

MIT March OPTION CROSS STUDIO

Spring 2017 *Tuesdays 1-6pm Thursdays 12-5pm*
Prof Mark Goulthorpe (Des) + Bill Pearson (North Sails) +
TA Nick Pacula SMArchS (Des)

**On DESERT FORM/ATION and WASTE-SCAPES
the RADICAL REVISIONING of LIGHTWEIGHT
NOMADIC ONTOLOGY (*Ute Tipi to Robotic TP*)**



Utah Sublime : Landscape Formation - Denudation to Detonation

Invited Guests

Dr Massimiliano Moruzzi (CAD-CAM/Composites, AutoDesk)

Prof Mike Lepech (Environmental Engineering, Stanford)

Prof Greg Lynn (Digital/Composite Architect, UCLA/UAAV)

Travel

Mid-Term Field Trip (1 week) to **Utah** and **Nevada** deserts, visiting **Superfund** and **Aboriginal Sites**; and **North Sails**, a pioneering robotic composite racing-sail manufacturer

Day-Trip to **Rhode Island** composite fabricators (**Hall Spars**, **SymX**, **Tri-Mack**, etc) to witness advanced composites manufacture, allowing potential lightweight architectures...

Events:

MG will present *Lightweight Living* at **JEC Paris** in February (the largest international composites conference), and at **JEC Chicago** in June, making the case for a range of composite material-processing for buildings. *Students and their work can inform these presentations.*



Spoil Heaps From Copper Mining

CROSS STUDIO : Konsult

The studio continues in the vein of recent MArch cross-studios, where a variety of different voices are brought to bear on a (complex) common problem: in this case a (temporary) camp to permit short-term access to isolated wasteland and wilderness sites, here in the arid high-altitude plateau of Utah/Nevada.

We will get historical input from *Prof Mark Jarzombec*, who has a keen interest both in the architecture and ontology of early human settlements, mapped out in his recent book, *Architecture of First Societies*. This surveys ancient civilizations in a manner that credits their sophistication in successfully inhabiting all global regions for many tens or hundreds of thousands of years prior to industrialization. Of particular interest will be the *lightweight architectures* of such ancient peoples, which generally have been overlooked in preference for the more durable heavyweight built legacy.

In regards to lightweight materials/fabrication, we will have contemporary input from **Bill Pearson**, who is the production manager of the pioneering manufacturing group in Nevada, *North Sails*, which produces racing yacht sails, but which now seeks to diversify into general applications such as architecture. *North Sails* uses variable-geometry molds and robotic composite fiber-laying robots.

We will also hear from **Massimiliano Moruzzi**, a research scientist at *AutoDesk*, who has pioneered robotic fiber placement for *Lamborghini*, *Lockheed Martin*, *Boeing*, and who now seeks *sentient* composite structures using the multi-functional attributes of graphene. He will showcase *DreamCatcher* design software as a vision for an emerging digital material paradigm.

CONTEXT :

Dancing with Wolves + The Smoking Pit of Death



Utah Sublime: Methane, Dust, Salt Pollution

We will take a very broad view of emerging ontology: a hyperbolic late-industrial production/ consumption logic, augmented by a now-ubiquitous digital conditioning of desire. We will consider the sheer scale of global building activity up through the mid-late 21st century, against a backdrop of mounting environmental concern, and consider what material-processing options are (really) available to global societies.

And we will also take a very *long* view of the history of human habitation, especially in areas of aridity and scarcity that offer historical lessons in successful and unsuccessful modes of settlement, exacerbated by prior (and current) climate change. For instance, in the abandoned *Anastazi* constructions in the Four Corners area; but equally the nomadic *Ute* or *Shoshone* habitation of the upper plateau of Utah: each indigenous culture offering salient lessons for long-term sustainability.

We will visit sites of extreme pollution (ancient and modern), where earth-surface exploitation leaves extreme toxicity or aridity, often eerily beautiful in the sublime alteration of the natural environment. We will look at environmental strategies that typically aim not so much at restoration as remediation, rendering wastelands non-fatal, sometimes attaining new forms of wilderness. The teams that carry out remediation are often non-profit organizations that are operated by intelligent and principled teams of engineers and technicians, most often requiring a temporary presence in isolated and quite toxic locations.

The studio will seek appropriate forms of quasi-nomadic habitation that offer ontological dignity to these remediation teams, looking to lower their own footprint to zero whilst attaining autonomous high-quality living. As such, the extreme condition is an allegorical prompt to invent new forms of architecture, both material and social.

PROJECT



Nomadic and Temporary Ancient Exemplars (Shoshone, Anastazi)

The studio will attempt re-visioning of *lightweight or temporary living*. The pedagogical framing prompts inventive new architectures that offer a counterpoint to extant contemporary materials/methods, most especially in their relentless commitment to eradicating their own “footprint”. The focus will be on the vanished sophistication of aboriginal nomadism (*Ute, Shoshone*, etc), likely overlooked until profound disquiet as to current modes of habitation settles upon us. Mark Jarzombec’s interest in the architecture of “First Peoples” will give voice to this new respect for ancient ontologies – not to repeat them, but to learn from them, deploy them in new ways. Indeed, we will witness ancient civilizational collapse, conjectured as resulting from environmental degradation (the *Anastazi*).

Each student will devise a material-processing logic that offers dignity-of-dwelling to a diverse community within stringent conditions: a way of minimal deployment of material/energy that allows for a sophisticated shrouding of lifestyle. This might be for remediation teams for the Superfund sites, or accommodation for the various mining/extraction companies such as *Rio Tinto* near Salt Lake, or even as prototype new towns that mime anticipated needs elsewhere (the brief will be devised by each student as a sort of proto-thesis).

As with the *Atacama Nomadic* mining camps developed in last year’s Option Studio in Chile, we aim to tease out a variety of “possibilities of (an) architecture”, but stimulated by paying close attention to some of the most sophisticated contemporary lightweight manufacturing materials/methods: *North Sails, Hall Spars, Graphenano*, etc. These groups will allow us insight into emerging material-processing paradigms, which already attain remarkable elegance: additive ultra-lightweight fabrication. Yet the challenge is to devise “light living” as a holistic social/material/spatial vision, rather than just to focus on new building techniques applied to a current ontology.

DESIGN, MATERIALS, FABRICATION



North Sails Spatial Fiber Placement, (now diversifying to Architecture)

The extreme material-formation of the desert landscape spurs imagination on new **design, material and fabrication** logics – you cannot help but be moved to aspire to poetic material processes. Also moving is the poignancy of the clean-up operation teams, who merit a dignity in their soulful nomadism.

In terms of **design**, we will be introduced to the creative platforms of two pioneering software-development groups: AutoDesk's emerging *Dreamcatcher* software and Aditazz' deployment of silicon-chip design logic (*Intel*) but re-oriented for use in building design optimization. Both of these pursue rule-based generative logics, where the software parses multiple iterations through cloud computing, shifting the role of the designer to that of editor and sampler of algorithmically-generated potential. *Dreamcatcher* looks at material/form optimization, Aditazz looks at spatial/organizational optimization. These new design platforms raise conceptual questions about the role of creative intellect as computational proclivity becomes more fully engaged as a generative as well as analytical tool. These software will be available to students and will be introduced by Massimiliano and his development teams – their use will not be mandated (there is no expectation of computational skill), but the studio will insist on speculative engagement with the conceptual implications of such rule-based generative logics (and the emerging man-machine symbiosis that they imply).

In terms of **materials**, we will consider the emerging paradigm of composites for the elegance they offer, visiting some leading fabrication facilities in Rhode Island to understand both thermoset and thermoplastic FRP logics. At issue is to weigh up (literally!) the potential benefits of contemporary (or ancient) composite materiality, mindful of the arid, high Rocky range, and extrapolate to the general global context from this extreme condition. In this we will consider the recent Life Cycle Analyses of Prof Mike Lepech at Stanford that witness a remarkably benign footprint to thoughtful use of such material-processing, giving legitimacy to contemporary polymeric glass/carbon-fiber methods. The studio will face up to the energy and water needs of any construction method we deploy given the fragility of the desert and the local political sensitivity to pollution caused by the mining activities.

Again, use of ancient or modern composites is not mandatory, but the impact of any given material-processing logic will be assessed comparatively, and Mike Lepech will give guidance as to how to conduct thorough LCA studies.

In terms of **fabrication**, we will also press towards new logics given the lack of infrastructure and skilled local labor. The current camps are pre-fabricated and shipped in by truck as complete dwellings. Similarly, food and water are shipped in, and waste shipped out, which is not only economically, logistically and environmentally strained, but denies stimulation of local economies. The ambition here is to demonstrate how semi-skilled local communities can be augmented via cloud-computed analysis/optimization/fabrication, suggesting agile and minimal new building-production processes. We may even extend our interest to the production of food and energy locally, another salient global issue that is highlighted in such an arid and mineral landscape.

ALLEGORY



Wasteland to Wilderness

The very stringency of the Utah landscapes, vivid as natural and artificial formations, serves as an almost *allegorical* siting of issues: the deep contradictions implicit within late-industrial ontology. It can also be held to be anticipatory of an arid and despoiled general condition.

The studio provides students with a series of historic, geographic, socio-political and technical contexts, and to offer insights into emerging design, material and fabrication logics. The goal of such an extreme series of prompts is not to expect an immediately credible architecture, but to invite conceptually plausible *potentials* for which benefit (aesthetic, technical, environmental) is argued for in a principled manner. Students will be expected to exhibit independence and imagination in proposing laudable alternatives to current late-industrial procurement logics in what is an extraordinary and extraordinarily sensitive context.

Pedagogically, it offers graduate students the means to speculate on a range of emerging social, technical and conceptual issues, and to gain an unusual insight into a fundamental commercial activity (mining) that underpins the current economy, and to engage these issues strategically as a form of inventive learning.

GUEST INPUT

These methods will be addressed from a software perspective by Dr Massimiliano Moruzzi of *AutoDesk*, who has created CAD/CAM software for *Lamborghini*, *Boeing*, *Lockheed Martin*, etc. He is an ebullient (very Italian) visionary with vivid experience of composite analytical CAD software (FEA, fiber-placement optimization) and CAM software to pilot CNC machines and robots.

Prof Mike Lepech (Stanford) will offer an overview of environmental impact assessment, specializing in composites in buildings, just to give analytical credibility to any claims for contemporary lightweight buildings. He sees potentially order-of-magnitude benefit if one deploys composites elegantly versus legacy materials.

Prof Greg Lynn is a leading proponent of composites for architecture, and he will join us for a session to give his insight as to the potentials of this new material-processing paradigm. He has tended to focus on the expressive use of composites in a series of installations; but he begins to deploy them for actual architectural projects, and has just executed a high performance catamaran that offers great insight into materials/methods.

TRAVEL

The Studio will travel to Utah/Nevada at mid-term, funded by the dept, but this may need to be supplemented by students (in which case travel will not be mandatory). Details to follow as an itinerary materializes (likely travel early March).

STUDIO PRODUCTION

There will be one or two short preliminary design exercises to encourage speculative “auto poietic” generative processes. Then we will engage the main studio project, designing a community at one or more of the Superfund Sites in support of remediation communities, or the continuing mining and mineral extraction activities.

Students will be expected to devise holistic development logics for designing, building and operating this community, mindful of the extreme climate and fragility of the (despoiled) environment. So it will be as much entrepreneurial as architectural, and you will devise ways to communicate *strategies* rather than just forms, in what is a temporary pattern of settlement at significant scale.

PARTICIPATION

Student presence is mandatory in studio at each session, and absences need to be communicated in advance and a doctor's (or other) note supplied, per MIT guidelines. Certain sessions may be announced in advance as working sessions, and your presence will only be required per a sign-up sheet for desk crits or individual pin-up.

COMMUNICATION

Please email with MG or NP if you are having difficulties with assignments – we are here to help you manage your workload, and we can also offer advice as to other assistance you might benefit from. Open communication is invited – do not hesitate to reach out.

GRADING

Grading will follow MIT's guidelines <http://catalog.mit.edu/mit/procedures/academic-performance-grades/#gradestext>, measuring the student's ability to understand the problem as well as to propose a solution, with independence of thinking/doing being an expectation of graduate studio engagement. Working in groups is possible, but will require clear articulation of each student's contribution, as well as enhanced production.

COMPUTATION

While computation and composites will be foregrounded relentlessly in the studio, the essential issue is to understand the conceptual implications of such new “design” and “material-processing” logics, which the guests will discuss theoretically in studio. The principles of computation or composites can be engaged intellectually without necessarily using or perfecting the given software - it is more important that the principles they suggest are conceptually addressed, the architect establishing *principle*.

READING LIST

this will be augmented as we go, but a provisional list of provocative texts is offered:

Book: **Avatar Emergency**, by Gregory Ulmer
by *Parlor Press*, Anderson SC, 2012

Book: **Digital Stockholm Syndrome in the Post Ontological Age**, by Mark Jarzombec
by *university Press*, Minnesota, 2016

Essay: **Building Dwelling Thinking**, by **Martin Heidegger**
from *Poetry, Language, Thought*, translated by Albert Hofstadter, Harper Colophon Books, New York, 1971.

Essay: **Building, Crashing, Thinking**, by Peter Galison
from *Art in the Anthropocene* by *Open Humanities Press*, 2015

Essay: **The Question Concerning Technology**, by **Martin Heidegger**
from *The Question Concerning Technology, and Other Essays* by Martin Heidegger, Harper Perennial
Modern Thought, New York, 2013

Essay: **Digital Materiality, Morphogenesis and the Intelligence of the Technodigital Object**, by **Betti Marenko**, From *Deleuze and Design*, B. Marenko and J. Brassett (eds.), Edinburgh: Edinburgh, University Press, 2015

Essay: **At The Edge Of The Smoking Pool Of Death: Wolves In The Throne Room**, by Tim Morton from *Helvete 1: Incipite*, Punctum Books, Brooklyn, 2013

Book: **Combinatory Urbanism: the Complex Behavior of Collective Form**, by Thom Mayne,
MORPHOSIS, by *Stray Dog Café*, 2011

CALENDAR (Draft)

FEBRUARY

Week 1

- 07 Feb **Studio Organization and Class Intro** MG
1st Studio Thematic : *On Drawdles and Auto-Poietic Process(ing)* MG
1st Assignment: *Drawdling in the Desert*
- 09 Feb **1st Pin-Up** : First Iteration(s) of *Drawdling in the Desert*
Discussion of Auto-Poietic Generative Artwork

Week 2

- 14 Feb **2nd Studio Thematic** : *From Mining and Manufacturing to Growing and Weaving* MG
2nd Assignment (*Aditazz*) : *Opti-Mall*
- 16 Feb NO STUDIO (I think) - Monday Classes : but let's try for Desk Crits

Week 3

- 21 Feb **3rd Studio Thematic** : *Goal Oriented Design via Cloud Computation* MG MM DA
Deepak Aatresh (*Aditazz*) / **Massimiliano Moruzzi** (*AutoDesk*)
2nd Pin-Up : Final Iteration(s) of *Drawdling in the Desert*
- 23 Feb **Introduction to Main Studio Project** : *Dwelling, Mining, Thinking* MG

Week 4

- 28 Feb **1st Field Trip** : Composite Fabrication, RI
SymX, Hall Spars, New England Boatworks, etc

MARCH

- 02 Mar **Pin Up** to review initial ideas

Week 5

- 07 Mar Desk Crits
09 Mar Desk Crits

Week 6

- 14 Mar Desk Crits
16 Mar **No Studio: JEC PARIS**

Week 7

- 21 Mar **MID TERM REVIEW**

Week 8

- 28 Mar SPRING BREAK Field Trip: **Utah/Nevada**
30 Mar SPRING BREAK Field Trip: **Utah/Nevada**

APRIL

Week 9

- 4 Apr Group Discussion/De-Briefing and Desk Crits
6 Apr **Pin-Up** to review evolving projects

Week 10

- 11 Apr
13 Apr

Week 11

- 18 Apr
20 Apr

Week 12

- 25 Apr **Pin-Up**
27 Apr

MAY

Week 13

2 May

4 May

Week 14

03 May Desk Crits

05 May Individual **Pin-Up** to Assess Final Presentation Material

Week 15

10 May **FINAL REVIEW** (likely date)
with Invited Jury including MMJ, BP, and Guests

12 May **FINAL REVIEW** (possible date)

