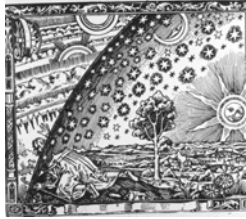


ARCHITECTURE 734 - Ecological Design – Contemporary Practices



Architecture is an inherently exploitive act – we take resources from the earth and produce waste and pollution to make buildings. The construction industry is, for example, one of the single largest producers of greenhouse gas emissions in the United States. Over the past decade a growing awareness of the negative environmental consequences of construction has led many designers to look for ways to change the way we design and build in order to lessen these impacts. *Green building* design, *sustainable* design, *high performance* design are all terms that have been used to describe this approach. Tools, such as the LEED rating system, Ecotect and energy simulation software have been developed to support designers to assess and then limit the impact of their projects.

The first part of this course we will investigate how the environmental concerns of resource efficiency, energy and water conservation effect the design of buildings? How do designers address health issues such as indoor air quality, mold, and other public health concerns. What about site impacts such as stormwater, habitat disruption and open space preservation? How do we track the ecological scale effects of architectural design. How can we measure progress towards more environmentally responsible design?

As green buildings become mainstream, there remains something unsatisfying about an approach that focuses on limits and being “less bad.” Can we aspire to something more? If so, what would that be? In the second part of the course, we will explore the evolving notion of *regenerative* design that seeks to re-integrate design and nature - This view moves from building as exploitive of nature to an “ecological architecture” in which design and natural systems work together to contribute to the ongoing renewal of life.

Moving towards ecological design will require an understanding of the ecology of “process.” How can our understanding of nature as an open, evolving system lead us to new approaches to the design of more environmentally sensitive building materials, construction systems and implementation strategies? What are the architectural implications of emerging concepts such as *biomimicry*, *industrial ecology*, and *integrated design*?

The course is structured as a seminar with lectures each week by the instructor or guest followed by class discussion of a particular issue from the weekly reading assignments. These discussions will be led by 1-2 students and you will be signing up for these at the first class meeting. Class participation by all students is expected and your performance will be evaluated accordingly.

Philadelphia is home to a number of ecological design innovators and several of these folks will appear as guest lecturers during the course. Reflecting the interdisciplinary nature of sustainable design, these guests will be professionals whose sphere of expertise is different than ours including landscape architects, hydrologists, material specialists and others.

The course work will include:

Homework– short **assignments** related to the readings and class discussions.

Final Project – individual research project.

Grades will be weighted as follows: Homework (25%), Class Participation (25%) Final Project (50%). Homework assignments submitted late will be marked down.

Required readings will be posted on Blackboard. Certain course materials, such as lecture presentations, will also be made available on Blackboard. You must be registered for the class and will need your PennKey to access the Blackboard website. <http://courseweb.library.upenn.edu>

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1 1/22 TOWARDS AN ECOLOGICAL ARCHITECTURE

- Topics Course overview;; sustainability definitions; ethics & architecture. history of environmental design
Reading Hagan, "Five Reasons to Adopt Environmental Design," *Harvard Design Magazine*, Spring/Summer 2003., pp. 4-11.
http://www.gsd.harvard.edu/research/publications/hdm/back/18_hagan.html **BB**
Reference Berry, "Conservation is Good Work" from *Sex, Economy, Freedom & Community*, **BB**
Hagan, *Taking Shape*, Chapter 1 "Defining Environmental Architecture," pp. 3-15 **BB**

Homework #1 issued

2 1/29 ENERGY USE, CARBON FOOTPRINTS & CLIMATE CHANGE The 21st Century Challenge

- Topics Energy & Buildings. Building Energy Use, Architecture and Climate Change,
Discussion *Is Green Architecture a Style? Is there a green aesthetic? Should there be?*
Reading Mazria, "It's the Architecture Stupid," **BB** and also www.architecture2030.org
Abley, *Sustaining Architecture in the Anti-Machine Age*, Chapter 5, "Design Tokenism and Global Warming," pp. 72-83. **BB**
Reference Scott, *Dimensions of Sustainability*, chapters by Richards, Short, McCarthy & Perraudin. **BB**

Homework #1 due

Homework #2 issued Your carbon footprint.

3 2/5 HOW GREEN IS MY BUILDING? Metrics & Benchmarks

- Sustainability Indicators; Performative Design; Quantitative Architecture.
Discussion Are green rating systems, such as LEED, useful in designing ecologically?
Reading "*LEED-NC™v2.2 Green Building Rating System*, from the U.S. Green Building Council,
https://www.usgbc.org/FileHandling/show_general_file.asp?DocumentID=1095
Fisk, Pliny and MacMath, Richard, *Anybody There? – Hello, Hello – (Architects, Ecological Footprints and Responsibility)*, Center for Maximum Potential Building Systems, 1998. **BB**

Homework #2 due

4 2/12 MAKING THE CASE FOR ECOLOGICAL DESIGN – The Costs & Benefits

- Topics Do green buildings cost more? Economics of green. Life Cycle Costing.
Reading Hawken, Lovins & Lovins, *Natural Capitalism*, Chapter 1, "The Next Industrial Revolution," pp. 1-21.
BB
Kats, Gregory H., "Green Building Costs and Financial Benefits,"
<http://www.cap-e.com/ewebeditpro/items/O59F3481.pdf>
Discussion Should private developers and building owners be required to build green buildings?
Reference Matthiesen, Lisa and Morris, Peter, "Costing Green; A Comprehensive Cost Database and Budgeting Methodolgy," Davis Langdon, **BB**

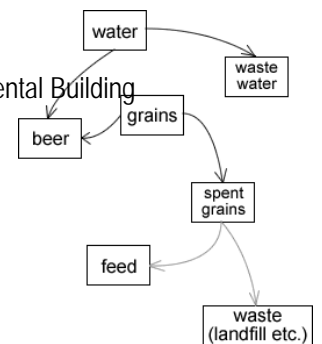
Homework #3 issued Your carbon footprint.

5 2/19 GENIUS LOCI – Guest Lecture
Jose Alminana, Andropogon

Topics Site, Landscape and the Significance of Place
Discussion *Can a building be alive?*
Reading Porter, *The Practice of Sustainable Development*, chapter 6, pp 75-86 **BB**
Scott, *Dimensions of Sustainability*, read chapter by McHarg **BB**
van der Ryn & Cowan, chapter 5 "Solutions Grow from Place." **BB**
Berkebile & McClennan, "The Living Building,"
<http://elements.bnim.com/resources/livingbuildingright.html>

6 2/26 WHERE DOES THAT COME FROM? Materials and Life Cycle Assessment
guest lecturer STEVE BAER, Five Winds International,
www.fivewinds.com

Topics Environmental Impacts of Materials, Life Cycle Assessment, Material Selection Tools
Discussion Does it matter if the green qualities of a material are invisible?
Reading Trusty & Horst, "Integrating LCA Tools in Green Building Rating Systems" **BB**
BEES Website <http://www.bfrl.nist.gov/oa/software/bees/>
Malin, "Navigating the Maze of Environmentally Preferable Products," *Environmental Building News*, vol. 12, no. 11, November, 2003. **BB**



7 3/4 FORM FOLLOWS FLOW –
guest lecturer Michele Adams, Meliora Environmental Design, LLC

Topics Water and design; Urban hydrology; green roofs and porous parking lots.
Discussion Should flushing be banned in buildings?
Reading van der Ryn & Cowan, chapter 7 "Design with Nature" **BB**
Porter, *The Practice of Sustainable Development*, chapter 6, pp. 86-97. **BB**
Discussion Water & Waste: How do they mean for architecture?

Final Project issued

.....Spring break

8 3/18 BEYOND SUSTAINABILITY – Guest Lecture

Bill Reed, Integrative Design Collaborative <http://www.integrativedesign.net/home>

Topics Changing Mindsets, Regenerative Design; Integrating Nature, Communities and Buildings
Reading Bill Reed, "Shifting our Mental Model – "Sustainability" to Regeneration" **BB**
Lyle, *Regenerative Design for Sustainable Development*, chapter 1 "Sustainability in the Neotechnic Era." **BB**

Readings noted with a **BB** can be found on the course website on Blackboard

9 3/25 Green Video Presentation

**ECOLOGICAL DESIGN: INVENTING THE FUTURE
LESSONS LEARNED**

Topics Pioneers of Ecological Design

10 4/1 To Be Determined

Topics
Reading
Reference

11 4/8 FIELD TRIP (locations to be announced)

Reading Abley, *Sustaining Architecture in the Anti-Machine Age, Chapter 2, "Zen and the Art of Life-Cycle Maintenance"* pp. 42-51. **BB**
Braham, William W. "Eyes That Do Not See: The Practice of Sustainable Architecture." **BB**

12 4/15 AGE BEFORE BEAUTY – Long-Lives, Open Buildings and Sustainable Design

Topics Embodied Energy vs. Operational Energy; Building Life Cycle Analysis; Time and Weathering; Long Life/Loose fit

Reading Brand, *How Buildings Learn*, chapter 2 "Shearing Layers." **BB**
Kevin Pratt, Kieran Timberlake Associates, On Prefabrication and Sustainability
http://www.kierantimberlake.com/research/prefabrication_1.html#
Martin, Age Before Beauty. **BB**

13 4/22 FINAL PROJECT PRESENTATIONS

14 4/29 FINAL PROJECT PRESENTATIONS