CITIES IN A CHANGING WORLD: 
QUESTIONS OF CULTURE, CLIMATE AND DESIGN

• Paper / Proposal Title:
The Interdisciplinary Timeline: Towards a New Paradigm for Exploring Energy Use in the Built Environment

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• Abstract (300 words):
Any single building is a physical manifestation of interdisciplinarity: perspectives, methods and trades from many discrete disciplines impact the building design process, the standards for building performance, construction sequencing, operational considerations, and the end user experience. However, conventional building design, construction and use practices often keep these processes separated. A transition to sustainable practices in the built environment necessitates increasing interdisciplinarity.

Incorporating novel energy technologies into buildings to decrease energy use while allowing electricity generation onsite is critical to reduce and offset carbon emissions from the building sector. Yet reliably delivering high-performance buildings requires new forms of deep interdisciplinarity: design teams that deconstruct disciplinary boundaries can potentially integrate energy features more successfully into a synergistic whole across a building’s lifecycle. Further, building energy use is dictated not just by design choices, but by government policies in place before the building is even conceived of,
and by the people who operate, maintain and use them long after construction is complete. To inspire radical reductions in building energy use, new forms of collaboration that not only cross disciplinary boundaries, but also allow for new and synergistic practices across all stages of a building’s lifecycle, are crucial. However, this sort of interdisciplinary work is much more challenging in practice than in theory.

This paper will draw findings from an interdisciplinary research project that explores novel energy generation methods in multi-family urban high-rise buildings. This paper will provide concrete steps to inspire deep interdisciplinarity from the beginning, and throughout, the building design process. These steps include visualizing an interdisciplinary timeline to establish an interdisciplinary platform for the work; the continuing practice of engaging with the methodologies of the other disciplines; and an investment in process. This paper will argue that deep interdisciplinarity is a productive paradigm for reducing energy use in the built environment.

• Author(s) Biography (200 words each):

Zach Colbert is an award-winning architect and is a licensed practitioner in the Canadian province of Ontario and the U.S. states of New York and Arizona. He is an Assistant Professor and Associate Director at the Carleton University Azrieli School of Architecture and Urbanism, principal of Zachary Colbert Architects, and he is a member of the Ontario Association of Architects, the Royal Architectural Institute of Canada, the American Institute of Architects, the Ottawa Regional Society of Architects and a board officer of the Urban Land Institute. He was previously on faculty at the Columbia University Graduate School of Architecture, Planning and Preservation (GSAPP) and the Parsons New School for Design School of Constructed Environments. His work has been featured in Art Forum, Architect, Canadian Architect, Architectural Record, Raven, GOOD and URBAN magazines and showcased in galleries and museums in New York City, Los Angeles, Dubai, Santiago de Chile, Rotterdam, Ottawa and Beijing. Prior to practicing independently, he worked for SHoP Architects and Bernard Tschumi Architects in New York City. His externally funded research program at Carleton focuses on using architectural thinking to productively engage intersections of politics and infrastructure within a changing climate.

Alexandra Mallett brings expertise in sustainable energy and climate policy, and energy system change and social acceptance. She holds an Honours Bachelor of Arts from the University of Toronto (International Relations), a Master of Arts at Dalhousie University (International Development) and a PhD from the London School of Economics and Political Science (LSE) (Development Studies). Dr. Mallett is an Associate Professor and Supervisor (policy side), Master’s Program in Sustainable Energy Engineering and Policy, School of Public Policy and Administration (SPPA), Carleton University. Research areas
include an examination of the innovation, cooperation and adoption processes (including policies, actors and institutions) involved in sustainable energy technologies, especially Canada and the United States and emerging economies including Mexico, Brazil and India. Past projects include systematic reviews assessing the effectiveness of climate policies and the potential for technological innovation to mediate policies aimed at environmental improvements, a media analysis regarding the framing of smart grids in Canada, and an examination of sustainable energy options in the Canadian Arctic.

Shelby Hagerman is a Master of Architecture candidate at Carleton University, where she also completed her Bachelor of Architectural Studies. In 2018, Shelby and studio design partner James Nguyen completed an urban proposal for a mixed-use residential high-rise complex that intensified the LRT transit line. In 2019, Shelby developed an adaptive reuse project incorporating vertical farming as well as solar energy and rainwater collection. She participated among three of her peers in the OAA Shift 2019 Infrastructure Architecture Challenge with Professor Zach Colbert and Antonio Gioventu. The project entitled Urban Energy Shift won the competition, envisioning new methods to generate renewable energy in high rise multi-family unit dwellings. She continues her investigation of these topics on the FES research team. Shelby has also worked at the Parliamentary Protective Service, Indigenous Services Canada and GRC Architects in Ottawa.

Lauren Johnson is a Master of Arts candidate in Sustainable Energy at Carleton University. Lauren has lived and worked all around the American West, and holds an MS in Environmental Studies, with a focus on food systems policy, from the University of Montana. She has worked at a variety of levels and jurisdictions supporting sustainable food systems development, from tiny rural communities to statewide to national. Lauren brings experience in qualitative research methods, community development, and coalition building for policy change to the FES research team, as well as a passion for the technical and economic workings of electricity grids.

Jean Duquette is an Assistant Professor in the Department of Mechanical and Aerospace Engineering at Carleton University. He holds Masters degrees in Materials Engineering (McMaster University, ON) and Renewable Energy Engineering (Zaragoza University, Spain), and a PhD in Mechanical Engineering (University of Victoria, BC). He is an active member of Engineers and Geoscientists BC, and the American Society of Heating, Refrigeration and Air-Conditioning Engineers. Dr. Duquette’s research expertise in alternative generation technologies, thermofluids, building science, and numerical analysis is of crucial importance for carrying out a number of the technical tasks outlined in the proposed project. Additionally, his capabilities in conducting techno-economic analyses on new and emerging energy systems will be instrumental in determining the
feasibility of utilizing the gravity turbine concept for energy recapture in our current and future building stock.

Tristan Walker is a student in the Master of Applied Science Program in the Department of Mechanical and Aerospace Engineering at Carleton University. Tristan graduated from the Aerospace Engineering program at Carleton University in 2019, concentrating on fluid dynamics and renewable power. For his fourth-year project he worked with a team of students to create a net zero multi-unit residential building concept through simulation and analysis of multiple interconnected subsystems. In 2018, Tristan established a passion for renewable energy and founded an apparel company called Step3Project to raise money for sustainable infrastructure installations in public facilities. His experiences with Step3Project have built an appetite for finding unconventional, affordable, and beneficial improvements to previously status quo operations.