Arch 125

Fall 2018

Principles of Environmental Design

Fall 2018, 0.5 credits
Lecture course, Wednesdays at 10 am
Course Instructor: Val Rynnimeri
TA: Azadeh Shayanfar

Life Supersurface, Superstudio Image, 1969

A fundamental difficulty in managing social-ecological systems for long-term, sustainable outcomes is that their great complexity makes it difficult to forecast the future in any meaningful way. Not only are forecasts uncertain, the usual statistical approaches will likely underestimate the uncertainties. That is, even the uncertainties are uncertain. There are several reasons why uncertainties are large and difficult to characterize:

- *Key drivers, such as (those of) climate and technological change, are unpredictable. Many change non-linearly.*
- *Human action in response to forecasts is reflexive. If important ecological or economic predictions are taken seriously, people will react in ways that will change the future, and perhaps cause the predictions to be incorrect.*
- *The system may change faster than the forecasting models can be recalibrated, particularly during turbulent periods of transition, so forecasts are most unreliable in precisely the situations where they are most wanted.*

These aspects of uncertainty limit the usefulness of forecasting methods for the scientific study and management of regions in transition. Given these limits to understanding, we must focus on learning to live within systems, rather than "control" them. One might argue that it is impossible to deal with such fundamental limits of understanding, and our only reasonable choice is to struggle blindly onward.

Walker, B., S. Carpenter, J. Anderies, N. Abel, G. Cumming, M. Janssen, L. Lebel, J. Norberg,G. D. Peterson, and R. Pritchard. 2002.

Resilience management in social-ecological systems: a working hypothesis for a participatory approach. from Conservation Ecology

"Since antiquity man has reacted to his environment, using his faculties to develop techniques and technologies, whether to back bread or to make brick, in such internal psychological balance with nature that humanity historically lived attuned to the environment. Man's creations were natural when built of the materials offered by the landscape…Every advance in technology has been directed toward man's mastery of his environment. Until very recently, however, man always maintained a certain balance between his bodily and spiritual being and the external world. Disruption of this balance may have a detrimental effect on man, genetically, physiologically or psychologically. And however fast technology advances, however radically the economy changes, all change must be related to the rate of change of man himself. The abstractions of the technologist and the economist must be continually pulled down to Earth by the gravitational force of human nature…"
Hassan Fathy, **Natural Energy and Vernacular Architecture**

"Being green should not be a bragging point, it should be the way we all act in our everyday lives and work and play places. If the world was shrunk to the size of a basketball, the biosphere - the zone of air, water and land where all life exists - would be thinner than a layer of varnish. That's it. It's finite and fixed and cannot grow. Humanity has exploded in number, technological musclepower, consumptive appetite and a global economy and we are now altering the chemical, physical and biological features of the planet on a geological scale. The challenge is finding ways to live in a truly sustainable way in our home, the biosphere."
David Suzuki

You don't design ecosystems. You design your relationships to them.

Ecosystem Theorist, James Kay, personal conversation

An introduction to the environmental aspects of architectural design and to an analysis of the form that landscapes take and the processes and ideals leading to those forms. The relationship of the landscape to microclimates and building environments. Topics of discussion include environmental concepts and influences on design, site planning, landscape, sustainability, solar geometry, embodied energy, climatic influences and microclimates, passive heating, passive cooling and carbon neutral design basics.

Design today is in the middle of being re-shaped by ecosystem thinking. The contemporary versions of such approaches, like "resilience management", are found in scientific journals like "Ecology and Society" published by the Resilience Alliance. In turn, the ecosystem approach itself is also being re-shaped by increasingly sophisticated theories of emergent complexity, system self-organization, post-human thinkers, and now the "hyper-objects and mesh theory of the philosophical analyses using object oriented ontology.

As a big picture global context for this work, there is the looming climate change crisis, ever more a fact and not a prediction. Lastly, there is the Anthropocene, the human-driven situational framework of our new

global ecological reality. We and our presence are everywhere, and our future design needs to reflect that extensive and interwoven mesh, far larger than any simple individual solution like more solar energy.

The Arch 125 course outlines the concepts of environmental design useful for design and project work in urban places, from rooftops and ack laneways and vacant lands to urban bioregions. Course focus will be on expanding the conventional theoretical and working methodologies of design to place the larger surrounding urban ecosystems themselves in a more central methodological position. Further, the course seeks to re-frame analysis and design in the terms of a more complex systems thinking, seeing the design work as part of a larger whole.

There will be a dual emphasis in the course on introducing both theory and methodology through selected readings, lectures, and seminar discussion. The broader outlook of the first half of the course will be followed by more building oriented lectures in the second half. The course goals for students of Arch 125 will be on using the theory and analytical methodology of environmental design introduced in the course to prepare an analysis of their Design Studio site and/or design framework. Such an analysis will be completed in a report outlining how the complex natural and cultural ecosystems of the landscape or cityscape of the student's individual design project affect the final design of their building project in the studio.

Course Evaluation

There will be two evaluation exercises for this course, a reading exam, of 1.5 hours, worth 40% of the final grade still to be arranged in the sixth or seventh week of the course, and a Design Report based on your final Arch 192 design and worth 60% of the final grade.

Course Schedule Week by Week

Week 1, 11 September
Overall course introduction
Brief discussion of 125 Final Report
Ecosystem Theory and Design Theory Introduction

- Levin's six questions
- Design, problem types, and problem spaces
- Complex Systems Thinking

Hardin Tragedy of the Commons

Week 2, 18 September
Setting the Context: historical approaches to large scale environmental design

- Gardens and Public parks, Haussmann, Olmstead and Burnham
- Modernism, Le Corbusier, the Garden City, Broadacre City, the mid-century Suburbs
- Ian McHarg and "Design with Nature"
- Lawrence Halperin and RSVP Cycles
- James Corner and the Fresh Kills project

125 Reading: Halperin and McHarg

Week 3, 25 September
The Urban Bioregion: shaping a basic ecosystem description of your building's underlying conditions

- Bioregions, watersheds, and urban morphology, a GTA case study

125 Readings: Jackson, Snyder, Berry, Cronon

Week 4, 2 October
Resilience and Sustainability: complex systems concepts for ecosystems analysis

- Narratives (using the HNA narrative as an example)
- Scale, complexity, pattern generation and self-organization
- Attractors
- Resilience and Sustainability
- Garret Hardin and the Commons
- Landscape scale and community scale

Kay, Waltner-Toews, Systems Dsc 03
Kay, Ecosystem SOHO Narratives 00
Kay, Thermodynamics of Ecosystems
Schneider Kay, Order from Disorder 95

Week 5, 11 October, Reading week, usual Tuesday class held on Thursday, 10am to noon, Paths to Practice in the afternoon

Film day, Manufactured Landscapes (1hr 26min)

Week 6

Course Reading Test, 16 October, 2 hours

No Arch 125 class on 23 October. Double Arch 142 class that day

Week 7, 30 October, Double class for Arch 125. No Arch 142 class that day

Global Warming, Climate Change and the Transformation of Architecture
Broad future issues affecting ecological and normative design of urban landscapes:

- global warming, species and biodiversity loss

- urban development, countering ecosystem degradation in urbanizing areas
- peak oil and alternate energy systems
- reworking what is already built

Readings TBA pending new IPCC report for 2018

The Anthropocene
- Near Time (to 2100) and Geological Time
- Deep Ecology, the alternative

UCS greatlakes_final
Oil PricesChart
RottenIce
ESAsiaBrownCloud
20100926-masdar-graphic

Week 8, 30 October
An introductory overview of concepts in Urban Environmental Design and Green Infrastructure
- Land mosaics and land systems
- Green infrastructure
- The Seaton competition, a green infrastructure case study
- Huron Natural Area, ecosystems based parks

Forman, General Principles Landscape Ecology

Climate and Human Comfort
Buildings need to provide much more than shelter. They need to keep us comfortable and this is a direct function of our regional climate. A discussion of various climate zones and their relationship to human comfort as impacts the design of the building enclosure or "third skin". Specific architectural responses to climate.

Vernacular Architecture
- regionality in architectural design
- specific vernacular responses to climatic condition
- the impact of translating climate specific responses.

Lechner. Chapter 3: Basic Priniciples
Lechner. Chapter 4: Thermal Comfort

Week 9, 06 November
Climate and the Environment: Introduction to Building Science
(video lecture by Professor Terri Boake)
- Understanding the architectural creation of comfort.
- The effects of solar geometry, siting, geo-regional characteristics on conceptual building design.
- Thermal considerations; heat gain and loss; air and vapour barriers.

Lechner: Chapter 5: Climate
Canadian Wood Frame House Construction: (link in Arch 172 course page)
Healthy Housing: p. 13-18
Vapour and Air Barriers p. 271-278
Thermal Insulation p. 255-270
Ventilation p. 283-29

Week 10, 13 November
Orientation, Solar Geometry and Shading
The importance of building orientation as it affects solar exposure. Basic principles. Students learn how to use sun angle data to plot shadows, determine solar gain, understand sun penetration into buildings for various geographical regions and for differing seasons.

Lechner. Chapter 6: Solar Geometry
Lechner. Chapter 9: Shading

Week 11, 20 November
Passive Design: Heating Strategies
An examination of passive strategies for heating. In depth look at case studies and application procedures. Direct gain vs. indirect gain systems.

Lechner. Chapter 7: Passive Solar

Passive Design: Cooling Strategies
An examination of passive strategies for cooling. In depth look at case studies and application procedures. Heat avoidance and natural ventilation strategies.

Lechner. Chapter 10: Passive Cooling

Week 12, 27 November
Film day, Revolution of the Present (1hr 24min)
Environmental Design, a Site and Building Overview
An examination of the residential and smaller scale site with respect to building placement, sun penetration, landscape elements/choices, wind, services. The effect of material choices on the small "microclimate" that is developed around our buildings.

Keyword: Microclimate

READ:
Lechner. Chapter 11: Site Design and Community Planning