STRATA

Politecnico di Milano - AUIC
Master Program in Architecture
Option Studio
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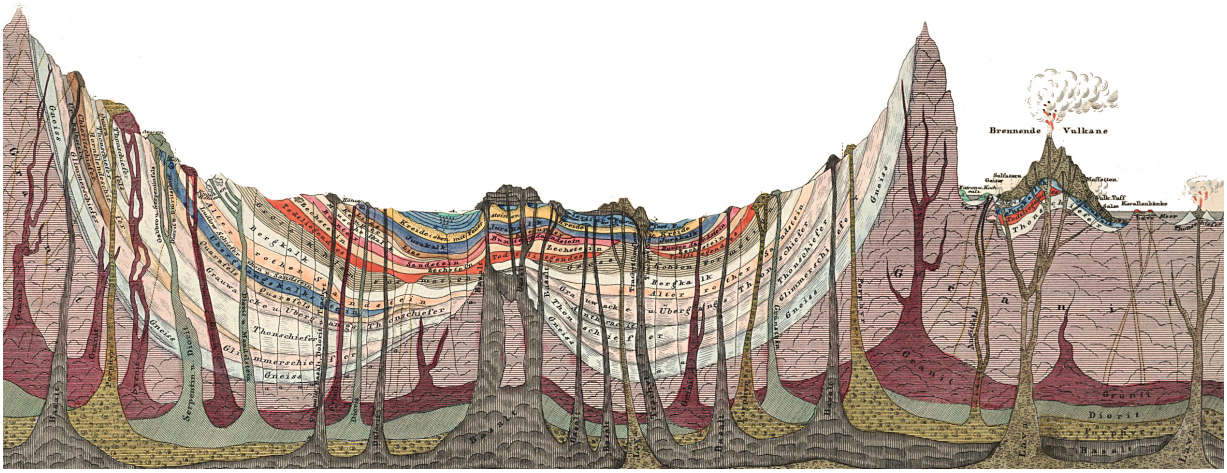

Hydrological and Geological survey maps by Alexander von Humboldt, 1769–1859

COURSE OVERVIEW

The establishment of the city, from its very inception, is the result of a fundamental separation between places of consumption – located within the city limits – and places of production, where enough surpluses of raw materials and food are created to support city development.
The interdependency of ecosystems on earth requires that each subsystem's intake and output must be compatible with the higher-level system's ability to provide energy and matter and to process waste. Natural ecosystems rely on a complex network of feedback loops to regulate activities within sustainable limits.

Similarly, spatial contiguity between cities and their host ecosystems has been the rule for the past 10.000 years in the history of stable human settlements. Until recently, urbanised areas still had a close relationship to places of agricultural production and extraction of natural resources. By and large, they existed only where enough resources in the immediate surroundings, including firewood, water and productive soil, could provide for a growing population of city dwellers. With the industrial revolution, cities outgrew these on-site resources and required increasing amounts of energy and materials to be transported from distant ecosystems. Breaking up the spatial and temporal continuity in the flow of energy and materials, however, resulted in interrupted feedback loops. A city that oversteps the ecological boundaries of its remote host-ecosystem does not need to suffer -- or even be aware of-- the environmental consequences of overconsumption. Today, the impact of cities on places elsewhere, be it hinterlands or places far away – the so-called city footprint – is reaching extraordinary proportions and threatening a drastic reduction of bio-diversity, air and water pollution, and the depletion of natural resources.

Extractive operations are expanding at an increasing pace globally. Mining in the United States, for instance, will exhaust available federally-owned land by mid-21st century. It becomes increasingly clear that quarries and mining grounds will have to be reclaimed for other purposes— from residential to infrastructural to leisure activities— at the latest by the end of this century. Previous design studios focused on addressing the 'demand' side of the relationship, looking into ways to bring back productive activities within city limits. In contrast, the current studio looks at the 'supply' side, so to speak, exploring ways to introduce programs typically located within the city in order to reclaim quarries and extractive sites.

The Option Design Studio STRATA asks students to examine ecological flows and processes across the strata of a rock quarry and to propose a landscape and architectural intervention for the site.

"Ecology" as a framework from which we design is an essential component of contemporary landscape architecture. Our definition of it is not confined to "natural" or "environmental" contexts; rather it refers to the complexity of agents acting in any environment and their unique interactions. These agents are biotic and abiotic, urban and natural, human and non-human and they produce incremental changes on the broader system over time. For centuries western culture considered nature to be outside of – and therefore separate from – the city. Nature was sacred, foreboding, pristine, pure, wild – something that lived independent from and was threatened by the influence of humanity. The city, on the other hand, was the realm of man and technology; it was a canker creeping out into primeval nature. Today we can no longer make this distinction; as urban areas expand and population growth strains our remaining resources we are forced to acknowledge humans and their constructions as an active participant in the natural environment.

We rely on the raw materials of stone, gravel, sand and clay for the construction of our cities, buildings and infrastructure. While the supply chain is becoming evermore global, the impacts remain local. Cities today are often supported by material and waste infrastructures that are removed from our daily lives. As a result, we often fail to consider the social and ecological consequences of these infrastructures. The process of blasting, crushing, sawing, splitting and transporting the raw material leads to environmental degradation including air and noise pollution, fragmentation of ecological corridors, habitat destruction. This studio unearths these out of sight processes and asks the students to propose how these sites of extraction might be re-conceived with new program and ecologies.

METHODOLOGY

In *Occupation*, Frei Otto suggests that forces have a specific field —a domain or territory —and that space can be organized based on the forces acting on it. In other words, each force—but also resource, such as water or nutrients in a field—has a spatial dimension to it. By means of extracting, transporting and storing resources, the industrial revolution has disrupted the original relationship force to territory, replacing it with new, more complex relations.
The Studio uses environmental analysis and parametric design strategies in order to re-establish a correlation between forces and territory.

Working in teams of two to three, students will select a site upon which to focus their design project. The first design exercise of the studio is to understand the complexities of the extractive site and to develop landscape strategies that will structure a new dynamic system in, on and over the ground. In the McHargian tradition teams will begin by separating layers of geology, hydrology, plant communities, topography, solar exposure, urban development, cultural meaning, infrastructure, pollution and contamination and overlapping them to reveal a new site reading. The mapping itself becomes the first critical exercise in the design process.
As James Corner puts it in the seminal essay *The Agency of Mapping*:

> *"As a creative practice, mapping precipitates its most productive effects through a finding that is also a founding; its agency lies in neither reproduction nor imposition but rather in uncovering realities previously unseen or unimagined, even across seemingly exhausted grounds."*

More than a simple cut-and-paste of data already available, each layer is drawn to represent a particular intention of the designer. The maps are closely edited for content and clarity; too much information does not allow for a clear reading of the design strategy, while too little information renders the map useless. As a complement to the mapping process, the site will be analysed by a time-based representation of the processes and flows. Together these analytical methods not only provide and understanding of the existing conditions and patterns, but allow for projective

simulations of future scenarios on the site. The second half of the studio will build on the work of the first half by developing a landscape and architectural intervention on your site.

The Studio is predicated on the support of digital consultants, teaching advanced computational skills to students with little or no experience in algorithmic design. Digital simulation tools that predict the environmental performance associated to a particular building form—such as airflow, daylighting and sun radiation levels—will provide an intuitive and inexpensive sketch tool to students. These tools have a profound impact on the way we design buildings and cities, since they provide invaluable support at a very early stage of the design process.

In one of his seminal writings, Buckminster Fuller famously declared: *"[...] Forms are inherently visible and no longer can 'form follow functions', because the significant functions are invisible".* He was referring to natural forces, as well as to material properties that are not detectable by senses or experience, since they result from manipulation at the molecular level that are invisible to the naked eye—yet have a great impact on the built form. Environmental analysis tools can provide critical insights into these invisible functions by widening the architect's gaze in areas of knowledge outside the spectrum of visible light.

There are obvious advantages in giving form to these invisible forces, as they play an increasingly larger role in the built environment. Architects typically resort to highly technical solutions for compliance with ever stricter energy codes— 'green gadgets' that come in the form of sophisticated mechanical systems, super-insulation materials or expensive glass treatments—so that they don't have to question a consolidated formal language. Conversely, formal solutions that directly address these invisible forces at a structural level can dramatically improve the performance of buildings by reducing heating and cooling loads, fostering daylighting and natural ventilation, and generally lowering energy demand.

Additionally, a building form that is the result of a form-finding process can manifest information regarding the ambient - prevailing wind direction, solar radiation levels, air flow or pedestrian traffic - in ways that are intuitive and do not require mediation. A classic example of the architect's disconnected design approach to the new energy imperative are the many digital displays showing the amount of energy being produced by solar panels that are hidden away on the roof of buildings. This is particularly relevant in an age of mediated information: as we increasingly rely on screens, large and small, to retrieve useful information on our environment, embedding information in the persistent structure of buildings can have positive effect in learning to navigate our world without depending on a smartphone.

REQUIREMENTS

Learning Objectives

The pedagogical objective of the Option Design Studio is to develop abilities to integrate issues of site, program, structure, material components and assembly into a landscape and architectural design of high complexity. The studio explores the social, economic, material, cultural and architectural issues intrinsic to the program of reclaiming, rehabilitating and re-programming an abandoned or active quarry in Italy. The studio also tests students' ability to work in collaboration with others and in multidisciplinary teams to successfully complete design projects.

Organization

During the first half of the semester, students will work in groups of 2 to 3 people on a program and a site of their choice. Groups should form on the bases of *complementary* skills and area of expertise. After mid-term review, students will work independently to develop individual proposals at the architectural scale.

Site scenario
Groups will have to select an abandoned or active quarry in Italy by the first pin-up at the end of March. Students are advised to consider a range of different sites and to make a final selection based on opportunities for program. While students are encouraged to make a site visit at any time during the semester, this is not a mandatory requirement.

Programmatic frame
Students will be responsible for developing a program consistent with design strategy and intent. It is important that program should be a driver from the very beginning of the project, not an afterthought. Site and program should converge by the first pin-up at the end of March.

Digital tutorials
Digital instructors will provide an intense training in digital design tools that is tailored to the requirements of the studio. Digital classes are typically held on Wednesday afternoon and they are mandatory.

Attendance
School-wide policy requires students to attend a minimum 70% of classes; the studio fully enforces this policy and will make no exceptions. Students who miss over 30% of classes will be forced to withdraw from the course.

Semester Structure
The studio emphasizes individual exchange with instructors in 3 different formats:

- Desk crit: Individual meeting with the instructor at the student's desk, typically it includes an informal conversation and the review of draft material.
- Pin-up: Individual presentations using material printed and pinned on the wall; pin-ups are intended to help students in formalizing their design process and presenting progress results throughout the semester; individual pin-ups are open to other students, yet they are designed not to disrupt work in the classroom.
- Review: Formal presentation to the class with specific deliverables provided by the instructor, including large-format boards, models, prototypes, etc. It is mandatory for all students to present and to attend the entire review; an invited jury may be in attendance.

Method of Assessment
Student's evaluation is based on the following requirements:

- Design of the building and its associated site, addressing the course objectives, program and comprehensive design studio criteria;
- Timely completion of the work for the required benchmarks;
- Final presentation through drawings of the highest quality at the prescribed scales;
- Final presentation models at prescribed scales;
- A final text as a lucid narrative;
- Mandatory attendance: students must attend all studio meetings, arrive on time and work in the studio for the entire time period scheduled;
- Full documentation of the research and analysis, progress, and completed project;

Presentation Requirements
Plans, sections and elevations should demonstrate an ability to integrate the required systems and criteria into a coordinated architectural project. Drawings should include physical and spatial context (adjacent structures), scale figures, and materials/shadows where appropriate.
Include selective process models and drawings to show evolution of conceptual thinking.