

**Shelly L. Miller**

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**Professional Preparation**

Harvey Mudd College, Applied Mathematics *with honors*, BS, 1986

Claremont Graduate School, Operations Research and Statistics, MS, 1987

University of California, Berkeley, Environmental Engineering, MS, 1991

University of California, Berkeley, Civil and Environmental Engineering, PhD, 1996

**Dissertation Title:** “Characterization and Control of Exposure to Indoor Air Pollutants Generated by Occupants,” William W Nazaroff (Chair)

Minors: Public Health, Chemical Transport Phenomena

**Academic/Professional Appointments University of Colorado Boulder**

Associate Director, 2019-present, Office of Faculty Affairs

Professor, 2015-present, Mechanical Engineering

Associate Professor, 2006-2015, Mechanical Engineering

Assistant Professor, 1998-2006, Mechanical Engineering

Chancellor’s Postdoctoral Fellow, 1996-1998

**Indexed Journal Publications (out of 86 publications)**

1. Miller, S. L., Mukherjee, D., Wilson, J., Clements, N., & Steiner, C. (2020). Implementing a negative pressure isolation space within a skilled nursing facility to control SARS-CoV-2 transmission. *American Journal of Infection Control*. <https://doi.org/10.1016/j.ajic.2020.09.014>
2. Dancer, S. J., Tang, J. W., Marr, L. C., Miller, S., Morawska, L., & Jimenez, J. L. (2020). Putting a balance on the aerosolization debate around SARS-CoV-2. *Journal of Hospital Infection*, 105(3), 569–570. <https://doi.org/10.1016/j.jhin.2020.05.014>
3. Miller, S. L., Nazaroff, W. W., Jimenez, J. L., Boerstra, A., Buonanno, G., Dancer, S. J., Kurnitski, J., Marr, L. C., Morawska, L., & Noakes, C. (n.d.). Transmission of SARS-CoV-2 by inhalation of respiratory aerosol in the Skagit Valley Chorale superspreading event. *Indoor Air*, n/a(n/a). <https://doi.org/10.1111/ina.12751>
4. Morawska, L., Tang, J. W., Bahnfleth, W., Bluyssen, P. M., Boerstra, A., Buonanno, G., Cao, J., Dancer, S., Floto, A., Franchimon, F., Haworth, C., Hogeling, J., Isaxon, C., Jimenez, J. L., Kurnitski, J., Li, Y., Loomans, M., Marks, G., Marr, L. C., ... Yao, M. (2020). How can airborne transmission of COVID-19 indoors be minimised? *Environment International*, 142, 105832. <https://doi.org/10.1016/j.envint.2020.105832>
5. Humphrey, J.L., Barton, K.E., Shrestha, P.M., Carlton, E.J., Newman, L.S., Root, E.D., Adgate, J.L. and Miller, S.L., 2020. Air infiltration in low-income, urban homes and its relationship to lung function. *Journal of Exposure Science & Environmental Epidemiology*, 30(2): 262-270. <https://doi.org/10.1038/s41370-019-0184-8>
6. Karnauskas, K., Miller, S. and Schapiro, A. Fossil fuel combustion is driving indoor CO2 toward levels harmful to human cognition. 2020, *GeoHealth*, 4(5), May 2020, e2019GH000237. <https://doi.org/10.1029/2019GH000237>
7. Auguste, D. and Miller, S.L., 2020. Volatile Organic Compound Emissions from Heated Synthetic Hair: A Pilot Study. *Environmental Health Insights*, 14, p.1178630219890876.
8. Price, D.J., Day, D.A., Pagonis, D., Stark, H., Algrim, L.B., Handschy, A.V., Liu, S., Krechmer, J.E., Miller, S.L., Hunter, J.F. and de Gouw, J.A., 2019. Budgets of organic carbon composition

and oxidation in indoor air. *Environmental Science & Technology*, 53(22), 13053-13063.  
<https://doi.org/10.1021/acs.est.9b04689>

9. Pagonis, D., Algrim, L.B., Price, D.J., Day, D.A., Handschy, A.V., Stark, H., Miller, S.L., de Gouw, J.A., Jimenez, J.L. and Ziemann, P.J., 2019. Autoxidation of Limonene Emitted in a University Art Museum. *Environmental Science & Technology Letters*, 6(9), pp.520-524.  
<https://doi.org/10.1021/acs.estlett.9b00425>
10. Pagonis, D., Price, D., Algrim, L.B., Day, D.A., Handschy, A., Stark, H., Miller, S.L., de Gouw, J.A., Jimenez, J.L. and Ziemann, P.J., 2019. Time-Resolved Measurements of Indoor Chemical Emissions, Deposition, and Reactions in a University Art Museum. *Environmental Science & Technology*, 53:4794-4802, 2019, <https://doi.org/10.1021/acs.est.9b00276>
11. Carlton, E.J., Barton, K., Shrestha, P.M., Humphrey, J., Newman, L.S., Adgate, J.L., Root, E. and Miller, S.L. Relationships between home ventilation rates and respiratory health in the Colorado Home Energy Efficiency and Respiratory Health (CHEER) study. *Environmental Research*, 169:297-307, 2019, <https://doi.org/10.1016/j.envres.2018.11.019>
12. Shrestha, P.M., Humphrey, J.L., Carlton, E.J., Adgate, J.L., Barton, K.E., Root, E.D. and Miller, S.L., 2019. Impact of Outdoor Air Pollution on Indoor Air Quality in Low-Income Homes during Wildfire Seasons. *International journal of environmental research and public health*, 16(19), p.3535.  
<https://doi.org/10.3390/ijerph16193535>
13. Shrestha, P.M., Humphrey, J.L., Barton, K.E., Carlton, E.J., Adgate, J.L., Root, E.D. and Miller, S.L. Impact of Low-Income Home Energy Efficiency Retrofits on Building Air Tightness and Healthy Home Indicators. *Sustainability*, 11:2667, 2019, <https://doi.org/10.3390/su11092667>
14. Eltarkawe, M. and Miller, S. Industrial odor source identification based on wind direction and social participation. *International Journal of Environmental Research and Public Health*, 16:1242, 2019, <https://doi.org/10.3390/ijerph16071242>
15. Humphrey, J.L., Lindstrom, M., Barton, K.E., Shrestha, P.M., Carlton, E.J., Adgate, J.L., Miller, S.L. and Root, E.D. Social and Environmental Neighborhood Typologies and Lung Function in a Low-Income, Urban Population. *International Journal of Environmental Research and Public Health*, 16:1133, 2019, <https://doi.org/10.3390/ijerph16071133>
16. Eltarkawe, M.A., and Miller, S.L. The impact of industrial odors on the subjective well-being of communities in Colorado, *International Journal of Environmental Research and Public Health*, 15: 1091, 2018, <https://doi.org/10.3390/ijerph15061091>
17. Militello-Hourigan, R., and Miller, S. L. The impacts of cooking and an assessment of indoor air quality in Colorado passive and tightly constructed homes, *Building and Environment*, 144:573-582, 2018, DOI: [10.1016/j.buildenv.2018.08.044](https://doi.org/10.1016/j.buildenv.2018.08.044)
18. Rosario, K., Fierer, N., Miller, S.L., Luongo, J., Breitbart, M. Diversity of DNA and RNA viruses in indoor air as assessed via metagenomics sequencing, *Environmental Science & Technology*, 52:1014-1027, 2018, <https://doi.org/10.1021/acs.net.7b04203>
19. Clements, N., Keady, P.B., Emerson, J., Fierer, N., Miller, S.L., Seasonal Variability of Airborne Particulate and Bacteria Concentrations in Colorado Homes, *Atmosphere*, 9(4):133, 2018, <https://doi.org/10.3390/atmos9040133>
20. Luongo, J.C., Barberan, A., Hacker-Cary, R., Morgan, E.E., Miller, S.L., Fierer, N. Microbial analyses of airborne dust collected from dormitory rooms predict the sex of occupants, *Indoor Air*, 27:338-344, 2017. <https://doi.org/10.1111/ina.12302>
21. Emerson, J.B., Keady, P.B., Clements, N., Morgan, E.E., Awerbuch, J., Miller, S.L. Fierer, N. High temporal variability in airborne bacterial diversity and abundance inside single-family residences. *Indoor Air*, 27:576-586, 2017

22. Luongo, J.C., Brownstein, J. Miller, S.L. Ultraviolet germicidal coil cleaning: Impact on heat transfer effectiveness and static pressure drop. *Building and Environment*, 112:159-165, 2017
23. Miller, S.L., Facciola, N.A., Toohey, D., Zhai, J., Ultrafine and fine particulate matter inside and outside of mechanically ventilated buildings, *International Journal of Environmental Research and Public Health*, 14(2):128, 2017, <https://doi.org/10.3390/ijerph14020128>
24. Miller, S.L., Clements, N., Elliott, S.A., Subhash, S.S., Eagan, A., Radonovich, L.J., Implementing a negative-pressure isolation ward for a surge in airborne-infectious patients. *American Journal of Infection Control*, 45:652-650, 2016
25. Adams, R., Bhangar, S., Dannemiller, K., Eisen, J., Fierer, N., Gilbert, J, Green, J., Marr, L., Miller, S.L., Seigel, J., Stephens, B., Waring, M., Bibby, K. Ten questions concerning the microbiome of buildings, *Building and Environment*, 109:224-234, 2016
26. Offermann, F.J., Eagan, A., Offermann, A.C., Subhash, S.S., Miller, S.L., and Radonovich, L.J. Potential airborne pathogen transmission in a hospital with and without surge control ventilation system modifications. *Building and Environment*, 106:175–180, 2016
27. Luongo, J.C. and Miller, S.L., Ultraviolet Germicidal Irradiation on HVAC Cooling Coils: Decreased Surface Microbial Loading and Resuspension of Cell Clusters, *Building and Environment*, 105:50-55, 2016
28. Subhash, S. S., Baracco, G., Miller, S.L., Eagan, A., Radonovich, L.J., Estimation of needed isolation capacity for an airborne-influenza pandemic, *Health Security*, 14(4):1-6, 2016
29. Clements, N., Hannigan, M.P., Miller, S.L., Peel, J.L., and Milford, J.B.: Comparisons of urban and rural PM<sub>10</sub>–2.5 and PM<sub>2.5</sub> mass concentrations and semi-volatile fractions in Northeastern Colorado, *Atmos Chem Phys*, 16:7469-7484, 2016
30. Liu, S., Li, R., Wild, R.J., Warneke, C., de Gouw, J.A., Brown, S.S., Miller, S.L., Luongo, J.C., Jimenez, J.L. and Ziemann, P.J., Contribution of human-related sources to indoor volatile organic compounds in a university classroom, *Indoor Air*, 26:925-938, 2016
31. Luongo, J.C., Fennelly, K.P., Keen, J.A., Zhai, Z.J., Jones, B.W. and Miller, S.L., Role of mechanical ventilation in the airborne transmission of infectious agents in buildings, *Indoor Air*, 26:666-678, 2016
32. Barberán, A., Dunn, R.R., Reich, B.J., Pacifici, K., Laber, E.B., Menninger, H.L., Morton, J.M., Henley, J.B., Leff, J.W., Miller, S.L., Fierer, N., The ecology of microscopic life in household dust, *Proc. R. Soc. B* 2015 282 20151139; <https://doi.org/10.1098/rspb.2015.1139>. Published 26 August 2015
33. Morgan, B., Hansgen, R., Hawthorne, W, Miller, S.L., Industrial Odor Sources and Air Pollutant Concentrations in Globeville, a Denver Colorado Neighborhood, *Journal of the Air & Waste Management Association*, 65:1127-1140, 2015, <https://doi.org/10.1080/10962247.2015.1064833>
34. Miller, S.L., Upper Room Germicidal Ultraviolet Systems for Air Disinfection Are Ready for Wide Implementation, *American Journal of Respiratory and Critical Care Medicine* 192:4, 407-409, 2015
35. Kim, S.-Y., Dutton, S.J., Sheppard, L., Hannigan, S.L., Milford, J.B., Peel, J.L., Vedal, S., The short-term association of selected components of fine particulate matter and mortality in the Denver Aerosol and Health (DASH) study, *Environmental Health*, 14:49, 2015
36. Emerson, J., Keady, P., Brewer, T., Clements, N., Morgan, E., Awerbuch, J., Miller, S.L., Fierer, N. Impacts of flood damage on airborne bacteria and fungi in homes after the 2013 Colorado front range flood, *Environmental Science & Technology*, 49(5):2675-2684, 2015
37. Clements, N., Eav, J., Xie, M., Hannigan, M.P., Miller, S.L., Navidi, W., Peel, J.L., Schauer, J.J., Shafer, M.M., and Milford, J.B., Concentrations and source insights for trace elements in fine and coarse particulate matter. *Atmospheric Environment*, 89:373-381, 2014

38. Clements, N., Milford, J.B., Miller, S.L., Navidi, W., Peel, J.L., Hannigan, M.P., Errors in coarse particulate matter mass concentrations and spatiotemporal characteristics when using subtraction estimation methods. *Journal of the Air & Waste Management Association*, **63**:1386-1398, 2013
39. Miller, S.L., Linnes, J., Luongo, J., Ultraviolet germicidal irradiation: future directions for air disinfection and building applications. *Photochemistry and Photobiology*, 89(4):777-781, 2013
40. Xu, P., Fisher, N., Miller, S.L., Using Computational Fluid Dynamics Modeling to Evaluate the Design of Hospital Ultraviolet Germicidal Irradiation Systems for Inactivating Airborne Mycobacteria. *Photochemistry and Photobiology*, 89(4):792-798, 2013
41. Xie, M., Piedrahita, R., Dutton, S.J., Milford, J.B., Hemann, J.G., Peel, J.L., Miller, S.L., Kim, S.-Y., Vedal, S., Sheppard, L., Hannigan, M.P., Positive matrix factorization of a 32-month series of daily PM<sub>2.5</sub> speciation data with incorporation of temperature stratification. *Atmospheric Environment*, **65**:11-20, 2013
42. Xie, M., Coons, T.L., Dutton, S.J., Milford, J.B., Miller, S.L., Peel, J.L., Vedal, S., and Hannigan, M.P., Intra-urban spatial variability of PM<sub>2.5</sub>-bound carbonaceous components. *Atmospheric Environment*, **60**:486-494, 2012
43. Xie, M., Coons, T.L., Hemann, J.G., Dutton, S.J., Milford, J.B., Peel, J.L., Miller, S.L., Kim, S.-Y., Vedal, S., Sheppard, L., Hannigan, M.P., Intra-urban spatial variability and uncertainty assessment of PM<sub>2.5</sub> sources based on carbonaceous species. *Atmospheric Environment*, **60**:305-315, 2012
44. Xie, M., Hannigan, M.P., Dutton, S.J., Milford, J.B., Hemann, J.G., Miller, S.L., Schauer, J.J., Peel, J.L., Vedal, S. Positive matrix factorization of PM<sub>2.5</sub>: comparison and implications of using different speciation datasets. *Environmental Science & Technology*, **46**(21):11962-11970, 2012
45. Rudnick, S.N., First, M.W., Sears, T., Vincent, R.L., Brickner, P.W., Ngai, P.Y., Zhang, J., Levin, R.E., Chin, K., Rahn, R.O., Miller, S.L. Nardell, E.A., Spatial distribution of fluence rate from upper room ultraviolet germicidal irradiation: experimental validation of a computer-aided design tool. *HVAC&R Research*, **18**(4):774-794, 2012
46. Clements, N., Piedrahita, R., Ortega, J., Peel, J.L., Hannigan, M., Miller, S.L., Milford, J.B., Characterization and nonparametric regression of rural and urban coarse particulate matter mass concentrations in northeastern Colorado, *Aerosol Science & Technology*, **46**:108-123, 2012
47. DiGuseppi, C., Goss, C.W., Dao, L., Allshouse, A., Bardwell, R.A., Hendrikson, E., Miller, S.L., and Litt, J., Safety practices in relation to home ownership among urban Mexican immigrant families, *Journal of Community Health*, **37**:165-175, 2012
48. VanSciver, M., Miller, S.L., and Hertzberg, J., Particle image velocimetry of human cough, *Aerosol Science & Technology*, **45**:415-422, 2011
49. Ryan, K., McCabe, K., Clements, N., Hernandez, M., and Miller, S.L., inactivation of airborne microorganisms using novel ultraviolet radiation sources in reflective flow-through control devices, *Aerosol Science & Technology*, **44**:541-550, 2010
50. Dutton, S.J., Vedal, S., Piedrahita, R., Milford, J.B., Miller, S.L., and Hannigan, M.P., Source apportionment Using positive matrix factorization on daily measurements of inorganic and organic speciated PM<sub>2.5</sub>, *Atmospheric Environment*, **44**:2731-2741, 2010
51. Litt, J.S., Goss, C., Diao, L., Allshouse, A., Diaz-Castillo, S., Bardwell, R.A., Hendrikson, E., Miller, S.L., DiGuseppi, C., Housing environments and child health conditions among recent Mexican immigrant families: a population-based study, *Journal of Immigrant and Minority Health*, **12**:617-625, 2010, <https://doi.org/10.1007/s10903-009-9261-8>
52. Miller, S.L., Scaramella, P., Camp, J., Goss, C., Diaz-Castillo, S., Hendrikson, E., DiGuseppi, C., Litt, J., An assessment of indoor air quality in recent Mexican immigrant housing in Commerce

City, Colorado, *Atmospheric Environment*, **43**:5661-5667, 2009,  
<https://doi.org/10.1016/j.atmosenv.2009.07.037>

53. Vedal, S., Hannigan, M.P., Miller, S.L., Milford, J.B., Rabinovitch, N., Kim, S.-Y., Sheppard, L., The Denver aerosol sources and health (DASH) study: overview and early findings, *Atmospheric Environment*, **43**:1666-1673, 2009
54. Hemann, J.G., Brinkman, G. L., Dutton, S.J., Hannigan, M.P., Milford, J.B., and Miller, S.L., Assessing positive matrix factorization model fit: A new method to estimate uncertainty and bias in factor contributions at the measurement time scale, *Atmospheric Chemistry and Physics*, 9: 497-513, 2009
55. Shafer, M., Kujundzic, E., Miller, S.L., and Moss, C., Measurement method for estimating ultraviolet germicidal fluence rates in a health-care room, *Journal of Infection Control and Hospital Epidemiology*, 29(11):1042-1047, 2008

### **Current Research Projects**

- Musicians and Performers Aerosol study, assessing the generation of aerosols and risk due to playing wind instruments and performances, 6-month study, funded by non-profit music organizations and led by the National Federation of High Schools Association
- Pesticide Exposure in agricultural Workers in Boulder, measuring passive exposures to pesticides at work and away from work, 12-month study, funded by CU Boulder Outreach grant
- Empowering Environmental Justice Communities with Smart and Connected Technology: Air and Noise Pollution, Social Relations and Wellbeing in Times of Disruption, 3-y study, funded by the National Science Foundation

### **Teaching Expertise**

- Indoor Air Pollution, Fundamentals of Environmental Engineering, Air Pollution Control Engineering, Toxic Chemicals in the Environment, Aerosols, Air Quality Measurements

### **Honors and Awards (recent)**

- Outstanding Research Award, Mechanical Engineering, University of Colorado Boulder, 2020
- Fellow, International Society of Indoor Air Quality and Climate Academy of Fellows, elected 2018
- Broadening Opportunity through Leadership and Diversity (BOLD) Faculty Fellow, College of Engineering and Applied Sciences, University of Colorado Boulder, 2017-2018
- Emerging Leaders Program, University of Colorado, 2014-2015

### **Synergistic Activities (recent)**

- National Academy of Sciences invited speaker, Airborne Transmission of SARS-CoV-2, Aug 2020
- Associate Editor, Environmental Science & Technology, 2020-present
- Plenary Speaker, *What to do about the Toll Biomass Burning is taking on our Health, Indoor Environments, and Climate*, American Association for Aerosol Research, Annual Conference, Portland OR, Oct 2019
- Tutorial Instructor, Designing and conducting field campaigns that include indoor environments, American Association for Aerosol Research, Annual Conference, St. Louis MO Sept 2018, Oct 2019
- Conference on World Affairs, member of the Board, 2018-present, Board Chair 2019-2020
- ImagineCU Project, Faculty Director, College-wide mentoring program for undergraduate female students, 2018-2020
- Editor for special issue on Indoor Air Pollution for the open Access MDPI journal Atmosphere, 2017-2019
- National Academy of Sciences invited speaker, Microbiomes of the Built Environment study, October 2016 and October 2017

- Conference President for the Healthy Buildings America Conference, Jul 2015, held at the University of Colorado Boulder. This is a biannual Conference of the International Society for Indoor Air Quality and Climate

### **Collaborators and Other Affiliations**

*Collaborators and Co-authors (past 48 months):* Adgate, J. (CU Denver); Carlton, E. (CU Denver); Fierer, N. (CU Boulder); Hannigan, Michael P. (CU Boulder); Jimenez, J. (CU Boulder); Milford, Jana B. (CU Boulder); Root, E. (Ohio State U); Ziemann, P. (CU Boulder)

*Graduate Advisor:* Nazaroff, William W (UC-Berkeley)

*Graduate Students and Postdoctoral Researchers Supervised (recent only):* Julia Luongo (PhD 2016); Prateek Shrestha (PhD 2018); Mohamed Eltarkawe (PhD 2019); Donna Auguste (PhD 2019); Jamie Humphrey (postdoc 2015-2017)