

ANTHONY V. PALUMBO

PRESENT POSITIONS

- 2002-Present Distinguished Scientist and Group Leader for Applied Environmental Science and Technology, Environmental Sciences Division (ESD), P. O. Box 2008, Oak Ridge National Laboratory, Oak Ridge, TN 37830-6038. Phone/Fax 865-576-8002/576-8646, E-mail palumboav@ornl.gov, Web: <http://www.esd.ornl.gov/programs/microbes/>
- 1992 - Present Adjunct Faculty, Ecology and Evolutionary Biology, The University of TN

PREVIOUS POSITIONS

- 2001-2002 Distinguished Scientist and Group Leader for Plant and Microbial Systems, ESD
2000-2001 Section Head for Earth and Microbial Science Section, ESD
1999-2000 Science Team Leader for Biogeochemistry for ESD
1997-1999 Senior Staff and Member of the Research Council
1993-1996 Group Leader - Microbial Interactions Group, ESD, ORNL, Oak Ridge, TN.
1987-1997 Staff Member, Environmental Sciences Division
1983-1986 Research Associate, University of Tennessee, Knoxville, TN.
1981-1983 Research Associate, University of North Carolina, Chapel Hill, NC.
1979-1981 Postdoctoral Associate, Massachusetts Institute of Technology, Cambridge, Mass.
1977-1979 Biologist, National Marine Fisheries Service, Beaufort, NC.

EDUCATION

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|----------------------------------|----------------|------------------------|
| Rensselaer Polytechnic Institute | Biology | B. S. 1973 |
| North Carolina State University | Marine Science | M. S. 1976; Ph.D. 1980 |

RESEARCH INTERESTS

Integration of physical, chemical, and biological remediation technologies; Microbial ecology in contaminated and pristine ecosystems; application of molecular techniques to microbial ecology.

PROFESSIONAL RECOGNITION AND AFFILIATIONS

Fellow of the American Academy for Microbiology.
Member of: American Society for Microbiology; American Society of Limnology and Oceanography; Society for Industrial Microbiology; Society for Applied Microbiology (UK), Remediation Technology Development Forum, Chlorinated Solvents Working Group
Editorial Board for Ecotoxicology, Ad hoc reviewer: Sea Grant, DOE, and NSF Proposals, Water Resources Research, Limnology and Oceanography, J. of the North American Benthological Society, 1st - 4th International Symposia on "In situ and On-Site Bioreclamation", Symposia on Biotechnology for Fuels and Chemicals. NSF Panel for SBIRs on Biosensors, Bioremediation J. Co-Chair for 7th Conference on Small Genomes, Va., 1999; Co-Chair/Organizer for the Symposium on Microbial Ecology at the VII International Congress of Ecology, July 1998. Co-Chair for "Mechanisms Regulating Microbial Diversity and Population Dynamics" ASLO 99 Aquatic Sciences Meeting. Organizer/Chair for DOE/OHER Meeting "Heterogeneity at Contaminated Sites," October, 1996. Chair for: Symposium on Surfactants for Bioremediation at 1996 Society for Industrial Microbiology Meeting; Symposium on Bioavailability and Biosurfactants at the 1994 Annual ASM Meeting;

PROFESSIONAL RECOGNITION AND AFFILIATIONS

Workshop on Techniques for Bioremediation at the 1992 Annual ASM Meeting; Section on Biological Processes for Symposium on Organic Contaminants at 1990 ACS Annual Meeting.

Former Member of; US DOE OTD, Technology Support Group, Advisory Committee for the University of the Tennessee Center for Environmental Biotechnology, Working Group for DOE OHER NABIR Program Plan; Invited Participant at: EPA Workshop "Development of Ecological Tier Testing Schemes for Microbial Biotechnology Applications;" NABIR Basic Workshop, June 1999. Invited Participant at EPA Workshop "Development and Application of Ecogenomics for Water Quality Assessment", May 2002.

GRANTS, AWARDS, PATENTS

Recipient of: > 25 Grants from DOE and DOD for microbial ecology, biodegradation, bioremediation , and marine biotechnology. Most Recent:

- 1) An Integrated Assessment of Geochemical and Community Structure Determinants of Metal Reduction Rates in Subsurface Sediments. DOE, A. Palumbo, C. Brandt, J. Kostka.
- 2) An Integrated Experimental and Modeling Approach for the Study of Microbial Biofilm Communities, ORNL, A. Palumbo, C. Brandt.
- 3) Enhancing Carbon Sequestration and Reclamation of Degraded Lands with Fossil-Fuel Combustion Byproducts - DOE, Fossil Energy Program, A. Palumbo, et. al.;
- 4) Microbially induced P bioavailability: Effects on community ecology and U sequestration - A. Palumbo, P. Sobecky, and C. Zhang;
- 5) Non-competitive microbial diversity patterns in soils: Their causes and implications for bioremediation -DOE, NABIR program J. Tiedje, J. Zhou, A. Palumbo, R. O'Neil.
- 6) Linking process and population studies to understand the nitrogen loss mechanisms of Pacific Northwest marine sediments - DOE, J. Tiedje, J. Zhou, A. Devol, A. Massol-Deya, A. V. Palumbo;
- 7) Intrinsic and Accelerated Bioremediation of DNAPL: Microbial Monitoring of Contaminated Sites - DOE, A. Palumbo, S. Pfiffner.

2002 Certificate of Appreciation, U.S. Department of Energy, Subsurface Contamination Focus Area.

2001 Merit Award from the Society for Technical Communication for Online Communications.

1998 Two Technical Communication Awards from the Society for Technical Communication.

1996 Annual Scientific Achievement Award, Environmental Sciences Division, ORNL.

Selected for "Leadership ORNL", completed 2/98.

Two 1995 Royalty-Sharing Awards from Lockheed Martin Energy Systems.

Patent No. 5,807,697. Strong-Gunderson, J. M. and A. V. Palumbo. Biological Tracer Method.

Patent No. 6,229,146. Cochran, J., T. J. Phelps, J. M. McCarthy, and A. V. Palumbo. Position sensitive radioactivity detector for gas and liquid chromatography.

PUBLICATIONS (Total > 100)

Schryver, J.C., C. C. Brandt, S. M. Pfiffner, A. V. Palumbo, J. S. Almeida, A. D. Peacock, D.C. White, J. P. McKinley, and P.E. Long. In press. Community Structure of UMTRA Site Groundwater as Assessed by Nonlinear Analyses. Microbial Ecology.

Palumbo, A. V., S. M. Pfiffner, L. Fagan, M. McNeilly, S. Rishell, J. E. Kostka, and C. C. Brandt. In press. Substrate and Community Structure Determinants of Uranium Reduction Rates in Subsurface Sediments. Proceedings of the 3rd European Bioremediation Conference, July 4-7, 2005. Crete

PUBLICATIONS (continued)

Stapleton, R. D. Jr., Z. L. Sabree, A. V. Palumbo, C. Moyer, A. Devol, Y. Roh, and J-Z. Zhou. 2005. Metal reduction at cold temperatures by *Shewanella* isolates from various marine environments. *Aquatic Microbial Ecology* 38: 81-91.

Palumbo, A. V., J. R. Tarver, L. Fagan, R. Ruther, and J. E. Amonette. 2005. Potential for metal leaching and toxicity from fly ash applied for increasing carbon sequestration in soil. Proceedings of the World of Coal Ash 2005 meeting. April 11-15, 2005. Conference. Lexington, KY.

Palumbo, A.V., J. C. Schryver, M. W. Fields, C. E Bagwell, J-Z. Zhou, T. Yan, X. Liu, and C. C. Brandt. 2004. Coupling of functional gene diversity and geochemical data from environmental samples using ANN. *Appl. Environ. Microbiol.* 70:6525-6534.

Palumbo, A. V., S. Fisher, M. Martin, Z. Yang, J. Tarver, S. D. Wulfschleger. 2004. Application of emerging tools and techniques for measuring carbon and microbial communities in reclaimed mine soils. *Environmental Management*. Vol 33, Supplement 1, pp S518-S527.

Pfiffner, S. M., A. V. Palumbo, and G. Sayles. 2004. Microbial population and degradation activities changes monitored during chlorinated solvent biovent demonstration. *Ground Water Monitoring and Remediation*. 24: 102-110.

Martin, M. Z., S. D. Wulfschleger, C. T. Garten, A. V. Palumbo, and J. G. Smith. 2004. Elemental analysis of environmental and biological samples using laser-induced breakdown spectroscopy and pulsed Raman spectroscopy. *Journal of Dispersion Science and Technology* 25:687-694.

Palumbo, A. V., W. Lee Daniels, J. A. Burger, J. F. McCarthy, Stan Wulfschleger, J. E. Amonette, L. S. Fisher. 2004. Prospects for enhancing carbon sequestration and reclamation of degraded lands with fossil-fuel combustion byproducts. *Adv. Environ. Res.* 8:425-438.

Zhou, J. Z., B.-C. Xia, H. Huang A. V. Palumbo, and J. M. Tiedje. 2004. Microbial diversity and heterogeneity in oligotrophic, sandy subsurface soils. *Appl. Environ. Microbiol* 70:1723-1734.

Zhou, J. Z., B. C. Xia, H. S. Huang, D. S. Treves, L. J. Hauser, R. J. Mural, A. V. Palumbo, and J. M. Tiedje. 2003. Bacterial phylogenetic diversity and a novel candidate division of two humid region, sandy surface soils. *Soil Biology and Biochemistry*. 35: 915-924.

Liu, X., S. M. Tiquia, G. Holguin, L. Wu, S.C. Nold, A.H. Devol, K. Lou, A.V. Palumbo, J. M. Tiedje, and J-Z. Zhou. 2003. Molecular diversity of denitrifying genes in continental margin sediments within the oxygen deficient zone of the Pacific Coast of Mexico. *Appl. Environ. Microbiol.* 69:3549-3560.

Martin, M. Z., S. D. Wulfschleger, C. T. Garten, and A. V. Palumbo. 2003. Laser-induced breakdown spectroscopy for the environmental determination of total carbon and nitrogen in soils. *Appl. Optics*. 42:2072-2077.

Palumbo, A. V., L.S. Fisher, J.R. Tarver, W.L. Daniels, Z. Yang, S.M. Tiquia, L. Wu, J. Zhou, J. Amonette. 2003. Microbial communities, carbon and nitrogen in mine soils reclaimed with fly ash and biosolids amendments (Issues with the Use of Fly Ash for Carbon Sequestration). In: Proceedings of the 2nd Annual

PUBLICATIONS (continued)

Conference on Carbon Sequestration. May 5-8, 2003. Alexandria, Va.

http://www.carbonsq.com/proc.cfm?paper_id=5E

Amonette, J. E., J. Kim, C. K. Russell, A. V. Palumbo, W. L. Daniels. 2003. Fly ash amendments catalyze soil carbon sequestration. In: Proceedings of the Second Annual Conference on Carbon Sequestration. May 5-8, 2003. Alexandria, Va. http://www.carbonsq.com/poster_list.cfm?poster_id=T .

Powers, L.G., H. J. Mills, A. V. Palumbo, C. Zhang, K. Delaney, and P. A. Sobecky. 2002. Introduction of a plasmid-encoded *phoA* gene for constitutive overproduction of alkaline phosphatase in three subsurface *Pseudomonas* isolates. FEMS Microbiol Ecol 41:115-123.

Palumbo, A. V., J. Z. Zhou, C. Zhang, R. D. Stapleton, B. L. Kinsall, and T. J. Phelps. 2002. Biotransformations and biodegradation in extreme environments. In Bioremediation Technology for Health and Environmental Protection. Eds. V. P. Singh and R. D. Stapleton. Progress in Industrial Microbiology, Vol 36, 636 pp. Elsevier, Amsterdam.

Pfiffner, S. M., P. A. Sobecky, T. J. Phelps, and A. V. Palumbo. 2002. Microbiology of Atlantic Coastal plain aquifers and other unconsolidated subsurface sediments. In Gabriel Bitton (Ed.) Encyclopedia of Microbiology Volume 4, pp. 2028-2042. John Wiley & Sons, Inc. New York, NY.

Phelps, T. J., A. V. Palumbo, A. Baleive. 2002. Metabolomics and microarrays for improved understanding of phenotypic characteristics controlled by both genomics and environmental constraints. Current Opinion in Biotech. 13:20-24.

Pfiffner, S. M., A. V. Palumbo, and G. Sayles. 2002. Microbial population and degradation activities changes monitored during chlorinated solvent biovent demonstration. In: Proceedings Spectrum 2002: International Conference on Nuclear and Hazardous Waste Management. Reno, Nevada, August 4-8, 2002. CD-ROM at <http://store.ans.org/index.cgi?c=prcd> .

Zhou, J.-Z., B.C. Xia, D. S. Treves, L.-Y. Wu, T. L. Marsh, R. V. O'Neill, A. V. Palumbo and J. M. Tiedje. 2002. Spatial and resource factors as causes for high soil microbial diversity. Appl. Environ. Microbiol. 68: 326-334.

Hurt, R. A., X. Qiu, L. Wu, Y. Roh, A. V. Palumbo, J. M. Tiedje, and J. Zhou. 2001. Simultaneous recovery of RNA and DNA from soils and sediments. Appl. and Environ. Micro. 67: 4495-4503.

Pfiffner, S.M., A.V. Palumbo, B.L. Kinsall, A.D. Peacock, and T. J. Phelps. 2001. Microbial Heterogeneity Implications for Bioremediation. Proceedings of In Situ and On-site Bioremediation. The Sixth International Conference. June 4-7, 2001. San Diego Ca. Battle Press. Columbus.

Sobecky, P., A.V. Palumbo, C.L. Zhang, and L.G. Powers. 2001. Over Production of Bacterial Alkaline Phosphatase for Uranium Immobilization and Sequestration. In Proceedings of In Situ and On-site Bioremediation. The Sixth International Conference. June 4-7, 2001. San Diego Ca. Battle Press. Columbus.

Zhou, J., S. Liu, B. Xia, C. Zhang, A. V. Palumbo, and T. J. Phelps. 2001. Molecular characterization of thermophilic iron-reducing enrichment cultures from deep subsurface environments. J. Applied. Micro. 90: 96-105.

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Qiu, X., L. Wu, H. Huang, P. E. McDonel, A. V. Palumbo, J. M. Tiedje, J. Zhou. 2001. Evaluation of PCR-generated chimeras, mutations, and heteroduplex with 16S ribosomal RNA gene-based cloning. *Appl. and Environ. Micro.* 67:880-887.

Zhou J. and A. V. Palumbo. 2000. Sequence to function: The 7th Conference on Small Genomes. *Genetica.* 108:VII-IX.

Cox, C.D., D. E. Nivens, S. Ripp, Meng Meng Wong, A. Palumbo, R. S. Burlage, G. S. Saylor. 2000. An intermediate-scale lysimeter facility for subsurface bioremediation research. *Bioremediation J.* 4:69-79.

Kinsall, B. L., G. V. Wilson, and A. V. Palumbo. 2000. The effect of soil heterogeneity on the vadose zone transport of bacteria for bioaugmentation. pp. C2-4:395-400. In G. B. Wickramanayake, A. R. Gavaskar, B. C. Alleman, V. S. Magar, [eds.]. *Bioremediation and Phytoremediation of Chlorinated and Recalcitrant Compounds. Proceedings of the 2nd International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 22-25, 2000, Monterey, California.* Battelle Press, Columbus.

Pfiffner, S. M., T. J. Phelps, and A. V. Palumbo. 2000. Bioaugmentation potential at a carbon tetrachloride contaminated site. pp. C2-4:389-394. In G. B. Wickramanayake, A. R. Gavaskar, B. C. Alleman, V. S. Magar, [eds.]. *Bioremediation and Phytoremediation of Chlorinated and Recalcitrant Compounds. Proceedings of the 2nd International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 22-25, 2000, Monterey, California.* Battelle Press, Columbus.

Zhou, J.-Z., B.-C. Xia, L.-Y. Wu, R. V. O'Neill, A. V. Palumbo, and J. M. Tiedje. 2000. Unusual diversity in soil microbial communities. *The 6th Chinese Society of Ecology.* P.29-40.

Zhang, C., R. D. Stapleton, J. Zhou, A. V. Palumbo, and T. J. Phelps. 1999. Iron Reduction by Psychrotrophic Enrichment Cultures. *FEMS Microbial Ecology* 30:367-371.

Zhou, J., A. V. Palumbo, and J. Strong-Gunderson. 1999. Phylogenetic characterization of a mixed microbial community capable of degrading carbon tetrachloride. *Appl. Biochem. and Biotech.* 80:243-253.

Palumbo, A. V., J.-Z. Zhou, T. J. Phelps, B. Kinsall, C. Zhang, E. L. Majer, J. E. Peterson, T. Griffin S. M. Pfiffner. 1999. Ecology and bioremediation: a staged approach to site characterization. pp. 195-204. In G. A. Uzochukwu and G. B. Reddy. [eds.]. *Proceedings of the 1998 National Conference on Environmental Remediation Science and Technology.* Battelle Press, Columbus.

Pfiffner, S. M., C. C. Brandt, J. C. Schryver, A. V. Palumbo, and J. S. Almeida. 1999. Using artificial neural networks to assess microbial communities. pp. 205-212. In G. A. Uzochukwu and G. B. Reddy. [eds.]. *Proceedings of the 1998 National Conference on Environmental Remediation Science and Technology.* Battelle Press, Columbus.

Pfiffner, S. M., A. V. Palumbo, T. J. Phelps, and B. L. Kinsall. 1999. Influence of other contaminants on natural attenuation of chlorinated solvents. pp. 5(1):47-52. In B. C. Alleman and A. Leeson. [eds.]. *Natural attenuation of chlorinated solvents, petroleum hydrocarbons, and other organic compounds. Proceedings of The Fifth International Symposium on In Situ and On-Site Bioremediation Symposium, San Diego, California.* Battelle Press, Columbus.

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Brandt, C. C., J. C. Schryver, S. M. Pfiffner, A. V. Palumbo, and D. C. White. 1999. Using artificial neural networks to assess changes in microbial communities. pp. 5(4):1-6. *In* A. Leeson and B. C. Alleman. [eds.]. Bioremediation of metals and inorganic compounds. Proceedings of The Fifth International Symposium on In Situ and On-Site Bioremediation Symposium, San Diego, California. Battelle Press, Columbus.

Gu, B., T. J. Phelps, L. Liang, M. J. Dickey, Y. Roh, B. L. Kinsall, A. V. Palumbo, and G. K. Jacobs. 1999. Biogeochemical interactions in zero-valent iron packed columns: Implications for the permeable reactive barriers. *Environ. Sci. and Tech.* 33:2170-2177.

Zhou, J.-Z., S. V. Liu, C.-L. Zhang, A. V. Palumbo, and T. J. Phelps. 1998. Extremophilic iron-reducing bacteria. Their implications for possible life in extraterrestrial environments. The Third Symposium of Chinese Young Scientists, Beijing, P. R. China.

Zhang, C., A. V. Palumbo, T. J. Phelps, J. J. Beauchamp, F. J. Brockman, C. J. Murray, B. S. Parsons, and D. J. P. Swift. 1998. Grain-size and depth constraints on microbial variability in coastal plain subsurface sediments. *Geomicrobiology* 15:171-185.

Zhou, J., A. V. Palumbo, and J. M. Tiedje. 1997. Sensitive detection of toluene-degrading denitrifiers, *Azoarcus toluyticus* using SSU rRNA primers and probes. *Appl. Environ. Micro.* 63:2384-2390.

Palumbo, A. V., J. M. Strong-Gunderson, and S. Carroll. 1997. Retaining enzyme activity during degradation of TCE by methanotrophs. *Appl. Biochem. and Biotech.* 63-65:789-796.

Pfiffner, S. M., A. V. Palumbo, T. Gibson, D. B. Ringelberg, and J. F. McCarthy. 1997. Relating water and sediment chemistry to microbial characterization at a BTEX-contaminated site. *Appl. Biochem. and Biotech.* 63-65:775-788.

Zhang, C., R. M. Lehman, S. M. Pfiffner, S. P. Scarborough, A. V. Palumbo, T. J. Phelps, J. J. Beauchamp, and F. S. Colwell. 1997. Spatial and temporal variations of microbial properties at different scales in shallow subsurface sediments. *Appl. Biochem. and Biotech.* 63-65:797-808.

Pfiffner, S. M., T. J. Phelps, A. V. Palumbo, and T. C. Hazen. 1997. Effects of nutrient dosing on subsurface methanotrophic populations and trichloroethylene degradation. *J. of Industrial Micro.* 18:204-212.

Strong-Gunderson, J. M., and A. V. Palumbo. 1997. Laboratory studies identify an innovative colloidal tracer: Implication to bioremediation. *FEMS Microbio. Let.* 148:131-135.

Chapatwala, K. D., G. V. Babu, E. Armstead, A. V. Palumbo, C. Zhang, and T. J. Phelps. 1996. Effect of temperature and yeast extract on sediments from a shallow coastal subsurface aquifer and vadose zone. *Appl. Biochem. and Biotech.* 57/58:827-835.

Palumbo, A. V., S. P. Scarborough, C. Zhang, S. M. Pfiffner, and T. J. Phelps. 1996. Influence of media on measurement of bacterial populations: Numbers and diversity. *Appl. Biochem. and Biotech.* 57/58:905-914.

Palumbo, A. V., S. P. Scarborough, S. M. Pfiffner, and T. J. Phelps. 1995. Influence of nitrogen and phosphorous on the in-situ bioremediation of trichloroethylene. *Appl. Biochem. and Biotech.* 55/56:635-647.

PUBLICATIONS (continued)

Strong-Gunderson, J. M., A. V. Palumbo, B. Applegate, and G. S. Sayler. 1995. Biosurfactants and increased bioavailability of sorbed organic contaminants: Measurements using a biosensor. pp. 17-26. *In* V. Srivastava, J. Smith, and T. D. Hayes [eds.]. Gas, Oil, and Environmental Biotechnology VI. Institute of Gas Technology, Des Plaines.

Strong-Gunderson, J. M., S. Wheelis, S. L. Carroll, M. D. Waltz, and A. V. Palumbo. 1995. Degradation of high concentrations of glycols, antifreeze, and deicing fluids. pp. 265-270. *In* R. E. Hinchee, C. M. Vogel, and F. J. Brockman [eds.]. Microbial Processes for Bioremediation. Battelle Press, Columbus.

Pfiffner, S. M., T. J. Phelps, and A. V. Palumbo. 1995. Subsurface microbial community and degradative capacities during trichloroethylene bioremediation. pp. 263-272. *In* R. E. Hinchee, A. Leeson, and L. Semprini [eds.]. Bioremediation of Chlorinated Solvents. Battelle Press, Columbus.

Burlage, R. S., A. V. Palumbo, and J. F. McCarthy. 1995. Method efficiency and signal quantification of bacteria for a groundwater transport experiment. pp. 139-148. *In* R. E. Hinchee, J. Fredrickson, and B. C. Alleman [eds.]. Bioaugmentation for Site Remediation. Battelle Press, Columbus.

Strong-Gunderson, J. M., and A. V. Palumbo. 1995. Bioavailability enhancement by addition of surfactant and surfactant-like compounds. pp. 33-40. *In* R. E. Hinchee, C. M. Vogel, and F. J. Brockman [eds.]. Microbial Processes for Bioremediation. Battelle Press, Columbus.

Tschantz, M., J. Bowman, T. L. Donaldson, P. Bienkowski, J. M. Strong-Gunderson, A. V. Palumbo, S. E. Herbes, and G. S. Sayler. 1995. Methanotrophic TCE biodegradation in a multi-stage bioreactor. *Environ. Sci. Technol.* 29:2073-2082.

Strong-Gunderson, J. M., and A. V. Palumbo. 1994. A novel method for rapidly determining microbial utilization of volatile contaminants. *J. of Industrial Microbiology.* 13:361-366.

McCarthy, J. F., J. Strong-Gunderson, and A. V. Palumbo. 1994. The significance of interactions of humic substances with organisms in the environment. pp. 981-997. *In* N. Senesi and T. M. Miano [eds.]. Humic Substances in the Global Environment and Implications on Human Health. Elsevier Publishers, Amsterdam.

Palumbo, A. V., S. Y. Lee, and P. Boerman. 1994. The effect of media composition on EDTA degradation by *Agrobacterium sp.* *Appl. Biochem. and Biotech.* 45:811-822.

Palumbo, A. V., J. F. McCarthy, A. Parker, S. Pfiffner, F. S. Colwell, and T. J. Phelps. 1994. Potential for microbial growth in arid subsurface sediments. *Appl. Biochem. and Biotech.* 45:823-834.

Burlage, R. S., A. V. Palumbo, A. Heitzer, and G. Sayler. 1994. Bioluminescent reporter bacteria detect contaminants in soil samples. *Appl. Biochem. and Biotech.* 45:731-740.

Phelps, T. J., R. L. Siegrist, N. E. Korte, D. A. Pickering, J. Strong-Gunderson, A. V. Palumbo, J. F. Walker, C. M. Morrissey, and R. Mackowski. 1994. Bioremediation of petroleum hydrocarbons in soil column lysimeters from Kwajalein Island. *Appl. Biochem. and Biotech.* 45:835-845.

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Burlage, R. S., D. Kuo, and A. Palumbo. 1994. Catabolic gene expression is monitored by bioluminescence in bioreactor studies. pp 439-443. *In* R. E. Hincee, D. B. Anderson, F. Blaine Metting, Jr., and G. D. Sayles [eds.]. Applied Biotechnology for Site Remediation. Lewis Publishers, Boca Raton.

Morrissey, C. M., S. E. Herbes, O. M. West, A. V. Palumbo, T. J. Phelps, and T. C. Hazen. 1994. Use of laboratory soil columns to optimize *in situ* biotransformation of tetrachloroethylene. pp. 326-331. *In* R. E. Hincee, D. B. Anderson, F. Blaine Metting, Jr., and G. D. Sayles [eds.]. Applied Biotechnology for Site Remediation. Lewis Publishers, Boca Raton.

Phelps, T. J., S. M. Pfiffner, R. Mackowski, D. Ringleberg, D. C. White, S. E. Herbes, and A. V. Palumbo. 1994. Application of microbial biomass and activity measures to assess in-situ bioremediation of chlorinated solvents. pp. 404-408. *In* R. E. Hincee, A. Lesson, L. Semprini, and S. K. Ong. [eds.] Bioremediation of Chlorinated and Polycyclic Aromatic Hydrocarbon Compounds. Lewis Publishers, Boca Raton.

Cook, R. L., M. A. Bogle, R. R. Turner, J. W. Elwood, P. J. Mulholland, and A. V. Palumbo. 1994. Acid Base chemistry of high-elevation streams in the Great Smoky Mountains, Tennessee. *Water, Air and Soil Pollution*. 72: 331-356.

Arrage, A. A., T. J. Phelps, R. E. Benoit, A. V. Palumbo, and D. C. White. 1993. Bacterial sensitivity to UV light as a model for ionizing radiation resistance. *J. of Microbiol. Methods* 18:127-136.

McCarthy, J. F., T. M. Williams, L. Liang, P. M. Jardine, L. W. Jolley, D. L. Taylor, A. V. Palumbo, and L. W. Cooper. 1993. Mobility of natural organic matter in a sandy aquifer. *Environ. Sci. Technol.* 27:667-676.

Steinman, A. D., P. J. Mulholland, A. V. Palumbo, D. L. DeAngelis and T. F. Flum. 1992. Lotic ecosystem response to a chlorine disturbance. *Ecol. Appl.* 2(4):341-55.

Mulholland, P. J., C. T. Driscoll, J. W. Elwood, M. P. Osgood, A. V. Palumbo, A. D. Rosemond, M. E. Smith, and C. Scofield. 1992. Relationships between stream acidity and bacteria, macroinvertebrates and fish: A comparison of north temperate and south temperate mountain streams, USA. *Hydrobiologia* 239:7-24.

Toran, L., and A. V. Palumbo. 1992. Colloidal transport through fractured and unfractured laboratory sand columns. *Journal of Contaminant Hydrology* 9:289-303.

Donaldson, T. L., A. V. Palumbo, P. A. Boerman, H. L. Jennings, A. J. Lucero, and R. L. Tyndall, G. W. Strandberg, and M. I. Morris. 1992. Cometabolic biotreatment of TCE-contaminated groundwater, laboratory and bench-scale development studies. pp. 633-637. *In* Proceed of the Symposium on Waste Management '92.

Ryan-Baker, M., T. Vo-Dinh, G. D. Griffin, G. H. Miller, J. P. Alarie, R. S. Burlage, A. V. Palumbo, D. C. White, and S. Herbes. 1992. Optical monitor for microbial metabolism for hazardous waste application Environmental and Process Monitoring Technologies. *Proceedings of SPIE-The International Society for Optical Engineering*. 1637:196-207.

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- Palumbo, A. V., P. A. Boerman, G. W. Strandberg, T. L. Donaldson, H. L. Jennings, T. J. Phelps, A. J. Lucero, D. C. White, and S. E. Herbes. 1991. A co-metabolic approach to groundwater remediation. pp. 95-100. In "Environmental Remediation '91: Cleaning up the Environment for the 21st Century".
- Palumbo, A. V., W. Eng, and G. W. Strandberg. 1991. The effects of groundwater chemistry on co-metabolism of chlorinated solvents by methanotrophic bacteria. Chapter 14. pp. 225-238. In R. Baker (ed). Organic Substances and Sediments in Water: Volume 3, Biological. Lewis Publishers. Chelsea, Mich.
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