

Jim C. Spain

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Civil and Environmental Engineering
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Research Professor
University of West Florida
Center for Environmental Diagnostics and
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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- 2015-present	Research Professor, University of West Florida CEDB Emeritus Professor of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA
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
1979-1982	Postdoctoral Research Associate, EPA Environmental Research Laboratory, Gulf Breeze, FL
1975-1979	Research Assistant, Department of Microbiology, University of Texas at Austin
1973-1975	Research Engineer-Scientist, Division of Environmental Health Engineering, University of Texas at Austin

III. Teaching and Mentoring

**Post Doctoral Research
Associates**

Christopher Gulvik
Zohre Kurt
Tekle Fida
Riqing Yu
Marco Minoa
Sarah Schroeder
Graham Pumphrey
Anthony Ranchou-Peyrouse
2007-2008
Lorena Betancor 2005-2006
Rayford Payne 2005-2008
Cecile Berne 2003-2006
Heather Luckarift 2002-2006
Matt Eby 2002-2005
Adrian Murza 2002-2003
Sandra Trott 2001-2003
Nicholas Coleman 2000-
2003
Zhonghi He 1995-1998
George Paoli 1997-2001
Urs Lendenmann 1994-1997
John Davis 1994-1997
Paul Fiorella 1994-1996
Manish Shah 1994-1995
William Wallace 1992-1994
Rakesh Jain 1992-1994
Wen-Chen Suen 1991-1993
Charles Pettigrew 1989-1991
William Seffens 1988-1990
Billy Haigler 1987-1988

Current Affiliation

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
University of Cambridge
University of Maryland
Indiana University
Air Force Research Laboratory
Air Force Research Laboratory
University of Pittsburg
University of Dayton
University of Sydney
US Dept. of Agriculture
US Dept. of Agriculture
Boston University Medical Center
Michigan State University
Florida Office of Laboratory Services
Battelle Northwest
Applied Research Associates
Institute of Microbial Technology, Chandigarh, India
Schering-Plough Research Institute
Proctor and Gamble
Clark Atlantic University
Alice Llodry College

PhD Students

Smruthi <u>Karthikeyan</u>	Graduated 2019. Currently faculty at Cal Tech	
Fei He	Graduated 2016. Project: Biodegradation of energetic compounds. Co-advising with Joe Hughes	
Zohre Kurt	Graduated 2012. Project: Biodegradation of natural nitroaromatic compounds.	
Kwanghee Shin	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		
Damilola Balogun	Current	
Jessica Smith	Environmental Consultant	
Megan Maloney	PhD candidate Auburn	
Amy Brower	Florida DNR	
Mallory Palatucci	Graduated 2017. Currently PhD candidate at UC San Diego	
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	Angie Mordant	
Government Scientists		
Glenn Johnson 1995- 2005	Air Force Research Laboratory	
Lloyd Nadeau 1993- 2005	Air Force Research Laboratory	
Shirley Nishino 1985- 2005	Georgia Institute of Technology	
Charles Somerville 1993- 1997	Marshall University	
Billy Haigler 1989-1997	Alice Lloyd College	
Jeff Robertson 1990-1992	LSU Medical School	
Sonya East 1991	University of South Carolina	
Ph.D. Scientists-Sabbaticals or Extended Visits	Affiliation	Current Affiliation
A. M. Craig 2002-2003	Oregon State University	Oregon State University

Venkateswarlu Kadiyala 2001-2002	Sri Krishnadevaraya University, India	Sri Krishnadevaraya University, India
Chunlong Zhang 1999	Rice University	University of Houston
Rakesh Jain Summer 1998	Institute of Microbial Technology, India	Institute of Microbial Technology
Pat Gilcrease Summer 1998	University of Wyoming	University of Wyoming
Barth Smets Summer 1996-7	University of Connecticut	University of Connecticut
Venkateswarlu Kadiyala 1995-1997	Sri Krishnadevaraya University, India	Sri Krishnadevaraya University, India
Jan Roelof van der Meer 1993, 1997	Swiss Federal Institute for Water Resources Research	Swiss Federal Institute for Water Resources Research
Jochen Michels 1995-1996	University of Gottingen, Germany	DECHEMA, Germany
Michael LaBare	US Army, West Point	US Army, West Point
Steve Peretti Summer 1993	University of North Carolina	University of North Carolina
Mercedes Mondecarr 1993	Tulane University	Clark Atlantic University
Kenneth Reardon Summer 1992	Colorado State University	Colorado State University
Mike McFarland Summer 1991	Utah State University	Utah State University
Joseph Dreisbach Summer 1990, 1991	University of Scranton	University of Scranton
In-Soon You Summer 1990	California State University	California State University
Deborah Dean-Ross Summer 1989	Purdue University	Purdue University
Roy Ventullo Summer 1986	University Cincinnati	Procter and Gamble
Students-Extended Visits		
Nicolas Coleman 1999	University of Sydney, Australia	University of Sydney, Australia
Rula Deeb 1998, 1999	University of California, Berkeley	University of California, Berkeley
Christof Werlen 1997-1998	EAWAG Swiss Federal Institute for Water Resources Research	EAWAG Swiss Federal Institute for Water Resources Research
Randall Mueller 1997	University of Connecticut	University of Connecticut
Pat Gilcrease 1996	Colorado State University	U. of Wyoming
Andreas Schenzle 1995-1996	University of Stuttgart	DuPont
Baum Bae 1995	Texas A & M University	
Caroline Peres 1995	Universite Catholique de Louvain, Belgium	Genencor
Frank Desiere 1994	University of Stuttgart	Nestle, Inc. Switzerland
Claudia Vorbeck 1993-1994	University of Stuttgart	Fraunhofer Institute, Stuttgart Germany
Hiltrud Lenke 1993	University of Stuttgart	Chemengineering GmbH, Hamburg, Germany

Stuart Thomas 1993

University of North Carolina

Dupont Central Research and
Development

Joe Bernardo Summer 1991

University of Scranton

IV. Scholarly Accomplishments

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 Assessment and Remediation of Contaminated Sites. Kluwer Academic 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 Google Scholar h index- 77

192. Rodrigues-Despeso, D.R., I. del Olmo Lianes, J.C. Spain and V. DeLorenzo. 2026. Synthetically primed growth of *Pseudomonas putida* on 2,4 dinitrotoluene as sole carbon and nitrogen source. *Metabolic Engineering*. 95:90-101.
191. Camara, I., N. Melo, L. Lonheim, EE Mack, EA Edwards, JC Spain, Osmar Menezes and Savia Gavazza. 2025. Designing a blended microbial culture to bioremediate distinct environmental matrices from a complex industrial site contaminated with amino-, nitro-, and chloroaromatic compounds. *Environ. Res.* 285:122618.
190. Spain, J.C. 2025. Conventions for reporting biodegradation rates. *J. Haz. Mat. Letter*. 493: 138338.
189. Araujo, S.P., L. Lonheim, S.P.Q Kraus, E.E. Mack. J.C. Spain, S. Gavazza, E.A. Edwards. 2025. *Dehalobacter* dechlorinates dichloroanilines and contributes to the natural attenuation of dichloronitrobenzenes at a complex industrial site. *Environ. Sci. Technol.* 59:15251–15260
188. Zhang, S.T, S.K. Deng, T. Li, M. E. Maloney, D.F. Li, J.C. Spain, N.Y. Zhou. 2024. Discovery of the 1-naphthylamine biodegradation pathway reveals a broad-substrate-spectrum enzyme catalyzing 1-naphthylamine glutamylation. *eLife*. 13:e95555.
187. Waidner, L.A., C.E. Daniel, S.E. Kovar, J.C. Spain. 2024. Use of qPCR to monitor 2, 4-dinitroaniline degrading bacteria in water and soil slurry cultures. *Ind Microbiol Biotechnol* 51, kuae047J doi: 10.1093/jimb/kuae047.
186. Suchana, S., S. Araujo, L. Lonheim, E. Mack, JC Spain, E. Edwards and E. Passepourt. 2024. Compound specific carbon, nitrogen, and hydrogen isotope analysis to characterize aerobic biodegradation of 2,3-dichloroaniline by a mixed enrichment culture. *Environ. Sci. Technol.* 58:12042–12050.
185. Melo, N., S.P. Araujo, S.P. Kraus, L. Lonheim, P.B. Quintero, E.E. Mack, E.A. Edwards, J.C. Spain, and S. Gavazza. 2023. Strategies for bioremediation of soil from an industrial site exposed to chlorinated and nitroaromatic compounds. *Groundwater Monitoring and Remediation*. 48: 108-120.
184. Zhang, S.-T., T. Li, S.-K. Deng., J. C. Spain, N.-Y. Zhou. 2023. A cytochrome P450 system initiates 4-nitroaniline degradation in *Rhodococcus* sp. strain JS3073. *J. Haz. Mat.* 458:131886.
183. Kurt, Z., Y. Qu and J.C. Spain. 2023. Novel catabolic pathway for 4-nitroaniline in a *Rhodococcus* sp. Strain JS360. *J. Haz. Mat.* 454:131473. doi.org/10.1016/j.jhazmat.2023.131473.
182. Li, T., A.L. Brower, Z.J. Xu, Y. Xu, J.C. Spain and N.Y. Zhou. 2023. Molecular basis and evolutionary origin of 1-nitronaphthalene catabolism in *Sphingobium* sp. Strain JS3065. *Appl. Environ. Microbiol.* e01728-22.

181. Menezes, O., C. Owens, E.E. Rios-Valencia, R. Sierra-Alvarez, J.A. Field, and J.C. Spain. 2022. Designing bacterial consortia for the complete biodegradation of insensitive munitions compounds in waste streams. *Biotechnol. Bioeng.* 119:2437-2446.
180. Menezes, O., K. Kocaman, S. Wong, E.E. Rios-Valenciana, E.J. Baker, J.K. Hatt, J. Zhao, C.L. Madeira, M.J. Krzmarzick, J.C. Spain, R. Sierra-Alvarez, K.T. Konstantinidis and J.A. Field. 2022. Quinone moieties link microbial respiration of natural organic matter to chemical reduction of diverse nitroaromatic compounds. *Environ. Sci. Technol.* DOI: 10.1021/acs.est.2c01329. 56:9387-9397
179. Xu, Zhi-Jing, J.C. Spain, N.Y. Zhou, and T. Li. 2022. Biodegradation of 3-chloronitrobenzene and 3-bromonitrobenzene by *Diaphorobacter* sp. strain JS3051. *Appl. Environ. Microbiol.* 88. e02437-21.
178. Karthikeyan, S., J.K. Hatt, M. Kim, J.C. Spain, M. Huettel, J.E. Kostka and K.T. Konstantinidis. 2021. A novel, divergent alkane monooxygenase (alkB) clade involved in crude oil biodegradation. *Environ. Microbiol. Rep.* doi:10.1111/1758-2229. 13:830-840.
177. Li, Tao, Y.Z. Gao, J. Xu, S.T. Zhang, Y. Guo, J.C. Spain, N.Y. Zhou. 2021. A recently assembled degradation pathway for 2,3-dichloronitrobenzene in *Diaphorobacter* sp. strain JS3051. *mBio*. doi: 10.1128/mBio.02231-21.
176. Hanson, A., K.K. Askarani, S. Gallo, B. Carling, C. Mowder, JC Spain, A. Harten, T. Sale, J. Blotvogel. 2021. Real-time remediation performance monitoring with ORP sensors. *Groundwat. Mon. and Remed.* 41:27-28. doi: 10.1111/gwmmr.12479.
175. Liu, J., Ying Xu, Shi-Kai Deng, Lei Liu, Jun Min, Ting Shi, Jim Spain, and Ning-Yi Zhou. 2021. Physiological role of the previously unexplained benzenetriol dioxygenase homolog in the *Burkholderia* sp. strain SJ98 4-nitrophenol catabolic pathway. *Appl. Environ. Microbiol.* DOI: [10.1128/aem.00007-21](https://doi.org/10.1128/aem.00007-21).
174. Madiera, C., O. Menezes, D. Park, K. Jog, J. Hatt, S. Gavazza, M. Krzmarzick, R. Sierra-Alvarez, J. Spain, K. Konstantinidis, J. Field. 2021. Bacteria make a living breathing the nitro-heterocyclic insensitive munitions compound 3-nitro-1,2,4-triazol-5-one (NTO). *Environ. Sci. Technol.* 55: 5806–5814.
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.* 23:1053-1065. <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. Konstantinidis. 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 techniques 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. Rodriguez, 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. *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-nitrotyrosine 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. *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. *Genome Announcements*. 1:e00843-13.
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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.
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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.
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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.
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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.

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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

- 2026 Nanjing Agricultural University, Nanjing, China
- 2026 Zhejiang University of Technology, Deqing, China
- 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

2022 REMTEC Emerging Contaminants Summit, Denver CO
 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

- 2022 University Consortium for Field-Focused Groundwater Contamination Research, Colorado State University
- 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 American 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

D. RESEARCH PRESENTATIONS

- Smith, J.J., and J.C. Spain. 2021. Phylogenetic diversity and distribution of bacteria catalyzing aristolochic acid detoxification. Society for Industrial Microbiology and Biotechnology, National Meeting.
- Pica, N., S. Amira, A. Hanson, T. Hofstetter, J.C. Spain and J. Blotvogel. 2019. Sequential electrochemical and biological treatment train for chloronitrobenzene-contaminated water. American Chemical Society, National Meeting.
- Karthikeyan, S., L.M. Rodriguez, P. Hertier-Robbins, W.A. Overholt, J.K. Hatt, J.C. Spain, M. Huettel, R. Ramon Rossello-Mora, J.E. Kostka, and K.T.

- Konstantinidis. 2018. *Macondimonas diazotrophicus*: A representative of a novel gammaproteobacterial family of globally-distributed, sediment-associated, keystone oil degraders. American Society for Microbiology Annual Meeting.
- Hofstetter, T., J. Bolotin, M. Palatucci, and J.C. Spain. 2017. Carbon and nitrogen isotope fractionation reveals the biodegradation of 2,4-dinitroanisole. American Chemical Society National Meeting, San Diego CA
- Palatucci, M., and J.C Spain. 2017. Biodegradation of dichloronitrobenzenes. Remediation Technology Summit, Denver CO.
- Davila-Santiago, L., N. DeLeon-Rodriguez, K.Y. LaSanta-Pagan, Z. Kurt, E. Padilla-Crespo, J. Hatt, J. Spain, K. Konstantinidis, A. Massol-Deya, Metagenomic survey of a military-impacted lagoon in Puerto Rico. American Geophysical Union, Ocean Sciences Meeting.
- Graham, D., K. Mahan, C. Gulvik, R. Giannone, DM Klingeman, RL Hettich, R Parry and J.C Spain. 2015. Novel nitration reaction in the biosynthesis of 2-nitroimidazole by *Streptomyces eurocidicus*. SIMB
- Mahan, K., T. Fida, R. Giannone, R.L. Hettich, D.M. Klingeman, R. Parry, J. Spain and D. Graham. 2015. Production of N-nitroglycine by *Streptomyces noursei*. Natural Product Discovery in the Post Genomic Era. SIMB.
- Kurt, Z., M. Minoa, and J.C. Spain. 2013. Resveratrol biodegradation by *Acinetobacter*. 113th General Meeting of the American Society for Microbiology
- Krishnan, R., R. Poretsky, J.C. Spain, and K.T. Konstantinidis. The role of the rare biosphere in degrading 2,4- dichlorophenoxyacetic acid and 3-nitrotyrosine in Lake Lanier. 113th General Meeting of the American Society for Microbiology
- Nishino, S.F., and J.C. Spain. 2012. Growth of marine bacteria on the natural organophosphate (S)-cinnamoylphosphoramidate. 112th General Meeting of the American Society for Microbiology
- Kurt, Z., Y. Qu, E. Lang, and J.C. Spain. 2012. Biodegradation of 4-nitroaniline by a *Rhodococcus* sp. 113th General Meeting of the American Society for Microbiology
- Nishino, S.F., S. Craven, E. Lang, and J.C. Spain. 2011. Biodegradation of m-tyrosine by rhizosphere bacteria. 111th General Meeting of the American Society for Microbiology
- Smitherman, C., K. Francis, S. Nishino, JC Spain, and G. Gadda. 2011. Detoxification of a lethal toxin by nitronate monooxygenase. International Symposium on Flavins and Flavoproteins, Berkeley, CA.
- Gadda, G., K. Francis, S. Nishino, and JC Spain. 2011. Propionate-3-nitronate oxidation by fungal nitronate monooxygenase: a 60- year mystery solved. Gordon Research Conference on Enzymes, Coenzymes and Metabolic Pathways.
- Wijker, R.S Zohre Kurt, Jim C. Spain, Jakov Bolotin, and Thomas B. Hofstetter. 2011. Enzyme kinetics of flavin-dependent monooxygenases modulate the observable isotope fractionation during monooxidation of 4-nitrophenol.

- American Chemical Society Symposium on Reaction Mechanisms in Environmental Organic Chemistry. Denver, CO.
- Cox, E., C. Austrins, J. Spain, K. Shin, S. Nishino, J. Gossett, C. Giddings, L. Jennings, E. Edwards, T. Johnson, M. Duhamel, and B. Sherwood-Lollar. 2010. The truth is out there: unraveling the mystery of the missing DCE, vinyl chloride, and ethane. Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA.
- Sherwood-Lollar, B., J. McKelvie, M. Elsner, S. Mancini, T. Johnson, M. Simpson, A. Simpson, E. Edwards, J. Gossett, L. Jennings, J.C Spain, and E. Cox. 2010. New developments in forensic evaluation of contaminant sources and microbial degradation pathways using CSIA. Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey CA.
- Wan Johari, W.L., J.C. Spain, and J.M. Gossett. 2010. The involvement of a cyclohexanone monooxygenase gene of *Polaromonas* sp. JS666 during aerobic *cis*-dichloroethene degradation. Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey CA.
- Major, D., C. Aziz, J.M. Gossett, J.C. Spain, and B. Sherwood-Lollar. 2009. Enhancing natural attenuation through bioaugmentation with aerobic bacteria that degrade *cis*-1,2-DCE. Partners in Environmental Technology Technical Symposium & Workshop, SERDP/ESTCP. Washington, D.C.
- Cox, E., J.M. Gossett, J.C. Spain, E. Edwards, and B. Sherwood-Lollar. 2009. The truth is out there: unraveling the mystery of the missing DCE, vinyl chloride, and ethane. Partners in Environmental Technology Technical Symposium & Workshop, SERDP/ESTCP, Washington, D.C.
- Hofstetter, T.B, A.E. Hartenbach, J.C. Spain, S.F. Nishino, and R.P. Schwarzenbach. 2009. Using compound-specific carbon and nitrogen isotope analysis for the assessment of nitroaromatic compound transformation. American Chemical Society National Meeting, Salt Lake City.
- Qu, Yi and J.C. Spain. 2009. Biodegradation of 5-nitroanthranilic acid by a *Bradyrhizobium* sp. Annual Meeting of the American Society for Microbiology.
- Shin, Kwanghee and J.C. Spain. 2009. Biodegradation of diphenylamine by *Burkholderia* sp, JS667. Annual Meeting of the American Society for Microbiology.
- Shin, Kwanghee and J.C. Spain . 2009. Biodegradation of nitrobenzene, aniline, and diphenylamine at the oxic/anoxic interface between sediment and water. RemTec Remediation Technology Summit.
- Cox, E., C. Austrins, J. Gossett, J. Spain, E. Edwards, and B. Sherwood-Lollar. 2008. Elucidation of the mechanisms and environmental relevance of *cis*-dichloroethene and vinyl chloride biodegradation. Partners in Environmental Technology Technical Symposium & Workshop, SERDP/ESTCP, Washington, D.C.
- Major, D., J. Gossett, L. Jennings, C. Sausville-Giddings, S. Nishino, J. Spain, C. Aziz, and M. Watling. 2008. Enhancing natural attenuation through bioaugmentation with aerobic bacteria that degrade *cis*-1,2-DCE. Partners in

- Environmental Technology Technical Symposium & Workshop, SERDP/ESTCP, Washington, D.C.
- Nishino, S.F, R.B. Payne, and J.C. Spain. 2008. Pathway for bacterial degradation of 3-nitropropionic acid and the purification and characterization of a novel denitrase. Annual Meeting of the American Society for Microbiology.
- Jennings, L.K., S.F. Nishino, R.B. Payne, J.C. Spain, and J.M. Gossett. 2008. Proteomic and transcriptomic analyses reveal genes upregulated by *cis*-dichloroethene in *Polaromonas* sp. JS666. Annual Meeting of the American Society for Microbiology.
- Shin, K. and J.C. Spain. 2007. Biodegradation of diphenylamine. Annual Meeting of the American Society for Microbiology.
- Seo, J.H, L. Betancor, K. S. Demirci, J.C Spain, and O. Brand. 2007. Liquid-Phase biochemical sensing with disk-type resonant microsensor. Transducers-14th International Conference on Solid-State Sensors, Actuators, and Microsystems, Lyon, France.
- Kroeger, N., N.C. Poulsen, and J.C. Spain. 2007. Biogenesis of functional silica nanostructures through diatom genetic engineering. Society for Industrial Microbiology, Annual Meeting.
- Jennings, L. K., J. M. Gossett, and J. C. Spain. 2007. Deciphering cDCE degradation pathways in *Polaromonas* sp. strain JS666. Ninth International In- Situ and On-Site Bioremediation Symposium, Baltimore MD.
- Aziz, C.E., M. Watling, D. Major, L.K. Jennings, C.G. Sausville-Giddings, J.M. Gossett, S. Nishino and J.C. Spain. 2007. Enhancing natural attenuation through bioaugmentation with aerobic bacteria that degrade *cis*-1,2-DCE. Partners in Environmental Technology - Technical Symposium & Workshop, SERDP/ESTCP, Washington, D.C.
- Aziz, C.E., M. Watling, D. Major, L.K. Jennings, C.G. Sausville-Giddings, J.M. Gossett, S. Nishino and J.C. Spain. 2006. Enhancing natural attenuation through bioaugmentation with aerobic bacteria that degrade *cis*-1,2-DCE. Partners in Environmental Technology - Technical Symposium & Workshop, SERDP/ESTCP, Washington, D.C.
- H.R. Luckarift, G.R. Johnson, M.M Tomczak, R.R. Naik, and J.C. Spain. 2006. Biomimetic silica encapsulation: an efficient and versatile enzyme immobilization technique. AIChE Annual Meeting, Bionanotechnology Symposium.
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E. OTHER SCHOLARLY ACCOMPLISHMENTS

Patents Issued

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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
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 Ground Water
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 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, Bioavailability 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 Bioremediation

- 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)

A. AS PRINCIPAL AND CO-PRINCIPAL INVESTIGATOR

Title: Biodegradation of nitroaromatic compounds, Corteva, 2026-2027, \$30,000 (gift)

Title: Biodegradation of synthetic chemicals, DuPont, 2023-2024, \$60,000 (gift)

Title: Biodegradation of organic contaminants, DuPont, 2023-2024, \$80,000

Title: Biodegradation of environmentally relevant chemicals, Chemours, 2021-2022, \$50,000 (gift)

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, 2019-2022

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

Title: Nitration enzyme toolkit for the biosynthesis of energetic materials, UT-Battelle LLC, 2016-2017, \$99,009 total to Spain
Role: PI

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, \$360,472 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