

JEFFREY A. CUNNINGHAM

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EDUCATION

Ph.D.	Stanford University	1999	Civil & Environmental Engineering
M.S.	Stanford University	1993	Civil Engineering (Environmental Engineering & Science)
B.S.	Rice University	1991	Chemical Engineering (conferred <i>magna cum laude</i>)

RESEARCH INTERESTS

Contaminant fate and transport in the (aqueous) environment
Physical, chemical, and biological processes for water treatment and water quality control
Water resources and water re-use
Mass transfer in natural and engineered environmental systems
Contaminant behavior in groundwater
Remediation of contaminated soil and groundwater
Geologic sequestration of carbon dioxide for mitigation of global climate change

RESEARCH EXPERIENCE

Assistant Professor	University of South Florida, Tampa, FL	Jan. 2005 – present
Assistant Professor	Texas A&M University, College Station, TX	Aug. 2003 – Dec. 2004
Research Associate	Stanford University, Stanford, CA	Feb. 2001 – Aug. 2003
Post-Doctoral Researcher	Stanford University, Stanford, CA	Jan. 1999 – Jan. 2001
Doctoral Student	Stanford University, Stanford, CA	July 1993 – Dec. 1998

ENGINEERING EXPERIENCE

Associate Engineer	Radian Corporation, Austin, TX	Aug. 1991 – Aug. 1992
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Passed Engineer-in-Training (EIT) licensure examination, 1993 (California license XE089121).

FUNDED RESEARCH PROJECTS

- IRES: Sustainable clean water technologies for the UN's Millennium Development Goals -- a partnership between UNESCO-IHE (Delft, Netherlands) and Univ. South Florida.* D. Yeh (PI), N. Alcantar, J. Cunningham, R. Izurieta, and M. Trotz. Funded by the National Science Foundation (NSF), 1 June 2009 – 31 May 2012: \$149,932.
- Carbon Sequestration Evaluation and Technologies.* M. Stewart (PI), J. Cunningham, and M. Trotz. Funded by the Florida Energy Systems Consortium (FESC), 27 Feb 2009 – 5 August 2011: \$479,640.
- Geochemical modeling of waste stream injection into deep aquifers.* M. Trotz (PI), M. Stewart, and J. Cunningham. Funded by Environmental Consulting and Technology (ECT), Inc., 12 September 2007 – 2 November 2007: \$32,305.
- Development of a new engineering course for non-engineering majors: "Global warming: politics & science of a contemporary issue."* J. Cunningham (PI). Funded by USF College of Engineering, summer 2007: \$10,000.
- Evaluation of subsurface sequestration of carbon dioxide (CO₂) at the Polk Power Station: Physical and chemical modeling.* J. Cunningham (PI) and M. Stewart. Funded by Tampa Electric Company (TECO), 16 May 2007 – 15 August 2008: \$107,453.
- Towards sustainable healthy communities: Communicating science and risks of emerging micropollutants in reclaimed water.* J. Cunningham (PI), F. Jaward, D. Holtzhausen, and D. Yeh. Funded by the State of Florida through the University of South Florida, 1 May 2007 – 30 April 2009: \$392,400.
- Optimization of reverse osmosis membrane system at the Dunedin water treatment facility: Understanding and control of membrane fouling.* D. Yeh (PI) and J. Cunningham. Funded by the City of Dunedin (Florida), 1 April 2007 – 31 March 2010: \$105,000.
- Macro-percolation rates in Hillsborough County closed basins.* M. Nachabe (PI) and J. Cunningham. Funded by Hillsborough County (Florida), 2 January 2007 – 31 December 2008: \$200,000.
- Investigation of cleaning protocol improvement and lifetime extension for reverse osmosis membranes.* D. Yeh (PI), J. Cunningham, and L.D. Duke. Funded by the City of Dunedin (Florida), 1 July 2006 – 31 August 2007: \$29,985.
- Closed-loop catalytic treatment of contaminated soils.* J. Cunningham (PI). Funded by the Texas Hazardous Waste Research Center, 1 September 2004 - 15 February 2006: \$20,000.
- Effect of flow velocity on biodegradation of trichloroethene (TCE) and perchloroethene (PCE) during restoration of contaminated groundwater aquifers.* J. Cunningham (PI). Funded by the Texas Water Resources Institute, 2004 – 2005: \$5000.

REFEREED JOURNAL PUBLICATIONS

17. Okwen, R., M. Stewart, and J.A. Cunningham, **2009**. Analytical Solution for Estimating Storage Efficiency of Geologic Sequestration of CO₂. *International Journal of Greenhouse Gas Control*, accepted for publication.
16. Wee, H.-Y., and J.A. Cunningham, **2009**. Soil treatment by solvent extraction and catalytic hydrodehalogenation. *International Journal of Environment and Waste Management (IJEWM)*, accepted for publication.
15. Wee, H.-Y., and J.A. Cunningham, **2008**. Palladium-catalyzed hydrodehalogenation of 1,2,4,5-tetrachlorobenzene in water-ethanol mixtures. *Journal of Hazardous Materials*, 155(1–2), 1–9. doi: 10.1016/j.jhazmat.2007.10.045
14. Cunningham, J.A., and Z.J. Fadel, **2007**. Contaminant degradation in physically and chemically heterogeneous aquifers. *Journal of Contaminant Hydrology*, 94(3–4), 293–304. doi: 10.1016/j.jconhyd.2007.07.011

REFEREED JOURNAL PUBLICATIONS (CONTINUED)

13. Mendoza-Sanchez, I., and J.A. Cunningham, **2007**. Efficient algorithm for modeling transport in porous media with mass exchange between mobile fluid and reactive stationary media. *Transport in Porous Media*, 68(3), 285–300.
12. Hoelen, T.P., J.A. Cunningham, G.D. Hopkins, C.A. Lebrón, and M. Reinhard, **2006**. Bioremediation of cis-DCE at a sulfidogenic site by amendment with propionate. *Ground Water Monitoring & Remediation*, 26(3), 82–91.
11. Cunningham, J.A., and I. Mendoza-Sanchez, **2006**. Equivalence of two models for biodegradation during contaminant transport in groundwater. *Water Resources Research*, 42(2), W02416, doi: 10.1029/2005WR004205.
10. Cunningham, J.A., J.J. Deitsch, J.A. Smith, and M. Reinhard, **2005**. Quantification of contaminant sorption-desorption time-scales from batch experiments. *Environmental Toxicology and Chemistry*, 24(9), 2160–2166.
9. Cunningham, J.A., T.P. Hoelen, G.D. Hopkins, C.A. Lebrón, and M. Reinhard, **2004**. Hydraulics of recirculating well pairs for ground water remediation. *Ground Water*, 42(6), 880-889.
8. Lin, A., J.F. Debroux, J.A. Cunningham, and M. Reinhard, **2003**. Comparison of rhodamine WT and bromide in the determination of hydraulic characteristics of constructed wetlands. *Ecological Engineering*, 20(1), 75–88.
7. Cunningham, J.A., and M. Reinhard, **2002**. Injection-extraction treatment well pairs: An alternative to permeable reactive barriers. *Ground Water*, 40(6), 599–607.
6. Cunningham, J.A., H. Rahme, G.D. Hopkins, C.A. Lebrón, and M. Reinhard, **2001**. Enhanced *in situ* bioremediation of BTEX-contaminated groundwater by combined injection of nitrate and sulfate. *Environmental Science & Technology*, 35(8), 1663–1670.
5. Cunningham, J.A., G.D. Hopkins, C.A. Lebrón, and M. Reinhard, **2000**. Enhanced anaerobic bioremediation of groundwater contaminated by fuel hydrocarbons at Seal Beach, California. *Biodegradation*, 11(2-3), 159–170.
4. Cunningham, J.A., M.N. Goltz, and P.V. Roberts, **1999**. Simplified expressions for spatial moments of ground-water contaminant plumes. *Journal of Hydrologic Engineering*, 5(4), 377–380.
3. Cunningham, J.A., and P.V. Roberts, **1998**. Use of temporal moments to investigate the effects of non-uniform grain-size distribution on the transport of sorbing solutes. *Water Resources Research*, 34(6), 1415–1425.
2. Cunningham, J.A., C.J. Werth, M. Reinhard, and P.V. Roberts, **1997**. Effects of grain-scale mass transfer on the transport of volatile organics through sediments, 1: Model development. *Water Resources Research*, 33(12), 2713–2726.
1. Werth, C.J., J.A. Cunningham, P.V. Roberts, and M. Reinhard, **1997**. Effects of grain-scale mass transfer on the transport of volatile organics through sediments, 2: Column results. *Water Resources Research*, 33(12), 2727–2740.

MANUSCRIPTS IN REVIEW/PREPARATION

- Mendoza-Sanchez, I., and J.A. Cunningham. Effect of pore velocity on the biodegradation of cis-DCE in column experiments. Under review for publication in *Biodegradation*.
- Okwen, R., R. Pu., and J. Cunningham. Quantifying heat effects from fossil-fueled power plants using remote sensing techniques: Case study, Tampa Bay. Under review for publication in *Environmental Monitoring and Assessment*.

PUBLISHED CONFERENCE PROCEEDINGS (SELECTED)

- Goldman, J.E., R. Ferlita, M. Keen, J. Cunningham, L.D. Duke, and D. Yeh, "Multi-level systematic evaluation of cleaning protocols for reverse osmosis membranes in drinking water treatment." Proceedings of the American Membrane Technology Association / Southeast Desalting Association (AMTA/SEDA) 2008 Joint Conference and Exposition. Presented in Naples, FL, July 14–17, 2008.
- Wee, H.Y., and J.A. Cunningham, "Effect of solvent composition on the Pd-catalyzed hydrodehalogenation of halogenated hydrophobic organic compounds." American Chemical Society, Division of Environmental Chemistry, Preprints of Extended Abstracts, vol 46, no 2, pp 458–463. Presented at the 232nd ACS National Meeting, San Francisco, CA, Sept 10–14, 2006.
- Reinhard, M., G.D. Hopkins, J. Cunningham, and C.A. Lebron, "From laboratory study to full scale application: Treating groundwater for TCE removal using catalyzed reductive dechlorination." American Chemical Society, Division of Environmental Chemistry, Preprints of Extended Abstracts, vol 46, no 2, pp 444–447. Presented at the 232nd ACS National Meeting, San Francisco, CA, Sept 10–14, 2006.
- Munakata, N., J.A. Cunningham, M. Reinhard, R. Ruiz, and C. Lebrón, "Palladium catalysis in horizontal flow treatment wells: Field-scale design and laboratory study." Proceedings of the Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds, edited by A.R. Gavaskar and A.S.C. Chen. Published by Battelle Press, Columbus, OH. Presented in Monterey, CA, May 20–23, 2002.
- Hoelen, T.P., J. Cunningham, C.A. Lebrón, and M. Reinhard, "Coupling of toluene oxidation with PCE dechlorination under sulfidogenic conditions." *Anaerobic Degradation of Chlorinated Solvents*, volume 6(7) of the Proceedings of the Sixth International In Situ and On-Site Bioremediation Symposium, edited by V. Magar, D. Fennell, J. Morse, B. Alleman, and A. Leeson, pp 95–102. Published by Battelle Press, Columbus, OH. Presented in San Diego, CA, June 4–7, 2001.
- Cunningham, J.A., G.D. Hopkins, M. Reinhard, and C.A. Lebrón, "Enhanced anaerobic in situ bioremediation of fuel hydrocarbons in groundwater at Seal Beach, California." *Groundwater 2000*, Proceedings of the International Conference on Groundwater Research, edited by P.L. Bjerg, P. Engesgaard, and T.D. Krom, pp 411–412. Published by A.A. Balkema Publishers, Rotterdam, Denmark. Presented in Copenhagen, Denmark, June 6–8, 2000.
- Cunningham, J.A., D.L. Freyberg, and P.V. Roberts, "Solute transport at the Borden field experiment: Grain- and field-scale rate limitations." *Groundwater: An Endangered Resource*, Proceedings of Theme C of the 27th Congress of the International Association for Hydraulic Research, Water for a Changing Global Community, edited by A.N. Findikakis and F. Stauffer, pp 65–70. Published by the American Society of Civil Engineers, New York, NY. Presented in San Francisco, CA, August 10–15, 1997.
- Thompson, P.A., C.A. Berry, A.P. Espenscheid, J.A. Cunningham, and J.M. Evans, "Estimating hydrocarbon emissions from triethylene glycol dehydration of natural gas." Proceedings of the SPE/EPA Exploration & Production Environmental Conference, pp 187–198. Published by the Society of Petroleum Engineers (SPE), Richardson, TX. Presented in San Antonio, TX, Mar. 7–10, 1993.

OTHER PUBLICATIONS (SELECTED)

- Goldman, J.E., R.E. Ferlita, M. Keen, J. Cunningham, L.D. Duke, and D. Yeh, "A multi-level, systematic evaluation of cleaning protocols for reverse osmosis membranes in drinking water treatment." *Solutions* [American Membrane Technology Association], Spring 2009, pp 10–16.
- Cunningham, J.A., and I. Mendoza-Sanchez. "Efficient algorithms for modeling the transport and biodegradation of chlorinated ethenes in groundwater." *Eos, Transactions of the American Geophysical Union*, vol 89, Fall meeting supplement, Abstract H21D-0838, December 2008. Presented at the American Geophysical Union 2008 Fall Meeting, San Francisco, CA, December 15–19, 2008.
- Okwen, R.T., and J.A. Cunningham. "Evaluating the effect of gravity on CO₂ plume behavior in deep confined saline aquifers." *Eos, Transactions of the American Geophysical Union*, vol 89, Fall meeting supplement, Abstract H23D-1010, December 2008. Presented at the American Geophysical Union 2008 Fall Meeting, San Francisco, CA, December 15–19, 2008.
- Kim, W.-S., and J.A. Cunningham, "Comparison of analytical methods with solid-phase extraction and solid-phase micro-extraction with derivatization for detecting and quantifying bisphenol-A in water." Society of Environmental Toxicology and Chemistry (SETAC), Abstract Book, SETAC North America 29th Annual Meeting. Presented in Tampa, FL, November 16–20, 2008.
- Cunningham, J.A., and I. Mendoza Sanchez, "How can we account for micro-scale biodegradation processes in macro-scale models of contaminant transport and degradation?" *Eos, Transactions of the American Geophysical Union*, vol 88, no 52, Fall meeting supplement, Abstract H32D-05, December 2007. Presented at the American Geophysical Union 2007 Fall Meeting, San Francisco, CA, December 10–14, 2007.
- Okwen, R., J. Nordbotten, M. Stewart, and J.A. Cunningham, "Analytical model for screening potential repositories for subsurface sequestration of CO₂." *Eos, Transactions of the American Geophysical Union*, vol 88, no 52, Fall meeting supplement, Abstract U43C-1393, December 2007. Presented at the American Geophysical Union 2007 Fall Meeting, San Francisco, CA, December 10–14, 2007.
- Mendoza-Sanchez, I., and J.A. Cunningham, "Modeling multi-species transport with non-linear reactions and mass exchange between mobile fluid and stationary porous medium." *Eos, Transactions of the American Geophysical Union*, vol 87, no 52, Fall meeting supplement, Abstract H41B-0401, December 2006. Presented at the American Geophysical Union 2006 Fall Meeting, San Francisco, CA, December 11–15, 2006.
- Guswa, A.J., J.A. Cunningham, and D.L. Freyberg, "A two-region model to account for slow advection through low-permeability lenses." *Eos, Transactions of the American Geophysical Union*, vol 80, Fall meeting supplement, Abstract H32A-08, December 1999. Presented at the American Geophysical Union 1999 Fall Meeting, San Francisco, CA.
- Cunningham, J.A., A.J. Guswa, D.L. Freyberg, and P.V. Roberts, "Use of temporal moment analysis to determine the importance of sorption kinetics for contaminant transport through heterogeneous groundwater aquifers." *Eos, Transactions of the American Geophysical Union*, vol 79, no 45, Fall meeting supplement, pg. F257, November 1998. Presented at the American Geophysical Union 1998 Fall Meeting, San Francisco, CA, Dec. 6–10, 1998.
- Cunningham, J.A., W.P. Ball, and P.V. Roberts, "Series diffusion model for the sorption kinetics of halogenated organic compounds on Borden aquifer sand." *Eos, Transactions of the American Geophysical Union*, vol 79, no 17, Spring meeting supplement, pg. S97, April 1998. Presented at the American Geophysical Union 1998 Spring Meeting, Boston, MA, May 26–29, 1998.
- Thompson, P.A., J.A. Cunningham, C.A. Berry, and J.M. Evans, "PC program estimates BTEX, VOC emissions." *Oil and Gas Journal*, vol 91, no 24, pp 36–41, June 14, 1993.

COURSES TAUGHT

- Environmental Systems Engineering.* Undergraduate-level class introducing students to the most important topics of environmental engineering, including environmental chemistry, water quality and treatment, wastewater treatment, air pollution, and solid waste management.
- Global Warming: Science and Politics of a Contemporary Issue.* Undergraduate-level class designed to engage students of all disciplines (i.e., non-science/non-engineering) in critical analysis of scientific evidence and proposed policy options related to global climate change.
- Physical and Chemical Principles in Environmental Engineering.* Graduate-level class emphasizing the chemical properties, physical processes, and environmental characteristics that determine the fate and transport of contaminants in the environment.
- Physical and Chemical Processes in Environmental Engineering.* Graduate-level class covering unit processes commonly used to treat domestic water supply and/or to treat contaminated environmental media.
- Transport in Porous Media.* Graduate-level class examining the fundamental phenomena governing scalar transport in porous media, with particular application to contaminant transport in groundwater.
- Groundwater Engineering.* Graduate-level class presenting analytical and numerical methods for solving practical groundwater problems under steady and non-steady flow conditions, e.g., flow to and from wells, delineation of capture zones, design of simple capture systems.
- Introduction to Human Exposure Analysis* (team taught). Graduate-level multi-media class concerned with human exposure to hazardous chemicals in the environment. My lectures covered mass transfer and contaminant fate and transport as they pertain to human exposure and to uptake of contaminants during an exposure event.

PROFESSIONAL SERVICE

Manuscript reviewer for several prominent scientific journals (listed alphabetically):

- Advances in Water Resources* (Elsevier);
- Applied Catalysis B: Environmental* (Elsevier);
- Environmental Engineering Science* (Mary Ann Liebert, Inc.);
- Environmental Science & Technology* (American Chemical Society);
- Environmental Toxicology and Chemistry* (Society of Environmental Toxicology and Chemistry);
- Ground Water* (National Ground Water Association);
- Ground Water Monitoring & Remediation* (National Ground Water Association);
- Journal of Contaminant Hydrology* (Elsevier);
- Journal of Environmental Engineering* (American Society of Civil Engineers);
- Journal of Hazardous Materials* (Elsevier);
- Journal of Hydrology* (Elsevier);
- Journal of Hydrologic Engineering* (American Society of Civil Engineers);
- Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management* (ASCE);
- Soil and Sediment Contamination* (Taylor & Francis);
- Water Resources Research* (American Geophysical Union).

Proposal reviewer for national and international funding agencies:

- Department of Energy (DoE);
- National Institutes of Health (NIH);
- National Science Foundation (NSF);
- U.S. Civilian Research & Development Foundation (CRDF).

HONORS AND AWARDS

Editor's Citation for Excellence in Refereeing, awarded by *Water Resources Research*, 2006.
Editor's Citation for Excellence in Refereeing, awarded by *Water Resources Research*, 1999.
Invited Speaker, American Geophysical Union 1997 Fall Meeting.
Outstanding Student Paper, Hydrology Section, American Geophysical Union 1996 Fall Meeting.
U.S. Environmental Protection Agency (EPA) Graduate Fellowship, 1995–1998.
National Science Foundation (NSF) Graduate Fellowship, 1992–1995.
B.S. conferred Magna Cum Laude, Rice University, May 1991.
Member of Phi Beta Kappa and Tau Beta Pi scholastic honor societies.

GRADUATE STUDENT ADVISEES

Allen, Whitney (co-advised by Prof A Ashmawy). M.S., University of South Florida, 2005. Thesis title: *Relationship between plasticity ratio and hydraulic conductivity for bentonite clay during exposure to synthetic landfill leachate.*

Dey, Dipesh. Ph.D., University of South Florida, expected 2012.

Engleson, Joel. Ph.D., University of South Florida, expected 2011.

Fadel, Ziad. M.S., Texas A&M University, 2005. Thesis title: *Stochastic modeling of transport and degradation of reactive solutes in heterogeneous aquifers.*

Goldman, Josh (co-advised by Prof L Donald Duke). M.S., University of South Florida, 2007. Thesis title: *Relationship between biofilm removal and membrane performance using Dunedin Reverse Osmosis Water Treatment plant as a case study.*

Kim, Won-Seok. Ph.D., University of South Florida, expected 2011.

Masi, Michelle. M.S., University of South Florida, expected 2010.

Mendoza, Itza. Ph.D., Texas A&M University, 2007. Dissertation title: *Effects of pore-scale velocity and pore-scale physical processes on contaminant biodegradation during transport in groundwater: Modeling and experiments.*

Okwen, Roland. Ph.D., University of South Florida, expected 2009.

Osborn, Claire. M.S., University of South Florida, expected 2010.

Thomas, Mark. M.S., University of South Florida, expected 2010.

Wee, Hun-Young. Ph.D., Texas A&M University, 2007. Dissertation title: *Remedial extraction and catalytic hydrodehalogenation for treatment of soils contaminated by halogenated hydrophobic organic compounds.*