

# LEARNING FROM NATURE HOW TO DESIGN SUSTAINABLE ENVIRONMENTS, ITALY

*Course ID: ARCH 365AJ  
July 1-July 28, 2018*

**FIELD SCHOOL DIRECTORS:**

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**INTRODUCTION**

Learning from Nature how to Design Sustainable Environments is a field course in the mountains of Northern Italy. The pre-alpine ecology of the Taleggio Valley lends itself to the study of an array of natural systems and cultural heritage sites that will serve as the backdrop for a bio-inspired sustainable design project. Students will be challenged to understand how the environment has shaped both the evolution of living organisms and the design of human constructions. Student learning and project development will be achieved through several means: 1) frequent outdoor treks and careful observation and analysis of the native flora and fauna, 2) site visits to local villages and historic settlements to document design and architectural practices of the local community, and, 3) interaction and dialogue with the course instructors and guest lecturers, who are experts in the fields of evolution and ecology, bio-inspired design, geology, and anthropology. The final project will be informed by observing the adaptations of organisms in order to draw analogies between natural and designed elements. This will lead to the development of a proposal for innovative and sustainable architectural design. This course illustrates how, by learning from nature, we can greatly enhance our design abilities and interface with the environment in a more sophisticated and less invasive way, creating a more intelligent manner of living.

Taking inspiration from aspects of the natural world and emphasizing the connections among natural elements is a primary focus of the instructors. Evolutionary biologist Shauna Price has been studying insect speciation and diversity for nearly 20 years, and architect Ilaria Mazzoleni has been developing conceptual design focused on sustainability and biomimicry. Together, they focus on systems that are seemingly “invisible” to most people. Insects and other invertebrates are often overlooked by designers for the important ecological roles they play and their incredible adaptations. The expertise of and long-term collaboration between the instructors, in combination with the unique pre-alpine ecology of the

field site, will serve to enhance the ongoing research projects of the instructors and provide a model for conducting integrative research and producing sustainable bio-inspired designs for the students.

### ACADEMIC CREDIT UNITS & TRANSCRIPTS

**Credit Units:** Attending students will be awarded 8 semester credit units (equivalent to 12 quarter credit units) through our academic partner, Connecticut College. Connecticut College is a private, highly ranked liberal arts institution with a deep commitment to undergraduate education. Students will receive a letter grade for attending this field school (see grading assessment and matrix). This field school provides a minimum of 160 direct instructional hours. Students are encouraged to discuss the transferability of credit units with faculty and registrars at their home institutions prior to attending this field school.

**Transcripts:** An official copy of transcripts will be mailed to the permanent address listed by students on their online application. One additional transcript may be sent to the student's home institution at no additional cost. Additional transcripts may be ordered at any time through the National Student Clearinghouse: <http://bit.ly/2hvurkl>.

### COURSE OBJECTIVES

This course offers a multidisciplinary perspective, combining the fields of biology, environmental science, and architecture to the ultimate goal of designing building elements inspired by the ecology of the site. The instructors will emphasize an approach where humans are viewed as connected to other elements of the ecosystem, thereby linking adaptations that organisms have evolved and adaptations communities use to live in their specific environment. Based on this approach, students will focus on the connections among elements in the environment, how they influence each other, and how ultimately they can inform the architectural project. Students will be exposed to theoretical principles explained through case studies as well as partaking in field work through understanding and analyzing a biological system. Working in multidisciplinary teams, students will first conduct research on a chosen system and then make line and computer-generated drawings to understand the form and functions of what they are studying. The project's research and the design assignment will be the means by which students will be able to understand, deepen and develop their specific interests.

### PREREQUISITES

There are no prerequisites for participation in this field school, though students with a biology/environmental science background or architecture/design experience will be given special consideration. This is hands-on, experiential learning and students will study on-site how to conduct bio-inspired research.

### LEARNING OUTCOMES

On successful completion of the field school, students will be able to:

- Analyze biological systems towards the goal of sustainable design
- Conduct research on a chosen system in terms of reading and understanding the biological literature as well as making careful scientific observations
- Develop a bio-inspired design project through engagement not only with the ecology of the site but also within its local cultural context
- Use emerging design tools to identify new opportunities within biological and architectural practices

## **Final Deliverables:**

Each student will produce a portfolio of the design project that documents the process of conducting field research and drawing inspiration from nature.

## **GRADING MATRIX**

- ❖ 40% Active participation, including lectures, readings and field work. Keep a field notebook
- ❖ 20% Project portfolio: including field notes, line and computer-generated drawings, and research of the biological/ecological literature
- ❖ 30% Final project
- ❖ 10% Presentation of project

## **ATTENDANCE POLICY**

Students are expected to participate in all activities as outlined in the calendar, except for extenuating circumstances. All students are expected to observe professional-level standards regarding commitments to classes, meetings and production work. This course relies on the full and punctual participation of all students. Unjustified absences or tardiness to classes or assignments are not tolerated. In case of an emergency, let your instructor know as soon as possible.

## **TRAVEL & MEETING POINT**

Students are encouraged to book flights scheduled to arrive to Milano Malpensa (MXP) by 1pm on Sunday July 1, 2018. Students arriving by air at Milano Malpensa (MXP) will be met at the airport by project staff members. A private bus will collect students and take them to Sottochiesa, the field school location.

If you arrive at a different airport or train station, missed your connection or your flight is delayed, please call, text or email project director immediately. A local emergency cell phone number will be provided to all enrolled students. Information regarding how to reach destinations via public transportation will be provided.

## **ACCOMMODATIONS**

Students will live in a residence in Sottochiesa, a charming village, 15 minutes away from the world famous San Pellegrino Terme. Large, Italian style lunch will be provided daily in the field or at the residence, depending on the activity. Students are responsible for their own breakfast and dinner (apartments have kitchen), and their own food on weekends. Once each week, the Project Director and the entire team will eat dinner together at a local restaurant.

Accommodation is provided in Sottochiesa, Taleggio Valley (Bg), Italy. One or two bedroom apartments with double or triple occupancy rooms will be offered to the students. Each apartment will have a kitchen and bathroom to be shared among the occupants. Shared working studio areas and open-air studio spaces will be provided. Students are expected to consider the studio as the base of their research on site and to spend most of their time outdoors. Indoor large spaces and/or tools studios are limited but available for communal activities.

Students are expected to participate to all programmed activities and to fulfill one relevant objective of this class: namely, the class expects to bring participants into active engagement with each other in addition to the natural environment. Daily collegial interaction with other students is an essential dimension of the experience, and students are expected to discuss their projects, receive, and provide feedback. Students are expected to take advantage of their staying by spending their time in the Valley, experiencing the alpine environment, visiting sites, contacting local people, working with traditional and

innovative materials, experimenting with old and new technologies, sharing reflections and contents in workshop sessions, promoting their works in public happenings, and producing the final class project.

**Wi-Fi:** Free wi-fi is provided in the shared studio space for work purposes (due to the remote location the connection has limited capacity for long Skype calls and movie streaming). Class activities will be structured accordingly. There is no wi-fi in individual apartments.

**Working languages:** English, although knowledge of Italian is a plus. All classes will be in English.

**Expenses:** the course supplies lodging, local transportation using the public service for scheduled field trips, and one main meal a day. Breakfast and the other meal is to be prepared by the individuals in their in-unit kitchens.

To be covered by students: Flight to MIL (MXP, LIN, BGY), travel to meeting location, supplies (see equipment paragraph). Extra - personal expenses.

#### **DISCLAIMER – PLEASE READ CAREFULLY**

Outdoors activities such as walks, hikes, and weather conditions, while part of this class, could imply a certain degree of risk. Health insurance (in addition to any other insurance individuals might select) is required and provided by IFR. Expect to take tech (laptops and cellphones) into the field.

If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the project director.

#### **EQUIPMENT LIST**

Students will be required to bring following:

- a field notebook
- A laptop or tablet (Special accommodations will be provided for students who do not own a laptop, but please let us know in advance)
- A camera (cell phone cameras are acceptable)
- Field gear: hiking boots, backpack, sunscreen, and water bottle
- If you take any medication, bring enough to last the duration of the course

Software requirements (basics for all software will be provided):

- Illustrator, Photoshop, Microsoft Office (Powerpoint) or equivalent
- AutoCAD or 2D drawing software
- Rhino, SketchUp or another 3D modeling software

\*Note: most software is available through a free education install. A computer with all required software will be available to share for those without computers or unable to install all software prior arrival.

#### **COURSE SCHEDULE\***

\*Itinerary and timetable are subject to adjustments.

**Week 1 (July 1-7): Sustainable design and Biomimicry: background and site visits**

Sunday            1-3:00 pm: Students and staff assemble at MXP. Transfer to Sottocchia  
6:00 pm: Unpack and settle in  
7:30 pm: Welcome dinner

Monday            Morning: Welcome coffee and introduction. Site visit 1

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|           | <p><u>Afternoon:</u> lecture - Introduction to Sustainability and Biomimicry. Biomimicry ctivity using examples from <i>Architecture Follows Nature</i></p> <p><u>Readings:</u> selected chapters from <i>Sustainable Design</i> (Ch. 1&amp;2) and <i>Architecture Follows Nature</i> (pages 1-43 &amp; 47-58)</p>           |
| Tuesday   | <p><u>Morning:</u> Guest Lecture, Geologist Field Work</p> <p><u>Afternoon:</u> lecture – Introduction to Ecology with a focus on pre-alpine ecology</p> <p><u>Readings:</u> selected chapters from <i>Biomimicry</i> (Ch.1)</p>   |
| Wednesday | <p><u>Morning:</u> lecture – Methods for Biological Observation and Research</p> <p><u>Afternoon:</u> Field Work</p> <p><u>Evening:</u> lecture – Adaptations to the Environment</p> <p><u>Readings:</u> selected chapters from <i>Elements of Ecology</i> (Ch. 1, 2, and 4)</p>   |
| Thursday  | <p><u>Morning:</u> lecture – Ecological Field Methods</p> <p><u>Afternoon:</u> Field Work, practice learned field methods</p> <p><u>Activity:</u> observe/draw something from site visit</p> <p><u>Readings:</u> selected chapters from <i>Elements of Ecology</i> (Ch. 5, 6, and 7)</p> <p><u>Evening:</u> Group dinner</p> |
| Friday    | <p><u>All day:</u> Field trip to Bergamo</p> <p><u>Evening:</u> Student discussion of concept development</p>  |
| Saturday  | <p><u>Morning:</u> Field activity focused on observations of pre-alpine ecosystem</p> <p><u>Afternoon:</u> Free</p>  |
| Sunday    | <p><u>All Day:</u> Free</p>  |

### **Week 2 (July 8-14): Field work and study of selected system**

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| Monday    | <p><u>Morning:</u> Multidisciplinary team creation</p> <p><u>Afternoon:</u> Q&amp;A and discussion with IM and SP about our process of developing concepts and projects</p> <p><u>Reading:</u> selected readings from <i>Biomimetics: Biologically Inspired Technologies</i> and <i>Animal Architecture</i> (Ch. 1)</p>  |
| Tuesday   | <p><u>Morning:</u> Field Work</p> <p><u>Afternoon:</u> Group work – researching and observing selected system</p>  |
| Wednesday | <p><u>All Day:</u> FIELD TRIP - visit to Science Museum in San Pellegrino Terme and guest lecturer, ecologist/naturalist</p> <p><u>Morning:</u> Activity and discussion about applying information about adaptations to project development</p> <p><u>Afternoon:</u> Group work – researching and observing selected system</p> <p><u>Readings:</u> selected readings from <i>Animal Architects</i> (pg 96-123) and <i>The Hidden Power of Animals</i> (Ch. 1)</p> |
| Thursday  | <p><u>Morning:</u> Field work with SP and IM consulting with each group</p> <p><u>Afternoon:</u> Group work – researching and observing selected system</p> <p><u>Evening:</u> Group dinner</p>  |
| Friday    | <p><u>Morning:</u> Group work – researching and observing selected system</p> <p><u>Afternoon:</u> presentation of informal group project proposals</p> <p><u>Evening:</u> Discussion of proposals</p>   |
| Saturday  | <p><u>Morning:</u> mid-program evaluation test</p> <p><u>Afternoon:</u> Free</p>   |
| Sunday    | <p><u>All Day:</u> Free</p>  |

### **Week 3 (July 15-21): Study and analysis of selected system and project development**

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| Monday    | <u>Morning:</u> selection and organization of field notes and materials<br><u>Afternoon:</u> group project development   |
| Tuesday   | <u>All day:</u> field trip to Bergamo  |
| Wednesday | <u>Morning:</u> software tutorial and group project development<br><u>Afternoon:</u> guest lecturer – “conversation on the theory of practice”   |
| Thursday  | <u>Morning:</u> software tutorial<br><u>Afternoon:</u> group project development with a focus on analysis and starting to design final project<br><u>Evening:</u> Group dinner         |
| Friday    | <u>Morning:</u> software tutorial and group project development<br><u>Afternoon:</u> group project development<br><u>Evening:</u> group discussion and feedback on project development |
| Saturday  | <u>Morning:</u> Group-based field or studio work<br><u>Afternoon:</u> Free   |
| Sunday    | <u>All Day:</u> Free   |

### **Week 4 (July 22-28): Final project development**

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| Monday    | <u>Morning:</u> Project Refinement – Anthropologist, guest lecturer: “the post-anthropocentric project: the culture-nature continuum”<br><u>Afternoon:</u> guest lecturer and project review |
| Tuesday   | <u>Morning:</u> field work<br><u>Afternoon:</u> Production of the final presentation   |
| Wednesday | <u>All Day:</u> Production of the final presentation   |
| Thursday  | <u>All Day:</u> Final Presentation with invited jury<br>Studio space and Apartment cleaning  |
| Friday    | <u>All day:</u> Final presentation with invited jury<br><u>Evening:</u> Group dinner   |
| Saturday  | <u>All day:</u> Free, Packing day. Return home/continued travel in Italy or elsewhere in Europe on your own – Bus to Milano 12.00 pm   |

### **REQUIRED READINGS**

Selected chapters from the readings listed below will be posted on-line for students to access and read in advance of the project using a Dropbox shared folder.

Mazzoleni I., Price S., Architecture Follows Nature: Biomimetic Principles for Innovative Design, CRC Press 2013

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

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

Smith T.M., Smith R.L., Elements of Ecology, Benjamin Cummings, 2014

Williams D.E., Sustainable Design: Ecology, Architecture, and Planning, Wiley 2007

<http://www.biomimicry.net>

<http://www.architecture2030.com>

<http://www.asknature.org>