

Biomimicry I

Inspired by Nature

Thursdays 1 pm – 4 pm – Room 225
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Animal Skins

"Biomimicry is a new way of viewing and valuing nature. It introduces an era based not on what we can extract from the natural world, but on what we can learn from it." (Janine Benyus)

Course Intent

The seminar finds inspiration from the animal world and, through the analysis and understanding of specific examples, such as termite mounds, pangolins, polar bears, bees, birds, etc., translates the learned principles to the design of building envelopes and in their integration at a larger city scale.

How the environment influences both the behavioral and physiological evolution of animals as well as human constructions are interesting questions for many of us. How to translate the lessons learned from the analysis and observation of the animal world into the architectural one is the learning experience proposed to the students.

Today, we design and engineer dynamic systems to mediate the interaction between man and nature. This course illustrates how by learning from nature we can greatly enhance our envelope design abilities and interface with the environment in a more sophisticated and less invasive way, creating a more intelligent way of living.

Starting from a common quest, we will analyze and develop a different relationship with the natural world. Our class will take a performative approach, where the form will be informed by the intelligence of living organisms to then draw analogies and finally develop proposal for innovative and intelligent building envelopes.

" The evolutionary roots of human behavior reach far back into the behavior patterns of animals. Those who are fascinated by these connections need only fasten on one such puzzle, the architecture of animals perhaps, to find an absorbing interest for a lifetime." (Karl von Frisch)

Some invited Guest speakers will include: Evolutionary Biologist Shauna Price, Zoologist Graham Slater, Architect and Biologist Sarah Dennison, Professor Geoff Spedding, Structural Engineers Lorraine Lin and Steve Ratchye among others.

Students will be exposed to the theoretical principles explained through case studies and field trips (UCLA Tropical Research Lab, LA Zoo, USC Aerospace research Lab). The project research and the design assignment will be the means by which they will be able to understand, deepen and develop their specific interests.



A selection of students' final drawings will be published in DOMUS in Spring 2011.

Logistics and Grading

Attendance is mandatory for all lectures, presentations and field trips, as per school policy. Arriving late or leaving early constitutes an absence. A third absence will result in the student being asked to withdraw from the seminar or receive NC. Phones and online chats have to be switched off during class.

The grade will be based on the following percentages:

2 projects @ 40% each

attendance and participation to class discussion and individual presentation of reading materials, intro project and editing work 20%

Late project presentations will not be accepted and will not be graded.



Tropical boxfish. Mercedes-Benz bionic concept vehicle.

Projects

Following the one-week start up project based on individual research, students, working individually or in team of 2, will for the first weeks study and analyze a selected animal. The understanding and elaboration of the animals' physiological and environmental adaptations to their environments will provide the basis for the design of a building envelope that will be developed in the second part of the semester.

Start-up research: Individual

Project 1: Team of 2. In two parts. Analysis of an animal and its habitat. Book compilation

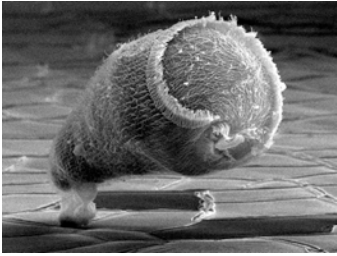
Project 2: Team of 2. Design a building envelope component following the criteria's and extrapolated innovative principles of the analyzed animal.

Each student will present the project to the whole class for discussion.

Submittal requirements:

- Bound copy of the project at the end of each presentation.
- CD containing all projects must be submitted the day of the last presentation.

Class expenses: book printing by Lulu or equivalent service, physical models material, field trips.



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Bibliography

Mandatory Readings:

Benyus J.M., *Biomimicry. Innovation Inspired by Nature*, Perennial, 2002

Forbes P., *The Gecko's Foot*, W.W. Norton & Company, 2005

Blumberg M.S., *Body Heat*, Harvard University Press, 2002

Von Friesch K., *Animal Architecture*, Harcourt Brace Jovanovich, 1974

Gould J. and C., *Animal architects, building the evolution of intelligence*, Basic Books, 2007

Shuker K., *The hidden power of animals. Uncovering the secrets of nature*, Reader's Digest, 2001

Farrant P.A., *Color in Nature. A visual and Scientific Exploration*, Brandford 1999

Schittich C., *In Detail: Building Skins*, Birkhaeuser

Additional readings include but are not limited to the bibliography indicated below:

Bar-Cohen Y., *Biomimetics Biologically Inspired Technologies*, Taylor& Francis, 2006

McDonough W., Braungart M., *Cradle to Cradle*, North Point Press, 2002

Daniels K., *Low Tech High Tech, Building in the Information Age*, Birkhaeuser, 1998

Pearce P., *Structure in Nature is a Strategy for Design*, The MIT Press, 1990

Heinrich B., *The Thermal Warriors. Strategies of Insects Survival*, Harvard University Press, 1996

Web links:

<http://www.biomimicry.net>

<http://biomimicry.typepad.com/>

<http://www.bath.ac.uk/mech-eng/biomimetics/about/>

<http://www.rdg.ac.uk/Biomim/>

<http://www.extra.rdg.ac.uk/eng/BIONIS/>

<http://www-cdr.stanford.edu/biomimetics/>

<http://www.scq.ubc.ca/?p=321>

<http://www.architecture2030.com>

<http://www.asknature.org/>

Course Outline

09/09 Lecture: Course Overview - IM

Assignment: Project 0

Reader: Biomimicry chap 1 – Biomimetic Chapt 1 + find an article on this topic

09/16 Lecture: IM

Assignment: Intro Project 1

Pinup: Project 0 presentation and discussion

Reader: TBD

09/23 Human Skin – Sarah Dennison

Pinup: review Project 1

Reader: TBD

10/02 SAT – 10am-1pm – Lecture at school by SE Steve Ratchye and Lorraine Lin

09/30 Lecture and Field Trip: Graham Slater UCLA Lab

Pinup: review Project 1

Reader: TBD

10/02 SAT - 10am-1pm - field trip LA ZOO w/ Graham Slater

10/07 Lecture: Ryan Harrigan

Pinup: Review Project 1

10/14 Lecture: Shauna Price

Assignment: Intro Project 2

Pinup: Final Review Project 1

10/21 Final Presentation Project 1 - book chapter due

Assignment: Project 2 – design through making

10/28 Lecture: Ilaria Mazzoleni

Assignment: Project 2 – book revision

Pinup: Review Project 2

Reader: Biomimicry Institute Life's Principles

10/30 SAT - 10am-4pm SAT CHARETTE, with invited crits

11/04 Lecture: Invited Architect TBD

Assignment: project 2 development

Pinup: review Project 2

Reader: TBD

11/11 Lecture: Field Trip: USC Geoff Spedding

Assignment: project 2 development

Pinup: review Project 2

Reader: TBD

11/13 SAT 10am-4pm CHARETTE, with invited crits

11/18 Lecture: Invited Mechanical Eng.

Assignment: project 2 development

Pinup: review Project 2

11/25 Happy Thanksgiving: NO CLASS

12/02 Project 2: final review physical model

12/09 Final Presentation Project 2 drawings and model due

NOTE: Subject to change depending upon the progress of the class