

Neil E. Klepeis, Ph.D.

Human Exposure and Environmental Health Scientist

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Consulting Assistant Professor, Stanford University, Civil & Environmental Engineering
Adjunct Assistant Professor, San Diego State University, Graduate School of Public Health
Senior Research Affiliate, Education, Training & Research Associates

Research Interests

Secondhand Tobacco Smoke Exposure; Exposure Reduction Strategies; Health Promotion; Human Exposure Data Analysis; Human Activity Patterns; Exposure Modeling; Indoor Air Quality; Airborne Particulate Matter; Real-Time Monitoring of Environmental Contaminants; Exposure Tracking; Quantitative Space-Time Characterization of Health-Related Social Behavior; Complexity and Agent-Based Simulation

Education

Ph.D., Environmental Health Sciences, University of California at Berkeley, 2004 (William W. Nazaroff, advisor in Civil and Environmental Engineering); Dissertation: *“Using Computer Simulation to Explore Multi-Compartment Effects and Mitigation Strategies for Exposure to Residential Secondhand Tobacco Smoke.”*

M.S., Chemistry, Stanford University, 1992 (Wesley D. Allen, advisor in Quantum Chemistry).

B.A., Chemistry, Colgate University, Magna Cum Laude, 1989 (Quang Shen, advisor in Physical Chemistry).

Research Positions

Adjunct Assistant Professor; 2007-present; San Diego State University, Graduate School of Public Health, Project: “Real-Time Feedback as a Catalyst for Smoke-Free Homes”; Grant awarded from Tobacco Related Disease Research Program (TRDRP); Co-Investigators: Suzanne Hughes and Melbourne Hovell.

Consulting Assistant Professor; 2006-present; Stanford University, Stanford, CA, Department of Civil and Environmental Engineering; Projects: “Human Exposure Analysis for Pollutants from Secondhand Tobacco Smoke” and “Exposure to Secondhand Smoke: The Effects of Proximity”; Grants Awarded from: Flight Attendant Medical Research Institute (FAMRI) and Tobacco Related Disease Research Program (TRDRP); Co-investigators: Lynn Hildemann, Wayne Ott, and James Repace.

Senior Research Affiliate; 2006-present; ETR Associates, Scotts Valley, CA, Department of Research; Project: “Computer Simulation as a Tool in Reducing Secondhand Smoke Exposure”; Grants Awarded From: Tobacco Related Disease Research Program (TRDRP) and National Institutes of Health (NIH), National Institute on Drug Abuse (NIDA); Co-investigators: Pamela Drake and Jonathan Winickoff.

Post-Doctoral Researcher; 2004-2006; Stanford University, Department of Statistics; Project: "Quantifying Human Exposure to Secondhand Smoke"; Grants Awarded from: California Department of Health Services Tobacco Control Section and Flight Attendant Medical Research Association (FAMRI); Paul Switzer, Principal Investigator; Wayne Ott, Co-investigator.

Graduate Researcher; 2003; Center for Exposure and Health Tracking, University of California at Berkeley, Center for Occupational and Environmental Health (COEH), School of Public Health.

Graduate Researcher; 1997-2002; Lawrence Berkeley National Laboratory, Indoor Environment Department, EPA University Partnership Project: "Multi-Domain Framework for Integrating Models and Measurements of Multimedia Environmental Contaminants"; Thomas McKone, Principal Investigator; Halûk Özkaynak, EPA Project Director.

Ph.D. Student; 1997-2004; University of California at Berkeley, School of Public Health, Environmental Health Sciences Division; William W. Nazaroff, advisor.

Independent Consultant; 1997-2001; Stanford University Award, Dept. of Statistics; Grant Awarded from: Tobacco Related Disease Research Program of California (TRDRP); Paul Switzer, Principal Investigator; Wayne Ott, Co-investigator.

Graduate Researcher; 1997-1998; Center for Occupational and Environmental Health, University of California at Berkeley; S. Katharine Hammond, Supervisor.

Senior Scientist; 1995-1997; Lockheed Martin, Las Vegas, NV; Technical and Research Support for EPA Activity Pattern and Exposure Modeling Projects, Steve Hern, EPA Project Director; William Engelmann, EPA Project Manager.

Project Manager; 1994-1995; Information Systems and Services, Inc., Las Vegas, NV; Technical and Research Support for EPA Activity Pattern and Exposure Modeling Projects, Niren Nagda, Project Director; Steve Hern, EPA Project Director; Joseph Behar, EPA Project Manager.

Research Consultant; 1993-1994; Stanford University, Dept. of Statistics; Grant Awarded from: Tobacco Related Disease Research Program of California (TRDRP); Paul Switzer, Principal Investigator; Wayne Ott, Co-investigator.

Graduate Researcher; 1989-1991; Stanford University, Department of Chemistry.

Undergraduate Researcher, 1986-1989; Colgate University, Department of Chemistry.

Teaching and Speaking Experience

Supervision and Teaching of Stanford Graduate Students, Stanford University, July 2008 – June 2010, Mentoring and practical education of Ph.D. students in computer programming, manuscript preparation, data analysis, exposure assessment, experimental procedures, and experimental design.

Public Real-Time Demonstration of Pollution from Smoking in Cars, Salt Lake City, UT, May 30, 2008; In support of Utah state efforts to educate citizens about the dangers of smoking in cars with children present.

Lecture to PROJECT RIDE on dangers of smoking in automobiles, Oakland, CA, January 26, 2008, hosted by Stella Jun.

Public Real-Time Demonstration of Pollution from Smoking in Cars, Hollywood, CA, January 3, 2008; In support of new California law banning smoking in automobiles with minors present.

- Training and Lecture for California Tobacco Control Specialists, Sacramento, CA, September 19, 2007; Presented data on outdoor tobacco air monitoring, car monitoring, and the role of air pollution messaging in tobacco control efforts.
- Public Comments; Santa Monica City Council Meeting; In Support of an Ordinance to Ban Outdoor Smoking in all Dining Areas and Service Areas Within 20 feet of all Entrances and Windows to Buildings Open to the Public, at Farmers' Markets, and on the Third Street Promenade. Motion Passed with a vote of 5-to-1; July 25, 2006.
- Invited Speaker; California Department of Health Services, Tobacco Control Section, Conference: Smoke-Free California: Where We Live, Work, and Play, "Monitoring Airborne Levels of Outdoor and In-Vehicle Secondhand Tobacco Smoke," May 16, 2006.
- Invited Speaker; Ontario Tobacco Research Unit, University of Toronto in Collaboration with the Centre for Addiction and Mental Health; Workshop on Biological and Atmospheric Measurement of Tobacco Use and Exposure in Transdisciplinary Research; Dr. Roberta Ferrence, host; "*Comparing Methods for the Real-Time Measurement of Secondhand Tobacco Smoke Particles,*" May 19-20, 2005.
- Invited Speaker; Air Quality Group Seminar, Department of Civil and Environmental Engineering, Stanford University; Lynn Hildemann, host; "*Measuring Proximate Exposure to Sources of Air Pollution in Outdoor Microenvironments*"; February 8, 2005.
- Invited Speaker; Environmental Energy Technologies Division Seminar, Lawrence Berkeley National Laboratory, Berkeley, CA; Brett Singer, host; "*Using Mathematical Models in Public Health: The Case of Residential Exposure to Secondhand Tobacco Smoke*"; November 11, 2004.
- Invited Lecturer; Environmental Health Seminar ENVH 580; L.-J. Sally Liu, Instructor; University of Washington, Department of Environmental Health; "*The Science of Exposure: Theory and Experiment*"; June 2004.
- Invited Lecturer; "Exposure Assessment"; James Leckie, Instructor; Stanford University, Department of Civil and Environmental Engineering; Fall 2002.
- Graduate Student Instructor; "Introduction to Environmental Health Sciences"; Kirk Smith, Instructor; University of California at Berkeley, School of Public Health; Fall 2000.
- Invited Lecturer; "Exposure Assessment"; James Leckie, Instructor; Stanford University, Department of Civil and Environmental Engineering; Fall 1997.
- Instructor; "Introduction to the BASIC Computer Language"; Las Vegas Community College; Fall 1996.
- Graduate Student Instructor; "Physical Chemistry" ; Wesley D. Allen, Instructor, Stanford University, Department of Chemistry, Fall 1990.
- Graduate Student Instructor; "Introduction to Chemistry"; Stanford University, Department of Chemistry; Fall 1989.

Memberships, Distinctions, and Service

International Society of Exposure Analysis, 1995.

American Chemical Society, 1997.

Haskell-Shiff Memorial Award (most promising in Physical Chemistry), Colgate University, 1986.

Phi Beta Kappa, 1989.

Reviewer for the US Environmental Protection Agency's *Exposure Factors Handbook*, 1995.

Reviewer of US Surgeon General's Report *The Health Consequences of Involuntary Exposure to Tobacco Smoke*, 2004.

Referee for professional journals, 1997-present:

- *Journal of Exposure Analysis and Environmental Epidemiology*
- *Environmental Health Perspectives*
- *Atmospheric Environment*
- *Risk Analysis*
- *The Science of the Total Environment*
- *Tobacco Control*
- *Journal of the Air and Waste Management Association*
- *Indoor Air*

Journal Articles

Ott WR, Klepeis NE, Switzer P (2007) Air change rates of motor vehicles and in-vehicle pollutant concentrations from secondhand smoke. *Journal of Exposure Science and Environmental Epidemiology*. Published online: doi:10.1038/sj.jes.7500601.

Klepeis NE, Ott WR, and Switzer P (2007) Real-time measurement of outdoor tobacco smoke particles. *Journal of the Air and Waste Management Association*. 57:522-534.

Klepeis NE and Nazaroff WW (2006) Modeling residential exposure to secondhand tobacco smoke. *Atmospheric Environment* 40(23):4393-4407.

Klepeis NE and Nazaroff WW (2006) Mitigating residential exposure to secondhand tobacco smoke. *Atmospheric Environment* 40(23):4408-4422.

Ott WR, Klepeis NE, Switzer P (2003) Analytical solutions to compartmental indoor air quality models with application to environmental tobacco smoke concentrations measured in a house. *Journal of the Air and Waste Management Association* 53:918-936.

Klepeis NE, Apte MG, Gundel LA, Sextro RG, Nazaroff WW (2003) Determining size-specific emission factors for environmental tobacco smoke particles. *Aerosol Science & Technology* 37(10): 780-790.

Klepeis NE, Nelson WC, Ott WR, Robinson J, Tsang AM, Switzer P, Behar JV, Hern S, and Engelmann W (2001). The national human activity pattern survey (NHAPS): A resource for

assessing exposure to environmental pollutants. *Journal of Exposure Analysis and Environmental Epidemiology* 11(3):231-252.

Klepeis NE, Ott WR, and Repace JL (1999) The effect of cigar smoking on indoor levels of carbon monoxide and particles. *Journal of Exposure Analysis and Environmental Epidemiology* 9(6): 622-635.

Klepeis NE (1999) Validity of the uniform mixing assumption: Determining human exposure to environmental tobacco smoke. *Environmental Health Perspectives* 107(Supp2): 357-363.

Klepeis NE (1999) An introduction to the indirect exposure assessment approach: Modeling human exposure using microenvironmental measurements and the recent national human activity pattern survey. *Environmental Health Perspectives* 107(Supp2): 365-374.

Klepeis NE, Ott WR, and Switzer P (1996) A multiple-smoker model for predicting indoor air quality in public lounges. *Environmental Science and Technology*, 30(9): 2813-2820.

Klepeis NE, East ALL, Csaszar AG, Allen WD, Lee TJ, and Schwenke DW (1993) The [FHCI]⁻ molecular anion - structural aspects, global surface, and vibrational eigenspectrum. *Journal of Chemical Physics* 99(5):3865-3897.

Journal Articles in Preparation

Ott WR, Klepeis NE, Rozenberg D, Switzer P "Evaluation of an Indoor-Outdoor Air Quality Model Using Continuous Measurements of Particulate PAH in Several Homes," 2008.

Klepeis NE, Ott WR, Switzer P "Quantifying Proximate Exposure to Sources of Outdoor Air Pollution," 2008.

Ferro AR, Klepeis NE, Ott WR, Nazaroff WW, Switzer P, Hildemann L "Measuring the Effect of Door and Window Position on Multi-Room Air Pollutant Concentrations in Residences," 2008.

Klepeis NE, Switzer P, Ott WR "An Averaging-Time Model for Ambient Particulate Matter Concentrations," 2008.

Book Chapters

Klepeis NE "Modeling Human Exposure to Air Pollution," In: *Human Exposure Analysis*, edited by Wayne R. Ott, Lance A. Wallace, and Anne Steinemann, CRC Press, 2006.

Nazaroff WW and Klepeis NE "Environmental Tobacco Smoke Particles," In: *Indoor Environment: Airborne Particles and Settled Dust*, edited by Lidia Morawska and Tunga Salthammer, Wiley-VCH, Weinheim, October 2003.

Repace JL, Ott WR, and Klepeis NE "Indoor Air Pollution from Cigar Smoke," In: *Cigars: Health Effects and Trends*, Smoking and Tobacco Control Monograph No. 9, edited by Donald R. Shopland, National Cancer Institute, National Institutes of Health, February 1998.

Technical Reports

Klepeis, NE, Ott WR, Switzer P "Real-Time Monitoring of Outdoor Environmental Tobacco Smoke Concentrations: A Pilot Study," Technical Report, Department of Statistics, Stanford University, Stanford, CA, Contract No. 3317SC, University of California at San Francisco, Prepared for the State of California, Tobacco Control Section, Sacramento, CA, March 2004.

Klepeis NE, Switzer P, and Ott WR "Estimating Potential Exposure to Environmental Tobacco Smoke Particles Using 24-Hour Recall Diaries from Three Human Activity Pattern Surveys Conducted on California Populations," Tobacco-Related Disease Research Program of the State of California (University of California), Grant No. 6RT-0118, Department of Statistics, Stanford University, Stanford, CA, 2001.

Klepeis NE, Ott WR, Switzer P "Determining Parameters of a Two-Compartment Indoor Air Quality Model From Experimental Data: Computer Optimization Using a Grid Search Method," Tobacco-Related Disease Research Program of the State of California (University of California), Grant No. 6RT-0118, Department of Statistics, Stanford University, Stanford, CA, 2001.

Tsang AM and Klepeis NE "Three Telephone Surveys of Human Activity Patterns in California: The 1992-94 National Human Activity Pattern Survey; the 1987-88 California Activity Pattern Survey of Adults and Youth; and the 1989-90 California Activity Pattern Survey of Children," Draft Technical Report, US EPA, Washington D. C., 1998.

Klepeis NE, Tsang AM, and Behar JV "Analysis of the National Human Activity Pattern Survey (NHAPS) Responses from a Standpoint of Exposure Assessment." Technical Report, EPA/600/R-96/074, US EPA, Washington D. C., 1996.

Tsang AM and Klepeis NE "A Detailed Analysis of the National Human Activity Pattern Survey (NHAPS) Respondents." Technical Report, EPA/600/R-96/148, US EPA, Washington D. C., 1996.

Klepeis NE "User's and Programmer's Manual for the Total Human Exposure Model (THEM), Version 1.0.," Technical Report, Stanford University, 1994.

Conference Presentations and Proceedings

Hildemann L, Klepeis NE, Ott WR, Repace JL. Poster on "Exposure Measurements Can Reduce Tobacco Smoke Exposure Around the World," 7th Annual Flight Attendant Medical Research Institute (FAMRI) Scientific Symposium, Boston, MA, May 2008.

Switzer P, Klepeis NE, Ott WR. Oral Presentation and First Prize in Poster Contest: "Quantifying Human Exposure to Secondhand Tobacco Smoke," 5th Annual Flight Attendant Medical Research Institute (FAMRI) Scientific Symposium, Cambridge, MA, May 2006.

Ott WR, Klepeis NE, Switzer P. "Measuring and Modeling Exposure to Secondhand Smoke In Vehicles," Presentation at the 15th International Society of Exposure Analysis (ISEA) Annual Conference, Tuscon, AZ, October 30 – November 3, 2005.

Switzer P, Ott WR, Klepeis, NE. Poster Presentation: "Quantifying Human Exposure to Secondhand Tobacco Smoke," 4th Annual Flight Attendant Medical Research Institute (FAMRI) Scientific Symposium, Miami, FL, May 2005.

Klepeis NE, Ott WR, and Switzer P "Human Exposure to Outdoor Secondhand Tobacco Smoke," Poster presentation at the 14th International Society of Exposure Analysis (ISEA) Annual Conference, Philadelphia, PA, October 17-21, 2004.

Ott WR, Klepeis NE, Rozenberg D, and Switzer P "Continuous Measurements of Indoor-Outdoor Particular Polycyclic Aromatic Hydrocarbon (PPAH) Concentrations in Seven Homes with Application to Indoor Mass-Balance Model Parameters and Prediction Error," Platform presentation at the 14th International Society of Exposure Analysis (ISEA) Annual Conference, Philadelphia, PA, October 17-21, 2004.

Klepeis NE, Switzer P, Ott WR "Development of Averaging Time Models for Particulate Air Pollutants," Poster presentation at ISEA/ISEE Joint Conference, Vancouver, BC, August 11-15 2002.

Klepeis NE and Nazaroff WW "Characterizing Size-Specific Environmental Tobacco Smoke Particle Emissions," 9th Annual Conference on Indoor Air Quality and Climate, Indoor Air 2002, Monterey, CA, June 30-July 5, 2002.

Klepeis NE and W. W. Nazaroff. "Determining Size-Resolved Particle Emission Profiles for Sources of Environmental Tobacco Smoke," PM-2000: Particulate Matter and Health, The Scientific Basis for Regulatory Decision-Making Specialty Conference and Exhibition. Charleston, SC, January 24, 2000.

Klepeis NE and W. W. Nazaroff. "Simulating Indoor Concentrations of Size-Resolved Particles: Emission Factors and Deposition Rates for ETS," 10th Annual Conference of the International Society of Exposure Analysis. October 24, 2000.

Repace JL, Ott WR, and Klepeis NE. "Mathematical Models for Predicting Indoor Environmental Tobacco Smoke (ETS) Concentrations: A Review." 10th Annual Conference of the International Society of Exposure Analysis. October 24, 2000.

Ott WR, Switzer P, and Klepeis NE "Determining Particle Emission Source Strengths for Common Residential Indoor Sources Using Real-Time Measurements and Piecewise Continuous Solutions to the Mass Balance Equation." 10th Annual Conference of the International Society of Exposure Analysis. October 24, 2000.

Ott WR, Switzer P, and Klepeis NE "Relationship Between Observed Fireplace Plume Activity in Residential Neighborhoods and Indoor-Outdoor Real-Time Particulate Aromatic Hydrocarbon (PPAH) Concentrations." 10th Annual Conference of the International Society of Exposure Analysis. October 24, 2000.

Ott WR, Wallace LA, Klepeis NE, Switzer P, Mage D, and Liroy P "Research Directions in Predicting Personal Exposure Distributions to Particles (PM-10) Using a Random Component Superposition (RCS) Model." 10th Annual Conference of the International Society of Exposure Analysis. October, 24, 2000.

Klepeis NE, Apte MG, Gundel LA, Nazaroff WW, and Sextro RG "Characterizing ETS Emissions From Cigars: Chamber Measurements of Nicotine, Particle Mass, and Particle Size." Proceeding of the 8th International Conference on Indoor Air Quality and Climate -- Indoor Air '99, 1999.

Klepeis NE, Ott WR, Switzer P, Zelenka M, Huber A, and Nelson W "Air Pollutant Time Series Analysis: Outdoor Sources of Carbon Monoxide and Polycyclic Aromatic Hydrocarbons." Joint Meeting of the Society for Risk Analysis and the International Society of Exposure Analysis. New Orleans, August 12, 1996.

Klepeis NE, Ott WR, Switzer P, Zelenka M, Huber A, and Nelson W "Optimization of a Real-Time Indoor-Outdoor Air Quality Model of Carbon Monoxide and Polycyclic Aromatic Hydrocarbons." Joint Meeting of the Society for Risk Analysis and the International Society of Exposure Analysis. New Orleans, August 12, 1996.

Klepeis NE, Ott WR, and Switzer P "Total Human Exposure Model (THEM) for Respirable Suspended Particles (RSP)." Paper Presented at the 87th Annual Meeting of the Air and Waste Management Association: Cincinnati, OH, June 19, 1994.

Ott WR., Wilson N, Klepeis NE and Switzer P "Real-time Monitoring of Polycyclic Aromatic Hydrocarbons and Respirable Suspended Particles from Environmental Tobacco Smoke in a Home." Paper Presented at the Air and Waste Management Symposium on Measurement of Toxic and Related Air Pollutants: Durham, NC, May 2-6, 1994.

Theses

Doctoral Dissertation: "Using Computer Simulation to Explore Multi-Compartment Effects and Mitigation Strategies for Residential Exposure to Secondhand Tobacco Smoke," University of California at Berkeley, 2004.

Masters Thesis: "The Potential Energy Surface and Vibrational Eigenspectrum of the FHC1- Molecular Anion," Stanford University, 1992.

Undergraduate Thesis, with high honors: "Using Computers to Aid in the Elucidation of Molecular Structure and Conformation Through the Phenomenon of Electron Diffraction," Colgate University, 1989.

Scientific Software

"A Software Package for Human Exposure Research Implemented in the R Language,"
2002-present.

"A Total Human Exposure Model for Airborne Particles Implemented in the BASIC Computer Language," 1994.