Curriculum Vitae

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1 Curriculum Vitae

1.1 Demographic information

Name:	Brent Stephens, Ph.D.
Title:	Associate Professor
Department:	Department of Civil, Architectural and Environmental Engineering
Program:	Architectural Engineering (with contributions to Environmental Engineering)
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1.2 Education

Doctor of Philosophy:	University of Texas at Austin
Department:	Civil Engineering
Date:	May 2012
Dissertation title:	"Characterizing the impacts of air-conditioning systems, filters, and building envelopes on exposures to indoor pollutants and energy consumption in residential and light-commercial buildings"
Honors:	Thrust 2000 Endowed Fellowship, 2007-2011 National Science Foundation IGERT Trainee Fellowship, 2009-2011 Graduate School Continuing Fellowship, 2011-2012
Master of Science:	University of Texas at Austin
Department:	Environmental and Water Resources Engineering
Date:	May 2009
Thesis title:	"Energy implications of filters in residential and light-commercial HVAC systems"
Honors:	Thrust 2000 Endowed Fellowship, 2007-2011 ASHRAE Graduate Student Grant-in-Aid, 2008
Bachelor of Science:	Tennessee Technological University
Department:	Civil Engineering
Date:	May 2007
Honors:	University Service Scholarship, 2002-2006 Asia Khatun Endowment Scholarship, 2005 J.R. Wauford Scholarship, 2006

1.3 Professional history

Time period: August 2012 – Present
Title: Associate Professor (2016-present); Assistant Professor (2012-2016)
Institution: Illinois Institute of Technology (IIT)
Department: Department of Civil, Architectural and Environmental Engineering (CAEE)
Program: Architectural Engineering (ARCE)
Responsibilities: Responsibilities in this position include: building an externally funded research group, the Built Environment Research Group (http://built-envi.com); serving as Principal Investigator on several externally funded research projects; supervising and mentoring postdoctoral, graduate, and undergraduate researchers; teaching undergraduate and graduate courses in architectural engineering and environmental engineering; advising undergraduate and graduate students in architectural engineering; developing and writing research proposals; writing and overseeing manuscript preparation for publication in peer-reviewed journals; presenting research results at national and international conferences, universities, national laboratories, and other industry, academic, and professional communities; serving as a peer reviewer for journals, conferences, and proposals; serving on departmental and university committees; and networking within the city of Chicago and beyond to promote research and education in CAEE at IIT. In 2016, I began serving alongside Prof. Jamshid Mohammadi and Prof. Paul Anderson on the CAEE department's Transition Leadership Team (appointed by Armour College of Engineering Dean DePaola) to manage the everyday affairs of the department and to work on strategic planning for CAEE.

Accomplishments: Major accomplishments in this position include the following:

- **External research funding:** Received **$1,469,728** in external research funding as PI or co-PI ($1,166,892 as PI) on 14 projects totaling approximately $2.8 million across all co-PIs. These projects have been funded by the U.S. Environmental Protection Agency (EPA); the Alfred P. Sloan Foundation (APSF); the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); the Centers for Disease Control (CDC) through the National Institute for Occupational Safety and Health (NIOSH); the Air-Conditioning, Heating and Refrigeration Institute (AHRI); and the National Air Filtration Association (NAFA) Foundation. Four unrestricted gifts in support of my research have also come from industry supporters (totaling **$47,400**). I have also received **$40,000** in internal funding from IIT, including a WISER Interdisciplinary Seed Funding Grant (co-PI Rodger Cooley, College of Architecture) and a Starr-Fieldhouse Fellowship for one of my students.
- **Peer-reviewed publications:** Published a total of **34** peer-reviewed journal articles, editorials, and commentaries in my career, **24** of which have been published while at IIT.
- **Teaching:** Taught three rotating courses (CAE 331/513 Building Science, CAE 463/524 Building Enclosure Design, and ENVE 576 Indoor Air Pollution) with a mean enrollment of 20 students, receiving a mean instructor rating of **4.70** and a mean course rating of **4.57** out of 5.00.
- **Mentoring:** Mentored 1 postdoctoral researcher, 5 Ph.D. students, 5 M.S. students, 15 undergraduate students (primarily through the Armour College of Engineering Program for Undergraduate Research in Engineering, PURE), and several external Ph.D. and M.S. students from other departments, colleges, and

universities. I have advised Engineers Without Borders and ASHRAE student groups at IIT, as well as an interdisciplinary team that placed 2nd in the Department of Energy's Race to Zero student home design competition in 2016.

- **Professional service:** Served as chair of the International Society for Indoor Air Quality and Climate's (ISIAQ) Scientific and Technical Committee (STC) 21 on Ventilation; served as a member of ASHRAE Technical Committee (TC) 2.4 on Particulate Air Contaminants and Particulate Contaminant Removal Equipment; and served as ISIAQ's first Mentorship Program coordinator. Also served as chair of sessions and workshops at national and international conferences.
- **Awards:** Awarded the ASHRAE New Investigator Award in 2015 ($100,000 over two years). Published what has become the most downloaded paper in the history of the journal *Atmospheric Environment*. My graduate students have won Grant-in-Aid awards from ASHRAE ($10,000 each to Parham Azimi and Torkan Fazli in 2015), a scholarship from the Association of Energy Engineers Foundation ($2,000 to Tommy Zakrzewski in 2015), and multiple student poster competitions at national conference (Dan Zhao, Healthy Buildings USA 2015 and Parham Azimi, International Society of Exposure Science 2015).
- **Marketing and outreach:** My work has been featured or mentioned in popular and scientific media including *Le Monde*, *Chicago Tribune*, *Fast Company*, *Popular Mechanics*, *Telegraph*, *Daily Mail*, *Fox News*, *Discovery News*, *Consumer's Digest*, *IEEE Spectrum*, *Nature*, *Environmental Health Perspectives*, CBS Chicago, and *IIT Magazine*.
- **Service to IIT:** Started a new M.S. program in Architectural Engineering and a joint Ph.D. specialization with the College of Architecture. Served on the CAEE department's Transition Leadership Team (appointed by Armour College of Engineering Dean DePaola) to manage the everyday affairs of the department and to work on strategic planning for CAEE.

Time period:	August 2007 – May 2012
Title:	Graduate Research Assistant
Institution:	University of Texas at Austin
Department:	Department of Civil, Architectural and Environmental Engineering
Responsibilities:	Responsibilities in this position included conducting independent research on energy and indoor air quality in buildings. Ph.D. adviser: Dr. Jeffrey A. Siegel.

1.4 Contributions to teaching

1.4.1 Teaching philosophy

I adhere to four main principles in the classroom: (1) mutual respect, (2) clear organization, (3) stimulating presentation, and (4) multiple directions. I believe it is imperative to show respect for the intellectual pursuits of students, which in turn help engender respect for the instructor. With a mutual respect between student and teacher, both can show their respect for the course material and the knowledge and ideas that are represented. If both students and teachers can maintain a sense of respect, I believe the classroom will be an effective learning environment. I also believe it is imperative to remain organized. I strive to always develop course materials and individual lectures in a coherent and logical manner, ensuring that a story is always told, and that the story has a narrative and message that is always related back to the discipline and the field of study. In the case of architectural or environmental engineering, that narrative and message should always relate back to the utmost goal: effectively ensuring the safety and health of people and the

planet by low-impact building design and operation. I also believe it is important to recognize how information is presented, understood, and translated by students. I generally assume that, at any given time, students with multiple learning styles are in my classroom. Therefore, I strive to convey information such that it is accessible and stimulating to as many senses as possible: visually stimulating but not distracting, auditorily clear and concise, and as hands-on as possible. Finally, I also believe there is room for multiple directions of communication in teaching. Some course material is better suited to primarily one-way approaches (i.e., from teacher to student), while other course material inherently requires more back-and-forth discussion or hands-on components. Engaging students in a variety of ways not only helps students learn to recognize when they understand topics and when they need more information, but also aids in evaluating the learning, understanding, and changing conceptions of students. I strive to be flexible in response to student feedback when deciding the direction of communication throughout the progress of each course, and I strive to anonymously survey each course to receive feedback during the semester while adjustments can still be made.

Further, I draw on recent literature on best practices in engineering education to (1) incorporate active and cooperative project-based learning approaches in which students work together in groups on specific projects to increase their understanding of important phenomena, and (2) create a knowledge-centered classroom environment in which students get real hands-on experience in measuring and critically analyzing data with the intent of challenging their initial mental models of important processes and phenomena. I strive to foster deep learning, where understanding is emphasized far more than memorizing or recalling, rather than surface- or strategic-learning in order to train students to be successful engineers and scholars. I believe that all students can learn and that it is the teacher's responsibility to find ways to help all students do so. I believe in placing high intellectual demands on all students, but also in giving students plenty of opportunities to revise and improve their work before receiving a grade. During the course of my teaching career, I realize I will make mistakes in the classroom, but I will use those mistakes to collectively enhance everyone's learning. I will maintain an open-door policy outside of classroom hours in order to be as accessible as possible to those who matter most: the students.

1.4.2 Teaching accomplishments

I have taught three rotating courses in architectural engineering and environmental engineering:

- CAE 331/513 Building Science
- CAE 463/524 Building Enclosure Design
- ENVE 576 Indoor Air Pollution

In each class I strive to make the topic as compelling as possible, framing the course topics within the overall bigger picture of why the topics matter. For example, for CAE 331/513 Building Science, buildings use more energy in the U.S. than any other individual sector, are responsible for more greenhouse gas emissions, and represent the environments in which we spend almost 90% of our time. Because buildings impact energy, the environment, the economy, and human health, I continually argue that it is crucial for architectural engineers to understand the fundamental physics of how buildings utilize energy, impact the indoor environment, human health, and productivity, and how we can make them more sustainable. Further, I strive to make connections throughout coverage of all course topics, often relating on week 12 back to what we first introduced on week 1 and touched on again in week 6. I think this improves consistency in the course material and triggers recall from students. I have also introduced several hands-on projects in each of my courses, which emphasize active and cooperative learning. In each class I also ensure to have at least one guest speaker, typically involving practicing professionals in Chicago. This serves to confirm the utility of topics covered throughout the course, highlight what projects industry members are working on, and showcase promising students and our program to influential members of

the profession in the city. Guest speakers have included Bruce Kaskel, Principal at WJE (CAE 463/524 Building Enclosure Design); Tommy Zakrzewski, Engineer at Buro Happold (CAE 331/513 Building Science); Ian Cull, President, Indoor Sciences, Inc. (ENVE 576 Indoor Air Pollution); and Stephanie Kunkel, postdoctoral researcher in my lab (ENVE 576 Indoor Air Pollution).

Throughout my experiences teaching these three classes multiple times, I have received the following select personal statements from previous students via email, which capture myriad successes of each course:
"Throughout this course, I think I found my future career…."

- June Young Park, B.S. Architectural Engineering, 2014 (CAE 463)

"I really enjoyed your class and it was definitely one of the best I've taken at IIT."

- Jay Shetty, MAS Architectural Engineering, 2014 (CAE 524)

"I really enjoyed the whole semester with you and this class."

- Sunyoung Oh, MAS Architectural Engineering, 2014 (CAE 524)

"It was a great pleasure to have [Dr. Stephens] as a very knowledgeable, well rounded, and attention to detail instructor. This course opened many doors in both architecture and engineering careers because the quality and quantity of tools we learned in his course. I wish IIT would offer more classes similar to CAE 524 and instructors like Dr. Stephens to help push students more and better understanding building systems."

- Allison Toonen-Talamo, MAS Architectural Engineering, 2015 (CAE 524)

"I enjoyed both the building enclosure and building science class from this year. From my perspective, it was a perfect combination of architecture and engineering, and its what I was hoping to find through the architectural engineering program."

- Kimberly Lis, B.S. Architectural Engineering, 2015 (CAE 331 and CAE 463)

"I would like to thank you for a great semester. I'm really glad that I had the opportunity to be in your building envelope design class. It is one of the best classes I've taken during my academic career. The skills and knowledge of useful softwares that I received is invaluable and would prove to be of great benefit in my professional career. I also deeply appreciate your time and support when it comes to teaching the class and helping with the projects and the homeworks."

- Dhaval Gadani, MAS Construction Engineering and Management, 2015 (CAE 524)

"I am greatly honored to have had the opportunity to learn from you and witness your personal drive, passion and investment in teaching topics in building science."

- Julie Chandler, MAS Architectural Engineering, 2016 (CAE 524)

1.4.3 Teaching evaluations

Results from course evaluations at IIT are provided below. I have had an average enrollment of approximately 20 students and received an average instructor rating of **4.70** and a mean course rating of **4.57** out of 5. Both are considerably higher than the IIT average of 4.26 and 4.15 since I started in 2012.

Course No.	Course Name	Term	Enrollment	Mean Instructor Rating	Mean Course Rating
CAE 463/524	Building Enclosure Design	Fall 2012	21	4.81	4.62
	Building Enclosure Design	Fall 2013	13	4.86	4.86
	Building Enclosure Design	Spring 2014	13	4.67	4.67
	Building Enclosure Design	Spring 2015	19	4.73	4.80
	Building Enclosure Design	Spring 2016	20	4.71	4.43
CAE 331/513	Building Science	Fall 2013	30	4.45	4.09
	Building Science	Fall 2014	40	3.79	3.62
	Building Science	Fall 2015	21	4.70	4.80
ENVE 576	Indoor Air Pollution	Spring 2013	9	5.00	4.57
	Indoor Air Pollution	Fall 2014	17	4.94	4.94
	Indoor Air Pollution	Fall 2015	18	5.00	4.92
		Mean	**20.1**	**4.70**	**4.57**

Further, below is a selection of comments from anonymous evaluations of my courses (from myIIT):

- *"Probably one of the best Professors at IIT. Engages students and challenges them to learn without being unreasonable."*
- *"Very good at explaining topics, extremely involved in student affairs, helpful and encouraging."*
- *"Great and clear presentation skills."*
- *"IAQ is an incredibly interesting topic and one that should not be exclusive to Environmental engineers. I think this course could have massive appeal to Architects and Architectural Engineers as its involvement in the built environment can teach students important factors relevant in the job and construction field."*
- *"Is one of the only professors I have had to take the effort to learn the names of everyone in the class, which may be a small gesture, but it means a lot."*
- *"I wish all IIT professors would prepare us for our major as well as Brent does."*
- *"Great passion. Engaging lectures that are themselves interesting. More than happy to go the extra mile to help out students."*
- *"Already has become one of my favorite professors at IIT. Keeps lectures very interesting, has done a great job teaching building science, and is very fair."*
- *"Best professor and best lectures I've had at IIT."*
- *"Very knowledgeable, easy to talk to."*
- *"Great teaching, excellent professor."*
- *"A very good speaker and answers questions very clearly. His in class demonstrations were great and showed exactly what equipment and how things worked."*
- *"Instructor was very knowledgeable on the subject. He was also very curious and interested in any questions that were brought up by students that he may not know the answer too. Was also very easy to get a hold of if I had any questions and very understanding of extenuating circumstances with working full time and taking graduate courses."*
- *"Dr. Stephens is very good at keeping the class engaged. He adds in humor to the class that makes it a little less difficult to last through a two and a half hour class."*
- *"Professor Stephens is my favorite professor in the CAE department. His classes are well taught and very relevant to architectural engineering. He is willing to meet outside of class to assist with problems not only related to course material but also to help with advising/ career path options within the industry."*
- *"Best professor in department"*

1.4.4 Course overviews

1.4.4.1 CAE 331/513 Building Science

Taught each fall semester, CAE 331/513 explores the fundamentals of building science and the physical phenomena that affect building design and performance. Topics include heat transfer, psychrometrics, indoor air quality, indoor thermal comfort, air infiltration, solar radiation, and heating and cooling load calculations. Upon completion of this course, students are expected to be able to:

1. Describe the role of building components and building environmental systems in energy consumption, peak electricity demand, thermal comfort, and human exposures to pollutants.
2. Describe the role of buildings and environmental systems in building design and construction.
3. Describe and quantify fundamental heat and mass transfer processes in buildings, including conduction, convection, radiation, thermodynamics, fluid flow, and mass balances.
4. Calculate heating and cooling loads in buildings.
5. Understand types of HVAC equipment for residential and commercial construction.
6. Understand basic ventilation and indoor air quality concepts.
7. Describe basic building diagnostic field tests (e.g., blower door tests).
8. Critically analyze claims about building components and environmental systems from product manufacturers, contractors, and building designers.

Students are evaluated primarily based on their performance on homework assignments and exams. I have also experimented with student blogging and group projects. I have recently opened this course to students from the College of Architecture as well in order to improve teaching of building science concepts more widely across the university.

1.4.4.2 CAE 463/524 Building Enclosure Design

Taught each spring semester, CAE 463/524 explores the design of building enclosures, elements of which include walls, floors, roofs, and intentional openings. Topics include the design of building exteriors, including the control of heat flow, air and moisture penetration; building movements; energy conserving designs; and deterioration. Analytical techniques and building codes are discussed through case studies and design projects. Upon completion of this course, students are expected to be able to:

1. Design and assess building enclosure elements for heat transfer, airflow, and moisture control.
2. Be proficient in current building codes and standards as they pertain to building enclosure design.
3. Critically analyze designs for advanced building enclosures for their impacts on energy use, airflow, and potential moisture issues.
4. Be proficient with several software tools used in building enclosure design.

Students are evaluated primarily based on their performance on homework assignments, exams, and group and individual projects. Many homework assignments involve the use of software programs including THERM, WUFI, BEopt + EnergyPlus, and eQUEST. The group project involves hands-on assessments of the enclosures of buildings on IIT's main campus in terms of heat, air, and moisture performance. Students gain hands-on experience with tools such as infrared cameras and blower doors. The individual project is a written research project on high performance building enclosures, which involves review of the peer-reviewed literature in their area of interest. This course is also open to students from the College of Architecture.

1.4.4.3 ENVE 576 Indoor Air Pollution

Taught each fall semester, ENVE 576 explores important concepts of indoor airborne pollutants, including their physical and chemical properties, emission sources, and removal mechanisms. Topics include indoor air pollution sources, indoor pollutant levels, monitoring instruments and designs; indoor pollution control strategies: source control, control equipment and ventilation; energy conservation and indoor air pollution; exposure studies and population time budgets; effects of indoor air population; risk analysis; models for predicting source emission rates and their impact on indoor air environments. Upon completion of this course, students are expected to be able to:

1. Describe particle-phase, gas-phase, and biological pollutants found in indoor environments
2. Model indoor pollutant emission, transport, and control
3. Manipulate and perform calculations with aerosol distributions and gas-phase compounds
4. Analyze indoor pollutant control technologies and determine their effectiveness
5. Read and critically analyze articles in the technical literature on indoor air pollution
6. Prepare and review written and oral technical communication

Students are evaluated primarily based on their performance on homework assignments, exams, blog posts, and a group project. The group project involves written and oral communication that is rooted in the peer-reviewed literature in areas related to the course topic.

1.4.5 Mentoring and supervision of researchers

I am currently supervising and mentoring 1 postdoctoral researcher, 5 full-time Ph.D. students, and 1 part-time (PT) Ph.D. student. I have graduated 5 M.S. students (1 of whom was co-advised) and have directly supervised 15 undergraduate research students and 1 high school student.

1.4.5.1 Postdoctoral researcher supervisions in progress

Researcher	Degree	Program	Years	Dissertation topic
Stephanie Kunkel[1]	Postdoc	CAE	2014-present	Bioaerosol fate, transport and control

[1]Microbiology of the Built Environment Postdoctoral Fellowship, Alfred P. Sloan Foundation

1.4.5.2 Ph.D. supervisions in progress

Student	Degree	Program	Years	Dissertation topic
Parham Azimi[1]	Ph.D.	ENVE	2013-present	Advances in indoor aerosols
Torkan Fazli[1]	Ph.D.	CE	2014-present	Climate change, indoor air, and health
Haoran Zhao	Ph.D.	ENVE	2014-present	Measuring outdoor pollutant infiltration into residences
Dan Zhao	Ph.D.	ENVE	2014-present	Emissions from desktop 3D printers
Akram Ali	Ph.D.	CE	2015-present	Open source building sensor network
Tommy Zakrzewski[2]	Ph.D.	CE (PT)	2012-present	District energy system design tools

[1]Received ASHRAE Graduate Student Grant-In-Aid Award ($10,000 scholarship in 2015)
[2]Received Association of Energy Engineers Foundation (FAEE) William "Bill" Maschburn Scholarship ($2,000 scholarship in 2015)

1.4.5.3 Ph.D. supervisions completed

No Ph.D. supervisions have been completed to date in CAEE, although my first Ph.D. student, Parham Azimi, has passed his qualifying and comprehensive exams and plans to defend his dissertation in Summer 2016 (he began working with me in Spring 2013). I have, however, served as the primary technical research supervisor for two completed Ph.D. dissertations in the College of Architecture at IIT (although I am not listed as their formal dissertation adviser):

Student	Degree	Program	Graduated	Dissertation topic
Irina Susorova[1]	Ph.D.	ARCH	2013	Assessing the thermal performance of vegetative facades
Aysan Khorraminejad	Ph.D.	ARCH	2014	Natural ventilation using a solar chimney and phase change materials

[1]Two peer-reviewed journal articles were published based on Dr. Susorova's work

1.4.5.4 M.S. supervisions in progress

Student	Degree	Program	Years	Thesis topic
Patrick Kevin Cueto	M.S.	ARCE	2015-present	Sustainable urban agriculture systems

1.4.5.5 M.S. supervisions completed

Student	Degree	Program	Graduated	Thesis topic
Zeineb El Orch	M.S.	CAE	2013	Modeling the infiltration of outdoor particulate matter
Maria G. Soriano[1]	M.S.	CAE	2013	On-site wind and PV design for O'Hare International Airport
Tiffanie Ramos[2]	M.S.	ENVE	2014	Building science measurements in the Hospital Microbiome Project
Honnie Leinartas	M.S.	CAE	2014	Prioritizing Chicagoland housing retrofits for 50% energy savings
Akram Ali	M.S.	ARCE	2015	Open source building science sensors

[1]Co-advised by Dr. Jamshid Mohammadi
[2]Starr/Fieldhouse Fellowship winner, 2013

1.4.5.6 Special project supervisions completed

Student	Degree	Program	Year	CAE or ENVE 497/597 topic
Alex Ballester	M.E.	ARCE	2013	597: Building energy simulation
Alvaro Gonzalez	M.E.	ARCE	2013	597: Building energy simulation
Janis Hubert	M.E.	ARCE	2014	597: Building energy simulation
June Young Park	B.S.	ARCE	2014	497: DOE student design challenge
Andi Mele	M.E.	ARCE	2015	597: Thermal bridging of enclosures
Elizbeth Mullin	B.S./M.E.	ARCE	2015	497: Fire alarms in MSV
Saeid Khodaei	ME.	ARCE	2015	597: Air filtration for cookstoves

1.4.5.7 Other graduate defense, comprehensive committees, and undergraduate mentoring

I have served as an external committee member for the following thesis and dissertation committees:

1. Abraham Kruger, M.S., Building Construction, College of Architecture, Georgia Institute of Technology, 2013
   - Primary adviser: Javier Irizarry, Georgia Institute of Technology
   - Thesis topic: "The impact of filter loading on residential HVAC systems"

2. Karen Dannemiller, Ph.D., Environmental Engineering, Yale University, 2014
   - Primary adviser: Jordan Peccia, Yale University
   - Dissertation topic: "Integrating measurements of environmental fungal communities with human health outcomes"

3. Se Yen Lai, M.S., Civil Engineering, IIT, 2014
   - Primary adviser: Ralph Muehleisen, Argonne National Laboratory
   - Thesis topic: "A parametric study of the thermal performance of different wall systems at various climate zones"

4. Peng Du, Ph.D. candidate, College of Architecture, IIT, in progress*
   - Primary adviser: Antony Wood, College of Architecture, IIT, and the Council on Tall Buildings and Urban Habitat (CTBUH)
   - Dissertation topic: "Sustainability implications of downtown high-rise vs. suburban low-rise living"

5. Gilberto Osornio Nieto, Ph.D. candidate, College of Architecture, IIT, in progress
   - Primary adviser: Matthew Herman, College of Architecture, IIT
   - Dissertation topic: "Integrating radiant cooling systems with natural ventilation in predominantly glazed facades in hot and warm climates"

6. Andres Pinzon Latorre, Ph.D. candidate, College of Architecture, IIT, in progress
   - Primary adviser: Peter Land, College of Architecture, IIT
   - Dissertation topic: "Thermal comfort of low-income patio houses in Colombia"

I have served as an undergraduate research adviser in the ACE PURE/MIND programs for 14 students:

1. Dina Curioni, CAEE, 2014, Building science performance assessment in Carman Hall
2. Deion Debose, CAEE, 2013-2015, Open source building science sensors
3. Laurit Dide, CAEE, 2013, Hospital Microbiome Project
4. Boyang "Bobo" Dong, ECE, 2014, Open source building science sensors
5. Utsav Gandhi, ChBE, 2013, Indoor air quality in developing countries
6. Sara Glade, CAEE, 2013, Emissions of ultrafine particles from desktop 3D printers
7. Hailey Kunkel, CAEE, 2013, Energy and life cycle cost impacts of duct designs in homes
8. Roxanne Myers, CAEE, 2013, Development of a hot box thermal testing facility
9. Matthew Thomas, CAEE, 2013, Developing of an in-situ filter performance testing facility
10. Nina Townley, CAEE 2013-2014, Building science performance assessment in Carman Hall
11. Benjamin Waccholz, CAEE, 2013, Developing a system to measure outdoor pollutant infiltration
12. Rou Yi Yeap, ChBE, 2014*, Energy implications of high pressure elements in residential HVAC
13. Zachary Zanzinger, CAEE, 2014, Open source building science sensors
14. Jihad Zeid, ChBE, 2014-2015, Measuring outdoor pollutant transport into an apartment unit

I have served as research adviser to one undergraduate student from the IIT-Paris program:

1. Claire Pouzet, 2015, EVIP*, Ultrafine particle and VOC emissions from desktop 3D printers

I have served as research adviser to one high school student from the Illinois Math and Science Academy:

1. Mylee Rolock, 2014 and 2015, IMSA, Open source sensors and indoor air quality modeling

*Students and researchers marked with an asterisk have been co-authors on peer-reviewed journal articles published, under review, or in preparation for submission

1.5 Academic concentrations and research interests

My academic concentrations and research interests involve **energy and air quality in the built environment** through the merger of architectural engineering and environmental engineering. I conduct research more specifically within the disciplines of **building science** and **indoor air quality**. I have five main areas of investigation in my Built Environment Research Group (BERG; www.built-envi.com).

1.5.1 Sources, fate, transport, and control of indoor air pollutants

We spend the vast majority of our time in buildings in which we are exposed to a wide variety of indoor air pollutants of both indoor and outdoor origin. Therefore, my research seeks to develop and apply methods to quantify and evaluate indoor emission sources and control strategies, and to understand how changes to building design and operation influence the fate, transport, and control of indoor air pollutants such as indoor aerosols (including bioaerosols), reactive gases (such as ozone and nitrogen dioxide), and nonreactive gases (including volatile organic compounds, aldehydes, and others). My recent research has involved quantifying sources of indoor pollutants (including outdoor pollutant infiltration; desktop 3D printers; and bioaerosols from human respiratory activities), as well as evaluating control strategies such as filtration in heating, ventilating, and air-conditioning (HVAC) systems and understanding trade-offs between energy efficiency and indoor air quality. We continue to advance knowledge of the physics, chemistry, and microbiology of indoor air.

1.5.2 Human exposure assessment and health risks

Research on fundamental mechanisms that influence the fate, transport, and control of indoor pollutants necessitates continued exploration of the impacts of these mechanisms on the practice of human exposure assessment and understanding/quantifying human health risks. Our work in this area primarily involves evaluating the contribution of indoor air pollutants to long-term mortality, disease burden, cancer risks, and infectious disease risks to building occupants. My recent research in this domain has sought to understand the magnitude of human exposures to pollutants of both indoor and outdoor origin, the quantitative health impacts associated with exposures, and the extent of exposure misclassification that occurs in epidemiology studies if indoor fate, transport, and control mechanisms are not accurately accounted for.

1.5.3 Building energy efficiency and sustainable building design and operation

Crucial to improving the sustainability of our built environment is improving energy efficiency in buildings. In this research area we seek to conduct modeling and measurements to support policy decisions for improving energy efficiency in buildings, such as identifying cost-optimal building retrofits in existing residential buildings. We also conduct modeling and measurements to understand the energy implications of improvements to thermal comfort or indoor air quality in buildings, or conversely, the comfort and indoor air quality implications of improvements to energy efficiency and sustainability in buildings.

1.5.4 Building science measurements and method development

Crucial to understanding how buildings operate and function is the development and application of extensive building science measurement capabilities. Much of my research in this area has involved long-term quantification of building environmental and operational parameters or developing novel methods to

quantify pollutant fate and transport inside buildings. Our work in building science measurements cuts across domains of energy engineering, indoor air sciences, microbial ecology, and electrical engineering.

1.5.5 Open source building environmental sensors

Finally, another key research area in my group is the development, evaluation, and application of open source building environmental sensors. Our primary research effort in this area is the Open Source Building Science Sensors (OSBSS) project, through which we have developed an Arduino-based platform for building arrays of inexpensive, open source sensors and data loggers designed to reduce the costs of recording long-term building environmental and operational measurements while also improving capabilities and functionality. We have developed sensors to measure air temperature and relative humidity, surface environmental conditions, CO_2 concentrations, human proximity, human occupancy via doorway beam breaks, illuminance levels, and more. We continue to improve functionalities and document detailed instructions for building your own sensor online at www.osbss.com. Colleagues at Drexel University and the University of Toronto have recently used the platform in their courses and research.

1.6 Publications

My citation statistics* from Google Scholar are as follows:

- 487 citations total (468 since 2011)
- h-index: 13
- i10-index: 16

*Data current as of May 18, 2016

1.6.1 Papers published in peer-reviewed journals

1. Zhao, H., **Stephens, B.** (in press). Using portable particle sizing instrumentation to measure the penetration of fine and ultrafine particles through residential building enclosures. *Indoor Air*.
2. Ali, A., Zanzinger, Z., Debose, D., **Stephens, B.** 2016. Open source building science sensors (OSBSS): A low-cost Arduino-based platform for long-term data collection in indoor environments. *Building and Environment* 100:114-126.
3. Azimi, P., Zhao, D., **Stephens, B.** (in press). Modeling the impact of residential HVAC filtration on indoor particles of outdoor origin (RP-1691). *Science and Technology of the Built Environment*.
4. Azimi, P., Zhao, D., Pouzet, C., Crain, N., **Stephens, B.** 2016. Emissions of ultrafine particles and volatile organic compounds from commercially available desktop 3D printers with multiple filaments. *Environmental Science and Technology* 50(3):1260-1268.
5. Zhao, H., **Stephens, B.** (in press). A method to measure the ozone penetration factor in residences under infiltration conditions: Application in a multi-family apartment unit with multiple ozone monitors. *Indoor Air*.
6. Du, P., Wood, A., **Stephens, B.**, Song, X. 2015. Life-cycle energy implications of downtown high-rise vs. suburban low-rise living: an overview and quantitative case study for Chicago. *Buildings* 5:1003-1024.
7. Fazli, T., Yeap, R.Y., **Stephens, B.** 2015. Modeling the energy and cost impacts of excess static pressure in central forced-air heating and air-conditioning systems in single-family residences in the U.S. *Energy and Buildings* 107:243-253.
8. Zhao, D., Azimi, P., **Stephens, B.** 2015. Evaluating the long-term health and economic impacts of central residential air filtration for reducing premature mortality associated with indoor fine particulate matter (PM2.5) of outdoor origin. *International Journal of Environmental Research and Public Health* 12:8448-8479.

9. Leinartas, H., **Stephens, B.** 2015. Optimizing whole house deep energy retrofit packages: A case study of existing Chicago-area homes. *Buildings* 5:323-353.
10. Dedesko, S., **Stephens, B.**, Gilbert, J.A., Siegel, J.A. 2015. Methods to assess human occupancy and occupant activity in hospital patient rooms. *Building and Environment* 90:136-145.
11. Ramos, T., Dedesko, S., Siegel, J.A, Gilbert, J.A., **Stephens, B.** 2015. Spatial and temporal variations in indoor environmental conditions, human occupancy, and operational characteristics in a new hospital building. *PLoS ONE* 10(3): e0118207.
12. **Stephens, B.**, Adams, R.I., Bhangar, S., Bibby, K., Waring, M.S. 2015. 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):1-3. (Editorial)
13. **Stephens, B.** 2015. Building design and operational choices that impact indoor exposures to outdoor particulate matter inside residences. *Science and Technology for the Built Environment*, 21:3-13.
14. Azimi, P., Zhao, D., **Stephens, B.** 2014. Estimates of HVAC filtration efficiency for fine and ultrafine particles of outdoor origin. *Atmospheric Environment* 98:337-346.
15. **Stephens, B.** 2014. The impacts of duct design on life cycle costs of central residential heating and air-conditioning systems. *Energy and Buildings*, 82:563-579.
16. Ramos T., **Stephens, B.** 2014. Tools to improve built environment data collection for indoor microbial ecology investigations. *Building and Environment* 81:243-257.
17. Susorova, I., Azimi, P., **Stephens, B.** 2014. The effects of climbing vegetation on the local microclimate, thermal performance, and air infiltration of four building facade orientations. *Building and Environment* 76:113-124.
18. El Orch, Z., **Stephens, B.,** Waring, M.S. 2014. Predictions and determinants of size-resolved particle infiltration factors in single-family homes in the U.S. *Building and Environment* 74: 106–118.
19. Azimi, P., **Stephens, B.** 2013. HVAC filtration for controlling infectious airborne disease transmission in indoor environments: Predicting risk reductions and operational costs. *Building and Environment* 70:150-160.
20. **Stephens, B.,** Azimi, P., El Orch, Z., Ramos, T. 2013. Ultrafine particle emissions from desktop 3D printers. *Atmospheric Environment* 79:334-339.
21. Susorova, I., Angulo, M., Bahrami, P., **Stephens, B.** 2013. A model of vegetated exterior facades for evaluation of wall thermal performance. *Building and Environment* 67:1-13.
22. Shogan, B.D., Smith, D.P., Packman, A.I., Kelley, S.T., Landon, E.M., Bhangar, S., Vora, G.J., Jones, R.M., Keegan, K., **Stephens, B.**, Ramos, T., Kirkup, B.C., Levin, H., Rosenthal, M., Foxman, B., Chang, E.B., Siegel, J.A., Cobey, S., An, G., Alverdy, J.C., Olsiewski, P.J., Martin, M.O., Marrs, R., Hernandez, M., Christley, S., Morowitz, M., Weber, S., Gilbert, J. 2013. The Hospital Microbiome Project: Meeting Report for the 1st Hospital Microbiome Project, Chicago, USA, January 15th, 2013. *Standards in Genomic Sciences* 8(3). doi:10.4056/sigs.4187859.
23. **Stephens, B.**, Siegel, J.A. 2013. Ultrafine particle removal by residential HVAC filters. *Indoor Air* 23(6):488-497.
24. Gall, E.T., Carter, E.M., Earnest, C.M., **Stephens, B.** 2013. Indoor Air Pollution in Developing Countries: Research and Implementation Needs for Improvements in Global Public Health. *American Journal of Public Health* 103(4):e67-72.
25. **Stephens, B.**, Siegel, J.A. 2012. Penetration of ambient submicron particles into single-family residences and associations with building characteristics. *Indoor Air* 22(6):501-513.
26. **Stephens, B.**, Gall, E.T., Siegel, J.A. 2012. Measuring the penetration of ambient ozone into residential buildings. *Environmental Science and Technology* 46(2):929-936.
27. **Stephens, B.**, Siegel, J.A. 2012. Comparison of test methods for determining the particle removal efficiency of filters in residential and light-commercial central HVAC systems. *Aerosol Science and Technology* 46(5):504-513.

28. Carter, E., Earnest, C.M., Gall, E.T., and **Stephens, B**. 2012. Progress and priorities in reducing indoor air pollution in developing countries. *Indoor Air* 22(1):1-2. (Editorial)
29. Rhodes, J.D., **Stephens, B.**, Webber, M.E. 2011. Using a database of energy audits to investigate the impacts of common air-conditioning design and installation issues on peak power and energy consumption in Austin, Texas. *Energy and Buildings* 43(11):3271-3278.
30. **Stephens, B.**, Siegel, J.A., Novoselac, A. 2011. Operational characteristics of residential and light-commercial air-conditioning systems in a hot and humid climate zone. *Building and Environment* 46(10):1972-1983.
31. **Stephens, B.**, Carter, E.M, Gall, E.T., Earnest, C.M., Hun, D.E., Jackson, M.C., Walsh, E.A. 2011. Home Energy-Efficiency Retrofits. *Environmental Health Perspectives* 119(7):A283 (Correspondence article)
32. **Stephens, B.**, Novoselac, A., Siegel, J.A. 2010. The effects of filtration on pressure drop and energy consumption in residential HVAC systems (RP-1299). *HVAC&R Research* 16(3):273-294.
33. **Stephens, B.**, Siegel, J.A., Novoselac, A. 2010. Energy implications of filtration in residential and light-commercial buildings (RP-1299). *ASHRAE Transactions* 116(1):346-357.
34. Carter, E., Earnest, C., Gall, E., Guerrero, P., Hun, D., Jackson, M., Lo, J., **Stephens, B.**, Walsh, E. 2009. Priorities in indoor environmental science and health, as students see them. *Indoor Air* 19(6):444-445. (Editorial)

1.6.2 Papers under review in (or in preparation for submission to) peer-reviewed journals

1. Du, P., Wood, A., **Stephens, B.** Operational energy analysis of downtown high-rise vs. suburban low-rise lifestyles: a Chicago case study. Under review in *energies*.
2. Zakrzewski, T., Stephens, B. Generalized natural gas reciprocating engine part-load performance curves for cogeneration applications. Under review in *Applied Energy*.
3. Lax et al., Colonization and succession of hospital-associated bacteria. Under review in *Science*.
4. Kunkel, S., Azimi, P., **Stephens, B.** Development and application of a human cough simulator to investigate the impacts of HVAC filtration and ventilation conditions on size-resolved bacterial bioaerosol concentrations. In preparation for submission to *Indoor Air*.
5. Fazli, T., **Stephens, B.** In-situ measurements of size-resolved particle removal efficiency of residential HVAC filters. In preparation for submission to *Indoor Air*.

1.6.3 Peer-reviewed conference presentations and posters

Oral presenter is listed in *italics*:

1. *Fazli, T.*, **Stephens, B.** Characterizing the in-situ size-resolved removal efficiency of residential HVAC filters for fine and ultrafine particles. ASHRAE 2016 Winter Conference, Orlando, FL.
2. *Azimi, P.*, Zhao, D., **Stephens, B.** Modeling the impact of residential HVAC filtration on indoor particles of outdoor origin (RP-1691). ASHRAE 2016 Winter Conference, Orlando, FL.
3. *Zhao, D.*, Azimi, P., **Stephens, B.** Modeling the impact of residential HVAC filtration on indoor PM2.5 of outdoor origin and associated chronic health risks. International Society for Exposure Science (ISES) 2015, Henderson, NV.
4. *Zhao, H.*, **Stephens, B.** Measuring the ozone penetration factor in a residence under infiltration conditions. International Society for Exposure Science (ISES) 2015, Henderson, NV.
5. *Azimi, P.*, Zhao, D., **Stephens, B.** Evaluating and controlling human exposure to ultrafine particle and VOC emissions from desktop 3D printers. International Society for Exposure Science (ISES) 2015, Henderson, NV. (**2nd place in the student poster competition**).
6. Zhao, D., Azimi, P., ***Stephens, B.*** The impact of HVAC filtration on indoor concentrations of outdoor PM2.5 inside residences. International Society for Exposure Science (ISES) 2015, Henderson, NV.

7. *Zhao, H.*, **Stephens, B.** A method to rapidly measure size-resolved particle penetration factors in residences. American Association for Aerosol Research (AAAR) 2015, Minneapolis, MN.
8. *Fazli, T.*, **Stephens, B.** Characterizing the in-situ size-resolved removal efficiency of residential and light-commercial HVAC filters for particle sizes between 0.01 and 10 μm. American Association for Aerosol Research (AAAR) 2015, Minneapolis, MN.
9. *Kunkel, S.*, Azimi, P., **Stephens, B.** Development of an experimental system for assessing indoor bioaerosol transport and control. American Association for Aerosol Research (AAAR) 2015, Minneapolis, MN.
10. *Zhao, D.*, Azimi, P., **Stephens, B.** Modeling the impact of residential HVAC filtration on indoor PM2.5 of outdoor origin and associated chronic health risks. American Association for Aerosol Research (AAAR) 2015, Minneapolis, MN.
11. *Zhao, H.*, **Stephens, B.** Measuring the ozone penetration factor in a residence under infiltration conditions. Healthy Buildings America 2015, Boulder, CO.
12. *Zhao, H.*, **Stephens, B.** Measuring the ozone penetration factor in a residence under infiltration conditions. Healthy Buildings America 2015, Boulder, CO.
13. *Azimi, P.*, Zhao, D., **Stephens, B.** Modeling the impact of residential HVAC filtration on indoor particles of outdoor origin. Healthy Buildings America 2015, Boulder, CO.
14. Ali, A., Fazli, T., Huan, J., Debose, D., Dong, B., ***Stephens, B.*** Open Source Building Science Sensors (OSBSS): An open source sensor network for indoor environmental data collection. Healthy Buildings America 2015, Boulder, CO.
15. *Zhao, D.*, Azimi, P., **Stephens, B.** Estimates of HVAC filtration efficiency for fine and ultrafine particles of outdoor origin. Healthy Buildings America 2015, Boulder, CO. (**Best student poster award**).
16. *Kunkel, S.*, Azimi, P., **Stephens, B.** Development of an experimental system for assessing indoor bioaerosol transport and control. Healthy Buildings America 2015, Boulder, CO.
17. *Fazli, T.*, Yeap, R.Y., **Stephens, B.** The energy consequences of excess static pressure in central residential heating and air-conditioning systems. Healthy Buildings America 2015, Boulder, CO.
18. ***Stephens, B.*** Built environment data collection: Updates on methods and sensor systems. Alfred P. Sloan Conference on the Microbiology of the Built Environment 2015, Boulder, CO.
19. Zhao, D., Azimi, P., ***Stephens, B.*** Modeling the impact of residential HVAC filtration on indoor $PM_{2.5}$ of outdoor origin. ASHRAE Annual Conference 2015, Atlanta, GA.
20. *Leinartas, H.A.*, **Stephens, B.** Optimization of cost-effective whole house retrofit packages for targeting 50% annual energy use reductions in existing Chicagoland homes. Engineering Sustainability 2015, Pittsburgh, PA.
21. Fazli, T., Yeap, R.Y., **Stephens, B.** The energy consequences of excess static pressure in residential heating and air-conditioning systems: differences between existing and new energy efficient homes. Engineering Sustainability 2015, Pittsburgh, PA.
22. Azimi, P., Zhao, D., **Stephens, B.** The impact of residential building characteristics on indoor particles of outdoor origin in three types of homes in multiple climates: Old homes, typical existing homes, and new sustainably built homes. Engineering Sustainability 2015, Pittsburgh, PA.
23. ***Stephens, B.*** The potential impacts of climate change on indoor air quality and health. Engineering Sustainability 2015, Pittsburgh, PA.
24. *Du, P.*, Wood, A., **Stephens, B.** Life Cycle Assessment of Urban vs. Suburban Residential Mobility in Chicago. Architectural Research Centers Consortium (ARCC) 2015 Annual Conference, Chicago, IL.
25. *Ali, A.*, Zanzinger, Z., **Stephens, B.** Open Source Building Science Sensors: an Open Source Sensor Network for Indoor Environmental Data Collection. IEEE SENSORS 2014, Valencia, Spain.
26. *Azimi, P.* and **Stephens, B.** Development and Application of a Markov Chain Model for Predicting Influenza Exposure in Indoor Environments. International Society for Exposure Science 2014, Cincinnati, OH.

27. El Orch, Z., Waring, M.S., ***Stephens, B.*** Predictions and determinants of size-resolved particle infiltration factors in single-family homes in the U.S. International Society for Exposure Science 2014, Cincinnati, OH.
28. *Zhao, D.*, Azimi, P., **Stephens, B.** Estimates of HVAC Filtration Efficiency for Fine and Ultrafine Particles of Outdoor Origin. American Filtration and Separations Society (AFS) Fall Conference 2014, Chicago, IL.
29. ***Stephens, B.*** The Impacts of Duct Design on Life Cycle Costs of Central Residential Heating and Air-Conditioning Systems. 2014 ASHRAE/IBPSA-USA Building Simulation Conference, Atlanta, GA.
30. ***Stephens, B.***, Ali, A., Debose, D., Dong, B., Fazli, T. Open Source Building Science Sensors for Indoor Microbiology. Indoor Air 2014, Hong Kong.
31. El Orch, Z., Waring, M.S., ***Stephens, B.*** Predictions and determinants of size-resolved particle infiltration factors in single-family homes in the U.S. Indoor Air 2014, Hong Kong.
32. *Ramos, T.*, Azimi, P., Dide, L., Dedesko, S., Gilbert, J.A., Siegel, J.A., **Stephens, B.** Building Science Measurements in the Hospital Microbiome Project. Indoor Air 2014, Hong Kong.
33. ***Stephens, B.*** and Azimi, P. HVAC filtration for controlling airborne influenza transmission in indoor environments: predicting risk reductions and operational costs. Indoor Air 2014, Hong Kong.
34. ***Stephens, B.*** Building design and operational choices that impact indoor exposures to outdoor particulate matter inside residences. ASHRAE IAQ 2013, Vancouver, CA.
35. ***Stephens, B.***, Azimi, P., El Orch, Z., Ramos, T., Zylstra, R., Steele, J. Ultrafine particle emissions from desktop 3D printers. The 32nd Annual Conference of the American Association for Aerosol Research (AAAR), 2013, Portland, OR.
36. ***Stephens, B.*** How do building design and operational choices impact indoor exposures to outdoor air pollution? Engineering Sustainability 2013, Pittsburgh, PA.
37. ***Stephens, B.*** The impacts of building envelopes and central air-conditioning systems on indoor exposures to outdoor submicron particulate matter. The 22nd Annual Meeting of the International Society of Exposure Science (ISES), 2012, Seattle, WA.
38. ***Stephens, B.*** and Siegel, J.A. Ultrafine Particle Removal by Central Heating and Air-Conditioning Filters in a Test House. The 31st Annual Conference of the American Association for Aerosol Research (AAAR), 2012, Minneapolis, MN.
39. *Gall, E.T.*, **Stephens, B.**, Corsi, R.L., and Siegel, J.A. The impact of effective diffusion coefficients on transport and reaction to porous indoor materials. The 2nd International Conference on Building Energy and Environment (COBEE 2012).
40. *Rhodes, J.*, **Stephens, B.**, and Webber, M.E. Energy audit analysis of residential air-conditioning systems in Austin, Texas. 2012 ASHRAE Winter Conference.
41. ***Stephens, B.*** and Siegel, J.A. Novel methods to measure the penetration of ozone and particulate matter into residences. The 21st Annual Meeting of the International Society of Exposure Science (ISES), 2011, Baltimore, MD.
42. ***Stephens, B.*** and Siegel, J.A. Penetration of particulate matter into residential buildings: relationship with building air leakage characteristics. The 30th Annual Conference of the American Association for Aerosol Research (AAAR), 2011, Orlando, FL.
43. **Stephens, B.** and *Siegel, J.A.* A refined whole-house method to determine the in-situ particle removal efficiency of HVAC filters in residences. The 30th Annual Conference of the American Association for Aerosol Research (AAAR), 2011, Orlando, FL.
44. ***Stephens, B.*** and Siegel, J.A. Comparison of HVAC filter test methods for particle removal efficiency. Indoor Air 2011, Austin, TX.
45. ***Stephens, B.***, Gall, E.T., and Siegel, J.A. A method for measuring ozone penetration through the building envelope. Indoor Air 2011, Austin, TX.
46. ***Stephens, B.*** and Siegel, J.A. Do heating and air-conditioning filters affect energy use or indoor air quality? Poster: 2011 NSF IGERT Online Poster Competition (Top-10 Finalist).

47. ***Stephens, B.*** Modeling the effects of geography and climate on a net zero energy residence powered by solar PV in six climates. Engineering Sustainability 2011, Pittsburgh, PA.
48. ***Stephens, B.*** Modeling a net-zero energy residence: combining passive and active design strategies in six climates. ASHRAE 2011 Winter Conference, Las Vegas, NV.
49. ***Stephens, B.***, Siegel, J.A., and Novoselac, A. Energy implications of filtration in residential and light-commercial buildings (RP-1299). Poster: ASHRAE 2010 Winter Conference, Orlando, FL.
50. ***Stephens, B.***, Novoselac, A., and Siegel, J.A. 2009. Impacts of HVAC filtration on air-conditioner energy consumption in residences. In the Proceedings of Healthy Buildings 2009, Syracuse, NY.

1.6.4 Peer-reviewed technical reports

1. Azimi, P., Zhao, D., **Stephens, B.** 2015. Modeling the impact of residential HVAC filtration on indoor particles of outdoor origin. Final report for ASHRAE Research Project RP-1691.
2. Fazli, T., Zhao, H., **Stephens, B.** 2015. Evaluating the moisture removal performance of Super Dry desiccants in footwear applications. Final report to Indoor Sciences, Inc.
3. **Stephens, B.** 2014. The impact of duct design on life cycle costs of central residential heating and air-conditioning systems. Final report for AHRI Project No. 8002.
4. **Stephens, B.**, Siegel, J.A., Novoselac, A. 2010. Energy implications of filtration in residential and light-commercial construction. Final report for ASHRAE Research Project RP-1299.

1.6.5 Other publications (blog posts, reports, popular magazines, etc.)

1. **Stephens, B.** 2015. Infiltration of outdoor pollutants. *Home Energy Magazine*, May/June 2015.
2. Contributor, www.microBE.net, blog posts for the Microbiology of the Built Environment Network: http://microbe.net/author/brent-stephens/.
3. **Stephens, B.** 2013. Filtration and infectious airborne disease transmission. National Air Filtration Association (NAFA) *Air Media*, Summer 2013, pages 4-16.
4. **Stephens, B.** 2013. Is that house an air filter? *Home Energy Magazine*, January/February 2013.
5. **Stephens, B.** 2012. Field measurements of filtration efficiency in homes. National Air Filtration Association *Air Media*, Summer 2012, pages 4-14.
6. Carter, E., Earnest, C.M., Gall, E.T., and **Stephens, B**. 2011. Student Symposium on Indoor Air Quality in Developing Countries: Full Meeting Report for NSF's IGERT.org: http://www.igert.org/documents/254.
7. **Stephens, B.** and Rhodes, J. 2011. "House Calls: Finding energy inefficiencies using residential energy audits." Guest blog post on Scientific American's blog network: Plugged In.
8. Rhodes, J. and **Stephens, B**. 2011. "Tighten up your house, but not too much…" Guest blog post, Scientific American's blog network: Plugged In.

1.7 Professional activities

1.7.1 Licensure

Engineer in Training: Passed Fundamentals of Engineering Exam, May 2007

1.7.2 Professional service

- Session organizer, "The next generation of ventilation", Indoor Air 2016, Ghent, Belgium — 2016
- Session co-organizer, "Indoor environment data collection with today's technolo- — 2016

gy," with Michael Waring and L. James Lo, Indoor Air 2016, Ghent, Belgium

- Workshop co-organizer, "Microbiology of the Built Environment Study Methods," Healthy Buildings America 2015, Boulder CO, funded by the Alfred P. Sloan Foundation — 2015
- Workshop co-organizer, "Dissemination and Integration of Microbiology of the Built Environment Research," Healthy Buildings America 2015, Boulder CO, funded by the Alfred P. Sloan Foundation — 2015
- Member, ASHRAE TC 2.4 Particulate Air Contaminants and Particulate Contaminant Removal Equipment — 2015-present
- Member, Science Advisory Board, Aquarium Microbiome Project, Shedd Aquarium — 2015-present
- Member, Advisory Board, Next Step Learning (ITEST), The Concord Consortium, Sponsored by NSF — 2015-present
- Member, Technical Advisory Committee, "Healthy Efficient New Gas Homes," a project sponsored by the California Energy Commission and conducted by Lawrence Berkeley National Laboratory — 2014-present
- Chair, Scientific and Technical Committee 21 on Ventilation, ISIAQ — 2014-present
- Member, Scientific and Technical Committee on Microbiology, ISIAQ — 2014-present
- Healthy Buildings Europe 2015, Scientific Committee — 2014-present
- Healthy Buildings America 2015, Advisory Committee — 2014-present
- ISIAQ Mentorship Program Coordinator — 2013-present
- Scientific Program Committee (SPC), Environmental Health Conference — 2012-2013
- Corresponding member, ASHRAE TC 4.3 Ventilation and infiltration — 2012-present
- Workshop co-organizer, "Indoor air quality and cookstoves in developing countries," Indoor Air 2011, Austin, TX — 2011
- Student organizing committee, Indoor Air 2011, Austin, TX — 2011

1.7.3 Editorial board service

- Guest editor, special issue on the Microbiology of the Built Environment, *Microbiome* (with Jack Gilbert), 2015
- Editorial board member, *AIMS Public Health*, 2013-2015

1.7.4 Journal reviewer

- *Energy and Buildings*
- *Indoor Air*
- *Building and Environment*
- *Environmental Science and Technology*
- *HVAC&R Research* (now *Science and Technology of the Built Environment*)
- *PLoS ONE*
- *Journal of Exposure Science and Environmental Epidemiology*
- *Atmospheric Environment*
- *Aerosol Science and Technology*
- *Energies*
- *Aerosol and Air Quality Research*
- *Indoor and Built Environment*
- *Energy Policy*

1.7.5 Research proposal reviews and review panels

- NSF review panel (1)
- External peer reviewer for Dr. Rachael Jones, University of Illinois at Chicago (UIC) School of Public Health, proposal to CDC/NIOSH (2015)
- U.S. Environmental Protection Agency (EPA) review panels (2)
- External peer reviewer for the Alfred P. Sloan Foundation's Microbiology of the Built Environment (MoBE) program (2013-present)
- Member, American Association for the Advancement of Science (AAAS) review panel for KACST Research Competiveness Program (2013)

1.7.6 Conference paper/abstract reviews

- Healthy Buildings USA, 2015
- Healthy Buildings Europe, 2015
- Indoor Air, 2011, 2014, 2016
- ASHRAE Transactions, 2013

1.7.7 Report reviews and other reviews

- External peer reviewer, "Optimization of ventilation energy demands and indoor air quality in airtight ZEBRAlliance homes," Final Report to the Department of Energy by Oak Ridge National Laboratory (2013)
- External peer reviewer, "Measurement-based evaluation of installed residential filtration system performance," Lawrence Berkeley National Laboratory (LBNL) report LBNL-6607E (2014)

1.7.8 Invited talks

1. "Microbiology of the built environment (MoBE) research and architectural engineering," Presentation to the Sloan MoBE Early Career Workshop, Chicago, IL, April 2016.
2. "Understanding the mechanistic drivers of indoor exposures to outdoor air pollution," Presentation to the graduate environmental engineering seminar, Virginia Tech, April 2016.
3. "Open source building science sensors (OSBSS): An open source platform for indoor environmental data collection," Presentation to Dr. Linsey Marr's graduate air pollution class, Virginia Tech, April 2016.
4. "Open source building science sensors (OSBSS): An open source platform for indoor environmental data collection," Presentation to College of Architecture PhD program, Illinois Institute of Technology, March 2016.
5. "Outdoor air and (non-combustion) appliances as sources of indoor particulate matter (PM)," Presentation to the IOM National Academies Workshop on the Health Risks of Indoor Exposure to particulate Matter, February 2016, Washington, DC.
6. "Understanding the mechanistic drivers of indoor exposures to outdoor air pollution," Presentation to the graduate environmental engineering seminar, Washington State University, February 2016.
7. "Introduction to indoor air quality (IAQ)," Webinar series for IPMM 510, Illinois Institute of Technology, November 2015.
8. "Open source building science sensors (OSBSS): An open source platform for indoor environmental data collection," Web presentation to Dr. Jing Du's Construction IT graduate course at Texas A&M University, October 2015.

9. "Building science measurements for microbiology of the built environment studies: How and why?" Presentation for workshop, Alfred P. Sloan Foundation Microbiology of the Built Environment Study Methods, Healthy Buildings America 2015, Boulder CO.
10. "Improving built environment data collection for investigations of the microbiology of the built environment," Presentation for workshop, Alfred P. Sloan Foundation Dissemination and Integration of Microbiology of the Built Environment Research, Healthy Buildings America 2015, Boulder CO.
11. "Energy and air quality in the built environment," Presentation to Spring 2015 Portland State University Department of Mechanical Engineering Seminar Series, Portland, OR, April 2015.
12. "Energy and air quality in the built environment," Presentation to Spring 2015 University of Illinois at Chicago (UIC) Department of Civil and Materials Engineering, Chicago, IL, February 2015.
13. "Energy and air quality in the built environment," Presentation to Spring 2015 Graduate Seminar series, Illinois Institute of Technology, Chicago, IL, February 2015.
14. "Indoor concentrations of outdoor pollution," Webinar presentation to Reducing Outdoor Contaminants in Indoor Spaces (ROCIS), funded by the Heinz Endowments, Southwestern PA, November 2014.
15. "Ultrafine particle emissions from desktop 3D printers," Presentation to an NSF-sponsored workshop on the Environmental Implications of Additive Manufacturing, hosted by the University of Florida and the Woodrow Wilson International Center for Scholars, National Science Foundation, Arlington, VA, October 2014.
16. "Indoor exposures to outdoor air pollution," Presentation to Dr. Aaron Packman's Spring 2014 Northwestern University CE 260 Introduction to Environmental Engineering undergraduate course, Evanston, IL, May 2014.
17. "Indoor exposures to outdoor air pollution," Presentation to Spring 2014 University of Illinois at Chicago (UIC) Occupational and Environmental Health and Safety ERC Seminar, Chicago, IL, April 2014.
18. "Energy and air quality in the built environment," Presentation to Spring 2014 Northwestern University Environmental Engineering Graduate Seminar, Evanston, IL, February 2014.
19. "Energy and air quality in the built environment," Presentation to Spring 2014 Graduate Seminar series, Illinois Institute of Technology, Chicago, IL, February 2014.
20. "Building design and operational choices that impact indoor exposures to outdoor particulate matter inside residences." Invited presentation to ASHRAE 2014 Winter Conference, New York, NY.
21. **"**Building science measurements in the Hospital Microbiome Project." Invited presentation to ASHRAE 2014 Winter Conference, New York, NY.
22. "Filtration for the prevention of airborne infectious disease transmission," Presentation to Filtration 2013, Chicago, IL, November 14, 2013.
23. "Indoor exposures to outdoor air pollution," Presentation to the ACSA/AIA Housing Research Lecture Series Webinar, October 7, 2013.
24. "Residential HVAC filtration: energy and airflow impacts," Presentation to the ASHRAE SSPC 62.2 IAQ subcommittee, ASHRAE 2013 Annual Conference, Denver, CO, June 21, 2013.
25. "Energy and environmental impacts of buildings," Presentation to the ASCE-Illinois 3rd Annual Sustainability Workshop, Chicago, IL, June 13, 2013.
26. "Filtration and the Wells-Riley model for infectious disease transmission risk," Presentation to the 2013 National Air Filtration Association (NAFA) Technical Seminar, Louisville, KY, April 11, 2013.
27. "Energy and Air Quality in the Built Environment," Presentation to Fall 2012 Graduate Seminar series, Illinois Institute of Technology, Chicago, IL, October 24, 2012.
28. "Energy and Air Quality in the Built Environment," Presentation to Fall 2012 Graduate Seminar series, Tennessee Technological University, Cookeville, TN, September 25, 2012.
29. "Field Measurements of Filtration Efficiency in Homes," Presentation to the 2012 National Air Filtration Association (NAFA) Technical Seminar, Phoenix, AZ, April 19, 2012.

30. "Indoor Air Quality in Developing Regions of the World," Presentation to CE396L.6: Human Exposure to Indoor Air Pollution, with Ellison Carter; Instructor: Dr. Richard Corsi, The University of Texas at Austin, Austin TX, April 17, 2012.
31. "Energy and Air Quality in Austin Homes," Presentation to the Austin Energy Green Building Seminar Series, Austin, TX, January 18, 2012 (with Joshua D. Rhodes).
32. "Indoor Air Quality in Developing Regions of the World," Web presentation to Arch Eng 366: Indoor Air Pollution, with Ellison Carter; Instructor: Dr. Glenn Morrison, Missouri University of Science and Technology, from Austin, TX, December 2, 2011.
33. "Indoor Air Quality in Developing Regions of the World," Presentation to Indoor Environmental Technical Information Exchange course, with Ellison Carter, Matt Earnest, and Elliott Gall; Instructor: Dr. Richard Corsi, The University of Texas at Austin, Austin TX, March 4, 2011.
34. "Chemical Culprits from Corrosive Drywall: An Engineering Analysis," Presentation at the 2010 Indoor Air Quality Association (IAQA) Annual Meeting and Exposition, Tampa, FL, March 9, 2010.
35. "Energy and Indoor Air Quality: Implications of HVAC Filtration," Presentations to the Austin Energy Green Building Seminar Series, Austin, TX, March 5, 2010, and Tom Green & Co. Engineers, Inc., Austin, TX, January 18, 2010.
36. "Pecan Street Project: Energy Modeling," Presentation to UT School of Architecture, Seminar in Sustainable Design; Instructor: Dr. Werner Lang, The University of Texas at Austin, Austin, TX, July 21, 2009.
37. Presentation and workshop at "Steps toward a Sustainable Austin Energy" Symposium, Austin, TX, March 10, 2009. Contents available online: http://www.utexas.edu/lbj/news/story/732/

1.7.9 Consulting experience

I have worked periodically as a consultant for the following institutions:

- U.S. EPA Indoor Environments Division (IED): Estimating the impact of indoor exposures to particulate matter of both indoor and outdoor origin on adverse health outcomes, 2016-present
- U.S. EPA Indoor Environments Division (IED): Reviewing and updating its flood cleanup guidance document, 2015-2016
- Indoor Sciences, Inc.: Consulting on a project to measure pollutant transport between apartment units for LEED certification testing, 2013

1.7.10 Select mentions in popular and scientific media outlets

- "Study: Some 3D Printers Emitting Harmful Particles." TV interview, CBS Chicago. http://chicago.cbslocal.com/2016/02/24/study-some-3d-printers-emitting-harmful-particles/
- "Use A 3-D Printer? You Should Read This Study." Fast Co.Design. http://www.fastcodesign.com/3056315/use-a-3-d-printer-you-should-read-this-study
- "3D printer study drills down on potentially harmful emissions." *Chicago Tribune*. http://www.chicagotribune.com/bluesky/originals/ct-3d-printer-emissions-health-risks-bsi-20160203-story.html
- "Paging Dr. Building." *IIT Magazine*, Spring 2015 (IIT at 125 anniversary edition). http://magazine.iit.edu/spring-2015/paging-dr-building
- "Ultrafine particles emitted by commercial desktop 3D printers." European Commission, Science for Environment Policy Thematic Issue: Nanomaterials' functionality. February 2015. http://ec.europa.eu/environment/integration/research/newsalert/pdf/nanomaterials_functionality_48si_en.pdf

- "Shedd Aquarium, Renowned Microbiologists Team Up to Pioneer First Aquarium Microbiome Project." Shedd Aquarium, 2015: http://www.sheddaquarium.org/About-Us/Press-Room1/Press-Releases/2015-Press-Releases/AMP/
- Brief mention in *Nature*: http://www.nature.com/news/seven-days-6-12-february-2015-1.16893
- "Rethinking Sterile: The Hospital Microbiome." *Environmental Health Perspectives*, 2014: http://ehp.niehs.nih.gov/122-a182/
- "Manipulating the Unseen Microbial Ecosystem—The Future of Hospitals?" PBS NOVA Next: http://www.pbs.org/wgbh/nova/next/nature/hospital-microbiome/
- "What passengers are breathing on Metra train cars." CBS Chicago investigation, 2014. http://chicago.cbslocal.com/2014/05/01/what-passengers-are-breathing-on-metra-train-cars/
- "3D printing indoors is as bad for you as smoking a cigarette inside." Gizmodo: http://gizmodo.com/3d-printing-indoors-is-as-bad-for-you-as-smoking-a-ciga-894193776
- "Airborne particles from 3D printers could be as harmful to your health as cigarette smoke." DailyMail: http://www.dailymail.co.uk/news/article-2378687/Airborne-particles-3D-printers-harmful-health-cigarette-smoke.html
- "3D printers could cause strokes, researchers warn." The Telegraph: http://www.telegraph.co.uk/technology/news/10204982/3D-printers-could-cause-strokes-researchers-warn.html
- "3D Printing is Headed to Space." Popular Mechanics: http://www.popularmechanics.com/science/space/nasa/how-it-works-3d-printing-in-space-15758828
- "Nanoparticles Emitted from 3D Printers Could Pose a Risk." IEEE Spectrum: http://spectrum.ieee.org/nanoclast/semiconductors/nanotechnology/nanoparticles-emitted-from-3d-printers-could-pose-a-risk
- "Will A 3-D Printer Destroy Your Lungs?" Fast Company: http://www.fastcoexist.com/1682760/will-a-3d-printer-destroy-your-lungs
- "Le versant sombre des imprimantes 3D." Le Monde: http://www.lemonde.fr/sciences/article/2013/08/26/le-versant-sombre-des-imprimantes-3d_3466650_1650684.html
- "Bringing a Building to Life: Architectural engineers shape structures from concept to completion and beyond." *Magazine of the Society of Women Engineers*, Spring 2013. http://www.bernards.com/wp-content/uploads/2013/04/04-18-13-SWE-Spring-2013.pdf

1.8 Contributions to administration and university service

1.8.1 Service to the university (IIT)

- Faculty mentor, DOE Race to Zero student home design competition — 2016-present
  - Won 2nd place in 2016
- Faculty mentor, Engineers Without Borders (EWB) — 2014-present
- Began a joint Ph.D. specialization between CAEE and the College of Architecture (CoA) in Technologies of the Built Environment — 2014
- Mentor, ACE Program for Undergraduate Research in Engineering (PURE) — 2013-present
- Camras scholarship interviewer — 2013-present
- Rettaliata Classroom Design Development Committee — 2013
- Rettaliata Interactive Learning Design Development Committee — 2013
- ACE Student-Led Project program adviser, greenhouse design/construction — 2013
- ASHRAE-IIT student chapter faculty advisor — 2012-present

1.8.2 Service to the department (CAEE)

- Member, CAEE Leadership Transition Team (interim chair committee) 2016-present
- Member, CAEE chair search committee 2016-present
- Member, CAEE graduate seminar committee 2015-present
- Interviewed staff and students for CAEE chair review 2015
- Consultant to CAE 495 Senior Design Capstone 2015-present
- Faculty search committee, Construction Engineering and Management, CAEE 2014
- Started a new thesis-based M.S. Architectural Engineering degree 2014
- US DOE Challenge Home Student Design Competition, faculty advisor 2014
- Introduction to CAEE, Discover IIT Day 2012-present
- B.S./M.E./M.S./Ph.D. advisor for IIT Architectural Engineering program 2012-present
- Member, architectural engineering program curriculum committee 2012

1.9 Professional honors, listings, awards, and research support

1.9.1 Research grants and contracts awarded at IIT

To date, I have received **$1,469,728** in external research funding as PI or co-PI ($1,166,892 as PI) on 14 projects totaling approximately $2.8 million across all co-PIs. These projects have been supported by organizations including the U.S. Environmental Protection Agency; the Alfred P. Sloan Foundation; the American Society of Heating, Refrigerating, and Air-Conditioning Engineers; the Centers for Disease Control through the National Institute for Occupational Safety and Health; the Air-Conditioning, Heating and Refrigeration Institute; and the National Air Filtration Association Foundation. I have also received **$37,400** in unrestricted gifts in support of my research and **$40,000** in internal funding from IIT.
A full summary of my awarded external research funding is provided below.

Summary of total external research funding ($1,469,728 as PI or co-PI):

1. 2016: Thermoplastic polyurethane 3D filament emissions during 3D printing. Fenner Drives, Inc. Role: PI (**$3,600**).
2. 2015-2018: Mechanistic modeling of microbial metabolic succession in the built environment. Alfred P. Sloan Foundation. Role: Co-PI (IIT portion: **$279,747**). PI: Jack Gilbert (Total project budget: $880,068).
3. 2015-2017: Evaluating the impacts of building enclosures and HVAC filtration on airborne particulate matter and energy efficiency in residential buildings. ASHRAE New Investigator Award. Role: PI (**$100,000**).
4. 2015-2016: Modeling the impact of mechanical ventilation and HVAC filtration compliance pathways in ASHRAE Standard 62.2 on fine and ultrafine particles inside residences. ASHRAE Graduate Student Grant-in-Aid Award to Parham Azimi. Role: PI (**$10,000**).
5. 2015-2016: Characterizing the in-situ size-resolved removal efficiency of residential and light-commercial HVAC filters for particle sizes between 0.01 μm and 10 μm. ASHRAE Graduate Student Grant-in-Aid Award to Torkan Fazli. Role: PI (**$10,000**).
6. 2014-2017: Combining measurements and models to predict the impacts of climate change and weatherization on indoor air quality and chronic health effects in U.S. residences. U.S. Environmental Protection Agency (US EPA). Role: PI (**$499,974**).
7. 2014-2016: Evaluating and controlling airborne emissions from desktop 3D printers. Centers for Disease Control (CDC), National Institute of Occupational Safety and Health (NIOSH). Role: PI (**$140,451**).
8. 2014: Building science to advance research on the microbiology of the built environment (workshop). Alfred P. Sloan Foundation. Role: PI (**$25,447**).

9. 2014: Modeling the impact of residential HVAC filtration on indoor particles of outdoor origin. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) RP-1691. Role: PI (**$40,998**).
10. 2014-2016: Indoor bioaerosol fate, transport and control: Implications for infectious disease transmission. Alfred P. Sloan Foundation. Microbiology of the Built Environment (MoBE) Post-doctoral Fellowship advisor to Stephanie Kunkel, Department of Biological and Chemical Sciences, IIT. Role: PI (**$120,000**).
11. 2013-2015: Open source building science sensors project. Alfred P. Sloan Foundation. Role: PI (**$163,340**).
12. 2012-2014: Building science measurements for the Hospital Microbiome Project. Alfred P. Sloan Foundation. Role: Subcontract to the University of Chicago (IIT portion: **$38,089**). PI: Jack Gilbert (Total project budget: $800,000).
13. 2012: Linking HVAC filtration and the Wells-Riley approach to assessing risks of infectious airborne diseases. National Air Filtration Association (NAFA) Foundation. Role: PI (**$5,086**).
14. 2012-2013: Impact of duct design on life cycle cost of residential HVAC systems. Air-Conditioning, Heating, and Refrigeration Institute (AHRI). Role: PI (**$33,336**).

Summary of unrestricted gifts ($37,400 received):

1. 2016: Unrestricted gift in support of ongoing research into the emissions of particles and gases from desktop 3D printers and filaments. Aleph Objects (**$6,400**).
2. 2015: Unrestricted gift in support of ongoing research into the penetration of ambient pollutants into indoor microenvironments. American Petroleum Institute. (**$20,000**).
3. 2014: Unrestricted gift in support of ongoing research evaluating the moisture removal performance of desiccants. Indoor Sciences, Inc. (**$1,000**).
4. 2014: Unrestricted gift in support of ongoing research into the penetration of ambient pollutants into indoor microenvironments. American Petroleum Institute. (**$10,000**).

Summary of total internal research funding (2 projects and $40,000 awarded):

1. 2015: WISER ISFG. Towards a Center for Sustainable and Efficient Urban Agriculture. Co-PI: Rodger Cooley, College of Architecture. (**$25,000**).
2. 2012: Starr-Fieldhouse Fellowship. Indoor air microbial sampling and human occupancy detection inside hospital patient rooms. Student: Tiffanie Ramos, M.S. candidate. Collaborator: Dr. Jack Gilbert, Argonne National Laboratory. (**$15,000**).

1.9.2 Proposal submissions and funding success

As of September 2015, I have submitted 43 research proposals for external research funding as either PI or co-PI, at an average of nearly 15 proposals per year. Four of these proposals still have decisions outstanding and 13 have been awarded. The total value of these proposals is ~$32 million for all PIs and co-PIs combined, of which ~$2.8 million has been awarded (~9%). I have also submitted 3 proposals for internal research funding (totaling $65,000) and have been awarded 2 projects (totaling $40,000). A full list of submitted proposals is provided below:

Sponsor	Project title	Date (year-month)	Role	Funds sought by me (total if co-PI)	Status
ASHRAE RP 1491	Cost/benefit of ozone air cleaners	12-May	PI	$142,805	Not funded
CTBUH seed funding	Simple model for stack effect	12-May	PI	$20,000	Not funded
NSF Environmen-	CAREER: Advancing research and education in	12-Jul	PI	$419,850	Not

tal Engineering	the transport and control of particulate matter in buildings				funded
AHRI	**Impact of duct design on life cycle costs in residences**	**12-Jul**	**PI**	**$33,336**	**Funded**
NAFA Foundation	**Linking HVAC filtration and the Wells-Riley model for infectious disease risk modeling**	**12-Sep**	**PI**	**$5,086**	**Funded**
Sloan Foundation	**Building science measurements in the Hospital Microbiome Project (subcontract to University of Chicago)**	**12-Oct**	**Co-PI**	**$38,089 ($800,000)**	**Funded**
EPA P3	Solar heated greenhouse for cold climates	12-Dec	PI	$14,972	Not funded
ASHRAE Graduate Student Grant in Aid	Tommy Zakrzewski - District energy systems	12-Dec	PI	$10,000	Not funded
ASHRAE Graduate Student Grant in Aid	Zeineb El Orch - Modeling indoor particles of outdoor origin	12-Dec	PI	$10,000	Not funded
ASHRAE Graduate Student Grant in Aid	Jun Lu - Hot box facility for measuring façade thermal performance	12-Dec	PI	$10,000	Not funded
ASHRAE Graduate Student Grant in Aid	Meng Ju - Life cycle assessment of building enclosure assemblies	12-Dec	PI	$10,000	Not funded
ASHRAE unsolicited RP	**Modeling impact of HVAC filters on indoor particles of outdoor origin**	**12-Dec**	**PI**	**$40,998**	**Funded**
Starr Fieldhouse (internal)	**Building science measurements in the Hospital Microbiome Project**	**12-Dec**	**PI**	**$15,000**	**Funded**
WISER ISFG (internal)	Energy efficient building enclosures	13-Mar	PI	$25,000	Not funded
National Institute of Standards and Technology (NIST)	Acoustic measurements of air infiltration in buildings (Co-PI Ganesh Raman)	13-Mar	Co-PI	$375,419	Not funded
Housing and Urban Development (HUD) HHTS	Cost effective assessment of outdoor pollutant infiltration and evaluation of control measures	13-Mar	PI	$750,000	Not funded
Health Effects Institute (HEI)	Residential exposure to traffic-related pollutants	13-Apr	PI	$599,995	Not funded
Sloan Foundation	**Open Source Building Science Sensors (OSBSS)**	**13-Aug**	**PI**	**$163,000**	**Funded**
Sloan Foundation	**MoBE Postdoctoral Fellow - Stephanie Kunkel - Filtration of bioaerosols**	**13-Aug**	**PI**	**$120,000**	**Funded**
CDC/NIOSH	**Evaluating and controlling UFP and VOC emissions from desktop 3D printers**	**13-Nov**	**PI**	**$140,451**	**Funded**
ASHRAE New Investigator Award	Fate and transport of indoro particulate matter	13-Dec	PI	$100,000	Not funded
ASHRAE Graduate Student Grant in Aid	Parham Azimi - Bioaerosol transmission modeling	13-Dec	PI	$10,000	Not funded
EPA Indoor Air and Climate Change	**Combining measurements and models to predict the impact of climate change and weatherization on indoor air and chronic health in homes**	**14-Jan**	**PI**	**$499,974**	**Funded**
Sloan Foundation	**Workshop - Building science to advance research in the microbiology of the built environment**	**14-Feb**	**PI**	**$25,447**	**Funded**
NSF Environmental Sustainability	Open source building environmental sensors	14-Feb	PI	$290,304	Not funded
DOE BENEFIT (LOI)	Open source building environmental sensors	14-Mar	PI	$630,000	Not funded

DOE BENEFIT (LOI)	Rare earth free permanent magnet motors for buildings	14-Mar	Co-PI	$585,000	Not funded
CTBUH seed funding	Vertical distribution of pollutants in tall buildigns (co-PI SOM)	14-May	PI	$20,000	Not funded
ASHRAE RP 1627	Evaluation of the ASHRAE Advanced Energy Design Guide	14-May	PI	$146,468	Not funded
NSF Urban Sustainability SRN	Safe and sustainable urban agriculture systems (co-PIs from WISER, IFSH, and others)	14-Apr	Co-PI	$500,000 ($12,000,000)	Not funded
NSF NRT	Data enabled urban infrastructure renewal (co-PIs from CAEE, Applied Math, Computer Science, and others)	14-Jun	Co-PI	$350,000 ($3,000,000)	Not funded
HUD HHTS (LOI)	Inexpensive sensor applications for particulate matter monitoring in homes	14-Jul	PI	$443,959	Not funded
NSF Environmental Engineering	Measuring outdoor ozone transport into indoor environments	14-Nov	PI	$329,542	Not funded
NSF CNH (coupled natural and human dynamics)	Indoor air microbial ecology (co-Pis at University of Chicago and others)	14-Nov	Co-PI	$391,041 ($1,710,274)	Not funded
ASHRAE Graduate Student Grant in Aid	**Torkan Fazli - In-situ measurements of size resolved particle removal efficiency by residential HVAC filters**	**14-Dec**	**PI**	**$10,000**	**Funded**
ASHRAE Graduate Student Grant in Aid	**Parham Azimi - Modeling the impact of filters on indoor particulate matter**	**14-Dec**	**PI**	**$10,000**	**Funded**
ASHRAE New Investigator Award	**Advancing measurements of indoor aerosol fate and transport**	**14-Dec**	**PI**	**$100,000**	**Funded**
Sloan Foundation	**Microbial surface metabolism (co-PI Jack Gilbert, University of Chicago)**	**15-Feb**	**Co-PI**	**$279,747 ($880,000)**	**Funded**
WISER ISFG (internal)	**Toward a Center for Sustainable Urban Agriculture**	**15-Mar**	**PI**	**$25,000**	**Funded**
Sloan Foundation	OSBSS Phase 2	15-Mar	PI	$224,987	Not funded
NSF NRT	Data enabled urban infrastructure renewal (co-PIs from CAEE, Applied Math, Computer Science, and others)	15-May	Co-PI	$350,000 ($2,945,650)	Not funded
ASHRAE TRP-1702	Case studies to test ASHRAE Performance Measurement Protocols	15-May	PI	$182,182	Not funded
USDA NIFA	Sustainable urban agriculture systems for increased food security (co-Pis from WISER, IFSH, and others)	15-Jun	Co-PI	$260,000 ($3,998,993)	Not funded
NSF Environmental Engineering	CAREER: Improving understanding of transport and control of indoor air pollutants	15-Jul	PI	$536,865	Not funded
Sloan Foundation	MoBE Postdoctoral Fellow - Parham Azimi - Modeling indoor microbial ecology	15-Aug	PI	$120,000	Not funded

1.10 Membership in professional societies

- American Association for Aerosol Research (AAAR)
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- International Society of Exposure Science (ISES)
- International Society of Indoor Air Quality and Climate (ISIAQ)
- National Air Filtration Association (NAFA)