Studio Phases: The studio will follow three cumulative phases.

1. Manufacturing Light: Absorbance and Reflection. Experimental work in radiance and day-lighting.

2. Up-Dating the Mock Up: the Case of the NY Times, Renzo Piano, and the Lawrence Berkeley Labs: We will propose new revisions of the Piano/LBL case study.


Studio Travel: The studio will travel to San Francisco, Palo Alto, Fremont and Hawthorne, California. Michael Bell will attend all studio sessions. Hamza Sarout will attend one studio sessions as well as hold a software workshop each week in day-lighting and finite element analysis software. Times will be coordinated to suit entire studio.
Fremont is home to the engineering and manufacturing plant for Tesla and its role in producing electrically powered cars is well known. Fremont is also the host city of the first extension of the Bay Area Rapid Transit system (BART) since the subway was founded in 1957.

While the Tesla plant is itself not a new construction—it was the former General Motors plant and then a partnership between GM and Toyota—the recreation of the plant by Tesla as a visionary new production facility for a new automobile is. In Fremont one finds a formidable story that is both old and new at once: the private car meets mass transit here in a vivid new way but also the car and its entire process of design, engineering and more so material knowledge is re-conceived and invented. In this same context the mass transit station seems stalled—even as it promises a new linkage and all the economies of public transportation it does not offer a great new urban vision.

In the history of manufacturing, factories of all kinds, we have seen historical examples of visionary works of architecture. We have also seen similar investment in the capacity of worker housing and urbanism that is parallel to and commensurate with the new factories.

Our studio will focus on the reinvention of the creative space—the studio and lab that precedes the factory.
Cupertino, California: As Apple undertakes a new corporate campus of infrastructural scale what are the parallel implications for areas of Cupertino adjacent to the campus? Is there a compensatory vision for architectural work in the program of housing, retail, government and public spaces? What is the scope of creative concern for today’s leading technology companies.

The Corporate Campus as Creative Empire: Private (but with a 10,000 car garage): The Valley Architecture matures; the urbanism lags behind and relies on automobiles and a low-density form of development. Apple’s new campus, futuristic in scope and material engineering hosts a 10,000 car parking garage as testimony to the Bay Area’s lack of public transit.

Drone Video: Apple Campus 2, Cupertino, Ca. Fall 2014. The campus dwarfs its neighbors but also will be relatively unseen from outside the property’s perimeter. At several billion dollars it is also a relatively small expenditure in the scale of Apple’s financial means. Its fuses infrastructure and architecture in ways that are moderated by high levels of engineering and aggregate talent and coordinated resources.
Earlier Paradigms: The factory was designed to be built out of its own products: today’s factories are rapidly changing and in doing so challenging the definition of a factory.

1917-28:
Albert Kahn: Ford Rouge Steel Rolling and Glass Plants: A constituent material / steel / rolled in architectural and automatic shapes. A conflacion of material as both building and commodity. The chemical and labor innovations beneath the scene are more difficult to discuss but present. (note photography by Walter Gropius or Ise, 1928--Negative Bauhaus archive, Berlin).

1973:
Despite the industrial violence an aesthetic prevails that both stalls and enables change: The image of the factory as laden with strife helps forge the environmental movement. Yet also seems to seed a recoiling from industrial imagination. Ford Motor Company: River Rouge Plant, Dearborn, Michigan.

2015:
Tesla: the electric car production line is antiseptically clean and a deep hybridization of computing and manufacturing. The works are as likely to operate a computer as use a hand held tool.
Studio Phase 3: A Design Studio for a Company that Engages:


Above: Tesla engineers have often come from Apple: Work at Apple and Tesla often advances new materials that alter the commodity aspect of new products—materials science, chemistry, physics alter mechanics and manufacturing. An example: Mike Pilliod (Tesla materials engineer formerly at Apple): Patent application: a topologically enhanced silica molecule for use as a binding agent in iPhone production. The topologically enhancing coating can take the form of functionally nano-silica particles. In one embodiment, the nano-silica particles are functionally activated using amine groups. The thermo-plastic composite can be used to join a number of metal components together to form a load bearing structure.

4_manufacturing_affected

5_physics_balance_center_of_gravity/mass

6_global_attention

7_aerodynamics

8_vertical_ribbon_window

9_architectural_topology

2_chemical_engineering

3_topologically enhanced_molecule
A backdrop of economic change: Debt, Houses and Cars—each creative zone is newly linked in today’s changing economy. Public Housing, Affordable Housing, Foreclosures, Reductions in Public Housing, Private Equity re-buys the suburbs.
Mark Rothko in his 69th Street studio with Rothko Chapel murals, c. 1964, © Hans Namuth Estate, courtesy Center for Creative Photography, The University of Arizona.

His work on the Rothko Chapel paintings, originally commissioned by John and Dominique de Menil for the University of St. Thomas in Houston, Texas, occupied Rothko between 1964 and 1967. In turning away from the radiance of the previous decade, Rothko heightened the perceptual subtlety of his paintings, making distinctions between shape and ground more difficult to discern. He also transformed the impact his canvases have on the experience of space, which is now characterized by a sensation of enclosure. This quality, which lends itself to meditation, can be clearly related to the spiritual nature of a chapel.
**What is a creative act?**

A voice is speaking about something. Someone is talking about something. At the same time, we are shown something else. And finally, what they are talking about is under what we are shown. This third point is very important. You can see how theater cannot follow here. The theater could take on the first two propositions: someone is telling us something, and we are shown something else. But having what someone is telling us be at the same time under what we are shown—which is necessary, otherwise the first two propositions would make no sense and be of little interest. We could put it another way: the words rise into the air as the ground we see drops further down. Or as these words rise into the air, what they are talking about goes underground.

What relationship is there between the work of art and communication? None at all. A work of art is not an instrument of communication. A work of art has nothing to do with communication. A work of art does not contain the least bit of information. In contrast, there is a fundamental affinity between a work of art and an act of resistance. It has something to do with information and communication as an act of resistance.


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**First Principles or Multiple First Principles**

“I think it’s important to reason from first principles rather than by analogy. The normal way we conduct our lives is we reason by analogy. [With analogy] we are doing this because it’s like something else that was done, or it is like what other people are doing. [With first principles] you boil things down to the most fundamental truths...and then reason up from there.”

Elon Musk / Source: https://www.youtube.com/watch?v=L-s_3b5FRd8

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**A Sample Mathematic and Engineering Creative problem:**

Material Failure: Non Linear Behavior and Problems Arising in the Analysis of Disk Brake Squeal

https://www.filepicker.io/api/file/ehF8u7ouM13xVM4uHg

The CREATIVE audience tries to see what they also cannot hear.

The Conversation, Francis Ford Coppola, Writer, Producer, Director

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https://www.filepicker.io/api/file/ehF8u7ouM13xVM4uHg
Electric Gravity

In preparing a studio that looks at the Future of the Creative Space and in particular at how the city’s prominent new industrial constituent, electric automobile manufacture, Tesla Motors, may affect the future planning of the city, Professor Skilling’s book and its opening chapters are still a remarkable guide—principally at how the city’s prominent new industrial constituent, electric auto-mobile manufacture, Tesla Motors, may affect the future planning of the city.

Professor Skilling, of course, did not see electricity and electromagnetic theory as a new industrial technical frontier: a New Industrial Technical Frontier: Electric-vehicle manufacture and its role in defining our future. As exotic (if not also abstract) as it is virtuous in giving life support to. At the moment Tesla’s innovation promises a new light span for the car, and indeed for the single family house and its cartographic-ic deployment but will Tesla innovations unfold to create a wider new archi-tectural and urban field? One that alters the literal and conceptual dimensions and forces that we wish to imagine in creating cities and buildings?

Can the thinking of not just Tesla but indeed scores of Bay Area technology companies spill over the corporate walls and into the street, into urban and spatial thought? To achieve this we would need to believe that a new type of receiver is possible: that is, that the technologies are not born of a given commodity that sustains their economies. What becomes of the car if it is abstracted into an industrial technical frontier?

And electricity and electromagnetic theory as a bound to purpose. This text is a necessary conflation of physics and chemis-try but it was also conceptual and abstract in his methods. Electromag-netic energy moves through things that seem to, but actually is not steady. Electromagnetic waves are a constituent of everything material. In architecture this seems barely acknowledged except for its direct and deeply choreogra-phed applications. It is is effect isolated from daily life but used to enable virtually every aspect of it. Tesla and Fremont have no immediate plans to alter this stable relationship (the car for the moment is the goal and the deep sophistication of physics and chemistry at play here will remain experiential at the level of driving) but as Tesla moves its focus towards home energy and in particular home batteries and solar power an architect—that is, us—wonders how long the resistive capacity of the houses, the car and city as we know it can hold? That is for how much longer we will constrain the innovative capacity embodied in every day technology from altering the base instrument they seem to give life support to. At the moment Tesla’s innovation promises a new light span for the car, and indeed for the single family house and its cartographic-ic deployment but will Tesla innovations unfold to create a wider new archi-tectural and urban field? One that alters the literal and conceptual dimensions and forces that we wish to imagine in creating cities and buildings?

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Vector and Scalar Fields

Skilling opened his text with dedicatedly architectural and accessible language and example. In explaining a distinction between vector and scalar fields as he began to place electric waves in the context of physics he used the spatial and time based dimensions of a room to create essential distinctions: In offering an example of a scalar field Skilling described a process of measuring the temperature at various points in a room. While the results may vary Skilling explains that one cannot associate vector components with temperature. As variable speeds, acceleration, deceleration—the balance of mass in the car. The electric car with its battery pack forming the floor pan has a newly lowered center of gravity—the application of electric car design here allows an alteration of the cars dynamics but in a more essential (that is scientific) way the electric car confines the physics of gravity with the vector fields of electricity that define or instigate the mass in motion. As exotic (if not convoluted) as this all sounds the Tesla Model S is still (simply) a car (taking up space in parking lots / being driven as a commuting tool)...in other words: all of this genius barely spills outside of the cars beautifully shaped form and newly confined authority of electricity and gravity. Is brilliant manufacturing provides a deeply new type of car but what would be possible if Tesla’s en-gineering and energy capabilities were allowed to affect architecture—that is we could make use of Professor Skilling’s depth of abstraction and bring a deep sense of these properties to architecture.

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Optic Signals, Galvanized, Steel, Cantilever
Iron, Water, Pressure
Timber, Oil Soaked, Galvanized Bolts, High Voltage, Catenary Wires
Catenary Wires, Low Voltage Electricity
Catenary Wires, Communications
Asphalt, Slumping
House, Housing
Everything else: a temple of infrastructure

Xiaoyu Wang: Lee Friedlander, Albuquerque, New Mexico, 1972
“Albuquerque, New Mexico, 1972,” by Lee Friedlander. He said he deliberately includes “those poles and trees and stuff” that other photographers avoid.
The fragmented landscape was made with careful attention to detail and to money:

At the Detroit Economic Club in 1944, the Secretary of the Treasury described a need for ten billion dollars a year in exported goods if the U.S. expected full employment after the war. During the 1940s, after the signing of the Bretton Woods Treaty, a new United States landscape emerged. This landscape was driven by a new level of integration of the dual mechanisms of production and finance. Production was understood through a lens of efficiency; while finance advanced towards the forms of structured leverage that are now common (and in crisis). Yet both finance and production still operated at local levels despite the international trade. Nations were largely segregated economically even if connected and the relationship of materials, goods, products and labor were partitioned into relatively local zones. They would of course become increasingly connected—and connected. You could call this the ductile era: the spectacle of cities, commerce, development, and jobs revealed itself in a tensioned constellation of cities—in the lights at night photograph above.

While a common attribute of this new landscape was a United States that could no longer provide full employment without exporting what it produced, it was still a United States based in material and labor. The country was deterritorialized by labor and economic issues but still a producer of hard goods—material economics.

Today this equation is virtually reversed—it is finance that seems to have driven production and while material is still the final equation of presence—material itself is sited at the final of many tiered steps—tranches—(far away from the real motivation which is virtually finance itself). Material is inevitable but if it can be isolated from the production of surplus all the better. So too actual labor or a paying customer. Is there an architectural result that would not critique this at its philosophical level: that is, not critique?

Optic Comfort: Creative Work in a Difficult Space

Far right: Specialist Richard Plum, center, rubs his eyes as he conducts trading in shares of Bristol-Myers Squibb on the floor of the New York Stock Exchange, Aug. 8, 2006.

Shares of Bristol-Myers Squibb Co. sank more than 6 percent that day as a generic drug maker, Apotex Corp. disclosed it has begun selling a cheaper version of the big pharmaceutical company's best-selling drug, Plavix. That's the deal with capitalism: constant competition, constant change. Photo credit: Richard Drew, AP

Left: "In the complex metropolitan environment, the city has no form. The forms of control over time, distance and money, and social space supersede any morphological analysis." California: Excerpt: Neil Denari, Gyroscopic Horizons, 1999, Princeton Architectural Press.

Below: Houston, I-59 and Beltway 8

72 years in traffic every two days

2 billion vehicles
Engineering An Office as Landscape / The Office as Studio
Structure, Risk, Material and Experience: Frank Lloyd Wright, Johnson Wax
The studio and the architecture are unified: Fusion of architecture and infrastructure: efficiency and synthesis but also as an attempt to reconcile large scale social need with emerging ideals for design, materials and engineering. Fusion of engineering and architecture: driven by material and in particular uses of membranes, tension elements and then new means of coordination. Lightweight aspects of membrane polymers involving large tensile or grid-shell roofs over massive volumes were designed and constructed for one-off events – expos, Olympics, etc... Our goal will be to consider the legacy of these projects on the surrounding areas they were designed for and see how they translate into new models for use in the US and our sites. They involve landscapes, utilities, environmental, circulation and are distinctly infrastructural.
The architectural and industrial design aspects of an office—as room—are topologically folded into the computer and keyboard. The room—as much as it remains is in service of the office systems: lighting, heating, cooling and cable and communications.

Sears mail order processing

Edward Hopper (the Office at Night, 1940). Typical of Hopper, the color emits light and is indeed a source of light.

Prototype office furniture (sans room/office)

Apple Office

The office topologically compacted into a computer?
Curtain wall, tiled floor, fluorescent light, desk: not designed for computer screens?

Mech Systems, Air Balancing, Cold Bridging and Glare

Gordon Bunshaft, Lever House
Mies van der Rohe, The Seagram Building
Dolores James by John Chamberlain’s: John Chamberlain’s dynamic agglomerations of scrap metal and used automobile bodies have been admired for translating the achievements of Abstract Expressionist painting into three-dimensional form. The whirling arabesques of color in wall reliefs such as Dolores James echo the energy and expressive power of paintings by Willem de Kooning; the heroic scale and animated diagonals suggest the canvases of Franz Kline. Like the Abstract Expressionists before him, Chamberlain reveled in the potential of his mediums. In a 1972 interview with critic Phyllis Tuchman he remarked, “I’m sort of intrigued with the idea of what I can do with material and I work with the material as opposed to enforcing some kind of will upon it.” Chamberlain emphasized the importance of “fit,” or the marriage of parts, in his sculpture. As in other early works, the various elements of Dolores James stayed in place by virtue of careful balances when the sculpture was first assembled; later, the work was spot-welded to ensure its preservation.

Chamberlain’s oeuvre appeared in the context of late-1950s assemblage or Junk Art, in which the detritus of our culture was reconsidered and reinterpreted as fine art. On some level, his conglomerations of automobile carcasses must inevitably be perceived as witnesses of the car culture from which they were born, and for which they serve as memorials. There is a threatening air about the jagged-edged protuberances in Chamberlain’s sculptures, and the dirty, dented automobile components suggest car crashes; the artist, however, preferred to focus on the poetic evocations that his sculptures elicit. Source: Jennifer Blessing
Studio Phase 2: Up Dating the Mock Up

Above: Luminance map produced by the commissioning tool to evaluate average window luminance (shades are in fully raised position in this image). The brighter yellow and red regions have the potential to cause discomfort glare. Notice how the architectural features of the building – the exterior shading system – mitigates glare from the upper, brighter regions of the sky. Copyright: LBNL. Jennifer Blessing

We are designing the new Mock Up. Not an actual office but the means to design/test the office

Above: The view section of the window wall is the open portion between the upper and lower exterior shading elements (photo from the daylighting mock-up at College Point, New York). Copyright: LBNL.

Early 2000's: The Lawrence Berkeley Lab assists Renzo Piano to exceed building codes, improve energy performance, improve optic comfort and LEED. Low Iron Glass and Environmental Controls

The Lawrence Berkeley Labs: The New York Times daylighting design: Low Iron Glass is shaded by 1-5/8” diameter ceramic rods. Automated shading devices and light balancing create an optically comfortable workspace. Video (above) shows mock-up testing for daylighting.

The automated shading enabled lighting and cooling energy use reductions, and reductions in peak electric demand. Energy savings due to the shading system alone could not be determined in isolation but the reduction in annual electricity use due to the combination of all three systems was estimated to be 24% (2.58 kWh/ft²-yr) across a typical tower floor compared to a code-compliant building. Annual heating energy use was reduced 51%. Peak electric demand was reduced by 25%. The Times Company’s investment in advanced energy-efficiency technologies was estimated to yield a 12% rate of return on their initial investment.

Above: wireless sensors in floor of NY Times office.
Source: Lawrence Berkeley Labs https://facades.lbl.gov/newyorktimes/nyt_post-occupancy.html
The automated shading enabled lighting and cooling energy use reductions, and reductions in peak electric demand. Energy savings due to the shading system alone could not be determined in isolation but the reduction in annual electricity use due to the combination of all three systems was estimated to be 24% (2.38 kWh/ft²-yr) across a typical tower floor compared to a code-compliant building. Annual heating energy use was reduced 51%. Peak electric demand was reduced by 25%. The Times Company’s investment in advanced energy-efficiency technologies was estimated to yield a 12% rate of return on their initial investment.

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**Daylighting the New York Times Building**

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Heat and Light: historical and present day examples. Image 1 and 2: Daylighting and electric lighting analysis of Hagia Sophia using high dynamic range photography technique.

The lighting quality in Hagia Sophia has been a topic of interest for centuries among visitors, writers, poets, and researchers. In fact, almost all literature on Hagia Sophia includes a brief statement on its daylighting and sun-lighting. In these documents lighting is defined as “poetic”, “magical” and “mystical”. Yet, there were not any comprehensive quantitative studies on Hagia Sophia’s lighting. The objectives of this research is:

1) To study the interior luminance values, luminance distribution patterns and luminance ratios in Hagia Sophia under naturally occurring sky conditions (the factors that are instrumental for creating the unique luminous environment in Hagia Sophia are discussed).

2) To study the electric lighting in conjunction with the daylighting in Hagia Sophia (the impact of electric lighting on the ambient light levels and luminance distribution patterns is evaluated during daylight hours).

3) To evaluate the analysis results and to provide recommendations on the lighting scheme of Hagia Sophia (the objective is to preserve the luminous environment as close as possible to the original design, and to improve the visitor experience).

Source: Mehlika Inanici, University of Washington (team member NY Times daylighting and LBL)

Matthias Schuler: Transsolar. Guy Nordenson, Structural Engineer: Toledo Glass Pavilion:

A solution with heat supply by radiation through the floor and ceiling surfaces, allows SANAA to temper the facade and buffer heat loss and gain without huge air flow rates. The heat supply by radiation heats the glass surfaces not by the air, but in a direct path. Therefore the air temperature in the cavity can be reduced to 12.5°C and with the only minimal reduced surface resistances, the heat losses through the facade drop to 180 W/m² or by 40%. The inner surface temperatures facing the room keep the level of 15-25°C, out of the condensation range. Aside of the balance method the CFD evaluations confirmed the approach to reduce the air flow rate and instead use the radiant system. By factor four and with strong consequences for the size of the ducts, solving strong conflicts with the structural concept. As a side effect, the radiant heating system can be used in summer as a radiant cooling system, absorbing radiation before it heats the air and has to be removed by an air flow.

An Architectural History of Materials

Material’s Isolated Qualities in a Commodity Market

Glass Exhibition: Berlin, 1934
Deutsches Volk, Deutsche Arbeit
Designed by Lilly Reich and Mies van der Rohe.

Non-Ferrous Metals: Berlin, 1934
Deutsches Volk, Deutsche Arbeit
Designed by Walter Gropius

American try to maintain old rituals but the proximity of the machine has both liberated them and made their space uncomfortable. The American’s are displaced, lost adjacent to their own means of liberation. They don’t yet miss the city. Robert Frank. The Americans.
In Techniques of the Observer Jonathan Crary provides a dramatically new perspective on the visual culture of the nineteenth century, reassessing problems of both visual modernism and social modernity.

Inverting conventional approaches, Crary considers the problem of visuality not through the study of art works and images, but by analyzing the historical construction of the observer. He insists that the problems of vision are inseparable from the operation of social power and examines how, beginning in the 1820s, the observer became the site of new discourses and practices that situated vision within the body as a physiological event. Alongside the sudden appearance of physiological optics, Crary points out, theories and models of "subjective vision" were developed that gave the observer a new autonomy and productivity while simultaneously allowing new forms of control and standardization of vision.

Crary examines a range of diverse work in philosophy, in the empirical sciences, and in the elements of an emerging mass visual culture. He discusses at length the significance of optical apparatuses such as the stereoscope and of pre-cinematic devices, detailing how they were the product of new physiological knowledge. He also shows how these forms of mass culture, usually labeled as "realist," were in fact based on abstract models of vision, and he suggests that mimetic or perspectival notions of vision and representation were initially abandoned in the first half of the nineteenth century within a variety of powerful institutions and discourses, well before the modernist painting of the 1870s and 1880s.

Crary: If discourses of the visible in the seventeenth and eighteenth centuries repressed and concealed whatever threatened the transparency of an optical system, Goethe signals a reversal, and instead poses the opacity of the observer as the necessary condition for the appearance of phenomena. Pure light and pure transparency are now beyond the limits of the visible.

The articulation of subjective vision in the early nineteenth century is part of a shift which Foucault calls "the threshold of our modernity." When the camera obscura was the dominant model of observation it was as "a form of representation which made knowledge in general possible." But at the beginning of the nineteenth century the site of analysis is no longer representation but man in his finitude.

. . . [It was found] that knowledge has anatomo-physiological conditions, that it is formed gradually within the structures of the body, that it may have a privileged place within it, but that its forms cannot be dissociated from its peculiar functioning, in short, that there is a nature of human knowledge that determines its forms and that at the same time can be manifest to it in its own empirical contents.” Michael Foucault

Creative Observation: Observing the Subject: The Subject Made Opaque
Mark Sexton: 2013: Restoration and Renovation

The lower panes of glass, doubled to each large pane above and milky-white to provide a measure of privacy, presented another problem. Mies’s originals had been sandblasted to create a white translucent finish. They were all replaced in 1975 with two eighth-inch panes of glass and a plastic film sandwiched in between. “We went to the laminate because of the breakage and the number of people that got hurt from it,” says Beltemacci, but the result was less translucent than opaque, casting reflections back into the building.

“One of the things that’s changed,” explains Sexton, “is that there’s now federal code that requires all of this glass to either be laminated or tempered, and at the time in 74 or so you couldn’t really temper a piece of sandblasted glass because when you do, you get a very thin layer of tension on the glass, and the sandblasting, because it was all done by hand, would break through that and it would be prone to breakage, so that wasn’t a good condition. When Mies did the original building, this glass was not tempered. It was just annealed. Now by law we have to temper it, but because of advances in sandblasting technologies, it’s all done by computer mechanism, and they now take off such a thin layer of glass . . . We went and researched this.

IIT: Transsolar: Matthias Schuler

Source: Engineered Transparency, The Visual, Technical and Spatial Effects of Glass, Edited by Michael Bell and Jeannie Kim
Material in Concert with Structure allow a new Creative Space

Iron and the Ornamental Reduction of Tension at the Bibliothèque Sainte-Geneviève (1838-50)

Henri Labrouste creates a double arch that spans a public reading room. The arch relies on the ornamental leaf pattern's clockwise/counter-clockwise rotation to reduce the presence of tension in the structural iron. A new national reading room, a place of creativity, is established by way of an ancient material and new level of structural control.

Paper by Michael Bell; Study by Michael Bell, Zachary Kostura and presented at the Museum of Modern Art.