Thanks to: the Onsite Advisory Board chaired by Michael Haddad; Richard M. Sommer; Faculties of Art and Design, Jill Chen and Kevin Hewitt; grOCAD, Ian Clarke; Bruce Hinds; Ju-Hye Ahn; Onsite Student staff including Rouzbeh Akhbari, Erin Smithies, Pallavi Thampi and Saba Moghtader; and especially the crew at Terreform ONE and Mitchell Joachim, Maria Aiolova, Melanie Fessel, Nurhan Gokturk, Oliver Medvedik.

Project credits: ***Bio City Map:*** Terreform ONE; Mitchell Joachim, Nurhan Gokturk, Melanie Fessel, Maria Aiolova, Oliver Medvedik. ***Research Fellows;*** Chloe Byrne, Adrian De Silva, Daniel Dewit, Renee Fayzimatova, Alena Field, Nicholas Gervasi, Julien Gonzalez, Lucas Hamren, Patty Kaishian, Ahmad Khan, Laasyapriya Malladi, Karan Maniar, Ricardo Martin Coloma, Puja Patel, Merve Poyraz, Mina Rafiee, Mahsoo Salimi, Manjula Singh, Diego Wu Law.

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OCAD UNIVERSITY

TERREFORM ONE

BIOLOGICAL URBANISM

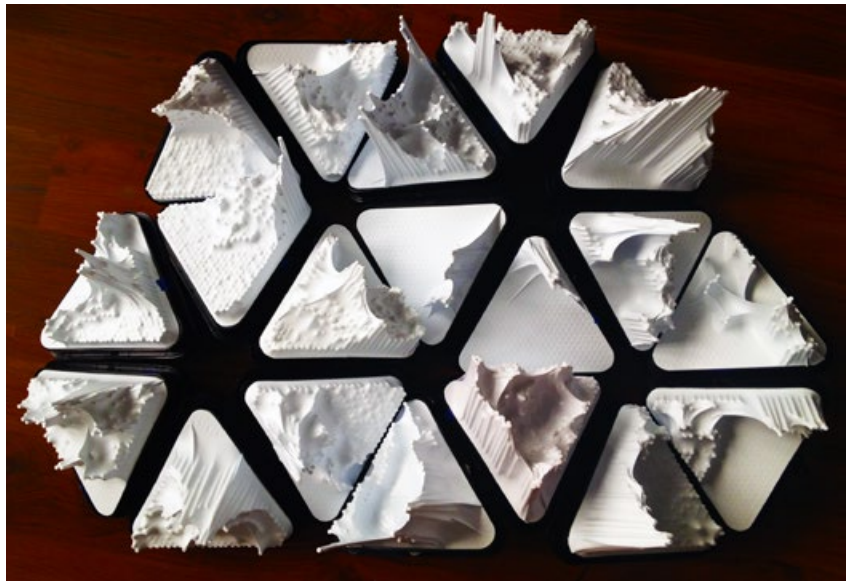
An Opera of Disciplines from
Architecture, Landscape, Urban Design,
Biology, Engineering and Art

November 6, 2013 to February 22, 2014

Bio City Map:
Global Networked Habitat
Projected World Population
Density of 11 Billion by 2110
Bioinformatics
beyond Buckminster Fuller

"I have summarized my discovery of the option of humanity to become omnieconomically and sustainably successful on our planet while phasing out forever all use of fossil fuels and atomic energy generation other than the sun. I have presented my plan for using our increasing technical ability to construct high-voltage, superconductive transmission lines and implement an around-the-world electrical energy grid integrating the daytime and nighttime hemispheres, thus swiftly increasing the operating capacity of the world's electrical energy system and, concomitantly, living standard in an unprecedented feat of international cooperation."

Cosmosgraphy, 1993, Buckminster Fuller and Kiyoshi Kuromiya



The world population will reach 11 billion by the end of this century. More than three quarters of us will live in cities, an unprecedented condition in human history. The numbers from different sources vary but they are all colossally sized. There is very little speculation, however, about the form and the impact of these mega cities. Most of the world has reached a consensus that human activity is a powerful, adverse contributor to climate change. A new revolution is underway, based on a search for alternative, renewable energy generation and healthy living. Our intention is to research the myriad consequences of these radical changes to the global cities, and explore how the world is adapting to address these changes.

This investigation is based on a series of interrelated themes of fundamental importance to the health of cities: political will and political failure in the determination of urban policy; the role of the automobile in the propagation of suburban sprawl; demographic challenges (expanding versus shrinking cities); contrasting patterns of racism, poverty and immigration; the emergence of a "planet of slums"; security in an age of war, chronic criminality and terrorism; and the threat of disease and epidemics. Global warming and environmental degradation is a central concern. The accelerated consumption of oil and energy, the unregulated creation and dispersion of pollution, the alarming increase of carbon dioxide emissions, and the consequent alterations to the earth's climatic equilibrium are no longer phenomena that can be ignored.

The impact of globalization on the shape and dynamics of cities is profound. This impact can be felt in urban centers and agricultural peripheries alike. While recognizable city centres might remain, in many cases they are now already supplemented with multiple centres, hubs and nodes. Typically, these centres are drawn together in a network of communication infrastructures to form complex polycentric urban systems that extend far into once rural hinterlands. The scale and networked quality of these mega-urban configurations will grow beyond reach and beyond control.

Seventy years ago, Buckminster Fuller unfolded the globe in a Dymaxion projection (ie. invention fusing dynamic, maximum and tension qualities). This resulted in an icosahedral net of almost contiguous landmass comprising all of Earth's continents. It was also connected to the flow of energy, and allowed solutions to global problems, matching human needs with resources. More recently, Rem Koolhaas proposed a similar exchange of energy, looping a ring of offshore wind farms in the North Sea and connecting them to vast photovoltaic arrays in Sub-Saharan Africa. Such a massive network would enable major flows of both energy and population on a global scale. In a fully connected world, competition will be replaced with cooperation.

Bio City Map

The Bio City Map is a forecast of the world population distribution in the next 100 years. The model combines all the world cities together as one continuous growth system. The current phenomena of explosive growth — the "mega-city" (those now hosting populations of more than 20 million: Shanghai, Sao Paulo, Mexico City, Lagos for example) and the "instant city" (those constructed in just a few years on previously unsettled land: Dubai, Abu Dhabi, new cities in China) — merge together into a continuous urban construct. As human population expands, we see it as one single macro city spread across the continents. Other cities, mainly in the developed world, demonstrate the opposite tendency because they are shrinking (Detroit, Leipzig, Manchester for example).

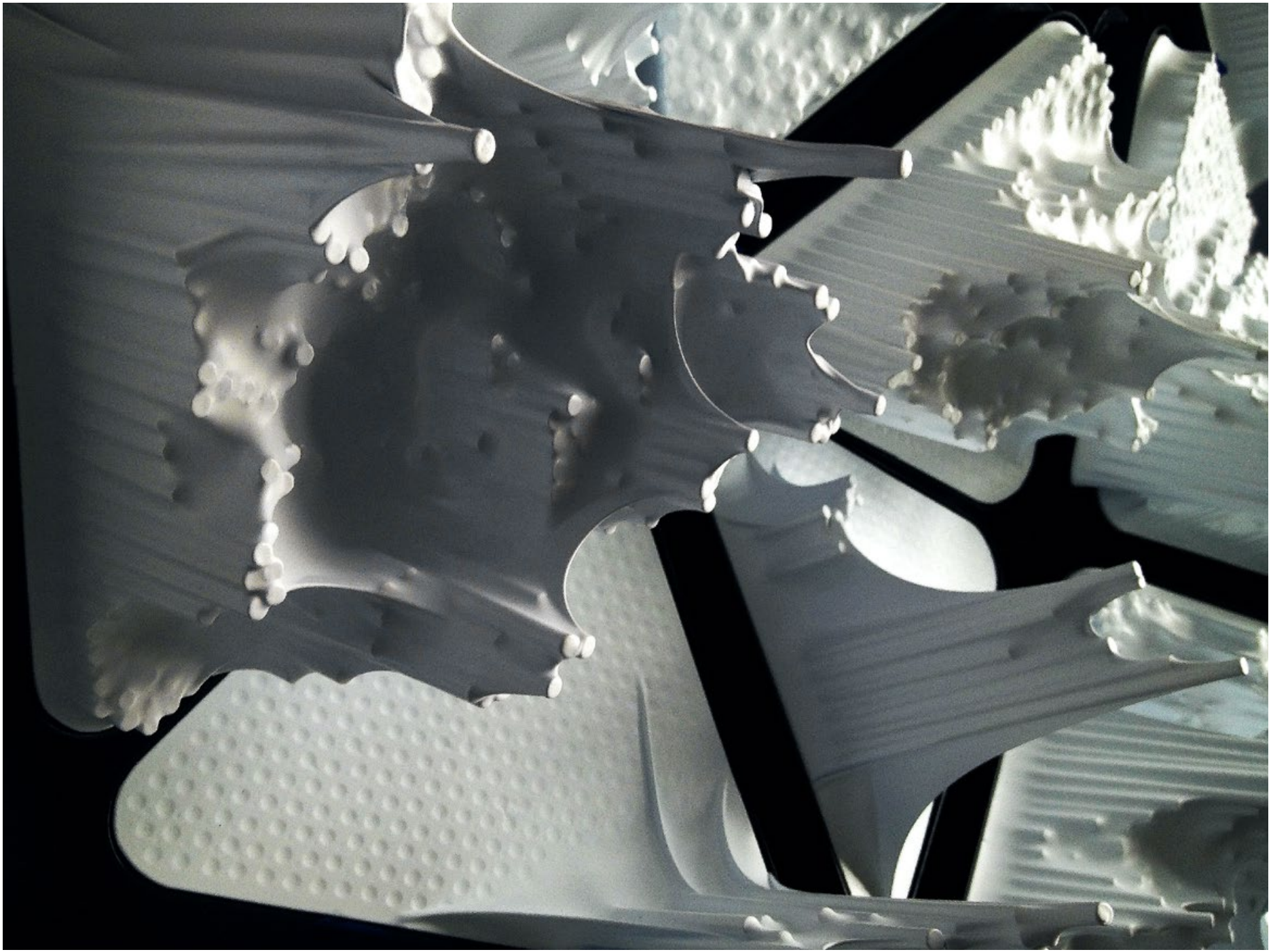
We argue that most nations cannot view the effects of planetary population density through the lens of just one city or region. Instead we aim to reveal the long-range effects of massive human population in areas of present and future urban intensity. On the reverse side of the mapping installation are focal points of biological details in specific localized city forms. They zoom in on density zones that are dispersed throughout the globe. These points use the technique of "bacteriography" (bacteria photography) to shift scale and underscore the highest zones of growth. Our method creates a real-time parametric display using Gammaproteobacterium Escherichia coli Strain K12 in agar medium that has been genetically modified to express color under UV light. The strains used are harmless variants of E. coli, studied by college students all across Europe and the United States. They have been utilized in schools for decades without any safety issues and are considered non-pathogenic and harmless.

The Bio City Map forms were transformed with DNA that encodes fluorescent proteins found in sea anemones and jellyfish. This enables those bacteria to emit red, green, yellow and blue light under long wave UV bulbs. The fluorescent proteins are based on the discoveries of Osamu Shimomura, Martin Chalfie and Roger Y. Tsien, who were honored with a Nobel Prize for their work in 2008. Ultimately, the bacterial photos grow to reveal variant patterns of biological transformation in urban regions.

Rather than using computer code to mimic growth in nature, this method is the actual iterative vehicle of growth itself. Bacteria in this constrained form and under the right conditions behave almost identically to urban population patterns. Moreover, the resolution of these bio-based city patterns will change with more nuanced biological inputs. In many cases, they are as good as computational versions because they are the source which algorithms are derived from in the first place. In time, the mapping installation may illustrate patterns yet unobserved in typical models. It is this emergent and unfettered map of population we wish to make into spectacle. By using bio lab based materials, we expect to narrow the gap between idealized mathematical interpretations and observable events in nature. This may lead to learning, in the words of Buckminster Fuller, "how to make the world work" for 11 billion people, without causing ecological damage and disadvantage to anyone.

Terreform ONE (Open Network Ecology) is a New York-based design group that promotes environmentally conscious urban planning. Its projects are an exciting mixture of architecture, landscape, urban design, biology, engineering and art and it is dedicated to finding innovative solutions for sustainability in energy, transportation, city infrastructure and waste management. The works featured in this exhibition at Onsite [at] OCAD U highlight Terreform ONE's interest in incorporating living organisms in design, and advancing the notion of sustainability beyond a popularized mainstream rhetoric.

www.terreform.org



Events:

*All events are at Onsite [at] OCAD U, 230 Richmond Street West (*except where noted below)*

Wednesday, November 6,
6:30 to 8 P.M.,
(*100 McCaul, Rm 190)
Lecture with Mitchell Joachim and Nurhan Gokturk of Terreform ONE and Richard M. Sommer, Dean of the John H. Daniels Faculty of Architecture, Landscape, and Design at the University of Toronto

Wednesday, November 6,
8 to 10 P.M.
Opening Reception

Wednesday, November 20,
6:30 P.M.
Insite Exhibition Tour with Ian Clarke, Associate Dean of the Faculty of Liberal Arts and Sciences & School of Interdisciplinary Studies, OCAD University

Wednesday, December 11,
6:30 P.M.
Insite Curator's Tour with Lisa Deanne Smith, Acting Curator, Onsite [at] OCAD U

Tuesday, January 21,
6:30 P.M.
Insite Exhibition Tour with Bruce Hinds, Chair, Environmental Design, OCAD University

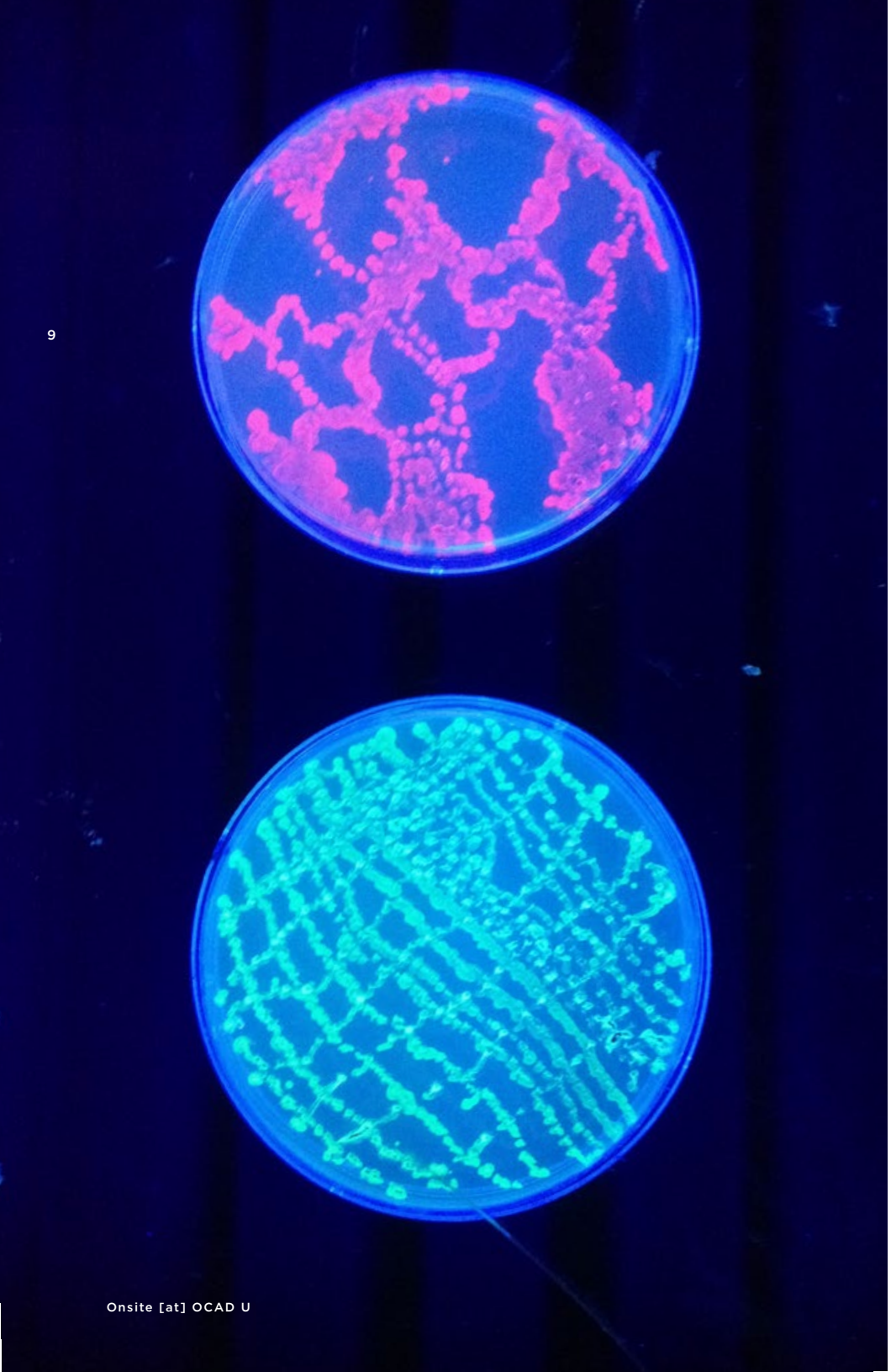
Wednesday, January 22,
6:30 P.M.
Freestyle Farm: An Urban Homestead presentation and hands-on workshop with Jill Chen and Kevin Hewitt, OCAD University Alumni, Urban Farmers and Photographers

Wednesday, January 29,
6:30 P.M.
Terrarium workshop with grOCAD

Wednesday, February 5,
6:30 P.M.
Lecture with Nikki Musina on Bees, Pollinators, and Insect Wonders with grOCAD

Wednesday, February 12,
5:00 P.M.
Regrow Your Kitchen Scraps workshop with grOCAD

grOCAD is a student led organization that works towards integrating plant life into our everyday experience by cultivating areas in and around OCAD U's campus. grOCAD's aim is to increase healthy food accessibility, encourage discourse about how plants improve quality of life, and heighten awareness of urban agricultural practices.



Bios:

Terreform ONE [Open Network Ecology]
A Non-Profit Architecture Group for Smart City Design, Ecological Planning, and Public Art in New York City.

Mitchell Joachim, Ph.D., is Co-Founder and Director of Research, Terreform ONE and Associate Professor of Practice, New York University. He was chosen by Wired magazine for "The Smart List: 15 People the Next President Should Listen To". Rolling Stone honored him with "The 100 People Who Are Changing America". He earned a Ph.D. Architecture, MIT, M.A.U.D., Harvard University, and M.Arch., Columbia University.

Maria Aiolova is Co-Founder and Director of Education, Terreform ONE and Academic Director of Global Architecture and Design, CIEE. She is Co-Chair of ONE Lab NY School for Design and Science and ONE Prize Award. She is an institutional adviser to New Lab at the Brooklyn Navy Yard. Maria is currently a visiting faculty at University of Applied Arts Vienna. She earned a M.A.U.D., Harvard University, B.Arch., Wentworth IT, and Dipl.-Ing., Technical University of Vienna, AT/ Sofia, BG.

Melanie Fessel is Director of Design, Terreform ONE and Managing Editor of Ecogram. Melanie was an associate with the Cooper Union Institute for Sustainable Design and worked as an architect with a focus on municipal buildings and masterplanning in Spain, Switzerland, and New York City. She earned a M.Arch II, Cooper Union, and Dipl.-Ing., Technical University of Berlin, DE/ Polytechnic University of Catalonia UPC, Barcelona, ES.

Nurhan Gokturk is Director of Innovation, Terreform ONE and Founder, Hometime L.L.C. He conceived of Project2020, an initiative to develop 2,020 modular homes as infill strategy on blighted and abandoned lots in New Orleans. He has been featured in Metropolis Magazine, and awarded Gambit's Top 40 under 40. Nurhan was a contributing artist to the Louisiana SPCA auction. He earned a M.A.U.D., Harvard University, and B.Arch, Pratt Institute.

Oliver Medvedik, Ph.D., is Director of Science at Terreform ONE and Genspace/ Bioworks Institute. He is also the Sandholm Visiting Professor and Assistant Director of the Center for Biomedical Engineering at The Cooper Union. He has worked at Sirtris Pharmaceuticals and mentored two Harvard University teams for the IGEM (international genetically engineered machines) competitions. Oliver has been awarded the TED fellowship. He earned a Ph.D. Harvard Medical School and B.A. Biology, Hunter College.