, ES&T Letters, (1), 26–30, 2014.  
 2014-now Thompson Reuter's Highly Cited Researcher (top 1% in Chemistry and in Environment Ecology)  
 2014 AAEEES Grand Prize, Excellence in Env. Eng. And Science University Research Award  
 2014 Plenary (Kavil Foundation) lecture, 248th ACS National Meeting & Exposition, San Francisco  
 2014 Honorary Professor, Chinese Academy of Sciences, Beijing  
 2014 Most downloaded paper in Water Research (*Wat. Res.* 47, (12), 3931–3946).  
 2013 Most cited paper in Water Research in the last 5 years (*Wat. Res.* 44:2894-2900)  
 2012 The Athalie Richardson Irvine Clarke Prize for Outstanding Research in Water Sci. & Technol.  
 2012 South Texas Section AIChE's Best Fundamental Paper Award  
 2011-2014 Science Advisory Board to the US Environmental Protection Agency (EPA)  
 2011 Dean of Engineering's Lecture, Columbia University  
 2010 Most cited paper in the past 5 year, Waters Research (*Wat. Res.* 40(19):3527-3532)  
 2010 Top-10 most read paper, ACS Nano (*ACS Nano*, 2010, 4 (7), pp 3580–3590).  
 2010 Honorary Professor, Kunming University of Science and Technology, Kunming, China  
 2009 Professor of the Year, ASCE & Chi Epsilon Student Chapters, Rice University  
 2008 Frontier in Research Award, Assoc. of Environmental Engineering and Science Professors  
 2008 Founding Member, Nicaraguan National Academy of Sciences  
 2008 John Henske Distinguished Lecture, Yale University  
 2007 McKee Medal for Groundwater Protection, Restoration or Sustainable Use (WEF)  
 2006 Board of Directors, Strake Jesuit College Preparatory  
 2006 Honorary Professor, Nankai University, Tianjin, China  
 2005-2006 President, Association of Environmental Engineering and Science Professors  
 2003-2006 Board of Directors, Nicaragua's Water Management Agency (ENACAL)  
 2003 Consul of Nicaragua for Iowa (*ad honorem*)  
 2002 Research project of the year award, SERDP cleanup division, Department of Defense.  
 2000 Awarded the Button of the City of Valencia, Venezuela, by the Mayor of the City  
 1998 The UI Collegiate Excellence in Teaching Award, University of Iowa  
 1997 Participant, National Academy of Engineering's Symposium: Frontiers of Engrg.  
 1997 Appointed Adjunct Professor, Universidad Autónoma de México, Mexico, D.F.  
 1996 Awarded the Alejo Zuloaga Medal by the Universidad de Carabobo, Venezuela  
 1995 Inducted into the American Academy of Environmental Engineers, Diplomate Status  
 1995 Career Award, National Science Foundation.  
 1995 Appointed Adjunct Professor, Universidade Federal de Santa Catarina, Brazil  
 1994, 2002 Elected to the University of Iowa Faculty Senate  
 1992 The Rackham Predoctoral Fellowship, The University of Michigan, Ann Arbor, MI  
 1991 The Outstanding Achievement Award in Environmental Engineering, U. of Michigan

Fellow of AAAS (2012); ASCE (2005), ALF (2008), AEESP (2015), Leopold Leadership Foundation (2008), WEF (Founding Fellow, 2011), IWA (2011)

Best student papers: Battelle 9<sup>th</sup> International Conf. on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, 2014 (Mengyan Li); Battelle 8<sup>th</sup> International Conf. on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, 2012 (Jie Ma); San Diego, 2000 (Todd Dejournett); Battelle 6<sup>th</sup> Bioremediation Symposium, San Diego, 2000 (Todd Dejournett); WEF 70<sup>th</sup> Annual Meeting, Chicago (Eric Aitchison), 1997; EPA HSRC for Regions 7&8, Kansas City, 1993 (Brad Helland)

Other student awards: ACS Environmental Chemistry Graduate Student Award, 2011 (Li Dong); best poster at IWA Leading Edge Technologies, Zurich, 2008 (Katherine Zodrow); best dissertation from Brown School of Engineering, 2007 (Del Lyon); best poster at EPA International Applied Phytotechnologies Conference, Chicago, 2003 (Roopa Kamath)

## **AFFILIATIONS**

AAAS, AAEE, ACS, AEESP, ASCE, ASM, IWA, Leopold LF, SHPE, WEF, Chi Epsilon, and Tau Beta Pi.

## **COURSES TAUGHT**

Environmental Biotechnology	Environmental Molecular Biology
Foundations of Bioremediation	Intl. Perspectives in Climate Change: COP15
Environmental Microbiology and Microbial Ecology	Principles of Environmental Engineering
Intl. Perspectives: Water Resources Planning	Engineering I
Integrated Approaches to Sustainable Development	Experiments in Environmental Engineering.

## **SELECTED PUBLICATIONS**

### **A. Textbooks and Other Books**

1. Alvarez P.J.J. and W. Illman (2006). Bioremediation and Natural Attenuation of Groundwater Contaminants: Process Fundamentals and Mathematical Models. John Wiley & Sons. ISBN No. 0-471-65043-9. 608 pages.
2. Alvarez P.J.J and E. Guevara (2003). Biorremediación y Atenuación Natural de Acuíferos Contaminados por Sustancias Químicas Peligrosas. Consejo del Desarrollo Científico y Humanístico, Universidad de Carabobo, Valencia, Venezuela. ISBN No.980-233-360-3.
3. Kalogerakis N., E. Psillakis and P.J.J. Alvarez (editors) (2005). Recent Advances in Bioremediation: a special issue. *Environment International*. 31 (2) 147-312.
4. Leeson, A., B.C. Alleman, P.J. Alvarez, and V.S. Magar (editors) (2001). Bioaugmentation, Biobarriers, and Biogeochemistry. Proceedings of the Sixth International In Situ and On-Site Bioremediation Symposium, Vol 6(9). Battelle Press, Columbus, OH, 2001.
5. Loucks D.P., P.J. Alvarez, M.J. Baedecker, J.W. Boyd, R.A. Conway, J.W. Day, C.T Driscoll, T.R. Fountain, E.H.. Herricks, R.J.. Huggett, T.K. Kratz, J.M. Lauria, J.L. Meyer, T.O. Najarian, C.R. O'melia, S.D. Parker, and D.K. Weir (2006). CLEANER and NSF's Environmental Observatories. National Research Council of the Academies. National Academy Press. ISBN No.0-309-10229-4.
6. Beaudet R.A., P.J. Alvarez, E.J. Bouwer, D.L. Freedman, K.L. Jones, R.M. Latanision, M.L. Lockett, P.J. Novak, G.F. Parkin, R.F. Probststein, R.B. Puyear, and V.L. Snoeying (2013) . Review of Biotreatment, Water Recovery, and Brine Reduction Systems for the Pueblo Chemical Agent Destruction Pilot Plan. National Research Council of the Academies. National Academy Press. ISBN No.0-309-26393-X.

### **B. Journal Publications (Google Scholar h = 67)**

1. Kang, F., X. Qu, P.J.J. Alvarez, D, and Zhu (2016). Extracellular saccharide-mediated reduction of Au<sup>3+</sup> to gold nanoparticles on microbial surfaces. Environ. Sci. Technol. (Submitted).
2. Lim J.; H. Kim, P.J.J. Alvarez, J. Lee, and W. Choi (2016). Visible light sensitized production of hydroxyl radicals using fullerol as an electron transfer mediator. Environ. Sci. Technol. (Submitted).
3. Zhu L., J. Dong, Z. Zhang, X. Dai, X. Xu and P. J.J. Alvarez (2015). Evolution and functional analysis of extracellular proteins during the granulation of aerobic sludge used to treat chloroaniline wastewater. Environ. Sci. Pollut. R. (submitted).
4. Zhu L., H. Yu, Z. Zhang, X. Dai, X. Xu and P. J.J. Alvarez (2015). Gradient reducing aeration in enhanced aerobic granular sludge process optimizes the dominant microbial community and its function. Bioresour. Technol. (submitted).
5. Toledo D., H.S. Chiaranda L, P.J.J. Alvarez, T.M. Vogel, M. Fernandes and H. X. Corseuil (2016). Biodiesel long-term influence on the source-zone leads to higher residual aromatic hydrocarbons concentrations in a biodiesel blend (B20)-contaminated groundwater. J. Cont. Hydrol. (Submitted).

6. Monzon O., Y. Yang, J. Kim, A. Heldenbrand, Q. Li and P.J.J. Alvarez (2016). MFC fed by high-salinity Barnett Shale produced wastewater: autochthonous bacterial population producing energy for desalination. Biochem. Eng. J. (Submitted).
7. Liu H., Z. Du, H. Fu, P.J.J. Alvarez, Q. Li, S. Zhang<sup>1</sup>, X. Qu, and D. Zhu (2016). A minimum threshold concentration of silver ions exists for the sunlight-induced formation of silver nanoparticles in the presence of natural organic matter. Environ. Sci. Technol. (submitted).
8. Shi X., Z. Li, W. Chen, L. Qiang, J. Xia, M. Chen, L. Zhu, and P.J.J. Alvarez (2016). Fate of titanium dioxide nanoparticles: from wastewater treatment plants to fish in the receiving streams. NanoImpact. (Submitted).
9. Duan L., Z. Wang, H. Yan., Z. Wang, G. Gao, W. Chen and P.J.J. Alvarez (2016). The oxidation capacity of Mn<sub>3</sub>O<sub>4</sub> nanoparticles is significantly enhanced by anchoring them onto reduced graphene oxide to facilitate regeneration of surface-associated Mn(III). Wat. Res. 103:101-108.
10. Vidonish J.E., K. Zygourakis, C.A. Masiello, G. Sabadell, and P.J.J. Alvarez (2016). Thermal treatment of hydrocarbon-impacted soils: A review of technology innovation for sustainable remediation. Engineering. 50: 2498–2506.
11. Huete J., M. Ortega, G. Urquhart, A. Covich, K. Vammen, B. Rittmann, J. Miranda, S. Espinoza, A. Acevedo, M. Acosta, Juan Gómez, M. Brett, M. Hanemann, A. Harer, J. Incer-Barquero, F. Joyce, J. Lauer, J. Maes, M. Tomson, A. Meyer, S. Montenegro, W. Whitlow, J. Schnoor and P.J.J. Alvarez (2016). Critical Uncertainties and Gaps in the Environmental and Social Impact Assessment of the Proposed Transoceanic Canal through Nicaragua Biosciences. doi:10.1093/biosci/biw064.
12. Yoo H-Y, S. Yan, D. Jeon, Y. Mackeyev, Y-Y Ahn, H-J Kim, L. J. Wilson, P.J.J. Alvarez, Y. Lee, W. Song, J. Kim, and J. Lee (2016). Tin porphyrin immobilization significantly enhances visible-light-photosensitized degradation of microcystins: mechanistic implications. Appl. Catal., B. 199:33-44.
13. Zhou J-H, Z-H Zhang, H. Zhao, H-T Yu, P. J.J. Alvarez, X-Y Xu, and L. Zhu (2016). Optimizing granules size distribution for aerobic granular sludge stability: Effect of a novel funnel-shaped internals on hydraulic shear stress. Bioresour. Technol. 216:562-570.
14. Gaspar J., D. Davis, C. Camacho, and P.J.J. Alvarez (2016). Biogenic versus thermogenic H<sub>2</sub>S source determination in Bakken wells: considerations for biocide application. ES&T Letters. 3:127-132.
15. Yu P., J. Mathieu, M. Li, Z. Dai and P.J.J. Alvarez (2016). Isolation of polyvalent bacteriophages using sequential multiple host approaches. Appl. Environ. Microbiol. 82:808–815.
16. Fu H, H. Liu, J. Mao, W. Chu, Q. Li, P.J.J. Alvarez, X. Qu, and D. Zhu (2016). Photochemistry of dissolved black carbon released from biochar: reactive oxygen species generation and phototransformation. Environ. Sci. Technol. 50: 1218–1226.
17. Zuo L., Y. Guo, X. Li, H. Fu, X. Qu, S. Zheng, C. Gu, D. Zhu, and P.J.J. Alvarez (2016). Enhanced adsorption of hydroxyl- and amino-substituted aromatic chemicals to nitrogen doped multiwalled carbon nanotubes: A combined batch and theoretical calculation study. Environ. Sci. Technol. 50: 899–905.
18. Vidonish J.E., K. Zygourakis, C.A. Masiello, X. Gao, J. Mathieu, and P.J.J. Alvarez (2016). Pyrolytic treatment and fertility enhancement of soils contaminated with heavy hydrocarbons. Environ. Sci. Technol. 50: 2498–2506.
19. Monzon O., Y. Yang, Q. Li, PJJ Alvarez (2016). Quorum sensing autoinducers enhance biofilm formation and power production in a hypersaline microbial fuel cell. Biochem. Eng. J. 109, 222-227.
20. Buono R.M., K.R. Zodrow, P.J.J. Alvarez and Q. Li (2015). A New Frontier in Texas: Managing and Regulating Brackish Groundwater. Water Policy. DOI: 10.2166/wp.2015.145.

21. Liu L., M. Sun, Q. Li, H. Zhang, K. Yu, M. Li, C. Zhang, G. Cao, Y. Yuang, H. Zhai, W. Chen and P.J.J. Alvarez (2016). High-facet-energy CdS nanorods are more reactive but less cytotoxic than lower-facet-energy homologues of similar morphology. NanoLetters. 16, 688–694.
22. Molosky L., J. Connor, T. McHugh, S. Richardson, C. Woroszylo and P.J.J. Alvarez (2016). Environmental factors associated with natural methane occurrence in the Appalachian basin. Groundwater. doi:10.1111/gwat.12401.
23. Gaspar J. J. Mathieu and P.J.J. Alvarez (2016). A rapid platform to screen therapeutic drugs for efficacy in removing lipofuscin. Materials, Methods and Technologies 10:1-9.
24. Zhou J., H. Zhao, Z. Zhang, M. Hu, H. Yu, X. Xu, J. Vidonish, P. J.J. Alvarez and L. Zhu (2015). Granular activated carbon as nucleating agent for aerobic sludge granulation: Effect of GAC size on velocity field differences (GAC versus flocs) and aggregation behavior. Bioresour. Technol. 198:358-363.
25. Yang Y. and P.J.J. Alvarez (2015). Sub-lethal concentrations of silver nanoparticles stimulate biofilm development. ES&T Letters. 2, 221–226.
26. Zhao P.Y., P. J. Alvarez, J. Wang, Y. Han, and C. Pan (2015). Development of analytical method on pesticide residues in berries with dispersive solid phase extraction by mixture sorbents of multiwalled carbon nanotubes and primary secondary amine. Food Chem. (submitted).
27. Luo Y., S. Yu, M. Rysz, D. Mao, F. Yang, J. Hou and P.J.J Alvarez (2015). Prevalence and proliferation of antibiotic resistance genes in municipal wastewater treatment plants. Wat. Res. 85:458-466.
28. Brame J., M. Long, Q. Li and, P.J.J. Alvarez (2015). Inhibitory effect of natural organic matter or other background constituents on photocatalytic advanced oxidation processes: Mechanistic model development and validation. Wat. Res. 84:1-10.
29. Zhang C., S. Chen, P. J. J. Alvarez and W. Chen (2015). Reduced graphene oxide enhances horseradish peroxidase stability by serving as radical scavenger and redox mediator. Carbon. 94:531–538.
30. Michels C., Y. Yang Y., M. Li, C., H. Moreira-Soares and Pedro J.J. Alvarez (2015). Silver Nanoparticles retard  $\text{NO}_2^-$  Production without significantly affecting  $\text{N}_2\text{O}$  release by *Nitrosomonas europaea*. Environ. Toxicol. Chem. 34(10):2231-2235.
31. Brett M.T. Brett, P.J.J. Alvarez, S. Chandra, A.P. Covich, J.A. Huete-Pérez, A.Meyer and K. Vammen (2015). The potential impacts of the proposed Interoceanic Canal on the ecology and water quality of Lake Nicaragua Silnews 66: June 2015: 4-5.
32. Li M., E.T. Van Orden, D.J DeVries, Z. Xiong, R. Hinchee, and P.J.J Alvarez (2015). Bench-scale biodegradation tests to assess natural attenuation potential of 1,4-dioxane at three sites in California. Biodegradation. 26:39–50.
33. Wang X., L. Le, P.J.J. Alvarez, F, Li and K. Liu (2015). Synthesis and characterization of green agents coated Pd/Fe bimetallic nanoparticles. J. Taiwan Inst. Chem. Eng. 50:297-305.
34. Ma J., J.W. Nossa and P.J.J. Alvarez (2015). Groundwater ecosystem resilience to organic contaminations: microbial and geochemical dynamics throughout the 5-year life cycle of a surrogate ethanol blend fuel plume. Wat. Res. 80:119-129.
35. Corseuil H., D. Gomez, C. Schambeck, D. Toledo Ramos, and P.J.J. Alvarez (2015). Nitrate addition to groundwater impacted by ethanol-blended fuel mitigates metabolic flux dilution and inhibition of BTEX biodegradation caused by ethanol. J. Contam. Hydrol. 174:1-9.
36. Huete-Pérez J., Meyer A. and P.J.J. Alvarez (2015). Rethink the Nicaragua canal. Science. 347(6220): 355.
37. Huete-Pérez J., P.J.J. Alvarez, J.L. Schnoor, B.E. Rittmann, A. Clayton, M. Acosta, C. E. Bicudo, M. Kalin Arroyo, M. Brett, V. H. Campos, H. Chaimovich, B. Jimenez-Cisneros, A.

- Covich, L. Lacerda, J.M. Maes, J. Miranda, S. Montenegro, M. Ortega Hegg, G. Urquhart, K. Vammen, and L. Zambrano (2015). Scientists raise alarms about fast tracking of transoceanic canal through Nicaragua. Environ. Sci. Technol. 49:3989-3996.
38. Ma J., Y. Deng, T. Yuan, J. Zhou and P.J.J. Alvarez (2015). Succession of microbial functional communities in response to a pilot-scale ethanol-blended fuel release throughout the plume life cycle. Environmental Pollution. 198: 154–160.
  39. Yang, J., Zhu, M., Wang, X., Alvarez, P. J. J., & Liu, K. (2015). Poly(vinylidene fluoride) membrane supported nano zero-valent iron for metronidazole removal: Influences of calcium and bicarbonate ions. J. Taiwan Inst. Chem. Eng. 49:113-118.
  40. Koo Y, J. Wang, Q. Zhang, H. Zhu, E. W. Chehab, V. L. Colvin, P. J. J. Alvarez, and J. Braam (2014). Fluorescence Reports Intact Quantum Dot Uptake into Roots and Translocation to Leaves of *Arabidopsis thaliana* and Subsequent Ingestion by Insect Herbivores. Environ. Sci. Technol. 48 (12), pp 6754–6762.
  41. Gaspar J., J. Mathieu, Y. Yang, R. Tomson, J. Diouma Leyris, K. Gregory and P.J.J. Alvarez (2014). Microbial Dynamics and Control in Shale Oil and Gas Production. ES&T Letters. 1(12), pp 465–473.
  42. Ma J. W.G. Rixey and P.J.J. Alvarez (2014). Increased fermentation activity and persistent methanogenesis in a model aquifer system following source removal of an ethanol blend release Wat. Res. 68:479-486.
  43. J. Yang, M. Zhu, X. Wang, Pedro JJ Alvarez and K. Liu (2014). Poly (vinylidene fluoride) membrane supported nano zero-valent iron for metronidazole removal: Influences of calcium and bicarbonate ions. J. Taiwan Inst. Chem. Eng. 49:113-118.
  44. Monzon O., Y. Yang, C. Yu, Q. Li and P.J.J. Alvarez (2014). Microbial Fuel Cells under Extreme Salinity: Performance and Microbial Analysis. Environmental Chemistry. doi.org/10.1071/EN13243
  45. Yang Y, M. Li, C. Michels, H. Moreira-Soares and Pedro J.J. Alvarez (2014). Differential sensitivity of nitrifying bacteria to silver nanoparticles in activated sludge. Environ. Toxicol. Chem. 33(10):2234-2239.
  46. Brame J., A.J. Kennedy, C.D. Lounds, A.J. Bednar, P.J. J. Alvarez, A.M. Scott, and J. K. Stanley (2014). Influence of carbon and metal oxide nanomaterials on aqueous concentrations of the munition constituents cyclotrimethylenetrinitramine (RDX) and tungsten. Environ. Toxicol. Chem. 33(5):1035-42.
  47. Liu L., M. Sun, Qi. Li, H. Zhang, P.J.J. Alvarez, H. Liu, and W. Chen (2014). Genotoxicity and Cytotoxicity of CdS Nanomaterials to Mice: Comparison between Nanorods and Nanodots. Env. Eng. Sci. 31(7):373-380.
  48. Mauter M.S., P.J.J. Alvarez, A. Burton, D C. Cafaro, W. Chen, G. Jiang, Q. Li, J. Pittock, D. Reible and J.L. Schnoor (2014). Regional variation in water-related impacts of shale gas development and implications for emerging international plays. Environ. Sci. Technol. 48(15): 8298–8306.
  49. Zhang C., Chen W., and P.J. J. Alvarez (2014). Manganese peroxidase degrades pristine but not surface-oxidized (carboxylated) single-walled carbon nanotubes. Environ. Sci. Technol. 48(14): 7918–7923.
  50. Wang J., Y. Yang, H. Zhu, J. Braam, J.L. Schnoor and P.J.J. Alvarez (2014). Uptake, translocation and transformation of quantum dots with cationic versus anionic coatings by poplar trees. Environ. Sci. Technol. 48(12): 6754–6762.
  51. Farrell J., J. Fortner, S. Work, C. Avendano, N. Gomez, R. Zarate Araiza, Q. Li, P.J.J. Alvarez, V. Colvin, A. Kan, and M. Tomson (2014). Evaluation of nanoscale magnetite for arsenic removal from drinking water wells in Guanajuato, Mexico. Env. Eng. Sci. 31(7):1-9.
  52. Mathieu J.M., E.A. Alvarez and P.J.J. Alvarez (2014). Recombination-Assisted Megaprimer (RAM) Cloning. MethodsX 1:23-29.

53. Brame J., M. Long, Y. Mackayev, L.J. Wilson, Q. Li and, P.J.J. Alvarez (2014). Trading power for efficiency: differential inhibition of photo-generated hydroxyl radicals versus singlet oxygen. Wat. Res. 60:259-266.
54. Toledo D., M.L.B. da Silva, C.W. Nossa, P.J.J. Alvarez and H.X. Corseuil (2014). Assessment of microbial communities associated with fermentative-methanogenic biodegradation of aromatic hydrocarbons in groundwater contaminated with a biodiesel blend (B20). Biodegradation. 25 (5): 681-691.
55. Xiu Z-M., J. Mathieu, Y. Liu, J. Wang, D. Zhu and P.J.J. Alvarez (2014). Elucidating the genetic basis for *E. coli* defense against silver toxicity using mutant arrays. Environ. Toxicol. Chem. 33(5): 993-997.
56. McPhail A., R. Griffin, M. El-Halwagi, K. Medlock and P.J.J. Alvarez (2014). An environmental, economic, and energy assessment of municipal solid waste's ultimate analysis and moisture content in a parallel co-combustion process. Energy & Fuels 28 (2): 1453–1462.
57. Vega L.M., J. Mathieu, Y. Yang, B.H. Pyle, E. Valenzuela Jr, C.D. Munoz, R.J.C. McLean, and P.J.J. Alvarez (2014). Nickel or cadmium ions inhibit quorum sensing and biofilm formation without affecting viability in *Burkholderia multivorans* and affect other QS-influenced traits in additional proteobacteria. Int. Biodeterior. Biodegrad. 91: 82-87.
58. Zhai G., K.S. Walters, D.W. Peate, P.J.J. Alvarez, and J.L. Schnoor (2014). Transport of gold nanoparticles through the plasmodesmata and precipitation of gold ions in leaf cells of whole poplars. ES&T Letters 1(2):146–151.
59. Kang F., P.J.J. Alvarez, and D. Zhu (2014). Microbial EPS reduce Ag<sup>+</sup> to silver nanoparticles and antagonize bactericidal activity. Environ. Sci. Technol. 48: 316–322.
60. Li .M., J. Mathieu, Y. Liu, E.T. Van Orden, Y. Yang, S. Fiorenza, and P.J.J. Alvarez (2014). The abundance of tetrahydrofuran/dioxane monooxygenase genes (*thmA/dxmA*) and 1,4-dioxane degradation activity are significantly correlated at various impacted aquifers. ES&T Letters. (1), 122-127.
61. Yi L., F. Yang, J. Mathieu, D. Mao, W. Qing, and P.J.J Alvarez (2014). Proliferation of multidrug-resistance NDM-1 genes in municipal wastewater treatment plants in Northern China. ES&T Letters. (1), 26–30.
62. Brame J., V. Fattori, R. Clarke, Y. Mackeyev, L. J. Wilson, Q. Li and P.J.J. Alvarez (2014). Water disinfection using nanotechnology for safer irrigation: A demonstration project in Swaziland. Environmental Engineer and Scientist: Applied Research and Practice. 50(2):40-46.
63. Ma J., H. Luo, G. E. DeVauil, W. G. Rixey, and P. J. J. Alvarez (2014). Numerical Model Investigation for Potential Methane Explosion and Benzene Vapor Intrusion Associated with High-Ethanol Blend Releases. Environ. Sci. Technol. 48 (1), 474–481.
64. Vega L.M., P.J.J. Alvarez and R.J.C. McLean (2013). Bacterial signaling ecology and potential applications during biofilm construction. Microbial Ecology DOI 10.1007/s00248-013-0321-1.
65. Choi Y., Y. Ye, Y. Mackeyev, M. Cho, L.J. Wilson, J. Lee, P.J.J. Alvarez, W. Choi, J. Lee (2014). C<sub>60</sub> aminofullerene-magnetite nanocomposite designed for efficient visible light photocatalysis and magnetic recovery. Carbon 69:92-100.
66. Mao D., L. Yi, J. Mathieu, Q. Wang, L. Feng, Q. Mu, C. Feng, and P.J.J. Alvarez (2014). Persistence of extracellular DNA in Haihe River sediment facilitates antibiotic resistance gene propagation. Environ. Sci. Technol. 48 (1), 71–78.
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## E. Conferences and Sessions Chaired

- 2014 International Workshop to Identify Scientific and technical Issues Associated with the Inter-oceanic Canal in Nicaragua (Interamerican Association of National Academy of Sciences) –Managua, 11/14
- 2014 Battelle 8<sup>th</sup> International Symposium on In Situ and Onsite Bioremediation– Advances in Monitored Natural Attenuation, Monterey, CA, 5/14.
- 2011 8<sup>th</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) – Program committee chair. Amsterdam, 6/11
- 2011 Applications of Nanotechnology in the Water. IWA Specialist group on Nano and Water Sector, Session chair and program committee. Monte Verita, Switzerland, 5/11.
- 2010 7<sup>th</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) – Program committee chair. Phoenix, 6/10
- 2009 6<sup>th</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) – Conference co-chair. Singapore, 6/09.
- 2009 2<sup>nd</sup> International Conference on Pollution Control and Resource Reuse – Session chair. Nanjing, China, 4/09.
- 2009 International Workshop on Priorities to Advance the Eco-Responsible Design and Disposal of Engineered Nanomaterials – Conference chair. Houston, 3/09.
- 2008 IWA Chemical Industries 2008- Program committee. Beijing, 11/08
- 2008 5<sup>th</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) –Program committee, session and workshop chair. Zurich, 6/08.
- 2007 4<sup>th</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) –Program committee, session and workshop chair. Singapore, 7/07.
- 2007 Nanotechnology-Enabled Water Treatment (NEWT) Workshop. Co-chair. Houston, 2/07.
- 2006 22<sup>nd</sup> Annual International Conference on Soils, Sediments and Water- Oxygenates Session. Amherst, MA 10/06
- 2006 The Fifth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Reductive treatment with nZVI Session, Monterey, CA, 5/06.
- 2005 3<sup>rd</sup> European Bioremediation Conference – Chania, Greece, CA, 7/05.
- 2005 Battelle 8<sup>th</sup> International Symposium on In Situ and Onsite Bioremediation– Biobarriers, Baltimore, MD, 6/05.
- 2005 3<sup>rd</sup> Leading Edge Conference on Water and Wastewater Technologies, International Water Association (IWA) –Program committee, session and workshop chair. Sapporo, Japan 7/05

- 2004 CONCARIBE 2004 Environmental Engineering and Science Conference –, General Secretary, Cartagena, Colombia, 5/04.
- 2004 The Tenth International Symposium on Microbial Ecology (ISME-10)- International Convener, Bioremediation Session, Cancun, Mexico, 8/04.
- 2003 2<sup>nd</sup> European Bioremediation Conference – Chania, Greece, CA, 6/03.
- 2003 Battelle 7<sup>th</sup> International Symposium on In Situ and Onsite Bioremediation– Biobarriers, Orlando, FL, 6/03.
- 2002 12<sup>th</sup> International Biodeterioration and Biodegradation Symposium –Biodegradation of persistent compounds session, Prague, Czech Republic, 7/02.
- 2001 First European Bioremediation Conference– Petroleum hydrocarbons bioremediation session, Chania, Greece, CA, 7/01.
- 2001 Battelle 6<sup>th</sup> International Symposium on In Situ and Onsite Bioremediation– Session D-10: Interactions between Microorganisms and Fe(0) in PRBs, San Diego, CA, 5/01.
- 2000 NGWA/API Petroleum Hydrocarbons Conference – Session II: Gasoline Oxygenates: Ethanol, Anaheim, CA, 11/00.
- 1998 ASCE Specialty Conference, Technical Session on Reductive Treatment of Hazardous Wastes with Zero-Valent Iron, Chicago, IL, 6/98.
- 1997 27th IAHR Congress, Technical Session on Groundwater Remediation and Risk Management, San Francisco, CA 8/97.
- 1997 NSF-CMS Workshop, Group Mentor, for Junior Faculty from Underrepresented Groups, Washington, D.C., 9/97.
- 1996 North-Central GSA Sectional Meeting, Research Symposium on Geomicrobiology, Ames, IA, 5/96.

## F. Environmental Impact Studies

Preliminary Environmental Review and Development of Environmental Evaluation Guidelines for Prince Rupert Bay, Dominica. Prepared for the Department of Regional Development and Environment, Organization of American States. Washington, D.C. May, 1991.

Environmental Impact Statement: Peacekeeper Rail Garrison Program.  
Prepared for United States Air Force, Norton AFB, California. June, 1988.

Environmental Planning Technical Report for Water Resources. Small Intercontinental Ballistic Missile Program. Malmstrom Air Force Base, Montana. Prepared for United States Air Force, Norton AFB, California. December, 1987.

## G. Patents

Alvarez P.J.J., B.A. Till, L.J. Weathers, G.F. Parkin, and J.L. Schnoor, “Iron-based bioremediation of aquifers contaminated with mixed wastes”. **US 6,719,902 B1**, April 13, 2004.

Alvarez P.J.J., J. Lee, L. Wilson, and Y. Mackeyev. “Immobilized Photocatalytic Fullerenes for Water and Wastewater Treatment and Disinfection” **US 8679442 B2**, March 25, 2014.

Alvarez P.J.J., M. Li, and J. Mathieu. “A catabolic gene probe for assessing the feasibility of monitored natural attenuation at dioxane-impacted sites”, **US 20150184232 A1**, July 2, 2015.

**INVITED LECTURES**

<u>Date</u>	<u>Location</u>	<u>Host Organization</u>	<u>Title/Description</u>
9/16	Lleida, Spain	Interfaces Against Pollution' (IAP2016) Conference	Environmental nanotechnology: implications & applications
8/16	Nashville, TN	Vanderbilt University	Nanotechnology-enabled water treatment
6/16	Jerez, Spain	IWA LET	NEWT: A vision to enabled decentralized treatment
6/16	Santiago, Spain	University of Santiago de Compostela	Environmental nanotechnology: implications & applications
6/16	Salamanca, Spain	Bioiberoamerica congress (Keynote)	Unintended consequences of nanomaterial releases
4/16	Xianmen, China	National Symposium on Environ. Nanotechnology	Environmental implications of nano-silver releases
3/16	Houston, TX	Friends of Fondren's Library	NEWT: A vision to enabled decentralized treatment
3/16	Los Angeles, CA	SERDP	Gene probes to assess dioxane natural attenuation
3/16	Mumbai, India	IIT Bombay	Environmental applications of nanotechnology
3/16	Chennai, India	IIT Madras	Antibiotic resistance propagation and mitigation
2/16	Beijing, China	Chinese Academy of Engineering	NEWT: A vision to enabled decentralized treatment
2/16	Monterrey, Mexico	IITESM	Innovations in remediation of hydrocarbon-impacted soils
2/16	Lubbock, TX	Texas Tech	NEWT: A vision to enabled decentralized treatment
1/16	San Ramon, CA	Chevron	Innovations in remediation of hydrocarbon-impacted soils
12/15	Florianopolis, Brazil	UFSC	Antibiotic resistance genes in wastewater treatment plants
11/15	Beijing, China	Peking University	Nanotechnology for water-energy nexus challenges
11/15	Guangzhou, China	8 <sup>th</sup> National Conference on Environmental Chemistry	NEWT: A vision to enable decentralized water treatment
10/15	Pittsburgh, PA	Carnegie Mellon University	Nanotechnology for water-energy nexus challenges
10/15	Iowa City, IA	University of Iowa	Valentine Lecture: environmental nanotechnology
10/15	Houston, TX	Sustainable Remediation Forum (SURF)	Nanotechnology for water-energy nexus challenges
10/15	Washington, DC	ACS-AAAS Policy Forum	Research priorities for environmental nanotechnology
9/15	Montreal, Canada	McGill University	Nanotechnology for water treatment
8/15	Cancun, Mexico	CONACyT China-Mexico Symposium on nano	Environmental Applications of Nanotechnology
5/15	Hong Kong	Hong Kong Polytechnic University	NEWT: A vision to enable decentralized water treatment
5/15	Pohang, South Korea	Postech	NEWT: A vision to enable decentralized water treatment
5/15	Dalian, China	IWA	Nanotechnology-enabled water treatment

4/15	Qindao, China	Ocean University of China	Environmental implications of nanotechnology
3/15	Minneapolis, MN	University of Minnesota (Warren Lecture)	Nanotechnology-enabled water treatment
3/15	Pittsburgh, PA	Carnegie Mellon University	Environmental applications of nanotechnology
3/15	Washington, DC	Inter American Dialogue	The transoceanic canal through Nicaragua and the environment
3/15	Aix en Provence, France	CEREGE	Nanotechnology for disinfection and microbial control
2/15	Bhubandeswar, India	KITT University	Nano-enabled water treatment for developing countries
1/15	Beijing, China	China Petroleum University	Environmental nanotechnology applications for O&G industry
11/14	Huntington Beach, CA	NWRI	Proliferation of superbugs in activated sludge plants
9/14	Lisbon, Portugal	IWA	Nanotechnology-enabled solar disinfection and desalination
8/14	Stockholm, Sweden	Stockholm World Water Week/ UNESCO session	Low-energy water disinfection and desalination
8/14	San Francisco, CA	ACS (keynote speaker at annual meeting)	Environmental implications and applications of nanotechnology
7/14	Harbin, China	IWA	Engineered nanomaterials for drinking water treatment
6/14	Florianopolis, Brazil	UFSC	Nano-enabled water treatment for developing countries
5/14	Abu Dhabi	IWA LET	Nanotechnology-enabled water reuse for the O&G industry
4/14	Porto Alegre, Brazil	Universidade Federal do Rio Grande	Nano-ecotoxicology: environmental matrix effects
4/14	Buenos Aires, Argentina	Gobierno de Buenos Aires, Congreso Int. de Residuos	Biorremediación de acuíferos contaminados con gasolina
4/14	Washington D.C.	AAEES	Proliferation of superbugs in sewage treatment plants
4/14	Jeddah, Saudi Arabia	KAUST	Research opportunities in the water-energy nexus
4/14	Istanbul, Turkey	Istanbul Institute of Technology	Advancements in water treatment
2/14	Beijing, China	Chinese Academy of Sciences	Environmental nanotechnology applications & implications
1/14	Jeddah, Saudi Arabia	KAUST	Convergence of microbiology and nanotechnology
12/13	Paris, France	UNESCO	Nano-enabled water treatment for developing countries
11/13	Newport Beach, CA	NWRI	Biofouling and microbial control
10/13	Managua, Nicaragua	Nicaraguan Academy of Sciences	Nano-enabled water treatment for developing countries
9/13	Guiyang, China	Chinese Academy of Sciences	Microbial control in oil and gas fields
8/13	Managua, Nicaragua	Nicaraguan Academy of Sciences	Interoceanic canal: economic development vs. environment?
7/13	Mérida, Mexico	Universidad Autónoma de Yucatán	Principios y aplicaciones de la nanotecnología ambiental
6/13	Bordeaux, France	IWA-LET	Novel approaches for biofouling control
6/13	Bratislava, Slovakia	UNESCO	Nano-enabled water treatment for developing countries

5/13	Bangkok, Thailand	EHWB	Nanotechnology for microbial control
4/13	Xi'an, China	Xi'an Jiao Tong University	Convergence of microbiology and nanotechnology
4/13	Nanjing, China	IWA nanotechnology specialty group (keynote talk)	Nanotechnology for the water-energy nexus
4/13	Shanghai, China	Shanghai Jiao Tong University	Nanotechnology for microbial control
4/13	New Orleans, LA	ACS presidential forum	When water and oil do mix: insights from nanotechnology
4/13	New Orleans	ACS	Nanotechnology for biofouling control
4/13	Medellin, Colombia	Universidad Nacional	Atenuación natural de acuíferos contaminados con BTEX
3/12	Blacksburg, VA	Virginia Tech	Convergence of microbiology and nanotechnology
2/12	Beijing, China	Peking University	Emerging technologies for water treatment
1/12	Chennai, India	Madras IIT	Nanotechnology: environmental applications and implications
12/12	Maseru, Swaziland	UN Food and Agriculture Organization	Nanotechnology for point of use water treatment
12/12	Washington, D.C.	NSF	Nanomaterials bioavailability and environmental effects
11/12	Phoenix, AZ	Arizona State University	Natural attenuation forensic assessment
11/12	Seoul, South Korea	KAIST	Nanotechnology for biofouling control
11/12	Seoul, South Korea	KIST	Convergence of microbiology and nanotechnology
11/12	Newport Beach, CA	National Water Research Institute	Clarke Prize Lecture
10/12	Florianopolis, Brazil	Universidade Federal de Santa Catarina (Chemistry)	Nanotechnology and water
10/12	Norman, OK	University of Oklahoma	Environmental applications & implications of nanotechnology
9/12	Pretoria, South Africa	Water Research Commission	Nanotechnology-enabled water treatment and reuse
8/12	Managua, Nicaragua	Nicaraguan Academy of Sciences	Ciencia y agua: instrumentos del desarrollo sostenible
7/12	Auckland, New Zealand	University of Auckland	Environmental applications & implications of nanotechnology
5/12	Florianopolis, Brazil	Universidade Federal de Santa Catarina (CEE)	Nano-ecotoxicology
5/12	Maseru, Swaziland	UN Food and Agriculture Organization	Photocatalysis for safer peri-urban irrigation
4/12	Bologna, Italy	University of Bologna	Potential environmental impacts of nanotechnology
4/12	Dubbendorf, Switzerland	EAWAG	Environmental fate and impacts of nanomaterials
4/12	Houston, TX	BP	Emerging opportunities in bio and nanotechnology
2/12	South Bend, IN	University of Notre Dame	Environmental applications & implications of nanotechnology
1/12	Merida, Mexico	Universidad de Merida	Quantum dots-microbial interactions

1/12	Beijing, China	China University of Geosciences	Nanomaterial interactions with the environment
12/11	Lyon, France	U de Lyon	Environmental implications & applications of nanotechnology
11/11	Washington DC	AAAS and Georgetown U	Nanotechnology in its teen years
11/11	Tianjin, China	Tianjin University (keynote)	Anaerobic bioremediation of hydrocarbon spills
9/11	Rehoboth Beach, DE	EPA Region 3	Microscopic, macroscopic and thermodynamic implications of fuel ethanol releases
9/11	London, England	The Royal Society	Quantum dots impacts on Nitrogen cycling
7/11	Chania, Greece	TUC	Biomarkers to assess bioremediation performance
6/11	Montreal, Canada	ACS Colloids symposium	Antibacterial mechanisms of silver nanoparticles
6/11	Denver, CO	Water research Foundations	Nanotechnology and water quality
6/11	Amsterdam	IWA	Welcome address for Leading Edge technologies conference
5/11	New Hampshire	Gordon conference	Research priorities in environmental nanotechnology
5/11	Monte Verita, Switzerland	ETH/EAWAG	Nanotechnology in the water sector; opportunities & concerns
4/11	Boston, MA	Harvard University	Environmental implications and applications of nanotechnology
4/11	New York, NY	Columbia University	Environmental implications and applications of nanotechnology
4/11	Mexico City	Tecnologico de Monterrey	Nano-enabled water treatment for developing countries
3/11	Atlanta, GA	Georgia Tech	Nanotechnology for sustainable water management
3/11	Boston, MA	Northeastern University	Environmental nanotoxicology
3/11	Abu Dhabi	Masdar Institute of Science & Technology	Bioremediation: principles and Applications
3/11	Washington DC	NNI US-EU Workshop: Bridging nanoEHS Research	Environmental data needs
2/11	Nanjing, China	Nanjing University	Emerging opportunities for nanotechnology in water
2/11	Managua, Nicaragua	St. Agustin Academy (graduation speech)	Global warming and global whining
11/10	Rome, Italy	FAO	Nano-enabled water treatment for developing countries
11/10	Veracruz, Mexico	PEMEX	Bioremediation of petroleum hydrocarbons
10/10	Washington D.C.	National Academy of Sciences	Fate and transport of engineered nanoparticles
10/10	Jalandhar, India	Kanya Maka Vidyalaya	Environmental challenges: a global concern
10/10	Bilbao, Spain	Labein Tecnalia	Ecotoxicology of engineered nanomaterials
9/10	Montreal, Canada	IWA	Nanotechnology applications in the water treatment sector
9/10	Montreal, Canada	McGill University	Environmental applications and implications of nanotechnology

9/10	Washington DC	NSF	Diversity, integrity and honor (National Hispanic Keynote).
9/10	Stockholm, Sweden	World Water Week	Emerging opportunities and challenges for GW remediation
7/10	Nazareth, Israel	Haiffa University	Photocatalytic disinfection with aminofullerene nanoparticles
6/10	San Carlos, Brazil	FAO, UN	Nano-enabled water treatment: opportunities and challenges
6/10	Johannesburg, South Africa	Mintek Advanced Materials Division	Nano-enabled functionalized water treatment membranes
5/10	Taipei, Taiwan	7th Conf. on Environmental Protection & Nanotechnology	Environmental applications and implications of nanotechnology
5/10	Taipei, Taiwan	National Taiwan University	Phytoremediation: principles and applications
5/10	Tainan, Taiwan	National Cheng Kung University	Bioremediation of hydrocarbon releases
5/10	Los Angeles, CA	UCLA	Risks of nanomaterials in the environment
5/10	Providence, RI	Brown University	Antimicrobial nanoparticles: implications & applications
4/10	Cairo, Egypt	Ministry of Agriculture	Nanotechnology for sustainable water management
3/10	Panama	Universidad Tecnológica de Panamá	Manejo sostenible de recursos hidricos
3/10	Chicago, IL	National Nanotechnology Initiative	Research priorities in Environmental nanotechnology
3/10	Kunming, China	KUST	Environmental nanotechnology
1/10	Tucson, AZ	University of Arizona	Antimicrobial nanoparticles: implications & applications
9/09	Helsinki, Finland	US National Academies	Environmental nanotechnology
9/09	Copenhagen, DK	Danmarks Naturfredningsforening	Sustainable water under climate change
9/09	Vienna, Austria	Austrian Academy of Sciences and U Vienna	Antimicrobial nanoparticles: implications & applications
8/09	San Antonio, TX	NEMC and EPA	Risks of nanomaterials in the environment
6/09	Aix, France	CEREGE	Environmental nanotechnology
6/09	Singapore	IWA	Antimicrobial nanoparticles: implications & applications
6/09	Prague, CZ	NICOM	Nanomaterials in Construction
5/09	Tunja, Colombia	Universidad de Santo Tomas	Nanotecnologia para manejo sostenible del agua
4/09	Baltimore, MD	Johns Hopkins University	Environmental applications of nanotechnology
4/09	Lansing, MI	Michigan State University	Environmental applications and implications of nanotechnology
3/09	Tianjin, China	Nankai University	Bioremediation: principles and applications
3/09	Nanjing, China	Keynote on Pollution Control and Resource Reuse Conf.	Nano-toxicology
2/09	Mumbai, India	IIT Mumbai	Environmental nanotechnology
2/09	Mangalore, India	NITK (Subba Rau Lecture in Chemical Engineering)	Bioremediation principles and applications

11/08	Baltimore, MD	Johns Hopkins University	Environmental applications and implications of nanotechnology
10/08	New Haven, CT	Yale University, John Henske Distinguished Lecture	Environmental applications and implications of nanotechnology
9/08	Chania, Crete	European Bioremediation Conference (keynote)	Microbial interactions with nanomaterials
8/08	Sidney, Australia	SETAC	Ecotoxicology of nanomaterials
4/08	Iowa City, IA	U Iowa (Caterpillar lecture)	Environmental applications and implications of fullerenes
4/08	Los Angeles, CA	UCLA	Ecotoxicology of nanomaterials
4/08	Amherst, MA	UMass	Environmental nanotechnology
3/08	Beijing, China	Tsinghua University	Environmental nanotechnology
3/08	Hong Kong	Hong Kong University	Sustainable water management
3/08	Monte Verita, Switzerland	EMPA/ETH	Microbial interactions with nanoparticles
12/07	Washington, DC	NSF	Environmental applications and implications of fullerenes
12/07	San Antonio, TX	Texas Water Board	Sustainable water resources management
11/07	South Bend, IN	University of Notre Dame	Environmental applications and implications of nanotechnology
11/07	Rimini, Italy	Ecomondo	Iron-based bioremediation of oxidized pollutants
10/07	Sapporo, Japan	Hokkaido University	Environmental applications of nanomaterials
10/07	Seoul, South Korea	Seoul National University and Gwangju University	Antibacterial mechanisms of fullerenes
10/07	Sao Paulo, Brazil	Acquacon	The water footprint of fuel ethanol
9/07	Riverside, California	UCR	Environmental impacts of fuel alcohols
9/07	Cambridge, England	Cambridge University	Medical bioremediation: targeting 7-ketocholesterol
8/07	Zurich, Switzerland	EAWAG	Environmental applications and implications of nanotechnology
7/07	Bogota, Colombia	Universidad de Los Andes	Decentralized water treatment systems
6/07	Durham, NC	Duke University	Environmental impacts of fuel alcohols
6/07	Singapore	IWA	Environmental applications and implications of nanotechnology
5/07	Seattle, WA	University of Washington	Fuel ethanol and groundwater pollution
4/07	Tempe, AZ	Arizona State University	Nanotechnology and the environment
3/07	San Diego, CA	AEHS	Bacterial-fullerene interactions
2/07	Durham, NC	Duke University	Environmental impacts of fuel alcohols
1/07	Ann Arbor, MI	University of Michigan	Ethanol in fuel: groundwater quality implications
12/06	Managua, Nicaragua	Universidad Centroamericana (UCA)	Nanotecnologia ambiental

11/06	Washington, D.C.	EPA/ORD	Fullerene-bacterial interactions
11/06	Copenhagen, Denmark	Technical University of Denmark	Environmental nanotechnology
10/06	Amherst, MA	U Mass	Microbial impacts of fuel ethanol
9/06	Houston, TX	Baker Institute, Rice	Groundwater impacts of ethanol
9/06	EL Paso, TX	UTEP	Environmental nanotechnology
8/6	Bogotá, Colombia	Universidad de Los Andes	Principles and applications of bioremediation
7/06	Tianjin, China	Nankai University	Fullerene micro-ecotoxicology
6/06	Mexico City	UAM	Nanotechnology and environmental engineering
6/06	New Hampshire	Gordon Conference	Biodegradation of organic compounds
5/06	Medellin, Colombia	Universidad Nacional de Colombia	Fitorremediacion
4/06	Ann Arbor, MI	University of Michigan	Fullerene ecotoxicology
3/06	Valencia, Venezuela	Universidad de Carabobo	Environmental implications and applications of nanotechnology
2/06	Tempe, AZ	Arizona State University	Environmental nanotechnology
11/05	Pachuca, Mexico	Universidad Politecnica de Pachuca	Bioremediation and natural attenuation
10/05	Washington, D.C.	EPA	Nanomaterial-bacterial interactions
9/05	Managua, Nicaragua	MARENA	Cleanup of gasoline contaminated aquifers
9/05	Washington, DC	ESTCP	Bioaugmented iron barriers to treat RDX contaminated aquifers
6/05	Sapporo, Japan	IWA	Emerging pollutants and treatment approaches
5/05	Toulouse, France	Université Paul Sabatier/ Laboratoire de Genie Chimique	Iron-based bioremediation of oxidized groundwater pollutants
5/05	Aix-En-Provence	Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE)	Emerging hazards and water treatment needs
3/05	Urbana-Champaign, IL	University of Illinois	Bioremediation: startups and upstarts
2/05	Zurich, Switzerland	EAWAG	Microbial interactions with nanomaterials
1/05	El Paso, TX	UTEP	Natural attenuation of BTEX-ethanol mixtures
11/04	Sao Paulo, Brazil	Instituto Ekos (keynote)	Phytoremediation: principles and applications
11/04	College Station, TX	Texas A&M	Effects of ethanol on BTEX natural attenuation
9/04	Tianjin, China	Nankai University (keynote)	Global changes and industrial ecology
9/04	Venice, Italy	INCA (keynote)	Sustainable chemistry

8/28	Cancun, Mexico	Asociación Mexicana de Microbiología	Biorremediación de BTEX <sup>®</sup> principios y aplicaciones
8/04	Cancun, Mexico	ISME	Fate and transport of BTEX-ethanol mixtures
7/04	Irvine, CA	CDM Inc	Effects of ethanol on BTEX natural attenuation: microscopic and macroscopic implications
7/04	Bethesda, MD	NIA	History and epistemology of bioremediation
7/04	Nuevo Vallarta, MX	Mayan Resorts	Civil and environmental engineering at Rice
6/04	Prague, Czech Republic	IWA	Attenuation and amplification of TC resistance genes in soil
5/04	Monterrey California	Battelle	Sustainable RDX degradation in bioaugmented iron columns
5/04	Cartagena, Colombia	CONCARIBE	Leapfrogging technologies for Caribbean environmental problems
2/04	Berkeley, CA	UC Berkeley	Groundwater impacts of ethanol
1/04	Washington, DC	NSF, EPA and DOD Interagency meeting	Phytoremediation and Rhizoremediation
11/03	Sao Paulo, Brazil	Instituto Eccos (keynote)	Monitored natural Attenuation
11/03	Mexico City	IMP, keynote	Bioremediation
10/03	Managua, Nicaragua	AIDIS, keynote	Bioremediation
8/03	Costa Mesa, CA	NGWA	Oxygenates workshop
8/03	Kansas City, KS	EPA	Effect of ethanol on BTEX natural attenuation
6/03	Chania, Greece	EU, keynote	Effect of ethanol on BTEX natural attenuation
4/03	West Lafayette	Purdue University	Environmental Impacts of Biofuels
4/03	Gainesville, FLA	University of Florida	Effect of ethanol on BTEX natural attenuation
4/03	Buenos Aires, Argentina	Universidad de Buenos Aires	Sustainable development and industrial ecology
3/03	Cartagena, Colombia	ANEIC, keynote	Phytoremediation principles and applications
2/03	Valencia, Venezuela	AVISA	Permeable reactive barriers for groundwater pollution
1/03	Ames, Iowa	ISU	Effect of ethanol on BTEX attenuation and plume length
12/02	Managua, Nicaragua	Universidad Catolica (UCA)	Bioremediation case studies
11/02	Davis, CA	University of California at Davis	Natural attenuation of gasohol releases
11/02	Valencia, Venezuela	Universidad de Carabobo - keynote	Sustainable Development and Industrial Ecology
9/02	Mexico City, Mexico	Universidad Autónoma de México	Bioremediation (Short Course)
7/02	Prague, Czech Republic	Institute of Chemical Technology	Iron-based bioremediation
5/02	Monterey, CA	Battelle	Biodegradation of ethanol

4/02	Monterrey, Mexico	Mexican Society for Microbiology - keynote	Principles and applications of BTEX bioremediation
3/02	Rio de Janerio, Brazil	Petrobras	Bioremediation an natural attenuation of gasohol spills
2/02	Pomona, CA	NWRI	Life cycle assessment of alternative fuel
12/01	Washington, DC	SERDP	RDX mineralization by Fe(0) and anaerobic sludge
11/01	Houston, TX	NGWA	Effect of ethanol on benzene plume length
10/01	Berlin, Germany	IWA	Effect of ethanol of BTEX degradation kinetics
10/01	Costa Mesa, CA	NWRI	Potential groundwater impacts of the use of methanol as fuel
7/01	Chania, Greece	Technical University of Crete	Fe(0)-based bioremediation of RDX contamination
7/01	Madrid, Spain	European Federation of Biotechnology	Novel trends in in situ bioremediation
5/01	Prague, Czech Republic	NATO Advance Studies Institute	Principles and applications of BTEX remediation
4/01	Seattle, WA	University of Seattle	Global Changes and Sustainable Development
4/01	Oakland, CA	Lawrence Livermore National Laboratory	The effect of ethanol on BTEX degradation kinetics
3/01	Houston, TX	University of Houston and Rice University	Natural attenuation of gasohol releases
3/01	Montreal, Canada	McGill University	Epistemology of bioremediation and natural attenuation
3/01	Guanajuato, Mexico	Mexican Society for Microbiology	Phytoremediation of contaminated soils
12/00	Madison, WI	University of Wisconsin	Biodegradation and bioremediation
11/00	Mexico, D.F.	UAM	Monitored natural attenuation workshop
11/00	Anaheim, CA	API/NGWA	Effects of ethanol versus MTBE on BTX natural attenuation.
10/00	West Lafayette, IN	Purdue University	Xenobiotic recalcitrance mechanisms
10/00	Irvine, CA	NAS/Ford Foundation	Challenges of an academic life in engineering
9/00	Iowa City, IA	ASCE	Merits and limitations of RBCA and natural attenuation
8/00	Managua, Nicaragua	INCAE (a Harvard Satellite)	Industrial ecology and sustainable development
7/00	Managua, Nicaragua	Universidad Centroamericana	Global changes and economic development
6/00	Paris, France	IWA	RDX degradation by an integrated microbial-Fe <sup>0</sup> system
5/00	Valencia, Venezuela	Carabobo Industrial Consortium	Global changes and industrial ecology
5/00	Columbus Ohio	Ohio State University	Bioremediation and natural attenuation
2/00	Cincinnati, OH	API/EPA	Effect of ethanol of natural attenuation of BTEX
11/99	Honolulu, HI	University of Hawaii	Bioremediation Perspectives
11/99	Chicago, IL	EPA	Fe(0)-Based Bioremediation

6/99	Zürich, Switzerland	ETH/ Biotechnology Institute	Intrinsic bioremediation and risk-based corrective action
12/98	Managua, Nicaragua	MARENA/IMPYME	Bioremediation and bioprospecting
11/98	Houston, TX	API/NGWA (keynote speaker)	BTEX degradation kinetics: model vs. field data
8/98	Managua, Nicaragua	PAMIC/INPYME	Green Technologies for sustainable development
7/98	Zürich, Switzerland	EAWAG	Substrate interactions for enhanced BTX biodegradation
5/98	Mexico, D.F.	Universidad Autónoma de México	Site assessment and remediation
3/98	Valencia, Venezuela	AVISA/ U. de Carabobo	Epistemology of environmental engineering
11/97	Caracas, Venezuela	AVISA/AIDIS	Xenobiotic biodegradation in natural systems
9/97	Washington, D.C.	NSF/CMS Workshop	BTPs for groundwater remediation
7/97	Mexico, D.F.	Universidad Autónoma de México	Hazardous waste remediation (Short Course)
6/97	Lincoln, Nebraska	University of Nebraska	Iron-Supported Denitrification
6/97	Florianopolis, Brazil	Universidade Federal de Sta. Catarina	Principles of bioremediation
5/97	Caracas, Venezuela	Ministry of the Environment	Fundamentals of environmental microbiology
5/97	Valencia, Venezuela	Assoc. Venezolana de Ing. Ambientales	Novel approaches to site remediation
4/97	New Orleans, LA	Battelle	Fe(0) based bioremediation of nitrate contaminated waters
4/97	San Francisco, CA	ACS	Effect of ethanol of anaerobic toluene biodegradation
8/96	Mexico, D.F.	Universidad Autónoma de México	Advances in hazardous waste site remediation
6/96	Singapore	IAWQ	Bioremediation perspective for Brazil
5/96	Florianópolis, Brazil	Universidade Federal de Sta. Catarina	Environmental chemodynamics (Short Course)
2/96	Valencia, Venezuela	AVISA (Keynote speaker)	Reductive treatment with Fe <sup>0</sup>
11/95	Hill AFB, UT	US Air Force and Montgomery Watson	TCE uptake by common garden vegetables
10/95	Iowa City, IA	Iowa Groundwater Association	Enhanced BTX degradation by benzoate
6/95	Florianópolis, Brazil	Universidade Federal de Sta. Catarina	Biotransformations of xenobiotics in soils
6/95	Florianópolis, Brazil	Universidade Federal de Sta. Catarina	Activated sludge design
5/95	Valencia, Venezuela	Assoc. Venezolana de Ing. Ambientales (Keynote spkr)	Contamination and remediation of aquifers
5/95	Valencia, Venezuela	Universidad de Carabobo	Fate and transport of xenobiotics in aquifers
4/95	Champagne, IL	University of Illinois	Nitrate-based bioremediation
12/94	Managua, Nicaragua	Universidad Nacional de Ingeniería	Chemical and microbial degradation of pollutants
12/94	Managua, Nicaragua	Fundación de Desarrollo	Socio-political implications of pollution

5/94          Copenhagen, DK          IAWQ Biofilm Conference          Degradation of BTX and their metabolites

### **ADVISORY BOARD & REVIEWER OF OTHER CEE PROGRAMS**

- Rice University, 2003
- Carnegie Mellon University, 2007
- The University of Kansas, 2008
- The University of Nebraska, 2008
- Central Florida University, 2010
- Seoul National University World Class University program on Chemical Convergence for Energy and the Environment, 2012
- Princeton University, 2012, 2015
- Chinese Academy of Sciences Institute of Applied Ecology, 2013

### **FUNDING AS PRINCIPAL INVESTIGATOR**

NSF. Nanoscience Engineering Research Center on Nanotechnology-Enabled Water Treatment (NEWT) (\$18,500,000). 9/1/2015-8/31/2020)

SERDP. Developing and Validating Genetic Catabolic Probes to Quantitatively Assess Monitored Natural Attenuation of 1,4-Dioxane (\$800,000). 5/1/2015-4/30/2018

Chevron. Enhancing the Biodegradation of Heavy Hydrocarbons in Soil: (1) Pyrolytic conversion of soil contaminated with heavy hydrocarbons into char to enhance soil fertility (\$190,728); (2) Enzymatic Pre-treatment of Soils Contaminated with Heavy Hydrocarbons to Accelerate Bioremediation (\$105,000) (3) Photocatalytic Pre-Oxidation with Titanium Dioxide (TiO<sub>2</sub>) (\$100,000). 1/1/2016-6/30/2017. (Co-PY on project 1 with Kyriacos Zygourakis and Carrie Masiello).

NSF. PIRE: Halting Environmental Antimicrobial Resistance Dissemination [HEARD]. (\$3,600,000; Rice share \$768,790) 5/1/2015-4/30/2018. (Co-PI with Peter Vikesland and Amy Pruden, Virginia Tech).

ESTCP. Delivering Improved Understanding of Natural Attenuation Processes Using A Massive Open (MOOC). (150,000). 09/01/15-11/30/16.

BP. Self-sustainable Bioelectrochemical (BEC) - Capacitive Deionization (CDI) Process for Simultaneous Removal of Organic Matter and Salinity from Oil and Gas Produced Water (\$150,000). 1/1/2014-21/31/2015 (PI: Qilin Li).

SERDP. Developing and Field-Testing Genetic Catabolic Probes for Monitored Natural Attenuation of 1,4-Dioxane (\$150,000). 9/1/2012-8/31-2014

Chevron. In-Situ Remediation of Heavy Hydrocarbons in Impacted Vadose Zone Soils (\$5,000,000). 9/1/2012-8/31-2017. (PI: Paul Johnson, ASU).

Honeywell. "1,4-Dioxane Natural Attenuation Potential". (\$115,000) 8/01/12-7/31/13.

U.S. EPA. "Consortium for Manufactured Nanomaterial Bioavailability & Environmental Exposure" (\$2,000,000) 1/1/10-1/1/13 (Co-PI's Vicki Colvin, Steve Klaine and Sam Luoma).

National Science Foundation, "Center for Biological and Environmental Nanotechnology" (\$12,110,746) 1/1/07-1/1/12 (PI Vicki Colvin, co-PI Jennifer West and John Hutchinson)

National Science Foundation, "Engineered Nanomaterials and Plant Interactions: Uptake, Biotransformations and Physiological Effects" (\$600,000) 9/1/10-8/31/13 (co-PI's Vicki Colvin, Janet Braam and Jerry Schnoor)

FAO, "Nanotechnology-Enabled Water Treatment for Improved Food Safety and Public Health in Swaziland" (\$50,000) 12/12/11-11/30/12 (Co-PI Qilin Li).

National Science Foundation, "Workshop on Applications of Nanotechnology in the Water Sector: Emerging Opportunities and Challenges for Water Treatment and Reuse, Monte Verita, Switzerland" (\$27,389) 5/18/11-5/21/11

Water Reuse Foundation, "Review of Nanomaterial Research and Relevance for Water Reuse" (\$24,741) 05/01/11-04/01/12 (PI: Qilin Li)

National Science Foundation, "Developing Novel Surface Immobilized Photocatalysts Using Functionalized C<sub>60</sub>" (\$350,000) 8/01/09-8/31/12 (Co-PI: Jaesong Kim)

Korean Institute of Science and Technology, "Application of Nano-sized Photocatalysts for the removal of toxic substances from aqueous solutions" (\$100,000) 06/01/10-05/31/14.

USEPA. "Interactions of Natural Organic Matter with C60 Fullerene and their Impact on C60 Transport, Bioavailability and Toxicity" (\$400,000), 12/01/08-08/30/11 (PI: Qilin Li)

U.S. EPA, "Quantum Dot Weathering and its Effects on Microbial Communities" (\$400,000) 9/01/08-8/31/11 (Co-PI: Vicki Colvin)

U.S. EPA, "Interactions of Natural Organic Matter with C60 Fullerene and their Impact on C<sub>60</sub> Transport, Bioavailability and Toxicity" (\$400,000) 9/01/08-8/31/11 (PI: Qilin Li)

BP America, "1,4-Dioxane Biodegradation in the Arctic" (\$125,000) 9/01/08-9/01/12

BP America, "Modeling the effect of fuel alcohol on BTEX plume dynamics" (\$50,000) 9/01/08-9/01/10

National Science Foundation, "C<sub>60</sub> Biotransformation and Bioaccumulation: Environmental Impact Implications" (\$240,000) 8/01/08-8/31/10 (Co-PI: Vicki Colvin)

National Science Foundation, "Correlation between Biomarker Concentrations and Hydrocarbon Biodegradation Rates to Enhance the Selection and Performance Assessment of Bioremediation and Natural Attenuation" (\$128,531) 9/01/07-8/31/09

Chevron, "The Water Footprint of Biofuels" (\$100,000) 9/01/07-8/31/09 (Co-PI: Amy Jaffe).

API, "The Impact of E85 on BTEX and other Hydrocarbons in Ground Water" (300,000) 7/1/07-6/30/09, (Co-PI: Bill Rixey)

API, "The Impact of E95 and E10 on BTEX and other Hydrocarbons in Ground Water" (270,000) 7/1/05-6/30/07, (Co-PI: Bill Rixey)

U.S. EPA, "Collaborative effect of surface coatings on the environmental and microbial fate of nano-iron and Fe-oxide nanoparticles" (\$75,000 subcontract to CMU) 9/01/07-8/31/10 (Co-PI Greg Lowry)

U.S. EPA, "Microbial Impacts of Engineered Nanoparticles" (\$375,000) 9/1/05-8/31/08 (Co-PI Mark Wiesner)

National Science Foundation, "Civil and Environmental Engineering Program Update to the 21st Century" (\$100,000) 9/01/05-8/31/06 (Co-PI Phil Bedient)

National Science Foundation, "Fullerene-Microbial Interactions: Implications for disinfection and risk

assessment" (\$150,000) 9/1/05-8/31/06 (Co-PI with Mark Wiesner and Jiasong Fang)

National Science Foundation, "NSF CAREER Award Proposal Writing Workshop" (\$16,000) 6/15/05-12/31/05

EPA/GCHSRC, "Development of an RTQ-PCR protocol for the detection and quantification of anaerobic benzene degraders" (100,000) 9/04-8/06.

ESTCP, "Reductions in DNAPL longevity through biological flux enhancement" (\$200,000) 6/1/2004-5/31/2006 (Co-PI Herb Ward).

National Science Foundation, "Workshop on U.S.-Latin American Caribbean environmental problems and sustainable solutions" (\$28,000) 5/15/04-12/31/04.

U.S. Army Corps of Engineers, CECER Lab "Evaluation of Rotating Biofilter Reactor at the Iowa Army Ammunitions Plant" (\$160,000) 05/01/03-12/31/04

National Science Foundation, "PAH biodegradation in the rhizosphere of tropical plants" (\$100,000) 9/15/02-8/14/04.

ISWRRI, "Fate and transfer of antibiotic resistance genes" (\$132,430), 5/02-4/04.

National Science Foundation, "Environmental Impacts of Ethanol in Gasoline: A Planning Trip to Brazil" (\$12,915) 8/15/01-8/14/02.

American Petroleum Institute, "Effect of Ethanol on BTEX Plume Length" (\$38,994) 8/01/01 - 7/31/02.

SERDP, "Fe(0)-Based Bioremediation of RDX Contaminated Groundwater" (\$500,000) 8/01/01 - 12/31/03

EPA/OER, "Effect of the gasoline oxygenate ethanol on the migration and natural attenuation of BTEX" (\$194,878) 1/1/00 -8/31/04.

SERDP, "Fe(0)-Based Bioremediation of RDX Contaminated Aquifers" (\$99,997) 1/01/00 - 12/31/00.

American Petroleum Institute, "Effect of Ethanol on BTEX and MTBE Natural Attenuation" (\$85,000) 7/01/99 - 6/30/01.

EPA/HSRC, "Iron-Enhanced Bioremediation of Aquifers Contaminated with Chlorinated Solvents, Heavy Metal, and Agrochemical Mixtures", (\$150,000), 10/01/99-5/31/01 01 (Co-PI with G.F. Parkin and M. Scherer).

Lawrence Livermore National Lab, "The Use of Ethanol as a Transportation Fuel Oxygenate" (\$98,055), 8/1/99 - 6/30/01.

Iowa Comprehensive Petroleum Underground Storage Tank Fund Board "Tier 3 model evaluation of groundwater contaminant models" (\$43,255 direct costs) 1/01/99 - 5/31/00.

U.S. Geological Survey.ISWRRI, "Treatment of Nitrate-Contaminated Groundwater with Fe(0) and Autotrophic Denitrifiers" (\$180,086) 9/01/98-8/31/00.

Department of Energy, "Biogeochemical Interactions in Zero-Valent Iron Walls" (\$491,985), 9/01/98 - 8/31/01 (Co-PI with G.F. Parkin and J.L. Schnoor)

National Science Foundation, "Research Training Grant: Gene expression in bioremediation" (\$1,600,000) 9/01/96 - 8/31/00 (PI is E.P. Greenberg).

Iowa Comprehensive Petroleum Underground Storage Tank Fund Board "Evaluation of Tier-3 Groundwater Models" (\$92,836direct costs) 1/1/99-12/31/01.

Iowa Comprehensive Petroleum Underground Storage Tank Fund Board "Evaluation of Tier-2 Groundwater Modeling Program" (\$17,079 direct costs) 5/01/98 - 12/31/98.

Hoescht Celanese, Inc., "Phytoremediation of 1,4-dioxane and bioaugmentation of the poplar rhizosphere" (\$88,317) 9/01/98 - 8/31/99 (Co-PI with Jerry L. Schnoor).

Hoescht Celanese, Inc., "Phytoremediation of sites contaminated with dioxane" (\$93,000) 9/01/96 - 8/31/97 (Co-PI with Jerry L. Schnoor).

National Science Foundation, "Career Award" (\$275,000) 7/01/95 - 6/30/99.

EPA/OER, "Biostimulation of BTX degradation with environmentally benign aromatic substrates" (\$246,342) 10/1/95 - 9/30/98.

Center for Health Effects of Environmental Contamination, "Bioaugmentation of the poplar rhizosphere with GEMs" (\$15,000) 2/1/97-8/31/97.

Center for Health Effects of Environmental Contamination, "Expression of toluene dioxygenase under various redox and substrate conditions" (\$15,000) 1/01/95 - 12/31/95.

Center for Health Effects of Environmental Contamination, "Effect of poplar trees on microbial populations important to hazardous waste bioremediation" (\$15,000) 1/01/95 - 12/31/95.

EPA/HSRC, "The role of elemental iron in biotransformations of halogenated xenobiotics" (\$554,591) 5/1/95 - 4/30/98. (Co-PI with Gene F. Parkin and Jerry L. Schnoor).

Montgomery Watson, Inc. (funded by DoD), "TCE uptake by common garden vegetables" (\$154,500) 9/01/94 - 8/31/95.

NIEHS Environmental Health Sciences Core Center at Iowa, "Enhanced degradation of trace levels of benzene" (\$9,000) 7/01/94 - 3/31/95.

Center for Global and Regional Environmental Research, "Reductive dechlorination of chlorinated methanes with iron metal" (\$15,000) 9/01/94 - 8/31/95.

Iowa State Water Resources Research Institute, "The effect of structural analogues on monoaromatic hydrocarbon biodegradation" (\$59,020 plus \$45,000 in equipment match-up from U. of Iowa) 7/01/93 - 6/30/96.

National Science Foundation, "The effect of sustained nitrate exposure on monoaromatic hydrocarbon biodegradation" (\$11,952) 1/01/94 - 12/31/94.

Microbiotics Corp., "The use of Microtox as a screening tool to evaluate bioremediation techniques" (Equipment grant for \$ 10,000) 7/1/94.