The Work of Terreform ONE

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Alternative Practice

At this stage, we’ve deliberately sought to avoid maintaining a traditional architecture office. We did not desire to ceaselessly toil for a private client or affluent developer. To operate as a nonprofit group inside a cluster of other innovative tech companies marks us as distinctive. Our studio space is similar to a “science garage.” The garage has long been the pinnacle of American invention. It’s an informal anarchic space where everything can be physically manipulated. There is nothing sacred in a garage. One can also identify them as “hackerspaces.” Located in an urban fringe zone, such a variegated space departs drastically from the cherished atelier models of previous centuries. We find this flowing topology the best-suited spatial arrangement for producing projects that react dynamically to undeviating, transient, or long-lasting issues.
As architectural designers confronted with a cumulative assortment of technical, manufactured, formalistic, and speculative alternatives, it becomes a formidable task to find a focus. It becomes simpler to mix one’s designs from numerous sources and check its justification to the measurable and physical aspects, be it scientific or economic. This narrow-minded inclination, arguably resulting from a reaction to the utter expansive nature of the field, from our outlook, has led to a palpable level of indifference resulting in abundant forms of conflict within the discourse. This anesthetized state within which others function becomes an involuntary proliferation of the banal, the exceedingly consumptive, the inconsequential, and the haphazard. If the concern is toward extending the influence of good design without surrendering its profound qualities, then it becomes essential that the discipline is infused by architects who are analytically considerate of the ramifications of their work from biological, native, regional, and global standpoints.

Architectural designers need to work within nature. The mixture of hi-tech tuning and formalistic liberties that are available to designers today can be significantly developed only through critical foundational principles in each scheme; a grounding which stresses design to pursue consequence by probing the greater and obscured natural environments of every discrete project. Such expeditions of critical discourse and attentiveness necessitate exactitude but, foregoing that, an inclination, which can be encouraged during the developmental stages of a given aspirant’s architecture education. Ultimately for architects, and their education, it ought to be almost indistinguishable from lessons in biology. Admittedly, the agency of architecture has yet to achieve this union. Our aim is to push the theoretical nature/design boundary until it becomes permanently fused.

Primary Principals

Our research topics span over twenty years of illuminating environmental issues as an amalgam of anthropocentric and ecologically balanced artifacts, procedures, and spaces. Over this period, it has established works that serve as an interdisciplinary authority in nature-intensive design operations at the intersection of art, architecture, and cities. Searching for how design intentions are derived and why they are cultivated into tangible site-specific interventions, the work is fortified in embodied knowledge or
an understanding attained through practice and field deployment. These arts intensive schemes find continuous dissemination for public consumption.

Currently, there is no prevailing distinct set of enduring methodologies or theoretical approaches that define a designer. We are inclined to work within a shifting cohort of creative arts practitioners that channel DIY communities, anti-discipline factions, hacker enclaves, well-intentioned entrepreneurs, makers, crowdsourcing advocates, and ample other creative outlets. These are fluid tactical linkages used to decipher boundless design problems. In most cases, our generation is unified at solving a host of fluctuating wicked environmental problems. Concerns in climate dynamics, uncontrolled urbanization, lack of social justice, and deficient housing are the explicit challenges we seek to answer through formidable acts of architectural design.

Architectural design, in and of itself, has astonishing power. It’s also simultaneously both perpetual and ethereal, like painting a watercolor in a stream. Design is not art. Contrariwise, the differences between art and design are heavily muddled. Design can juxtapose imperceptible properties and just as equally foreground the obvious general physics of almost any challenge. We see design as an action that blends benevolence with radical intelligence. Virtuous architectural designers work together to invent original contributions towards refining human knowledge. Architectural design today, as we see it, is an open, free, limitless, and an exceptionally self-governing process.

Teaching Elements

The following directives characterize our views that generate the teaching methods in a workshop, seminar, or architecture studio setting. It is the confluence of a spirited equanimity amongst methodological priorities, student inputs, and critical interests that trace the roots of our instruction.

We instinctively care about teaching and working with engaging thought-provoking scholars. For this explicit reason, we are continuing to pursue academia on numerous levels. We passionately believe that teaching and research must balance each other. We’ve had the privilege to be exposed to diverse pedagogical methods and extraordinary mentors within our own completed degree programs. These influential academicians from dozens
of wide-ranging fields have undeniably tested and shaped our philosophy as university professors and design practitioners.

Predominantly, we think that successful teaching consists of two key components: first, inspiring the students by being impassioned about the topic and second, elevating them to vigorously learn the subject through active participatory group exercises and to invoke solutions by themselves independently beyond class. In our educational experience, we have attempted to not merely deliver the material, but to aid students in comprehending the perceptions behind architectural design choices and have them interrelate with other colleagues. For instance, when deliberating the trade-offs of dissimilar design tactics, we involve students by posing step-by-step queries and by soliciting reactions from them. This permits students to transmit the material, emboldens them to come up with the benefits and constraints of numerous frameworks on their own and enables us to evaluate their understanding. We trust that this approach and other methods help scholars develop valuable experiences that open pathways to designing superior techniques themselves. We also believe that hands-on proficiency is essential for students to cognize the tangible experiments of architecture. Additionally, we’ve continually crafted and improved upon syllabi for the interdisciplinary courses we have taught for years. We’ve advised students to participate in advanced studio sequences that focus across deep-learning multivalent research endeavors. We believe that wicked problems created by certain adverse activities of society can only be solved by equally rigorous efforts of humankind buttressed by in-depth edifying measures.

Teaching at the university level is a clear privilege and an undertaking that can attain immense gratification. We’ve been teaching in the role as professors in various fields of art, architecture, environment, biology, media, and transportation. Our instruction primarily revolves around issues of ecological design thinking. For the most part, students we’ve encountered have been extraordinarily affable, intelligent, and prolifically creative. They are almost all interested in being challenged. Many of them are focused and dedicated to intellectual purists that will evolve their current worldview. Students, we’ve found, are seeking to keenly reshape and amplify their individualized filters of reason. They wish to grasp the ideas and methods of architecture education and nurture concepts themselves.
Customarily, we have design students in a conservatory-based learning model bent on a single pre-defined concentration. Instead, we encourage them to seek new adaptations to their education as a young newfangled artist, architect, designer or something else entirely. They often wish to include overlapping interests culled from separate fields of knowledge. In short, they are fascinated being taught something that is atypical.

Our courses are deliberately attenuated and tailored to gather a myriad of individualized modes of expression. We’ve found each and every student has a particular skill set they like to communicate in class as answers for assignments. We are delighted to accommodate their method of choice to manifest a unique resolution in their projects.

Design Research

An appetite for innovation and change drives the research work we do. This requires many vantage points to address a given investigation. Therefore, it’s important to emphasize our research is intrinsically collaborative in nature. We almost always work in teams of assorted disciplines and heterodox knowledge sets.

Our hypothetical explorations, in the most fundamental of interpretations, are in the study of socio-ecological design and architecture. A nascent term that recognizes science-based design alone is not enough to confront the enormous issues facing humanity with regards to climate dynamics. It is our understanding that no matter how comprehensive the technical solutions are to climate change, the socio-cultural constraints are a considerable factor. The knowledge of ecology combined with various methods of design is necessary to achieve planetary stability, but only in tandem with corresponding societal elements. That is why we describe it specifically as socio-ecological designing, not merely eco-design, sustainability, green or biomimicry. Even if the key factors in both science and design are tenable, the capricious public still may have an opposite perspective. We’ve been making headway in this self-defined interdisciplinary approach for almost two decades.

Research is the area of work we sense has been our most successful contribution. At Terreform ONE, we’ve been able to complete numerous projects that bring the elements of socio-ecological design to a greater level
of depth, consistency, and refinement. We’ve explored these issues at three primary scopes of inquiry: mobility, architecture, and urbanization. We’ve been designing environmentally-driven transportation systems, buildings, and urban neighborhoods since 2006. They are all cross-linked and integrated with one another at different scales of operation to mitigate issues of waste, energy, water, materials, sustenance, and air quality. All of them are grounded and manifested in substantially visual items. A few key examples are: Urban Tangle spliced map fragments, Mini-stacking electric cars for China, Mycoform structures grown from strains of fungi, Gen2Seat biopolymer compostable chair, Governor’s Hook resilient waterfront infrastructure made of decommissioned military ships, and the Bio City Map of 11 Billion People using genetically modified E. coli colonies as printed geographies.

Public Outreach

Outside of the local spectrum, we’re also responsible for enlivening the public in an international dialogue on ecological design, art, and urban culture. In this manner we serve as noted public intellectuals and directors of the research institute, Terreform ONE, presenting arguments that help justify the meaning and power of design in relationship to local communities and planetary metabolism. We are intensely involved in publicly speaking, visualizing, and writing about our discipline and how it relates to the cultural and social world around it. This kind of discourse is extremely crucial, and it involves good, clear, simplified explanations of design that bridge many mindsets. Our projects aim to remove obstacles that distort meaning or fail to connect with the general public. Our objective is to annihilate the effects of climate change through spatial and visual vocabularies that promote ecological design thinking.

Project: Cricket Shelter

The UN has mandated that insect-sourced protein will become a major component in solving global food distribution problems. This impacts people globally, since continuing to raise livestock is not possible at our current rate of consumption and resource extraction.
It is a well-established fact that industrialized animal agriculture accounts for a fifth of all human greenhouse gas emissions. With global demand for meat projected to double by 2050, the industry’s land requirements constitute one of the most significant drivers for deforestation in the world. This project proposes an alternative: with 1% of the greenhouse gas emissions and requiring 0.001% the land to produce the same amount of protein annually as cattle farming, we feel that environmental destruction need no longer be the consequence of ensuring our food supply. Cricket Shelter is a prototype for an urban farming strategy that minimizes the ecological footprint of protein-rich food production.

The continuous impact of climate dynamics, armed conflicts, non-stop urbanization and economic upheavals present a distinct need for a hybrid architectural typology to deliver parallel solutions for food and shelter in distressed regions. Our proposal is a dual-purpose shelter and modular insect farm in one structure.

Raising cattle, pigs, and chickens for meat all require immense amounts of fresh water, land and energy. Breeding insects for food typically takes three hundred times less water for the same yield of protein. Our project aims to maximize access to nutrient resources and to support local communities in anticipation of post-disaster scenarios. This also targets societal upgrading strategies in both developed and developing countries as the temporary shelter easily converts to a permanent farming system/eatery after the crisis has dissipated.

Cricket Shelter is a self-sufficient, interconnected array of structural pods that fosters an optimal environment for supporting the life cycle of crickets. The embedded ecosystem was developed to permeate the structural system, each independent module linked by tubes connecting the elements to render the crickets “free-range.” Whereas in many parts of the world entomophagy is more common but contamination is more likely, Cricket Shelter’s innovative process offers a sanitary and hygienic solution.

Cricket Shelter was conceived as a hybrid architectural typology delivering parallel solutions for food and shelter in distressed regions throughout the world. As a modular structural system it lends itself to simple construction and deconstruction in various site-specific orientations, making it easy to educate consumers on use and maintenance. As an architectural object, the
shelter can contribute to the public realm inhabiting into vacant lots, pocket parks, and rooftops, bringing agriculture and entomophagy into focus for the local populations. In this way we can fulfil our aim of educating the public about their role in sustainable consumption.

Credits

Terreform ONE
Mitchell Joachim (PI), Maria Aiolova, Melanie Fessel, Felipe Molina, Matthew Tarpley, Jiachen Xu, Lissette Olivares, Cheto Castellano, Shandor Hassan, Christian Hamrick, Ivan Fuentealba, Sung Moon, Kamila Varela, Yucel Guven, Chloe Byrne, Miguel Lantigua-Inoa, Alex Colard.

Sponsor: Art Works for Change.

Project: Monarch Sanctuary

Our mission is to design against extinction. The monarch butterfly of North America is a species at risk. The U.S. Fish & Wildlife Services is currently assessing whether the monarch needs to be granted “endangered species” status, while the monarch population erodes due to the combined forces of agricultural pesticides and habitat loss. Monarchs are a delicate presence in New York City.

Monarch Sanctuary will be eight stories of new commercial construction in Nolita, NYC. Central to its purpose is serving as a breeding ground and sanctuary for the threatened monarch butterfly. It aims to be socio-ecologically robust, weaving butterfly conservation strategies into its design through the integration of monarch habitat in its façade, roof, and atrium. Not just a building envelope, the edifice is a new biome of coexistence for people, flora, and butterflies.

The double-skin street façade, with a diagrid structure infilled glass at the outer layer and with “pillows” of ETFE foil at the inner layer, encloses a careful climate-controlled space, 3’ deep. This “vertical meadow,” the terrarium proper, serves as an incubator and safe haven for Monarchs in all seasons. It contains suspended milkweed vines and flowering plants to nourish the butterflies at each stage of their life cycle. Hydrogel bubbles maintain
Building section perspective mapping the trajectory of butterflies from across the street Petrosino Park through the double-skin facade vertical meadow finally up to the pollinator rooftop garden.

Annual migration pattern of monarch butterflies from the United States to Mexico.
optimal humidity levels, and sacs of algae purify the air and wastewater. LED screens at the street level provide magnified live views of the caterpillars and butterflies in the vertical meadow, which also connects to a multi-story atrium.

**An Ecological Building Façade System Designed to Stop the Extinction of the Monarch Butterfly**

How the Design Anticipates the User Experience and Benefits Society

The building will present a striking public face and a powerful argument in favor of a diversity of life forms in the city. The façade of the Monarch Sanctuary building will add a lush vertical meadow for butterflies.

The building is intended to serve as an object lesson in enhancing the urban environment with green technologies, including plant life and other creatures, in designing for other species, and in conveying images of new possibilities for the urban environment. This project alone will not save the Monarch but it will crucially raise awareness about our much-loved insect residents.

**Image 4** Linked stages of milkweed columns and butterfly life cycle:
Stage 1: Milkweed column rises from glass casing. Fresh milkweed exposed to butterflies allowing them to lay eggs.
Stage 2: Milkweed column fully contained within glass casing. Caterpillar development isolated from butterflies. Leaf count slowly diminishes.
Stage 3: Milkweed column lowers from glass casing. Chrysalis and hatching butterflies exposed to inner facade. Little leaf structure remains on column.

**Image 5** An architecture that aims to be ecologically generous, weaving butterfly conservation strategies into its design through the integration of monarch habitat in its façades, roof, and atrium. Not just a building envelope, the edifice is a new biome of coexistence for people, plants, and butterflies.
How the Design is Original and Innovative

The innovation of this project is to serve as a large-scale Lepidoptera terrarium. This type of façade has never been constructed before in any known context. It will bolster the monarch’s presence in the city through two strategies: open plantings of milkweed and nectar flowers on the roof, rear façade, and terrace will provide breeding ground and habitat for wild monarchs, while enclosed colonies in the atrium and street side double-skin façade will grow monarch population. The insects will be periodically released to join the wild population, enhancing overall species population numbers.
How the Design Captivates

Key features of the project are equally in service of the insects are meant to captivate people. Giant LED screens on the surface of the building provide a spectacle of caterpillars, chrysalis, and butterflies. Interior partitions are constructed from mycelium, and additional planting at the ceiling enhances the interior atmosphere and building biome. The entire project is meant to make ecological systems visible to the public in as many scales as possible.

Credits

Terreform ONE
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Project Management: Vivian Kuan.
Tech Consultant: Anouk Wipprecht.
Sponsors: BASF, Intel, RNR Foundation.
Mitchell Joachim, Ph.D., Assoc. AIA is the Co-Founder of Terreform ONE and an Associate Professor of Practice at NYU. Formerly, he was an architect at the offices of Frank Gehry and I.M. Pei. He has been awarded a Fulbright Scholarship and fellowships with TED, Moshe Safdie, and Martin Society for Sustainability, MIT. He was chosen by Wired magazine for “The Smart List” and selected by Rolling Stone for “The 100 People Who Are Changing America”. Mitchell won many honors including ARCHITECT R+D Award, AIA New York Urban Design Merit Award, 1st Place International Architecture Award, Victor Papanek Social Design Award, Zumtobel Group Award for Sustainability, History Channel Infiniti Award for City of the Future, and Time magazine’s Best Invention with MIT Smart Cities Car. He’s featured as “The NOW 99” in Dwell magazine and “50 Under 50 Innovators of the 21st Century” by Images Publishers. He co-authored three books, XXL-XS: New Directions in Ecological Design, Super Cells: Building with Biology, and Global Design: Elsewhere Envisioned. His design work has been exhibited at MoMA and the Venice Biennale. He earned: PhD at Massachusetts Institute of Technology, MAUD Harvard University, MArch Columbia University.