AUTOMATIC | MACHINE LEARNING, ROBOTICS, LABOR, AND ENVIRONMENT

Advanced Studio 4
Columbia University Graduate School of Architecture, Planning and Preservation
Critic: David Benjamin

OVERVIEW

In May of 1997, the world's best human chess player, Garry Kasparov, sat down to play the world's best computer, IBM's Deep Blue. Ten years before, Kasparov had boasted, "No computer can ever beat me." But the recent progress of computation seemed impressive and potentially game-changing. In the lead-up to the competition, the battle had been dubbed Ali-Frazier.

Near the end of the first game, in the forty-fourth move, Deep Blue a made highly unusual play, sacrificing a rook while ahead, which seemed to hint at a sophisticated strategy of preventing countermoves. Kasparov was rattled. He could not comprehend why the computer made the move, and he feared that it demonstrated a superior intelligence. The game ended in a draw, but at the beginning of the next game, Kasparov made an unprecedented error, and Deep Blue went on to win the epic battle. According to a report in Wired Magazine, "The chess world found it devastating. 'It was too much to bear,' said grandmaster Yasser Seirawan. The cover of Inside Chess magazine read 'ARMAGEDDON!'"

In 2012, long after computers asserted their dominance in chess, one of the inventors of Deep Blue revealed that the fateful forty-fourth move had been due to a software bug. According to writer Nate Silver, "Unable to select a move, the program had defaulted to a last-resort fail-safe in which it picked a play completely at random… Kasparov had concluded that the counterintuitive play must be a sign of superior intelligence. He had never considered that it was simply a bug." In the end, the computer won not because of an innovative strategy, but because the human was prone to worry and doubt and self-destruction. The human assumed that machine intelligence worked like human intelligence—and therefore the unusual move must have been a rational strategy. But the computer had a different intelligence altogether, one that was subject to bugs but not subject to weariness or worry. Neurologist Robert Burton elaborates, "The ultimate value added of human thought will lie in our ability to contemplate the non-quantifiable… Machines cannot and will not be able to tell us the best immigration policies, whether or not to proceed with gene therapy, or whether or not gun control is in our best interest." In other words, since machines cannot worry, and since worry and doubt are productive in creating humanistic, fair solutions to the problems of our time, humans will never be replaced by machines.

Yet in 2016, almost 20 years after the fateful computer victory in chess, Google's DeepMind defeated a human champion at the game Go, which was once considered a game for uniquely human intelligence. It was thought that Go was impossible for a machine to win due to the nearly infinite number of outcomes and the difficulty of calculating which player is leading at any given moment. Google's computer used a new version of artificial intelligence called machine learning, and this new victory may signal what Maksim Podolyak, a vice-president of the Russian Go Federation, refers to as the birth of a "new age—an age of computers able to resolve specifically humanistic problems." Machine learning is now being applied for financial trading, advertising, language translation, malware detection, computer vision, and countless other applications. And because of
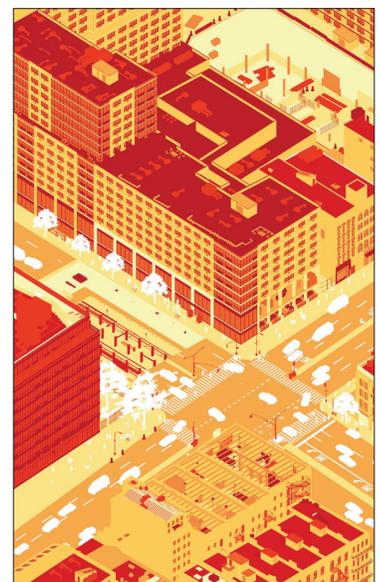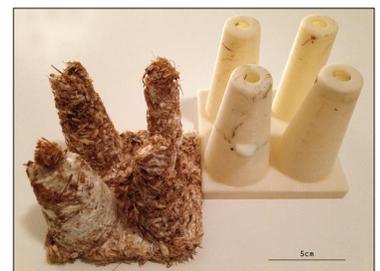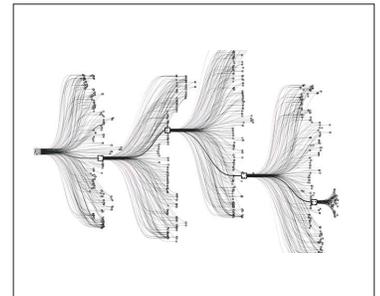
Images (top to bottom): Karl Lagerfeld / Chanel fashion show playing on the excitement and anxiety created by automation and robots; Chess match between Kasparov and Deep Blue (via Wired); Analysis of Google's AlphaGo "thinking" through its moves in a match against a human; New biogradeable material with 3D-printed mold (Benjamin Studio 5, Thomas Wegener); Visualization of embodied energy in materials (Embodied Energy Pilot Project at GSAPP).

its quiet ubiquity, this brings up questions about its use as well as its effectiveness. As with all technologies, machine learning involves assumptions and biases. But the biases of machine learning may be even more troubling than other biases because they are hidden, sometimes even hidden from their own inventors. This concept has been articulated by recent writing including Cathy O'Neil's "Weapons of Math Destruction" and Kate Crawford's "Artificial Intelligence's White Guy Problem." O'Neil and Crawford show how the biases of these algorithms can lead to racial profiling in policing, sexism in job listings, and uneven distribution of resources in urban neighborhoods. And their arguments imply that understanding algorithms requires understanding the humans who create them, the humans who are displaced by them, and the humans who are affected by their conclusions.

Perhaps the battles of chess and Go—and the growth of machine intelligence that they represent—suggest that it is important to become more fluent in algorithms. It is important to understand what's going on under the hood—including the bugs they contain, the data they are based on, and the rules that lead to their conclusions. This is crucial not just to be able to use the algorithms effectively, but also be able to guide, temper, and respond to their use. In other words, this is a political issue as well as a technical issue.

The ongoing story of humans and machines is a fascinating case study of technology in the 21st Century, and it sets the stage for Automatic: an architecture studio that engages technology, environment, buildings, infrastructure, landscapes, ecosystems, numbers, images, stories, values, trade-offs, nature, and climate change. The studio will combine technology with environment. It will explore the latest generation of algorithms, robots, and artificial intelligence—and it will interrogate several emerging frameworks related to themes of environment and technology, including the Circular Economy, Antifragility, and Hyper Nature. The studio will also examine a range of design approaches, including multi-scalar design, new materials, and new software techniques. Within this context, the studio will work on architecture for education, energy, labor, and water bodies. Over the course of the semester, we will generate proposals that are both quantitative and qualitative. We will produce metrics, narratives, and images. We will design rules rather than fixed forms. We will anticipate rapid change. And we will welcome shifting forces, unknowable crises, and uncertainty.

THE CIRCULAR ECONOMY

The Circular Economy is an emerging concept for a new era of design across multiple industries. This concept is based on creating ecosystems with two types of nutrients: biological nutrients that are designed to circulate without unhealthy waste products, and technical nutrients that are designed to circulate at high quality without material impact. The Circular Economy promotes renewable energy and materials with low embodied energy, but it also involves a broader range of open source scientific projects and solutions that are healthy in terms of environment, finance, and society. A recent report by the World Economic Forum explains, "In a world of close to 9 billion—including 3 billion new middle-class consumers—the challenges of expanding supply to meet future demand are unprecedented. Our current 'take-make-dispose' approach results in massive waste, and in the fast-moving consumer goods sector about 80% of its $3.2 trillion value is lost irrecoverably each year. The switch from a linear to a
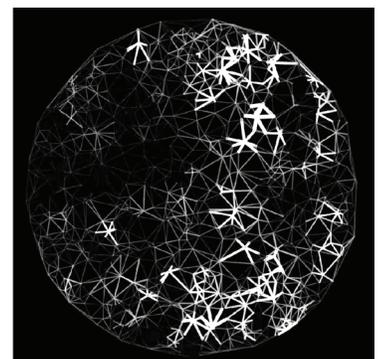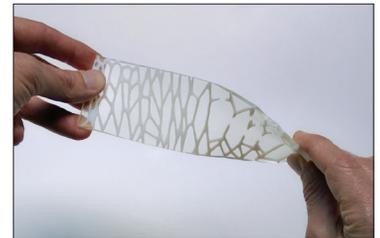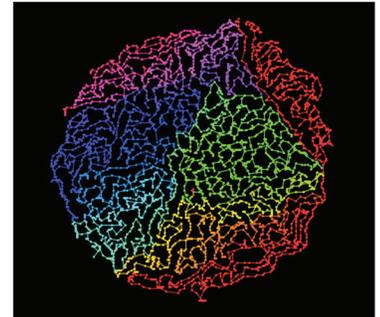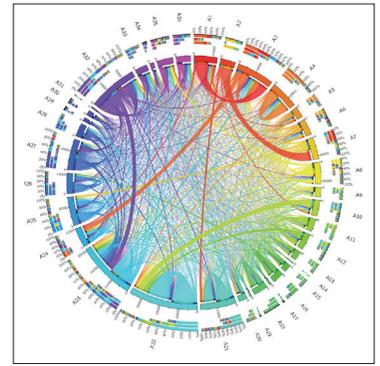
Images (top to bottom): Diagram of Circular Economy in Portugal (via MM & Random Thought); Data visualization of bacterial colony growth (Columbia Advanced Data Visualization Project, Danil Nagy); Pre-Circular Economy Global Supply Chain; Multi-material 3D print of new composite sheet (Bio Computation, The Living); Mycelium growth (Ecovative Design); Data visualization of animated hair (Columbia Advanced Data Visualization Project, Danil Nagy, Eitan Grinspun, David Benjamin).

regenerative circular economy provides credible and quantified perspectives to address this generational challenge. Ultimately the circular economy could decouple economic growth from resource consumption—truly a step-change." In this context, could we similarly aim to decouple building construction from resource consumption? How might we design buildings, landscapes, and cities as part of regenerative circular economies? Should the domain of architecture expand over space and time to incorporate global supply chains and recycling/composting of construction material? How should agency and responsibility be shared in this context? What are the social, political, and economic levers that designers might pull?

ANTI-FRAGILITY

In the context of climate change, resilient systems have become appealing as a model for design with shifting forces, unknowable crises, and uncertainty. In response to extreme weather such as Hurricane Sandy, multiple parties—including politicians, community groups, environmental activists, urban planners, architects, engineers, and the general public—are seriously considering resilient design as a strategy for rebuilding and resisting future damage. Yet some people argue that resilient systems are not enough. While resilient systems are defined as recovering quickly from stress, "antifragile" systems are defined as thriving and improving under stress. Nassim Nicholas Taleb, who developed the concept, states: "Antifragility is beyond resilience or robustness. The resilient resists shocks and stays the same; the antifragile gets better. This property is behind everything that has changed with time: evolution, culture, ideas, revolutions, political systems, technological innovation, cultural and economic success, corporate survival, good recipes . . . the rise of cities, cultures, legal systems, equatorial forests, bacterial resistance . . . even our own existence as a species on this planet." But is the concept of antifragility useful for architecture? Is it possible to design antifragile buildings, landscapes, and cities? How might we design with inherently dynamic ecological processes? How might our design strategies incorporate risk and change?

HYPER NATURE

If the Twentieth Century was the Century of Physics, then the Twenty-First Century is the Century of Biology. Biological technologies are advancing exponentially. In the past ten years, it has become possible observe living systems in new ways through high-resolution imagery, to create computer models of biological cells, to cut and paste DNA, and to combine biological functions such as growth, movement, sensing, deposition, regeneration, and self-healing into new organisms that never existed in nature. These developments allow us to imagine and design a new form of nature—a hyper nature. This concept of nature blurs old distinctions between the artificial and the natural. It involves biology, the environment, engineering, computation, and the problems and technologies of our times. But this concept is not limited to the technical realm. According to the publication Next Nature, "Hyper nature is culture in disguise." So what is new about the concept of hyper nature, and what is simply a rebranding of well-worn ideas? What is the architecture of hyper nature? Can we harness biology for design without fetishizing it? Is it possible to "collaborate" with natural systems and derive hypernatural designs that humans alone—or nature alone—could never create?

SCALES AND ENVIRONMENT

The studio will operate at multiple scales simultaneously. Over the course of the semester, we will rethink materials, buildings, site plans, and infrastructures. We will

Image: Collaboration diagram (Benjamin Studio 4, Muchan Park).
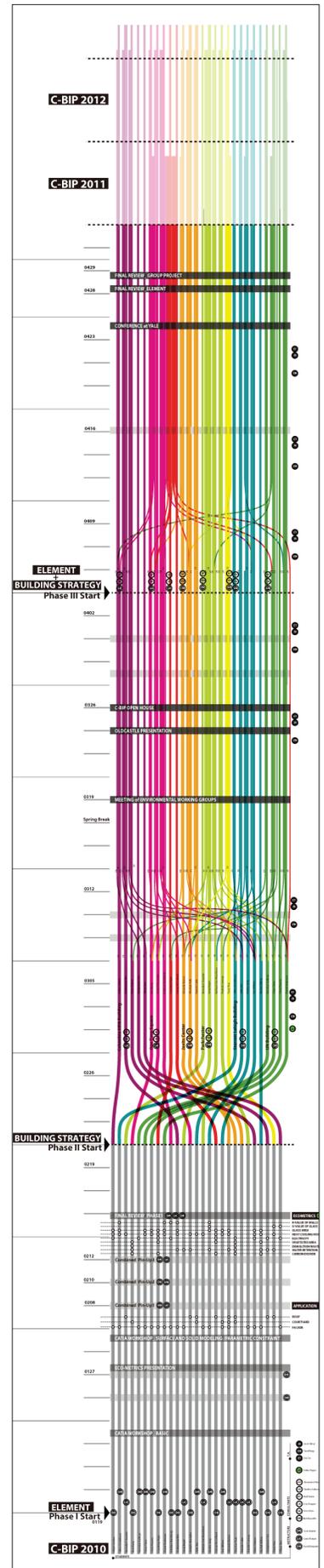
look at new multi-scalar paradigms that include robust biological and social dynamics, energy generation, and adaptability. We will explore design from the scale of material composition, including molecules with a diameter of about 10^-9 meters, to the scale of global production, including the earth with a diameter of about 10^7 meters—16 powers of ten in the same studio.

ENERGY AND LABOR

The studio will explore architecture, environment, and technology through the interrelated lenses of energy and labor. It is well known that buildings are major contributors to climate change (about one-third of the world's solid waste, energy consumption, and carbon emissions come from architecture). And energy is fundamentally related to materials as well as systems. (In the past fifty years, operational energy—defined as the energy for things like heating, cooling, and lighting—has in fact declined as a percentage of total energy consumption in buildings. At the same time, embodied energy—typically defined as the sum of all energy required to extract raw materials, and then produce, transport, and assemble the materials of a building—has rapidly increased.)

But energy is also fundamentally related to labor. In 1973, a young Swiss architect named Walter Stahel was looking for ways to save large amounts of energy in the construction industry. Instead of looking at technologies such as more efficient lighting or cooling, Stahel turned to behavior patterns and socioeconomic issues. Stahel and his collaborator, Genevieve Reday-Mulvey, eventually reached the conclusion that these problems could be best addressed by substituting manpower for energy. In a report called Jobs for Tomorrow, they wrote, "The creation of new skilled jobs can be achieved in parallel with a considerable reduction of the energy consumption through a prolongation of the useful like of materials and products." Stahel and Reday-Mulvey's line of thinking itself was not new. All accounts of industrialization involve the increase in productivity due to machines taking over the labor of humans, which translates to machines consuming energy (usually fossil fuel) to do work instead of humans consuming food to do work. But it was refreshing for Stahel and Reday-Mulvey to suggest that this trend could be selectively reversed through having humans take back some work from machines.

Of course much has changed since 1973, but Stahel and Reday-Mulvey's original argument about the need to look simultaneously at fossil fuel consumption and fulfilling employment is as relevant as ever—especially in light of the current wave of anti-globalization populism in Europe and the United States. Labor and environment should not be considered separate agendas. This studio will consider how architects might design jobs, machines, and materials as well as buildings, energy, and environmental impact. It will explore how labor and equality are necessary factors when considering urgent environmental issues.

PHYSICAL EXPERIMENTS: NEW MATERIALS, A.I., AND ROBOTICS

This is a hands-on studio, and we will apply our concepts to physical and digital designs and prototypes. Our physical experiments will combine our thinking about embodied energy, raw materials, re-use, and waste with old and new technologies for making. More specifically, this studio will work with physical automation through a new "friendly robot" at GSAPP that points to a new era of human-machine collaboration. Students will develop systems to use robotics not just for top-down precision fabrication, but also
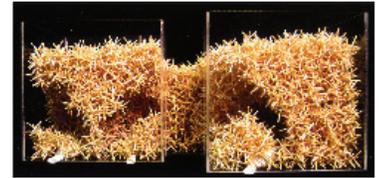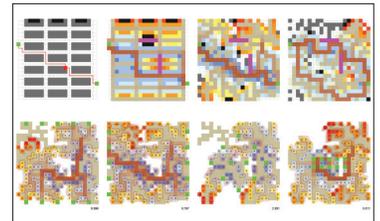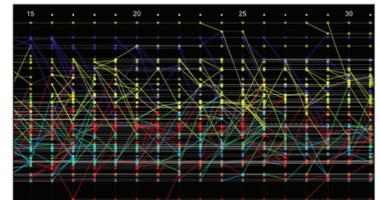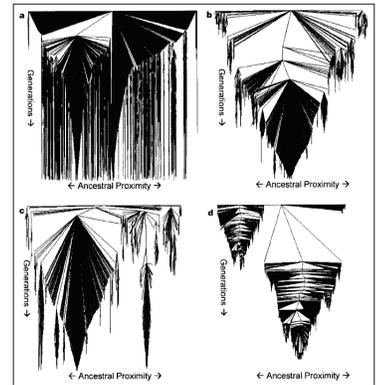
Images (top to bottom): Material ecologies (Neri Oxman, MIT Media Lab); Robotic processing of salvaged New York City scaffolding boards (Princeton Laboratory for Embodied Computation, by The Living); Evolutionary computation through generative design (Hod Lipson, Creative Machines Lab, Columbia University); Visualization of design space of 10,000 designs (The Living); Using generative design for program layout and robotic circulation (Benjamin Studio 5; Thomas Wegener).

for bottom-up feedback-based assembly. We will learn to program the Universal Robots UR3 and design systems for processing and constructing prototypes with salvaged materials. We will program the robot with rules rather than forms. We will rely on the robot's sensors to capture real-time information, and we will experiment with its ability to adapt and learn over time as a new form of artificial intelligence. We will create novel design ecosystems that combine high-tech and low-tech, digital and physical, control and emergence. We will engage advanced robotics as well as messy found materials. We will explore the next generation of robotics in architecture, as it tackles complexity, feedback, and machine learning. And at the same time, we will engage a return to craft and multi-material physical prototypes.

## DIGITAL EXPERIMENTS: NEW SOFTWARE AND GENERATIVE DESIGN

Our digital experiments will build off of our physical experiments and explore the emerging framework of generative design. This framework relies on recent advances in cloud computing, digital simulation, and data science. It involves designing goals and constraints (as opposed to designing formal solutions), and using automation to generate, evaluate, and evolve thousands or tens of thousands of designs. With this framework, we will use software to investigate data, to explore a very wide potential design space, to minimize our preconceptions, to avoid relying on old rules of thumb, to derive unexpected high-performing results, and to negotiate between competing architectural values. For our purposes, computation and optimization will not be about achieving cold-blooded efficiency—but rather it will be about enhancing our creativity. It will be about discovering possibilities that a human alone—or a computer alone—could never produce. Yet while this studio will explore new frontiers of design and computing, no prior experience with software is necessary.

METRICS + NARRATIVES + IMAGES

Metrics are inextricably related to climate change and our understanding of the natural environment. They are also entwined with almost everything about our current world. Metrics drive public health, personal health, election polling, global supply chains, search engines, social networks, and computer simulations of everything from airplane flights to hurricane paths to crowd behavior. Writers Michael Blastland and Andrew Dilnot declare, "For good or ill, numbers are today's preeminent public language—and those who speak it rule." But while numbers are more available and more important than ever, in many ways our understanding and use of them is confused and unimaginative.

In this studio, we will consider how architecture might be defined by an ecology of numbers—an ebb and flood of input numbers and output numbers. But we will also explore aspects of architecture and the environment that are difficult to quantify. We will engage theory, culture, and aesthetics. We will recognize that dealing with complex and urgent issues requires qualitative approaches as well as quantitative approaches. In a recent New York Times essay called "Are We Missing the Big Picture on Climate Change?" Rebecca Solnit explores the complexity of ecosystems, and she argues, "Addressing climate [change] means fixing the way we produce energy. But maybe it also means addressing the problems with the way we produce stories." As architects, we might add that addressing climate change means addressing problems with the way we produce images. With this in mind, our studio will explore a nuanced combination of designing with metrics, designing with narratives, and designing with images.

Images (top to bottom): Metric drawing (Benjamin Studio 4, Lindsey Wikstrom); Metric drawing (Benjamin Studio 5, Nathan Smith); Tower typologies; Generative design options (Benjamin Studio 5, Nathan Smith); Flexible space for education on Governors Island (Benjamin Studio 4, Xiaoyu Wang); Response surface as visualization of complexity of design space (The Living); Decentralized, self-organizing living pods for adaptive architecture (Benjamin Studio 5, Ray Wang and Jim Stoddart).
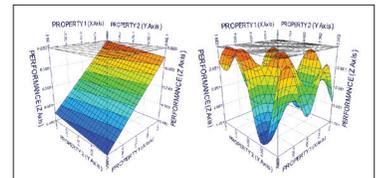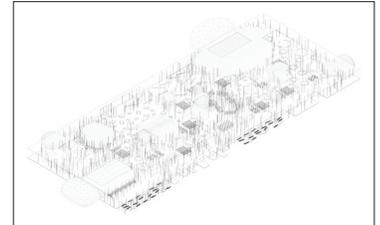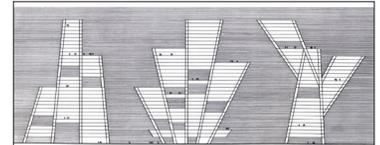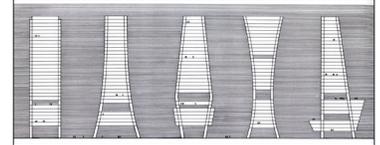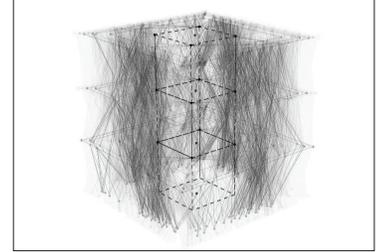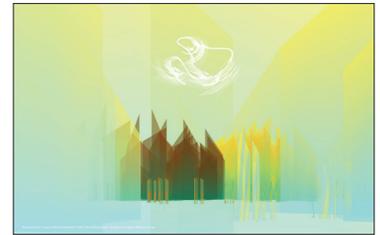
EDUCATION + JOBS + AUTOMATION

Automation involves more than technology. It is clearly affecting economics and employment. Many economists have noted that the loss of jobs in the Midwestern United States—clearly a major factor in the 2016 United States Presidential election—was caused more by automation than by trade deals. The same robots and algorithms that are exciting for designers can be devastating for workers who are displaced by them. But perhaps energy offers a clue to a new direction. According to a recent report by the U.S. Department of Labor, wind-farm technician is projected to be the fastest-growing occupation in America over the next decade.

This studio will address climate change through the architecture of education, energy, labor, and water bodies. Students will design a new mixed-use building for education and job training in the Brooklyn Navy Yard. The Navy Yard is currently playing out a complex and ambitious private-public partnership that aims to become a hub for entrepreneurship and to bring manufacturing back to New York City. The Navy Yard is also one of the waterfront sites in the city that is most susceptible to the rising sea levels and flooding that will come with climate change. In a sense, this site is ground zero for a new integration of technology and environment. Yet this is also a contested site, and our job training center will address the friction between the advancement of the people who program robots and the transformation of the people who have been upended by them.

This friction reminds us that "sustainability" has to be framed in social as well as environmental terms. As Jodi Dean has recently put it, "Just as a class politics without ecology can support extractivism, so can an ecology without class struggle continue the assault on working people that has resulted in deindustrialization in parts of the North and West and hyperindustrialization in parts of the South and East (we might call such an ecology without class struggle 'green neoliberalism')."

In this studio, we will engage both a new form of technical education and an expanded waterfront as classroom. We will engage both the traditional campus and an expanded city as campus. We will think about the future, and design for the present, encompassing new models of environment and technology into our projects, and producing visionary and viable buildings.
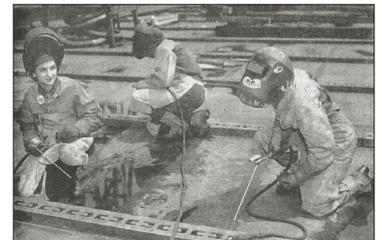
Images (top to bottom): Brooklyn Navy Yard; Same; Tesla factory with reconfigurable robots; Labor in Brooklyn Navy Yard; Future food building in Brooklyn Navy Yard; Brooklyn Navy Yard; Fly By Night art performance in Brooklyn Navy Yard; Same.

Advanced Studio IV
Spring 2017
Dong Ping Wong - dpw@familynewyork.com and Oana Stanescu - os@familynewyork.com

The Experience is Everything
The hypothesis for this studio is that experience is key to changing how we think about the environment.

The main assumption is that the visceral experience of water is an essential part in creating a shift in people's understanding of this natural resource.

To truly transform our relationship to water, we must first develop a deep appreciation of water through touching, feeling, smelling and tasting water. Only an inherent appreciation of our natural resources will shift the challenge of climate change from an abstract responsibility to a visceral belief, and create lasting and measurable political, social and technological progress.

The studio will explore design environments that not only change how we use water, but also how we fundamentally think and care about water.

The design process will be driven by the refinement of an experiential concept. In parallel to the site and programmatic research and architectural design development, students will be asked to create an experiential collage/ sketch each week.

Schedule
First day of studio - January 19th
Mid Review - week of February 27th
Final Review - week of April 24th

Program
The program of the studio is a "Water Center" - a building or campus focused on bringing together all aspects of water - recreation, health, science, policy and industry - with the singular intention of changing how the public understands the very natural resource that physically defines New York City (and 90% of the largest cities in the world). A place for all things water.

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The space program includes:
- Swimming Pools and Facilities
- Marine Biology and Hydrology Labs
- Boat Building Workshop and Storage
- Classrooms
- Lecture Halls
- Galleries
- Event Space
- Public Lobby
- Administrative Offices
- Restaurant
- Cafe
- Garden
- Water Center Store
- Library and Research Center

The 300,000sf program includes 100,000sf of student-chosen program. A detailed program table will be provided at the beginning of the studio.

Site
The site is the southern half of Governor's Island, non-historic part.

Readings and References

Mapping Three Decades of Global Water Change
http://www.nytimes.com/interactive/2016/12/09/science/mapping-three-decades-of-global-water-change.html
Photographing the Impact of California's Water Crisis
http://lens.blogs.nytimes.com/2016/11/07/photographing-the-impact-of-californias-water-crisis/
Food Water Footprint
http://graphics.latimes.com/food-water-footprint/
From the gutter: How your litter ends up in the ocean
http://www.latimes.com/visuals/graphics/la-me-g-snapshot-storm-drains-20150401-htmlstory.html
 Christo - A Walk on Water
https://www.nytimes.com/video/arts/design/100000004476178/a-walk-on-water.html
Moses Bridge
Rain Room by Random International
The Weather Project Olafur Eliasson
James Turrell
Dream House - Mela Foundation NY
Marina Abramovic Institute - OMA
Spa Castle
Chelsea Piers
Lincoln Center
Rolex Learning Center SANAA
Therme Vals - Peter Zumthor

Relevant Water Organizations
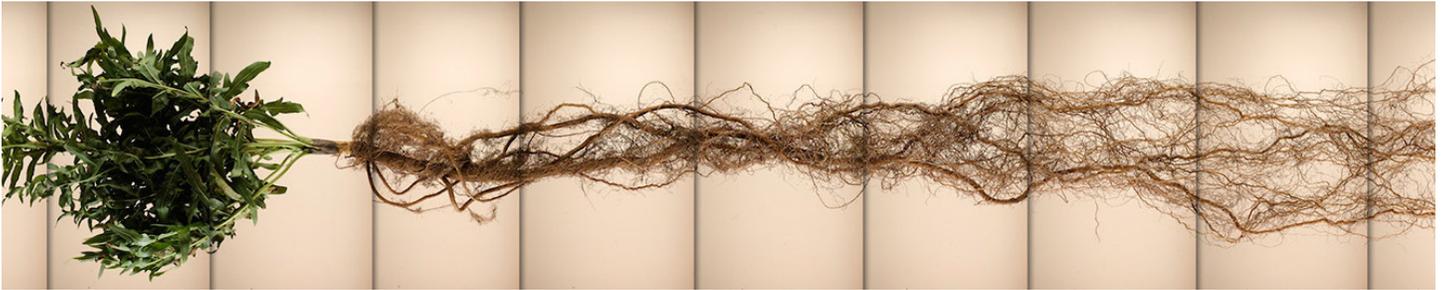River Project
Harbor School
Waterfront Alliance
Columbia Water Center (part of the Earth Institute)

ANTI-FRAGILITY: CROP DIVERSITY & CLIMATE CHANGE

Advanced Studio 4 - Spring 2017
Columbia University Graduate School of Architecture, Planning and Preservation
Critic: Caitlin Taylor

Introduction

Agricultural production exists at a particularly fertile intersection between the common themes of Studio 4 - scale, technology, environment, circular economics, resilience and anti-fragility. Nowhere is the environment more intimately interwoven with technological advancement than in modern farming practice, the privileging of productive landscapes via control and mechanization. Farming is a complex system of inputs and outputs (embodied energy, nutrients, labor, sunlight, water cycles, climate patterns, economies, government incentives, nourishment, corporate colonization, scientific discovery, environmental impact) that reveals the interconnection of global forces, but is also necessarily local and literally rooted to its place.

A looming food crisis calls into stark relief the reliance of our food system on increasingly fragile industrial-scale monocultures. 10,000 different varieties of wheat once grew in China alone; now the documented number is well below 1,000. 6,500 species of apples that once grew in North America have gone extinct. Meanwhile, corporate monopolies introduce new monocultural crops that are genetically modified for increased productivity but dramatically upend local ecological balance.

Mechanical radii of new machines map the historical ideals of technocracy across the modern landscape, while computerized management tools privilege homogenizing ecologies as the pseudo-scientific answer to a technocratic social order. Automated systems are built whereby food production is a result of optimized chemical inputs, satellite communications, remote sensing devices and GPS tracking. Lockheed Martin's tractor-based technologies measure 13 weather parameters in 15 minute increments and send the data to a computer in the field. 430 gauges per 10 acres measure irrigation and yield measurements are taken every three seconds during harvest. Constant feedback informs the automated input systems - seeds, fertilizers, and pesticides are dispensed accordingly. Local difference disappears.

Agricultural monocultures, like all fragile systems, fail when subject to stress. Invasive pests find new opportunities for growth, soil degrades, fields erode, and ecological equations are imbalanced as native species die off en masse. Meanwhile, climate scientists have issued a call to action - global food production requires climate-ready crops within two breeding cycles. In the face of a rapidly changing climate, the resilience of our global food system relies on genetic crop diversity, which provides an invaluable resource in the form of a multiplicity of options. The effect of genetics and evolution in agricultural methodology is inherently anti-fragile because annual growth cycles provide an opportunity for constant adaptation. The most resilient germ lines reveal themselves under stress.

One notable response to this recent discourse in agriculture has been the formation of seed banks, which have been designed to protect and preserve the genetic information of our modern crops for use at some unknowable

future point when our food supply requires a complete reboot. Though many scientists believe firmly in the merits of these seed banks as insurance policies against a global food crisis, there are as many critics that identify limits to the centralized model of corporate and governmental management. Critics claim that crop diversity and resilience depends on farmers' ability to quickly adapt and scale based on changing conditions, without needing to wade through corporate hierarchy to access trademarked seed stock. Though both scientists and farmers aim to leverage genetic data for increased resilience in our food system, their methods of doing so are at odds.

Studio Framework
The Hudson Valley is a productive territory on which to study these issues, as it is both an agricultural hub in the northeast (New York City's most proximate "foodshed"), and a crucial component of the New York City watershed. Within the context of the larger Studio 4 curriculum, we will seek to understand the watershed as a water body with particularly complex environmental, political, ecological, and infrastructural control. The resilience of the watershed will be analyzed specifically as it relates to agricultural production in the Hudson Valley, projective climate change scenarios, and New York City's unmet demand for local food.

In collaboration with the NYC Agriculture Collective, students will locate their work precisely within the networked landscape of food production surrounding New York City and imagine future scenarios in which climate change has redesigned those landscapes according to new environmental variables. Specifically, how food is grown and travels from the Hudson Valley into the metropolitan area will be understood as a key infrastructural pathway in the face of a changing climate, and the resilience of that pathway will be examined at multiple scales.

Typical architectural signifiers of quasi-urban agriculture include micro-scale rooftop gardens, vacant lot community gardens, and unrealized designs for vertical urban farming; these models sometimes succeed on an individual basis, but, though they are not ruled out entirely, we go into this studio suspicious of their many requirements and limited production potential.

Multiple scales will be studied simultaneously - from the genetic data of indigenous crops to the biotechnology enhancing productivity, from the scale of a single plant to the deep soil section of native grassland root structure, from a field to a networked urban food system. We will learn from farmers and ecologists about the intelligence of native ecologies, and what information is preserved along with genetic diversity. We will study politicians, corporations, and governments through history as they defined the singular economic power of crop subsidies and incentives. We will learn from scientists about how to preserve genetic diversity in seed banks, and about bioengineering advancements in crop productivity.

We will ask what wisdom the agricultural resilience practices of crop rotation, diversification, pollination, seed banking and intercropping can lend to our urban ecologies. We will ask how architecture can act as a mediator in the fraught relationship between biotechnology research and local agricultural intelligence.
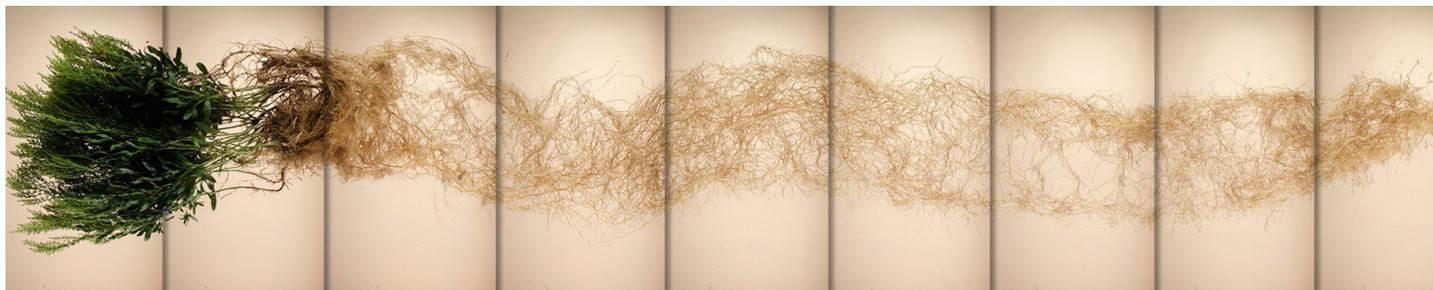
Program and Site

The program for this studio will be a crop breeding research facility and seed storage vault, with associated agricultural production landscape, for the Hudson Valley Farm Hub. The Farm Hub is an existing non-profit center for research and education located in Hurley, NY that provides farmer training, hosts research, promotes an equitable food and farm economy, and acts as an educational resource for area farmers. Located between the Ashoken Reservoir and Esopus Creek, just upriver from the arterial Catskill Aqueduct, the Farm Hub is currently developing an applied research program for the Hudson Valley that will focus on resilient agriculture and climate-smart farming. At the building scale, students will design a home for this initiative within an anti-fragile food network. As all students in Studio 4 will be asked to grapple with the Circular Economy, in this section we will examine the buildings and landscapes designed in each project according to their inputs and outputs, and ask what role architecture can play in shaping the discourse around agricultural production for our cities.

While the primary site of building-scale intervention will be a research and education facility for the Farm Hub in Hurley, NY, each student's work will also take a clear position on future climate scenarios as they relate to the Hudson Valley as a foodshed and watershed for New York City. Design work will include an investigation into how innovative resilient landscapes can be replicable, scalable, flexible, and anti-fragile in a variety of rural, suburban, exurban, and urban conditions.

Schedule & Format
(detailed schedule to be discussed at the start of the semester)

Project 1: Research Framework (2 weeks) - As a studio we will develop a vocabulary with which to rigorously describe modern agricultural production and its effect on the landscape, to be catalogued in a booklet. Economic and policy drivers, tools of mechanization, methods of crop breeding and seed banking, and indigenous planting techniques will be studied, diagrammed, and analyzed for their spatial potential. We will read about the history of agrarian urbanism in order to position our discourse.

Project 2: Mapping of Hudson Valley as Foodshed and Watershed (2 weeks) - Students will perform a series of mapping exercises individually to understand the rural to urban continuum (and associated flows of energy, water, and food) of the Hudson Valley as it relates to New York City. Half the studio will analyze the foodshed and half the watershed, and this project will culminate in a pin-up where each student synthesizes their research into one large projective drawing that indicates the direction of their project moving forward.

Project 2 will include site visits to the Hudson Valley Farm Hub and Stone Barns Center for Food and Agriculture, where we will meet some of the pioneers of resilient agriculture and major farmers in the NYC foodshed.

Project 3: Farm Hub Research Facility and Agricultural Landscape
Building design and infrastructural networks will be designed according to a more detailed schedule to be developed at the beginning of the semester.

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KNOWLEDGE CITY

Knowledge and the City

In 1966, through an unsolicited proposal of "Potteries Thinkbelt," Cedric Price envisioned a transformation of a town-region of North Staffordshire in England, in which its functional territory was no longer defined by medieval town centers, an ideal grid, or other familiar administrative edifices. Instead, his plan appropriated the existing infrastructural network to produce a new framework for the city - education. Although unrealized, the project remains an important moment when knowledge production and its spatial mechanisms were proposed as the main drivers for the definition and transformation of the city. The new relationship between the ideals of the city (education) and the operations of the city (infrastructure, mobility, industry, technology, housing etc.), between the aspirations of the city and its environment, were articulated through the city-scale framework of "anticipatory architecture"[1] and the participation of the newly defined student body, the new citizens. Education was a "generator of urban location and form."[2]

Participating in the continuing discourse on the relationship between the architecture of education and the city, and acknowledging both precarity[3] *and* possibilities in knowledge in the context of a knowledge economy, this 2017 Spring studio, working with the expanded school program shared year-wide and as a part of the on-going research and studio series "Knowledge City," focuses on the typological investigations of experimental educational institutions and their less institutional counterparts. Exploring the possibilities of a novel architecture for knowledge production, exchange, and consumption, the investigation aims to challenge their familiar spatial and institutional formats, while utilizing the potentials in the typology of schools[4] to generate new configurations for collectivity in the city.

Experiments and Utopias

As a genre of architecture, educational environments have been one of the most instrumental experimental platforms to instigate new organizations and forms as well as new values and ideologies. The Groundscraper of Berlin Free University prompted the architecture of "Opera Aperta" attempted by Team 10 and others[5], and Ant Farm's inflatable "Clean Air Pod" that declared "air failure" at the1970 U.C. Berkeley campus pushed forward the typology of tactical inflatables, soft yet subverting. Challenging institutional and typological conventions in different ways, Herman Hertzberger's Montessori buildings explored configurations of ideal collectivity within the framework of "School as City," while Aldo Van Eyck's playgrounds across-post World War II Amsterdam spatialized the notion of learning dissociated from institutional enclosures, through the non-hierarchical, distributed design that asserted the idea of the city open to and re-imaginable by anyone. The Open Air School movement at the beginning of the 20th century, Neutra's indoor-outdoor classrooms, and the contemporary Edible Schoolyard Movement challenge the assumed boundary of the type and suggest its provocative permutations while articulating renewed ideals of the individual's place within the nature.

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[1] Isabel Allen, 'Anticipatory architecture: Cedric Price', *Architects' Journal,* vol.204 no.8 September 5, 1996, pp.20-21,24-25, 27-41
[2] Cedric Price and Paul Barker,'The Potteries Thinkbelt',*New Society*, 2 June 1966, pp.14-17.
[3] See the notion of precarity in the context of contemporary "Edufactory" and neoliberal knowledge economy in Aureli, Pier Vittorio. 2011. 'Labor and Architecture: Revisiting Cedric Price's Potteries Thinkbelt'. Log, No. 23. Anyone Corporation: 97–118.
[4] Banham, Reyner. "Megastructures in Academe." In *Megastructure: Urban Futures of the Recent Past*. New York: Harper and Row, 1976.
[5] See Eco's concept of "Opera Aperta" (The Open Work) adopted by Team 10 through the typology of Mat Building in Eco, Umberto. *The Open Work*. Translated by Anna Cancogni. Cambridge, Mass: Harvard University Press, 1989. (original publication 1962)

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The studio investigates historical experiments and their ideological and disciplinary contexts, as well as contemporary spaces of formal and informal knowledge production and exchange, to formulate positions and outline individual projects pertinent to the issues and priorities of the contemporary landscape. In the essay "Utopie Experimentale: Pour un Nouvel Urbanisme," Henri Lefebvre defines "Experimental Utopia" as "the exploration of human possibilities, with the help of the image and the imagination, accompanied by a ceaseless criticism and a ceaseless reference to the given problematic in the 'real." In the context of continuing socio-political and environmental crisis and deepening inequalities, the studio's work aims to utilize the program of education and learning as a platform for daring yet effective experimentation that speculates on the ideal relationships between the goals of individuals, institutions, and the city, and the agency and opportunities of architecture in the milieu.

Environments

Engaging the discussion on the environment shared year-wide this semester, the studio will explore multifarious and constantly evolving notions of the environment through the programs of knowledge. In a series of symposiums and discussions at MoMA in 1972 titled "The Universitas Project" Emilio Ambasz and the multidisciplinary participants including Manuel Castells, Umberto Eco, Jean Baudrillard, and Henri Lefebvre explored the possibility of "Institutions for a Post-Technological Society," "a new type of University concerned with the evaluation and design of our man-made milieu."[6] Despite the fact that the effort did not actualize and that it still invoked the familiar institutional structure of a university as a solution, the project was an attempt to "inquire into the nature of the man-made environment" and the role of design and agency of education in the context. The project sought to, through new modes of education, find the conceptual link to produce and communicate a more comprehensive thus more resistant definition of the environment, that connects and blurs the binary distinctions between the artificial and the natural, author and products, and most importantly the technical and the social.

> *If one begins with the affirmation that "man constructs his milieu," and if one refuses to reduce this "man" to a technical agent imbued with a universal and ahistorical rationality, then the problem becomes one of a social relation. The environment is no longer a physical "given," exterior to human action, but a particular form of matter (human and nonhuman), an expression, a relation among elements. But what elements? And the expression of what?* [7]

After 45 years, the key concerns of "Universtas" - the environment as a complex bio-techni-socio-political milieu; and the instrumentality of knowledge as a medium and a framework in the context- are still, if not more, relevant. The studio will investigates different readings and goals of the environments and their implications through strategically framed design interventions.

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[6] Emilio Ambasz, "Introduction." In *The Universitas Project: Solutions for a Post-Technological Society*, edited by Emilio Ambasz. The Museum of Modern Art, 2006.

[7] Manuel Castells. "Urban Symbolism and Social Movements: On a New Institution for the Study of the Urban Environment." In *The Universitas Project: Solutions for a Post-Technological Society*, edited by Emilio Ambasz. The Museum of Modern Art, 2006.

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Approaches

Acknowledging the significance and diverse potentials of the knowledge environment in the contemporary city, the studio will engage the possibilities in architecture of knowledge through a set of projects diverse in concept, location, and scale. The studio will start with a research and analysis effort through a review of relevant discourse and an overview of both historic and contemporary cases through readings and surveys. Following the initial overview, fact based investigations on selected topics or examples with focused research and analytic documentations will instigate the individuated agendas of the design projects to be set forth in the next phase. Initiating the design phase, the students will be asked to define a set number of project trajectories and outline basic framework, potential strategies, and the site(s) of interest pertinent to each project. The design work, revised through an iterative process in response to the ongoing investigations and dialogue within the studio, will be developed articulating the rationales and intentions at multiple scales and time frames regardless of the projects' physical bounds -from global and regional scales of intersecting networks and operations; and the urban scales of the newly defined collectives; to the architectural scale of buildings, systems, configurations, and their interfaces.

Manhattan as a Laboratory

Taking advantage of the infinite programmatic and demographic complexity, the studio utilizes the site of the never realized Universitas - Manhattan - and its extended water territories as a testing ground. The hard bound island of Manhattan has been the most potent paradigmatic site for the architectural and urban explorations for the past centuries[8]. The city of the consummate grid and the muse to the Manhattan Transcripts, the City of Captive Globe is where infinite "environments" are constructed, and their ideals are maintained. Through allegorical urban blocks of the Gotham City, the metaphors and metamorphosis of the city are conceptualized.[9] Manhattan obsessively "more interested in becoming than being" is also full of "unforeseen potential for conceiving a quite different notion of city."[10] Investigating the island's most rooted mechanisms and familiar manifestations as well as its hidden and connected geographies, time frames, and transformations, the work aims to explore diverse notions of environments and their ever critical implications in the contemporary city.

The emphasis of the studio is on the production of rigorously articulated architectural propositions that each engages the critical inquiry of the studio topic with a distinctive thesis. The following short list of examples of potential programs and institutional sites of experimentation and interventions are provided as a reference to briefly illustrate their potentials for engaging the program of education.

>   Halfway Houses
>   Center for Urban Pedagogies (CUP)

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[8] See the discussion of Manhattan and Venice as paradigm islands, in Stoppani, Teresa,*Paradigm Islands: Manhattan and Venice. Discourses on Architecture and the City*, Abingon, Oxford: Routledge, 2010
[9] O.M. Ungers, Werner Goehner, Hans F. Kollhoff, and Arthur A. Ovaska, *The Urban Block and Gotham City: Metaphors & Metamorphosis: Two Concurrent Projects*, Cornell Summer Session in Ithaca NY, (1976)
[10] Emilio Ambasz, "Manhattan:Capital of the 20th Century." In *The Universitas Project: Solutions for a Post-Technological Society*, edited by Emilio Ambasz. The Museum of Modern Art, 2006.

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KNOWLEDGE CITY

Pilot Universitas

Refugee Academies

Army Corps of Engineers - Prime Power School

Center for Land Use interpretation

School of the Future (www.publicsphereproject.org)

Correctional Educational Facilities

University Clubs

"Labs"

"Incubators"

Co-Located Research Institutions

Cornell Tech v 2.0.

City As School High School

Department of Education

New York Harbor School

And other institutions and examples

* *Group work for some portion of the semester will be encouraged but students will have options to work individually.*

* *Studio excursions to selected sites are being scheduled for February.*

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AUTOSCALE

Columbia University
Graduate School of Architecture, Planning and Preservation
A4004: Advanced Studio IV, Spring 2017
Vishaan Chakrabarti, Associate Professor of Professional Practice
Christopher James Botham, Associate of Architecture

ABSTRACT

Building on current trends moving away from vehicle-dominated lifestyles,[1] the studio begins with the assumption that 50% fewer vehicles are on the streets of Manhattan. Our focus of examination will not be the technology that renders this change, but rather the question of what to do with an extraordinary amount of new found space that can be re-appropriated from vehicular use. Throughout New York City today, 26.6% of our land area is taken up by streets.[2] Manhattan's land area is 22.829 square miles,[3] meaning that streets comprise just over 169 million square feet of space. This, combined with the area given to parking on our streets, means that a 50% recoupment of the space presents a crucial opportunity for the next evolution of Manhattan's morphology. How do we re-think the city if the dominance of vehicular traffic subsides? What do we do with all this new-found space currently taken up by vehicles throughout the city?

THE STREET AND THE CITY

One cannot experience a city without experiencing a street. Since the first permanent human settlements, a dichotomy between positive and negative space has been present: the positive being the built forms that shelter us, and the negative being the space between these built forms. Streets are the most common example of this negative space. They are the lifeblood of the city, serving as its circulatory system. Traditionally, streets were designed to the scale of the human. This is evident in any medieval town or medina, where foot traffic is predominant (Figure 1,2). As humans congregated in larger numbers, our cities grew and our technology necessitated larger streets to allow for different types of traffic. Thus, vehicles have since dominated the planning of our streets. Cars and trucks have overtaken foot traffic, and the pedestrian experience has become ancillary to vehicular traffic (Figure 3). The island of Manhattan provides us with a felicitous example of this change through time. Moving north up the island, the urban morphology transitions from the irregular street systems of the original Dutch settlement to the rigid and far-reaching gridiron (Figure 4). The streets themselves also transition from the human scale of Lower Manhattan to the vehicular scale of the gridiron. How does this affect the experience of the city? Does the larger street scale of the gridiron make for a better urban experience, or should our streets return to the scale of the human found in Lower Manhattan?

Along with the rise of vehicular traffic on our streets, the vehicles themselves needed a place to reside when not in use. In the urban context, vehicular parking has become a major part of the planning puzzle. Nearly every street in New York City gives at least one lane of traffic over to stationary vehicles, and most of these give two. Add to this the need for a new building typology (the parking garage) to handle the overflow of stationary vehicles, and one can easily see the impact that vehicles have had on the spatial experience of our cities.

[1] Moss, Stephen. "End of the Car Age: How Cities Are Outgrowing the Automobile." The Guardian, April 28, 2015. Accessed December 1, 2016. https://www.theguardian.com/cities/2015/apr/28/end-of-the-car-age-how-cities-outgrew-the-automobile.
[2] New York City Department of Transportation. Street Design Manual, 2015 Updated Second Edition
[3] United States Census Bureau. "2010 Census Gazetteer Files: New York Counties." 2010 Census Gazetteer Files: New York Counties. Accessed December 1, 2016. http://www2.census.gov/geo/docs/maps-data/data/gazetteer/counties_list_36.txt.

Figure 1: Brussels, Belgium. An example of a medieval street, planned around the human scale and without vehicular traffic.

Figure 2: Financial District, Manhattan. Irregular street pattern from the original Dutch settlement and pedestrian-only.

Figure 3: Midtown Manhattan. Vehicular traffic is given precedence, with foot traffic pushed up against building facades.
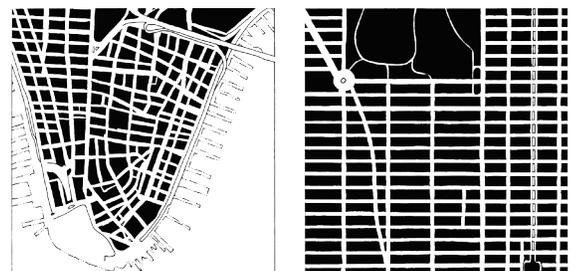

Figure 4: Lower Manhattan and Midtown Manhattan street grids. Irregularity versus regularity in street planning within the same city. (image source: Jacobs, Great Streets

AUTOSCALE

Columbia University
Graduate School of Architecture, Planning and Preservation
A4004: Advanced Studio IV, Spring 2017
Vishaan Chakrabarti, Associate Professor of Professional Practice
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STUDIO PROCESS

The semester will progress through four stages, focusing on multiple scales and themes that seek to integrate with and inform each-other throughout the process. The three scales to be engaged are that of the parking space, then multiple lanes on a city avenue block, and finally the highway.

Part One (Week 1): *Precedent research and data gathering*
Students will study the idea of the street through a combination of historic and contemporary precedents, and will compose a project thesis that outlines major themes to be explored throughout the semester.

Part Two (Week 2-3): *The parking space*
Working from data gathered in Part 1 and building upon the project thesis, students will design a re-appropriation prototype for a single parking space on a street on Manhattan. The redesign of this 10' x 24' space will inform the subsequent scale studies. The site will be near the water and is tbd.

Part Three (Week 4-5): *Avenue Lanes*
Moving up in scale, students will consider the re-appropriation of 50% of the lanes of a typical avenue block. The students should assume that the remaining lanes of the block will continue to be used for vehicular traffic. The site will be near the water and is tbd.

Midterm Review
Parking space and avenue block designs to be presented, focusing on 2D representation and study models. See studio requirements for specific deliverables.

Part Four (Week 7-12): *The Waterfront Highway / Linear City*
Continuing with project concepts from the first half of the studio, students will design a proposal for a stretch waterfront highway to be determined; the students should assume that half of the highway must still allow for the flow of vehicular traffic. The program should have an educational component of the student's choosing. The second half of the semester will deal with the intersection of architecture and large-scale urbanism, and will require students to implement ideas from the previous scale into the scale of a linear highway.

Final Review
Projects spanning all three scales to be presented. See studio requirements for specific deliverables.

In addition, throughout the semester particular attention will be given to representation and presentation skills. You will be required to develop a visual language that supports your project thesis, and to implement it at each pin-up and review. Drawing and models are the primary mode of communication for architects, and the studio will put emphasis on both throughout the semester. Presentation skills will also be developed and discussed. Dry-run presentations before each major review will allow for individual feedback and dialogue about presenting your work, as well as framing your argument through your drawings.

Figure 5: The island of Manhattan will be our lab. We will both engage and propose alternatives to the cityscape, all while simultaneously being sensitive to, and critical of, the existing state of the city.
Change is the only constant in New York City.
(image source: Google Earth)

AUTOSCALE

Columbia University
Graduate School of Architecture, Planning and Preservation
A4004: Advanced Studio IV, Spring 2017
Vishaan Chakrabarti, Associate Professor of Professional Practice
Christopher James Botham, Associate of Architecture

STUDIO REQUIREMENTS

In addition to weekly work to be completed, major milestones will require the following:

Midterm

Project thesis: 50-100-word concise statement of intent
Site plan of city block at 1/16” = 1’
Detail plan(s) of lanes at 1/8” = 1’
Street section(s) of city block at 1/16” = 1’, to compliment site plan
Detail section(s) of lanes at 1/4” = 1’, to pair with detail plan
Study model(s): at least one each for city block and individual parking space
3D perspective views (at least 3) of both the overall city block and the individual parking space

Final Review

Project thesis: 50-100-word concise statement of intent
Neighborhood analysis diagrams and sketches
Site plan at 1/64” = 1’
Detail plan(s) 1/16” = 1’
Street section(s) at 1/16” = 1’, to compliment site plan
Detail section(s) at 1/4” = 1’, to pair with detail plan
Study model(s)
Linked Studiowide Drawing and Model (to be explained)
3D views (at least 4): can be drawings or renderings
Any other supporting drawings or models that support your thesis

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Figure 6: We will consider the relationship between the city and its waterfront. Currently, Battery Park is the only place on the island where you can access the waterfront without engaging a freeway. (image source: Wikipedia)

Columbia GSAPP, Spring 2017
Advanced IV: Environment
Critic: Tei Carpenter
Contact: tei.carpenter@columbia.edu

Architectural Wilds

Examples of Hybrid Conditions Between Humans and Nature, left to right: A coyote riding Portland, Oregon's public transportation system; Plastiglomerate sample, a new rock made primarily out of plastic; Biologists transporting Bighorn Sheep by helicopter in the Sierra Nevada mountains to maintain population diversity and health; Bullock's Oriole nest, a bird nest made by the Oriole with human waste (photo: Sharon Beale).

"The range of attitudes, prescriptions, warnings, restrictions, summons, sermons, and threats that go with ecology seem to be strangely out of sync with the magnitude of the changes expected from all of us, the demands that appear to impinge on each and every detail of our material existence. It is as if the rather apocalyptic injunction 'your entire way of life must be modified or else you will disappear as a civilization' has overwhelmed the narrow set of passions and calculations that go under the name of 'ecological consciousness.' The camel seems to stand no chance of going through the eye of this needle. When the first tremors of the Apocalypse are heard, it would seem that preparations for the end should require something more than simply using a different kind of lightbulb…"

> - Bruno Latour, "Will Non-Humans Be Saved? An Argument in Ecotheology,"
> *Journal of the Royal Anthropological Institute* 15 (September 2009): 459-475.

"We start by thinking that we can 'save' something called 'the world' 'over there,' but end up realizing that we ourselves are implicated…Dark ecology undermines the naturalness of the stories we tell about how we are involved in nature."

> - Timothy Morton, *The Ecological Thought* (Cambridge: Harvard University Press, 2012), 187.

APPROACH
The studio will explore an expanded idea of environment that moves beyond the nature versus human dialectic to investigate an increasingly contemporary condition in which humans and nature can no longer be considered separate entities, but rather how the natural world and the human world are collapsing into one another. This approach to architecture recognizes the entanglements of human-made products and byproducts in its definition of the environment along with the strange and sometimes accidental ways in which natural processes have been hybridized, interrupted, changed or accelerated by human impact. Situated in the context of global warming and the Anthropocene, a new geologic era in which humans are now the dominant biogeophysical force on Earth, the studio will challenge prevailing sustainability discourse that tends toward short-term efficient solutions, objective metrics, and assumptions about maintaining a stable and pristine version of

nature. As an alternative, the studio will approach the environment as a dynamic set of processes, materials and behaviors that take into account duration and change over time.

In order to explore these concepts, the studio will develop techniques by borrowing from what philosopher Timothy Morton calls *dark ecology*, an approach that admits our coexistence with pollution, waste, and toxic human-made substances. For the purposes of the studio, dark ecology is an attitude as much as it is a category. Dark ecology has both aesthetic and material implications that point towards physical material cycles and larger material streams of inputs and outputs and closed and open loops, within an urban ecology. These systems of material exchange will be examined as larger transformative and contingent processes between human-induced waste, byproducts, and excesses to transform and affect existing conditions of geology, hydrology, and the environment at large. To that end, we will investigate and experiment with material both in terms of physical scale moving from the unit to larger systems of material exchange, while also analyzing the temporal scale looking both backwards and forwards in time at overall material life cycles and at transformative states of matter such as erosion, accretion, residue and contamination. Giving agency to nonhuman actors and forces such as water, wind, animals, flora, and seasonal change, the studio will consider site, materials and architecture not as static entities, but as embodying shifting dispositions in a constant state of flux. Locating new opportunities for architecture, we will examine the hybridization of humans and nature through a dark ecological lens as a productive framework to identify alternative potentials for material, form and perception.

The studio will develop multi-scalar material experiments, narrative scenarios and alternative future worlds that will account for temporal scales of process, sequence, and change. Using dark ecology as a lens for seeing and reading site and material throughout the semester, we will seek out radical hybridity and hybrid conditions as well as latent contaminants with transformative possibilities. The studio will operate as a test bed for rigorous experimentation and precise risk-taking through design to generate new knowledge, materials, artifacts and aesthetics.

SITE + PROGRAM
The studio will design a fourth satellite campus for the Brooklyn Academy of Science and the Environment [BASE], a public high school that emphasizes active, hands-on learning in the outdoors, beyond the classroom walls. Founded as a partnership between the Brooklyn Botanic Garden, Prospect Park Alliance, and the New York City Department of Education in 2003, BASE is an institution dedicated to incorporating nature into everyday life and to producing engaged citizens and stewards of the environment. As part of a civic infrastructure, the school operates as a publically-funded institution invested in the observing, monitoring and measuring of New York City's ecological resources. The testing ground for the studio will be in Sunset Park, Brooklyn—a demographically diverse neighborhood at the edge of New York Harbor—which will be the site for envisioning BASE's pedagogical framework shifting from the constructed natures of Prospect Park and the Brooklyn Botanic Garden to the post-industrial and compromised natures at Sunset Park. Formerly one of the main sites of industry and maritime trade in New York City, Sunset Park as a physical ground is rich in historical and geological layers of accretion and erosion dating back to glaciers carving out the area 60,000 years ago to more currently as a site of exchange for highly choreographed logistical operations such as the existing Sims Municipal Recycling Facility and Bush Terminal. Recently Sunset Park has been subject to scrutiny and a site of design interest in the development of the NYC Economic Development Corporation's Sunset Park Vision Plan (overturned in 2015), the NYC Brownfields Opportunity Areas [BOA] Community Resilience East River Industrial Corridor Pilot Plan, the Brooklyn Greenway Initiative, and the development of Bush Terminal Park by the NYC Department of Parks and Recreation in 2014. Moreover, major adaptive reuse projects in Sunset Park have recently transformed former industrial warehouses and factories at Bush Terminal and Brooklyn Army Termi-

nal into innovation and technology hubs such as the new Industry City complex. At a site of emerging hybrid natures, how can the design of a school—its own site of discovery—support exploration into dark ecologies and alternative environments to generate new architectural forms, materials and organizations?

SCHEDULE + LOGISTICS
The studio will meet Mondays and Thursdays from 1:30-6:30pm. On Wednesdays there will be lectures, collective workshops, and seminars across the Advanced IV studios from 3:00-5:00pm. Roving engineers will be available to provide specific expertise during the latter-half of the semester. A field trip to Sunset Park and accompanying sites in the area including Sims Municipal Recycling Facility will be arranged early in the semester.

A series of concrete exercises leading up to the final design project will develop a common conceptual framework and design approaches to the final project. These exercises will include exploration into site analysis through duration and mapping; intensive material experiments; material exchange studies; nonhuman actors; dark ecological techniques; precedent studies; and development of program and organization. Group work is encouraged, but not required.

Midreview: February 27 / March 2
Spring Break: March 13 - 17
Interim Review: April 3
Final Review: April 26 / 27

STUDIO CULTURE
The building of a body of collective knowledge and the exchange of ideas are essential to this course. Students are expected to foster a studio culture of positive collaboration and respectful critical discourse and should strive to engage and learn from one another. Students must work in the studio and be present during studio hours. All work must be backed up throughout the semester both on an external hard drive and in the cloud. At the end of the semester, students are required to submit their final materials (including model photographs) to the instructor via Google Drive.

REFERENCES
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Corner, James, ed. *Recovering Landscape: Essays in Contemporary Landscape Architecture*. New York: Princeton Architectural Press, 1999.

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Kubler, George. *The Shape of Time: Remarks on the History of Things*. New Haven, CT: Yale University Press, 1962.

May, John. "Against Sustainability." *ID Magazine* (Jan/Feb 2010): 20-21.

Morton, Timothy. *Dark Ecology: For a Logic of Future Coexistence*. New York: Columbia University Press, 2016.

Orff, Kate. *Towards an Urban Ecology*. New York: Monacelli Press, 2016.

Sanderson, Eric. *Mannahatta: A Natural History of New York City*. New York: Harry N. Abrams, 1013.

Soper, Kate. *What is Nature? Culture, Politics and the non-Human*. Cambridge, MA: Wiley-Blackwell, 1995.

Tsing, Anna. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. New York: Princeton University Press, 2015.

Collectivity

At the beginning of 2017, the development of a cohesive framework for a pluralistic and divided society seems to be an increasingly urgent social and political question. Considering the contemporary city, one encounters a highly complex and unequal assemblage influenced not by overall coordination or integrated agency but rather overlapping and sometimes contradictory market forces, speculation, and commercial pressures. In this milieu, the clearly defined realms of public and private space are increasingly dissolved, blurred, or fragmented. This raises the fundamental question, how do we achieve any form of collectivity, and to what extent is coherence required?
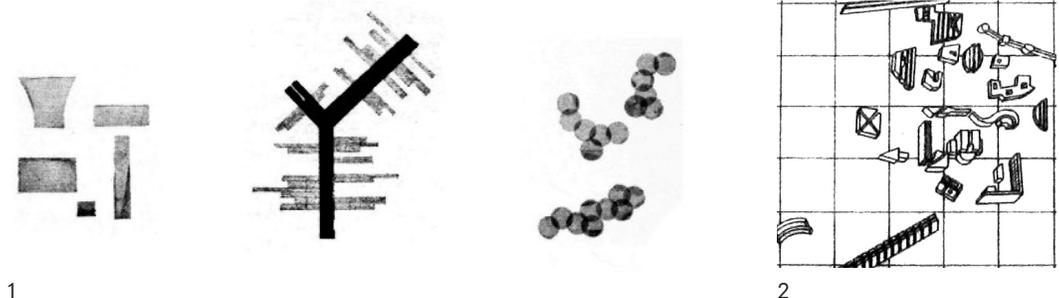
The studio will entail a disciplinary investigation into theories of collectivity, from Fumihiko Maki's Investigations in Collective Form (compositional form, megastructure, group form)[1], to O.M. Unger's Cities within the City[2,3] and its model of the Green Archipelago of heterogeneous fragments. In doing so, the ambition is to engage questions such as, how does architecture resolve (or reveal) its own internal differences? What are the compound relationships between architecture and urbanism? How does architecture engage with, rather than retreat from, the broader environments of politics, the economy, and the city?

1   2

Along the Brooklyn Heights waterfront, the studio will collectively design the "BQE Biotech Corridor", a new campus for the Applied Life Sciences. As a type, the campus is an ideal platform to examine collectivity: it consists of multiple, diverse and specialized yet interrelated buildings and disciplines of knowledge production. Like Cedric Price's speculative Potteries Thinkbelt,[4] the BQE Biotech Corridor will not be an ivory tower or enclave, but rather a dispersed ensemble of components that will operate together, connected to, rather than detached from, the post-industrial knowledge economy.

The Applied Life Sciences Campus is an initiative in the earliest stages of consideration now and will likely be realized through public / private partnerships. As such, it offers the opportunity to not only to engage current issues of urban policy, but also to speculate upon future forms of collectivity.

1
Maki, Fumihiko. Investigations in Collective Form. St. Louis: The School of Architecture, Washington University, June 1964.

2
Ungers, O.M., Rem Koolhaas, Peter Riemann, Hans Kollhoff, and Artur Ovaska. Cities within the City. Sommer Akademie of Berlin by Cornell University. 1978.

3
Schrijver, Lara. "The Archipelago City: Piecing together the Collectivities." OASE 71 (2016): 18-37.
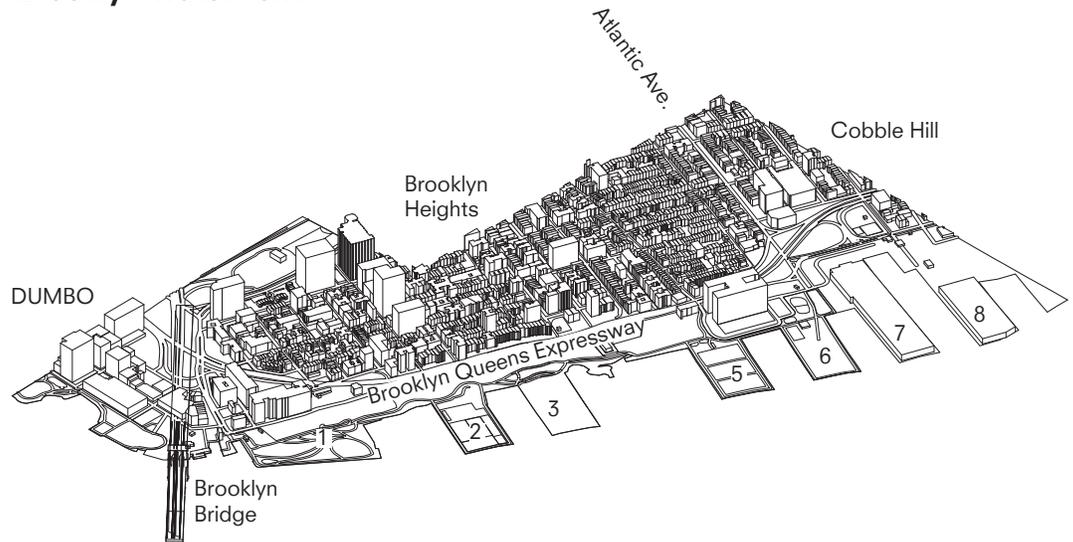
4
Aureli, Pier Vittorio. "Labor and Architecture: Revisiting Cedric Price's Potteries Thinkbelt." LOG 23 (Fall 2011): 97-118.

Brooklyn Waterfront

5
Bruner Foundation, Inc.
"Brooklyn Bridge Park"
Partnering Strategies for the
Urban Edge: Rudy Brunner
Award for Urban Excellence.
2011: 41-74.

6
New York City, Department
of Transportation. "BQE
Atlantic to Sands Project
Overview." 20 Apr 2016.
Web: http://www.nyc.gov/
html/dot/downloads/pdf/
bqe-atlantic-to-sands-
apr2016.pdf. Accessed 1 Jan
2017.

7
New York City, Department
of Transportation. "BQE
Atlantic to Sands Project
Update." 1 Nov. 2016. Web:
http://www.nyc.gov/html/
dot/downloads/pdf/bqe-
atlantic-to-sands-nov2016.
pdf Accessed 1 Jan 2017.

The studio site is located along the East River waterfront from the west edge of DUMBO and Brooklyn Heights to the north edge of Cobble Hill. The site includes the landing of the Brooklyn Bridge and the recently completed, 85-acre Brooklyn Bridge Park,[5] which converted the post-industrial waterfront into a new landscape and park. This territory includes a range of different urban fabrics, existing building types, road infrastructure, tunnels, bridges, and piers.

Additionally, the site encompasses a section of the I-278 Brooklyn Queens Expressway (BQE) running from Sands Street to the Atlantic Avenue interchange, which includes twenty-one bridges and is slated for replacement or upgrade over the next ten to fifteen years.[6,7] Despite Robert Moses' highly innovative "triple cantilever" structure beneath the Brooklyn Heights Promenade that configures automobile and pedestrian traffic into a diagonal stack, this section of the BQE does not meet NYS highway standards. A more radical adjustment to its geometry, structure, and location may be considered, in line with recent efforts to re-conceptualize the presence and status of interstate highways in cities.

Aside from dealing with a highly complex urban site, the intention of working here is to engage the waterfront and the body of the East River, which is increasingly vulnerable to climate change and sea level rise. Along the waterfront, the ground can no longer be considered a fixed and stable datum. Additionally, projects may work with the linear infrastructure of the highway and sectional differences across the site.

BQE Biotech Corridor

In December 2016, Mayor de Blasio and Governor Cuomo announced two parallel initiatives, totaling over $1.1 billion in capital investments, research grants, and tax credits to attract the life sciences industry to New York City. According to New York State, "the Life Science sector encompasses the fields of biotechnology, pharmaceuticals, biomedical technologies, life systems technologies, and includes organizations and institutions that devote the majority of their efforts to the various stages of research, development, technology transfer and commercialization."[7] Capitalizing on its proximity to finance and academic institutions, New York City intends to compete with similar clusters in Silicon Valley and Boston. Existing facilities for biotech startups in New York City include several incubators and the Alexandria Center for Life Sciences, a complex on Manhattan's east side that opened in 2010. Nonetheless, more space is in demand. In response, as part of these new initiatives, plans for a new Applied Life Sciences Campus along the East River, similar to Cornell Tech, are currently in development, although a final location has not yet been determined.

7
New York State. "Governor Cuomo Announces Groundbreaking $650 Million Initiative to Fuel Growth of a World-Class Life Science Cluster in New York." 12 Dec. 2016.

Drawing on its proximity to transit and the Brooklyn Tech Triangle, the studio will propose an Applied Life Sciences Campus dispersed throughout the Brooklyn Heights waterfront to accommodate approximately 10,000 knowledge workers and supporting staff. The campus will include office space, modular laboratory spaces[8] (wet-lab and dry-labs), classrooms, a library, auditoria, conference centers & event spaces, restaurants, cafes, and hotel/dormitories.

8
Braun, Hardo and Dieter Grömling, and Helmut Bleher, Eds. Research and Technology Buildings: A Design Manual. Basel: Birkhauser, 2005.

Process

Throughout the semester, students will work collectively in teams. There will be three phases:

I.   Research (2 weeks)
      Teams will conduct site analysis and develop case studies of relevant precedents. Architectural research is intended to be generative, i.e. leading to specific insights and potential design directions. Scale comparison, superimposition, and figure-ground will be important techniques and representational devices. The studio will also construct a large-scale, physical site model (1" = 60' or 1:1000, TBD) and digital base files. Teams may focus on topics like the construction of the site physical model, assembly of digital base files, site analysis, collective form as an architectural and urban problem, the tech campus, the laboratory as a type, the linear building, the urban highway, etc...

II.   <u>Envelope and Urban Proposal (4 weeks)</u>
Each team will define and work within a specific envelope within the overall BQE Biotech Corridor. These envelopes may take on existing buildings in the site (i.e. the Jehovah's Witness Watchtower), existing development locations (i.e. the site south of One Brooklyn Bridge Park), existing piers (i.e. Piers 7 or 8), or other existing elements or infrastructure within the site (i.e. linear segments along the BQE Envelopes may also be proposed for new areas, irrespective of land ownership, or in / over the water (i.e. the re-construction of Pier 4). Because the entire studio is creating a sort of "masterplan" of the BQE Biotech Corridor, negotiation with the whole in terms of the form, programmatic elaboration, and relationship to other parts will be important to define the identity and role of the individual. Each envelope will accommodate some proportion of the 10,000 knowledge workers and approximately 250,000SF-750,000SF of built area, consisting of a diverse mixture of the given program. In this phase, the emphasis is on the development of a volume, narrative and polemical position relative to the larger territory.

III.   <u>Architectural Elaboration (8 weeks)</u>
Within each envelope, teams will create a "campus within the campus." Strategies and insights from the urban scale may be translated to an architectural scale as structure, materiality, and program is elaborated. In particular, how do urban frameworks of collectivity, difference, or multiplicity occur at an architectural scale? Large-scale thinking and large-scale models will be important techniques for the development of the design.

Notes

The studio meets for desk crits on Monday and Thursdays from 1:30-6:30pm. There will also be a workshop/seminar session on Wednesdays from 3-5pm.

Additionally, pin-ups and reviews will be announced in a schedule to be distributed at the beginning of the semester.

A more detailed agenda will be distributed for Phase II and III, which will include requirements for presentations.

All studio work will be compiled into a book summarizing the studies and outcomes of the semester.

9
Haar, Sharon. <u>The City as Campus: Urbanism and Higher Education in Chicago</u>. Minneapolis: University of Minnesota Press, 2011. xiii-xxx.