Jim C. Spain

|  |  |
| --- | --- |
| Professor Emeritus  Civil and Environmental Engineering  Georgia Institute of Technology  [jspain@ce.gatech.edu](mailto:jspain@ce.gatech.edu)  770-851-0007 cell  850-474-2806 office | Research Professor  University of West Florida  Center for Environmental Diagnostics and Bioremediation  11000 University Pky  Pensacola, FL 32514-5750  jspain@uwf.edu |

##### I. Earned Degrees

### Ph.D. 1979 University of Texas Microbiology

### Minor: Biochemistry

### 

### B.S. 1973 University of Texas, Arlington Biology

### Minor: Chemistry

# **II. Employment**

2015- Research Professor, University of West Florida CEDB

2005-2015 Professor of Environmental Engineering, Adjunct Professor of Biology, Georgia Institute of Technology, Atlanta, GA

2000 Sabbatical, ETH Institute for Biotechnology, Zurich

1988-2004 Chief, Environmental Biotechnology Research, Air Force Research Laboratory, Tyndall AFB, FL

1984-1987 Senior Research Microbiologist, Air Force Engineering and Services Center, Tyndall AFB, FL

1983-1984 Senior Scientist, Georgia State University, Atlanta, GA

1982-1983 On-Site Project Director, Georgia State University/Environmental Protection Agency Environmental Research Laboratory, Florida

# **III. Teaching and Mentoring**

|  |  |  |  |
| --- | --- | --- | --- |
| **Post Doctoral Research Associates** | **Current Affiliation** | | |
| Christopher GulvikZohre KurtTekle FidaRiqing YuMarco MinoaSarah SchroederGraham PumphreyAnthony Ranchou-Peyrouse 2007-2008 | CDC  Florida State University at Panama  University of Calgary  University of Texas at Tyler  University of Copenhagen  University of Adelaide  Buffalo Community College  University of Rouen, France | | |
| Lorena Betancor 2005-2006 | University of Cambridge | | |
| Rayford Payne 2005-2008 | University of Maryland | | |
| Cecile Berne 2003-2006 | Indiana University | | |
| Heather Luckarift 2002-2006 | Air Force Research Laboratory | | |
| Matt Eby 2002-2005 | Air Force Research Laboratory | | |
| Adrian Murza 2002-2003 | University of Pittsburg | | |
| Sandra Trott 2001-2003 | University of Dayton | | |
| Nicholas Coleman 2000-2003 | University of Sydney | | |
| Zhonghi He 1995-1998 | US Dept. of Agriculture | | |
| George Paoli 1997-2001 | US Dept. of Agriculture | | |
| Urs Lendenmann 1994-1997 | Boston University Medical Center | | |
| John Davis 1994-1997 | Michigan State University | | |
| Paul Fiorella 1994-1996 | Florida Office of Laboratory Services | | |
| Manish Shah 1994-1995 | Battelle Northwest | | |
| William Wallace 1992-1994 | Applied Research Associates | | |
| Rakesh Jain 1992-1994 | Institute of Microbial Technology, Chandigarh, India | | |
| Wen-Chen Suen 1991-1993 | Schering-Plough Research Institute | | |
| Charles Pettigrew 1989-1991 | Proctor and Gamble | | |
| William Seffens 1988-1990 | Clark Atlantic University | | |
| Billy Haigler 1987-1988 | Alice Llody College | | |
| **PhD Students** |  | | |
| Smruthi KarthikeyanFei HeZohre KurtKwanghee Shin | Began 2014. Project: Biodegradation of nitroaromatic compounds.  Graduated 2016. Project: Biodegradation of energetic compounds. Co-advising with Joe Hughes  Graduated 2012. Project: Biodegradation of natural nitroaromatic compounds.  Graduated 2010. Project: Biodegradation of carbazole and nitrobenzene at interfaces. | | |
| Samantha Parks | Graduated 2010. Project: Biodegradation of natural nitroaromatic compounds. | | |
| Yi Qu | Graduated 2010. Project: Evolution of pathways for biodegradation of nitroaliphatic compounds. | | |
| **MS Students** |  | | |
| Amy BrowerMallory Palatucci | Converted to research scientist  Graduated 2017. Project: Biodegradation of dichloronitrobenzenes | | |
| Hangping Zheng | Graduated 2015. Project: Biosynthesis of energetic compounds. | | |
| **Undergraduate Students** |  | | |
| Heather Wade Angie Mordant  Wei Cheng Shrestha Alok  Jenny Kim Tiffany Louie  Se Na Yoo Shilpi Gupta  Susie Lee Alejandro Caro  Bailey Wright Kacey Ivey  Emma Lang Heysuk Lim David Wituzinski James Kipp Caroline Smith | | |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |
|  |  |  | |

# **IV. Scholarly Accomplishments-** Google Scholar h index- 69

###### **A. Published Books and Parts of Books**

###### **Books**

Spain, J.C., J.B. Hughes, and H.-J. Knackmuss. 2000. Biodegradation of Nitroaromatic Compounds and Explosives. Lewis Publishers, Boca Raton, Florida

Spain, J.C. (ed) 1995. Biodegradation of Nitroaromatic Compounds. Plenum Press, New York

Ward, C.H., R.C. Loehr, E.K Nyer, M.R. Piotrowski, J.M. Thomas, J.C. Spain, J.T. Wilson,and R.D. Norris. 1995. Innovative Site Remediation Technology: Bioremediation. W.C. Anderson (Ed.) American Academy of Environmental Engineers

###### **Book Chapters**

Jennings, L.K., C.G.S. Giddings, J.M. Gossett, and J.C. Spain. 2013. Bioaugmentation for aerobic degradation of cis-1,2-dichloroethylene. In Stroo, H.F., A. Leeson, and C.H. Ward (eds). Bioaugmentation for Groundwater Remediation. SERDP ESTCP Environmental Remediation Technology. Volume 5:199-217.

Nishino, S. F., and J. C. Spain. 2004. Catabolism of nitroaromatic compounds. pp. 575-608. In: J.-L. Ramos (ed.), The Pseudomonads Vol III. Biosynthesis of macromolecules and molecular metabolism. Kluwer Academic/Plenum Publishers.

Ward, C.H., J.B. Hughes, G.A. Pope, M. Delshad, V. Dwaranath, J. Spain, S. Nishino, J.S. Fruchter, V.R. Vermeul, M.D. Williams, and J.E. Szecsody. 2002. In situ treatment technologies. In: D. Reible and K. Demnerova (eds.) Innovative Approaches to the On-Site Assessement and Remediation of Contaminated Sites. Kluwer Acacemic Publishers, Dordrecht, The Netherlands.

Nishino, S.F. and J.C. Spain. 2001. Identification of bottlenecks to the in situ bioremediation of dinitrotoluene. In: Magar, V.S., G. Johnson, S.K. Ong, and A. Leeson (eds.) Bioremediation of Energetics, Phenolics, and Polycyclic Aromatic Hydrocarbons. Battelle Press, Columbus, OH.

Nishino, S.F. and J.C. Spain. Biodegradation, transformation and bioremediation of nitroaromatic compounds. 2002. In: C.H. Hurst, G.R. Knudsen, M.J. McInerney, L.D. Stetzenbach, and M.V. Walter (eds.) Manual of Environmental Microbiology, 2nd Edition. ASM Press, Washington DC.

Herrington, R.T., J. Hicks, D. Downey, J.C. Spain, S.F. Nishino, J. Gossett, and E. Becvar. 2000. Natural attenuation of chlorinated benzenes at a former disposal site. In: G.B. Wickramanayake, A.R. Gavaskar, and M.E. Kelley (eds.) Natural Attenuation Considerations and Case Studies: Remediation of Chlorinated and Recalcitrant Compounds. Battelle Press, Columbus, OH.

Nishino, S. F., J. C. Spain and Z. He. 2000. Strategies for aerobic degradation of nitroaromatic compounds: process discovery to field application. In Spain, J. C., J. B. Hughes, and H. -J. Knackmuss (eds.). Biodegradation of

Nitroaromatic Compounds and Explosives. Lewis Publishers, Boca Raton, FL

Spain, J. and S. Nishino. 2000. Oxidative pathways for biodegradation of nitroaromatic compounds. Proceedings of the Ninth European Congress on Biotechnology. Branche Belge de la Societe de Chimie Industrielle, Brussels, Belgium.

Spain, J. C., S. F. Nishino, M. R. Green, J. E. Forbert, N. A. Nogalski, R. Unterman, W. M. Riznychok, S. E. Thompson, P. M. Sleeper, and M. A. Boxwell. 1999. Field demonstration of FBR for treatment of nitrotoluenes in groundwater. In: B. C. Alleman and A. Leeson (eds.) Bioremediation of Nitroaromatic and Haloaromatic Compounds. Battelle Press, Columbus, OH.

Ward, C. H., M. Alexander, J. Ryan, and J. C. Spain. 1999. Transformation. In: W. C. Anderson, R. C. Loehr, and B. P. Smith (eds), Environmental Availability in Soils. American Academy of Environmental Engineers, Wash. DC.

Nishino, S. F., and J. C. Spain. 1999. Strategies for aerobic biodegradation of dinitrotoluenes. In R. Fass, .Y. Flashner, and S. Reuveny (eds.) Novel Approaches for Bioremediation of Organic Pollution. Plenum Press, New York.

Nishino, S.F. and J.C. Spain, 1996. Biodegradation and transformation of nitroaromatic compounds. In C.H. Hurst, G.R. Knudsen, M.J. McInerney, L.D. Stetzenbach, and M.V. Walter (eds.) Manual of Environmental Microbiology. ASM Press, Washington, DC.

Spain, J.C., 1995. Biodegradation of nitroaromatic compounds. In: L.N. Ornston, A. Ballows, and E.P. Greenberg (Eds.) Annual Reviews in Microbiology. Vol. 49:523-549. Annual Reviews Inc. Palo Alto, CA.

Spain, J.C., 1995. Bacterial degradation of nitroaromatic compounds under aerobic conditions. In J.C. Spain (ed.). Biodegradation of nitroaromatic compounds. Plenum Press, New York.

Spain, J.C., C.A. Pettigrew, B.E. Haigler, 1991. Biodegradation of mixed solvents by a strain of Pseudomonas. In: G.S. Sayler et al (eds). Environmental Biotechnology for Waste Treatment. Plenum Press, New York.

Spain, J.C., 1990. Microbial adaptation in aquatic ecosystems. In: K.D. Racke and J.R. Coates (eds). Enhanced Biodegradation Pesticides in the Environment. American Chemical Society, Washington, D.C.

Spain, J.C., 1990. Metabolic pathways for biodegradation of chlorobenzenes. In: S. Silver et al (eds). Pseudomonas: Biotransformations, Pathogenesis, and Evolving Biotechnology. American Society for Microbiology, Washington, D.C.

Spain, J.C., 1988. Development of bacteria for biodegradation of chloroaromatic compounds. In: G. Lewandowski et al (eds). Biotechnology Applications in Hazardous Waste Treatment. Engineering Foundation, New York.

###### **B. Refereed Publications**

173. Gao, Yi-Zhou, M.L. Palatucci, L.A. Waidner, T. Li, Y. Guo, J.C. Spain and N.Y. Zhou. 2020. A Nag-like dioxygenase initiates 3,4-dichloronitrobenzene degradation via 4,5-dichlorocatechol in *Diaphorobacter* sp. Strain JS3050. Environ. Microbiol. https://doi.org/10.1111/1462-2920.15295.

172. Karthikeyan, S., M. Kim, P. Heritier-Robbins, J. Hatt, J.C. Spain, W. Overholt, M. Huettel, J. Kostka, and K. Kostantinidis. 2020. Integrated omics elucidate the mechanisms driving the rapid biodegradation of Deepwater Horizon oil in intertidal sediments undergoing oxic-anoxic cycles. Environ. Sci. Technol. 54:10088–10099.

171. Sexton, W.K., M. Fidero, J.C. Spain, L. Jiang, K. Bucalo, J.M. Cruse-Sanders and G.S. Pullman. 2020. Characterization of endophytic bacterial communities within greenhouse and field- grown rhizomes of three rare pitcher plant species (*Sarracenia oreophila*, *S. leucophylla*, and *S. purpurea* spp. venosa) with an emphasis on nitrogen-fixing bacteria. Plant and Soil. 447:257–279.

170. Madeira, C.L., K.V. Jog, E.T, Vanover, M.D. Brooks, D.K. Taylor, R. Sierra-Alvarez, L.A. Waidner, J.C. Spain, M.J. Krzmarzic, and J.A. Field. 2019. Microbial enrichment culture responsible for the complete oxidative biodegradation of 3-amino-1,2,4-triazol-5-one (ATO), the reduced daughter product of the insensitive munitions compound 3-nitro-1,2,4-triazol-5-one (NTO). Environ. Sci. Technol. 2019, 53, 21, 12648-12656.

169. Orellana, L.H., J.K. Hatt, R. Iyer, K. Chourey, R.L. Hettich, J.C. Spain, W. H. Yang, J.C. Chee-Sanford, F.E. Loeffler and K.T. Konstantinidis. 2019. Multi-omic techniquês predict the dynamics of microbial nitrogen utilization in agricultural soil. Sci. Rep. 9:17630.

168. Palatucci, M.L., L.A. Waidner, E.E. Mack, and J.C Spain. 2019. Aerobic biodegradation of 2,3- and 3,4-dichloronitrobenzene. J. Haz. Mat. 378:120717.

167. Karthikeyan, S., L.M. Rodriquez, P. Heritier-Robbins, M. Kim, W.A. Overholt, J.C. Gaby, J.K. Hatt, J.C. Spain, R. Rossello-Mora, M. Huettel, J.E. Kostka, and K.T. Konstantinidis. 2019. *Candidatus* Macondimonas

diazotrophica”, a novel gammaproteobacterial genus dominating crude oil-contaminated coastal sediments. Environ. Microbiol. 13:2129-2134.

166. Yu, R., Z. Kurt, F. He, and J.C. Spain. 2018. [Biodegradation of the allelopathic chemical pterostilbene by a *Sphingobium* sp. strain from the peanut rhizosphere](https://scholar.google.com/scholar?oi=bibs&cluster=17672780154073541193&btnI=1&hl=en). Appl. Environ. Microbiol. **DOI:** 10.1128/AEM.02154-18

165. Zhao, H., Y. Xu, S. Lin, J.C. Spain, N-Y. Zhou. 2018. The molecular basis for the NIH shift in carboxyl group migration. Molecular Microbiology. 110:411-424.

164. Ulrich, B.A., M. Palatucci, J. Bolotin, J.C Spain and T.B. Hofstetter. 2018. Different mechanisms of alkaline and enzymatic hydrolysis of the insensitive munition component 2,4-dinitroanisole lead to identical products. Environ. Sci. Technol. Lett. DOI: 10.1021/acs.estlett.8b00258

163. Kurt, Z., M. Minoia, and J.C. Spain. 2018. Resveratrol as a growth substrate for bacteria from the rhizosphere. Environ. Microbiol. 84:doi:10.1128/AEM.00104-18.

162. Mundle, S.O.C, J.C. Spain, G.L. Lacrampe-Couloume, S.F. Nishino, and B.S. Lollar. 2017. Branched pathways in the degradation of cDCE by cytochrome P450 in *Polaromonas* sp. JS666. Sci. Tot. Environ. 15:99-105.

161. Mahan, K.M., H. Zheng, T.T. Fida, R.J. Parry, D.E. Graham and J.C. Spain. 2017. A novel, iron-dependent enzyme that catalyzes the initial step in the biodegradation of N-nitroglycine by *Variovorax* sp strain JS1663. Appl. Environ. Microbiol. doi:10.1128/AEM.00457-17.

160. Konstantinidis, K., Y. Wang, J. Hatt, D. Tsementzi, L. Rodriguez, C. Ruiz-Perez, M. Weigand, H. Kizer, G. Maresca, R. Krishnan, R. Poretsky, and J. C. Spain. 2017. Quantifying the importance of the rare biosphere for microbial community response to organic pollutants in a freshwater ecosystem. Appl. Environ. Microbiol. 83 (8) e03321-16.

159. Kalyoncu, S., D.P. Heaner, Z. Kurt, C.M. Bethel, C.U. Ukachukwu, S. Chakravarthy, J.C. Spain, and R.L. Lieberman. 2016. Enzymatic hydrolysis by transition-metal-dependent nucleophilic aromatic substitution. Nature Chem. Biol. 12:1031-1036.

158. Chen, Y., D. Hou, C. Lu, J.C. Spain, J. Luo. 2016. Effects of rate-limited mass transfer on modeling vapor intrusion with aerobic biodegradation. Environ. Sci. Technol. 50:9400-9406.

157. Kurt. Z., E.E. Mack and J.C. Spain. 2016. Natural attenuation of non-volatile contaminants in the capillary fringe. Environ. Sci. Technol.  50:10172–10178.

156. Karthikeyan, S and J.C. Spain.2016.Immobilized biocatalyst for detection and destruction of the insensitive explosive, 2,4-dinitroanisole (DNAN). Environ. Sci. Technol.  50:11193–11199.

155. Yan, X., T. Gu, Z. Yi, J. Huang, X. Liu, J. Zhang, X. Xu, Z. Xin, Q. Hong, J. He, J.C. Spain, S. Li, and J. Jiang. 2016. Comparative genomic analysis of isoproturon-mineralizing sphingomonads reveals the isoproturon catabolic mechanism. Environ. Microbiol.12:4888-4906.

154. Karthikeyan, S. and JC Spain. 2016. [Biodegradation of 2,4-dinitroanisole (DNAN) by *Nocardioides* sp. JS1661 in water, soil and bioreactors](http://scholar.google.com/citations?view_op=view_citation&hl=en&user=5rLHxrcAAAAJ&sortby=pubdate&citation_for_view=5rLHxrcAAAAJ:QYdC8u9Cj1oC). J. Haz. Materials 312:37-44.

153. Luo, J., Z. Kurt, D. Hou, and J.C. Spain. 2015. Modeling aerobic biodegradation in the capillary fringe. Environ. Sci. Technol. 49:1501-1510.

152. Vercammen, K., Q. Wei, D. Charlier, A. Dötsch, S. Haussler, S. Schulz, F. Salvi, G. Gadda, J.C Spain, M. L. Rybtke, T. Tolker-Nielsen, J. Dingemans, L. Ye, and P. Cornelis. 2015. *Pseudomonas aeruginosa* LysR PA4203 regulator NmoR acts as a repressor of the PA4202 nmoA gene encoding a nitronate monooxygenase. J. Bacteriol. 197:1026-1039.

151. Kurt, Z., E.E. Mack, and J.C. Spain. 2014. Biodegradation of *cis*-dichloroethene and vinyl chloride in the capillary fringe. Environ. Sci. Technol. 48, 13350−13357.

150. Fida, T.T., S. Palamuru, G. Pandey, and J.C. Spain. 2014. Aerobic biodegradation of 2,4-dinitroanisole (DNAN) by *Nocardioides* sp. JS1661. Appl. Environ. Microbiol. 80:7725-31.

149. Salvi, F., J. Agniswamy, H. Yuan, K. Vercammen, R. Pelicaen, P. Cornelius, J.C. Spain, I.T. Weber, and G. Gadda. 2014. The combined structural and kinetic characterization of a bacterial nitronate monooxygenase from *Pseudomonas aeruginosa* PAO1 establishes NMO class I and II. J. Biol. Chem. 289(34):23764-75.

148. Oh, S.,Z. Kurt, D. Tsementzi, M. Weigand, M. Kim, J. Hatt, M. Tandukar, S. Pavlostathis, J.C. Spain, and K. Konstantinidis. 2014. Microbial community degradation of widely used quaternary ammonium disinfectants. Appl. Environ. Microbiol. 80:5892-5900.

147. Han, JI, JC Spain, JR Leadbetter, G. Ovchinnikova, LA Goodwin, CS Han, T Woyke, KW Davenport and P. Orwin. 2013. [Genome of the root-associated plant growth-promoting bacterium *Variovorax paradoxus* strain EPS](http://genomea.asm.org/content/1/5/e00843-13.short). Genome Announcements. 1:e00843-13.

146. Wijker, RS, Z. Kurt, JC Spain, J. Bolotin, J. Zeyer and TB Hofstetter. 2013. Isotope fractionation associated with the biodegradation of 2- and 4-nitrophenols via monooxygenation pathways. Environ. Sci. Technol. 47:14185-14193.

145. Anton BP, Chang Y-C, Brown P, Choi H-P, Faller LL, et al. 2013. The COMBREX project: design, methodology, and initial results. PLoS Biol. 11(8): e1001638.

144. Francis, K., C. Smitherman, S. Nishino, J.C. Spain and G. Gadda. 2013. The biochemistry of the metabolic poison propionate 3-nitronate and its conjugate acid, 3-nitropropionate. IUBMB Life. 65:759-768.

143. Kurt, Z., and J.C. Spain. 2013. Biodegradation of chlorobenzene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene in the vadose zone. Environ. Sci. Technol. 47:5846-5854.

142. Wijker, R., J. Bolotin, S.N. Nishino, J.C. Spain, and T. Hofstetter. 2013. Using compound-specific isotope analysis to assess the biodegradation of nitroaromatic explosives in the subsurface. Environ. Sci. Technol. 47:6872-6883.

141. Nishino, S.F., K. Shin, J.G. Gossett, and J.C. Spain. 2013. Cytochrome P450 initiates degradation of *cis*-dichloroethylene by *Polaromonas* sp. JS666. Appl. Environ. Microbiol. 79:2263-2272.

140. Kurt, Z., K. Shin, and J.C. Spain. 2012. Biodegradation of chlorobenzene and nitrobenzene at the oxic/anoxic interface between sediment and water. Environ. Sci. Technol. 46:11829-11835.

139. Pati, S.G., K. Shin, M. Skarpeli-Liati, J. Bolotin, S.N. Eustis, J.C. Spain, and T.B. Hofstetter. 2012. Carbon and nitrogen isotope effects associated with the dioxygenation of aniline and diphenylamine. Environ. Sci. Technol. 46:11844-11853.

138. Francis, K., S. Nishino, J.C. Spain and G. Gadda. 2012. A novel activity for fungal nitronate monooxygenase: detoxification of the metabolic inhibitor propionate-3-nitronate. Arch. Biochem. Biophys. 521:84-89.

137. Husserl, J., J.B. Hughes, and J.C. Spain. 2012. Key enzymes enable growth of *Arthrobacter* strain JBH1 on nitroglycerin as the sole source of carbon and nitrogen. Appl. Environ. Microbiol. 78: 3649-3655.

136. Coleman, N.V., N.L. Wilson, K. Barry, T.S. Brettin, D.C. Bruce, A. Copeland, E. Dalin, J.C. Detter, T.G. del Rio, L.A. Goodwin, N.M. Hammon, S. Han, L.J. Hauser, S. Israni, E. Kim, N. Kyrpides, M.L. Land, A. Lapidus, F. W. Larimer, S. Lucas, S. Pitluck, P. Richardson, J. Schmutz, R. Tapia, S.Thompson, H.N. Tice, J.C. Spain, J.G. Gossett, T.E. Mattes. 2011. [Genome sequence of the ethene-and vinyl chloride-oxidizing actinomycete *Nocardioides* sp. strain JS614](http://jb.asm.org/content/193/13/3399.short). J. Bacteriol. 193:3399.

135. Hoffstetter, T.B, J. Bolotin, M. Skarpeli-Liati, J. Wijker, Z. Kurt, S.F. Nishino and J.C. Spain. 2011. Tracking transformation processes of organic micropollutants in aquatic environments using multi-element isotope fractionation analysis. Appl. Geochem. 26S:334-336.

134. Pumphrey, G.M., A. Ranchou-Peyruse, and J.C. Spain. Cultivation-independent detection of autotrophic hydrogen-oxidizing bacteria by DNA stable isotope probing. 2011. Appl. Environ. Microbiol.77:4931-4938.

133. Schroeder, S., A. Ranchou-Peyruse, M. Ranchou- Peyruse, and J.C. Spain. 2011. Reverse-transcriptase quantitative PCR method to detect interspecies hydrogen exchange by *Alcaligenes hydrogenophilus,* an aerobic hydrogen-oxidising bacterium. Arch. Microbiol. 193:687-692.

132. Qu, Y., and J.C. Spain. 2011. Molecular and biochemical characterization of the 5-nitroanthranilic acid degradation pathway in a *Bradyrhizobium.* J. Bacteriol. 193:3057-3063.

131. Parry, R., S. Nishino, and J.C. Spain. 2011. Naturally- occuring nitro compounds. Nat. Prod. Reports. 28:152-167.

130. Qu, Y. and J.C. Spain. 2011. Catabolic pathway for 2-nitroimidazole involves a novel nitrohydrolase that also confers drug resistance. Environ. Microbiol. 13:1010-1017.

129. Han, J., H.-K. Choi, S.-W. Lee, P.M. Orwin, J. Kim, S.L. LaRoe, T. Kim, J. O’Neil, J.R. Leadbetter, S.Y. Lee, C.-G. Hur, J.C. Spain, G. Ovchinnikova, L. Goodwin, and C. Han. 2011. Complete genome sequence of the metabolically versatile plant growth-promoting endophyte, *Variovorax paradoxus* S110. J. Bacteriol. 193:1183-1190.

128. Nishino, S.F, K.A Shin, R. Payne, and J.C. Spain. 2010. Growth of bacteria on 3-nitropropionic acid as a sole carbon, nitrogen and energy source. Appl. Environ. Microbiol. 76:3590-3598.

127. Qu, Y. and J.C. Spain. 2010. Biodegradation of 5-nitroanthranilic acid by *Bradyrhizobium* sp. Strain JS329. Appl. Environ. Microbiol. 76:1417-1422.

126. Husserl, J. J.C. Spain, and J.B. Hughes. 2010. Growth of *Arthrobacter* sp. Strain JBH1 on nitroglycerin as the sole source of carbon and nitrogen. Appl. Environ. Microbiol. 76:1689-1691.

125. Jennings, L.K., M.M.G. Chartrand, G. Lacrampe-Couloume, B.S. Lollar, J.C. Spain, and J.M. Gossett. 2009. Proteomic and transcriptomic analyses reveal genes upregulated by *cis*-dichloroethene in *Polaromonas* JS666. Appl. Environ. Microbiol. 75:3733-3744.

124. Shin, K.E, and J.C. Spain. 2009. Biodegradation of diphenylamine by *Burkholderia* sp. Strain JS667: pathway and evolutionary implications. Appl. Environ. Microbiol. 75:2694-2704.

123. Rankin, L.D., D.M. Bodenmiller, J.D. Partridge, S.F. Nishino, J.C. Spain, and S. Spiro. 2008. *Escherichia coli* NsrR regulates a pathway for oxidation of 3-nitrotyramine to 4-hydroxy-3-nitrophenylacetate. J. Bacteriol. 190:6170-6177.

122. Hofstetter, T.B., J.C. Spain, S.F. Nishino, J. Bolotin, and R.P. Schwarzenbach. 2008. Identifying competing aerobic nitrobenzene biodegradation pathways by compound-specific isotope analysis. Environ. Sci. Technol. 42:4764-4770.

121. Luckarift, H.R., and J.C. Spain. 2008. Continuous-flow applications of silica-encapsulated enzymes. Biomol. Catalysis. ACS Symposium Series. 986:243-253.

120. Li, L. T.V. Marolla, L. Nadeau, and J.C. Spain. 2007. Probing the role of promoters in zinc reduction of nitrobenzene: continuous production of hydroxylaminobenzene. Ind. Eng. Chem. Res. 46:6840-6846.

119. Betancor, L., H.R. Luckarift, J.H Seo, O. Brand and J.C. Spain. 2007. Three dimensional immobilization of β-galactosidase on a silicon surface. Biotechnol. Bioeng. 99:261-267.

118. Luckarift, H.R., R. Greenwald, M. Bergin, J.C. Spain, and G.R. Johnson. 2007. Biosensor system for continuous monitoring of organophosphate aerosols. Biosens. Bioelectron. 23:400-406.

117. Luckarift, H.R., Bosung Ku, J.C. Spain, and J. Dordick. 2007. Silica-immobilized enzymes for multi-step synthesis in microfluidic devices. Biotechnol. Bioeng. 98:701-705.

116. Poulsen, N. C. Berne, J. Spain, and N. Kroger. 2007. Silica immobilization of an enzyme via genetic engineering of the diatom, *Thalassiosira pseudonana*. Angewandte Chemie. Int. Ed. Engl. 46:1843-1846.

115. Mattes, T.E., N.V. Coleman, A.S. Chuang, A.J. Rogers, J.C. Spain, and J.M. Gossett. 2006. Mechanism controlling the extended lag period associated with vinyl chloride starvation in *Nocardioides* sp. strain JS614. Arch. Microbiol. 187:217-226.

114. Betancor, L., C. Berne, Luckarift, H.R., and J.C. Spain. 2006. Coimmobilization of a redox enzyme and a cofactor regeneration system. Chem. Comm. (34):3640-3642.

113. Berne, C., L. Betancor, H.R. Luckarift, and J.C. Spain. 2006. Application of a microfluidic reactor for screening cancer prodrug activation using silica-immobilized nitrobenzene nitroreductase. Biomacromolecules. 7:2631-2636.

112. He, Zhongqi, R.E. Parales, J.C. Spain, and G.R. Johnson. 2007. Novel organization of catechol meta pathway genes in the nitrobenzene degrader *Comamonas* sp. JS765 and its evolutionary implication. J. Ind. Microbiol. Biotechnol. 34:99-104.

111. Luckarift, H.R., G.R. Johnson, and J.C. Spain. 2006. Silica-immobilized enzyme reactors; application to cholinesterase-inhibition studies. J. Chromatogr. B. 843:310-316.

110. Wang, D.H, J-.B. Baek, S.F. Nishino, J.C. Spain, and L-.S. Tan. 2006. Thermally reactive phenylethynyl-terminated bis(benzylester) and bis(amide) monomers based on semi-enzymatically produced 6-phenylethynyl picolinic acid. Polymer. 47:1197-1206.

109. Luckarift, H.R., M.B. Dickerson, K.H. Sandhage, and J.C. Spain. 2006. Rapid, room temperature synthesis of anti-bacterial bio-nano composites of lysozyme with amorphous silica or titania. Small. 2:640-642.

108. Nadeau, L.J., J.C. Spain, R. Kannan, and L-S. Tan. 2006. Conversion of 2-(4-carboxyphenyl)-6-nitrobenzothiazole to 4-(6-amino-5-hydroxybenzothiazol-2-yl)benzoic acid by a recombinant *E. coli* strain. Chem. Comm. (5):564-565.

107. Nishino, S.F., and J.C. Spain. 2006. Biodegradation of 3-nitrotyrosine by *Burkholderia* sp. JS165 and *Variovorax paradoxus* JS171. Appl. Environ. Microbiol. 72:1040-1044.

106. Daprato, R.C., C. Zhang, J.C. Spain, and J.B. Hughes. 2005. Modeling aerobic bioremediation of 2,4-dinitrotoluene in a bioslurry reactor. Environ. Eng. Sci. 22:676-688.

105. Johnson, G.R. and J.C. Spain. 2005. Synthesis of substituted catechols using nitroarene dioxygenases. Enzyme Microb. Technol. 38:142-147.

104. Fournier, D., S. Trott, J.C. Spain, and J. Hawari. 2005. Metabolism of the aliphatic nitramine 4-nitro-2,4-diazabutanal (NDAB) by *Methylobacterium* sp. strain JS178. Appl. Environ. Microbiol. 71:4199-4202.

103. Mattes, T.E., N.V. Coleman, J.C. Spain and J.M. Gossett. 2005. Physiological and molecular genetic analyses of vinyl chloride and ethene biodegradation in *Nocardioides* sp. strain JS614. Arch. Microbiol. 183:95-106.

102. Luckarift, H.R., L.J. Nadeau, and J.C. Spain. 2005. Continuous synthesis of aminophenols from nitroaromatic compounds by combination of metal and biocatalyst. Chem. Comm. (3):383-384.

101. Luckarift, H.R., G.R. Johnson, and J.C. Spain. 2004. Biosynthesis of  
hydroxydiphenylacetylene by regiospecific monooxygenation. Chem. Comm. (14):2402-2403.

100. Naik, R.R., M.M. Tomczak, H.R. Luckarift, J.C. Spain, and M.O. Stone. 2004. Entrapment of enzymes and nanoparticles using biomimetically synthesized silica. Chem. Comm. (14):1684-1685.

99. Zhao, J.-S., J.C. Spain, S. Thiboutot, G. Ampleman, C. Greer, and J. Hawari. 2004. Phylogeny of cyclic nitramine-degrading psychrophilic bacteria in marine sediment and their potential role in the natural attenuation of explosives. FEMS Microbiol. Ecol. 49:349-357.

98. Bhushan B., A. Halasz, J. C. Spain, and J. Hawari. 2004. Initial reaction(s) in biotransformation of CL-20 catalyzed by salicylate 1-monooxygenase from *Pseudomonas* sp. Appl Environ. Microbiol. 70:4040-4047.

97. Luckarift, H.R., J.C. Spain, R.R. Naik, and M.O. Stone. 2004. Enzyme immobilization in a biomimetic support. Nature Biotechnol. 22:211-213.

96. Fournier, D., A. Halasz, J.C. Spain, R.J. Spanggord, J.C. Bottaro, and J. Hawari. 2004. Biodegradation of the RDX ring-cleavage product, 4-nitro-2,4-diazabutanal (NDAB) by *Phanerochaete chrysosporium*. Appl. Environ. Microbiol. 70:1123-1128.

95. Fleischmann, T.J., K.C. Walker, J.C. Spain, J.B. Hughes, and A.M. Craig. 2004. Anaerobic transformation of 2,4,6-TNT by bovine ruminal microbes. Biochem. Biophys. Res. Comm. 314:957-963.

94. Coleman, N.V. and J.C. Spain. 2003. Epoxyalkane:Coenzyme M transferase catalyzes epoxide metabolism during biodegradation of ethene and vinyl chloride in *Mycobacterium* strain JS60. J. Bacteriol. 185:5536-5545.

93. Bhushan, B., L. Paquet, J.C. Spain, and J. Hawari. 2003. Biotransformation of 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazaisowurtzitane (CL-20) by denitrifying *Pseudomonas* sp. Strain FA1. Appl. Environ. Microbiol. 69:5216-5221.

92. Fortner, J. D., C. Zhang, J. C. Spain, and J. B. Hughes. 2003. Soil column evaluation of factors controlling biodegradation of DNT in the vadose zone. Environ. Sci. Technol. 37:3382-3391.

91. Coleman, N.V. and J.C. Spain. 2003. Distribution of the coenzyme M pathway of epoxide metabolism among ethene- and vinyl chloride-degrading mycobacteria: evidence for plasmid-mediated lateral gene transfer. Appl. Environ. Microbiol. 69:6041-6046.

90. Zhao, J. S., J.C. Spain and J. Hawari. 2003. Phylogenetic and metabolic diversity of RDX- transforming bacteria in strictly anaerobic mixed cultures enriched on RDX as nitrogen source. FEMS Microbiol. Ecol. 46:189-196.

89. Kadiyala, V., L.J. Nadeau, and J.C. Spain. 2003. Construction of *E. coli* strains for conversion of nitroacetophenones to *ortho*-aminophenols. Appl. Environ. Microbiol. 69:6520-6526.

88. Johnson, G.R., and J.C. Spain. 2003. Evolution of catabolic pathways for synthetic compounds: bacterial pathways for degradation of 2,4-dinitrotoluene and nitrobenzene. Appl. Microbiol. Biotechnol. 62:110-123.

87. Spain, J.C., S.F. Nishino, B. Witholt, L.-S. Tan, and Wouter Duetz. 2003. Production of 6-phenylacetylene picolinic acid from diphenylacetylene by a toluene-degrading *Acinetobacter*. Appl. Environ. Microbiol. 69:4037-4042.

86. Bhushan, B., S. Trott, J. Spain, A. Halasz, and J. Hawari. 2003. Biotransformation of RDX by cytochrome P450 2B4: Insights into the mechanism of RDX biodegradation by *Rhodococcus* sp.strain DN22. Appl. Environ. Microbiol. 69:1347-1351.

85. Nadeau, L.J., Z. He, and J.C. Spain. 2003. Bacterial conversion of hydroxylamino aromatic compounds by both lyase and mutase enzymes involves intramolecular transfer of hydroxyl groups. Appl. Environ. Microbiol. 69:2786-2793.

84. Muller, T.A., C. Werlen, J.C. Spain, and J.R. van der Meer. 2003. Evolution of a chlorobenzene degradative pathway among bacteria in a contaminated groundwater mediated by a genomic island in *Ralstonia*. Environ. Microbiol. 5:163-173.

83. Bhushan, B., L. Paquet, A. Halasz, J.C. Spain, and J. Hawari. 2003. Mechanism of xanthine oxidase catalyzed biotransformation of HMX under anaerobic conditions. Biochem. Biophys. Res. Comm. 306:509-515.

82. Trott, S., S.F. Nishino, J. Hawari, and J.C. Spain. 2003. Biodegradation of the nitramine explosive, CL-20. Appl. Environ. Microbiol. 69:1871-1874.

81. Coleman, N.V., J.C. Spain, and T. Duxbury. 2002. Evidence that RDX biodegradation by *Rhodococcus* strain DN22 is plasmid-borne and involves a cytochrome p-450. J. Appl. Microbiol. 93:463-472.

80. Coleman, N.V., T.E. Mattes, J.M. Gossett, and J.C. Spain. 2002. Phylogenetic and kinetic diversity of aerobic vinyl chloride-assimilating bacteria from contaminated sites. Appl. Environ. Microbiol. 68:6162-6171.

79. Johnson, G.R., R.K. Jain, and J.C. Spain. 2002. Origins of the 2,4-dinitrotoluene pathway. J. Bacteriol. 184:4219-4232.

78. Bhushan, B., A. Halasz, J. Spain, S. Thiboutot, G. Ampleman, and J. Hawari. 2002. Biotransformation of hexahydro-1,2,4-trinitro-1,3,5-triazine catalyzed by a NAD(P)H:nitrate oxidoreductase from *Aspergillus niger*. Environ. Sci. Technol. 36:3104-3108.

77. Coleman, N.V., T.E. Mattes, J.M. Gossett, and J.C. Spain. 2002. Biodegradation of *cis*-dichloroethene as sole carbon source by a β-proteobacterium. Appl. Environ. Microbiol. 68:2726-2730.

76. Bhushan, B., A. Halasz, J.C. Spain, and J. Hawari. 2002. Diaphorase catalyzed biotransformation of RDX via N-denitration mechanism. Biochem. Biophys. Res. Com. 296:779-784.

75. Lessner, D.J., G.R. Johnson, R.E. Parales, J.C. Spain, and D.T. Gibson. 2002. Molecular characterization and substrate specificity analysis of nitrobenzene dioxygenase from *Comamonas* sp. strain JS765. Appl. Environ. Microbiol. 68:634-641.

74. Fournier, D., A. Halasz, J. Spain, P. Fiurasek, and J. Hawari. 2002. Determination of key metabolites during biodegradation of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) with *Rhodococcus* sp. Strain DN22. Appl. Environ. Microbiol. 68:166-172.

73. Halaz, A., J. Spain, L. Paquet, C. Beaulieu, and J. Hawari. 2002. Insights into the formation and degradation mechanisms of methylenedinitramine during the incubation of RDX with anaerobic sludge. Environ. Sci. Technol. 36:633-638.

72. Johnson, G.R., B.F. Smets, and J.C. Spain. 2001. Oxidative transformations of aminodinitrotoluene isomers by multicomponent dioxygenases. Appl. Environ. Microbiol. 67:5460-5466.

71. Zhang C., R.C. Daprato, S.F. Nishino, J.C. Spain, and J.B. Hughes. 2001. Remediation of dinitrotoluene contaminated soils from former ammunition plants: soil washing efficiency and effective process monitoring in bioslurry reactors. J. Haz. Mat. 87:139-154.

70. Davis, J. K, Z. He, G. C. Paoli, L. J. Nadeau, C. C. Somerville, and J. C. Spain. 2000. Sequence analysis and initial characterization of two isozymes of hydroxylaminobenzene mutase from *Pseudomonas pseudoalcaligenes* JS45. Appl. Environ. Microbiol. 66:2965-2971.

69. He, Z., L. J. Nadeau, and J. C. Spain. 2000. Characterization of hydroxylaminobenzene mutase from pNBZ139 cloned from *Pseudomonas pseudoalcaligenes* JS45: a highly-associated sodium-dodecyl-sulfate-stable enzyme catalyzing an intramolecular transfer of hydroxyl group. Eur. J. Biochem. 267:1110-1116.

68. He, Z., and J. C. Spain. 2000. One-step production of picolinic acids from 2-aminophenols catalyzed by 2-aminophenol 1,6-dioxygenase. J. Ind. Microbiol. Biotechnol. 25:25-28.

67. He, Z., and J. C. Spain. 2000. Reactions involved in the lower pathway for degradation of 4-nitrotoluene by *Mycobacterium* strain HL 4-NT-1. Appl. Environ. Microbiol. 66:3010-3015.

66. Johnson, G. R., R. K. Jain, and J. C. Spain. 2000. Properties of the trihydroxytoluene oxygenase from *Burkholderia cepacia* R34; an extradiol dioxygenase from the 2,4-dinitrotoluene pathway. Arch. Microbiol. 173:86-90.

65. Nishino, S. F., G. Paoli, and J. C. Spain. 2000. Aerobic degradation of dinitrotoluenes and pathway for bacterial degradation of 2,6-dinitrotoluene. Appl. Environ. Microbiol. 66:2139-2147.

64. Zhang, C., J.B. Hughes, S.F. Nishino, J.C. Spain. 2000. Slurry-phase biological treatment of 2,4- and 2,6-dinitrotoluene: role of bioaugmentation and effects of high dinitrotoluene concentrations. Environ. Sci.Technol. 34:2810-2816.

63. Nadeau, L. J., He Z. and J. C. Spain. 2000. Production of 2-amino-5-phenoxyphenol from 4-nitrobiphenyl ether using nitrobenzene nitroreductase and hydroxylaminobenzene mutase from *Pseudomonas pseudoalcaligenes* strain JS45. J. Ind. Microbiol. Biotechnol. 24:301-305.

62. Davis, J. K., Z. He, C. C. Somerville, and J. C. Spain. 1999. Genetic and biochemical comparison of 2-aminophenol 1,6-dioxygenase of *Pseudomonas pseudoalcaligenes* JS45 to meta cleavage dioxygenases: divergent evolution of 2-aminophenol meta cleavage pathway. Arch. Microbiol. 172:330-339.

61. Smets, B. F., R. G. Riefler, U. Lendenmann, and J. C. Spain. 1999. Kinetic analysis of simultaneous 2,4-dinitrotoluene (DNT) and 2,6-DNT biodegradation in an aerobic fluidized-bed biofilm reactor. Biotechnol. Bioeng. 63:642-653.

60. He, Z., and J. C. Spain. 1999. Preparation of 2-aminomuconate from 2-aminophenol by coupled enzymatic dioxygenation and dehydrogenation reactions. J. Ind. Microbiol. Biotechnol. 23:138-142.

59. He, Z., and J. C. Spain.1999. Comparison of the downstream pathways for degradation of nitrobenzene by *Pseudomonas pseudoalcaligenes* JS45 (2-aminophenol pathway) and by *Comamonas* sp. JS765 (catechol pathway).1999. Arch. Microbiol. 171:309-316.

58. Schenzle, A., H. Lenke, J.C. Spain, and H.-J. Knackmuss. 1999. Chemoselective nitro group reduction and reductive dechlorination initiate degradation of 2-chloro-5-nitrophenol by *Ralstonia eutropha* JMP134. Appl. Environ. Microbiol. 65:2317-2323.

57. Schenzle, A., H. Lenke, J.C. Spain, and H.-J. Knackmuss. 1999. 3-Hydroxylaminophenol mutase from *Ralstonia eutropha* JMP134 catalyzes a Bamberger rearrangement. J. Bacteriol. 181:1444-1450.

56. Nadeau, L. J., G. S. Sayler, and J. C. Spain. 1999. Oxidation of 1,1,1,-trichloro-2,2-bis(4-chlorophenyl)ethane (DDT) by *Alcaligenes eutrophus* A5. Arch. Microbiol. 171:44-49.

55. Nishino, S. F., J. C. Spain, H. Lenke and H.-J. Knackmuss. 1999. Mineralization of 2,4- and 2,6-dinitrotoluene in soil slurries. Environ. Sci. Technol. 33:1060-1064.

54. Haigler, B.E., G.R. Johnson, W-C. Suen, and J.C. Spain. 1999. Biochemical and genetic evidence for meta-ring cleavage of 2,4,5-trihydroxytoluene in *Burkholderia* sp strain DNT. J. Bacteriol. 181:965-972.

53. van der Meer, J.R., C. Werlen, S. Nishino, and J.C. Spain. 1998. Evolution of a pathway for chlorobenzene metabolism leads to natural attenuation in a contaminated groundwater. Appl. Environ. Microbiol. 64:4185-4193.

52. Kadiyala, V., and J.C. Spain. 1998. A two-component monooxygenase catalyzes both the hydroxylation of *p*-nitrophenol and oxidative release of nitrite from 4-nitrocatechol in *Bacillus sphaericus* JS905. Appl. Environ. Microbiol. 64:2479-2484.

51. Goodall, J. L., S. M. Thomas, J. C. Spain, and S. W. Peretti. 1998. Operation of mixed-culture immobilized cell reactors for the metabolism of meta- and para-nitrobenzoate by *Comamonas* sp. JS46 and *Comamonas* sp. JS47. Biotechnol. Bioeng. 59:21-27.

50. Kadiyala, V., B. F. Smets, K. Chandran, and J. C. Spain. 1998. High affinity p-nitrophenol oxidation by *Bacillus sphaericus* JS905. FEMS Microbiol. Lett. 166:115-120.

49. He, Z., J. K. Davis, and J. C. Spain. 1998. Purification, characterization, and sequence analysis of 2-aminomuconic 6-semialdehyde dehydrogenase from *Pseudomonas pseudoalcaligenes* JS45. J. Bacteriol. 180:4591-4595.

48. He, Z., and J. C. Spain. 1998. A novel 2-aminomuconate deaminase in the nitrobenzene degradation pathway of *Pseudomonas pseudoalcaligenes* JS45. J. Bacteriol. 180:2502-2506.

47. Spiess, T., F. Desiere, P. Fischer, J. C. Spain, H-.J. Knackmuss, and Hiltrud Lenke. 1998. A new 4-nitrotoluene degradation pathway in a *Mycobacterium* sp. strain. Appl. Environ. Microbiol. 64:446-452.

46. Vorbeck, C., H. Lenke, P. Fischer, J. C. Spain, and H-.J. Knackmuss. 1998. Initial reductive reactions in aerobic microbial metabolism of 2,4,6-trinitrotoluene (TNT). Appl. Environ. Microbiol. 64:246-252.

45. Lendenmann, U., J.C. Spain, and B.F. Smets. 1998. Simultaneous biodegradation of 2,4-dinitrotoluene and 2,6-dinitrotoluene in an aerobic fluidized bed biofilm reactor. Environ. Sci. Technol. 32:82-87.

44. He, Z., and J.C. Spain. 1997. Studies on the catabolic pathway of degradation of nitrobenzene by *Pseudomonas pseudoalcaligenes* JS45: Removal of the amino group from 2-aminomuconic semialdehyde. Appl. Environ. Microbiol. 63:4839-4843.

43. Spain, J.C. 1997. Synthetic chemicals with potential for natural attenuation. Bioremediation J. 1:1-9.

42. Fiorella, P. D., and J.C. Spain. 1997. Transformation of 2,4,6-trinitrotoluene (TNT) by *Pseudomonas pseudoalcaligenes* strain JS45. Appl. Environ. Microbiol. 63:2007-2015.

41. Shah, M.M., and J.C. Spain. 1996. Elimination of nitrite from the explosive 2,4,6-trinitrophenylmethylnitramine catalyzed by ferredoxin NADP oxidoreductase from spinach. Biochem. Biophys. Res. Commun. 220:563-568.

40. Lendenmann, U., and J.C. Spain. 1996. 2-Aminophenol 1,6-dioxygenase: a novel aromatic ring cleavage enzyme purified from *Pseudomonas pseudoalcaligenes* JS45. J. Bacteriol. 178:6227-6232.

39. Suen, W.C., B.E. Haigler, and J.C. Spain. 1996. 2,4-Dinitrotoluene dioxygenase from *Burkholderia* sp. strain DNT: similarity to naphthalene dioxygenase. J. Bacteriol. 178:4926-4934.

38. Haigler, B.E., W.C. Suen, and J.C. Spain. 1996. Purification and sequence analysis of 4-methyl-5-nitrocatechol oxygenase from *Burkholderia* sp. strain DNT. J. Bacteriol. 178:6019-6024.

37. Haigler, B.E., and J.C. Spain. 1996. Degradation of nitroaromatic compounds by microbes. SIM News Feature Article. 46:59-68.

36. Klecka, G., S. McDaniel, P. Wilson, C. Carpenter, J. Clark, A. Thomas, and J.C. Spain. 1996. Field evaluation of a granular activated carbon fluid-bed bioreactor for treatment of chlorobenzene in groundwater. Environ. Prog. 15:93-107.

35. Somerville, C.C., S.F. Nishino, and J.C. Spain. 1995. Purification and characterization of nitrobenzene nitroreductase from *Pseudomonas pseudoalcaligenes*. JS45. J. Bacteriol. 177:3837-3842.

34. Nishino, S.F., and J. C. Spain. 1995. Oxidative pathway for the biodegradation of nitrobenzene by *Comamonas* sp. strain JS765. Appl. Environ. Microbiol. 61:2308-2313.

33. Nadeau, L.J., and J.C. Spain. 1995. Bacterial degradation of 3-nitrobenzoic acid. Appl. Environ. Microbiol. 61:840-843.

32. An, D., D.T. Gibson, and J.C. Spain, 1994. Oxidative release of nitrite from 2-nitrotoluene by a three-component enzyme from *Pseudomonas* sp. strain JS42. J. Bacteriol. 176:7462-7467.

31. Jain, R.K., J.H. Driesbach, and J.C. Spain, 1994. Biodegradation of p-nitrophenol via 1,2,4-benzenetriol by an *Arthrobacter* sp. Appl. Environ. Microbiol. 60:3030-3032.

30. Haigler, B.E., W.H. Wallace, and J.C. Spain, 1994. Biodegradation of 2-nitrotoluene by *Pseudomonas* sp. strain JS42. Appl. Environ. Microbiol. 60:3466-3469.

29. Nishino, S.F., J.C. Spain, and C.A. Pettigrew, 1994. Biodegradation of chlorobenzene by indigenous bacteria. Environ. Toxicol. Chem. 13:871-877.

28. Haigler, B.E., S.F. Nishino, and J.C. Spain, 1994. Biodegradation of 4-methyl-5-nitrocatechol by *Pseudomonas* sp. strain DNT. J. Bacteriol. 176:3433-3437.

27. Nishino, S.F., and J.C. Spain, 1993. Degradation of nitrobenzene by a *Pseudomonas pseudoalcaligenes*. Appl. Environ. Microbiol. 59:2520-2525.

26. Haigler, B.E., and J.C. Spain, 1993. Biodegradation of 4-nitrotoluene by *Pseudomonas* sp. strain 4NT. Appl. Environ. Microbiol. 59: 2239-2244.

25. Suen, W.C., and J.C. Spain, 1993. Cloning and characterization of *Pseudomonas* sp. strain DNT genes for 2,4-dinitrotoluene degradation. J. Bacteriol. 175:1831-1837.

24. Nishino, S.F., and J.C. Spain, 1993. Cell density-dependent adaptation of *Pseudomonas putida* to biodegradation of *p*-nitrophenol. Environ. Sci. Technol. 27:489-94.

23. Haigler, B.E., C.A. Pettigrew, and J.C. Spain, 1992. Biodegradation of mixtures of substituted benzenes by *Pseudomonas* sp. strain JS 150. Appl. Environ. Microbiol. 58:2237-2244.

22. Nishino, S.F., J.C. Spain, L.A. Belcher, and C.D. Litchfield, 1992. Chlorobenzene degradation by bacteria isolated from contaminated groundwater. Appl. Environ. Microbiol. 58:1719-1726.

21. Ross, D.D., H. Mayfield, and J.C. Spain, 1992. Environmental fate and effects of jet fuel JP-8. Chemosphere. 24:219-228.

20. Robertson, J.B., J.C. Spain, J.D. Haddock, and D.T. Gibson, 1992. Oxidation of nitrotoluenes by toluene dioxygenase: evidence for a monooxygenase reaction. Appl. Environ. Microbiol. 58:2643-2648.

19. Spanggord, R.J., S.F. Nishino, and J.C. Spain, 1991. Biodegradation of 2,4-dinitrotoluene by a *Pseudomonas* sp. Appl. Environ. Microbiol. 57:3200-3205.

18. Haigler, B.E., and J.C. Spain, 1991. Biotransformation of nitrobenzene by bacteria containing toluene degradative pathways. Appl. Environ. Microbiol. 57:3156-3162.

17. Spain, J.C. and D.T. Gibson. 1991. Metabolic pathway for biodegradation of *p*-nitrophenol in *Moraxella*. Appl. Environ. Microbiol. 57:812-819.

16. Pettigrew, C.A., B.E. Haigler, and J.C. Spain. 1991. Simultaneous biodegradation of toluene and chlorobenzene by *Pseudomonas* sp. strain JS6. Appl. Environ. Microbiol. 57:157-162.

15. Spain, J.C., G.J. Zylstra, C.K. Blake, and D.T. Gibson. 1989. Monohydroxylation of phenol and 2,5-dichlorophenol by toluene dioxygenase in *Pseudomonas putida* F1. Appl. Environ. Microbiol. 55:2648-2652.

14. Haigler, B.E. and J.C. Spain. 1989. Degradation of *p*-chlorotoluene by a mutant of *Pseudomonas* sp. strain JS6. Appl. Environ. Microbiol. 55:372-379.

13. Spain, J.C. and D.T. Gibson. 1988. Oxidation of substituted phenols by *Pseudomonas putida* F1 and *Pseudomonas* sp. JS6. Appl. Environ. Microbiol. 54:1399-1404.

12. Spain, J.C., D.C. Downey, and J. Milligan. 1989. Excessive bacterial decomposition of H2O2 during enhanced biodegradation. Groundwater. 27:163-167.

11. Haigler, B.E., S.F. Nishino, and J.C. Spain. 1988. Degradation of 1,2-dichlorobenzene by a *Pseudomonas* sp. Appl. Environ. Microbiol.54:294-301.

10. Spain, J.C., and S.F. Nishino. 1987. Degradation of 1,4-dichlorobenzene by a *Pseudomonas* sp. Appl. Environ. Microbiol. 53:1010-1019.

9. Pritchard, P.H., C.R. Cripe, W.W. Walker, J.C. Spain, and A.W. Bourquin. 1987. Biotic and abiotic degradation rates of methyl parathion in freshwater and estuarine water and sediment. Chemosphere. 16:1509-1520.

8. Somerville, C.C., C.A. Monti, and J.C. Spain. 1985. Modification of the 14C-most-probable-number method for use with nonpolar and volatile substrates. Appl. Environ. Microbiol. 49:711-713.

7. Spain, J.C., and C.C. Somerville. 1985. Fate and toxicity of high density missile fuels in aquatic test systems. Chemosphere. 14:239-248.

6. Spain, J.C., P.A. Van Veld, C.A. Monti, P.H. Pritchard, and C.R. Cripe. 1984. Comparison of *p*-nitrophenol degradation in field and laboratory test systems. Appl. Environ. Microbiol. 48:944-950.

5. Van Veld, P.A., and J.C. Spain. 1983. Degradation of selected xenobiotic compounds in three types of aquatic test systems. Chemosphere. 12:1291-1305.

4. Spain, J.C., and P.A. Van Veld. 1983. Adaptation of natural microbial communities to degrade xenobiotic compounds: effect of concentration, exposure time, inoculum, and chemical structure. Appl. Environ. Microbiol. 45:428-435.

3. Spain, J.C., P.H. Pritchard, and A.W. Bourquin. 1980. Effects of adaptation on biodegradation rates in sediment/water cores from estuarine and freshwater environments. Appl. Environ. Microbiol. 40:726-734.

2. Spain, J.C., O. Wyss, and D.T. Gibson. 1979. Enzymatic oxidation of p-nitrophenol. Biochem. Biophys. Res. Comm. 88:634-641.

1. Bellion, Edward, and J.C. Spain. 1976. Distribution of isocitrate lyase serine pathway amongst one-carbon utilizing organisms. Can. J. Microbiol. 22:404-408.

**C. Invited Lectures**

**Academic Institutions**

2019 Shanghai Jiao Tong University, Shanghai, China

2019 Shandong University, Qingdao, China

2017 Zhejiang University of Technology, Hangzhou, China

2017 Shanghai Jiao Tong University, Shanghai, China

2016 Shandong University, Jinan China

2015 Institute of Microbiology, Chinese Academy of Sciences, Beijing

2015 Peking University, College of Urban and Environmental Sciences

2015 Tsinghua University, College of Hydraulic and Hydroelectric Engineering

2015 University of Science and Technology, Beijing, Department of Environmental Engineering

2015 University of Minnesota, Department of Biochemistry

2015 Duke University, School of Civil and Environmental Engineering

2014 Nanjing Agricultural University, Department of Microbiology

2014 Nanjing University, School of the Environment

2014 Shanghai Jiao Tong University, School of Life Science and Biotechnology

2014 Xi’an Jiao Tong University, School of Energy and Power Engineering

2013 University of Sydney, Department of Molecular Biology

2013 Rice University, Department of Civil and Environmental Engineering

2013 University of West Florida, Department of Biology

2011 University of South Australia/CRC-CARE, Adelaide, Australia

2010 Georgia State University, Department of Chemistry

2010 University of Georgia, Department of Microbiology

2009 University of Iowa, Department of Microbiology

2007 University of Florida, Department of Microbiology

2007 Rutgers University, Department of Environmental Sciences

2006 University of Puerto Rico, Biology Department, Mayaguez

2004 Georgia Institute of Technology, Department of Civil and Environmental Engineering

2004 University of Vermont, Microbiology & Molecular Genetics

2003 Georgia Institute of Technology, Department of Biology

2002 University of Texas, School of Public Health, Houston, Texas

2002 Marine Biological Laboratory, Woods Hole, MA

2002 Cornell University, Department of Microbiology

2002 University of California—Berkeley, Department of Engineering

2002 University of Houston, Department of Engineering

2002 University of British Columbia, Department of Microbiology

2001 University of Tennessee, Department of Microbiology

2001 Biology Department, University of Delhi

2000 CSIC Department of Biochemistry and Cell Biology, Granada, Spain

2000 University of Konstanz, Germany

2000 Institute of Biotechnology, ETH Zurich

1999 University of California, Riverside Department of Chemical and Environmental Engineering

1999 Colorado State University, Department of Agricultural and Chemical Engineering

1999 University of Wyoming, Departments of Engineering and Microbiology

1999 University of Stuttgart, Institute for Microbiology

1998 University of Iowa, Biocatalysis and Bioprocessing Conference.

1998 University of Tennessee, Department of Microbiology

1997 Stanford University, Department of Civil and Environmental Engineering

1995 Agriculture and Biotechnology Center, Rutgers University

1995 Keynote speaker, Texas A&M University, Bioremediation Workshop

1994 Department of Microbiology, University of Iowa

1994 Keynote Speaker, Colorado Biotechnology Symposium

1993 Department of Environmental Science and Engineering, Rice University

1993 Department of Microbiology, University of Georgia

1993 Department of Microbiology, University of Nebraska

1992 Department of Microbiology, Ohio State University

1991 Departments of Agricultural and Chemical Engineering, Colorado State University

1989 University of Tennessee, Department of Microbiology

1987 University of Stuttgart, Institute for Microbiology

**International Symposia**

2017 Keynote. National Environmental Microbiology Symposium, Hangzhou, China

2017 Battelle International Bioremediation Symposium, Miami

2016 Keynote. International Symposium on the Genetics of Industrial Microorganisms, Wuhan, China

2015 Society for Industrial Microbiology and Biotechnology, Philadelphia

2015 Battelle International Bioremediation Symposium, Miami

2014 Division Lecture, American Society for Microbiology Annual Meeting, Boston

2012 International Plant and Animal Genome Conference, San Diego

2011 Symposium on Microbiology of Extremophiles, University of Georgia

2011 Indo-Swiss Collaboration in Biotechnology. Recent Trends in Developing Bioremediation Strategies for Hexachlorocyclohexane and other Chlorinated Contaminants, Delhi, India

2010 International Environmental Research Center Symposium, Gwangju, Korea

2010 Unified Korean Society for Microbiology, Seoul, Korea

2004 Korean Society for Applied Biological Chemistry, Boryung City, Korea

2004 Federation of Korean Microbiological Societies, Seoul, Korea

2004 Second International Environmental Research Workshop, Gwangju Institute of Science and Technology, Gwangju, Korea

2004 Gordon Conference on Biocatalysis

2003 Gordon Conference on Applied and Environmental Microbiology

2002 Symposium on Utilization of Microbes for Development of Bioremediation Technologies. Delhi, India

2001 ASM/SGM Conference on Biodegradation, Biotransformation, and Biocatalysis, San Juan, Puerto Rico

2001 Workshop on Microbes for the Environment: Degradation of Xenobiotics and New Benign Products, Bad Honnef, Germany

2001 NATO Workshop on Environmental Remediation Technology Developments, Prague, Czech Republic

2001 Society for General Microbiology, Edinburgh, Scotland

1999 Second International Symposium on Biodegradation of Nitroaromatic Compounds and Explosives, Leesburg, Virginia

1999 European Congress on Biotechnology, Brussels

1999 Battelle International Bioremediation Symposium, San Diego

1998 Israel Institute for Biological Research OHOLO Conference on Novel Approaches for Bioremediation of Organic Pollution, Eilat, Israel

1997 Battelle International Bioremediation Symposium

1997 UK Soil and Groundwater Association Annual Meeting, Torbay, England

1997 Gordon Research Conference on Applied and Environmental Microbiology

1997 American Society for Microbiology-International Conference on *Pseudomonas* Biology, Vancouver, BC

1987 Swiss Federal Institute for Water Resources and Pollution Control, Zurich

1996 Fraunhofer Institute for Applied Microbiology, Stuttgart, Germany

1996 European Environmental Research Organization Symposium on Biodegradation of Pollutants, Palma Majorca, Spain

1995 International Symposium on Biochemical Engineering at the University of Stuttgart, Germany

1995 Juan March International Workshop on the Molecular Basis for Biodegradation of Pollutants. Madrid, Spain

1992 Invited lecture at the WE-Heraeus Seminar on Microbial Degradation of Environmental Pollutants, Bad Honnef, Germany

1992 Session chairman and invited lecture at The Second Environment Science and Technology Congress, Bangkok, Thailand

1992 International Conference on Bioinorganic and Biotechnological Aspects of Environmental Chemistry sponsored by the European Environmental Research Organization, Florence, Italy

1989 American Society for Microbiology International Conference on *Pseudomonas* Biology, Biotechnology, and Applications

1987 Workshop for Ecotoxicology in Zurich sponsored by the Swiss Federal Institute for Water Resources and Pollution Control

**National Symposia**

2019 University Consortium for Field-Focused Groundwater Contamination Research, Colorado State University

2017 University Consortium for Field-Focused Groundwater Contamination Research, Denver, CO

2017 Remediation Technology Summit, Denver, CO

2015 Remediation Technology Summit, Denver, CO

2013 Remediation Technology Summit, Denver, CO

2012 University Consortium for Field-Focused Groundwater Contamination Research, Denver, CO

2012 University of Guelph, University Consortium for Field-Focused Groundwater Contamination

2011 Society for Industrial Microbiology, Annual Meeting, New Orleans

2010 American Chemical Society, Chemistry for Peace, CeRMACS, Dayton, OH

2009 American Society for Microbiology, Annual Meeting, Proctor and Gamble Award lecture

2007 Society for Industrial Microbiology, Annual meeting, Denver, CO

2005 DoD Strategic Environmental Research and Development Program/Environmental Security Technology Certification Program Partners Symposium, Washington, DC

2004 American Chemical Society Symposium on: The Interface of Polymers and Biomimetics

2004 American Society for Microbiology Symposium on Biodegradation and Biotransformation

2002 Superfund Symposium: Transitioning Basic Science into Practical Applications to Meet Environmental and Public Health Challenges. Tucson, Arizona

2002 America Society for Microbiology Symposium on Microbial Oxygenases

1997 National Environmental Technology Applications Center Conference on Innovative Groundwater Remediation, Philadelphia, PA

1996 Engineering Foundation Conference on Bioremediation of Surface and Subsurface Contamination, Palm Coast, FL

1996 American Society for Microbiology Symposium on Biodegradation and Biotransformation of Aromatic Compounds, New Orleans, LA

1995 Society for Industrial Microbiology Symposium on Bioremediation Science and Technology, San Jose, CA

1992 University of Notre Dame Center for Bioengineering and Pollution Control-Hazardous Waste Conference

1991 National Meeting American Society for Microbiology

1991 Environmental Biotechnology Symposium, University of Tennessee.

1990 American Society for Microbiology Conference on Biotechnology

1990 American Society for Microbiology National Meeting, Symposium on "Cooxidation of Organic Compounds"

1990 Society for Environmental Toxicology and Chemistry.

1989 American Chemical Society National Meeting Symposium on "Advances in Enhanced Soil Microbial Degradation Research"

1989 American Chemical Society National Meeting Symposium on "Metabolic Pathway Engineering"

1988 Engineering Foundation Conference on Biotechnology Applications in Hazardous Waste Treatment

1988 Annual Meeting of the American Society for Microbiology Symposium on "Microbiological Degradation of Chlorinated Aromatic and Aliphatic Compounds"

1986 Symposium on Biodegradation of Xenobiotic Compounds Annual Meeting of the American Society for Microbiology

1984 Society for Environmental Toxicology and Chemistry

**Federal Institutions**

2002 U.S. Army Environmental Center Technology Focus Meeting on Munitions

2001 DoD Strategic Environmental Research and Development Program Symposium

2000 Microbial Ecology and Environmental Engineering, Lawrence Berkeley National Laboratory

2000 Department of Energy Savannah River Laboratory

1999 U.S.-Canada-Australia Trilateral Meeting on Environmental Impacts of Energetic Materials

1998 Center for Environmental Biotechnology, Lawrence Berkeley National Laboratory

1997 Los Alamos National Laboratory, Environmental Biotechnology Division

1996 U.S. EPA-Air Force Symposium on Natural Attenuation of Chlorinated Organics in Groundwater Dallas, Texas

1996 Department of Energy Savannah River Laboratory

1995 Microbial Ecology Forum, U.S. EPA, Gulf Breeze, FL

1993 U.S. Army Construction Engineering Research Laboratory- sponsored Workshop on Bioremediation of Explosives at Northwestern University

1991 U.S. Environmental Protection Agency, Environmental Research Center, Cincinnati, OH

1990 Los Alamos National Laboratory, Environmental Biotechnology Division

**Industry**

2009 Proctor and Gamble

2007 Novozymes

2003 DuPont Chemical Corporation

2002 Genencor International, Biocatalysis Group

2000 Genencor International, Biocatalysis Group

1999 Searle/Monsanto Bioprocess/Biocatalysis Group

1997 ICI Nobel Explosives, Ardeer, Scotland

1997 Air Products and Chemicals, Industrial Chemicals Division

1997 DuPont Chemical, Environmental Biotechnology Group

1997 A.H. Marks Chemical Co. Ltd. Bradford, England

1994 Pfizer Central Research Division Environmental Sciences Section

1993 Molecular Biology and Environmental Research Division, E.I. DuPont Corporation

1993 Imperial Chemical Industries, Ardeer, Scotland

1993 ICI/DuPont-Sponsored Workshop on Biodegradation of Nitroaromatic and Explosive Chemicals

1993 Celgene Environmental Biotechnology Group

**Other**

2013 CSIRO Ecosystem Sciences/Australia National University, Canberra

2011 CSIRO Ecosystem Sciences/Australia National University, Canberra

2011 CSIRO Land and Water, Perth, Australia

2001 Institute of Microbial Technology, Chandigarh, India

2001 Microbial Biotechnology Department, India Habitat Center, New Delhi

2000 FOA Defense Research Establishment, Umea, Sweden

1996 Swiss Federal Institute for Water Resources Research, Duebendorf, Switzerland

1992 National Research Council of Canada Biotechnology Research Institute, Montreal Canada

**E. Other Scholarly Accomplishments**

**Patents Issued**

L.J. Nadeau, H. Luckarift, and J.C. Spain. 2011. Biocatalytic process for the production of ortho-aminophenols from chloramphenicol and analogs. US Patent No. 11,602,435.

Spain, J.C., L.J. Nadeau, and Z. He 2004. Biological process for the production of ortho-aminophenols from nitroaromatic compounds. US Patent No. 6,797,497. September 28, 2004.

He, Z., and J. C. Spain. 2002. Preparation of 2-aminomuconate from aminophenol by coupled enzymatic dioxygenation and dehydroxylation. US Patent No. 6,432,683. Aug. 13, 2002.

Spain, J.C., S.F. Nishino, and U. Lendenmann. Process for the biodegradation of dinitrotoluene. US Patent No. 6,248,580 B1. June 19, 2001.

Nadeau, L.J., J.C. Spain, and V. Kadiyala. 2005. Biological process for the conversion of nitroarenes to ortho-aminophenols using recombinant E. coli strains. US Patent No. 7,364,881. April 29, 2008.

Tan, L-S.,R. Kannan, J.C. Spain and L. Nadeau. 2006. Enzymatically Produced o-Aminophenol Containing AB-Monomer for Heterocyclic Rigid-Rod Polymer Synthesis. 7,495,106. Feb. 24, 2009.

**V. Service**

### **A. Professional Contributions**

**Editor**

1992-1999 Applied and Environmental Microbiology

###### **Editorial Boards**

2011- Frontiers in Microbial Physiology

2000-2006 Applied and Environmental Microbiology

1990-2000 Biodegradation

1982-1992 Applied and Environmental Microbiology

1990-1995 Journal of Industrial Microbiology

1996-2000 Bioremediation

#### **Ad Hoc Reviewer**

Molecular Microbiology

Journal of Hazardous Materials

PLOS

PNAS

MBio

Environmental Microbiology

ISME Journal

Gene

Biochemistry

Journal of Industrial Microbiology and Biotechnology

Microbial Ecology

Canadian Journal of Microbiology

Biotechnology and Bioengineering

Ground Water

Journal of Bacteriology

Environmental Science and Technology

Environmental Toxicology and Chemistry

Microbiology and Molecular Biology Reviews

Microbiology

Water Research

National Science Foundation

### **Scientific Advisory Boards**

2008-2012 United Nations Compensation Commission Independent Reviewer Panel for Environmental Awards to Kuwait for restoration of environmental damages resulting from the first Gulf War

2005- DuPont Chambers Works Science Advisory Board

2004-2007 External Advisory Board, Rice University NSF Center for Biological and Environmental Nanotechnology

2002-2005 Science Advisory Board, University of Iowa Center for Biocatalysis and Bioprocessing

2002-2005 Science Advisory Committee, EPA Hazardous Substances Research Center Consortium of Stanford and Oregon State

1994 Technical Advisory Team, DOE-University of Tennessee Demonstration: Field Release of Genetically Engineered Bioluminescent Reporter Bacteria for PAH Bioremediation in Subsurface Soil.

1993-1995 Science Advisory Board, US Army Research Office/DARPA Center for Environmental Biotechnology, Rutgers University

1992-2000 Science Advisory Committee, EPA Hazardous Substance Research Center, Consortium of Louisiana State University, Rice University and Georgia Institute of Technology

1992-1995 Army Research Office Bioremediation Advisory Group, Bioremediation Research Center at Texas A&M

1991-1999 Science Advisory Committee, EPA Hazardous Substances Research Center, Consortium of University of Michigan, Michigan State, Howard University

**Working Groups**

2005 The University of Minnesota-BBD Predictive Biodegradation Workshop

2000-2004 Biotechnology Working Group, Air Force Research Laboratory

1999 New Biocatalysts: Essential Tools for a Sustainable 21st Century Chemical Industry, Genencor

1998 National Research Council Planning Workshop, Bioavailablity of Contaminants in Soil, Sediments, and Ground Water

1998 American Academy of Environmental Engineers/Strategic Environmental Research and Development Program, Environmentally Acceptable Endpoints Working Group

1993 Chair and Moderator NIEHS Conference, Biodegradation: Its Role in Reducing Toxicity and Exposure to Environmental Contaminants

1992 Technical Support Group for Identification of Research and Development Priority Needs. DOE In-Situ Remediation Integrated Program.

1992 American Academy of Environmental Engineers/US EPA WASTECH 92 Bioremediation Task Group

1992 American Academy of Microbiology Colloquium of Experts, "Scientific Foundations of Bioremediation; Current Status and Future Needs"

1991-1994 DOE/Westinghouse Savannah River Laboratory-Integrated Demonstration Program, Bioremediation Technical Support Group

1991 Panel Chair, Rutgers Center for Agricultural Molecular Biology Workshop, Translating Laboratory Results into the Field: Difficulties and Recommendations

1991 Expert panel, Department of Energy Office of Technology Development, Bioremediation Strategy Development Workshop

1991-1993 Steering Committee and Subgroup Chair, U.S. Environmental Protection Agency, Bioremediation Action Committee to Identify Research Priorities for the 1990s

1990 Advisory Committee, Evaluation of In Situ Biotreatment Research Program, U.S. Army Engineer Waterways Experiment Station

1990 Second Expert Systems Survey Panel, U.S. Environmental Protection Agency Office of Toxic Substances

1987 Expert Systems Survey Panel, U.S. Environmental Protection Agency Office of Toxic Substances

**Review Committees**

2016 Genome Canada, Natural Resources and the Environment, Large Scale Applied Research Project Competition

2008 DoE Hydrogen Fuel Initiative of the Office of Science

2007 DoE Environmental Remediation Science Program

2005 DoE Genomes to Life Program

2004 Air Force MURI for Photobiological Hydrogen Production

1996 DOE Natural and Accelerated Biodegradation Program

1994 EPA Office of Pollution Prevention and Toxics Sediment/Water Microcosms Biodegradation Test Guidelines

1994 Department of Defense, Advanced Applied Technology Demonstration Facility Program

1994 Army Research Office, Chemical and Biological Sciences Program

1994 Wright Laboratory Materials Directorate project on Biodegradation of Prepreg and Paint Stripping Waste

1994 U.S. Environmental Protection Agency, Environmental Release of Biotechnology Products Program

1994 National Institute of Environmental Health Sciences, Hazardous Substances Basic Research Program

1993 International Science Foundation, Long-Term Research Grants Program

1993 USDA National Research Initiative, Water Quality Program

1992 Lewis Publishers, reference text on Bioremediation Field Experience

1992 US Environmental Protection Agency, expert panel for review of “Guide for Conducting Treatability Studies under CERCLA”

1992 DOE Office of Health and Environmental Research.

1992 National Science Foundation, Division of International Programs

1991 National Institute of Environmental Health Sciences, Hazardous Substances Basic Research program

1991-1998 Air Force Office of Scientific Research, Environmental Biotechnology Program

1991 Army Research Office, Bioremediation Research Initiative

1991 Office of Naval Research, Bioremediation Initiative

1991 Defense Advanced Research Projects Agency, University Research Initiative on Bioremediation

1991 Department of Energy, Subsurface Science Program

1990 US EPA Protocol: Aerobic biodegradation Laboratory Screening

**Symposia Organized and Chaired**

2017 RemTec Remediation Technology Summit. Denver, CO.

2015 RemTec Remediation Technology Summit. Denver, CO.

2013 RemTec Remediation Technology Summit. Denver, CO.

2003 Workshop on Biohydrogen, Molecular Biomimetic Systems, and Artificial Photosynthesis for Hydrogen Production. National Renewable Energy Laboratory, Golden, CO. Co-chair- Michael Seibert,

1999 Second International Symposium on Biodegradation of Nitroaromatic Compounds and Explosives. Leesburg, VA. Co-chairs Hans Knackmuss and Joe Hughes

1994 International Symposium on Biodegradation of Nitroaromatic Compounds. Las Vegas, NV

**Sessions Organized and Chaired**

2011 Biological Reduction and Oxidation of Contaminants, RemTEC 11 Remediation Technology Summit

2009 Biological Reduction and Oxidation of Contaminants, RemTEC 09 Remediation Technology Summit

2007 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In Situ and On Site Bioremediation Symposium

2005 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In Situ and On Site Bioremediation Symposium

2003 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In Situ and On Site Bioremediation Symposium

2002 Biodegradation of Explosives, SERDP/ESTCP Symposium

2001 Biodegradation of Explosives, SERDP/ESTCP Symposium

2001 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In Situ and On Site Bioremediation Symposium

1999 Second International Symposium on Biodegradation of Nitroaromatic Compounds

1999 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In Situ and On Site Bioremediation Symposium

1997 Biodegradation of Nitroaromatic Compounds and Explosives, Battelle International In-situ and On-site Bioremediation Symposium, New Orleans, LA

1995 Bioremediation of Explosives and Nitroaromatic Compounds at the Battelle International Symposium on In Situ and On-Site Bioreclamation, San Diego, CA

1995 Microbial Ecology of Bioremediation, 7th International Symposium on Microbial Ecology, Brazil

1994 EPA sponsored Symposium on Intrinsic Bioremediation of Groundwater

1993 Biodegradation of Nitroaromatic Compounds, Battelle International Symposium on In Situ Biorestoration

1992 "In-Situ Bioremediation," Annual Meeting of the Society for Environmental Toxicology and Chemistry

1993 Biodegradation in the Environment: Mechanisms of Adaptation, National Meeting American Society for Microbiology

1987 A Symposium on Biodegradation and Biotechnology: Applications to Hazardous Waste Treatment, Annual Meeting of the Society for Environmental Toxicology and Chemistry

**Consulting**

2014 Suncor Energy Inc. Energy Innovation Workshop

2007-2008 Novozymes

2007-2009 Hydrogeologic

2005-2007 CH2M Hill/Air Products

2006- Evolugate

2005- DuPont

**Georgia Tech**

2014- College of Engineering RPT committee

2011-2014 CEE RPT committee

2009- CEE Awards committee

2008-2011 College of Engineering RPT committee

2007- Institute Biological Materials Safeguards Committee

# **VI. Funding (Grants, Contracts, Foundation Contributions)**

1. **As Principal and Co-Principal Investigator**

Title: Degradation of environmentally relevant chemicals, Chemours, 2018-2019, $80,000

Title: Complete Biodegradation of Insensitive Energetic Compounds $274,366, Strategic Environmental Research and Development Program/University of Arizona, 2019-2021

Title: Biodegradation of nitroaromatic contaminants, DuPont, 2016-2020, $390,000

Title: Aerobic biodegradation of chloro-, nitro-, and amino-aromatic contaminants, Chemours, 2015-2016, $74,957 total to Spain

Role: PI

Title: Nitration enzyme toolkit for the biosynthesis of energetic materials, DoD Strategic Environmental Research and Development Program, 2012-2014, $459,472 total to Spain

Role: CoPI with David Graham, ORNL PI

Title: The role of biodiversity for microbial adaptation to anthropogenic perturbations, NSF, 2012-2017, $1,847,191 total.

Role: Konstantinidis (PI) Spain and Voit (CoPI)

Title: Allelochemicals and Soil Bacteria, USDA, 2011-2014, $493, 000 total

Role: PI

Title: Biodegradation of Nitrobenzene at Oxic/Anoxic Interfaces, DuPont, 2005-2015, $1,223,000 total

Role: PI with Joe Hughes (Co-PI)

Title: Assigning function to 3-nitropropane dioxygenase, NIH, 2011, Subcontract from Boston University Combrex program in collaboration with Georgia State. $15,050. Role: PI

Title: Biological Destruction of Solid-State RDX, DARPA, 2009, $202,524 total

Role: PI

Title: Bio-prospecting for Improved Hydrogen-Producing Organisms, Air Force Office of Scientific Research, 2007-2011, $ 800,500 total

Role: PI

Title: Elucidation of the Mechanisms and Environmental Relevance of cis-Dichloroethene and Vinyl Chloride Biodegradation, DoD Strategic Environmental Research and Development Program, 2007-2011, $413,000 total

Role: Co-PI with James Gossett (Cornell), Evan Cox (Geosyntec), Barbara Sherwood Lollar (University of Toronto), and Elizabeth Edwards (University of Toronto)

Title: Microbial Investigations on the Degradation of Mononitrotoluenes in Contaminated Sites, University of Marburg, 2007, $59,283

Role: PI

Title: Metabolic Diversity for Degradation Detection, and Synthesis of Nitro Compounds and Toxins, U.S. Army Research Office, 2007-2012, $866,949 total

Role: PI

Title: Enhancing Natural Attenuation Through Bioaugmentation with Aerobic Bacteria that Degrade *cis*-1,2-DCE, DoD Environmental Security Technology Certification Program, 2005-2007, $227,028 total

Role: Co-PI with David Major (Geosyntec), James Gossett (Cornell)

# Title: Laboratory Investigation of Biological Strategies for Destruction and Decontamination, U.S. Air Force, 2005, $99,941

Role: PI

Title: Residual Dinitrotoluenes at Badger Army Ammunition Plant, Coastal Operations Institute, 2005, $74,480

Role: Co-PI with Joe Hughes (GT)

Title: Biodegradation and Biocatalysis, Air Force Office of Scientific Research, 1996-2006, $3,282,000 total

Role: PI

Title: Regulation of Pathways for Biodegradation of Nitroaromatic Compounds, DoD Strategic Environmental Research and Development Program 2000-2004, $509,292 total

Role: Co-PI with Rebecca Parales (UC Davis)

Title: Biocatalysis and Biodegradation of Air Force Materials, Air Force Research Laboratory 1998-2006, $ 1,418,000 total

Role: PI

Title: Reactivity and Fate of Arylhydroxylamines in Environmental Systems, Strategic Environmental Research and Development Program 2000-2004, $485,302 total

Role: Co-PI with Joe Hughes (Rice University)

Title: Characterization of the Aerobic Oxidation of *cis*-Dichloroethylene and Vinyl Chloride in Support of Bioremediation of Chloroethene-Contaminated Sites, DoD Strategic Environmental Research and Development Program, 2000-2003, $447,000 total

Role: Co-PI with James Gossett

Title: Microbial Processes for Mineralization of RDX and HMX, DoD Strategic Environmental Research and Development Program 2000-2003, $488,602 total

Role: Co-PI with Jalal Hawari (NRC Canada)

Title: Bioremediation of Xenobiotic and Energetic Compounds, DoD Strategic Environmental Research and Development Program, Federal Integrated Biotreatment Research Consortium (FIBRC): Flask to Field Initiative. 1995-2000, $1,013,000 total

Role: PI

# **VIII. Honors and Awards**

2015 Association of Environmental Engineers and Scientists, Outstanding Faculty Award

2013 Sir Fredrick McMaster Fellowship, CSIRO Australia Visiting Lectureship

2011 Sir Fredrick McMaster Fellowship, CSIRO Australia Visiting Lectureship

2009 American Society for Microbiology-Proctor and Gamble Award for Excellence in Environmental Microbiology

1994 Elected Fellow American Academy for Microbiology