# Yarrow M. Nelson, Ph.D.

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## PROFESSIONAL EXPERIENCE

### **California Polytechnic State University,** San Luis Obispo, CA

Nationally recognized program in environmental engineering

- **Professor Emeritus** (2017-present)
- **Department Chair** (2015-2017)
- **Professor** (2006 – 2015)
- **Associate and Assistant Professor** (1999 – 2006)

Managed department with 60 direct reports (10 staff, 20 professors and 30 lecturers) and 900 students. Taught environmental engineering and biochemical engineering courses. Conducted research on biodegradation, pollution prevention, and algae-based air pollution control.

### **Cornell University,** Ithaca, NY

R1 university (Departments of Chemical Engineering, Environmental Engineering and Agricultural Engineering)

- **Visiting Assistant Professor** (Summer 2000)
- **Research Associate and Lecturer** (1997-1999)
- **Graduate Research Assistant/ EPA Fellow** (1994-1996)
- **Research Support Specialist** (1981 – 1996)

Conducted research on pollutant fate, transport and bioavailability. Taught undergraduate courses in environmental engineering. Completed doctoral research under a fellowship from the U.S. EPA. Developed integrated models for toxic trace metal fate and transport.

### **Photon Power, Inc.,** El Paso, TX

Builder of the world's largest photovoltaic factory in the early 1980s.

- **Chemical Design Engineer** (1980)

Designed the chemical unit processes and air pollution control systems for a photovoltaic solar cell manufacturing plant

### **Lion Oil Company / TOSCO**, Martinez, CA

- **Process Engineer** (1978 – 1979)
- Designed air pollution control systems and developed a computer model for use in optimization of refinery processes.

## EDUCATION

Ph.D. 1997 Environmental Engineering, Cornell University, GPA 4.25
M.S. 1992 Agricultural and Biological Engineering, Cornell University, GPA 4.3
B.S. 1979 Chemical Engineering, University of California, Berkeley, GPA 3.7

## PUBLIC SERVICE

Air Pollution Control District Hearing Board (Vice Chair; 2001 – present)
Global Waste Research Institute (2008 to present)
Center for Applications in Biotechnology (Executive Board)
Engineers for a Sustainable World (Faculty Advisor)
Surfrider Foundation (Faculty Advisor)
Morro Bay National Estuary Program Technical Advisory Board (2003 – 2009)

## AWARDS

Cal Poly Distinguished Teaching Award 2005
Northrup Grumman Excellence in Research and Development Award 2004
Raytheon Excellence in Teaching and Applied Research Award, 2003
Environmental Protection Agency 1995-1997 STAR Graduate Student Fellowship

## PROFESSIONAL ORGANIZATIONS

American Chemical Society - Division of Environmental Chemistry.
American Association of Environmental Engineering and Science Professors

## PUBLICATIONS AND PRESENTATIONS

Nelson, Y., 2017 "Algae-Based Biofuel Production combined with Wastewater Treatment and Air Pollution Control for Synergistic Environmental Benefits." Energy for Tomorrow International Conference & Workshop (REMOO), 10–12 May 2017, Venice, Italy.

Nelson, Y. 2017, "Zero Waste Strategies for Oily Sludge in the Petroleum Industry." Second International Resource Recovery Conference, 5-9 August, 2017, Columbia University, New York, NY.

Nelson, Y., 2016. "New directions for environmental research to address growing evidence for anthropogenic global climate change." 26th Oxford Roundtable International Environment, Sustainability and Climate Change Symposium, 20-23 July, 2016, Oxford, UK

Billings, Mackenzie, Y. Nelson, C. Kitts and K. Roberts, 2015. "Microcosm Tests for Natural Attenuation, Biostimulation, and Bioaugmentation of Soils Contaminated with PCBs, Dioxins, PAHs, and Petroleum Hydrocarbons, Presented at the Third International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, Florida, May, 2015.

Croyle, Kenneth, Y. Nelson, A. Hamrick, C. Kitts, T. Lane, K. Poorey, D. Curtis and K. Williams. 2015. "Microbial Characterization of Soil using Molecular Methods and Traditional Culturing for Assessment of Natural Attenuation of Mixed Contaminants." Presented at the Third International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, Florida, May, 2015.

Poltorak, Matthew , Y. Nelson, M. Curto, D. Dowd, and K. Roberts, 2014. "Field Greenhouse Studies of Phytoremediation with Califorenia Native Plants for Soil Contaminated with Petroleum Hydrocarbons, PAHs, PCBs, Chlorinated Dioxins/Furans, and Metals." Presented at the Third International Symposium on Bioremediation and Sustainable Environmental Technologies, Miami, Florida, May, 2015.

Poltorak, M. , Y. Nelson, M. Curto, A. Koivunen, and K. Roberts, 2014. "Potential for Phytoremediation of Soil Contaminated with Petroleum Hydrocarbons, PAHs, PCBs, Dioxins/Furans, and Metals at the former

Energy Technology Engineering Center." Presented at the 9th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA May, 2014.

Croyle, K., Y. Nelson, C. Kitts and T. Lane "Genetic Analysis of Soil Microbes to Determine Potential for Natural Attenuation of PAHs, Dioxins, PCBs, and petroleum hydrocarbons" Presented at the 9th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA May, 2014.

Billings, M., Y. Nelson, C. Kitts and K. Roberts, 2014. "Natural Attenuation, Biostimulation, and Bioaugmentation of Soils Contaminated with PCBs, Dioxins, PAHs, and Petroleum Hydrocarbons." Presented at the 9th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA May, 2014.

Manheim, D. and Y. Nelson. 2013. "Settling and bioflocculation of two species of algae used in wastewater treatment and algae biomass production" *Environmental Progress & Sustainable Energy,* Vol 32, No. 4, pp. 946–954

Shihady, S., Nelson, Y, et al.,. 2012 "Bench-scale testing: Transfer of NOx from artificial flue gas to *Chlorella* algae grown in photobioreactors." Presented at the annual meeting of the National Algae Association, Nov. 2012

Kline, K., D. Mackay, L. Rastegarzadeh, Y. Nelson and J. Clark. 2011. "Importance of exposure history when using single well push pull tests to quantify in situ ethanol biodegradation rates." *Ground Water Monitoring & Remediation*., Vol 31, pp 103-110.

Woertz, I., A. Feffer, T. Lundquist and Y. Nelson. 2009. "Algae grown on dairy and municipal wastewater for simultaneous nutrient removal and lipid production for biofuel feedstock." *J. Environ. Engin.* (ASCE). Vol 135, No 11, pp 1115-1122.

Nelson, Y.M., S. Bragg-Flavan, L. Rastegarzadeh, M. Chell, K. Crossley, and E. Mick. "Assessment of Alternative Modes of Biodegradation for Natural Attenuation of Weathered Petroleum." Presented at the 10th International Conference on In-situ and On-site Bioremediation." Baltimore, MD, May, 2009.

Mick, E., K. Crossley, and Y. M. Nelson, 2007. " Chemical Composition of Groundwater Hydrocarbon Mixtures Before and After Aerobic Biodegradation." Platform presentation at the 9th International Conference on in-situ and on-site Bioremediation." Baltimore, MD, May 7-10, 2007.

Dreyer, M.G., Y.M. Nelson, C. Kitts, P. Lundegard and G. Garcia, 2005. "Weathering effects on biodegradation and toxicity of hydrocarbons in groundwater." Presented at the 8th International Conference on In Situ and On-Site Bioremediation, Battelle, Baltimore, MD, June 5, 2005.

Cunningham, C.R., Y.M. Nelson, C. Kitts, P. Lundegard, 2005. "Biodegradation of weathered hydrocarbons in soil columns and laboratory microcosms simulating natural attenuation field conditions. Presented at the 8th International Conference on In Situ and On-Site Bioremediation, Battelle, Baltimore, MD, June 5, 2005.

Orchard, B. Y.M. Nelson, L. Maloney, C. Kitts, and P. Lundegard, 2005 "Microbial activity of soil following steam treatment." Presented at the 8th International Conference on In Situ and On-Site Bioremediation, Battelle, Baltimore, MD, June 5, 2005.

Martin, W., Y.M. Nelson and K. Hoffman, 2004."Investigation of hydrocarbon phytoremediation potential of *Lupinus chamissonis* in laboratory microcosms. Platform presentation at the Water Environment Federation Conference, October, 2004, New Orleans.

Maloney, L., Y.M. Nelson and C.L. Kitts, 2004. "Characterization of aerobic and anaerobic microbial activity in hydrocarbon-contaminated soil." in: A.R. Gavaskar and A.S.C. Chen (Eds.), *Remediation of Chlorinated and Recalcitrant Compounds*. Battelle Press, Columbus, OH, 2004

Waudby, J. and Y.M. Nelson, 2004. "Biological feasibility and optimization of biosparging at a hydrocarbon-contaminated site," in: A.R. Gavaskar and A.S.C. Chen (Eds.), *Remediation of Chlorinated and Recalcitrant Compounds*. Battelle Press, Columbus, OH, 2004

Scott, S., and Y.M. Nelson, 2004. "Biodegradability and toxicity of hydrocarbon leachate from land treatment units." in: A.R. Gavaskar and A.S.C. Chen (Eds.), *Remediation of Chlorinated and Recalcitrant Compounds*. Battelle Press, Columbus, OH, 2004

Nelson, Y.M. and L. W. Lion (2003) "Formation of biogenic manganese oxides and their influence on the scavenging of toxic trace metals." Book Chapter in Geochemical and Hydrological Reactivity of Heavy Metals in Soils, H.M. Selim and W.L. Kingerly, Eds., CRC Press.

Hoffman, K.M. and Y. M. Nelson (2003) "Phytostimulation of hydrocarbon biodegradation by Arroyo willows in laboratory microcosms," In Phytoremediation of Petroleum-contaminated Sites, Battelle Press, Columbus, OH.

Chokshi, B. G. and Y. M. Nelson (2003) "Optimization of high-strength hydrocarbon biodegradation using respirometry." In Landfarming of Contaminants, Seventh International Conference on In Situ and On-Site Bioremediation, Battelle.

Nelson, Y.M., L. W. Lion, M.L. Shuler, and W. C. Ghiorse (2002) "Lead adsorption to mixtures of biogenic Mn oxides and Fe oxides." *Environ. Sci. Technol.:* **36**, 421-425.

Green, C.E., A. Stansberry, J. Sczechowski and Y.M. Nelson (2001) "Enhanced biodegradation of hydrocarbon contaminants using photocatalytic pretreatment." In *In Situ Aeration and Aerobic Remediation*, *Physical or Chemical Pretreatment Approaches*, A. Leeson et al., Ed. Vol. 6, pp 311-318.

Wilson, A. R., L.W. Lion, Y.M. Nelson, M.L. Shuler, and W.C. Ghiorse (2001) "The effects of pH and composition on Pb adsorption to natural freshwater biofilms." *Environmental Science and Technology:* **35** (15) pp 3182-3189

Nelson, Y.M., L.W. Lion, W.C. Ghiorse, and M.L. Shuler (1999) "Lead binding to metal oxide and organic phases of natural aquatic biofilms." *Limnology and Oceanography,* **44**, 1715-1729.

Nelson, Y.M., L.W. Lion, W.C. Ghiorse, and M.L. Shuler (1999) "Production of biogenic Mn oxides by Leptothrix discophora SS-1 in a chemically defined growth medium and evaluation of their Pb adsorption characteristics." *Appl. Environ. Microbiol*., Vol. 65, pp 175-180.

Nelson, Y. M. (1999) "Modeling toxic metal adsorption in aquatic environments." Presented to the Chinese Academy of Sciences, Institute of Geochemistry, Guangzhou, China, and at Jilin University Dept. of Environmental Science, Changchun, China. Sept. 1999

Nelson, Y.M., R.J. Thampy, Motelin, G.K., J.A. Raini, C.J. DiSante, L.W. Lion (1998) "Model for toxic metal exposure to filter-feeding flamingos at a polluted alkaline Rift Valley lake." *Environ. Toxicol. Chem*., Vol. 17, No. 11, pp 2302-2309.

Nelson, Y.M., L.W. Lion, W.C. Ghiorse, and M.L. Shuler (1998) "Pb adsorption and surface area of bacterially oxidized Mn." Presented at the 8th Annual V.M. Goldschmidt Conference, Toulouse, France, Aug. 30 - Sept. 3, 1998.

Nelson, Y.M., L.W. Lion, W.C. Ghiorse, and M.L. Shuler (1998) "New evidence for a greater role of biogenic manganese oxides in controlling trace metal transport and bioavailability in aquatic environments." Gordon Research Conference, Environmental Sciences: Water, June 14-19, 1998, Henniker, NH.

Nelson, Y. M. (1997). "Formulation, verification and application of integrated models for trace metal phase distribution in laboratory microcosms and aquatic environments." Ph.D. Thesis, Cornell University, August, 1997.

Nelson, Y.M., L.W. Lion, M.L. Shuler, and W.C. Ghiorse (1997), “Modeling lead binding to biological metal oxide components of surface coatings from freshwater environments.” Presented at the Amer. Soc. of Limnology and Oceanography, Aquatic Sciences Meeting, Santa Fe, NM, February 10-14, 1997, Session # S41.

Nelson, Y.M., L.W. Lion, M.L. Shuler, and W.C. Ghiorse (1996), "Modeling oligotrophic biofilm formation and lead adsorption to biofilm components." *Environmental Science and Technology*, Vol. 30, No. 6, pp 2027-2035.

Nelson, Y.M., L.W. Lion, M.L. Shuler and W.C. Ghiorse (1996). “Lead binding to surface coatings from natural and engineered environments.” American Chemical Society, Division of Colloid and Surface Chemistry, 70th Colloid and Surface Science Symposium., Clarkson University, June, 1996, Potsdam, NY.

Nelson, Y.M., L.W. Lion, M.L. Shuler and W.C. Ghiorse (1996). “Modeling the roles of metal oxides and biogenic materials in controlling lead binding to freshwater surface coatings.” Gordon Research Conference, Environmental Sciences: Water, June 23-28, 1996, New Hampton, NH.

Nelson, Y.M., L.W. Lion, M.L. Shuler, and W.C. Ghiorse (1996), "Modeling oligotrophic biofilm formation and lead adsorption to biofilm components." Presented at the 212th Annual Meeting of the American Chemical Society, Division of Environmental Chemistry Student Awards, Aug. 25-29, 1996.

Nelson, Y. M., W. Lo, L. W. Lion, M. L. Shuler and W. C. Ghiorse (1995) “Lead distribution in a simulated aquatic environment: Effects of bacterial biofilms and iron oxide.” *Water Research*. Vol. 29, pps. 1934-1944.

Nelson, Y. M. and W. J. Jewell (1993) “Vinyl chloride biodegradation with methanotrophic attached films.” *ASCE Journal of Environmental Engineering*, Vol. 119, No. 5.

Fennell, D. E., Y. M. Nelson, S. E. Underhill, T. E. White and W. J. Jewell (1993) “TCE degradation in a methanotrophic attached-film bioreactor.” *Biotechnology and Bioengineering*, Vol. 42, pp 859-872.

Nelson, Y. M., M. S. Wilson and W. J. Jewell (1992) “Methanotrophic bacteria for nutrient removal from wastewater: attached film system.” *Water Environment Research*, Vol. 64, No. 6, pp 756-765.

Nelson, Y. M. (1992) “Methanotrophic vinyl chloride biodegradation.” MS Thesis, Cornell University, August, 1992.

Nelson, Y. M. and W. J. Jewell (1992) “Methanotrophic vinyl chloride biodegradation kinetics: methane inhibition and vinyl chloride toxicity.” Presented at the Water Environment Federation Conference.