

Tianzhen Hong

Senior Scientist
 Lead Urban Systems Group
 Building Technology and Urban Systems Division
 Lawrence Berkeley National Laboratory
 One Cyclotron Road, Berkeley, CA 94720, USA
 Phone: (510) 486-7082 E-mail: THong@lbl.gov

RESEARCH INTERESTS

- Resource efficient, sustainable, and resilient buildings, communities and cities
- Building energy modeling and simulation: building energy use, emerging technologies, operational faults, weather data, building energy code, computational tools research and development
- Occupant behavior: sufficiency, occupants' energy use and adaptive behavior, modeling occupants, occupant-centric building design and operation.
- Urban systems: 3D city models, urban scale building energy modeling, inter-building effect, coupling buildings, transportation and urban microclimate, high performance computing
- Digital twin: innovative sensing, analytics, modeling, and machine learning for buildings and urban systems
- Building technologies: energy efficiency, demand flexibility, electrification, decarbonization, climate resilience

APPOINTMENTS

Current position **Lawrence Berkeley National Laboratory**, Berkeley, CA (Supervisor: Mary Ann Piette)
 Building Technology and Urban Systems Division
 July 2020 – present: Senior Scientist
 2017 – September 2022: *Deputy, Building Technologies Department*
 2014 – June 2020: Staff Scientist
 2007 – 2014: Research Scientist

Previous positions **Architectural Energy Corporation**, San Francisco, CA (Supervisor: Charles Eley)
 1999 - 2007: Senior Engineer, VisualDOE Product Manager

Supersymmetry Ltd., Singapore (Supervisor: Eng Lock Lee)
 1998 - 1999: Senior Engineer

National University of Singapore, Singapore (Advisor: Prof. SK Chou)
 Department of Mechanical Engineering
 1996-1998: Postdoctoral researcher

Tsinghua University, Beijing, China (Advisor: Prof. Yi Jiang)
 Department of Thermal Engineering
 1994-1996: Lecturer

EDUCATION

Ph.D. in Thermal Engineering (top ten outstanding graduate students in the university)
 Tsinghua University, China, 1994.
 Thesis title: Stochastic modeling and analysis of thermal environment in buildings.
 Advisor: Prof. Yi Jiang (Academician of Chinese Academy of Engineering).

BEng in HVACR and BS in Applied Mathematics (top 1% honor, double major)
 Tsinghua University, China, 1991.

SUMMARY OF SCIENTIFIC CONTRIBUTIONS

- Highly cited researcher 2021. <https://www.webofscience.com/wos/author/record/488791>
- 171 articles in 28 peer-reviewed journals, as of September 3, 2022
- [Google Scholar](#), as of September 3, 2022
 - h-index: 64
 - i10-index: 170
 - 13,531 citations
- 5 software disclosures (EnergyPlus, [CBES](#), [CityBES](#), [Occupancy Simulator](#), obFMU)
- 7 book chapters
- 64 invited presentations
- 75 conference papers

AWARDS AND MEMBERSHIPS

- 2022: *R&D 100 Award*. CityBES web tool for climate change strategies
- 2022: Three highly cited paper awards from Applied Energy, and Advances in Applied Energy
- 2021: *Highly Cited Researcher*
- 2020: Best Research Paper Award from Building Simulation journal
- 2019: *R&D 100 Award*. Commercial Building Energy Saver (CBES) Software Toolkit
- 2018: *Best Review Paper Award*, Energy and Buildings, only three best papers and two best review papers were selected for the 10-year period (2008-2017).
- 2017: Elected to the *Academy of Fellows*, International Building Performance Simulation Association (IBPSA)
- 2014: *SPOT Award*, Building Technology and Urban Systems Division, LBNL
- 1993: *Top Ten Outstanding Graduate Students Award*, Tsinghua University, China
- 1991: *Outstanding Student Award*, Tsinghua University, China
- 1990: *Prof. Chia-chiao Lin's Applied Mathematics Award* (Highest ranked mathematical award for students), Tsinghua University, China
- Member, American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE)
- Member, American Association for the Advancement of Science (AAAS)
- Licensed Mechanical Engineer, California
- LEED Accredited Professional, United States Green Building Council (USGBC)

RESEARCH SUPPORT

- USD \$35M received in funded research 2010-2022
- Federal funding: US Department of Energy (DOE: Building Technologies Office, Office of Science, Office of Electricity), National Science Foundation
- State funding: California Energy Commission (CEC), California Strategic Growth Council
- International funding: Chile (University of Talca), Japan (Daikin)
- Other funding: LBNL LDRD (Laboratory Directed Research and Development) Program, industry

PROFESSIONAL SERVICE

Academic committees

- 2022-present: Member of editorial board, Advances in Applied Energy
- 2022-present: Member of editorial board, Buildings and Cities
- 2016-present: Associate Editor, Energy and Buildings
- 2017-present: Member of editorial board, Applied Energy
- 2010-present: Member of editorial board, Building Simulation
- 2014-2019: Member of editorial board, Building and Environment
- 2019: Chair of the committee for selecting best paper awards for Building and Environment journal
- 2018: Co-chair of the committee for selecting best paper awards for papers published during the twenty years'

period (1998-2017) at Energy and Buildings journal

- 2017: Guest Editor of a special issue, [Advances in building energy modeling and simulation](#), for Energy and Buildings journal
- 2016: Guest Editor of a special issue, [Insights from IEA EBC Annexes](#), for Energy and Buildings journal
- 2013-present: Doctoral committees at various universities including Tsinghua University, EPFL, George Institute of Technology, Polytechnic di Torino, University of Padua, and Budapest University of Technology and Economics.
- 2015 and 2013: LBNL ETA/EETD Mentor Committee
- 2008-present: member of scientific committee of various conferences, including ASim, COBEE, IBPC, ISHVAC, BSO.

Technical committees

- 2021-present: Member of CIB TG Nature-based solutions
- 2019-present: Established and lead the Urban Systems Group at LBNL
- 2016-present: Established and chair ASHRAE Multidisciplinary Task Group on Occupant Behavior in Buildings
- 2020-2025: Participant of IEA EBC Annex 81 Data-driven smart buildings.
- 2018-2023: Co-lead of Subtask 3 of Annex 79: Occupant-centric building design and operation, under the International Energy Agency (IEA)'s Energy in Buildings and Communities (EBC) Programme
- 2013-2018: Operating Agent and Subtask Lead of IEA EBC Annex 66: Definition and Simulation of Occupant Behavior in Buildings
- 2013-present: Voting member of ASHRAE SSPC 205: Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment
- 2012-2018: Voting member of ASHRAE SSPC 140: Standard Method of Test for Building Energy Simulation Computer Programs
- 2015 and 2016: IBPSA-USA Board of Directors

Standard development

- 2022-present: *ASHRAE 232P: Schema-Based Building Data Model Protocols*
- 2013-present: Development of *ASHRAE Standard 205: Standard Representation of Performance Simulation Data for HVAC&R and Other Facility Equipment*
- 2012-2017: Development of *ASHRAE Standard 140: Standard Method of Test for Building Energy Simulation Computer Programs*
- 2000-2007: Development of *California Building Energy Efficiency Standards Title 24*
- 2003-2006: Development of *India's Energy Conservation Building Code*

Organization of scientific meetings and seminars

- 2022: Chair of the seminar, big data analytics to inform building operations, resilience, policy and human mobility. COBEE conference, Montreal, Canada. July 2022.
- 2022: Chair of the seminar, understanding and Analysis of Inter-Building Effects to Inform Decision Making on Urban Buildings. ASHRAE conference, Toronto, Canada. June 2022.
- 2021: Chair of the seminar, Thermal resilience modeling and analysis to inform building design and strategy for improving occupants health in buildings. ASHRAE BPAC conference, November 2021.
- 2020: Chair of the seminar, an introduction to the new chapter of ASHRAE Handbook HVAC Applications: Occupant-centric sensing and controls, ASHRAE Conference, Orlando, February 2, 2020.
- 2019: Chair of the panel on Urban Information and Energy Modeling, IBPSA Building Simulation Conference, Rome, September 2, 2019.
- 2016: Co-lead of the Panel on Savings through Behavior Changes, ACEEE Summer Conference on Energy Efficiency in Buildings
- 2015: Organizer and chair of the international forum on occupant behavior and Annex 66 Expert meetings, Berkeley, March 31 – April 1, 2015.
- 2012: Co-lead of the Panel on Commercial Building Technologies, ACEEE Summer Conference on Energy Efficiency in Buildings
- 2010: Co-lead of the Panel on Commercial Building Technologies, ACEEE Summer Conference on Energy Efficiency in Buildings

Peer review of articles submitted to the following journals:

- *Nature Communications*
- *Applied Energy*
- *Building Performance Simulation*
- *Building Simulation*
- *Automation in Construction*
- *Building Engineering*
- *ASHRAE Journal*
- *Sustainable Cities and Communities*
- *Renewable and Sustainable Energy Review*
- *Clean Production*
- *Nature Scientific Data*
- *Frontier in Energy*
- *Environmental Science and Technology*
- *Indoor and Built Environment*
- *Building and Environment*
- *Energy and Buildings*
- *IEEE Smart Grid, Access, Transactions on Automation Science and Engineering*
- *Energy Efficiency*
- *Energy*
- *Energy Policy*
- *Buildings*
- *Sustainability*
- *Energy Conversion and Management*
- *Energy Research and Social Science*
- *Solar Energy*
- *Joule*
- *Building Research and Information*

Peer review of research proposals submitted to:

- Austria Translational Research Programme
- Australia Research Council
- Hong Kong Research Grant Council
- Canada New Frontiers in Research Fund
- UK NERC Science of the Environment
- Swiss National Science Foundation
- U.S. National Science Foundation
- Dutch Research Council (NWO)
- Belgium Fund for Scientific Research-FNRS (F.R.S.-FNRS)

PUBLICATIONS**Book Chapters**

1. T. Hong, J. Langevin, N. Luo, Kaiyu Sun. Chapter 3.2: Developing quantitative insights on building occupant behaviour: Supporting modelling tools and datasets. In *Energy and Behaviors: Towards A Low Carbon Future*. 2020. [ISBN: 9780128185674].
2. T. Hong, B. Dong, J. Langevin, N. Luo. Chapter 65: Occupant-centric sensing and controls. In *ASHRAE Handbook - HVAC Applications*. 2019. [ISBN: 9781947192126].
3. T. Hong, A. Cowie, S. Park, D. Yan, K. Sun, A. Lindner. Chapter 7: Occupant Behavior Modeling Tools and Integration with Building Performance Simulation Programs. In *Annex 66: Definition and Simulation of Occupant Behavior in Buildings*. 2018. [ISBN: 9780999696477]. Hong is also co-editor of the book.
4. Two sections on HVAC and BPS for Mary Ann Piette’s chapter. *Energy Efficiency: Innovations: Driving Prosperity, Slashing Emissions*. November 2020. ISBN 9789811217876. World Scientific.
5. *Rethinking Sustainability Towards a Regenerative Economy*. ISBN: 978-3-030-71818-3. Chapter “The Application of Urban Building Energy Modeling in Urban Planning”
6. T. Hong, et al. Chapter 5: Occupant-centric performance metrics and performance targets. In *Simulation-aided occupant-centric building design: Theory, methods, and detailed case studies*. 2023. [ISBN:].
7. T. Hong, et al. Two sections on occupant modeling and multi-scale building energy modeling as part of *Chapter 19 Energy Estimating and Modeling Methods of ASHRAE Fundamentals Handbook 2021 and 2025*.

Software Disclosures

1. EnergyPlus: a USDOE’s flagship building energy modeling program, Energyplus.net
A major developer and contributor since 2008.
EnergyPlus won the 2001 R&D 100 Award (before I joined LBNL).
2. Commercial Building Energy Saver (CBES) Toolkit. CBES.lbl.gov
Lead software architect and PI and Co-PI on several projects funding the CBES development.
CBES won the 2019 R&D 100 Award
3. Occupancy Simulator: A web app for simulating stochastic occupant presence and movement in buildings.
OccupancySimulator.lbl.gov
Lead software architect and PI of several projects funding the research and development.
4. CityBES: A web-based data and computing platform for urban buildings, energy and sustainability.
CityBES.lbl.gov. **CityBES won the 2022 R&D 100 Award**
Lead software architect and PI of several projects (including LDRD) funding the CityBES research and development.
5. obFMU: a functional mockup unit for occupant behavior modeling. Behavior.lbl.gov
Lead software architect and PI of several projects (including LDRD) funding the research and development.

PRESENTATIONS

Keynotes, invited lectures and talks

64. Decarbonization of buildings: Strategies integrating energy sufficiency, efficiency, flexibility, and resiliency. 5th International COBEE Conference, Montreal, Canada. July 28, 2022. Keynote
63. Applications of machine learning techniques in buildings: an overview and examples. Turkish Academy of Sciences, TUBA World Conference on Energy Science and Technology, August 8-12, 2021.
62. Urban buildings and energy systems: opportunities and challenges for energy efficiency, demand flexibility, and resiliency. Applied Energy Symposium: Low Carbon Cities and Urban Energy Systems, September 4-8, 2021. Keynote
61. Rethinking buildings: opportunities and challenges. PennState University, September 8, 2021. Distinguished lecture.
60. Modeling and analysis of thermal resilience of buildings. UC Berkeley, October 19, 2021. Invited lecture for course Arch 246.
59. Machine learning for smart buildings: applications and perspectives. Workshop on “Tackling Climate Change with Machine Learning” at the Conference on Neural Information Processing System (NeurIPS), December 14, 2021. Keynote.
58. Decarbonization of buildings: technologies and strategies. UC Berkeley, March 9, 2022. Invited lecture for course EEP 170.
57. Multi-scale building energy modeling. Google X, May 3, 2022.
56. Human-oriented opportunities in decarbonization of buildings. Center for Advanced Power Engineering Research (CAPER), UNC Charlotte. CAPER 2022 Spring Meeting, March 24, 2022.
55. IEA Energy Technology Perspectives 2020: Accelerating the transition towards sustainable buildings, 12/14/2020. Invited panelist.
54. Urban buildings: opportunities and challenges for energy efficiency, demand flexibility and climate resiliency, Energetics PhD Days, Politecnico di Torino, 12/15/2020.
53. CityBES: supporting design and operation of energy efficient and climate resilient buildings, CalBEM Symposium, 11/18/2020.

52. Disadvantaged communities: strategies to zero-net energy retrofit and climate resilience, technical session on smart cities and communities, 2021 AEI Conference, 4/8/2021.
51. Valuing energy efficiency for thermal resilience of buildings, BTO brownbag seminar, June 23, 2021.
50. Digital Twin: Opportunities and Challenges. Environmental Science Symposium, Iowa State University, April 15, 2020.
49. Rethinking Buildings: Energy Efficiency, Demand Flexibility, and Resiliency. STEM Seminar, CU Boulder, February 11, 2020.
48. Pathway to 100% clean energy for buildings in cities, CCRUN seminar, Drexel University, December 4, 2019.
47. Modeling Urban Buildings for Improvement of Efficiency and Resiliency, University of Southern California, November 7, 2019.
46. Urban Systems Modeling - Opportunities and Challenges, Graduate Seminar, Syracuse University, October 25, 2019.
45. Transforming energy profile of cities with data and modeling – CityBES, IIT Madras Summit, Santa Clara, October 5, 2019.
44. Urban systems on high-performance computing, Keynote, International Supercomputing Conference in Mexico, ISUM 2019, March 27, 2019.
43. Urban systems modeling: opportunities and challenges, the Institute of High-Performance Computing of Singapore, January 31, 2019.
42. Buildings and urban systems research at LBNL, Coolest Singapore Seminar, National University of Singapore, January 30, 2019.
41. Urban systems: Connecting buildings, humans and microclimate, the U.S. NSF sponsored RCN-SEES-SHBE International Workshop, Singapore, January 28-29, 2019.
40. Modeling coupled urban systems: Opportunities and challenges, the International Symposium Energy and The Digital Built Environment, TU Delft, the Netherlands, December 6, 2018.
39. CityBES and urban modeling, International Open Geospatial Consortium Workshop on CityGML EnergyADE, TU Delft, the Netherlands, December 6, 2018.
38. Modeling urban systems and occupant behavior: Opportunities and challenges, TU Eindhoven, the Netherlands, December 4, 2018.
37. Urban systems: efficiency, sustainability and resilience, CIMNE, Spain, November 23, 2018.
36. Modeling building performance and occupant behavior at district and urban scales, IEA EBC Annex 70 Workshop, Washington DC, November 8, 2018.
35. System-level key performance indicators, Alliance to Save Energy's System Efficiency Subcommittee meeting, Washington DC, November 7, 2018.
34. An interdisciplinary framework for occupant behavior in office buildings, IEA EBC Annex 79, International Symposium OB-18, Ottawa, October 10, 2018.
33. Occupant behavior modeling and simulation, School of Architecture, UC Berkeley, October 16, 2018.
32. Understanding and integrating human behavior in the building life cycle. National Technical Day, Stockholm. June 19, 2018.
31. Urban Modeling for Large-Scale Assessment of Building Energy Efficiency Improvements, IBPSA-USA seminar. April 25, 2018.
30. Scaling up building energy efficiency: Connecting smart cities and communities. University of Tennessee Knoxville, SLC seminar, February 9, 2018.
29. Modeling Urban Systems: Opportunities and Challenges. International Symposium OB-17, Tsinghua University, China. September 25, 2017.

28. Modeling occupant behavior in buildings. COORDICY Workshop, Southern Denmark University, UCB CITRIS, June 2017.
27. Building energy efficiency in cities: opportunities and challenges. Smart Cities Distinguished Lectures, University of Texas at San Antonio, May 2017.
26. Building performance simulation for buildings and communities. Mechanical Engineering Distinguished Seminar Series, Santa Clara University, March 2017.
25. Building performance simulation: advances and challenges. UC Berkeley, December 2016.
24. Building performance simulation. University of Talca, Chile, November 2016.
23. Design and operation of ZNE buildings and communities. Beijing Institute of Architectural Design, Beijing, China, September 2016.
22. Zero-net-energy buildings and communities: opportunities and challenges. Tsinghua University, Beijing, China, September 2016.
21. Rethink buildings and communities. Shanghai Institute of Building Research, Shanghai, China, September 2016.
20. An Overview of Buildings Research at LBNL and IEA EBC Annex 66. NRCAN, Canada, August 2016.
19. Overview of buildings research at LBNL, NTNU, Norway, June 6, 2016.
18. Potential energy savings of behavioral measures: A simulation case study, U.S. NSF international workshop on implications of occupant behavior for building operation and design, Vienna, April 2, 2016.
17. Building data analytics: Two case studies. Big data and applications in buildings workshop, Tsinghua University, China, July 16, 2015.
16. Commercial Building Energy Saver: An Energy Retrofit Analysis Toolkit, IBPSA-USA San Francisco Chapter, February 17, 2015.
15. Modeling of occupant behavior in buildings, LBNL Behavior Group Seminar, October 3, 2014.
14. Overview of buildings research at LBNL, VTT, Finland, November 4, 2014.
13. An overview of Annex 66. Annex 58 and 60 Open Seminar, LBNL, September 17, 2014.
12. IEA EBC Annex 66 and Behavior Modeling, IBPSA-USA San Francisco Chapter, June 10, 2014.
11. Analysis of 51 high performance buildings, Hong Kong Polytechnic University, March 11, 2014.
10. Building Performance Simulation – Opportunities and Challenges, Tsinghua University, China, October 23, 2013.
9. EnergyPlus and its use in green building design, code compliance, and LEED ratings, National Taipei University of Technology, Taiwan, China, October 16, 2013.
8. EnergyPlus: history and the road ahead, Industrial Technology Research Institute, Taiwan, October 14, 2013.
7. Challenges and opportunities of energy efficiency in high performance buildings – a case study, Industrial Technology Research Institute, Taiwan, China, October 14, 2013.
6. Occupant behavior research at LBNL, KEMA, Oakland, September 13, 2013.
5. Discovering occupancy behavior from lighting switch data, Occupant Behavior Symposium, Rotterdam, April 26, 2012.
4. Rethinking energy performance of buildings. USDOE BTO, December 2, 2011.
3. Low energy buildings: opportunities and challenges. International Forum of Energy Frontier, Taiwan, August 5, 2011.
2. Challenges of modeling human behavior, Occupant Behavior Symposium, Copenhagen, April 28, 2011.
1. Building energy technologies, performance monitoring and simulation, Hong Kong Polytechnic University, April 15, 2011.