BIOGRAPHICAL SKETCH

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NAME: Patrick T. O'Shaughnessy

eRA COMMONS USER NAME (credential, e.g., agency login): OSHAUGHNESSY

POSITION TITLE: Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Vermont, Burlington, VT	B.S.	1980	Wildlife Biology
University of Vermont, Burlington, VT	M.S	1993	Civil Engineering
University of Vermont, Burlington, VT	Ph.D	1996	Environmental Engineering

A. Personal Statement

Professor O'Shaughnessy teaches courses in "Statistics for Experimenters" and "Air Pollution Control Technology." He is the Associate Head for Student Affairs and Curriculum in the department of Occupational and Environmental Health. He is the Director of the NIOSH-funded Heartland Center for Occupational Health and Safety, a training grant that helps provide stipend and tuition support to over 40 graduate students each year. He has developed expertise in the general area of aerosol physics, specializing in the assessment of aerosol sampling devices, the hazards associated with nanoparticles, the properties of respirators worn in agricultural environments, and the dispersion of dusts and gases spatially from air pollution sources.

B. Positions and Honors

Positions and Employment

1988-1997 Laboratory Technician, Department of Civil and Environmental Engineering, University of Vermont, Burlington, VT
1997-2003 Assistant Professor, Department of Occupational and Environmental Health (75%) and Department of Civil and Environmental Engineering (25%), The University of Iowa, Iowa City, IA
2002–present Associate Head for Student Affairs and Curriculum, Department of Occupational and Environmental Health, College of Public Health, The University of Iowa, Iowa City, IA
2003–2010 Associate Professor, Department of Occupational and Environmental Health (75%) and Department of Civil and Environmental Engineering (25%), The University of Iowa, Iowa City, IA
2010–present Professor, Department of Occupational and Environmental Health (75%) and Department of Civil and Environmental Engineering (25%), The University of Iowa, Iowa City, IA

Other Experience and Professional Memberships

1993- Member, American Association for Aerosol Research
1998- Member, American Industrial Hygiene Association

Honors

1994 & 2004 Outstanding Aerosol Paper Award, American Industrial Hygiene Association Journal
2002 Collegiate Teaching Award, University of Iowa
2008 Outstanding Individual Contributor Award, American Industrial Hygiene Association

2008 Certified Industrial Hygienist, American Board of Industrial Hygiene
2014 Fellow, American Industrial Hygiene Association

C. Contributions to Science

1. Environmental Exposure Assessment and Modeling: My research is related to both the assessment of exposures to ambient pollutants and the use of dispersion models to simulate pollutant migration from a source. Over the last three decades agricultural practices in Iowa have changed from family-owned and operated farms to mechanized, corporate-owned operations. Because they concentrate a large number of animals in a small area, these confined animal feeding operations (CAFOs) can produce large volumes of pollutant gases. My research with regards to pollutants in the ambient environment has therefore been primarily associated with CAFOs and their effect on local populations. Modelling efforts have also included those in collaboration with EHSRC member Dr. Ching-Long Lin who is renowned for his sophisticated computational fluid dynamic models of the human lung and the use of it to determine the deposition of particles in the lung. Examples of publications in this area include:
    a. O'Shaughnessy PT, Altmaier R. (2011) Use of AERMOD to determine a hydrogen sulfide emission factor for swine operations by inverse modeling. *Atmospheric Environment, 45*, 4617-4625. PMC: PMC3144569, PMID: DOI:10.1016/j.atmosenv.2011.05.061
    b. Pavilonis B, Anthony T, O'Shaughnessy PT, Humann M, Moore G, Thorne PS, Weisel C, Sanderson W. (2013) Indoor and outdoor particulate matter and endotoxin concentrations in an intensely agricultural county. *Journal of Exposure Science and Environmental Epidemiology, 23*, 299-305.
    c. Pavilonis BT, O'Shaughnessy PT, Altmaier R, Metwali N, Thorne PS. (2013) Passive monitors to measure hydrogen sulfide near concentrated animal feeding operations. *Environmental Sciences: Processes and Impacts, 15*, 1271-1278
    d. Lambert A, O'Shaughnessy PT, Tawhai M, Hoffman E, Lin CL (2011). Regional deposition of particles in an image-based airway model: Large-eddy simulation and left-right lung ventilation asymmetry. *Aerosol Sci Technol*, 45:11-25. PMC: PMC3034252
2. Engineering Aerosol Exposure Systems: My academic training was in the field of environmental engineering but my early research efforts were involved with the development of inhalation exposure systems and associated aerosol generation systems. Early papers were devoted to computer automation, including feedback control, of the generation of inorganic aerosols using a Wright dust feed. This effort included contributions to the science of stochastic control systems as the aerosol measurement signal contained a random component. I have continued this work throughout my career by aiding in the development of a small rodent exposure chamber now used extensively in our toxicology facility as well as a system for exposing humans to a consistent aerosol, and the characterization of an air-liquid interface in vitro exposure system. With the recent emphasis on nanoparticle toxicity, my efforts focused on the difficult task of producing a consistent nanoparticle aerosol for delivery to animal subjects despite the wide variety in bulk nanopowders characteristics; for example the “fluffy” nature of amorphous nano-silicon dioxide and the “sticky” nature of nano-titanium dioxide. I have 10 publications in this area including the following:
    a. O'Shaughnessy PT, Hemenway DR, Absher RG. (1996) System identification and feedback control of an aerosol production process. *Aerosol Sci Technol, 25*, 292-304.
    b. O'Shaughnessy PT, Achutan C, O'Neill ME, Thorne PS. (2003) A small whole-body exposure chamber for laboratory use. *Inhalation Toxicology, 15*(3), 251-263.
    c. Schmoll L, Elzey S, Grassian V, O'Shaughnessy PT. (2009) Nanoparticle aerosol generation methods from bulk powders for inhalation exposure studies. *Nanotoxicology, 3*(4), 265-275.
    d. Kim JS, Peters TM, O'Shaughnessy PT, Adamcakova-Dodd A, Thorne PS. (2013) Validation of an in vitro exposure system for toxicity assessment of air-delivered nanomaterials toxicology in vitro. *Toxicology in vitro, 27*, 164-173. PMC: PMC3950355.
3. Inhalation Toxicology Support: My early research career was associated with an inhalation toxicology facility at the University of Vermont where the emphasis of the studies conducted was related to crystalline silica and asbestos aerosol exposures. That experience provided me with the expertise

needed to support the inhalation toxicology research conducted at the University of Iowa which has emphasized the toxicology of organic aerosols and nanoparticles. My contributions to those studies were primarily associated with aerosol delivery and measurement. For example, inhalation systems were developed and well characterized prior to actual animal exposures using both whole-body and nose-only systems. Sophisticated instruments were used to continually monitor aerosol concentrations as well as to characterize their mass concentration and size distribution. The studies related to nanoparticle exposures were performed as a member of a large team that also included physical chemists and toxicologists. Our results were some of the first to demonstrate toxicological differences resulting from exposure to nanoparticles of varying sizes. We have added extensively to the literature with regards to the pulmonary toxicity of a number of metal and metal-oxide nanoparticles. I have 16 publications in this area including the following:

a. BeruBe KA, Quinlan TR, Moulton G, Hemenway DR, O'Shaughnessy PT, Vacek P, Mossman BT. (1996) Comparative proliferative and histopathological changes in rat lungs after inhalation of chrysotile and crocidolite asbestos. *Toxicol Appl Pharmacol, 137*, 67-74.

b. Grassian VH, Adamcakova-Dodd A, Pettibone JM, O'Shaughnessy PT, Thorne PS. (2007) Inflammatory response of mice to manufactured titanium dioxide nanoparticles: Comparison of size effects through different exposure routes *Nanotoxicology, 1*(3), 211-226.

c. Kim JS, Adamcakova-Dodd A, O'Shaughnessy PT, Grassian VH, Thorne PS. (2011) Effects of copper nanoparticle exposure on host defense in a murine pulmonary infection model. *Particle and Fibre Toxicology, 8*, 29. PMC: PMC3193802, PMID: DOI:10.1186/1743-8977-8-29

d. Adamcakova-Dodd A, Stebounova LV, Kim JA, Vorrink SU, Ault AP, O'Shaughnessy PT, Grassian VH, Thorne PS. (2014) Toxicity Assessment of ZnO Nanoparticles using Sub-acute and Sub-chronic Murine Inhalation Models. *Particle and Fibre Toxicology, 11*(15), 1-15. PMC: doi:10.1186/1743-8977-11-15.

4. Assessment/Enhancement of Aerosol Sampling Devices and Sensors: Another area of my research concerns the assessment and/or enhancement of aerosol sampling devices and sensors. Both gravimetric samplers and direct-reading instruments are commonly used to assess aerosol exposures in both inhalation toxicology and workplace settings. My research has helped to establish the use of direct-reading aerosol photometers for use as a sensor in a feedback control system to automatically control chamber-air flow rate, and therefore the aerosol concentration within the chamber. Additional studies have helped to develop ratios to compare the gravimetric concentrations obtained from aerosol samplers that have different collection characteristics in terms of the size of the particle that is captured on the filter. I have aided the field of industrial hygiene by providing guidance on the use of hand-held particle counters for assessing engineered nanoparticles that escape from fabrication equipment and become an inhalation hazard in workplaces**.** I have 10 publications in this area including the following:

   a. O'Shaughnessy PT, Hemenway DR. (2000) Characteristics of an aerosol photometer while automatically controlling chamber dilution-air flow rate. *Inhalation Toxicology, 12*, 101-118.

   b. O'Shaughnessy PT, Lo WY, Golla V, Nakatsu J, Tillery M, Reynolds S. (2007) Correction of sampler-to-sampler comparisons based on aerosol size distribution *Journal of Occupational and Environmental Health Hygiene, 4*(4), 237-245. PMID: 17365494

   c. Reynolds SJ, Nakatsu J, Tillery M, Keefe T, Mehaffy J, Thorne PS, Donham K, Nonnenmann M, Golla V, O'Shaughnessy PT. (2009) Field and wind tunnel comparison of four aerosol samplers using agricultural dusts. *Annals of Occupational Hygiene, 53*(6), 585-594. PMC: PMC2723214

   d. Schmoll L, Peters TM, O'Shaughnessy PT. (2010) Use of a condensation particle counter and an optical particle counter to assess the number concentration of engineered nanoparticles. *Journal of Occupational and Environmental Hygiene, 7*, 535-545.

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/patrick.o'shaughnessy.1/bibliography/41160130/public/?sort=date&direction=ascending

D. Research Support

ONGOING

T42 OH008491-08 O'Shaughnessy (PI) 07/01/00-06/30/19
Heartland Center for Occupational Safety and Health Occupational Safety and Health Training Grant–Education and Research Center (ERC)
The goal of this Center is to provide graduate training, continuing education and outreach in occupational safety and health to serve Federal Region VII (IA, KS, MO, NE)
Role: PI

P30 ES005605-20 Thorne (PI) 09/29/90-3/31/22
Environmental Health Sciences Research Center
The goal of the EHSRC is to promote research interactions among environmental health researchers at the UI, enhancing ongoing environmental health research and facilitating initiation of new collaborative and interdisciplinary environmental health research focused on rural populations.
Role: Environmental Modeling and Assessment Facility (Director)
Pulmonary Toxicology(Facility Co-Director)

U01 ES027252-01 Thorne (PI) 09/30/16 – 8/31/21
Biological Response Profiles of Selected Engineered Nanomaterials after Perinatal Exposure
The primary goal of this project is to conduct innovative research to elucidate biological response profiles associated with inhalation of commercially important engineered nanomaterials (ENMs) after perinatal exposure.
Role: Co-Investigator

COMPLETED

R21 OH009920-02 Peters (PI) 7/1/10-8/31/13
Methods to assess personal exposures to airborne metallic nanoparticles
The goal of this study is to standardize and validate measurement methods needed to quantify personal exposure to a range of metallic nanoparticles that are commonly incorporated into commercial products
Role: Co-Investigator

R01 OH009448-04 Grassian (PI) 4/01/08-3/31/2013
An integrated approach towards understanding the toxicity of inhaled nanomaterials
The goal of this study is to fully integrate studies of the physical and chemical properties of commercially manufactured nanoparticles with inhalation toxicological studies of these same nanoparticles to determine thought properties that most significantly affect nanoparticle toxicity.
Role: Co-Investigator

U50 OH007548-12 Gerr (PI) 10/31/2011-10/30/2014
Great Plains Center for Agricultural Health: Project A - Intervention to Reduce Exposures in Concentrated Animal Feeding Operations
The goal of this study is to develop and evaluate particulate control systems to minimize respirable aerosols in animal rearing buildings.
Role: Co-Investigator of Project