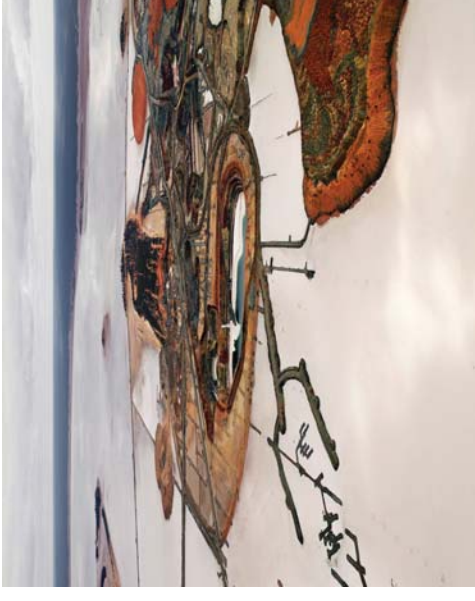


UCL Bartlett MARCH URBAN DESIGN - UD2



# RC16

BIO-URBAN DESIGN

Claudia Pasquero and Marco Poletto  
[ecoLogicStudio.com]

## RC16

### INTRO

RC16 will focus on the investigation of the relationship among established global mega-cities and new resource driven boom towns; the research is framed by the understanding of cities and the surrounding landscape as complex systems of relationships in dynamic equilibrium rather than as the overlapping of separate static objects.

RC16 design method follows a scientific approach to experimentation; students start the year by working with dynamic simulations and run a series of comparative studies of urban morphology. This will constitute their entry point to read selected bio-urban landscapes.

In the second part of the year the simulations will find material and technological definition and evolve into actual urban design scenarios.

The selected sites of investigation are:

1\_gulf region, united arab emirates, dubai, abu dhabi region, comprising al ain, liwa and the edge of the rhub al kali desert,

2\_ulan baator, ordos city, baotou [baiyun-obo], the mining district of the gobi desert. inner mongolia

The exact individual sites will be defined through dedicated research in term1 by cluster tutors together with students.

In the case of the “cyber-gardens” series presented in London (H.O.R.T.U.S.) and Paris (HORTUS.PARIS) in 2012 and 2013, flows information (images, tweets and stats posted by visitors) affect the growth of micro algal organisms and bioluminescent bacteria. The visitor, who is at once user and author, contributes through his action to a redefinition of the boundaries between local and global, real and virtual, nature and artifice. For ecologicStudio this form of “artificial ecology” is a quest for new “architectural hybrids” promoting the end of the mechanical paradigm in favor of a new “machinic” one.

Claudia Pasquero and Marco Poletto have, over these past few years, been teaching at the Architectural Association and the UCL Bartlett in London, as well as at the IAAC Barcelona and as visiting critics at Cornell University. Their projects have been published and exhibited throughout the world, in particular in Venice (STEMv3.0 the lagoon experiment, 2008; The Ecological Footprint Grotto, 2010; Seville (STEMcloud, 2008), Istanbul (Fibrous Room, 2008) and Milan (Aqua Garden, 2007). All their research has been published in 2012 by Routledge in a book titled “Systemic Architecture”.

## BIO-URBAN DESIGN RESEARCH

RC16 will focus on Bio-Urbanism through a non anthropocentric understanding of the urban landscape, intended as a territory of self-organization and co-evolution of multiple dynamical systems, including ecological systems, infrastructures and technological systems and social groups.

On one side the research will look at bio-mimetic applications of biological models to urban planning while on the other will investigate innovative methods of building with nature, i.e. to harvest the morphogenetic potential of natural system to construct inhabitable urban landscapes.



Sample of bio-cemented stone - Choff al Jerid

Moving away from the understanding of nature in cities as a mere ornamental device, the research will develop new bio-technological morphologies and apply cutting edge construction technologies capable of enhanced spatial and performative interaction with the landscape and its renewable resources.

Key outcome of the research will be large scale simulations of ecologic cities, developed as urban morphologies and related 3D tectonic models, as

well as physical models [proto-types] of new bio-technological building solutions.



Vacuum Formed model of electrolytic landscape

## ADVANCED DETERMINISM AS URBAN DESIGN METHOD

At the conceptual level the bio-Urban Design cluster will engage urban design as a computational practice to embody an alternative model of representation of the city and to prefigure its future development; such model refers to the past and the present territory,

*'[...] as pregnant not only with possibilities which become real, but with virtualities which become actual. Unlike the former, which defines a process in which one urban structure out of a set of predefined plans acquires reality, the latter defines a process in which an open urban problem is solved in a variety of different ways, with actual forms emerging in the process of reaching a solution.'*<sup>1</sup>

<sup>1</sup> Gilles Deleuze, "Bergsonism," *Zone Books, New York 1988, p. 97.*

Le jardin planétaire – il giardiniere planetario \_ Gilles Clement \_ 22publishing

A thousand Machines\_Gerald Raunig\_ semiotext(e) Occupying and Connecting \_ Frei Otto \_ Menges

Emergent technologies and design\_ Hensel, Menges, Weinstock\_ Routledge

System City\_AD July August 2013

Masterplanning the Adaptive City\_ edited by Tom Verbes\_ Routledge July 2013

## RC16 TUTORS SHORT-BIO

ecologicStudio is an architectural and urban design studio involved in digital design and architecture research for the definition of a new "ecology" of space and behavior.

Co-founded in London in 2005 by Claudia Pasquero and Marco Poletto, the studio has built up an international reputation for its innovative work on 'systemic' design, a method defined by the combination and integration of systemic thinking, computational design, bio-hacking and digital prototyping.

This "broadened" approach to design – ranging from the micro to the macro and from nanotechnologies to urban networks – is embodied into an experimental practice, where projects and installations become laboratories of "interactions". Locally activated design protocols synthesize a form of expanded "hyper-reality" hacking larger organizational systems.

portfolio submission [end of August]  
 External examinations and grading [mid September]  
 Set up of end of year students Show.

### RC16 READING LIST

Systemic Architecture: operating manual for the self-organizing city\_ by Poletto, Pasquero published by Rutledge.

The World Dubai Marine Life Incubators\_AA INTER10\_ ecoLogicStudio Publishing.

Network Oasis\_AA INTER10\_ ecoLogicStudio Publishing.

Atlas of Novel Tectonics\_ Reiser+Umemoto\_ Princeton Architectural Press

Deleuze&Guattari for Architects \_ Andrew Ballantyne\_ Routledge

The tree ecologies\_ Felix Guattari\_ Routledge

A thousand years of nonlinear history- Manuel Delanda\_ Swerve

Walkscapes, walking as an aesthetic practice \_ Francesco Careri\_ GG

Constant's New Babylon\_ Mark Wigley

Weak and Diffuse Modernity\_ Andrea Branzi\_ Skira

The conceptual difference leads to a vision of the future that could be defined of advanced determinism, based on the non-linear and circular causality of the feedback loop, where the effects of an action reacts back onto their causes.

Within this paradigm the resolution of the conflictual dimensions and material redundancies found within the contemporary urban, peri-urban and agri-urban terrains, become drivers of urban morphogenesis.

### A NEW CURRICULUM FOR ARCHITECTURE AND URBAN DESIGN

The refinement of such method of Advanced Computational Urban Design and planning can have important consequences in terms of agency for architects; the ambition of the program is to stimulate a *trans-disciplinary* discourse that should reach wider academic research networks as well as other scientific organizations; this is to underline the relevance of triggering a more radical unfolding of the urban dimension of trans-disciplinary design globally.

The programs' design methodology opens untapped opportunities to engage emergent subjects such as Non Governmental Organizations, Global Environmental Groups, as well as other governmental institutions or local citizens networks.

Engaging these subjects culturally as well as technologically may entail a new agency for architecture and the role of architects and urban designers globally.

Our task will be to recognize, test and unfold these latent opportunities, taking their virtualities to their uttermost extreme, revealing in the process new forms of actual urban and social organization.



Activated Living drosscape - Tunis South Lake

## THE BIO-URBAN TERRAIN AS A CONTEXT FOR COMPUTATIONAL DESIGN RESEARCH.

*'Social ecology will consist in developing specific practices that will modify and reinvent the ways in which we live as couples or in the family, in an urban context or at work, etc [...] Instead of clinging to general recommendations we would be implementing effective practices of experimentation, as much on a micro social level as on a larger institutional scale.'*<sup>2</sup>

<sup>2</sup> Guattari, Felix – the three ecologies

### \_Bio-inspired Simulated cities (GH+processing)

The workshop will look at bio-mimetic models that could be used as urban design strategies; working on specific simulations engines students will look at notions of urban optimization, evolution, responsiveness or adaptation to specific changing environments. The outcome of the workshop will be a series of video simulations and parametric studies of urban optimizations.

### \_Robotic Cities (GH + Processing )

The workshop will look at on site robotic protocols for urban fabrication; Using the small scale Robots of the LAB or building custom designed manufacturing machines [1:20 scale], students will design dedicated end effectors and fabrication protocols. The outcome will be large scale physical models testing the building protocols for the development of large scale urban morphologies.

term3 will focus on the production of design scenarios within the specific sites of choice; in this first year students will be invited to visit and explore scenarios by group thus opening up different strands of research within the cluster.

end of term3: Collective jury.

In term4 the thesis will argue the limits of applicability of the bio-mimetic urban design strategy to the urban scenario. Students will be required to describe these limits both qualitatively (morphological models and final renders) as well quantitatively through the computational model.



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their digital data-scapes. Such live data streams will feed evolving digital urban models. The outcome will be wireless sensing boxes prototypes and videos of evolving urban morphologies.

term1 will conclude with a UD2 cross workshops that will map Resource Driven Boom Towns in relationship to Establish Global Cities.

Christmas Break + Field trip.



Choft Al Jerid - Tozeur

term2 will be focused on material definition and on dedicated research on bio-technological systems for building with nature, we would look in particular at the use of on-site swarm robotics and on site large scale 3Dprinting in collaboration with D-Shape.

For the end of term2 Jury each team of students is expected to develop detailed construction protocols through drawings, renders and scaled physical models.

term2 will be also characterized by a series of transversal UD2 workshops such as:

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The last two decades have brought about a revision of the notion of nature, which is expanding to encompass a variety of manmade complex systems like cities themselves.

Perhaps now more than ever, the city is an integral part of one global urban landscape, a complex meshwork of "artificial" habitats that has become our natural environment.



The Choft al Jerid near Tozeur

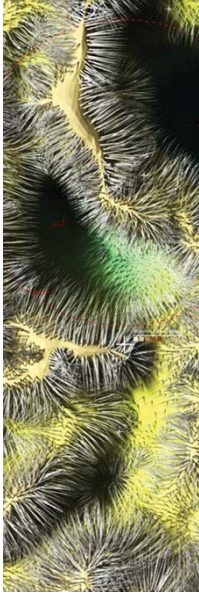
We call these "bio-urban terrains", encompassing large sprawling urban centers, satellite cities, resource related boom towns, infrastructural landscapes, refugee/migrant camps, natural and ecologic reserves and so on.

Despite being often miles apart these territories are constantly communicating; propelled by the drive of contemporary capitalism for profit, and, as a byproduct, for producing both human and material waste, large flows of energy, matter and information emerge as a form of global turbulence. Locally this turbulence actualizes in various forms that can be observed in large cities as sprawling informal settlements, as well as in the wild as large territorial scars or manufactured landscapes.

Often out of sight, these terrains represent a nascent even though unarticulated form of urbanization, peripheral to both city centers and the great landscapes of "nature" and tourism.

bio-UD will engage this blurred zone of contemporary urbanism as a context for advanced computational design research, to learn how to manipulate its redundancies and to exploits the generative potential of its instabilities.

The program's key endeavor is to reinvent it as a fertile terrain for breeding of new urban morphologies, effective as much on a micro social level as on a larger infrastructural scale.



Activated Living drosscape Detail - Tunis South Lake

## METHOD, RESEARCH TRAJECTORY AND EXPECTED OUTPUT

The program will adopt algorithmic coding to enable us to test bio-inspired urban design strategies across scales and regimes, from the molecular to the territorial. Collaborating with scientist, sociologists,

The workshop proposes algorithmic techniques of mapping and indexing with Grasshopper and Processing; students will develop digital machinic models that will be deployed to scan urban datascapes and generate operational landscapes. Input data will come from GIS maps, satellite imagery, research and real-time urban feeds. The outcome will be large scale laser cut models and digital animations.

### \_ Analogue Urban Morphogenesis

The workshop will be focused on the design and manufacturing of apparatus for material computation; the apparatus will then be tested with a series of simulations. Analogue results will be digitized with Kinect and rendered digitally as a series of urban morphologies.

### \_ Algorithmic Mega Cities

The workshop will engage a set of radical urban projects and utopias from the 60s to 80s and reload them into new morphogenetic urban protocols. Students will read and study references and then work digitally with GH, Processing and Softimage to develop specific algorithms to generate new urban morphologies. The outcome will be videos and photorealistic renderings of the emergent urban morphologies.

### \_ Sensing City

The workshop will investigate the production of real-time urban models; students will design and build from scratch sensing boxes to be installed around London and send a real time data feed to





Accreted Urban Ecologies - Tozeur

## SCHEDULE

term1 will start with the investigation of bio-mimetic models of minimal path systems (such as leaf cutter ants nest or spider webs), aggregate systems (such as snow crystals or forests) and geo-morpho-dynamic systems (such as dunes and meandering rivers)

these bio-mimetic models will be researched, analyzed and then modelled both digitally, through dedicated simulations and physically, through the prototyping of experimental apparatus.

For the end of term1 Jury each team of students is expected to describe his bio-mimetic model, the related research and propose the application of such a model to selected urban territories

term1 will be also characterized by a series of transversal UD2 workshops such as:

– Indexing Machines, operational landscapes (GH+Processing) –

agronomists and engineers, student work will oscillates between articulating tectonic solutions, coding urban protocols and breeding material effects. As we can only conceive what we can represent or draw, the course will focus on advanced representation of dynamic processes of matter [morphogenesis], information [control and communication] and energy [entropy and self-sufficiency]. Such work will be carried out through a set of specifically designed seminars workshops.



Rain Water Flow Patterns - Operational field

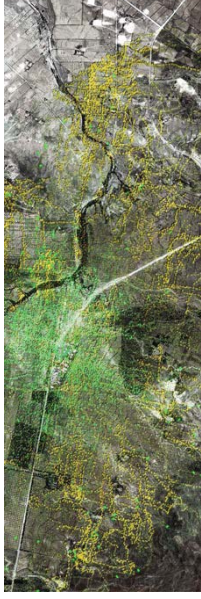
This year the design research will focus on resource related boom-towns and mining landscapes; we will explore new strategies to re-metabolize and re-synthesize these cities and urban landscapes into novel inhabitable morphologies. Adopting bio-technological construction systems and biomimetic design strategies we will engage 3 different kind of design scenarios:

- building in extreme environments
- recuperating vast depleted and contaminated terrains
- recycling abandoned infrastructures and urban development's.

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The research proposals will involve the following modules:

- Diagnostics: the mapping of Operational Fields of potentials and conflicts present on site.
- Design Engineering: of new techno-urban assemblages, via implementation of new technologies of building with nature.
- Coding: urban optimisation
- Simulations: the simulation of Urban Morphological Scenarios, bio-inspired strategies.



Edible Landscapes - Simulated scenario

The project proposals will be prototypical in nature, possessing both character of generality and specificity, while avoiding localism. General applicability will make the design solutions relevant for many cities globally, while specificity will ensure resilience within the specific scenario.

As the year progresses the development of the urban prototypes will enter a more specific phase of material definition, spatial and volumetric articulation. Such definition implies a conceptual shift from the understanding of buildings and infrastructural technologies as the rational

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assemblage of discrete components, to their formulation as self-similar structures made up of multiple discrete elements; within this paradigm material organization became prominent. In particular this year we will engage with cutting edge on-site robotic fabrication technologies, such as D-shape [the largest 3D printer in the world], which will be consultant of the cluster.



Edible Landscape - Model

To complete their projects and enter thesis mode students will be asked to deploy their design solutions and develop simulations of *urban design scenarios*. Such scenarios will be quantified and tested in the final design thesis; they may be simulated with videos and animated diagrams; as the program develops we envision scenarios to be tested on-site in specific test beds, involving academic institutions, the industry, NGOs, community groups and/or other stakeholders contributing to the development of real testing prototypes or pilot projects.