

Curriculum Vitae

Michael S. Waring, Ph.D.

Professor
Director of Architectural Engineering Program
Associate Department Head for Undergraduates
Department of Civil, Architectural and Environmental Engineering
College of Engineering @ Drexel University
3141 Chestnut St., Philadelphia, PA 19104, USA
Phone: (215) 895-1502
Email: m59@drexel.edu

Research Interests

- Indoor air quality and building sustainability
- Indoor oxidative chemistry; and indoor secondary organic aerosol (SOA) formation
- Aerosol dynamics, fate, and transport indoors and in HVAC systems
- Control of indoor aerosols; and secondary impacts of control technologies and strategies
- Control of infectious aerosols, particularly in context of COVID-19
- Intelligent and dynamic ventilation strategies
- Bio-filtration; and indoor microbiome

1. Education

- Ph.D. Civil Engineering, University of Texas at Austin, 2009
Dissertation: “Indoor Secondary Organic Aerosol Formation: Influence of Particle Controls, Mixtures, and Surfaces”
- M.S.E. Environmental Engineering, University of Texas at Austin, 2006
Thesis: “Smoking Bans as Particle Source Control and HVAC Component Loading due to Airborne Particle Mass Deposition”
- B.S.E. Architectural Engineering, University of Texas at Austin, 2005
- B.A. English (Special Honors) and Economics, University of Texas at Austin, 2000

2. Professional Appointments and Preparation

Professor, Drexel University	9/2020 to Present
Director of Architectural Engineering	9/2015 to Present
Associate Department Head for Undergraduates	9/2015 to Present
Associate Professor, Drexel University	9/2015 to 8/2020
Assistant Professor, Drexel University	9/2009 to 8/2015
Guest Researcher, National Institute for Occupational Safety and Health	9/2008 to 12/2008
Harrington Dissertation Fellow, University of Texas at Austin	9/2008 to 9/2009
NSF IGERT Trainee, University of Texas at Austin	9/2006 to 9/2008

3. Publications

- (Morawska, L., Milton, D. K. (2020). It is time to address airborne transmission of COVID-19. *Clin Infect Dis*, 6, ciaa939. -- I am one of 238 signatories.)
1. Kruza, M., McFiggans, G., **Waring, M.S.**, Wells, J.R., Carslaw, N. (2020). Indoor secondary organic aerosols: Towards an improved representation of their formation and composition in models. *Atmospheric Environment*, 240, 117784.
 2. Adams, R.I., Sylvain, I., Spilak, M.P., Taylor, J.W., **Waring, M.S.**, Mendell, M.J. (2020). Fungal signature of moisture damage in buildings: identification by targeted and untargeted approaches with mycobiome data. *Applied and environmental microbiology*, 86(17).
 3. Kohanski, M.A., Lo, L.J., **Waring, M.S.** (2020). Review of indoor aerosol generation, transport, and control in the context of COVID-19. In *International forum of allergy & rhinology*.
 4. Cummings, B.E., **Waring, M.S.** (2020). Potted plants do not improve indoor air quality: a review and analysis of reported VOC removal efficiencies. *Journal of Exposure Science & Environmental Epidemiology*, 30(2), 253-261.
 5. Cummings, B.E., Li, Y., DeCarlo, P.F., Shiraiwa, M., **Waring, M.S.** (2020). Indoor aerosol water content and phase state in US residences: impacts of relative humidity, aerosol mass and composition, and mechanical system operation. *Environmental Science: Processes & Impacts*.
 6. Katz, E.F., Goetz, J.D., Wang, C., Hart, J.L., Terranova, B., Taheri, M.L., **Waring, M.S.**, DeCarlo, P.F. (2019). Chemical and Physical Characterization of 3D Printer Aerosol Emissions with and without a Filter Attachment. *Environmental Science & Technology*, 54(2), 947-954.
 7. Allen, J.G., **Waring, M.S.** (2019). Harnessing the power of healthy buildings research to advance health for all. Editorial: *Journal of Exposure Science and Environmental Epidemiology*.
 8. Ben-David, T., Rackes, A., Lo, L. J., Wen, J., **Waring, M.S.** (2019). Optimizing ventilation: Theoretical study on increasing rates in offices to maximize occupant productivity with constrained additional energy use. *Building and Environment*, 166, 106314.
 9. Won, Y., **Waring, M.S.**, & Rim, D. (2019). Understanding the Spatial Heterogeneity of Indoor OH and HO₂ due to Photolysis of HONO Using Computational Fluid Dynamics Simulation. *Environmental Science & Technology*, 53(24), 14470-14478.
 10. Ampollini, L., Katz, E.F., Bourne, S., Tian, Y., Novoselac, A., Goldstein, A.H., Lucic, G., **Waring, M.S.**, DeCarlo, P.F. (2019). Observations and Contributions of Real-Time Indoor Ammonia Concentrations during HOMEChem. *Environmental Science & Technology*, 53(15), 8591-8598.
 11. Cummings, B., **Waring, M.S.** (2019). Predicting the Importance of Oxidative Aging on Indoor Organic Aerosol Concentrations using the Two-Dimensional Volatility Basis Set (2D-VBS). *Indoor air*.
 12. Shiraiwa, M., Carslaw, N., Tobias, D.J., **Waring, M.S.**, Rim, D., Morrison, G., ... & Won, Y. (2019). Modelling Consortium for Chemistry of Indoor Environments (MOCCIE): Integrating chemical processes from molecular to room scales. *Environmental Science: Processes & Impacts*.
 13. Avery, A.M., **Waring, M.S.**, DeCarlo, P.F. (2019). Human occupant contribution to secondary aerosol mass in the indoor environment. *Environmental Science: Processes & Impacts*.
 14. Avery, A.M., **Waring, M.S.**, DeCarlo, P.F. (2019). Seasonal variation in aerosol composition and concentration upon transport from the outdoor to indoor environment. *Environmental Science: Processes & Impacts*, 21(3), 528-547.
 15. DeCarlo, P.F., Avery, A.M., **Waring, M.S.** (2018). Thirdhand smoke uptake to aerosol particles in the indoor environment. *Science advances*, 4(5), p.eap8368.

16. Ben-David, T., Wang, S., Rackes, A., **Waring, M.S.** (2018). Measuring the efficacy of HVAC particle filtration over a range of ventilation rates in an office building. *Building and Environment* 144, 648-656.
17. Ben-David, T., Rackes, A., **Waring, M.S.** (2018). Simplified daily models for estimating energy consumption impacts of changing office building ventilation rates. *Building & Environment*, 127, 250-255.
18. Rackes, A., Ben-David, T., **Waring, M.S.** (2018). Outcome-based ventilation: A framework for assessing performance, health, and energy impacts to inform office building ventilation decisions. *Indoor Air*, (4), 585-603.
19. Wang, S., Zhang, Y., **Waring, M.S.**, Lo, L.J. (2018). Statistical analysis of wind data using Weibull distribution for natural ventilation estimation. *Science & Technology for the Built Environment*, 0, 1-11.
20. Rackes, A., Ben-David, T., **Waring, M.S.** (2018). Sensor networks for routine indoor air quality monitoring in buildings: Impacts of placement, accuracy, and number of sensors. *Science and Technology for the Built Environment* 24 (2), 188-197
21. Ben-David, T., **Waring, M.S.** (2018). Interplay of ventilation and filtration: Differential analysis of cost function combining energy use and indoor exposure to PM_{2.5} and ozone. *Building and Environment*, 128, 320-335.
22. Wells, J.R., Schoemaeker, C., Carslaw, N., Waring, M.S., Ham, J., Nelissen, J., Wolkoff, P. (2017). Reactive Indoor Air Chemistry and Health-A Workshop Summary. *International Journal of Hygiene and Environmental Health*, 220 (8), 1222-1229.
23. Morrison, G., Carslaw, N., **Waring, M.S.** (2017). A Modeling Enterprise for Chemistry of Indoor Environments (CIE). Editorial published in *Indoor Air*.
24. Morawska, L., Ayoko, G.A., Bae, G.N., Buonanno, G., Chao, C.Y H., Clifford, S., Mazaheri, M., Salthammer, T., **Waring, M.S.**, Wierzbicka, A. (2017). Airborne particles in indoor environment of homes, schools, offices and aged care facilities: The main routes of exposure. *Environment International*, 108, 75-83.
25. Ben-David, T., Rackes, A., **Waring, M.S.** (2017). Alternative ventilation strategies in US offices: Saving energy while enhancing work performance, reducing absenteeism, and considering outdoor pollutant exposure tradeoffs. *Building and Environment*, 116, 140-157.
26. Rackes, A., **Waring, M.S.** (2017). Alternative ventilation strategies in US offices: Comprehensive assessment and sensitivity analysis of energy saving potential. *Building and Environment*, 116, 30-44.
27. Johnson, A.M., **Waring, M.S.**, DeCarlo, P.F. (2017). Real-time transformation of outdoor aerosol components upon transport indoors measured with aerosol mass spectrometry. *Indoor Air*, 27, 230-240.
28. Adams, R.I., Bhangar, S., Dannemiller, K.C., Eisen, J.A., Fierer, N., Gilbert, J.A., Green, J.L., Marr, L.C., Miller, S.L., Siegel, J.A., Stephens, B., **Waring, M.S.**, Bibby, B. (2016). Ten questions concerning the microbiomes of buildings. *Building and Environment*.
29. **Waring, M.S.** (2016). Secondary organic aerosol formation by limonene ozonolysis: Parameterizing multi-generational chemistry in ozone-and residence time-limited indoor environments. *Atmospheric Environment*, 144, 79-86.
30. Youssefi, S., **Waring, M.S.** (2016). Predicting the evolution of secondary organic aerosol (SOA) size distributions due to limonene ozonolysis in indoor environments. *Building and Environment*, 108, 252-262.
31. Ben-David, T., **Waring, M.S.** (2016). Impact of natural versus mechanical ventilation on simulated indoor air quality and energy consumption in offices in fourteen US cities. *Building and Environment*, 104, 320-336.

32. Yang, Y., **Waring, M.S.** (2016). Secondary organic aerosol formation initiated by α -terpineol ozonolysis in indoor air. *Indoor Air*, 26, 939-952.
33. Rackes, A., **Waring, M.S.** (2016). Do time-averaged, whole-building, effective VOC emissions depend on the air exchange rate? A statistical analysis of trends for 46 VOCs in US offices. *Indoor Air*, 26, 642-659.
34. Hamilton, M., Rackes, A., Gurian, P., **Waring, M.S.** (2016). Perceptions in the building industry of the benefits and costs and improving indoor air quality. *Indoor Air*, 26 (2), 318-330.
35. Youssefi, S., **Waring, M.S.** (2015). Indoor transient SOA formation from ozone + α -pinene reactions: Impacts of air exchange and initial product concentrations, and comparison to limonene ozonolysis. *Atmospheric Environment*, 112, 106-115.
36. **Waring, M.S.**, Wells, J.R. (2015). Volatile organic compound conversion by ozone, hydroxyl radicals, and nitrate radicals in residential indoor air: Magnitudes and impacts of oxidant sources. *Atmospheric Environment*, 106, 382-391.
37. Stephens, B., Adams, R.I., Bhangar, S., Bibby, K., **Waring, M.S.** (2015). Editorial: From commensalism to mutualism: Integrating the microbial ecology, building science, and indoor air communities to advance research on the indoor microbiome. *Indoor Air*, 25, 1-3.
38. Youssefi, S., **Waring, M.S.** (2014). Transient secondary organic aerosol formation from limonene ozonolysis in indoor environments: Impacts of air exchange rates and initial concentration ratios. *Environmental Science and Technology*, 48, 7899-7908.
39. Russell, J. Hu, Y., Chau, L. Pauliushchyk, M., Anastopoulos, I., Anandan, S., **Waring, M.S.** (2014). Indoor biofilter growth and exposure to airborne chemicals induce similar changes in the root bacterial communities of plants. *Applied and Environmental Microbiology*, 80, 4805-4813.
40. **Waring, M.S.** (2014). Secondary organic aerosol in residences: predicting its fraction of fine particle mass and determinants of formation strength. *Indoor Air*, 24, 376-389.
41. El Orch, Z., Stephens, B., **Waring, M.S.** (2014). Predictions and determinants of size-resolved particle infiltration factors in single-family homes in the US. *Building and Environment* 74, 106-118.
42. Liu, R., Wen, J., **Waring, M.S.** (2014). Improving airflow measurement accuracy in VAV terminal units using flow conditioners. *Building and Environment*, 71, 81-94.
43. Rackes, A., **Waring, M.S.** (2014). Using multiobjective optimizations to discover dynamic building ventilation strategies that can improve indoor air quality and reduce energy use. *Energy and Buildings*, 75, 272-280.
44. Wang, C., **Waring, M.S.** (2014). Secondary organic aerosol initiated from reactions between ozone and surface-sorbed squalene. *Atmospheric Environment*, 84, 222-229.
45. **Waring, M.S.**, Siegel, J.A. (2013). Indoor secondary organic aerosol formation initiated from reactions between ozone and surface-sorbed d-limonene. *Environmental Science and Technology*, 47, 6341-6348.
46. Morawska, L., Afshari, A., Bae, G.N., Buonanno, G., Chao, C.Y.H., Hänninen, O., Hofmann, W., Isaxon, C., Jayaratne, E.R., Pasanen, P., Salthammer, T., **Waring, M.S.**, Wierzbicka, A. (2013). Indoor Aerosols: From Personal Exposure to Risk Assessment. *Indoor Air*, 23, 462-487.
47. Rackes, A., **Waring, M.S.** (2013). Modeling impacts of dynamic ventilation strategies on indoor air quality of offices in six US cities. *Building and Environment*, 60, 243-253.
48. Youssefi, S., **Waring, M.S.** (2012). Predicting indoor secondary organic aerosol mass formation with varying yields. *Indoor Air*, 22, 415-426.

49. **Waring, M.S.**, Wells, J.R., Siegel, J.A. (2011). Secondary organic aerosol formation from ozone reactions with single terpenoids and terpenoid mixtures. *Atmospheric Environment*, 45, 4235-4242.
50. **Waring, M.S.**, Siegel, J.A. (2011). The effect of a portable ion generator on indoor air quality in a residential room. *Indoor Air*, 21, 267-276.
51. **Waring, M.S.**, Siegel, J.A. (2010). Influence of HVAC system parameters on indoor secondary organic aerosol formation. *ASHRAE Transactions*, 116, 556-571.
52. **Waring, M.S.**, Siegel, J.A. (2008). Particle loading rates for HVAC filters, heat exchangers, and ducts. *Indoor Air*, 18, 209-224.
53. **Waring, M.S.**, Siegel, J.A., Corsi, R.L. (2008). Ultrafine particle removal and generation by portable air cleaners. *Atmospheric Environment*, 42, 5003-5014.
54. **Waring, M.S.**, Siegel, J.A. (2007). An evaluation of the indoor air quality in bars before and after a smoking ban in Austin, Texas. *Journal of Exposure Science and Environmental Epidemiology*, 17, 260-268.

Articles submitted for review in or in preparation for peer-referred journals

1. Yang, Y., Wells, J.R., Carslaw, N., Cena, L., **Waring, M.S.** (2020). Indoor secondary organic aerosol (SOA) formation initiated by α -terpineol ozonolysis in the presence of nitrogen dioxide. To be submitted to *Chemosphere*.
2. Wang, C., DeCarlo, P., **Waring M.S.** (2020). Differences in effective filtration removal for aerosol types with varying degrees of semivolatile character. To be submitted to *Building and Environment*.
3. Wang, C., Goetz, D., DeCarlo, P., **Waring M.S.** (2020). Impacts of portable humidifiers on indoor aerosol concentrations: Size-resolved number and mass aerosol emissions and corresponding lung deposition fractions. To be submitted to *Indoor Air*.
4. Wang, C., **Waring M.S.** (2020). Predicting indoor organic aerosol concentrations in mechanical systems and occupied spaces with the volatility basis set. To be submitted to *Indoor Air*.
5. Spilak, M.P., Sylvain, I., Adams, R., **Waring, M.S.** (2020). Indoor air parameters and dwelling characteristics in Public and Private housing in New York City: Observations and indicators of water damage. To be submitted to *Building and Environment*.

Articles published in refereed conference proceedings

1. Cummings, B., Li, Y., Shiraiwa, M., DeCarlo, P., **Waring, M.S.** (2020-forthcoming). Predicting indoor aerosol water content and phase state: Impacts of region, season, and mechanical system operation. *Indoor Air Conference 2020 in Seoul, Korea (virtual)*.
2. Berman, B., Cummings, B., Avery, A., Capps, S., DeCarlo, P., **Waring, M.S.** (2020-forthcoming). Modeling indoor aerosol inorganic chemical processes with ISORROPIA. *Indoor Air Conference 2020 in Seoul, Korea (virtual)*.
3. Cummings, B., Katz, E., Pothier, M., Farmer, D., DeCarlo, P., **Waring, M.S.** (2020-forthcoming). Computing cooking organic mass emissions from HOMEChem. *Indoor Air Conference 2020 in Seoul, Korea (virtual)*.
4. Well, J.R., Ham, J.E., Harrison, J., Jackson, S.R., Waring, M.S. 2020-forthcoming). Ethanolamine Influence on Secondary Organic Aerosol from α -Pinene Ozonolysis. *Indoor Air Conference 2020 in Seoul, Korea (virtual)*.

5. Cummings, B., **Waring, M.S.** (2018). Understanding the Impact of Chemical Aging on Indoor Secondary Organic Aerosol Using the 2D Volatility Basis Set. Indoor Air Conference 2018 in Philadelphia, PA.
6. Avery, A., **Waring, M.S.**, DeCarlo, P. (2018). Aerosol-Phase Effects of Occupants on the Indoor Environment. Indoor Air Conference 2018 in Philadelphia, PA.
7. Wang, C., **Waring, M.S.** (2018). Do all particles get filtered equally? Effective particle removal for aerosol types exhibiting semivolatile behavior. Indoor Air Conference 2018 in Philadelphia, PA.
8. Kruza, M., **Waring, M.S.**, Wells, J.R., Carslaw, N. (2018). Improved method for gas-to-particle phase conversion: first steps towards indoor air chemistry model integration. Indoor Air Conference 2018 in Philadelphia, PA.
9. Pant, P., **Waring, M.S.** (2018). Predicting Indoor Exposure to Outdoor Air Pollution in Residential Buildings on a U.S County Level Using GIS. Indoor Air Conference 2018 in Philadelphia, PA.
10. Katz, E., Goetz, D., Wang, C., Terranova, B., **Waring, M.S.**, DeCarlo, P. (2018). Chemical and Physical Characterization of 3D Printer Aerosol Emissions with the Aerosol Mass Spectrometer. Indoor Air Conference 2018 in Philadelphia, PA.
11. Rackes, A., Ben-David, T., **Waring, M.S.** (2016). Formulation and sensitivity analysis of a flexible, multi-criteria ventilation decision-making framework. ASHRAE IAQ Conference, September 2016 in Alexandria, VA.
12. Rackes, A., **Waring, M.S.** (2016). Spatial resolution and sensor accuracy in routine indoor air quality monitoring networks: Are more sensors better? ASHRAE IAQ Conference, September 2016 in Alexandria, VA.
13. Rackes, A., Ben-David, T., **Waring, M.S.** (2016). Empirical Predictive Modeling of the Impact of Ventilation and Filtration on Energy Cost and Monetized IAQ Exposure in Offices in the U.S. ASHRAE IAQ Conference, September 2016 in Alexandria, VA.
14. Wang, S., **Waring, M.S.** (2016). Impact of high-efficiency filtration with different ventilation rates on indoor/ outdoor (I/O) ratios for particle mass and number. Indoor Air Conference 2016 in Ghent, Belgium, Paper 973.
15. Rackes, A., Hamilton, M., Gurian, P., **Waring, M.S.** (2016). Do building industry professionals and stakeholders believe what IAQ experts think is true? Indoor Air Conference 2016 in Ghent, Belgium, Paper 319.
16. Wang, C., **Waring, M.S.** (2016). Filter effectiveness may be reduced for secondary organic aerosol (SOA): Impact of re-equilibration of semivolatile products to aerosol phase. Indoor Air Conference 2016 in Ghent, Belgium, Paper 859.
17. DeCarlo, P., Johnson, A., **Waring, M.S.** (2016). Impact of environmental gradients on aerosol composition measured with real-time aerosol mass spectrometry. Indoor Air Conference 2016 in Ghent, Belgium, Paper 683.
18. **Waring, M.S.**, DeCarlo, P. (2016). Framework to predict indoor aerosol concentrations as a function of composition, temperature-based volatility, and deposition. Indoor Air Conference 2016 in Ghent, Belgium, Paper 959.
19. Yang, Y., **Waring, M.S.** (2016). Secondary intake fraction (sIF) framework for products generated by cleaning: Example of secondary organic aerosol (SOA) due to terpene ozonolysis. Indoor Air Conference 2016 in Ghent, Belgium, Paper 960.
20. Sylvain, I., Adams, R., **Waring, M.S.**, Spilak, M., Taylor, J. (2016). Impact of water damage on microbial communities in residential buildings. Indoor Air Conference 2016 in Ghent, Belgium, Paper 661.

21. Spilak, M., **Waring, M.S.**, Adams, R., Sylvain, I. (2016). Use of indoor air parameters as indicators of water damage in buildings: Results from a field study of Public and Private housing in New York City. Indoor Air Conference 2016 in Ghent, Belgium, Paper 954.
22. Rackes, A., Ben-David, T., **Waring, M.S.** (2016). An integrated utility maximization approach to next-generation commercial building ventilation. Indoor Air Conference 2016 in Ghent, Belgium, Paper 321.
23. Johnson, A., **Waring, M.S.**, DeCarlo, P. (2015). Changes in outdoor aerosol chemical composition upon transport into the indoor environment. Healthy Buildings America 2015, Boulder CO.
24. Yang, Y., **Waring, M.S.** (2015). Secondary organic aerosol from α -terpineol ozonolysis. Healthy Buildings America 2015, Boulder CO.
25. Sylvain, I., Spilak, M.P., **Waring, M.S.**, Adams, R.I. (2015). Impact of water damage on microbial community in residential buildings. Healthy Buildings America 2015, Boulder CO.
26. Spilak, M.P., Sylvain, I., Adams, R., Waring, M.S. 2015. Building characteristics as determinants of moisture in water-damaged homes. Healthy Buildings America 2015, Boulder CO.
27. Rackes, A., Ben-David, T., **Waring, M.S.** (2014). Statistical Models of Whole-Building Volatile Organic Compound Emission Rates in US Offices. Indoor Air 2014, Hong Kong.
28. **Waring, M.S.**, Wells, J.R. (2014). Role of Different Oxidants on VOC Conversion in Residences and Offices. Indoor Air 2014, Hong Kong.
29. Youssefi, S., **Waring, M.S.** (2014). Transient Secondary Organic Aerosol Formation from d-Limonene and α -Pinene Ozonolysis in Indoor Environments. Indoor Air 2014, Hong Kong.
30. Wang, C., **Waring, M.S.** (2014). Particle Generation in HVAC Systems due to Ozone/Terpene Reactions. Indoor Air 2014, Hong Kong.
31. El Orch, Z., **Waring, M.S.**, Stephens, B. (2014). Predictions and determinants of size-resolved particle infiltration factors in single-family homes in the U.S. Indoor Air 2014, Hong Kong.
32. Rackes, A., **Waring, M.S.** (2013). Advanced integrated indoor air quality and thermal air movement strategies. ASHRAE IAQ 2013 Environmental Health in Low Energy Buildings, Vancouver, Canada.
33. **Waring, M.S.** (2013). Exploring the impact of residential weatherization on indoor secondary organic aerosol formation due to ozone reactions with organic compounds. ASHRAE IAQ 2013 Environmental Health in Low Energy Buildings, Vancouver, Canada.
34. Youssefi, S., **Waring, M.S.** (2012). Predicting indoor secondary organic aerosol formation from d-limonene ozonolysis with varying yields. Healthy Buildings, July 2012, Australia.
35. Rackes, A., **Waring, M.S.** (2012). Modeling impacts of dynamic ventilation strategies on indoor air quality over the United States office sector. Healthy Buildings, July 2012, Australia.
36. **Waring M.S.**, Siegel J.A. (2011). Yields of Secondary Organic Aerosol from Reactions between Ozone and Surface-Adsorbed d-Limonene. Indoor Air 2011, Austin, TX.
37. Langevin, J., Wen, J., Hsieh, S., Novosel, D., **Waring, M.S.** (2011). Occupant Comfort, Productivity, and Personal Control in Twenty Air Conditioned Office Buildings. Indoor Air 2011, Austin, TX.
38. **Waring M.S.**, Siegel J.A. (2009). The influence of HVAC systems on secondary organic aerosol formation. Healthy Buildings 2009, Syracuse, NY.
39. **Waring M.S.**, Siegel J.A., Corsi R.L., Morrison G. (2008). Do surface reactions influence formation of secondary organic aerosol? Indoor Air 2008, Copenhagen, Denmark.
40. **Waring M.S.**, Siegel J.A. (2008). Indoor Air Quality Implications of Using Ion Generators in Residences. Indoor Air 2008, Copenhagen, Denmark.

41. Siegel J.A., **Waring M.S.**, Yu, X., Corsi R.L. (2007). Do ion generators have a role in sustainable indoor environments? ASHRAE IAQ Specialty Conference 2007, Baltimore, MD.
42. Siegel, J.A., **Waring, M.S.**, Yu, X., Corsi, R.L., (2006). Indoor air quality implications of portable ion generators. A&WMA Specialty Conference on Indoor Environmental Quality – Problems, Research, and Solutions, Research Triangle Park, NC.
43. **Waring, M.S.**, Siegel, J.A., Huang, P., (2006). An Evaluation of a Smoking Ban Ordinance in Bars in Austin, TX. Healthy Buildings 2006, Lisbon, Portugal.

4. Conference Presentations (only presentations I gave; my students' presentations not included)

1. Cummings, B., **Waring, M.S.** 2019. Influence of Gas-Phase and Heterogeneous OH Aging Reactions on Indoor Organic Aerosol Loading and SOA Formation. Accepted for presentation at AAAR 2019 Conference in Portland, Oregon.
2. Wang, S., **Waring, M.S.** 2016. Impact of high-efficiency filtration with different ventilation rates on indoor/ outdoor (I/O) ratios for particle mass and number. Poster Presentation of Paper at Indoor Air Conference 2016 in Ghent, Belgium.
3. Carslaw, N., **Waring, M.S.** 2016. How well can modeling characterize personal exposure to reactive chemistry? Workshop Presentation at Indoor Air Conference 2016 in Ghent, Belgium.
4. **Waring, M.S.**, DeCarlo, P. 2016. Framework to predict indoor aerosol concentrations as a function of composition, temperature-based volatility, and deposition. Poster Presentation of Paper at Indoor Air Conference 2016 in Ghent, Belgium.
5. Yang, Y., **Waring, M.S.** 2016. Secondary intake fraction (sIF) framework for products generated by cleaning: Example of secondary organic aerosol (SOA) due to terpene ozonolysis. Platform Presentation of Paper at Indoor Air Conference 2016 in Ghent, Belgium.
6. Spilak, M., **Waring, M.S.**, Adams, R., Sylvain, I. 2016. Use of indoor air parameters as indicators of water damage in buildings: Results from a field study of Public and Private housing in New York City. Poster Presentation of Paper at Indoor Air Conference 2016 in Ghent, Belgium.
7. **Waring, M.S.**, DeCarlo, P. 2015. Model Framework to Predict Indoor Aerosol Concentrations based on Composition, Volatility, Water Uptake, and Mechanical Losses. Platform Presentation at AAAR 34th Annual Conference, Minneapolis, Minnesota.
8. Yang, Y., **Waring, M.S.**, 2015. Indoor Secondary Organic Aerosol Formation due to α -Terpineol Ozonolysis. Platform Presentation at AAAR 34th Annual Conference, Minneapolis, Minnesota.
9. Johnson, A., **Waring, M.S.**, DeCarlo, P. 2015. Changes in outdoor aerosol chemical composition upon transport into the indoor environment. Healthy Buildings America 2015, Boulder CO.
10. Yang, Y., **Waring, M.S.** 2015. Secondary organic aerosol from α -terpineol ozonolysis. Healthy Buildings America 2015, Boulder CO.
11. **Waring, M.S.**, Wells, J.R. 2014. Role of Different Oxidants on VOC Conversion in Residences and Offices. Indoor Air 2014, Hong Kong.
12. Youssefi, S., **Waring, M.S.** 2014. Transient Secondary Organic Aerosol Formation from d-Limonene and α -Pinene Ozonolysis in Indoor Environments. Indoor Air 2014, Hong Kong.
13. Wang, C., **Waring, M.S.** 2013. Emissions of secondary organic aerosol initiated by surface reactions between ozone and squalene. AAAR 32nd Annual Conference, Portland, OR.
14. Youssefi, S., **Waring, M.S.** 2013. Impact of air exchange rates on steady state aerosol mass fractions describing secondary organic aerosol formation. AAAR 32nd Annual Conference, Portland, OR.

15. **Waring, M.S.** 2013. Exploring the impact of residential weatherization on indoor secondary organic aerosol formation due to ozone reactions with organic compounds. ASHRAE IAQ 2013 Environmental Health in Low Energy Buildings, Vancouver, Canada.
16. Youssefi, S., **Waring, M.S.** 2012. Predicting indoor secondary organic aerosol formation from d-limonene ozonolysis with varying yields. Healthy Buildings, July 2012, Brisbane, Australia.
17. Rackes, A., **Waring, M.S.** 2012. Modeling impacts of dynamic ventilation strategies on indoor air quality over the United States office sector. Healthy Buildings, July 2012, Brisbane, Australia.
18. **Waring M.S.**, Siegel J.A. 2011. Yields of Secondary Organic Aerosol from Reactions between Ozone and Surface-Adsorbed d-Limonene. Indoor Air 2011, Austin, TX.
19. **Waring M.S.**, Siegel J.A. 2009. The influence of HVAC systems on secondary organic aerosol formation. Healthy Buildings 2009, Syracuse, NY.
20. **Waring M.S.**, Siegel J.A., Corsi R.L., Morrison G. 2008. Do surface reactions influence formation of secondary organic aerosol? Indoor Air 2008, Copenhagen, Denmark.
21. **Waring M.S.**, Siegel J.A. 2008. Indoor Air Quality Implications of Using Ion Generators in Residences. Indoor Air 2008, Copenhagen, Denmark.
22. **Waring, M.S.**, Corsi, R., Siegel, J.A. 2007. Ultrafine Particle Removal and Generation by Portable Air Cleaners. ISEA Conference 2007, Durham, NC.
23. **Waring, M.S.**, Siegel, J.A., Corsi, R. 2007. Indoor Air Quality and Exposure Implications of Using an Ion Generator in a Residential Environment. ISEA Conference 2007, Durham, NC.
24. **Waring, M.S.**, Siegel, J.A. 2005. Modeling Particle Deposition to HVAC Heat Exchangers. AAAR 2005 Annual Conference, Austin, TX.

5. Invited Presentations

1. **Waring, M.S.** 2020. AEROSOLS 2020 Conference Plenary Speaker, May 2020 (canceled COVID).
2. **Waring, M.S.**, Cummings, B. 2019. MOCCIE 2 Future Directions: Applying and developing the indoor aerosol model. MOCCIE Annual Meeting, UNC-Chapel Hill, NC, June 24-25, 2019.
3. **Waring, M.S.**, Cummings, B. 2018. MOCCIE Year 2: Applying and improving the indoor aerosol model. MOCCIE Annual Meeting, UT-Austin, Austin, TX, June 21-22, 2018.
4. **Waring, M.S.** 2017. Impact of High-Efficiency Filtration Combined with High Ventilation Rates on Particulate Matter Concentrations in U.S. Offices. Presented at National Air Filtration Association Annual Meeting in Annapolis, MD., September 2017.
5. **Waring, M.S.** 2017. Component- & thermodynamic modeling for predicting indoor SOA formation and aerosol concentrations. MOCCIE Kickoff Meeting, University of California, Irvine, July 20-21, 2017.
6. **Waring, M.S.** 2016. Component- and thermodynamic-based indoor aerosol modeling: Importance and building-specific challenges. Presented at Sloan Foundation Workshop on Indoor Chemistry Models. Washington, DC, November 7-8, 2016.
7. **Waring, M.S.** 2016. Bio-walls and indoor houseplants: Facts and fictions. Presented at the NAE Microbiomes of the Built Environment: From Research to Application, Meeting #3; University of California, Irvine, October 17-18, 2016.
8. **Waring, M.S.** 2016. What building science parameters should we think about in Microbiology of Built Environment and Chemistry of Indoor Environment. Presented at Sloan MoBE Annex Session 1, in Ghent, Belgium on July 8, 2016.

9. **Waring, M.S.** 2016. Model Framework to Predict Indoor Aerosol Concentrations based on Composition, Volatility, Water Uptake, and Mechanical Losses. Presented at Meeting of Mid-Atlantic Indoor Air Researchers.
10. **Waring, M.S.** 2015. Impact of High-Efficiency Filtration Combined with High Ventilation Rates on Indoor Particle Concentrations and Energy Usage in Office Buildings. Presented at National Air Filtration Association Annual Meeting in Key West, FL.
11. **Waring, M.S.** 2015. Indoor organic aerosols: Influencing factors on concentration source strengths. Presented at Meeting of Mid-Atlantic Indoor Air Researchers (small meeting held at Drexel, organized by Dustin Poppendieck from NIST and Michael Waring).
12. **Waring, M.S.** 2015. Indoor organic aerosols: Influencing factors on concentration source strengths. Presented at Drexel CAEE Environmental Engineering Professors Lecture Series.
13. Anandan, S., Russell, J., **Waring, M.S.** 2012. Cleaner, Cheaper Air: Uncovering the Benefits and Mechanisms of Biowalls for Improved Indoor Air Quality. Dean's Seminar Series, College of Arts and Sciences, April 11, 2012.
14. Anandan, S., Russell, J., **Waring, M.S.** 2012. Presentation to the Delaware Valley Green Building Council on the Drexel Biowall, February 23, 2012.
15. **Waring, M.S.** 2010. Indoor Secondary Organic Aerosol Formation: Novel Sources, Exposure Implications, and Potential Engineering Uses. Drexel IAHR Lecture Series, April 10, 2010.
16. **Waring, M.S.** 2010. A Breath of Fresh Indoor Air Quality. Warminster Green Building Association, March 12, 2010.
17. **Waring, M.S.** 2009. Particle Research and the Gas-and-Vapor team at NIOSH. National Institute for Occupational Safety and Health, October 17, 2008.

6. Funded Grants and Awards

1. Commonwealth of Pennsylvania; GRID: Using Biowalls to Sustainably Reduce Human Exposure to Indoor Volatile Organic Compounds; **PI (Waring)**, Co-PIs (Anandan and Russell, Drexel); \$153,021; 1/1/2011 to 12/31/2013; credit = 40%.
2. Department of Energy; Energy Efficient Building Hub; PI (Wen, Drexel), **Co-PIs (Waring and Gurian, Drexel)**; \$1,999,717; 2/1/2011 to 1/31/2016; credit = 25%.
3. National Science Foundation; CAREER: Time- and Size-Resolved Formation of Secondary Organic Aerosol in Indoor Air; **PI (Waring)**; \$402,498; 4/01/2011 to 3/31/2016; credit = 100%.
4. Drexel Office of the Provost and the Steinbright Career Development Center; Undergraduate Research Coop Support; **PI (Waring)**; \$7,052.50; Fall 2011/Winter 2012 term; credit = 100%.
5. American Society for Heating, Refrigeration and Air-conditioning Engineers; Grant-in-Aid; **PI (Waring, with Ph.D. student, Rakes)**; \$10,000; 7/1/2012 to 6/31/2013; credit = 100%.
6. National Science Foundation; MRI: Acquisition of a Soot-Particle Aerosol Mass Spectrometer, for the Measurement of Submicron Particulate Chemical Composition; PI (DeCarlo, Drexel), **Co-PIs (Waring, Burstyn, Velinsky, and Miller, Drexel)**; \$467,925, 9/2012 to 8/2013; credit = 10%.
7. Henry and Camille Dreyfus Foundation; CLEAR PM: Chemistry Lessons: Enabling Aerosol Realizations with Particulate Measurements; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$44,000, 12/2012 to 6/2014; credit = 40%.
8. American Society for Heating, Refrigeration and Air-conditioning Engineers; New Investigator Award; **PI (Waring)**; \$150,000; 7/1/2013 to 6/30/2016; credit = 100%.

9. National Science Foundation; Particulate Matter Size and Composition Change in Response to Transport from the Outdoor to Indoor Environment; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$329,164; 9/1/2014 to 8/31/2017; credit = 40%.
10. Alfred P. Sloan Foundation; Microbial Community Response to Water Damage in Residential Buildings; PI (Adams, Berkeley), **Co-PI (Waring)**, Drexel; Eisenhard, Red Hook Initiative); \$324,726 (Drexel portion is \$156,748); 9/1/2014 to 2/28/2016; Drexel portion credit = 100%.
11. Department of Education; Drexel University GAANN Fellowships in (Appropriate) Resource Management in the Urban Environment; PI (Olson, Drexel), **Co-PI (Waring)** and others from Drexel); \$590,556; 9/1/2015 to 8/31/2018; credit = 14%.
12. American Society for Heating, Refrigeration, and Air-conditioning Engineers; Grant-in-Aid for Sheng Wang; **PI (Waring)**; \$10,000; 8/1/2015 to 7/31/2016; credit = 100%.
13. American Society for Heating, Refrigeration, and Air-conditioning Engineers; Grant-in-Aid for Chunyi Wang; **PI (Waring)**; \$10,000; 8/1/2015 to 7/31/2016; credit = 100%.
14. National Air Filtration Association; Impact of High-Efficiency Filtration Combined with High Ventilation Rates on Indoor Particle Concentrations and Energy Usage in Office Buildings; **PI (Waring)**; \$20,000; 9/1/2015 to 8/31/2016; credit = 100%.
15. National Science Foundation; Intelligent Multi-criteria Building Ventilation Control within Dynamic Urban Environments; **PI (Waring)**, Co-PI (Wen, Drexel); \$299,664.35; 9/1/2015 to 8/31/2018; credit = 75%.
16. National Science Foundation; Variability of wind effects on natural ventilation and pollutant transport in buildings; PI (Lo, Drexel), **Co-PI (Waring)**; \$303,870; 9/1/2016 to 8/31/2019; credit = 40%.
17. International Society of Indoor Air Quality and Climate (ISIAQ); Proposal to host Indoor Air 2018 Conference at Drexel University, on June 18–23, 2018; **PI (Waring)**; credit = 100%.
18. Alfred P. Sloan Foundation; Modeling Consortium for Chemistry of Indoor Environments; PI (Shiraiwa, UCI; Carslaw, Univ. of York), **Co-I (Waring)**; Drexel portion \$142,757 of \$1-million total; 7/01/2017 to 6/30/2019; Drexel portion credit = 100%.
19. Procter and Gamble; Impact of Fragrance Chemicals in Febreze on Indoor Secondary Pollutant Formation in a Statistical Representation of the U.S. Residential Building Stock; **PI (Waring)**; \$70,000; 8/1/2017 to 5/1/2018; credit = 100%.
20. National Science Foundation; REU Supplement: Particulate Matter Size and Composition Change in Response to Transport from the Outdoor to Indoor Environment; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$6,000; 3/01/2017 to 2/28/2018; credit = 40%.
21. Alfred P. Sloan Foundation; Sloan Foundation Support for Symposia and Plenary Talk at INDOOR AIR 2018; **PI (Waring)**; \$84,797; 11/15/2017 to 10/31/2018; credit = 100%.
22. Alfred P. Sloan Foundation; Modeling Consortium for Chemistry of Indoor Environments, second round; PI (Shiraiwa, UCI; Carslaw, Univ. of York), **Co-I (Waring)**; Drexel portion \$103,069 of \$789771 total; 7/01/2019 to 12/31/2020. Drexel portion credit = 100%.
23. Alfred P. Sloan Foundation; Influence of HVAC Systems on Aerosol Partitioning and Chemical Processing; **PI (Waring)**, Co-PI (DeCarlo); \$468,434; 8/1/2019 to 7/31/2022; credit = 50%.
24. Drexel Office of the Provost and the Steinbright Career Development Center; Undergraduate Research Coop Support; **PI (Waring)**; \$7,250; Spring/Summer 2019 terms; credit = 100%.
25. Alfred P. Sloan Foundation; Modeling Consortium for Chemistry of Indoor Environments, third round; PI (Shiraiwa, UCI; Carslaw, Univ. of York), **Co-I (Waring)**; Drexel portion \$114,000 of \$1,310,000 total; 1/01/2021 to 12/31/2024.

26. Drexel Internal COVID-19 research award; COVID-19: Developing a PPE Facemask and Validating Its Removal Efficiency; **PI (Waring)**; Co-PI (Dion); \$10,000
27. Drexel Internal COVID-19 research award; COVID-19: "Biocontainment Intubation "Tent": Design Refinement, Testing and Deployment"; PI (Walker); **Co-PI (Waring and others)**; \$10,000
28. Drexel Internal 2020 Scholarly Materials and Research Equipment Award; Acquiring a Scanning Mobility Particle Sizer (SMPS) for Indoor and Outdoor Air Quality Measurements. **PI (Waring)**; Co-PI (others from Drexel); \$30,000
29. Drexel Plasma Institute IUCRC Proposal; Antiviral effect of plasma-generated reactive oxygen and nitrogen species for disinfection of personal protective equipment after COVID-19 use; PI (Sales); **Co-PI (Waring, Fridman, Rabinovich)**; \$200,000

7. Pending Grants

1. Commonwealth of PA, CURE, Drexel Internal proposal; Characteristics of Aerosolized Droplets Emitted from Patients in a Clinical Setting; PI (Lo); **Co-PI (Waring, Kohanski)**; \$75,000

8. Unfunded Grants and Awards

1. National Science Foundation; The Partitioning of Semivolatile Organic Compounds to Secondary Organic Aerosol in the Indoor Environment; **PI (Waring)**; \$268,116; Submitted 3/2010.
2. National Science Foundation; EFRI-SEED: Indoor Ecology - Defining Human-Building Ecosystem; PI (Ellis, Drexel), **Co-PIs (Waring, Wen, Weber, and McEachron, Drexel)**; \$1,995,428; Submitted 4/2010.
3. National Science Foundation; Biowalls for Sustainable Indoor VOC Control: Removal Kinetics of Bacterial Communities on Plant Roots; **PI (Waring)**, Co-PIs (Anandan and Russell, Drexel); \$442,546; Submitted 9/2010.
4. Commonwealth of Pennsylvania; GRID: The Relationship Between Hospital Room Environments and Patient Well-Being; PI (Waring), Co-PIs (Handly and Rogers, Drexel); \$93,411; Submitted 10/2010.
5. Environmental Protection Agency; Low Cost Sensor Networks for Pervasive Urban Air Quality Measurement; PI (Dandekar, Drexel), **Co-PIs (Waring, Kam, Kurzweg, and Primerano, Drexel; Kondo, UPenn)**; \$495,280; Submitted 2/2011.
6. National Science Foundation; Rapid online size and chemical characterization of indoor outdoor particulate matter exchange; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$297,181; Submitted 2/2012.
7. National Science Foundation; Using Biofiltration to Control Indoor Air Pollution in Green Buildings; **PI (Waring)**, Co-PIs (Anandan and Russell, Drexel); \$331,056; Submitted 2/2012.
8. Philadelphia Collaborative Violence Prevention Center for Interdisciplinary Community Based Participatory Research in Stress and Wellness; Port Neighborhood Air Pollution Outreach and Monitoring Study; PI (Kondo, UPenn), **Co-PIs (Waring, DeCarlo, and Burstyn, Drexel)**; \$10,000; Submitted 3/2012.
9. American Society for Heating, Refrigeration and Air-conditioning Engineers; Literature Review, Product Review, and Cost-Benefit Analysis of Ozone Air Cleaning Technologies for HVAC Systems (TRP-1491); PI (Stephen, Illinois Institute of Technology), **Co-PI (Waring)**; \$129,573; Submitted 6/2012.
10. Commonwealth of Pennsylvania; GRID: Micro Personal Exposure Monitors for Particulate Matter Measurement and Characterization; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$96,800; Submitted 10/2012.

11. National Science Foundation; Rapid online size resolved chemical composition of particulate matter outdoors, indoors, and in the building supply air flow; PI (DeCarlo, Drexel), **Co-PI (Waring)**; \$337,965; Submitted 2/2013.
12. National Science Foundation; REU SITE: Engineering Cities: Sustainable Buildings; **PI (Waring)**, Co-PI (Sjoblom, Drexel); \$285,704; Submitted 8/2013.
13. Environmental Protection Agency; Impacts of Climate Change on Health Effects due to Indoor Air Chemical and Particulate Matter Exposure over the U.S.; **PI (Waring)**, Co-PIs (DeCarlo and Pradhan, Drexel); \$499,988; Submitted 1/2014.
14. Drexel Institute for Energy and Environment; Drexel IExE Seed: Optimal Multi-criteria Building Ventilation Control to Save Energy and Improve Indoor Environments; **PI (Waring)**, Co-PIs (Wen and Pradhan, Drexel); \$49,920; Submitted 2/2014.
15. National Science Foundation; Optimal Multi-Criteria Building Ventilation Control within Dynamic Urban Environments; **PI (Waring)**, Co-PIs (Wen and Pradhan, Drexel); \$329,164; Submitted 2/2014, recommended but not funded.
16. National Science Foundation; REU Site: Engineering Cities–Sustainable Buildings; **PI (Waring)**, Co-PI (Sjoblom, Drexel); \$359,727; Submitted; Submitted 8/2014.
17. National Science Foundation; Intelligent Multi-Criteria Building Ventilation Control within Dynamic Urban Environments; **PI (Waring)**, Co-PI (Wen, Drexel); \$306,542; Submitted 11/2014
18. National Science Foundation; Harnessing wind: Transforming the utilization of wind power in innovative building designs; PI (Lo), **Co-PIs (Waring and Moon, Drexel)**; \$366,207; Submitted 2/2015
19. Indian Institute of Technology Delhi; Indo-US joint resource building for microbial risk assessment and evaluation; PI (Gurian), **Co-PIs (Waring and others)**; \$32,000; Submitted 8/2015
20. National Institutes of Health; Falling asleep while driving: Impact of carbon dioxide (CO₂) exposure on drivers of long-haul, semi-trailer trucks; **PI (Waring)**; \$155,862; Submitted 10/2015
21. American Society for Heating, Refrigeration and Air-conditioning Engineers; IAQ and Energy Implications of High Efficiency Filters in Residential Buildings; **PI (Waring)**; \$184,460; Submitted 12/2015.
22. American Society for Heating, Refrigeration and Air-conditioning Engineers; Update to Measurements of Office Equipment Heat Gain Data; **PI (Waring)**; \$81,776; Submitted 12/2015.
23. National Science Foundation; NRT-DESE: Building Informatics - Big data for human-centered and sustainable building design and operation; PI (Wen), **Co-PIs (Waring and others)**; \$2,999,995; Submitted 2/2016.
24. National Science Foundation; SCC-IRG Track 1: The Energy-Health Nexus: An integrated approach to reducing asthma and energy burden in Philadelphia; PI (Hoque, Drexel), Co-PIs and SIs (Waring and others); \$3-million; Submitted 9/2019.

9. Collaborators and their Affiliations

- Adams, Rachel (University of California, Berkeley)
- Afshari, Alireza (Aalborg University)
- Ampolini, Laura (Drexel University)
- Avery, Anita (nee Johnson) (Aerodyne Research, LLC)
- Bae, G N (Korea Institute of Science and Technology)
- Ben-David, Tom (BuroHappold Engineering)
- Bhangar, Seema (Aclima, Inc.)

- Bibby, Kyle (University of Pittsburgh)
- Bourne, Stephen (University of Texas at Austin)
- Buonanno, Giorgio (Queensland University of Technology, University of Cassino and Southern Lazio)
- Carslaw, Nicola (University of York)
- Chao, Christopher (Hong Kong University of Science and Technology)
- Cummings, Bryan (Drexel University)
- Dannemiller, Karen (Ohio State University)
- DeCarlo, Peter (Drexel University)
- Dion, Genevieve (Drexel University)
- Eisen, Jonathan (University of California, Davis)
- Fierer, Noah (University of Colorado, Boulder)
- Gilbert, Jack (University of California, San Diego)
- Goldstein, Allen (University of California, Berkeley)
- Green, Jessica (University of Oregon)
- Gurian, Patrick (Drexel University)
- Ham, Jason (NIOSH)
- Hamilton, Michael (Drexel University)
- Hanninen, Otto (National Institute for Health and Welfare, Kuopio, Finland)
- Hofmann, W. (University of Salzburg)
- Isaxon, Christina (Lund University)
- Jayaratne, E (Queensland University of Technology)
- Katz, Erin (Drexel University)
- Kohanski, Michael (University of Pennsylvania)
- Kruze, Magdalena (University of York)
- Lakey, Pascale (University of California, Irvine)
- Lo, L. James (Drexel University)
- Lucic, Gregor (Picarro, Inc.)
- Marr, Linsey (Virginia Tech)
- McFiggans, Gordon (University of Manchester)
- Miller, Shelly (University of Colorado, Boulder)
- Morawska, Lidia (Queensland University of Technology)
- Morrison, Glenn (University of North Carolina, Chappel Hill)
- Nelissen, Inge (Flemish Institute for Technological Research)
- Novoselac, Atila (University of Texas at Austin)
- Pasanen, Patti (University of Eastern Finland)
- Rackes, Adams (Kinetic Buildings LLC)
- Rim, Donghyun (Pennsylvania State University)
- Salthammer, Tunga (Fraunhofer WKI)
- Schoemaeker, Coralie (University of Lille)
- Shiraiwa, Manabu (University of California, Irvine)
- Siegel, Jeffrey (University of Toronto)
- Spilak, Michal (Liberty Mutual Insurance)
- Spillar, Kara (Drexel University)
- Stephens, Brent (Illinois Institute of Technology)
- Sylvain, Iman (University of California, Berkeley)
- Taylor, John (University of California, Berkeley)

- Tian, Yilin (University of California, Berkeley)
- Tobias, Douglas (University of California, Irvine)
- von Domaros, Michael (University of California, Irvine)
- Walker, Sharon (Drexel University)
- Wang, Sheng (Drexel University)
- Well, J Raymond (NIOSH)
- Wen, Jen (Drexel University)
- Wierzbicka, Anita (Lund University)
- Wolkoff, Peder (University of Copenhagen)
- Won, Youngbo (Pennsylvania State University)
- Yang, Yanan (Lehigh Valley Health Network)
- Youseffi, Somayeh (University of Maryland, College Park)
- Zhang, Yun (Drexel University)

10. Professional Affiliations

- American Society for Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE)
 - Chair of Research Subcommittee for TC 2.4: Particulate Air Contaminants and Particulate Contaminant Removal Equipment (2013 to 2016)
 - Voting member for TC 2.4: Particulate Air Contaminants and Particulate Contaminant Removal Equipment (2014 to 2017; member from 2009 to 2017)
- International Society of Indoor Air Quality and Climate (ISIAQ)
 - Member of STC 12: Source, monitoring and evaluation: Aerosols (2012 to present)
 - Member of STC 21: Ventilation (2015 to present)

11. Professional Activities

- Member United Nations Environment Programme Global LCIA Human Health (HH) taskforce
- Associate Editor for journal *Indoor Air* (impact factor 4.74)
- Member of Editorial Board for *Journal of Exposure Science and Environmental Epidemiology*.
- Guest Editor for special issue on Healthy Buildings for *Journal of Exposure Science and Environmental Epidemiology*, with Joseph Allen (Harvard University)
- President and Host of INDOOR AIR 2018, 15th Conference of the International Society for Indoor Air Quality and Climate (ISIAQ), July 22 to 27, 2018
- Organizer and Participant, workshop sponsored by the Alfred P. Sloan Foundation program on Indoor Chemistry, entitled “Sloan Workshop on Chemistry of Indoor Environments: Data and Instrument Needs,” Fort Collins, CO, January 19-20, 2017.
- Organizer and Participant, workshop sponsored by the Alfred P. Sloan Foundation program on Indoor Chemistry, entitled “Workshop on Indoor Chemistry Models,” Washington, DC, November 7-8, 2016.
- Organizer and Participant, workshop sponsored by the Alfred P. Sloan Foundation program on Indoor Chemistry and the National Science Foundation, entitled “Interaction between Indoor and Atmospheric Chemistry,” Ghent, Belgium, July 2, 2016.
- Invited Participant, IA 2016 Annex sponsored by the Alfred P. Sloan Foundation program on Microbiology of the Built Environment, Ghent, Belgium, July, 2016.

- Invited Participant, Expert Panel sponsored by the Alfred P. Sloan Foundation program on Indoor Chemistry, New York, NY, September 10-11, 2015.
- Invited Participant, workshop sponsored by the Alfred P. Sloan Foundation program on Indoor Chemistry and the National Science Foundation, entitled “Interaction between Indoor and Atmospheric Chemistry,” Lille, France, May 15-16, 2015.
- Invited Participant, Advisory Board sponsored by the Alfred P. Sloan Foundation program on Microbiology of the Built Environment, entitled “Open Source Building Science Sensors (OSBSS) Advisory Board,” Chicago, IL, January 26-27, 2015.
- Invited to submit a paper for special edition on ‘Indoor Air’ for the journal, Atmospheric Environment.
- Invited Participant, Workshop sponsored by the Alfred P. Sloan Foundation program on Microbiology of the Built Environment, entitled “Building science to advance research in the microbiology of the built environment,” Chicago, IL, May 22-23, 2014.
- Invited Session Chair at international conferences, including Indoor Air (2008 in Copenhagen, Denmark; 2011 in Austin, TX, USA; 2014 in Hong Kong, Special Administrative Region of China; 2016 in Ghent, Belgium) and Healthy Buildings (2009 in Syracuse, NY, USA; 2012 in Brisbane, Australia; 2015 in Boulder, CO).
- Technical Reviewer at international conferences, including Indoor Air (2011 in Austin, TX, USA; 2014 in Hong Kong, Special Administrative Region of China; 2016 in Ghent, Belgium).
- Development Team Leader, Building Mass and Energy Balances Website at University of Texas at Austin: <http://www.ce.utexas.edu/bmeb/>
- Invited Participant, Workshop sponsored by the National Science Foundation and UMR Environmental Research Center for Emerging Contaminants, entitled “Interfacial Chemistry in Indoor Environments,” Berkeley, CA, July 2007.
- Professional Reviews for papers submitted to *Environmental Science and Technology*, *Building and Environment*, *Indoor Air*, *Journal of Aerosol Science*, *Journal of Occupational and Environmental Hygiene*, *Environmental Engineering Science*, and the IEEE International Conference on Automation Science and Engineering.
- Professional Reviews for proposals submitted to the Sloan Foundation, National Science Foundation, the Environmental Protection Agency, and the Drexel Engineering Cities Initiative.

12. Courses Taught

- **AE 220** – *Introduction to Heating, Ventilation, and Air Conditioning*, Instructor, undergraduate level, winter quarter: 2010, 2011, 2012, 2013, 2014, 2015, 2016
 - Description: This course includes a review of thermodynamics, moist air properties and processes, basic heat transfer, solar radiation, heating and cooling losses and load calculation, types of air conditioning systems, infiltration and ventilation, air motion and distribution.
 - Development: I have steadily developed the materials of course since taking it over in Winter 2010, including adding a new building assessment section to its laboratory section.
- **AE 390** – *Architectural Engineering Design*, Instructor (co-taught with Professor Jim Mitchell), undergraduate level, spring quarter: 2012
 - Description: Establishes a base of building systems design concepts, knowledge and performance criteria, with emphasis on the thermal, electrical, illumination and structural aspects of buildings.

- **AE 550/ENVE 465 – *Indoor Air Quality***, Instructor, graduate + undergraduate level combined, fall quarter: 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2017, 2018, 2019, 2020
 - Description: Introduces basic concepts about indoor air quality, indoor air pollutants, including their sources and health effects, transport of pollutants, modeling of pollutant concentration in buildings, and ventilation as well as air cleaning systems.
 - Development: Upon taking over this course, I completely redesigned because indoor air quality is my research field and I wanted the class to reflect my own viewpoints on important topics and include the latest research in the field (including my own).
- **AE I599 – *Independent Study on Building Enclosures***, Instructor, undergraduate level. 2016
- **AE 790 – *Indoor Air Modeling and Measurements***, Instructor, graduate level, spring quarter: 2013, 2015
 - Description: Expand on basic concepts about indoor air quality, with a strong focus on indoor modeling and measurements, and help students hone their research and communication skills.
 - Development: This course was 100% initiated and developed by me, and in it, students collaborate with each other to carry out an extensive modeling and measurement project.
- **CAE, ENVE 491, 2, and 3 – Senior Design**, Instructor, undergraduate level, fall 2020 (winter and spring 2021 forthcoming)
 - Description: Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education; writing intensive course.
 - Development: I have updated the speaker series in the fall term of the course, as well as broaden the use of electronic tools to facilitate the course.
- **CAEE 203 – *System Balances and Design in CAEE***, Instructor, undergraduate level, winter quarter: 2017, 2018, 2019, 2020
 - Description: Based on fundamental science and mathematics preparation, this course for all students in Civil, Architectural, and Environmental Engineering covers delineation of system boundaries, analysis of mass, energy and force balances that support system integration; life cycle and uncertainty analysis; and formulation of problem solutions using these balances.
 - Development: This course was initiated and 100% developed by me, including all lecture notes, homework and laboratory assignments, and TA aids.
- **CIVE 320 – *Introduction to Fluid Flow***, Instructor, undergraduate level, spring quarter: 2010, 2011, 2014, 2015, 2016, 2017
 - Description: Covers fundamentals of fluid flow, fluid properties, hydrostatic forces, kinematics of flow, the Bernoulli equation, linear momentum, dimensional analysis, Froude and Reynolds similarity and hydraulic models and an introduction to pipe flows and friction.
 - Development: Similar to AE 220, I inherited this course and I have developed new lecture and homework materials since beginning to teach it in Spring 2010.
- **CIVE 399 – *Independent Study***, Instructor, undergraduate level, 2013
- **ENGR 113 – First Year Engineering Design**, Instructor, undergraduate level, spring quarter: 2019, 2020
 - Description: Guided introduction on conducting a 10-week, team-based, experiential + directed learning, design course for Freshmen. My section centered on designing a sustainable building.
 - Development: This thematic material for this course was initiated and 100% developed by me, including all lecture notes, and design assessments.

13. Educational Initiatives

- Conception and development of required course for Sophomores in any of our three CAEE programs of Civil, Architectural, and Environmental Engineering: CAEE 203 *System Balances and Design in CAEE*.
- Development of new cross-cutting curriculum for Mechanical Concentration for Civil Engineering MS degree (with Jim Mitchell and Jin Wen in CAEE Department)
- Development of new Architectural Engineering MS and PhD degrees (with Jim Mitchell and Jin Wen in CAEE Department)
- Development of new 'Digital Building' undergraduate Architectural Engineering concentration (with Jim Mitchell and Jin Wen in CAEE Department)

14. Research and Student Supervision

Postdoctoral Researchers

- Dr. Michael Spilak, post-doctoral researcher from 2015 to 2017

Ph.D. Students

- Dr. Somayeh Youssefi, Ph.D. holder, graduated 2015
- Dr. Adams Rackes, Ph.D. holder, graduated 2017
 - Note: While a Ph.D. student, Dr. Rackes received an ASHRAE Grant-in-Aid, a National Science Foundation Graduate Research Fellowship, and a Fulbright Scholarship
- Dr. Yanan Yang, Ph.D. holder, graduated 2017
- Dr. Tom Ben-David, Ph.D. holder, graduated 2018
- Dr. Anita Avery, Ph.D. holder, graduated 2018, co-advised with primary advisor Dr. Peter DeCarlo
- Dr. Chunyi Wang, Ph.D. holder, graduated 2019
- Bryan Cummings, M.S. holder, Ph.D. candidate, expected graduation 2021
- Bryan Berman, M.S. holder, Ph.D. candidate, expected graduation 2022
- Prateek Pant, M.S. holder, Ph.D. student, expected graduation 2023
- Gabriel Grajewski, current M.S. student and upcoming Ph.D. student, graduation 2024

Undergraduate Students

- Gabriel Grajewski (BS/MS student, independent researcher, Jan. 2019 to present)
 - Mr. Grajewski is writing a paper with Dr. James Lo and myself about investigating heterogeneity of age of air in naturally ventilated office buildings.
- Bryan Cummings (BS/MS student, independent researcher, Sept. 2016 to 2017)
 - Mr. Cummings wrote an MS thesis on biowall (biofiltration) systems. He is now my PhD student on the Sloan Foundation MOCCIE 1 and 2 grants.
- Jonathan Fink (BS student, independent researcher, Oct. 2014 to May 2015)
- Tom Ben-David (BS/MS student, independent researcher, Jan. 2013 to 2015)

- Mr. Ben-David became my Ph.D. student and has now graduated
- Michael Rullo (Laboratory assistant)
- Michael Magee (BS student, independent researcher, Jan. 2013 to Summer 2013)
- Roland Ngaba Mbiakop (Laboratory assistant, Fall 2012/Winter 2013)
- Margarita Pauliushchik (BS student, research Co-op student, Fall 2011/Winter 2012)
 - Ms. Pauliushchik is a coauthor on the following published paper: Russell, J. Hu, Y., Chau, L. Pauliushchik, M., Anastopoulos, I., Anandan, S., **Waring, M.S.** 2014. Indoor biofilter growth and exposure to airborne chemicals induce similar changes in the root bacterial communities of plants. Applied and Environmental Microbiology, AEM-00595.
- Young Kwang Lee (BS student, STAR scholar, Summer 2011)
- Adams Rackes (BS/PhD student, independent researcher, Winter 2010 to present, Mr. Rackes is now a PhD candidate in my group)

Senior Design:

- Advisor: “Design a Mobile Tiny House” (Reece Masucci, Kendi Only, Elrod Owusu-Asumeng, Ashlyn Rimsky), 2020-21.
- Advisor (with Dr. Charles Haas): “Designing a Packing List for a Mars Colony, Team 1” (Thomas Sisson, Allison Abad, Pauline Iniewicz), 2017-18.
- Advisor (with Dr. Charles Haas): “Designing a Packing List for a Mars Colony, Team 2” (Michael Sangern, David Kahn, Peter Dannemann, Liliana Lobaton, Conor McTaggart), 2017-18.
- Advisor (with Prof. Jim Mitchell): “AEI Pankow Design Competition” (Marko Durica, Nick Gangi, Reid Manus, Rikki Moore, Adam Naar, Albert Parker, Andrew Weinstein), 2015-16
- Advisor: “Brewpub Building Design” (Alexandria Crouthamel, Adrian Lowman, Anthony Scaccia, and Louis Schetley), 2015-16
- Advisor: “High Performance Philadelphia Rowhouse” (Michael Magee), 2013-14
- Advisor: “A New Home for the College of Engineering” (Taylor Derr, Tucker Faherty, Samuel Martin, Matthew Morabito, David Simon), 2012-13
- Advisor: “A framework for the design and implementation of environmental sensor networks for promoting energy efficiency and IAQ in commercial buildings” (Adams Rackes), 2011-12
- Advisor: “A New Home for the “Drexel CAEE Department (Robert Belardi, Matthew Helner, William Mahon, Ryan Weir), 2010-11
- Advisor: “Sustainable HVAC Design for the Drexel Smart House” (Jean Boda, Lauren Giardiello, AJ Leonard, Jamie McDonald, Michelle Robinson), 2009-10
- Technical Reviewer: “Ludwig’s Corner Site Development” and “Traffic Mitigation Plan for Interstate 76, Exit 338 Belmont Avenue and Green Lane,” 2019-2020.
- Technical Reviewer: “Concentrated Swine Production Environmental Impact Mitigation,” 2018-2019.
- Technical Reviewer: “All-Weather Bicycle Expressway,” 2017-18.

- Technical Reviewer: “Glen Foerd Historical Park: Renovation of Carriage House and Site Improvements,” 2016-17.
- Technical Reviewer: “AEI Pankow Design Competition,” 2015-16
- Technical Reviewer: “All-Weather Bicycle Expressway,” 2015-16
- Technical Reviewer: “Schuylkill River Hub at Bartram’s Garden,” 2014-15
- Technical Reviewer: “Design for a Community Development Center Located in Zambia,” 2014-15
- Technical Reviewer: “Building Energy Efficiency Retrofit for the City of Philadelphia’s Parks and Rec Sector,” 2014-15
- Technical Reviewer: “Historical Restoration of The Hotel Syracuse”, 2013-14.
- Technical Reviewer: “LNG Export Terminal at Hope Creek,” 2013-14
- Technical Reviewer: “Mantua Green Resource Center Project,” 2012-13
- Technical Reviewer: “The Structural and Mechanical Design of a Contemporary Art Museum,” 2010-11
- Technical Reviewer: “Case Farnese Building Renovation,” 2009-10

Senior Seminar:

- Advisor: “Artificial Intelligence in Civil and Building Engineering” (Qiaodan Lin), 2019-20
- Advisor: “Effectiveness of Plant Based Biofiltration for Indoor Air Quality” (Alexander Tieu), 2018-19.
- Advisor: “Analysis of Air Quality of the Amazon Spheres” (Jennifer Fretta), 2018-19.
- Advisor: “The Effects of Household Fragrance Products on Indoor Air Quality” (Shaina Slaughter), 2018-19.
- Advisor: “Lighting Effects on Human Systems and Performance” (Ray Powell), 2016-17.
- Advisor: “Building Green Affordable Housing For Low Income Families” (Ronald Park), 2016-17.
- Advisor: “Improving Productivity Levels and Health in Office Workers by Optimizing Indoor Air Quality” (Reid Manus), 2015-16.
- Advisor: “Effects of Intelligent Building Systems on Building Energy Efficiency and Occupant Comfort” (Nilay Kantaria), 2015-16.
- Advisor: “Sustainability of Underground Homes” (Leo Reilly), 2014-15.
- Advisor: “Building Data Collection” (Derek Lavigne), 2014-15.
- Advisor: “Indoor Air Quality in Libraries” (Xiaoxiao Tan), 2014-15.
- Advisor: “Critical Analysis of LEED Certified Buildings” (Gurjit Kaur), 2014-15.
- Advisor: “Integration of Fire Alarm and Building Automation Systems” (David Lemons), 2013-14.
- Advisor: “The Evolution of HVAC and Indoor Air Quality in the 20th Century” (Ivan Pineiro), 2013-14.
- Advisor: “Air Quality and Air Conditioning Techniques in Server Farms” (John Dobbs), 2012-13.
- Advisor: “LEED IEQ Category in Indoor Air Quality” (Kesla Duka), 2012-13.
- Advisor: “Waste Reduction in Existing Reheat Water Systems” (Ilya Sirordochev), 2012-13.

- Advisor: “Economic Advantages of Decoupling Sensible and Latent Loads Using Parallel Air and Hydronic Systems” (Stephen Wayland), 2012-13.
- Advisor: “Wind Turbines in Urban Environments” (John Jones), 2011-12.
- Advisor: “Pump Selection for Miramar, El Salvador” (Tejas Patel), 2011-12.
- Advisor: “Review of Porous Pavement Technologies” (Ryan Pinkowski), 2011-12.
- Advisor: “Building Technology of the Future: Biowall Filtration” (Anthony Nicastro), 2010-11.
- Advisor: “Removing Volatile Organic Compounds Using Photocatalytic Oxidation” (William Mahon), 2010-11.
- Advisor: “HVAC Air Duct Leakage” (Matt Albracht), 2010-11.
- Advisor: “Radon Remediation Techniques” (Nick Hall), 2010-11.
- Advisor: “Modeling Pollutant Removal by Biowalls” (Casey Gallagher), 2009-10.
- Advisor: “Impact of Green Rating Systems on Indoor Environmental Quality” (Lauren Giardiello), 2009-10.
- Advisor: “Emerging Alternative Energy Technologies in Building Sustainability” (Aisha Sandidge), 2009-10.
- Advisor: “Sustainability and Energy Efficiency in Building Design: Utilizing Solar Strategies and Technology to Create Off-the-Grid Structures” (Tony Chadwell), 2009-10.

15. Graduate Student Committees

PhD Final Defense Committees:

- Adam Regnier, Architectural Engineering, March 2020
- Sheng Wang, Architectural Engineering, October 2020
- Chunyi Wang, Environmental Engineering, August 2019, chair
- Daniel Chung, Architectural Engineering, March 2019
- Liam Hendricken, Architectural Engineering, October 2018
- Tom Ben-David, Architectural Engineering, May 2018, chair
- Adams Rackes, Architectural Engineering, December 2017, chair
- Anita Avery (nee Johnson), Environmental Engineering, November 2017
- Yanan Yang, Environmental Engineering, September 2017, chair
- Scott Jeffers, Environmental Engineering, June 2017
- J. Doug Goetz, Environmental Engineering, February 2017
- Shokouh Pourarian, Architectural Engineering, December 2015
- Xiwang Li, Architectural Engineering, October 2015
- Somayeh Youssefi, Environmental Engineering, defended April 2015, chair
- Jared Langevin, Civil Engineering, May 2014

- Ghasideh Pourhashem, Environmental Engineering, November 2013
- Ran Liu, Civil Engineering, April 2012
- Lisa Chen Ng, Civil Engineering, July 2010
- Shamia Hoque, Environmental Engineering, June 2010

PhD Proposal Defense Committees:

- Kyle Banecker, Department of Chemistry, June 2020
- Henry Colby, Department of Chemistry, June 2019
- Yun (Emma) Zhang, Architectural Engineering, April 2019
- Zhelun Chen, Architectural Engineering, October 2018
- Chunyi Wang, Environmental Engineering, April 2018, chair
- Tom Ben-David, Architectural Engineering, January 2018, chair
- Sheng Wang, Architectural Engineering, November 2017
- Adams Rackes, Architectural Engineering, May 2017, chair
- Yanan Yang, Environmental Engineering, April 2017, chair
- Anita Avery (nee Johnson), Environmental Engineering, February 2017
- J. Doug Goetz, Environmental Engineering, August 2016
- Daniel Chung, Architectural Engineering, July 2016
- Scott Jeffers, Environmental Engineering, March 2016
- Adam Regnier, Architectural Engineering, July 2015
- Shokouh Pourarian, Architectural Engineering, January 2015
- Xiwang Li, Architectural Engineering, November 2014
- Somayeh Youssefi, Environmental Engineering, August 2014, chair
- Liam Hendricken, Civil Engineering, August 2013
- Jared Langevin, Civil Engineering, July 2012
- Ghasideh Pourhashem, Environmental Engineering, June 2012
- Ran Liu, Civil Engineering, December 2010

PhD Candidacy Exam Committees:

- Ojas Pradhan, Architectural Engineering, July 2020
- Andrew Lindsay, Department of Chemistry, April 2019
- Bryan Berman, Environmental Engineering, March 2019
- Dienne Tolofari, Environmental Engineering, February 2019

- Congmeng Lyu, Environmental Engineering, November 2018
- Bryan Cummings, Environmental Engineering, April 2018, chair
- Yun (Emma) Zhang, Architectural Engineering, March 2018
- Ben Werden, Environmental Engineering, March 2017
- Tom Ben-David, Architectural Engineering, November 2016, chair
- Zhelun Chen, Architectural Engineering, September 2016
- Steven Snyder, Architectural Engineering, December 2015
- Yanan Yang, Architectural Engineering, September 2015, chair
- Sheng Wang, Architectural Engineering, August 2015, chair
- Daniel Chung, Architectural Engineering, August 2015
- Anita Avery (nee Johnson), Environmental Engineering, April 2014
- J. Doug Goetz, Environmental Engineering, December 2013
- Adams Rackes, Civil Engineering, January 2013, chair
- Chunyi Wang, Environmental Engineering, October 2013, chair
- Scott Jeffers, Environmental Engineering, May 2013
- Adam Regnier, Civil Engineering, June 2012
- Liam Hendricken, Civil Engineering, June 2012
- Xiwang Li, Civil Engineering, June 2012
- Shokouh Pourarian, Civil Engineering, December 2011
- Somayeh Youssefi, Environmental Engineering, September 2011, chair
- Jared Langevin, Civil Engineering, April 2011
- Ghasideh Pourhashem, Environmental Engineering, November 2010

MS Thesis Defense Committees:

- Richard Kimball, Architectural Engineering, July 2020
- Bryan Cummings, Architectural Engineering, June 2017, chair
- Alexander Bui, Environmental Engineering, June 2013
- Liam Hendricken, Civil Engineering, August 2011

16. University Service

- Director of Architectural Engineering, 2015 to present
- Associate Department Head for Undergraduates, 2015 to present
- Chair of CAEE Senior Design Committee, 2020 to present (member since 2015)

- Chair of CAEE Department Committee on Advising, 2015 to present
- Member of Drexel CAEE Department CQI Committee, 2015 to present
- Member of Drexel CAEE Department Curriculum Committee, 2014 to present
- Member of Drexel CAEE Department Graduate Committee, since 2011
- Member of Tenure and Promotion Committee (and 3-Year Review) for Dr. James Lo, 2020
- Chair of 3-Year Review Committee for Dr. Shannon Capps, 2019
- Member of Tenure and Promotion Committee (and 3-Year Review) for Dr. Peter DeCarlo, 2016
- Member of Department Head Search Committee, 2013-2014
- Member of Faculty Search Committee for position open related to Urban Infrastructure, Energy, and Environment, 2013-2014
- Member of Faculty Search Committee for position open related to Water-Energy Nexus, 2012-13
- Member of Drexel CAEE Department Forefront Committee, 2013
- Member of Drexel CAEE Department: Mission, Vision, Values Committee, 2012
- Advisor for ASHRAE Student Chapter, since 2011 to 2016
- Advisor for Architectural Engineering Institute (AEI) Chapter, 2015 to present
- Faculty Advisor for B.S./M.S. degree for Building Systems Concentration at Drexel, since 2011 (now shared with Jin Wen/James Lo)
- Faculty Advisor for Drexel Liberty Scholar Program, 2011-13
- Faculty Advisor for Drexel STAR Scholar Program, 2011
- Moderator for ASCE MASC Critical Issues Seminar, hosted at Drexel University, 2011
- Member of Junior Faculty Committee, Drexel College of Engineering, 2010-11
- Faculty Lecturer for Drexel CAEE Fundamentals of Engineering (FE) Review Class, twice yearly lectures since 2010
- Faculty Attendee for Drexel CAEE New Student Days and Open Houses, regular attendance since 2009
- Faculty Lecturer for Drexel courses, CAEE 201, twice yearly lectures in each since 2009

17. Awards, Honors, Fellowships and Scholarships Received

- National Science Foundation CAREER Award, funded starting in 2011
- ASHRAE New Investigator Award, awarded in 2012
- ASHRAE 2010 Willis H. Carrier Award, awarded in 2011
- ASHRAE 2010 Transactions Paper Award, with Jeffrey Siegel, awarded in 2011
- University of Texas Harrington Dissertation Fellowship, 2008-09
 - This is the highest fellowship from the University of Texas at Austin that a current doctoral candidate can hold: <http://www.utexas.edu/harrington/graduate/selection/>

- ASHRAE Graduate Student Grant-in-Aid, awarded in 2008
- National Science Foundation IGERT Trainee Fellowship, 2006-08
- University of Texas Innovative Instructional Technology Awards Program Gold Medal for Resource Development for BMEB, an educational web site at: <http://www.ce.utexas.edu/bmeb/>, 2007
- National Merit Scholar, 1996