

JENNIFER SCHEIB

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University of Colorado Boulder
Civil, Environmental and Architectural Engineering
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TEACHING AND RESEARCH INTERESTS

Sustainable design, indoor environmental quality, student-centered and project-based learning

PROFESSIONAL EXPERIENCE

- Assistant Teaching Professor* University of Colorado, Boulder, CO
Fall 2017 – Present Department of Civil, Environmental and Architectural Engineering
- Teaches architectural lighting fundamentals and sustainable design undergraduate and graduate courses. Advises graduate student projects and theses. Serves on department committees focused on student experience.
- Research Engineer* National Renewable Energy Laboratory, Golden, CO
2009 – Fall 2017 Commercial Buildings Research Group
- Served as the technical project manager for the \$30M Wells Fargo Innovation Incubator program, which provides technical support to startups developing climate solutions. Performed lighting system, occupant behavior, and building acquisition research projects to help owners realize zero energy in building operation.
- Project Engineer* Architectural Energy Corporation, Boulder, CO
2006 – 2009 Daylighting Analysis Group
- Co-developed software for daylighting sensor placement and commissioning. Performed daylighting design and analysis for schools, airports, and offices.
- Research Assistant* National Institute of Standards and Technology, Gaithersburg, MD
2003 Optical Radiation Group
- Characterized the intensity distribution of LED sources.
- Lighting Design Intern* HLB Lighting Design, Los Angeles, CA
2002
- Prepared fixture layouts, schedules, presentation boards, and calculations.

ACADEMIC BACKGROUND

- M.S. (2004) University of Colorado Boulder
Civil Engineering Building Systems Program
- Thesis titled, “Metrics of perception: Sharpness of beam edges.” Funded by LiteControl to research relationship between sharpness judgments and spatial frequency content of beam edges through subjective experimentation and digital image analysis.
Advisors: Robert Davis, David DiLaura, Lewis Harvey
- B.S. (2003) University of Colorado Boulder
Architectural Engineering Lighting Program

TEACHING

New Course Development

Architectural Lighting Design Capstone, AREN 5530

Co-developed the new, required 3-credit course in 2021 for students of the Professional Graduate Certificate in Architectural Lighting. The course is the culminating experience of the 9-credit certificate. It offers an immersive experience with one-week of the summer semester spent on the CU Boulder campus. Topics include photometry, color theory, biological responses, field surveys, controls, and the lighting design and documentation process. The concepts learned in the two prior online courses are demonstrated and experienced using hands-on, active learning strategies.

Building Systems Modeling and Simulation, Special Topics

Co-developed the new, elective course in 2020 for graduate students of the Building Systems Program. The team-taught course explores the fundamentals of simulating and analyzing buildings and associated energy systems with an integrated and comprehensive modeling approach. The course covers three critical modeling domains: thermal and energy systems, air flow and ventilation, and lighting systems. The lighting systems module topics include daylighting, electric lighting control, and simulation approaches. The module uses a flipped classroom approach with recorded content and tutorial-based, self-guided design projects, with one-on-one or small group instructor support during class time and office hours.

Adaptive Lighting Systems, AREN 4/5620

Developed the new, elective 3-credit course in 2017 and redesigned the course in 2019 for undergraduate and graduate Architectural Engineering students. The course builds on two architectural lighting fundamentals courses, which prepare students for internships. This course prepares students for technical leadership in the field of architectural lighting by exposing students to current lighting design challenges such as demand management, light and health, and smart city integration. Through a flipped classroom approach, the course asks students to develop a basic understanding of lighting control codes and standards, network architecture and components, control theory, design documentation, and commissioning. Class time is used for demonstrations and hands-on activities to reinforce content and teach a prototyping process. The course culminates with students developing and testing their own adaptive lighting solutions.

Residential Design Build I/II, Special Topics

Co-developed the new, elective 6-credit course sequence in 2019. The course builds on previous courses focused on architectural engineering practice for commercial-scale buildings. This two-part course challenges students to design and prototype a sustainable, affordable home. The timeline for the course is framed around the U.S. Department of Energy's Solar Decathlon Build Competition however it is not necessary for students to participate in the competition for successful completion of the course. Topics include passive design technologies, efficient approaches to active heating and lighting, material selection based on life cycle analysis, codes and standards, and construction methods and safety. The course relies on active learning strategies such as charrettes, peer/industry reviews, site visits, and wall panel prototyping, which supplemented out-of-class readings, assignments, and tutorials.

Courses Taught	Course Type	Course Essential Questions	Semesters Taught
<i>Illumination I</i> AREN 3540	Undergrad requirement	What is light? How can the behavior of light be predicted? How can math and science be used to better the built environment?	Fall 2017-2019 Spring 2020-2023
<i>Arch. Design Studio I</i> AREN 3080	Undergrad requirement	How do architectural design teams collaborate? What is good design?	Spring 2023
<i>Luminous Radiative Transfer</i> AREN 4560	Undergrad elective	How does light exchange between surfaces? How can an understanding of phenomena be used to develop tools for designers?	Spring 2018-2019 Spring 2021
<i>Adaptive Lighting Systems</i> AREN 4/5620	Undergrad/ grad elective	How can the use of light in architecture help and harm people? How can engineering concepts be tested and demonstrated?	Spring 2018-2019 Fall 2019-2022
<i>Daylighting</i> AREN 4/5580	Undergrad/ grad elective	What is climate and microclimate? How can daylighting support human health and wellbeing, and the health of the power grid?	Fall 2017-2018 Spring 2021-2023
<i>Residential Design Build I/II</i> AREN 4830	Undergrad electives	Is it possible to design a home that is sustainable and affordable? What building practice changes are required to build a sustainable home?	Fall 2019 Spring 2020
<i>Building Energy Systems</i> AREN 5001	Grad requirement, co- taught	What is light? How can the behavior of light be predicted? How can light be used to enhance the sustainability of a building?	Fall 2018-2022

<i>Building Modeling & Sim</i> AREN 5830	Grad elective, co-taught	What architectural design approaches best balance the need for light, heat/cool, and fresh air? How can a designer predict a technology's effect on all three critical building functions?	Spring 2020
<i>Arch. Ltg. Design II</i> Daylighting module AREN 5520	Certificate requirement, co- taught	Is the sustainability of a building something that an illumination engineer can influence?	Spring 2021-2023
<i>Arch. Ltg. Design Capstone</i> Field survey and controls modules AREN 5530	Certificate requirement, co- taught	How can a designer trust their predictions about how a building system will work?	Summer 2021-2022

STUDENT ADVISING

Student Organizations

<i>Faculty co-advisor</i> 2017 - present	<p>Illuminating Engineering Society Support alumni engagement, student scholarships, retreats, student travel, and an annual career fair</p>
<i>Faculty mentor</i> 2022 - present	<p>Solar Decathlon 2023 Build Challenge Support design charrettes, mentor and donor engagement, and build community events</p>
<i>Faculty lead</i> 2019 - 2021	<p>Solar Decathlon 2020/21 Build Challenge Supported the design, procurement, construction, and competition activities for a student-led sustainable home build</p>

Student Research Projects

(Served as primary advisor or co-advised*. Titles are abbreviated. Dates are of project completion.)

Sula Ali	M.S. project	HDRI-based Daylighting Analysis to Assess Impact of Daylighting Design on Circadian Entrainment	Fall 2022
Lulwa Husain	M.S. project	CCT-based Daylighting Analysis to Assess Impact of Daylighting Design on Circadian Entrainment	Fall 2022
Danah Boabbas	M.S. thesis	Tool Development and Validation for Spectral Daylight Analysis	Spring 2021
Melissa Szymulewska	M.S. project	Analysis of Light Distribution and Spectrum on Circadian Entrainment, Alertness, and Mood	Spring 2021
Josianne Proulx	M.S. thesis	A Comparative Study of Lighting Perceptions between Virtual Reality and Physical Space	Fall 2020
Justin Rimbach	Undergraduate DLA	Design of a Panelized, Prefabricated Wall Assembly for a Sustainable Home	Spring 2020
Josianne Proulx	Summer project	Luminance-Based Sensors for Occupant Comfort and Energy Efficiency	Fall 2019
Kyle Crump	Summer project	Review of the Research Basis for Dynamic Lighting for Well-Being and Energy Performance	Fall 2019
Michael Anthony	Undergraduate UROP	*Visual and Categorical Analysis of Light Exposure in Chosco, Bolivia	Summer 2018

Student Project Funding

\$69,766	Pacific Northwest National Laboratory	Lighting Research for Realistic Settings: Evaluating issues related to tunable lighting and human responses and ongoing development of lighting measurement using HDRI techniques (2019 grant)
\$40,000	U.S. Department of Energy / National Renewable Energy Laboratory	Solar Decathlon 2020/21 Build Challenge notice-to-proceed build phase award (2019 gift)
\$55,000	CU Boulder Engineering Excellence Fund	Solar Decathlon 2020/21 Build Challenge undergraduate student team sponsorship (2020, 2021 combined)
>\$150,000	Private donors	Solar Decathlon 2020/21 Build Challenge client, industry, family, and friend donations (2019-2021 gifts)

Independent Study Courses

Architectural Acoustics, University of Nebraska-Lincoln collaboration (2018, 8 students; 2020 1 student)
Virtual Reality for Architectural Design Analysis (2019, 4 students)
Python and Radiance Workflow for Daylighting Analysis (2020, 2 students)
Luminous Radiative Transfer and Commercial Software Applications (2022, 3 students)

SERVICE

Department

Board member
2017 – present

Rocky Mountain Lighting Academy
Support planning and running an annual workshop for industry professionals. Helped develop the Professional Graduate Certificate in Architectural Lighting, a first-of-its-kind online education offering.

Member/Chair
2020/2022 – present

Undergraduate Student Pathways Committee
Initiated and facilitate a professional mentorship program, plan and support implementation of recruiting initiatives, plan and support student welcome and pathways events, nominate students for awards of excellence

Member
2021 – present

Justice, Equity, Diversity, and Inclusion Committee
Support department education of JEDI issues, and action in response to the campus IDEA plan and culture survey results

National

Member
2019 – present

Illuminating Engineering Society Education, Library, and Office Committee
Co-develop and publish lighting design guidance on topics such as glare and controls

Board member
2023

Building a Legacy in Engineering
Support “living-learning lab” collaboration with Tuskegee University's School of Architecture and Construction Science and Management

Peer reviewer
2018 – present

Journals and programs including Solar Energy, Energy and Buildings, U.S. Department of Energy Solid State Lighting Program

Joint Appointment
2017 – present

National Renewable Energy Laboratory
Collaborate to develop building science curriculum and review intelligent lighting concepts for cleantech incubators

PROFESSIONAL DEVELOPMENT

- 2022 Community-Based Participatory Research semester course
Offered by the CU Boulder School of Education
- 2022 Climate Across the Curriculum two-day pedagogy workshop
Offered by a Mission Zero and cross-disciplinary CU Boulder faculty
- 2021 Learning by Design semester course on active student-centered learning
Offered by the CU Active Learning Academy
- 2020 Supporting Student Resiliency workshop series
Offered by CU Health and Wellness Services
- 2019 Course consultation and student interviews for AREN 3540
Offered by CU Center for Teaching & Learning

ACHEIVEMENTS

- U.S. Department of Energy Zero Energy Design Designation, department (2022)
- Solar Decathlon 2020 Build Challenge first place overall, faculty lead (2021)
- Architectural Engineering Student Appreciation Award (2019, 2021)
- Civil, Environmental and Architectural Engineering Department Teaching Award (2020)
- National Renewable Energy Laboratory (NREL) Outstanding New Partnership Award, team (2015)
- NREL President's Award for Excellence in Campus Development, team (2014)
- LightFair International's Most Innovative Product of the Year, team (2008)
- College of Engineering and Applied Science Outstanding Graduate for Research (Fall 2004)
- Civil and Architectural Engineering Clarence Eckel outstanding graduate award (Fall 2004)

PUBLICATIONS AND ARTICLES

Scheib, J., Taddonio, K., Smyth, J. (2022). *Affordable, All-Electric Cold-Climate Homes: A Look Inside the Winning 2020/2021 Solar Decathlon Build Challenge House: Preprint*. In Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.

AEDG. (2019). *Advanced Energy Design Guide for Zero Energy Office Buildings*. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, Georgia. <https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download>

Kung, T., Frank, S., **Scheib, J.**, Heredia, W.B., Pless, S. (2016). *Supervisory Control of Loads and Energy Storage in Next-Generation Zero Energy Buildings*. NREL/TP-5500-67007, National Renewable Energy Laboratory, Golden, Colorado. <http://www.nrel.gov/docs/fy16osti/67007.pdf>

Walker, A., **Scheib, J.**, Turchi, C., Robi, R., Tomberlin, G., Burman, K., Hillesheim, M., Kroposki, B., Qu., M. (2016). *Integration of Renewable Energy Systems*. American Society of Mechanical Engineers Technologies for Sustainable Life (TSL) – Concise Monograph Series. ISBN: 9780791861240. 150 pages. <https://www.asme.org/products/books/integration-of-renewable-energy-systems>

Fregosi, D., Ravula, S., Brhlik, D., Saussele, J., Frank, S.; Bonnema, E., **Scheib, J.**, Wilson, E. (2015). “A Comparative Study of DC and AC Microgrids in Commercial Buildings Across Different Climates and Operating Profiles.” Presented at the *IEEE First International Conference on DC Microgrids*, Atlanta, Georgia. <http://www.nrel.gov/docs/fy15osti/63959.pdf>

Scheib, J., Pless, S., Coleman, E. (2015). *Realizing High-Performance Buildings: How To maintain Energy-Efficient Design Intent During Building Operation*. NREL/BR-5500-62530, National Renewable Energy Laboratory, Golden, Colorado. <http://www.nrel.gov/docs/fy15osti/62530.pdf>

Pless, S., **Scheib, J.**, Torcellini, P., Hendron, B., Slovensky, M. (2014). *NASA Net Zero Energy Buildings Roadmap*. NREL/FS-5500-60838, National Renewable Energy Laboratory, Golden, Colorado. <http://www.nrel.gov/docs/fy15osti/60838.pdf>

Scheib, J., Pless, S., Torcellini, P. (2014). *An Energy-Performance-Based Design-Build Process: Strategies for Procuring High-Performance Buildings on Typical Construction Budgets*. NREL/FS 5500-61571, National Renewable Energy Laboratory, Golden, Colorado. <http://www.nrel.gov/docs/fy15osti/62530.pdf>

Scheib, J. (2013). *Integrated Design Team Guide to Realizing Over 75% Lighting Energy Savings in High-Performance Office Buildings*. NREL/FS-5500-51665, National Renewable Energy Laboratory, Golden, Colorado. <http://www.nrel.gov/docs/fy14osti/51665.pdf>

Schott, M., **Scheib, J.**, Long, N., Fleming, K., Benne, K., Brackney, L. (2012). “Progress on Enabling an Interactive Conversation Between Commercial Building Occupants and Their Building To Improve Comfort and Energy Efficiency.” In *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings*. Monterey, California. <http://www.nrel.gov/docs/fy12osti/55197.pdf>

Guglielmetti, R., **Scheib, J.**, Pless, S., Torcellini, P., Petro, R. (2011). “Energy Use Intensity and its Influence on the Integrated Daylighting Design of a Large Net Zero Energy Building.” In *Proceedings of ASHRAE Winter Conference*, Las Vegas, Nevada. <https://www.seventhwave.org/sites/default/files/49103.pdf>

SPEAKING ENGAGEMENT HIGHLIGHTS

Moderator, “Light & Health” Panel discussion on the impact of light on human health in the indoor environment, held as part of the *AEI Conference*, April 2021.

Panelist, “What is Ideal Light?” Presentation and panel discussion on the potential value of novel spectral and spatial light distributions given at the *DOE Lighting R&D Workshop*, February 2021.

Panelist, “Will LED Lighting Systems Change Daylighting Design for Energy Efficient Buildings?” Presentation and panel discussion on daylighting design in the era of solid state lighting, given at the *DOE Solid-State Lighting Technology Trends Workshop*, November, 2017, Portland, Oregon.

Co-Presenter, “Real Performance for Real Buildings,” Conference lecture on zero energy building operation, given at *Rocky Mountain Green*, April, 2015, Denver, Colorado.

Presenter, “What’s Next for Lighting Systems,” Conference lecture on retail lighting system advancements, given at *RetailGreen*, December, 2014, Tucson, Arizona.

Presenter, “Energy-Performance-Based Design-Build: Strategies for Procuring High-Performance Buildings on Typical Construction Budgets,” Paper presentation on zero energy building procurement strategies, given at the *ACEEE Summer Study on Energy Efficiency in Buildings*, August, 2014, Monterey, California.

Co-Presenter, “The Evolution of Daylighting Design at the National Renewable Energy Laboratory,” Conference lecture surveying thirty-years of daylighting design approaches, given at *LightFair International*, June, 2014, Las Vegas, Nevada.

Co-Presenter, “The Largest Net Zero Energy Building: What's Under the Hood,” Conference lecture on the lighting systems at the National Renewable Energy Laboratory’s Research Support Facility, given at the *ASHRAE Annual Conference*, June, 2013, Denver, Colorado.

Co-Presenter, “High Dynamic Range Imaging: A Tool for Lighting Designers,” Conference workshop, given at *LightFair International’s Daylighting Institute*, May, 2012, Las Vegas, Nevada.

Co-Presenter, “High Dynamic Range Imaging for Glare Analysis,” Conference workshop, given at *LightFair International’s Daylighting Institute*, May, 2011, Philadelphia, Pennsylvania.