

## Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

### Online Proceedings

---

#### POSTER SESSION 3

Commons West, Easel 8

2:30 PM to 4:00 PM

##### **U.S. Housing Stock Lifespan Modeling by Decade of Construction**

*Oleksandra (Alex) Ianchenko, Senior, Architectural Design*  
*Mentor: Kathrina Simonen, Architecture*

In 2013, buildings were single-handedly responsible for 44.6% of all CO<sub>2</sub> emissions generated in the United States. In order to confront the reality of climate change, the life-cycle assessment (LCA) approach has been developed as a way to quantify the carbon footprint of existing and projected structures from cradle to grave. Although the accuracy of LCA hinges on the ability to accurately predict the lifespan of a building, most conducted studies focusing on LCA are explicitly based on an arbitrary building lifetime ranging between 50 to 100 years. The goal of my research is to provide a probabilistic model of housing stock lifespan rooted in existing data as an alternative. The National Science Foundation has funded an interdisciplinary research project aimed at integrating sustainability and resilience into community decision making. The UW team is focusing on evaluating environmental and economic sustainability in residential construction using LCA. The models I developed of the expected lifetime of existing housing stock will increase the accuracy of that LCA through an application of building demolition over time derived from real-world trends of housing longevity. In order to estimate the longevity of housing stock, I compiled data from the American Housing Survey (AHS) and the New Residential Construction report. I split the existing housing stock into cohorts based on decade of construction to investigate a change in longevity over time. Building off of previous work done by Michael Gleeson over thirty years ago, I fit statistical curves to each data set and assessed them in order to enable probabilistic assessment of building lifespan.

#### POSTER SESSION 3

Commons West, Easel 7

2:30 PM to 4:00 PM

##### **Sound before Space: John Cage's Music as Urban Acoustic Ecology**

*Jocelyn Ines Beausire, Senior, Architecture, Applied Music (Voice)*

*UW Honors Program*

*Mentor: Ann Marie Borys, Architecture*

From intimate Baroque chamber halls to vast stadiums, architecture has long dictated music's performance and composition. The 20th century rise of acoustic science brought about a quantitative way of perceiving the interaction which was sometimes successful, and other times justified the creation of buildings like Leo Beranek's Boston Philharmonic Hall, which failed to serve its experiential purpose. With this becoming the norm, it is increasingly important to analyze the way sounds construct spaces, rather than the reciprocal. Psychoacoustics, or the study of auditory perception, can be applied to create built environments which are sensitively and intimately related to the sounds performed or produced within. Raymond Murray Schafer and several other theorists proposed the idea of psychoacoustic ecology as a framework for viewing and shaping the large-scale urban environment. Acoustic ecology is the study of the relationship between humans and sounds in a given environment, and the larger societal systems framing the interaction. My research applies Schafer's lens to analyze the extent to which existing urban "sound spaces", (or built environments as perceived by sound), underserve their occupants. Furthermore, Schafer's perception of urban acoustic environments through the lens of music composition holds potential to inform new ways of structuring the built environment. My research critiques existing urban theories on silence through the writing and work of several prominent figures in the urban planning community. I analyze the repercussions of existing urban acoustic environments on the societies which occupy the spaces. Using in particular the theories of midcentury music composer John Cage, including his "emancipation of noise," I propose an improved framework for viewing and creating urban acoustic ecologies to encourage more egalitarian, cooperative, and inclusive urban spaces.