School of Architecture | College of Architecture | Georgia | Institute of Technology

ARCH 4227/6227: Architecture & Ecology

Fall Term 2012 | Tuesdays-Thursdays 9:30-10:55 | CoA West, Room 259 | 3 credit hours

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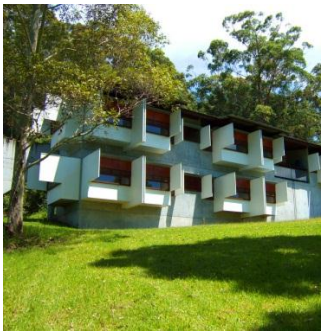

the poetics of passive energy design Boyd Art Center by Glenn Murcutt

Nabib Desert beetle hydrodynamics biomimetic design inspiration for

The Bioscience In novation Center by Servo Los Angeles, Architects

sustainabilityVenn: economy within society within ecology, Christianson

course objectives & student learning outcomes | Noted environmental designer Susannah Hagan asks us, "in a culture increasingly capable of merging nature and culture, why on earth are thoughtful talented people still addressing only one end of an enormous range of new possibilities?" The aim of this new course is to enable participants to bring about new possibilities critical to the future of the planet *and* careers in architecture that unite both ends and re-invent architecture's deeper ethical and creative/aesthetic project in the process. It provides the new knowledge-base and interdisciplinary approach our field urgently awaits a new generation to bring into practice, effectively reconnecting not only *nature* and *culture*, but *science* and *art* as well. This requires the development of both a practical and poetical understanding of the dynamic interactions between the natural and built environments and inhabitants, and rethinking of the ways that a truly ecological architecture can and should operate within them. A broad range of ideas and scales of practice are considered, drawn from many fields of expertise, including the instructor's own in the areas of social and ecosystem concepts and their applications in architectural practice. Students develop a range of *knowledge, skills*, and *experience* during the course:

- ***ability* at case study research, investigating/communicating implications of key works of ecological architecture**
- ***understanding* of the related ideas of ecology and architecture, their historical construction & embedded values**
- ***understanding* of dynamic interactions between natural and built environments and their implications for design**
- ***understanding* of key global paradigms of ecological architecture--their arguments, values, ethics, and impacts**
- ***understanding* of eco-design research methods and *ability* constructing & communicating new lines of research**

course procedure & organization | The course is structured as a seminar with lectures by the instructor and guests followed by presentations of readings by seminar members and follow-up discussions.
Part I explores ecology as core ideas and principles, and the ways they have been historically-constructed as a function of larger beliefs and values of *nature & culture, art & science* embedded within them.
Part II examines the nature of the interactions between natural and built environments and how design practices operate and impact within them and could in the future.
Part III engages the lessons of key global paradigms of ecological architecture and shifts between their theories and practices—traditional, 'green', and more radical technologies—through case study research.
Part IV investigates ecological architecture as a range of other emerging types of interdisciplinary research practice including quantitative-& qualitative-performance types (biomimicry simulation, GIS spatial ecology).
Part V involves seminar members finalizing & presenting their speculative, interdisciplinary lines of ecological architecture research resulting in proposals of new environmental design principles & applications.

course requirements | Students are expected to attend class regularly, read assigned materials, prepare assigned presentations, and participate actively in class discussions. Grades are weighted as follows: attendance/participation/reading presentation (25%), midterm exam (25%), case study research/ Powerpoint presentation (25%); line of future ecological architectural research paper/presentation (25%).

course readings | There is no required textbook to purchase for the course. Pdfs of the required readings are provided by the instructor on the course T-Square site. An extensive bibliography and list of useful websites and recommended supplemental readings are also provided.

course deliverables:

reading presentation: Each member of the seminar signs up for, analyzes, and presents to the seminar one of the required readings on the sign-up sheet during the first six weeks, and leads a follow-up discussion of the reading. Twenty-five minutes total are allotted for each of these presentations and discussions. A one- to two-page synopsis of the primary arguments of the reading and two to three questions for discussion is provided to all members of the seminar. If this provided to the instructor the evening before the class, he will be happy to make the copies for everyone.

research presentation no. 1: Each member of the seminar signs up for, researches, and makes a visual presentation to the seminar of a case study of an exemplary example of ecological architecture or urbanism during the third phase of the course. This is a Powerpoint presentation addressing a set of questions and issues common to all of the precedents, and a follow-up discussion by the seminar. After the presentation is made, each Powerpoint is to be converted to a pdf and posted in the 'resources' folder of the course T-Square site so that others in the seminar may have access to it at a later time.

research presentation no. 2: Each member of the seminar frames a particular line of research of their choosing that draws from the range the core issues of the course. This can be related to the case study research of the previous phase, but does not need to. It may be a topic that relates to other courses being taken this term or next term, but does not need to. The format and content of the presentation is a Word document framing the research problem, question and methods that are being proposed for the remainder of the research process.

research presentation no. 3: Each member of the seminar signs up for and makes a visual presentation of the their progress findings to date. This is also a Powerpoint presentation addressing the critical research issues and methods presented in the previous presentation as they are playing out, resulting in certain findings and conclusions and ecological design propositions that are beginning to being applied to design research. This is roughly a twenty-minute presentation followed by five to ten minutes of feedback from the seminar.

research presentation no. 4: Each member of the seminar pins up at the designated time and place a set of research documents of all phase of their research process, printed out on landscape-oriented 11x17s, and arrange in a matrix that communicates all phases of their process. These are to be nominally to include the following types of information: 'the reearch problem + methods statement,' 'the research findings,' and 'the design research applications.' Each member of the seminar will make a brief presentation to the seminar and receive feedback on the presentation.

additional course requirements:

please note:

1) Copies of each of the assigned readings must be brought to the class in which that reading will be presented and discussed. This copy may be either a physical copy or an electronic copy viewed on your laptop.

2) Students with disabilities requiring special accommodations must obtain an accommodations letter from the ADAPTS Office [www.adapts.gatech.edu] and present this to the instructor the first week of class to ensure that appropriate arrangements can be made.

3) Georgia Tech aims to cultivate a community based on trust, academic integrity and honor. Students are expected to act according to the highest ethical standards. For policy information on Georgia Tech's Academic Honor Code, please see [http://www.catalog.gatech.edu/rules_regulations/#18].

4) All cell phones and/or smart phones of any type should be turned off and put out of sight when entering the classroom and kept turned off and out site throughout the entire class throughout the length of the course.

5) In case of emergency (i.e. fire, accident, criminal act), please call the Georgia Tech Police at 894-2500. Please note that Perry Minyard, IT Support Administrator is also a firefighter and an Emergency Medical Technician (EMT) certified in performing CPR.

course evaluation criteria + policy on absences

Attendance, participation, timely completion of work, the depth of engagement in course issues, and the making of progress in your work provides the foundation for your grade. Conceptual and project development and refinement, drawing and model making requirements, and craftsmanship matter greatly and factor equally in the evaluation of your performance. Remember, grades are earned by you –not given by your instructor. Again, because of the material covered in class and the centrality of dialogue, attendance and participation are essential. Attendance is taken each class. Excused absences required either prior approval or documentation. Three unexcused absences results in the lowering of the final grade by a letter grade.

course schedule of topics + readings

week 01	08/21	introduction to the course
	08/23	**competing ecologies** readings: Jax/Schwarz (3), Trepl/Voigt, Lechner
week 02	08/28	**the science of ecology** readings: Krebs
	08/30	**energy-related issues I** Readings: Sayre
week 03	09/04	**energy-related issues II** readings: Sayre
	09/06	**environmental perception**
Phase II		readings: Uexküll, Gibson, Dewey
week 04	09/11	**competing logics & values** readings: Hagan, Guy/Farmer, Moore/Engstrom
	09/13	**design movements** readings: Steele, Kallipoliti
week 05	09/18	**construction ecology** readings: Kibert/Sendzimir/Guy, Addinton
	09/20	**ecological urbanism** readings: Mostafavi, Forman, Brook
week 06	09/25	**some ways forward** readings: Guy (2), Moe
	09/27	**midterm exam**
Phase III		
week 07	10/02	case-study presentations
	10/04	case-study presentations
week 08	10/09	case-study presentations
	10/11	case-study presentations
week 09	10/16	FALL BREAK
	10/18	case-study presentations
Phase IV		
week 10	10/23	presentations of research
	10/25	presentations of research
week 11	10/30	presentations of research
	11/01	presentations of research
week 12	11/06	presentations of research
	11/08	presentations of research
Phase V		
week 13	11/13	presentations of research
	11/15	presentations of research
week 14	11/20	presentations of research
	11/22	THANKSGIVING HOLIDAY
week 15	11/27	presentations of research
	11/29	presentations of research [last day of class]

course bibliography
ecological architecture & urbanism

Addington, "Michelle. Energy, Body, Building," *Nature, Landscape, and Building for Sustainability*, W. Saunders (ed). Minneapolis: University of Minneapolis Press. pp. 157-69.

Addington, Michelle and Daniel Schodek. 2005. *Smart Materials and Technologies: For Architecture and Design Professions.* Amsterdam: Elsivier.

Allen, Edward. 2005. *How Buildings Work: the Natural Order of Architecture. Oxford*: Oxford University Press.

Allen, Stan and Marc McQuade. 2011. *Landform Building.* New York: Lars Muller Publishers.

Awan, Nishat/Tatjana Schneider/Jeremy Hill. 2011. *Spatial Agency: Other Ways of Doing Architecture.* London: Routledge.

Bachman, Leonard. 2003. *Integrated Buildings: The systems Basis of Architecture*. New York: John Wiley & Sons.

Baird, George. 2001. *The Architectural Expression of Environmental Controls Systems*. London: Spon Press.

Banham, Reyner, 1969. *The Architecture of the Well-tempered Environment.* London: Architectural Press.

Brown, G.Z. and Mark DeKay, 2001. *Sun, Wind & Light: Architectural Design Strategies. second edition.* John Wiley and Sons.

Bougdah, Hocine/Stephen Sharples. 2010. *Environment, Technology and Sustainability.* London: Taylor & Francis.

Broadbent, G. and C.A. Brebbia. 2006. *Eco-Architectur: Harmonisation between Architecture and Nature.* Southhampton: WIT Press.

Chan, Yenna. 2007. *Sustainable Environments.* Gloucester: Rockport Publishers.

Contal, Marie-Helène and Jana Revedin. 2009. *Sustainable Design: Towards a New Ethic in Architecture and Town Planning.* Basel: Birkhäuser.

Contal-Chavannes Marie-Helène and Jana Revedin. 2009. *Sustainable Design II: Towards a New Ethic in Architecture and Town Planning.* Basel: Birkhäuser.

Cottom-Winslow, Margaret. 1990. *Environmental Design: Architecture and Technology* (New York: Wiley).

Crowther, Richard. 1992. *Ecologic Architecture.* Boston: Butterworth Architecture.

Daniels, Klaus. 1997. *The Technology of Ecological Building,* E. Schwaiger (trans). Basel: Birkhäuser Verlag.

_____. 1998. *Low-Tech, Light-Tech, High-Tech.* Basel, Switzerland: Birkhauser.

Davies, Colin and Ian Lambot. 1997. *Commerzbank Frankfurt: Prototype for an Ecological High-rise.* Basel, Switzerland: Birkhauser.

Earth Pledge. 2000. *Sustainable Architecture White Papers: Essays on Design and Building for a Sustainable Future.* New York: Earth Pledge Foundation.

Eliot. Cecil. 1994. *Technics and Architecture.* Cambridge, MA: MIT Press.

Feuerstein, Gunther. 2002. *Biomorphic Architecture: Human and Animal Forms in Architecture.* Stuttgart: Edition Axel Menges.

Pliny Fisk III. 198 . "Bioregions and Biotechnologies," in *New Perspectives in Planning in the West.* Arizona State University.

Gauzin-Müller, Dominique. 2002. *Sustainable Architecture and Urbanism: Concepts, Technologies, Examples.* Basel: Birkhauser.

Givoni, Baruch. 1994. *Passive and Low Energy Cooling of Buildings.* New York: Van Nostrand Reinhold.

Gruber, Petra. 2011 *Biomimetics in Architecture: Architecture of Life and Buildings.* Vienna: Springer Verlag.

Guy, Simon, and Graham Farmer, "Reinterpreting Sustainable Architecture," *JAE* 54/3 Feb, 2001 pp. 140-147.

Guy, Simon, and Steven A. Moore (eds.). 2005. *Sustainable Architectures.* New York: Spon Press.

Guy, Simon. "Pragmatic Ecologies: Situating Sustainable Building,"*Architectural Science Review*, 53:1, pp. 21-28.

_____. "Designing Fluid Futures: Hybrid Transitions to Sustainable Architectures," *Environmental Innovations and Societal Transitions* 1 (2011), pp. 140-45.

Guzowski. Mary. 2010. *Towards Zero Energy Architecture.* London: Lawrence King.

Hagan, Susannah. 2008. "Five Reasons to Adopt Ecological Design," *Nature, Landscape, and Building for Sustainability*, W. Saunders (ed). Minneapolis: University of Minneapolis Press. pp. 100-13.

Hawkes, Dean. 1997. *The Environmental Tradition: Studies in the Architecture of Environment.* London: Spon.

_____. 2002. *The Selective Environment: An Approach to Environmentally-Responsive Architecture.* London: Spon Press.

_____. 2008. *The Environmental Imagination: Technics and Poetics of the Architectural Environment.* London: Routledge.

Hara. Sara. 2011. *Ecoarchitecture: The Work of Ken Yeang.* New York: Wiley.

Hawkes, Dean/Wayne Forster. 2002 *Energy Efficient Buildings: Architecture, Engineering, and Environment.* New York: Norton.

Hensel, M., Menges, A. and Weinstock, M. 2010. *Emergent Technologies and Design: Towards a Biological Paradigm for Architecture*. 2011. London: Routledge. Schwarz,

Hindrichs, Dirk and Klaus Daniels. 2007. *PlusMinus20°/40°Latitude: Sustainable Building Design in Tropical and Subtropical Regions.* Stuttgart: Axel Menges.

Hough, Michael. 1995. *Cities and Natural Process.* New York: Routledge.

Keiran, Stephen/James Timberlake. 2003. *Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction.* New York: McGraw-Hill.

Keller, Bruno, and Stephan Rutz. 2010. *Pinpoint Key Facts + Figures for Sustainable Buildings.* Basel: Birkhauser.
Kellert, Stephen, Judith Heerwagen, Martin Mador. 2008. *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life.* Hoboken: John Wiley & Sons.
Kibert, Charles, Jan Sendzimir, Bradley Guy. 2002. Construction Ecology: Nature as the Basis for Green Buildings. London: Spon Press.
Kibert, Charles. 2008. "Ecological Design," *Sustainable Construction*. Hoboken: John Wiley & Sons, pp. 99-125.
_____. 2008. Sustainable Construction: Green Building Design and Delivery, 2nd edition. New York: John Wiley & Sons.
Kwok, Alison and Walter Grondzik. 2007. *The Green Studio Handbook: Environmental Strategies for Schematic Design.* Architectural Press.
Kolarevic, Branko/Ali Malkawi. 2005. *Performative Architecture: Beyond Instrumentality.* New York: Spon.
Jones, David Lloyd. 1998. *Architecture and the Environment: Bioclimatic Building Design.* Overlook Press.
La Roche Pablo M. 2011. *Carbon-Neutral Architectural Design.* CRC Press. electronic book online.
Leatherbarrow, David and Richard Wesley. "Frameworks of performance and delight." *Harvard Design Magazine*, 2009 Spring-Summer, n.30, pp.84-95,154,
LEED. 2000. *Green Building Rating System*, (Washington, DC: U.S. Green Building Council.
Lyle, John Tillman. 1994. *Regenerative Design for Sustainable Development.* New York: Wiley.
Maiellaro, Nicola, editor. 2001. *Towards Sustainable Building.* Dorcrecht: Kluwer Academic Publishers.
Mapelli, Elisabetta. 2001. *AD Urban Environments.* New York Wiley-Academy.
McDonough, William/Michael Braungart, 2002. *Cradle to Cradle: Remaking the Way We Make Things.*North Point Press.
William McDonough, "Design, Ecology, and the Making of Things," in *Theorizing a New Agenda for Architecture*, Kate Nesbitt, Ed., New York: Princeton.
Joachim, Mitchell. 2010. "Envisoning Ecological Cities." *Ecological Urbanism*. M., Mohsen/ G. Doherty (eds). Lars Muller Publishers, 2010. pp. 224-9.
Moe, Kiel. 2008. *Integrated Design in Contemporary Architecture.* New York: Princeton Architectural Press.
_____. 2010. *Thermally-active Surfaces in Architecture.* New York: Princeton Architectural Press.
_____. 2012. "Forms of Energy, Energy and Architecture, Brahan/Willis (eds). London: Routledge.
_____. 2010. "Technique is the Architecture of Sustainability, *New Directions in Sustainable Design*. Parr/Zaretsky (eds). London: Routledge.
Mostafavi, Mohsen/ Gareth Doherty (eds). 2010. *Ecological Urbanism*. Lars Muller Publishers, 2010.
Olgyay, Victor. 1963. *Design with climate: bioclimatic approach to architectural regionalism.* Princeton: Princeton University Press.
Parr, Adrian and Michael Zaretsky (eds.). 2010. *New Directions in Sustainable Design.* London: Routledge Press.
Poole, Buzz. 2006. *Green Design.* New York: Mark Batty Publisher.
Saunders, William, editor. 2008. *Nature, Landscape, and Building for Sustainability*. Minneapolis: University of Minneapolis Press. pp. 100-13.
Schaik, Leon. 2010. *Vertical Ecoinfrastructure: The work of T.R. Hamzah and Yeang*. New York, Images Publishing.
Senosiain, Javier. 2003. *Bio-Architecture*. Oxford: Elsevier.
Slessor, Catherine. 1997. *Eco-Tech: Sustainable Architecture and High Technology.* London: Thames & Hudson.
Steele, James. 1997. *Sustainable Architecture: Principles, Paradigms, and Case Studies*. New York: McGraw Hill.
_____. 2005. *Ecological Architecture: A Critical History.* London: Thames & Hudson.
Stein, Carl. 2010. *Greening Modernisms: Preservation, Sustainability and the Modern Movement.* New York: W.W. Norton & Company.
Teymur, Necdet. 1982. *Envionrmental Discourse*. London: Questions Press.
Van der Ryn, Sim. 1986. *Sustainable Communities.* San Francisco: Sierra Club Books.
_____. 2005. *Design For Life: The Architecture of Sim Van der Ryn.* Gibbs Smith.
_____, and Stuart Cowan. (1996). *Ecological Design.* Washington, DC: Island Press
_____, and _____. 2008. Buildings for the 21st Century, "Ecological Design Redux.'
Vitruvius. 1960. *Ten Books on Architecture,* M.H .Morgan (trans). New York: Dover.
Voss, Karsten/Eike Musall. 2012. *Net Zero Energy Buildings: International Comparison of Carbon-Neutral Lifestyles.* Birkhauser. [Michael Gamble copy in library]
Wall, Robert and Maria. 2007. *Sustainable Solar Housing 1: Strategies and Solutions. London and Sterling*, VA: Earthscan & International Energy Agency.
Wall, Robert and Maria. 2007. *Sustainable Solar Housing1: Exemplary Buildings and Technologies.* London and Sterling, VA: Earthscan & International Energy Agency.
Watson, Donald, and Kenneth Labs. 1983. *Climatic Building Design: Energy-Efficient Building Principles and Practice.* New York: McGraw-Hill.
Watson, Donald, ed. *The Energy Design Handbook.* Washington, D.C.: The American Institute of Architects Press, 1993.
Williams, Daniel. 2007. *Sustainable Design: Ecology, Architecture, and Planning.* New York: John Wiley & Sons.

Williamson, Terry/Antony Radford/Helen Bennetts. 2003. *Understanding Sustainable Architecture*. London: Spon Press.
Wright, David, and Dennis A. Andrejko. 1982. *Passive Solar Architecture: Logic and Beauty.* New York: Van Nostrand Reinhold.
Yeang, Ken. 1995. *Designing with Nature: The Ecological Basis for Architectural Design.* New York: McGraw-Hill.
_____. 2009. *EcoMasterplanning.* New York: Wiley.
_____. 2012. *Dictionary of EcoDesign.* New York: Routledge.
Yeang, Ken and Arthur Spector. 2011. *Green Design: From Theory to Practice*. London: Black Dog Architecture.

ecological science

Krebs, Charles. 2009. *Ecology: the Experimental Analysis of Distribution and Abundance(*sixth edition). San Francisco: Benjamin Cummings,.
Odum, E. P. 1953. *Fundamentals of Ecology.* Philadelphia, W.B. Saunders.
Putnam, R.J. and S.D. Wratten. 1984. *Principles of Ecology.* Berkeley: University of California Press.
Sanborn, 2009. "Sustainable Cities: The Sanborn Principles for sustainable Development," http://www.donaldaitkenassociates.com/sanborn_daa.html
Sayre, Kenneth. *Unearthed: The Roots of our Environmental Crisis*. Notre Dame, Ind: University of Notre Dame Press, 2010, [Electronic book avaialbe through Georgia Tech Library].
Soellman, Frank and Nancy Whiting. 2006. *Environmental Science and Technology*. Lanham, MD: Scarecrow Press.
Von Uexkull, Jakob. 1936. "Introduction to Umwelt," *Space Reader*, Hensel, Hight, and Menges (eds). New York: Wiley, pp. 145-8.
Worster, Daniel. 1994. *Nature's Economy: A History of Ecological Ideas*, 2nd edition. Cambridge: Cambridge University Press.

theory and philosophy of ecology

Bateson, Gregory. 1972. *Steps to an Ecology of Mind.* Chicago: University of Chicago Press.
_____. 1979. *Mind and Nature: a Necessary Unity.* Toronto: Bantam.
Benyus, Janine. 1997. *Biomicry: Innovations Inspired by Nature.* New York: Harper Collins Publishers.
Cooper, G. J. 2004. *The Science of the Struggle for Existence: On the Foundations of Ecology*. New York: Cambridge University Press.
Crowe, Norman. 1995. *Nature and the Idea of a Man-Made World: An Investigation into the Evolutionary Roots of Form and Order in the Built Environment.* Cambridge: MIT Press.
Dewey, John. 1934. *Art as Experience.* New York: Putnam.
Finsterwalder, Rudolf (ed.). 2011. *Form Follows Nature: A History of Nature as Model for Design in Engineering, Architecture and Art (*German and English Edition). Vienna: Springer.
Foley, P. 1994. "Predicting Extinction Times from Environmental Stochasticity and Carrying Capacity." *Conservation Biology* 8: 124-137.
Fox. Warwick (ed.). 2000. *Ethics and the Built Environment.* London: Routledge.
Fryxell, J. M. and Lundberg, P. 1998. *Individual Behavior and Community Dynamics*. London: Chapman and Hall.
Gause, G. F. 1934. *The Struggle for Existence*. Baltimore: Williams and Wilkins.
Gilbert, F. S. 1980. "The Equilibrium Theory of Island Biogeography: Fact or Fiction?" *Journal of Biogeography* 7: 209-235.
Gilpin, M. E. and Soulé, M. E. 1986. "Minimum Viable Populations: Processes of Species Extinction." In Soulé, M. E. Ed. *Conservation Biology: The Science of Scarcity and Diversity*. Sunderland: Sinauer, pp. 19-34.
Ginzburg, L. and Colyvan, M. 2004. *Ecological Orbits: How Planets Move and Populations Grow*. Oxford: Oxford University Press.
Gleason, H. A. 1922. "On the Relation between Species and Area." *Ecology* 3: 158-162.
Glacken, Clarence. 1967. *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century.* Berkeley: University of California Press.
Golley, F. B. 1993. *A History of the Ecosystem Concept in Ecology : More than the Sum of the Parts*. New Haven: Yale University Press.
Goodman, D. 1975. "The Theory of Diversity-Stability Relationships in Ecology." *Quarterly Review of Biology* 50: 237-266.
Grimm, V. and Wissel, C. 1997. "Babel, or the Ecological Stability Discussions: An Inventory and Analysis of Terminology and a Guide for Avoiding Confusions." *Oecologia* 109: 323-334.
Grumbine, R. E. 1992. *Ghost Bears: Exploring the Biodiversity Crisis*. Washington: Island Press.
Guattari, Felix. 2000. "The Three Ecologies," *The Three Ecologies.* London: Athlone Press.
Guy, Simon and Steven A. Moore. 2005. *Sustainable Architectures: Natures and Cultures in Europe and North America* (London: Routledge/ Spon.
Haila, Y. 1997. "Trivialization of Critique in Ecology." *Biology and Philosophy* 12: 109-118.
Haila, Y. and Levins, R. 1992. *Humanity and Nature: Ecology, Science and Society*. London: Pluto Press.
Heidegger, Martin. 1977. *The Question Concerning Technology and Other Essays*,William Lovitt (trans.). New York: Harper and Rowe.
Hosey, Lance. 1012. *The shape of green aesthetics, ecology, and design.* Washington, DC : Island Press.

Hubbell, S. P. 2001. *The Unified Neutral Theory of Biodiversity and Biogeography*. Princeton: Princeton University Press.
International Union for the Conservation of Nature. 1980. *World Conservation Strategy: Living Resource*
Kot, M. 2001. *Elements of Mathematical Ecology*. Cambridge, UK: Cambridge University Press.
Latour, Bruno. 2004. *Politics of Nature: How to bring the sciences into democracy*. Cambridge, MA: Harvard University Press.
Lawton, J. H. 1999. "Are There General Laws in Ecology." *Oikos* 84: 177-192.
MacKenzie, Donald and Wajcman, Judy. 1999. *The Social Shaping of Technology.* Philadelphia: Open University Press, Second Edition.
McDonough, William, and Michael Braungart. 2002. *Cradle to Cradle: Remaking the Way We Make Things.* New York: North Point Press.
McIntosh, R. P. 1985. *The Background of Ecology: Concept and Theory*. Cambridge, UK: Cambridge University Press.
McHarg, Ian L. 1992. *Design with Nature.* New York: J. Wiley.
Meffe, G. K. and Carroll, C. R. 1994. *Principles of Conservation Biology*. Sunderland, MA: Sinauer Associates.
Morton, Timothy. 2007. Ecology Without Nature. Cambridge: Harvard University Press.
_____. 2010. *The Ecological Thought*. Cambridge: Harvard University Press.
Orr, David. 2002. *The Nature of Design: Ecology, Culture, and Human Intention*. New York: Oxford Univ. Press,
Pianka, E. R. 2000. *Evolutionary Ecology*. 6th. Ed. San Francisco: Benjamin-Cummings.
Pimm, S. L. 1991. *The Balance of Nature?: Ecological Issues in the Conservation of Species and Communities*. Chicago: University of Chicago Press.
Princen, Thomas. 2010. *Treading Softly: Paths to Ecological Order.* Cambridge, MA: MIT Press.
Sayre, Kenneth. 2010. *Unearthed: The Roots of our Environmental Crisis*. Notre Dame, Ind: University of Notre Dame Press.
Scheiner, Samuel and Michael Willig (eds). 2011. *The Theory of Ecology.* Chicago: University of Chicago Press.
Schwarz, Astrid and Kurt Jax, Editors. 2011. *Ecology Revisited: Reflecting on Concepts, Advancing Science.* London: Springer.
Scudo, F. M. and Ziegler, J. R. 1978. *The Golden Age of Theoretical Ecology*. Berlin: Springer-Verlag.
Seamon, David, ed. 1993. *Dwelling, Seeing, and Designing: Toward a Phenomenological Ecology*. Albany: State Univ. of New York.
Wilson, E. O. and Willis, E. O. 1975. "Applied Biogeography." In Cody, M. L. and Diamond, J. M., (ed.), *Ecology and the Evolution of Communities*. Cambridge, MA: Harvard University Press, pp. 522-534.
Worster, D. 1994. *Nature's Economy: A History of Ecological Ideas.* Cambridge, UK: Cambridge University Press.

art and science

DaCosta, Beatriz. 2010. Tactical Biopolitics: Art, Activism, and Technoscience. Cambridge, MA: MIT Press.
Ede, Sian. 2005. *Art and Science*. London: I.B. Tauris.
Goldsworth, Andy. 2008. Time. New York: Abrams.
Kastner, Jeffrey, and Brian Wallis. 2010. *Land and Environmental Art.* New York: Phaidon Press.
Kemp, Martin. 2006. *Seen/Unseen: Art, Science, and Intuition from Leonardo to the Hubble Telescope.* Oxford: Oxford University Press.
Mitchell, Robert. 2010. *Bioart and the Vitality of Media.* University of Washington Press.
Spaid, Sue. 2002. *Ecovention, Current Art to Transform Ecologies.* Contemporary Arts Center.
Strewlow, Heike, Hermann Prigann, Vera David. 2000. Ecological Aesthetics: Art in Environmental Design. Birkhäuser Architecture
Strossberg, Eliane. *Art and Science.* New York: Abbeville Press.
Wilson, Steven. *Art + Science.* New York: Thames & Hudson.

research methods

Booth, Wayne. C., Gregory Colomb, and Joseph Williams. 1995. *The Craft of Research.* Chicago: University of Chicago Press.
Christensen, Larry, R. Burke Johnson, and Lisa Turner. 2010. *Research Methods, Design, and Analysis*. Allyn and Bacon.
Creswell, John W. 2008. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
Groat, Linda, and David Wang. 2002. *Architectural Research Methods*. New York: John Wiley.
Denzin, Norman, and Yvonna Lincoln. 2000. *Handbook of Qualitative Research.* Thousand Oaks: Sage.

ecology research

Ian Billick/Mary Price. 2010. *The Ecology of Place Contributions of Place-Based Research to Ecological Understanding.* Chicago: University of Chicago Press.
Cooper, Gregory. 2003. *The Science of the Struggle for Existence*. Cambridge: Cambridge University Press.
Apul, Defne. 2010. "Ecological Design Principles and Their Implications on Water Infrastructure Engineering," *Journal of Green Building*, Volume 5, Issue 3 (Summer 2010), pp. 147-162.

course topics + readings sign-up sheet

G = graduate student presenter U = undergraduate student presenter

Part I--core ideas and principles as historically-constructed

competing ecologies Jax/Schwarz, "Sources of Term Ecology," pp. 144-7.*
Jax/Schwarz, "Competing Terms," pp. 155-58.*
Jax/Schwarz, "Fundamental Subdivisions," pp. 175-79.*
Trepl/Voigt, "The Classical Holism-Reductionism Debate in Ecology," pp. 45-76.*
Lechner, "Science, Art & Edification," pp. 1-8.*

science of ecology Krebs, *Ecology*, pp. 4-16, 18-29, 32-47.
G_____ U_____

energy-related issues I Sayre, *Unearthed,* pp 1-25, 42-59.
G_____ U_____

energy-related issues II Sayre, *Unearthed,* pp. 60-116.
G_____ U_____

environmental perception Uexküll, "Introduction to *Umwelt*," pp. 145-8.*
Gibson, *The Ecological Approach to Visual Perception*, pp. 1-44.
G_____
John Dewey, "The Live Creature," pp. 3-19.*

Part II—competing logics of architecture & place/art & science

competing logics/values Hagan, "Five Reasons for Adopting Environmental Design," pp. 100-12.
Guy/Farmer, "Reinterpreting Sustainable Architecture," pp. 140-147.
Moore, Engstrom, "The Social Construction of 'Green Building Codes," pp. 51-70.
U_____

design movements Steele, *Ecological Architecture: A Critical History*, pp. 6-37.*
Kallipoliti, "Eco-Redux," pp. 5-16.*

construction ecology Kibert, Sendzimir, Guy, "Definining an ecology of construction," pp. 7-26.
U_____
Addington, Schodek, *Smart Materials*, pp 1-20, 21-45
G_____

ecological urbanism Mostafavi, "Why Ecological Urbanism? Why Now? pp. 12-50.
G_____
Forman, "Urban Ecology and the Arrangement of Nature in Cities," pp. 312-23.*

Brook, "Can Spirit of Place be a Guide to Ethical Building?" pp. 139-50.
U_____

some ways forward Guy, "Pragmatic Ecologies," pp. 21-27.*
Guy, "Designing Fluid Futures," pp. 140-45.*
Moe, "Integrated Design in Contemporary Architecture," pp. 6-9.*

Part IV—individual lines of research

framing research Booth/Colomb/Williams, *The Craft of Research,* pp. 48-63.*

research methods Groat/Wang, "Preface," Architectural Research Methods, pp. vii-xiii.*