The Well-Tempered City: Health & the Built Environment in Interdisciplinary Design Education

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The humanist approach to architectural knowledge and production has traditionally taken the body as the irreducible unit of measure. Likewise health is an attribute most often ascribed to individuals, measured against other individuals, and enacted upon at the scale of the individual. As architecture, along with landscape architecture, urban design and planning, more fully address issues of health, we have come to understand it as a collection of knowledge that also describes places and phenomena beyond the individual, from information and structures to systems and environments. Not only does this shift how we design for the built environment, but what we analyze, how we intervene, and in what ways we define irreducibility. This paper examines the role of the city as the pedagogical subject of inquiry and the site of speculative intervention for an interdisciplinary design education.

INTRODUCTION

"Cultures whose members organize their environment by means of massive structures tend to visualize spaces as they have lived in it, that is bounded and contained, limited by walls, floors and ceilings. There are, obviously, reservations and quibbles that can be raised against this proposition, but its general truth in which architects and designers visualize 'free' or 'unlimited' space as retaining the rectangular format of walled rooms…. Societies – through whatever organs they see fit, prescribe the creation of fit environments for human activities; the architectural profession responds, reflexively, by proposed enclosed spaces framed by massive structures, because that is what architects have been taught to do, and what society has been taught to expect from architects…. The architectural profession has had little to offer beyond further variations upon massive structure, and has normally responded as if these constituted the unique and unavoidable technique for dealing with environmental problems. In their role as creators of actual physical environments, architects have to be both cautious and practical. They have to see something in use, sometimes for as much as a generation, before they feel the confidence to extrapolate new and radical uses for it, knowing that their clients will never forgive nor forget if anything goes wrong, even it is the inexperience or improvidence of the client himself that causes the malfunctioning."[1]

In a series of two undergraduate design-research studios at the Harvard University Graduate School of Design, students were asked to examine the city through a non-human urban agent, which became the indicator and lens through which they both interpreted and re-imagined the urban context. The decentralization of the human body and the human experience repositioned the city and its manufactured artifacts, as their design interventions were subjected to the context of health and the built environment.

In its institutional context, the studios pursued the study of architecture and urbanism within the framework of a liberal arts education. The studios were jointly administered between the Graduate School of Design and the Department of History of Art & Architecture; and students from all parts of the university including Visual & Environmental Studies, Environmental Science & Public Policy, Biomedical Engineering, Human Evolutionary Biology, Molecular & Cellular Biology, Economics, Computer Science, and Applied Mathematics have all been enrolled in the two studios since its induction four years ago.

"And yet, as the word information implies itself, there is a hidden form-making impulse in information society. Or at least, we can say that information processes often leaves material residues. Or, to be more brutal but more honest, that information processes can be forced to leave material forms."[2]

The first of the two studios, the Transformations Studio introduced basic architectural concepts and techniques used to address issues of form, function, ornament and material. The course provided instruction on project analysis, information visualization, and material fabrication using both physical and digital modeling and animation; and was organized by two central phases: Phase 1 – Design Strategies: Material Properties + Manufacturing and Phase 2 – Visual Representation + Documentation.

Students proceeded through a series of progressively complex investigations of transformational procedures and programs. As an introduction to architectural design, students explored foundational to comprehensive design principles, skill sets, and critical thinking with the act of making. Design investigations occurred through information-based material assemblages with an introduction to form-based and systems-based design methodologies.

RESEARCH + DESIGN

Scientific research entails a body of techniques to investigate a particular phenomenon; and it asks for the acquisition of new knowledge sets or the rectification or integration of previous knowledge sets. This method of inquiry is based on empirical, measurable and quantifiable evidence that is developed through controlled and replicable experiments. The linear progression – based on the formulation of a question, whether broad or specific in nature – can be characterized as a protypical model of scientific inquiry based on logical reasoning. Although fields of inquiry and modes of practice may be similar between the design and STEM disciplines (Science, Technology, Engineering, Mathematics), both entailing a systematic approach to observation, formulation and the testing of a proposition, the process of pursuing research and developing conclusions are very different. Fundamental to design's agency is its capacity to evoke diverse meanings and interpretations; to expose vulnerabilities; to capitalize opportunities and efficiencies; and to envision projective models and deployable scenarios. The dichotomy that exists between the design and non-design disciplines can – and should – be cultivated, in order to bridge the practical with the impractical, the logical with the imaginative.

CITY AS THE SUBJECT OF INQUIRY

Cities are the physical manifestations of adaptive modes in exchange, economy and production. As such, they require multiple lenses through which to view their complex spatial structures and to understand how they are to be conceived, perceived and inhabited. To understand the latitude of the city is to not just see it as a collection of systems and environments alone, rather as a collection of various constituents, municipalities and circumstance.

Cities are places, which give us the opportunity to meet strangers, mysteries and unknowns – each entity and situation informing a very different understanding about the non-anthropocentric lives beyond our own. To understand the layers of influence and interconnections that define the city simultaneously is impossible. They require multiple urban agents to understand the byproducts of our material and technological culture and the consequences on our health and the environment.

Cities are shaped by advances in technology and are altered by the gravity of political, social and economic activity. As such, they require multiple indicators to understand the scales and programs that influence the design and planning for these urban networks.

Cities are not devoid of human influence or ideas; they are highly impacted by both human and non-human formations. Over time, these urban formations have the potential to generate new spatial, experiential frameworks for the city; and the urban agent provides us with a gauge to measure the influences of these formations.

URBAN AGENTS

"To draw a carp, Chinese masters warn, it is not enough to know the animal's morphology, study its anatomy or understand the physiological functions vital to its existence. They tell us that it is also necessary to consider the reed against which the carp brushes each morning while seeking its nourishment, the oblong stone behind which it conceals itself, or the rippling of water when it springs toward the surface. These elements should in no way be treated as the fish's environment, the milieu in which it evolves or the natural background against which it can be drawn. They belong to the carp itself, insofar as it is not defined as a distinct form capable of a set of movements or as a particular organism performing a series of functions. Instead, the carp must be apprehended as a certain power to affect and be affected by the world. In other words, rather than a formed and organized individual, the brush should sketch a life, since a life is constituted simply by traces left behind and imprints silently borne."[3]

Over half the world's inhabitants live in urban environments. Understanding, re-imaging and engaging the urban condition, with all its complexities and idiosyncrasies has become a pressing issue for architects, landscape architects, and urban designers alike. In the second undergraduate design-research studio – the Connections Studio – students investigated system(s)/environment(s) relationships through the examination of qualities, behaviors and territories for a select set of urban agents. Each student's investigation revealed latent, suppressed, emerging, provisional, and otherwise unmapped connections, which influenced the space of existing urban networks and urban formations.

In the first phase of the studio, students were asked to examine the built environment through a non-human agent, which became the indicator and lens through which they interpreted and re-imagined an urban context. Through research methodologies based on observational, analytical and representational techniques, students examined the metric, logic and operations of the selected urban agent to provide an opportunity to step out of one's own anthropocentric understandings of the systems and environments that surround us and to sharpen their knowledge of the interconnections, correspondences, and continuities that constitute these surroundings.

Experiencing the perspectives of these urban agents exposed the city – its cultural identity, historical footprint, built infrastructure, expansion and growth – in unforeseen ways. And the collective experiences of these urban agents informed and affected our spatial notions and design strategies for built form. The urban agent's metrics identified its formative and behavioral identity through a set of diagrams and maps that described the shaping of its form and structure including its unique rules, hierarchy and organization. In addition, the logic and operations identified the spatiotemporal dimensions and territory of the urban agent, which was represented

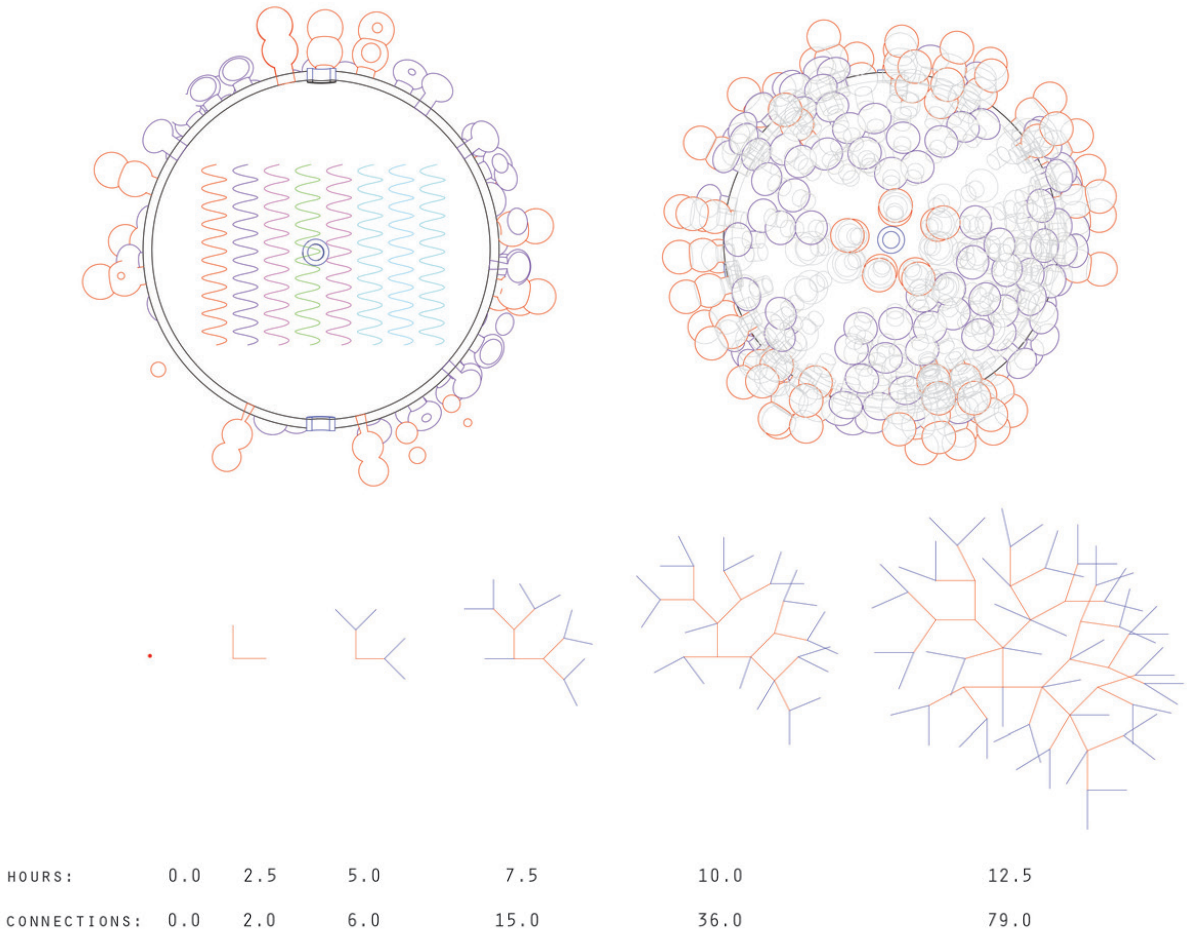

Figure 01: Urban Agent – A virus.

visually through diagrams that depicted the cycles, flows, interactions, etc. These defined unique procedural and generative trajectories for each student's project as they progressed to the next phase (Fig. 01).

The selection of urban agents was intended as non-human entities that were common and ordinary figures in the everyday fabric of the constructed environment. These included the apple, bee, brick, mosquito, newspaper, pigeon, plastic bottle, pollutant, smog, rat, virus, weed, and so on .

URBAN NETWORKS

In the second phase, students were asked to evaluate their research through a particular focus of enquiry based on their previous research ideas and methodologies. Using mappings as a form of experimentation and information visualization, students considered these next steps as an evolution to the urban agent's narrative and a means to programming and simulating the urban agent within an urban network.

Each student investigated information profiles classified by available Google Earth + Geographic Information Systems (GIS)[4] data sets through a series of maps, animations and physical models that explored the qualities of the absolute, the relational and the relative.[5] The production of their research culminated in a refined set of visualizations that depicted the urban agents' anatomical or structural physiology, flow charts with input(s) and output(s), timelines, perception mappings and field-line drawings (Fig. 02 & 03).

Four categories of socioeconomic and spatiotemporal data sets were collected and examined in order to reveal these potentially latent connections between the urban agent and its territory, occupation, and trends.

• City Typologies – urban form and pattern, land, program.

• Infrastructural Networks – modes of transportation, energy, telecommunications, materials.

• Environmental Dynamics – hydrology, topography, geology, flora and fauna, climate.

• Societal Flows - social and culturalactivities, economic structures and subcultures.

In event to this research, students considered these questions:

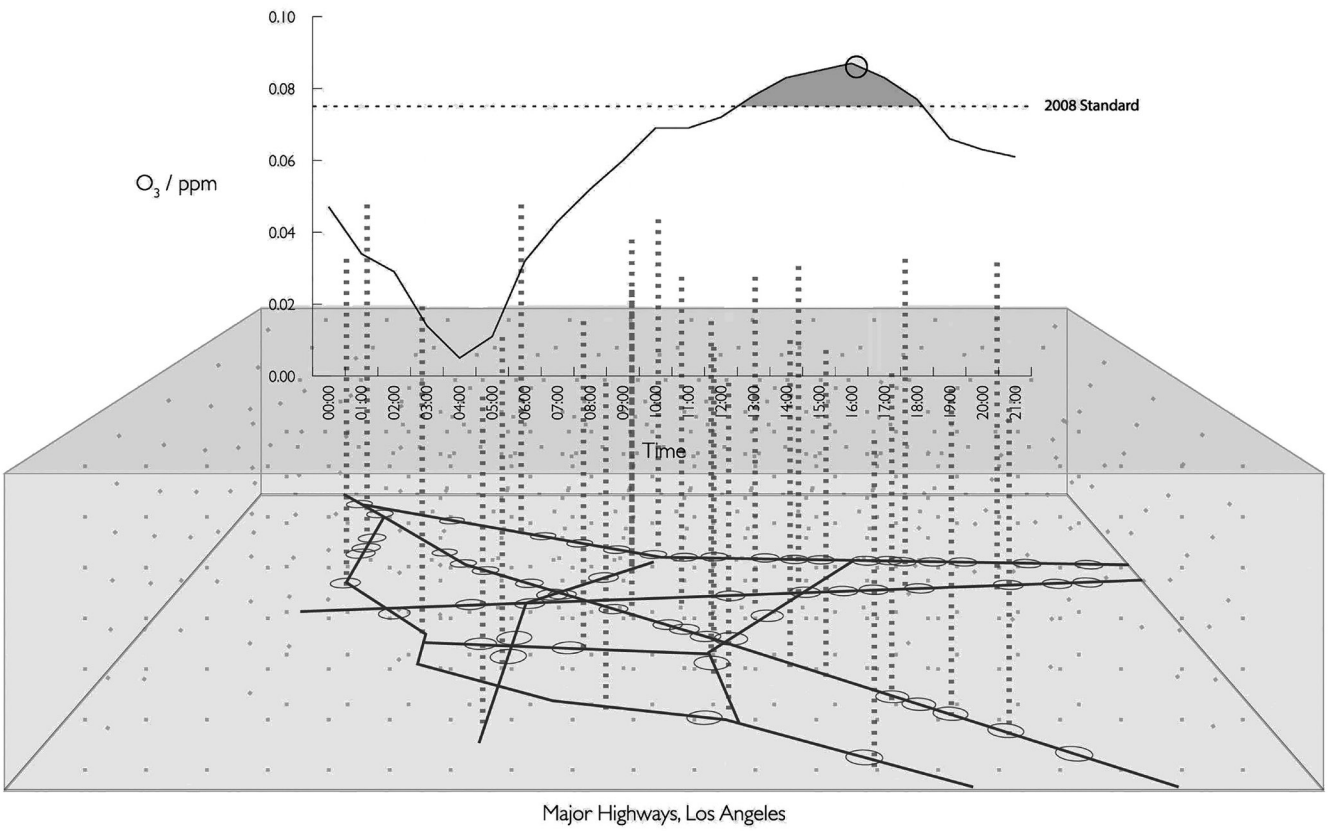

Figure 02: Urban Networks – The mapping of smog on major highways in Los Angeles, CA.

How does the urban agent occupy, appropriate, manipulate, adapt, reconstruct or otherwise operate in a specific urban network? What are the specific infrastructural and ecological systems that the urban agent operates within? How would looking through the lens of an agent expose and/or transform the appearance, focus and scale of the city's perspective in unexpected ways? How does revealing this alien perception of the city become a basis for architectural design and a way to ameliorate the health of the built environment?

URBAN FORMATIONS

"The architect's role is to make that information physical and experiential, taking it out of databases and making it engage social life and the contemporary city as we try to solve environmental problems, housing problems, and educational issues connecting different communities."[6]

In the final phase, students were asked to design and develop an urban formation from their study of the urban agent and its corresponding urban networks. The intervention was meant to be a deployment of imagined strategies for a selected site, sequence and perception for its visitors. The design projects represented in the studio ranged from the speculative – i.e. city-scale smog vacuums and light-based virtual displays that alerted emergency activity – to the practical – i.e. integrated food systems with transporation infrastructure and re-examined housing typologies that were considerate to the repopulation of bee habitats.

INTERDISCIPLINARY DESIGN EDUCATION

Design education prepares students to not only solve a range of problems, from the imaginary to real, but to use and modify the tools and technologies of the design process to solve extraordinary problems through unconventional means. As a consequence, the development of new tools and technologies for practice can emerge, and on some occasions, even become a problem or research project unto itself. As an example, the use of animations and videos – once considered auxiliary and extravagant – today, they have become essential mediums for design expression, especially when environments of flux and indeterminacy are the context for measurement and performance. Our traditional medium of design expression has expanded from 2-D projections, e.g. plans, elevations, axons and perspectives to 3-D and 4-D digital models that include real-time data visualizations and virtual and augmented realities.

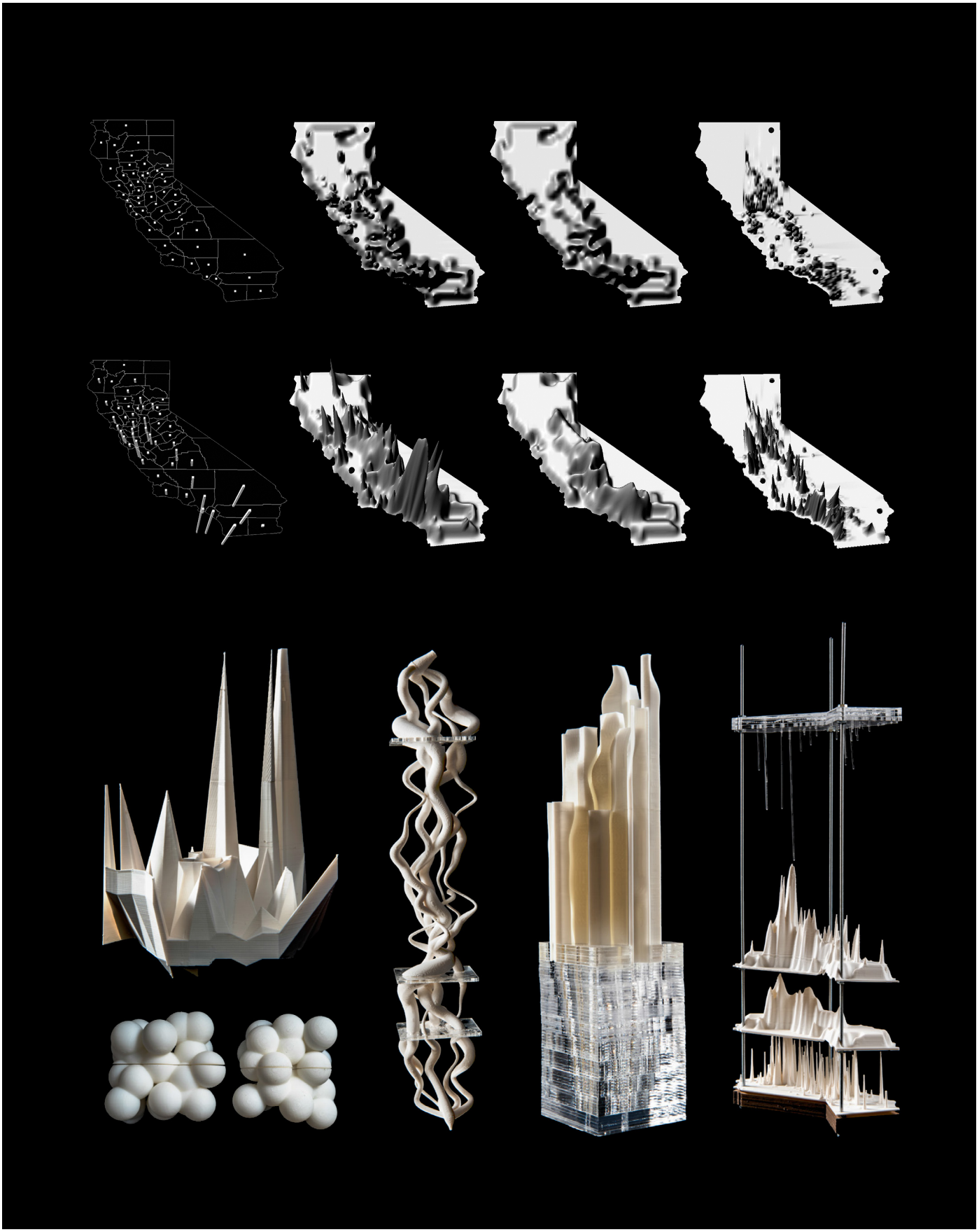

Figure 03: Urban Networks (collective digital and physical models)

Along with personal laptops and smart tablets, the students in the studio had access to multiple projection screens for digital pin-up and video conferencing. The fabrication facilities were also amenities to the studio; and these included the wood shop, laser cutters and 3-D printers. The ceiling grid in the studio space was outfitted with 3-D sensors, cameras, speakers, and additional projectors that were supported by a web-based presentation platform. During the course of a studio session, students had the potential to three-dimensionally model an idea on their personal laptops and digitally fabricate physical prototypes within a few hours. The digital presentation media provided a democratic review process allowing the studio an enhanced level of collaboration with its open display, permitting the sharing and convergence of ideas. In addition, it coordinated students to present free from the constraints and cost of paper printing and plotting.

The studio space has drawn greater visibility and opportunity from individuals in other departments such as medicine, business, law, as well as other university organizations and research centers. Each stakeholder has become a unique contributor to the studio space's overall vision through organized events including charrettes, competitions and hackathons.[7]

Interaction and dialogue commonly took form between an instructor and an individual student; however, several variations – both formal and informal – emerged during the semester. Students were consistently active and engaged participants, as both presenter and critic; and the space allowed for this programmatic flexibility, allowing students to focus on individual work, and yet simultaneously participate in group work and discussion. With instruction and critique, students could also exercise their interpersonal skills and collaborate by freely commenting and offering feedback to one another's projects.

CONCLUSION

"The 'life of the city' can be reduced neither to the rational functionality of the modern city nor to the nostalgic and colorful pastiches of the past. The challenge for urbanists is how to combine rationality with imagination, the prosaic with the dream world, the planned with the unexpected – the city as the site of multiple representations and multiple desires."[8]

Imagination is an act or power of forming a mental image of something not present to the senses or never before wholly perceived in reality. Imagination is a creative ability, the ability to confront and deal with a problem. Imagination is a creation of the mind, a fanciful or empty assumption.[9]

In contemporary education, imagination is too often aligned with the last definition. But the first definition, suggests the ability to envision the future and to make connections between unlikely things with underexplored potential. Embedded in this definition is also the suggestion towards establishing new avenues for interdisciplinary design thinking and learning.

An interdisciplinary design education carries the many benefits to the domains of architecture and beyond. Through an ability to reframe problems, a development of communication and collaboration skills, along with a digital literacy, students can think laterally between and among the different disciplines. Digital literacy in itself has become a modern necessity for students, and today's students need to be aware and competent of the latest tools and technologies, such that they are even expected to hack them towards new and novel applications for health and the built environment.

ENDNOTES

1. Reyner Banham, *The Architecture of the Well-tempered Environment* (Chicago: The University of Chicago Press, 1969), 18-28.
2. Lev Manovich, "Information and Form: Electrolobby at Ars Electronica 2000", *Ars Electronica 2000: Festival for Art, Technology and Society* (Linz: Ars Electronica Linz GmbH, 2000).
3. Michel Feher and Sanford Kwinter, *Zone 1/2: The [Contemporary] City* (Cambridge: Zone Books, 1986).
4. Bill McGarigle, "Mapping Places and Spaces", *Architectural Record* 190(6): 180-184. GIS is *"a geographic information system, a type of software system, enables a user to link any amount or kind of data to a location with either geographic- or user-defined coordinates. The data can be analyzed to find relationships and trends, and results can be visualized in 2D or 3D map layers, each representing a distinct group or class of information, such as wetlands, wildlife habitats, crime statistics, or demographics (much like the layers of a CAD file that represent different elements of a building). The amount and type of information that can be associated with a spatial or geographic location in GIS is virtually unlimited, and the data can be integrated with imagery and other objects, stored in databases, and distributed as interactive maps via the Internet or other electronic means…. The last few years have witnessed the growing use of GIS as a tool for defining the context in which we build structures and develop cities and for understanding the effects of proposed design on their surroundings."*
5. David Harvey, "Space as Keyword" (paper presented at the Marx and Philosophy Conference, Institute of Education, London, May 29, 2004). *"Absolute space is fixed and we record or plan events within its frame. This is the space of Newton and Descartes and it is usually represented as a pre-existing and immoveable grid amenable to standardized measurement and open to calculation…. The relative notion of space is mainly associated with name of Einstein and the non-Euclidean geometries that began to be constructed most systematically in the 19th century. Space is relative in the double sense: that there are multiple geometries from which to choose and that the spatial frame depends crucially upon what it is that is being relavatised and by whom…. The relational view of space holds there is no such thing as space outside of the processes that define it. Processes do not occur in space but define their own spatial frame. The concept of space is embedded in or internal to process. This very formulation implies that, as in the case of relative space, it is impossible to disentangle space from time."*
6. McGarigle, "Mapping Places and Spaces", 180-184.
7. The HILT Room, *Gund* 522, http://research.gsd.harvard.edu/gund522
8. Mohsen Mostafavi, "Tale of Cities", *The Life of Cities* (Zurich: Lars Muller, 2012).
9. *Merriam Webster Dictionary*, www.merriam-webster.com.