
# Changing Time for Concrete

## The Second Columbia Conference on Architecture, Engineering and Materials

## October 1–3, 2008

# SOLID STATES
## CHANGING TIME FOR CONCRETE

WOOD AUDITORIUM, AVERY HALL
GSAPP, COLUMBIA UNIVERSITY

OCTOBER 1—3, 2008

Convened by

Graduate School of Architecture, Planning and Preservation, Columbia University

Mark Wigley, Dean

Michael Bell, Professor, Conference Chair

in collaboration with

Fu Foundation School of Engineering and Applied Science, Department of Civil Engineering and Engineering Mechanics, Columbia University

Christian Meyer, Chair and Professor

Exclusive sponsor: Lafarge

The conference will be accompanied by the exhibition *Concrete Trajectories*
Curator: Rosana Rubio Hernandez
Associate Curator: Jesús Donaire García de la Mora
On display in Avery Hall 200 level September 29—October 3, 2008

CONCRETE IS ENTERING A RENEWED ERA OF DEVELOPMENT WITH WORLDWIDE IMPLICATIONS AND UNDER RADICALLY NEW ECONOMIC CIRCUMSTANCES. WHAT ARE THE FUTURES OF CONCRETE IN ARCHITECTURE AND ENGINEERING IN TERMS OF TECHNOLOGIES OF REINFORCEMENT, MATERIALS SCIENCE, EMERGING MARKETS AND CAPITALIZATION, GEOGRAPHIC PRODUCTION, INSTALLATION, AND ENVIRONMENTAL IMPACT? WHERE WILL INNOVATION HAPPEN AND WHAT WILL INSTIGATE POTENTIALS IN DESIGN AND ENGINEERING?

THE GOAL OF THIS CONFERENCE IS TO OPEN NEW UNDERSTANDINGS OF THIS PERVASIVE, YET EVER-EVOLVING MATERIAL. BRINGING TOGETHER A WIDE RANGE OF LEADING ARCHITECTS, ENGINEERS, AND SCHOLARS, THE COLUMBIA CONFERENCE ON ARCHITECTURE, ENGINEERING AND MATERIALS  IS A MULTI-YEAR PROJECT TO EXPLORE THE DRAMATICALLY CHANGING LIMITS OF KNOWN AND NEW MATERIALS IN AN ERA OF RAPID URBANIZATION AND WITHIN UNPRECEDENTED FORMS OF TECHNICAL MEASUREMENT,



COORDINATION, AND PRODUCTION THAT INCREASINGLY BLUR THE BOUNDARIES OF PROFESSIONS AND OF MATERIALS. DO CONTEMPORARY MEANS  OF STRUCTURAL AND MATERIAL ANALYSIS SUGGEST A WAY OF MODELING MATERIAL ATTRIBUTES SUCH THAT ANALYSIS ITSELF MIGHT PRODUCE A NEW MATERIAL? WILL ALTERNATE TECHNIQUES CREATE A VIRTUAL STRAIN OR QUASI-ALLOY, LEADING TO A POTENTIAL REALM OF COORDINATED MATERIAL ACTION?

THE COLUMBIA CONFERENCE ON ARCHITECTURE, ENGINEERING, AND MATERIALS EXPLORES THE BOUNDARIES BETWEEN MATERIALS SCIENCE, ENGINEERING AND DESIGN BY MOBILIZING SYMPOSIA, STUDIOS, EXHIBITIONS, BOOKS. AND FILMS IN AN INTENSELY FOCUSED INVESTIGATION. HOW IS A NEW GENERATION OF PROFESSIONALS AND MANUFACTURERS FUSING ENGINEERING AND ARCHITECTURAL PRACTICES INTO RADICAL PLATFORMS FOR DECISIVE URBAN ACTION?

CONFERENCE SCIENTIFIC COMMITTEE

Michael Bell
Professor, The Graduate School of Architecture, Planning and Preservation, Columbia University, Conference Chair

Jean-Louis Cohen
Sheldon H. Solow Professor in the History of Architecture, Institute of Fine Arts, New York University

Laurie Hawkinson
Professor, The Graduate School of Architecture, Planning and Preservation, Columbia University

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Werner Sobek
Professor and Director, Institute for Lightweight Structures and Conceptual Design, University of Stuttgart

Mark Wigley
Dean, The Graduate School of Architecture, Planning and Preservation, Columbia University

CONCRETE: MEASUREMENT AND COORDINATED ACTION

Concrete is understood to be the building material that virtually assured and verified the rise of modern engineered cities. Reinforced concrete, the composite of concrete and steel, instigated more than one hundred years of invention in building form and structure and still is the predominant system in use today. The fusion relies on both concrete and steel, but it is arguably concrete that gains the accolades for the plastic shaping of building and space—both today and historically—even as this shaping would not be possible without reinforcement. What, then, is concrete, and what are the futures of concrete not only in terms of its reinforcement but also in terms of its chemical engineering, its capitalization, its geographic production and installation, and its role in energy and environmental impact? Is it still fruitful today to examine a material in isolation?

In the matrix of reinforced concrete it is concrete that seems to be the colloquial focus—the role of steel, even as reinforcement, is essential and integral yet it has less value in the popular discussion of building. The confidence to imagine new forms of plastic work, however, was sourced and manifest in this hybrid of steel and concrete. The rationalization of structure lies with the fusion of two materials—the synergism between the properties of the two materials. Today the techniques of both reinforcement and concrete are dramatically changing even as rapid urbanization does not fully allow change to incubate. What future roles do we see for both aspects of hybrid structures—both for reinforced concrete and for the wider aspect of hybrid or concerted action?

PARALLEL ACTION

In the past decade the concept of a composite or what would constitute concerted but segregate behavior between materials has come under a new lens of evaluation and opportunity. Can we still talk about reinforced concrete with the operative word *reinforced*—or is a more complex interaction now the key to our thinking about material coordination? Is concrete still reinforced or can we supplant that term with new more accurate terms? What constitutes coordinated materials today and how are we reinventing the control of coordinated structural assemblies both before and after construction? What are the limits of the modeling of complex or coordinated behavior of structural form?

Aspects of time and duration—the nature of material in time and its application, but also under effects such as thermal action or long-term deterioration—are central to our work and are more carefully examined today. Engineers, architects, and materials scientists are more able to predict and anticipate the interaction and dynamic relationships between materials with a level of accuracy that was not possible even ten years ago. These examinations of material behavior arguably more fully constitute the cutting edge in architecture and engineering than the material itself—that is, the techniques of measurement and prediction might be seen as equal to and in part constitute a mode of material. In this regard do we begin to see materials as approaching or differentiating themselves from each other as forms of behavior rather than as intrinsic differences? Are species of material modeling attributes of material: do they form a circumstance that is by nature material and intrinsic?

NEW LOCATIONS, SAME MATERIAL

Material persists in isolation even as it cannot be as easily segregated as it once might have been; material offers innovation at its own inherent levels and within its own chemical engineering. Industries are still segregate as well, and their locations, means of capitalization, and relation to labor and economies are key to how something is built and in the case of contemporary global trade it also



affects aspects of sustainability. With this in mind, what then, can we say about concrete in architecture or engineering that we don't already know—that is, after a discussion of its historical role, of its role as indicator of mass, weight, and presence—of its seeming permanence in monumental works?

The persistence of concrete as both a renewed material and a new application is more urgent then ever if we gauge its current implementation—the scope of its uses. New species of concrete and reinforced concrete are entering the world's markets and rapid urbanization creates as much as 80 percent of the worldwide market for concrete. These factors are instigating a wave of new works drawn from new circumstances. What are the critical dimensions of this expansion in terms of urbanity or architectural space and structure—the plastic aspects of design? What are the futures of concrete in regard to contracting and implementation—of coordination of economic circumstance as much as labor or materials?

URBANISM AND INFRASTRUCTURE: CONCRETE PLUS

In its known roles concrete has never been far from urbanism or from being vested as a form of civil life itself. From its essential chemical engineering to its place in formal aesthetics and the plastic arts, concrete has often been seen as the source of a kind of pragmatic brilliance: as basic and essential, yet also lofting the indices of social life and public progress and carrying the weight of perceived urban success and urban failures. Concrete has also been expected to provide aspects of the ineffable. Its properties provide a sense of permanence, but it also has been the very material to provide everything but permanence: concrete is intrinsically based in concepts of time and of movement—of flow and the formalization of flow, and here it can perhaps be renewed as a temporal medium—as something that is both actual and a model. It is both fixed and in transition—solid, but only as a stage that indicates attributes of solidity. Recall the use of concrete in the banked test tracks at the Fiat factory in Turin completed in 1923; concrete as the substratum upon which acceleration and centrifugal force were played out above a factory where column span was a component of production, labor, and efficiency. Compare this to the stilled and expansive spans—the fragile lofted interiors of Auguste Perret 's Notre Dame du Raincy completed almost simultaneously or the concave modeling of the surfaces of Le Corbusier's Ronchamp. Concrete as we have historically received it has always been concrete plus form—but also concrete plus speed plus aesthetics plus abstraction.

What don't we know about concrete going forward—to the day after tomorrow? To next year? Ten years from now?

These histories can be projected into future states: to uses of concrete in infrastructure, in waterworks, in airports, in military installations, and, predominantly, within the rapid development of cities today. This conference brings leading architects, scholars, and engineers to Columbia University to discuss the implications of new technologies in concrete within architecture and engineering, at the scale of building and at the scale of infrastructure—within new forms of measurement, coordination, and production.

—Michael Bell, Conference Chair

# WEDNESDAY OCTOBER 1

6:30—8:00 PM

WELCOMING REMARKS AND INTRODUCTION TO CONFERENCE

Mark Wigley
Dean, GSAPP, Columbia University

Bruno Lafont
Chairman and CEO, Lafarge

KEYNOTE LECTURE

Steven Holl
Professor, GSAPP,
Columbia University

# THURSDAY OCTOBER 2

10:00—10:30 AM

WELCOME, INTRODUCTION, AND STRUCTURE OF THE CONFERENCE

Mark Wigley
Dean, GSAPP, Columbia University

Christian Meyer
Chair and Professor,
Department of Civil Engineering
and Engineering Mechanics,
Columbia University

Michael Bell
Professor, GSAPP,
Columbia University



10:30 AM—12:00 PM

PLASTIC MATERIAL=PLASTIC SPACE

Moderator: Michael Bell
Professor, GSAPP, Columbia University

Preston Scott Cohen
Gerald M. McCue Professor in Architecture and Chair, Department of Architecture, Graduate School of Design, Harvard University

Neil Denari
Professor-in-Residence, Department of Architecture and Urban Design, University of California, Los Angeles

Detlef Mertins
Professor of Architecture, School of Design, University of Pennsylvania

Pierluigi Serraino
Architect, Anshen+Allen Architects
San Francisco

12:00—1:30 PM
BREAK

If concrete has virtually constituted a material history of the antique city and its infrastructure it is also understood and referenced by an often narrowly received history that presents its links to modern urbanization and metropolitan life as inevitable, robust, and vigorous. Concrete in this regard is fundamentally central to modern architecture and to the modern city. Based in the work of Auguste Perret, reinforced concrete is, however, situated as a rational, pragmatic material that is also given tenuous balance and tremendously delicate installation: it is pushed to limits of structure, formwork, and execution and it weaves between the rationalized aspects of a modern society and the traces and signifiers of historical programs and building types such as the basilica. Perret showed a deeply restrained relation to the plastic aspects of concrete that are commonly known in the work of Le Corbusier. Plasticity of form and the rationalization of construction dominate architectural thought in the 20th century and Le Corbusier's architecture made both cases emphatically, but there were hybrid directions that were more often tenuous and they bear renewed examination in light of new advances in concrete today that show it to be a material of more technical refinement. Giuseppe Terragni's work in concrete replaced an expected robustness with a severe and thinned surface planarity easily associated with Mies van der Rohe's work in glass, marble, and/or travertine. Richard Neutra's Lovell Health House (indeed his entire career) fused light steel framing technologies with similarly planar readings that made concrete seem as planar and as liquid as glass in his work. His Lovell Health House was a hybrid structure of steel stiffened by the diaphragm action of concrete. Terragni and Le Corbusier both used ferroconcrete for thinner, more planar installations—in stair balustrades and other details—narrowing the wall from the normal robust installation in structure or building volume. Today can these be seen as precursors to new problems in concrete: are the histories of concrete too narrowly understood and can they be reopened to provide new tributaries? How, for example, do concrete and construction materials integrate with other systems today and those from the outset of the 20th century? How are concrete works dismantled—is there innovation in the expected life span of materials that affect design? Do we still expect material properties to affect space in architecture and engineering; how is material understood as plastic and expressive? What constitutes a material's limits?

Le Corbusier worked in concrete for an entire career. Mies approached a quasi-nihilism in his arid a-plastic spaces realized in steel, glass, and quarried stone—he did not pursue concrete after his early works, but his work represents an instrumental role of measure, calculation, and precision of tectonic expression that seems more central today then ever. For all its weight, concrete has almost always been simultaneously an indicator of empty space—by way of surface and volume, and at times of lightness (as in the work of Perret). These ideas are renewed as we reexamine concrete not only as surface and form but also as integral to and coordinated with other materials; as composites that are not so much assemblies but alloys—new materials in total with new potentials.

1:30—3:00 PM

## FORMWORK: BUILDING A BUILDING TWICE

**Moderator: Mabel Wilson**
Professor, GSAPP, Columbia University

**Angelo Bucci**
Faculdade de Arquitetura e Urbanismo, Universidad de São Paulo

**Fernando Menis**
Architect, Fernando Menis, Santa Cruz de Tenerife

**Stanley Saitowitz**
Emeritus Professor of Architecture, College of Environmental Design, University of California at Berkeley

**Hans Schober**
Engineer, Schlaich Bergermann and Partner, Stuttgart

Advanced work in the chemical makeup of concrete allows new methods of formwork and newly extensive pours. Yet to build in concrete is still to build twice: one builds the formwork prior to the pour. What aspects of formwork change in light of new concrete mixtures? What evolutions in formwork such as precasting or lost formwork have greatest implications for our work? At the small scale, formwork is often literally rented and relocated from site to site. Does the formwork constitute an absent origin—the trace of a once immense outward force—or is its significance less critical than in previous generations? What aspects of formwork can be seen as essential and/or intrinsic to the work —how is it designed and understood as a temporal medium versus an unacknowledged pre-structure?

What role will cementitious structural insulated panels play in future work—in relation to sustainability but also to labor, organization of construction, and architectural space?



3:15—5:00 PM

## CONCRETE TECHNOLOGIES: NEW FORMS OF FLOW AND OF TIME

**Moderator: Antoine Picon**
Professor of the History of Architecture and Technology, Graduate School of Design, Harvard University

**Sanford Kwinter**
Professor, School of Architecture, Rice University, and Graduate School of Design, Harvard University

**Toshiko Mori**
Robert P. Hubbard Professor in the Practice of Architecture, Graduate School of Design, Harvard University

**Guy Nordenson**
Structural engineer, New York and Professor, School of Architecture, Princeton University

**Jesse Reiser**
Architect, Reiser + Umemoto, New York and Professor, School of Architecture, Princeton University

**Ysrael A. Seinuk**
Head of Structural Department, The Irwin S. Chanin School of Architecture of The Cooper Union

**Nanako Umemoto**
Architect, Reiser + Umemoto, New York

Still recent advances in the workability and flow properties of concrete dramatically alter what we can achieve in concrete construction and design. Self-consolidating concrete has revolutionized the field in recent years and these changes coincide with concepts of flow in a wide range of disciplines.

Woven into existing circumstances, concrete requires focus, precision, and an ultimate willingness to see the work last—it is not a temporary material and its execution requires a view to what will likely be the next century. How do we measure doubt and apprehension in light of a long-lasting material? What concepts of flow present in the formation of concrete can be applied to themes of use, space, or the other aspects of the life of the concrete building?

What role do new technologies—be they of or aside from concrete—offer the concrete work produced today? How was concrete understood in the early part of the 20th century as an attribute of technical achievement and/or a political device and what do these trajectories mean in contemporary work?

What aspects of major work readied for emerging economies can be related to the rise of the mid-century state-sponsored infrastructural and/or industrial projects by international contractors such as Bechtel or Brown and Root; to concrete as an apparatus of the state or of states—the World Bank and/or global corporations? How has your work fused concepts of material to concepts of flow, of time, and increasingly, to new forms of economic flow?

RECEPTION

# FRIDAY OCTOBER 3

9:30—11:00 AM

## STRUCTURAL CONCRETE: AFTER STEEL REINFORCEMENT

**Moderator: Kenneth Frampton**
Ware Professor of Architecture, GSAPP, Columbia University

**Pascal Casanova**
Group Director, Research and Development, Lafarge

**Benjamin A. Graybeal**
Engineer, Federal Highway Administration, Washington, DC

**Antoine Naaman**
Professor Emeritus of Civil Engineering, University of Michigan, Ann Arbor

**Surendra Shah**
Walter P. Murphy Professor of Civil Engineering and Director of the Center for Advanced Cement-Based Materials, Northwestern University

Reinforced concrete is being reengineered; both the means and techniques of reinforcement are changing, as are the plasticity and nature of admixtures. New innovations allow more contiguous pours and thus newly continuous surfaces, newly elastic forms. What are the futures of reinforcement in concrete and what applications do we imagine they will as a catalyst for change in design and engineering?

Potential new work includes:

—Micro-thin concrete; fiber-reinforced concretes are examples of the migration of reinforcement technologies.

—Quality: Concrete is unique, compared with other materials, especially steel and glass, as it requires an elaborate quality-assurance program to assure that both off- and on-site work meets specifications.

—Ductility/Brittleness: Concrete is a very brittle material. But by properly reinforcing it, can be made ductile. This is of particular importance in seismic regions. In a transition to fiber-reinforced concrete, engineers are elevating this "art of reinforcing" to a new level, in which the material is now basically ductile.

—Serviceability/Durability/High Performance: Not long ago, a "good" concrete meant simply concrete with high compressive strength. In recent years, the concept of durability has taken hold, because we want to assure that the concrete maintains its properties throughout its design life. "High-performance concrete" is now understood as a material that assures superior performance throughout its design life. This concept allows a new mean to address problems associated with the life span of infrastructure.



11:15 AM—12:30 PM

## CONCRETE: SUSTAINABILITY, DEVELOPMENT, AND NEW INITIATIVES

**Moderator: Laurie Hawkinson**
Professor, GSAPP, Columbia University

**Jacques Ferrier**
Architect, Jacques Ferrier Architectures, Paris

**Jacques Lukasik**
Group Senior Vice President, Scientific Affairs, Lafarge

**Christian Meyer**
Professor and Chair of the Department of Civil Engineering and Engineering Mechanics, Columbia University

**Paulo Monteiro**
Professor, Department of Civil and Environmental Engineering, University of California at Berkeley

12:30—2:00 PM
BREAK

The concrete industry is addressing sustainability issues on several fronts. Advances are necessarily measured against the global production of concrete and also against smaller regional and local dimensions. As with all building materials, questions of embedded energy, eventual use, and local advantages, such as proximity to building site for shipping, are all both global in nature and local and contingent on immediate detail: the degree of modernization at plants worldwide affects wider sustainability goals and emissions, and the nature of aggregates as recycled and/or newly mined minerals couples with building life-span issues of use, such as the expected value of thermal mass, or the rapidity of urbanization and the sourcing of materials. Sustainability in this regard is far from a direct equation even as direct action is possible—increasingly it will be embedded in issues such as carbon trading and global markets but the question is, what role can we add to this equation today that lies within both technical and political or social dimensions.

An immediate issue is the successful development of Portland cement substitutes, typically by-products of other industrial processes, such as fly ash and slags. Aggregate can be partially replaced by recycled materials such as construction debris, including recycled concrete aggregate and also glass, paper mill residues, and tires. These efforts not only result in the value-added secondary uses of what otherwise would become waste materials (often land filled at high cost), but they often improve the properties of the end product. What is possible to further reduce the environmental footprint of the concrete industry?

How is sustainability a unique project for concrete and what are the goals beyond sustainability? What are the key social and political dimensions of concrete and sustainability issues.

—Water: Approximately one billion cubic meters of water are used each year in producing concrete. Regions that lack a ready water supply can be inordinately affected by the amount of water needed to produce concrete.

—Reuse and Recycling: Post-production is also a central issue: the demolition and disposal of concrete structures, pavements, and the like constitutes an environmental question that has unique parameters when compared to other building materials. Construction debris contributes a large fraction of our solid-waste disposal problem, with concrete being its largest single component.

—Plant Modernization: It has been estimated that more than ten billion tons of concrete are produced each year worldwide. In the United States this translates to a ratio of approximately two tons of concrete per person a year. This requires an unequaled amount of natural resources to provide the aggregate and the raw materials for cement production. Of equal concern is the fact that the production of Portland cement has historically released large quantities of $CO_2$ into the atmosphere, making not only advancements in the design of plants critical but also the use of recycled aggregates. The cement industry is believed to account for five to seven percent of all carbon dioxide released worldwide, but as major

advances are made in how cement production is accomplished, these advances are measured against both the location and region of production. Are there advantages in the regional aspects of production, such as the levels of modernization and investment at plants, production demands, and levels/speeds of urbanization?



2:00–3:15 PM

## URBANIZATION AND THE GLOBAL ASPECTS OF CONCRETE PRODUCTION

**Moderator: Reinhold Martin**
Professor and Director, Temple Hoyne Buell Center for American Architecture, GSAPP, Columbia University

**Carlos Eduardo Comas**
Professor and Chair, Graduate Studies Program in Architecture, Universidade Federal do Rio Grande do Sul, Porto Alegre

**Qingyung Ma**
Dean, School of Architecture, University of Southern California

**Marc Mimram**
Architect/engineer, Marc Mimram Paris

**Kate Orff**
Professor, GSAPP, Columbia University

New forms of urbanization create as much as 80 percent of the worldwide market for concrete today. The persistence of concrete as both a renewed material and as new application is more urgent then ever if we gauge its current implementation. How do we gauge the fact that the speed of urbanization means that concrete will effectively become the primary material of new cities in the next decade? Will design and technical innovation be more likely to occur in certain locations where there is a confluence of key factors such as accessibility of materials and investment? What does an architect or engineer offer in light of the global aspects of building materials today—in terms of construction and contracting, and also in light of the speed, liquidity, and processes of urban change? Where do we place our concerns and establish a stake in the situation—how do these development scenarios affect forms of architecture in terms of region or even aspects of architecture and urban design that often have addressed disinvestment rather than rapid change?

Are the goals of practice in relation to macro-scale or smaller-scale work outpaced by urbanization, or do we have new capabilities that arise from this rapid urbanization?

—What distribution or outlines of production describe relations between material manufacturing, installation, and use in work today—where a material originates and where it meets design and installation goals?

—How does work on infrastructure change in light of what we know of evolving economies or evolving demand? Has the arena of infrastructure expanded to included a wider range of technologies, a more prevalent awareness of new means and methods from leveraging economic potentials, off-site work, embedded digital technologies, and smart materials?

—Does concrete still portend plastic architectural space: is it still an architectural project or has concrete migrated to being a question of infrastructure even at the level of building design in which virtual city-scale works are realized as near singular events; indeed as forms of evolved infrastructure?

3:30—5:00 PM

## THE SCALE OF PRACTICE: GLOBAL PRACTICE/GLOBAL CLIENT

**Moderator: Jean-Louis Cohen**
Sheldon H. Solow Professor in the History of Architecture, Institute of Fine Arts, New York University

**Juan Herreros**
Professor, Escuela Técnica Superior de Arquitectura de Madrid

**Matthias Schuler**
Engineer, TRANSSOLAR Energietechnik, Stuttgart

**Werner Sobek**
Professor and Director, Institute for Lightweight Structures and Conceptual Design, University of Stuttgart

**Bernard Tschumi**
Professor, GSAPP, Columbia University

Bound to material and its spatial organization, architecture and engineering practices are also tied to intricate layers of commodity practices and investment that today have almost inevitably become global in nature. The nature of practice is more tightly woven into and responsive to investment than it ever has been; yet it is also frequently less weighted by overt characteristics of place and instead tied to trans-locations and interconnected matrices of development as well as consultants and partner practices. During the past 20 years, practice often seemed to have been indexed by way of a constellation of world cities and their particular relations—the city in this sense superseded the nation as the nexus of interchange.

Yet today trade and barriers between emerging economies are changing dramatically and at times reinforcing the role of national relations in development and design. In this realm, the anticipated roles of architectural and engineering practice, in terms of both cities and wider themes of urban life, are often fused. That is, they form unified practices that take on characterics of one another, as architecture, engineering, and, increasingly, economics. These practices at times produce work that is more quasi-infrastructure than architecture.

What forms of practice have emerged today in this arena—how have concepts of architectural space and technique been reorganized within practices of engineering and architecture to allow us to operate at levels that may have been previously the domain of international contractors or state organizations? What is the role of the architectural concept in an era of deeply engineered materials and equally instrumental economic demands on design?

Generations of architects since the 1930s have helped write a story of international and then global practice, yet the global practice, as a socially critical instrument, is still relatively young. If the practices of Archigram or Superstudio and others depicted infrastructural worlds that borrowed industrial metaphors as well as outright techniques from history while promoting radical forms of social life, what can we say of today's critical practices? What is the role of the image of infrastructure and its material techniques—what is the role of space, of event, or of nonmaterial design in an era of deeply coordinated material value?

Have practitioners of the generation that began work in the 1970s and 80s on what were often disinvested and neglected urban sites now emerged as global participants in the rise of a new city? How do building materials and their new means of capitalization and distribution affect design practice: within the global exchange of real estate, high-tech forms of construction and materials management are relatively new—so, too, is the need to again examine cities as a central frontier of social life. Is material a significant attribute of this condition or can we examine it still as an attribute of design rather than a determining factor?



5:00—6:00 PM

## CONCLUDING DISCUSSION: THE ARCHITECT AND ENGINEER

**Moderator: Mark Wigley**
Dean, GSAAP, Columbia University

**Werner Sobek**
Professor and Director, Institute for Lightweight Structures and Conceptual Design, University of Stuttgart

**Bernard Tschumi**
Professor, GSAPP, Columbia University

How has practice in engineering and architecture changed, and going forward, what does a university need to address about industry and what does industry need to know about the university?

What are the most advanced new relationships between academia and industry, and how are they are organized?

# PARTICIPANTS

MICHAEL BELL
Michael Bell is a Professor of Architecture at Columbia University's Graduate School of Architecture, Planning and Preservation, where he is Director of the Core Design Studios and Chair of the Columbia Conference on Architecture, Engineering, and Materials. He is the founder of Michael Bell Architecture, based in New York City. His design work has been shown at The Museum of Modern Art, New York; the Venice Biennale; Yale University's School of Architecture; the University Art Museum, University of California, Berkeley; and Archi-Lab, France. Bell has received four Progressive Architecture Awards, and his work is included in the collection of the San Francisco Museum of Modern Art. Books by Bell include *16 Houses: Designing the Public's Private House* (2000), *Michael Bell: Space Replaces Us: Essays and Projects on the City* (2000), and *Slow Space* (1998). He is a founding editor, along with Yung Ho Chang and Steven Holl, of the urbanism journal *32*. Bell has taught at the University of California, Berkeley; Rice University; and Harvard University's Graduate School of Design. In 2000–02 he led a team of architects to provide research, planning, and design for 2,100 units of housing on a 100-acre parcel of oceanfront land owned by the city of New York. The work was funded to assist in the city's future planning and development goals. Bell also founded "16 Houses," a low-income housing design program in Houston, Texas. Bell's Binocular House is included in *American Masterworks: Houses of the 20th and 21st Centuries* by Kenneth Frampton (2008) and published in the magazine *Casabella*.

ANGELO BUCCI
Angelo Bucci is a founder of the São Paulo-based SPBR Architects, of which he has been principal in charge since 2003. He teaches at the Faculdade de Arquitetura e Urbanismo, Universidad de São Paulo, Brazil, and has been a visiting professor at Harvard University's Graduate School of Design, Massachusetts Institute of Technology, and the University of California, Berkeley, as well as at universities in Argentina, Chile, and Ecuador.

PASCAL CASANOVA
Pascal Casanova is the Group Director of Research Development at Lafarge. He is a graduate of the Ecole Polytechnique and Ecole Nationale des Ponts et Chaussées. Casanova started his career with a public works company specializing in civil engineering, where he was in charge of supervising French bridge projects. He joined Lafarge in 1999 as Technical Director, where he worked on Ductal®, the ultra-high-performance concrete, handling its transition from the research stage to implementation in industry. In 2002 he was appointed Head of Research and Development for Roofing at Lafarge, overseeing several technological breakthrough projects. Since 2005 he has also served as Managing Director of Lafarge Roofing Components, headquartered in Germany.

JEAN-LOUIS COHEN
Trained as an architect and historian in Paris, Jean-Louis Cohen is the Sheldon H. Solow Professor in the History of Architecture at New York University's Institute of Fine Arts. His research has focused on twentieth-century architecture and urban planning in France, Russia, Germany, and North Africa. His work has resulted in numerous exhibitions and publications on both sides of the Atlantic, including *Casablanca: Colonial Myths and Architectural Ventures* (2002), *Scenes of the World to Come* (1995), and *Le Corbusier and the Mystique of the USSR* (1991). He has co-edited, with G. Martin Moeller, Jr., *Liquid Stone: New Architecture in Concrete* (2006).

PRESTON SCOTT COHEN
Preston Scott Cohen's work is known for its synthesis of architectural typologies, descriptive geometry, and digital media. The work of his firm, Preston Scott Cohen, Inc., encompasses projects ranging in scale from residences to educational and cultural institutions.
Cohen received the first prize in the international competitions for the design of Robbins Elementary School in Trenton, New Jersey (2006), and for two museums: the Taiyuan Art Museum in Taiyuan, China (2007–11), and the Tel Aviv Museum of Art, Amir Building (2003–09). He is the recipient of numerous awards and honors, including the Academy Award in Architecture from the American Academy of Arts and Letters and three Progressive Architecture Awards.
The author of *Contested Symmetries and Other Predicaments in Architecture* (2001), Cohen has been widely published. His work is included in the permanent collections of The Museum of Modern Art, New York; The Cooper-Hewitt National Design Museum, San Francisco Museum of Modern Art, Museum of Contemporary Art, Los Angeles; and the Fogg Museum of Art, Harvard University. It has been exhibited at the Museum of Contemporary Art, Los Angeles (2007), The National Design Triennial, Cooper-Hewitt Museum (2007); the Venice International Architecture Biennale (2004, 1996, 1985); ICA University of Pennsylvania (2003); Max Protetch Gallery (2002); and The Museum of Modern Art, New York (1999). Cohen's work is represented by the Thomas Erben Gallery, New York.
Cohen is the Gerald M. McCue Professor in Architecture and Chair of the Department of Architecture at Harvard University's Graduate School of Design where he is the coordinator of first-year design studios. He was the Frank Gehry International Chair at the University of Toronto (2004) and the Perloff Professor at the University of California, Los Angeles (2002). He has held faculty positions at Princeton, Rhode Island School of Design, and Ohio State University.

CARLOS EDUARDO COMAS
Carlos Eduardo Comas studied architecture at the Universidade Federal do Rio Grande do Sul in Porto Alegre, Brazil; the University of Pennsylvania, and the Université de Paris VIII. He operates a private practice in Porto Alegre and is Professor at the Universidade Federal do Rio Grande do Sul and Chair of its Graduate Studies Program in Architecture. He has written and lectured intensively on modern architecture and urbanism, emphasizing the role of reinforced-concrete frames and shells in the theoretical and practical formulations of architects such as Lucio Costa, Oscar Niemeyer, Affonso Reidy, Vilanova Artigas, Lina Bo Bardi, Paulo Mendes da Rocha, Lelé Filgueras Lima, and Alvaro Siza. His contributions have appeared in the magazines *2G*, *AA Files*, *A&V*, *Arquine*, *Summa+*, and *Projeto*, and the books *Cruelty and Utopia: Cities and Landscapes of Latin America* (2005), *La Casa Moderna Latinoamericana* (2003), *Le Corbusier e Rio* (1999), and *Le Corbusier y Sudamérica: viajes y proyectos* (1991). Comas's work has won awards in architectural competitions in Brazil. Among his built projects are Porto Alegre's Central Market and several private houses.

NEIL DENARI
Neil Denari is an architect and principal of Neil M. Denari Architects (NMDA, Inc.). He studied at the University of Houston and Harvard University, and is a Professor-in-Residence in the Department of Architecture and Urban Design at the University of California, Los Angeles. His office currently is engaged with projects of various scales throughout the United States, Europe, and Asia. Denari is the author of two bestselling books, *Interrupted Projections* (1996) and *Gyroscopic Horizons* (1999).

JACQUES FERRIER
Architect Jacques Ferrier lives and works in Paris. He graduated from the Université de Paris VIII in 1985 and from the Ecole Centrale in 1981. Ferrier established his own firm in 1990 and his works now include the design of public facilities, research centers, cultural institutions, office buildings, and housing. The firm's output is based in the creation of an architecture for a sustainable society. In parallel, Ferrier also conducts innovative research activity in partnership with industries. His projects, which include the Concept Office and the Hypergreen skyscraper, initiated a reflection on the future role of architecture, which takes into consideration the challenges represented by megalopolises and the planet's needs. In March 2008, he was selected to design the French pavilion for the 2010 World Expo in Shanghai, on the theme of "A better city, a better life." Jacques Ferrier has received several architectural prizes and is the author of a number of books, including *The Poetry of Useful Things* (2004).

KENNETH FRAMPTON
Kenneth Frampton is the Ware Professor of Architecture at the Graduate School of Architecture, Planning and Preservation at Columbia University. He trained as an architect at the Architectural Association School of Architecture, London, and has worked as an architect and architectural historian and critic in England, Israel, and the United States. He is the author of such distinguished books as *Modern Architecture: a Critical History* (1980), *Modern Architecture and the Critical Present* (1980), *Studies in Tectonic Culture* (1995), *American Masterworks* (1995), *Le Corbusier* (2002), *Labor, Work and Architecture* (2002), and the updated and expanded fourth edition of *Modern Architecture: A Critical History* (2007).

BENJAMIN A. GRAYBEAL
Benjamin Graybeal is a research structural engineer with the U.S. Federal Highway Administration (FHWA) at its Turner-Fairbank Highway Research Center. He manages the structural concrete research program for FHWA, with a distinct emphasis toward application of advanced cementitious materials in the highway infrastructure. Since 2001 he has been the principal investigator for FHWA's Ultra-High Performance Concrete (UHPC) research program. Thrusts of this work have included UHPC material characterization, full-scale structural testing of UHPC components, and field deployment of UHPC technology.

LAURIE HAWKINSON
Laurie Hawkinson is a partner of Smith-Miller + Hawkinson Architects—a New York City-based architecture and urban planning firm. The firm's projects include the expansion of the Corning Museum of Glass, Corning, New York; the Wall Street Ferry Terminal at Pier 11, in New York City; the Outdoor Cinema and Amphitheater at the North Carolina Museum of Art in Raleigh; and a recently completed house in Sagaponack, Long Island. The firm was a finalist for the Olympic Village Design Competition sponsored by the NYC 2012 Olympic Committee. Among its current projects are the U.S. Land Ports of Entry at Champlain and Massena, New York, for the General Services Administration. Hawkinson is Professor of Architecture at Columbia University's Graduate School of Architecture, Planning and Preservation.

JUAN HERREROS
Professor at the Escuela Técnica Superior de Arquitectura de Madrid and Visiting Professor at The Graduate School of Architecture, Planning and Preservation, Columbia University,

Juan Herreros has also taught at the Ecole Polytechnique Fédérale de Lausanne, the Architectural Association in London, and the School of Architecture at Princeton University. He has conducted numerous lectures, courses, and international seminars as well as research workshops. In 1984, with Iñaki Abalos, he founded the Madrid-based practice Abalos & Herreros; in 1992 he established the Multimedia International League LMI; and in 2006 founded his current practice, Juan Herreros Arquitectos, which encompasses both professional and pedagogical activity. The firm has projects underway in Spain, Portugal, the United States, Mexico, and Uruguay. His work has been widely published and exhibited; among his books, co-authored with Iñaki Abalos, is *Tower & Office* (2003).

STEVEN HOLL
Steven Holl has realized cultural, civic, university, and residential projects both in the United States and internationally. In 1976 he founded Steven Holl Architects, which currently operates offices in New York and Beijing with a staff of 65. The firm has been recognized around the world with numerous awards and accolades, and its work has been widely published and exhibited. Currently under construction is the Linked Hybrid mixed-use complex (Beijing, China), Nanjing Museum of Art and Architecture (Nanjing, China), Vanke Center (Shenzhen, China), Knut Hamsun Center (Hamaroy, Norway), and Herning Center of the Arts (Herning, Denmark). Recent international design competitions won include including the Cité du Surf et de l'Océan (Biarritz, France), Sail Hybrid (Knokke-Heist, Belgium), and Meander (Helsinki, Finland). In June 2007, Steven Holl Architects opened the highly acclaimed Nelson-Atkins Museum of Art (Kansas City, Missouri). Holl is an honors graduate of the University of Washington, Seattle. He studied architecture in Rome, Italy, in 1970 and undertook postgraduate work at the Architectural Association in London in 1976. An accomplished author, he is also a Professor of Architecture at Columbia University's Graduate School of Architecture, Planning and Preservation.

SANFORD KWINTER
Sanford Kwinter is Professor at Rice University's School of Architecture and at Harvard University's Graduate School of Design. Kwinter has written widely on the philosophical aspects of design, architecture, and urbanism and is the author of *Far From Equilibrium: Essays on Technology and Design Culture* (2007), *Architectures of Time: Toward a Theory of the Event in Modernist Culture* (2002) and the forthcoming *Requiem: Meditations on the Metropolis at the Turn of the Millennium*. Kwinter was co-founder and editor of the groundbreaking Zone Books and the journal *Zone* from 1984 to 2001.

JACQUES LUKASIK
Jacques Lukasik is Lafarge Senior Vice President for Scientific Affairs. Trained in atomic and molecular physics and in quantum electronics, he has served as Lafarge's General Manager of the Central Research Laboratory and Chairman of the Group's External Scientific Advisory Council. Active in various European research networks, he is also an adviser to Canadian concrete research teams in Quebec.

Dr. Lukasik is a member of the French Academy of Technologies and an associate member of the Civil Engineering Committee of the Polish Academy of Sciences.

QINGYUN MA
Qingyun Ma is Dean of the School of Architecture at the University of Southern California, where he actively promotes technological integration and design intelligence from a global perspective. Prior to his deanship, he was principal of the firm MADA s.p.a.m. (strategy, planning, architecture, media), which is based in Shanghai, China. His "participative practice" and teaching of architecture have received attention internationally. Recognizing the power of public spectacles, his firm has designed and built a series of exhibition spaces in China, including the Telemedia City (Xian), Shanghai Natural History Museum, Ullens Center for Contemporary Art (Beijing), Renault Truckland, Ningpo Urban Museum, and the Chinese Pavilion for the 2010 World Expo (Shanghai). Ma has served on juries for several important projects in China, including the National Stadium for the 2008 Beijing Olympic Games.

REINHOLD MARTIN
Reinhold Martin is Associate Professor of Architecture in the Graduate School of Architecture, Planning and Preservation at Columbia University, where he directs the PhD program in architecture and the Temple Hoyne Buell Center for the Study of American Architecture. He is a founding co-editor of the journal *Grey Room*, a partner in the research practice Martin/Baxi Architects, and has published widely on the history and theory of modern and contemporary architecture. Martin is the author of *The Organizational Complex: Architecture, Media, and Corporate Space* (2003), and the co-author, with Kadambari Baxi, of *Multi-National City: Architectural Itineraries* (2007). He is currently completing a book that re-theorizes postmodernism.

FERNANDO MENIS
Fernando Menis, a native of Santa Cruz de Tenerife, Spain, studied architecture at ETSA Barcelona. In 1981 he established a partnership with architects Felipe Artengo Rufino and José María Rodríguez Pastrana Malagón. Since July 2004 he has operated a solo practice. His work has been widely published and exhibited internationally. He received an award for *Un objeto para b.d.* (with Inés Rodríguez Mansilla) at the 1st International Competition for Industrial Design; for Chaise Longue, at YUH (1989); 1st Prize Manuel de Oráa for MM House (1989). In 1999, MM House was a finalist at FAD. Menis has been a visiting professor and has given lectures and workshops at universities in Berlin, Barcelona, Buenos Aires, Graz, Havana, Paris, Rome, Santiago de Chile, and Vienna.

DETLEF MERTINS
Detlef Mertins is an architectural historian known for his revisionist histories of twentieth-century modernisms. He is a Professor in the University of Pennsylvania's Department of Architecture, where he was also Chair from 2003 to 2008. He previously taught at the University of Toronto where he held the Canada Research Chair and directed the graduate program. He has also taught at Columbia, Harvard, Princeton and Rice universities and has been a Visiting Fellow at the Canadian Centre for Architecture. He is a recipient of the Konrad Adenauer Research Prize of the Humboldt Foundation and Royal Society of Canada (2003). Mertins edited the *The Presence of Mies* (1994) and the English edition of Walter Curt Behrendt's *The Victory of the New Building Style* (2000). He has published widely in journals, anthologies, and exhibition catalogues, which include *Zaha Hadid* (2006), *Mies in America* (2001), and *Mies in Berlin* (2001). Among his current projects are a monograph on Mies and an English edition of the avant-garde journal *G: Material for Elemental Form-Creation*, originally published in 1923—26.

CHRISTIAN MEYER
Christian Meyer is Professor and Chair of the Department of Civil Engineering and Engineering Mechanics at Columbia University. He completed his undergraduate studies at the Technical University Berlin and obtained his M.S. and Ph.D. degrees from the University of California, Berkeley. He then spent eight years in engineering practice, first working with Albert C. Martin and Associates in Los Angeles on the earthquake-resistant design of tall buildings, then with Stone and Webster Engineering Corporation in Boston on analysis and design of nuclear power plant facilities. Since 1978 he has been on the faculty of Columbia University. His primary interests are related to analysis and design of structures, in particular concrete structures. In recent years, his interests have shifted toward concrete materials science and technology. He and his co-workers are focusing particularly on the beneficiation of recycled waste materials for the production of concrete, such as waste glass, carpet fibers, and dredged material from New York Harbor. This work extends from basic scientific research through technology development to technology transfer by closely working with concrete producers. Meyer has written almost 200 technical articles, including a textbook on the design of concrete structures. He is the recipient of the prestigious research award from Germany's Alexander von Humboldt Foundation.

MARC MIMRAM
Marc Mimram holds a master's degree in mathematics and graduated as an engineer from the Ecole Nationale des Ponts et Chausées. He is a DPLG architect and earned a master's degree in civil engineering from the University of California, Berkeley, in addition to a postgraduate degree in philosophy. He founded his own consultancy and architecture-engineering firm in Paris in 1981 and has realized numerous civil engineering structures and architectural projects in France and elsewhere. Mimram has taught at the Ecole Nationale des Ponts et Chausées, Ecole Polytechnique Fédérale de Lausanne, and at Princeton University. He was appointed Professeur des Ecoles d'Architecture (Professor of Architectural Schools) and currently teaches at the Ecole d'Architecture de Marne-la-Vallée in France.

PAULO MONTEIRO
Paulo Monteiro, professor and group leader of the Structural Engineering Mechanics and Materials Group, Department of Civil and Environmental Engineering at the University of California, Berkeley, received his engineering degree from the University of São Paulo and master and Ph.D. degrees from the University of California, Berkeley. Monteiro's professional experience includes working on a number of projects with the late Roy Carlson, a pioneer in the technology of mass concrete. Recent projects include working with roller-compacted concrete and architectural concrete. At Berkeley, he and his students are creating micromechanical models, characterizing deleterious reactions in concrete, and developing new microscopic techniques, such as low-temperature scanning electron microscopy, soft X-ray microscopy, and direction cooling. In addition to being a co-author, with P.K. Mehta, of the widely used textbook *Concrete: Microstructure, Properties, and Materials*, Monteiro has published more than 100 articles in archival journals.

TOSHIKO MORI
Toshiko Mori is the Robert P. Hubbard Professor in the Practice of Architecture at Harvard University Graduate School of Design and was chair of the Department of Architecture from 2002 to 2008. She is also principal of her firm, Toshiko Mori Architect, in New York City. In 2005 she received the Academy Award in Architecture from the American Academy of Arts and Letters, and the Medal of Honor from the New York City chapter of the AIA. Her design for the Syracuse Center of Excellence was awarded a 2008 Project Honor Award from the New York Chapter of the AIA. Her design for an addition to a Paul Rudolph house in Florida received a 2008 Award of Excellence from the New York State AIA. Mori is the editor of a volume on material and fabrication research, *Immaterial/Ultramaterial* (2002), and a monograph of her work, *Toshiko Mori Architect: Works and Projects*, was published in 2008. She is a frequent participant in international design juries and symposia.

ANTOINE E. NAAMAN
Antoine E. Naaman is Professor Emeritus of Civil Engineering at the University of Michigan in Ann Arbor. He obtained his Ph.D. degree in civil engineering from the Massachusetts

Institute of Technology in 1972. He is a Fellow of the American Concrete Institute, the Prestressed Concrete Institute, the American Society of Civil Engineers, and the International Ferrocement Society. Naaman's research has led to more than 300 technical publications, including two textbooks, and twelve co-edited books. His research interests include prestressed concrete, high-performance fiber-reinforced cement composites, ferrocement, and the integration-tailoring of advanced construction materials to improve structural performance.

GUY NORDENSON

Guy Nordenson is a structural engineer and Professor of Structural Engineering at Princeton University's School of Architecture. He is also a Faculty Associate at the Princeton University Center for Human Values. After studying at MIT and the University of California, Berkeley, he began his career as a draftsman in the joint studio of R Buckminster Fuller and Isamu Noguchi in Long Island City in 1976. Nordenson has worked as a structural engineer in San Francisco and New York. He established the New York office of Ove Arup & Partners in 1987 and was its director until 1997, when he began his own practice, Guy Nordenson and Associates Structural Engineers, LLP. In 1993–94 he was a Loeb Fellow at Harvard University. In 2003 he was the first recipient of the new American Academy of Arts and Letters Academy Award in Architecture for contributions to architecture by a non-architect. He was appointed Commissioner of the New York City Art Commission in 2006 by Mayor Michael Bloomberg and the New York City Council, the first engineer appointed since the Art Commission was established in 1898.

Nordenson was the structural engineer for The Museum of Modern Art expansion in New York, the Jubilee Church in Rome, the Simmons Residence Hall at Massachusetts Institute of Technology, the Disneyland parking structure in California, the Santa Fe Opera House, and more than 100 other projects. Recently completed projects include the New Museum of Contemporary Art in New York, The Nelson-Atkins Museum of Art in Kansas City, Missouri; the Glass Pavilion at the Toledo Museum of Art; and the University of Iowa School of Art and Art History building. Among the architect's current projects are the World Trade Center Memorial Museum slurry-wall bracing structure, two pedestrian bridges at Yale University, the Asian Cultural Complex in Guangju, South Korea, the expansion of the Kimbell Art Museum in Fort Worth, Texas, and the San Francisco State University Creative Arts Center. His project "On the Water, A Model for the Future: A Study of New York and New Jersey Upper Bay" won the 2007 AIA College of Fellows Latrobe Prize.

Nordenson is active in earthquake engineering, including code development, technology transfer, long-range planning for FEMA and the USGS, and research. He initiated and led the development of the New York City Seismic Code from 1984 to its enactment into law in 1995. In 1996 he co-founded the Structural Engineers Association of New York. He was co-curator, with Terence Riley, of the exhibition *Tall Buildings* held at MoMA QNS in 2004. His drawings and models for the 2003 World Trade Center Tower 1 design are in the collection of The Museum of Modern Art.

KATE ORFF

Kate Orff established the Manhattan design studio SCAPE in 2004. Professor at the Columbia University Graduate School of Architecture, Planning and Preservation, she leads studios that integrate the earth sciences into the design curriculum. After graduating from the University of Virginia with Distinction, Orff earned a master's degree in landscape architecture from the Graduate School of Design at Harvard University. She has worked on projects for many prominent academic institutions and private clients that have been published nationally and internationally. She trained for several years with Hargreaves Associates and with the Dutch architect/urbanist Rem Koolhaas at the Office for Metropolitan Architecture, before founding SCAPE. Orff has built SCAPE's reputation for design innovation and collaboration, leading dynamic, open work processes with large, complex teams of collaborating consultants across the fields of engineering, science, and design. The studio alternates between research and design, developing new visions and understandings of urban nature. She has been nominated for several national awards, including the RISD-*Surface Magazine* Emerging Designer, and she was named among "50 for the Future of Design" by *H&G Magazine*. SCAPE is the recipient of a 2008 ASLA Award.

ANTOINE PICON

Antoine Picon is Professor of the History of Architecture and Technology at Harvard University's Graduate School of Design where he is also serving as Director of Doctoral Programs. He has published extensively on the relations between architecture, urban design, science, and technology with a special focus on construction history and theory. Among other publications, he is the author of *French Architects and Engineers in the Age of the Enlightenment* (1988; English trans., 1992), *Claude Perrault (1613-1688) ou la curiosité d'un classique* (1988), *L'Invention de l'ingénieur moderne* (1992), *La ville territoire des cyborgs* (1998), and *Les Saint-Simoniens: Raison, Imaginaire et Utopie* (2003). In 1997 he edited a dictionary of the history of engineering for the Centre Georges Pompidou, *L'Art de l'Ingénieur: Constructeur, entrepreneur, inventeur*. In 2003, Picon edited, with Alessandra Ponte, *Architecture and the Sciences: Exchanging Metaphors*. He recently completed a monograph on the work of the architect and engineer Marc Mimram and is currently writing a book on digital culture and architecture.

JESSE REISER AND NANAKO UMEMOTO

Jesse Reiser and Nanako Umemoto have practiced together in New York City since 1986. Their internationally recognized architectural design firm, Reiser + Umemoto, has realized projects at a wide range of scales—from furniture design to residential and commercial structures, up to the scale of landscape design and infrastructure. Reiser and Umemoto have taught and lectured throughout the United States, including at Columbia University's Graduate School of Architecture, Planning and Preservation during the 1990s, and in Europe and Japan.

Jesse Reiser is Associate Professor at Princeton University's School of Architecture. He received his bachelor of architecture degree from The Cooper Union for the Advancement of Science and Art and his master of architecture degree at the Cranbrook Academy of Art. He was a fellow of the American Academy in Rome in 1985.

Nanako Umemoto is an architect and landscape architect. She graduated from The Cooper Union for the Advancement of Science and Art following studies at the School of Urban Design at the Osaka University of Art.

STANLEY SAITOWITZ

Stanley Saitowitz is Emeritus Professor of Architecture at the University of California, Berkeley's College of Environmental Design. A native of Johannesburg, South Africa, he received his bachelor of architecture degree at the University of Witwatersrand in 1974 and his master of architecture degree at the University of California, Berkeley, in 1977. He was the Elliot Noyes Professor at Harvard University's Graduate School of Design (1991—92) and the Bruce Goff Professor, University of Oklahoma, Norman (1993), and he has also taught at the University of California, Los Angeles, SCI-Arc, Rice, Cornell, and Syracuse universities, and the University of Texas, Austin. He has given more than 200 public lectures in the United States and abroad. He realized his first residentaial design in 1975 and, with Stanley Saitowitz/Natoma Architects Inc., he has completed numerous buildings and projects, including housing, master plans, offices, museums, libraries, wineries, synagogues, churches, commercial and residential interiors, memorials, and urban landscapes. These projects have received national and international recognition. Among many awards, the Transvaal House was declared a National Monument by the Monuments Council in South Africa in 1997; the New England Holocaust Memorial received the Henry Bacon Medal in 1998; and in 2006 Satowitz was a finalist for the Smithsonian Cooper-Hewitt National Design Award .

HANS SCHOBER

Hans Schober is a Partner with Schlaich Bergermann and Partner, Consulting Engineers in Stuttgart, Germany, and President of the Schlaich Bergermann branch office in New York. He studied civil engineering at the University of Stuttgart, from which earned a Ph.D. in 1984. He has worked on glass roofs and glass walls, cable structures, pedestrian bridges, membrane structures, and road- and railway bridges around In New York, Schober has been involved in the design of the new 7 World Trade Center building, the Time Warner Center, Moynihan Station, and the Freedom Tower. Currently he is working on the new Transbay Transit Center in San Francisco and on several projects in Abu Dhabi and Dubai.

MATTHIAS SCHULER

Matthias Schuler is a Managing Director of TRANSSOLAR Energietechnik in Stuttgart, Germany. He trained as a mechanical engineer at the University of Stuttgart where he participated in international research projects on energy efficiency in commercial buildings. In 1992, based on this work, he founded the company TRANSSOLAR, a climate-engineering consulting firm, which aims to integrates comfort-optimizing and energy-saving strategies into building design and master planning. The firm today has offices in Stuttgart, Munich, and New York, and Schuler has worked on national and international projects with architects such as Kazuyo Sejima, Frank O. Gehry, Steven Holl, and Helmut Jahn. Schuler is also Adjunct Professor of Environmental Technology at Harvard University's Graduate School of Design, where he has been a lecturer since 2001, teaching courses on sustainability and urban design.

YSRAEL A. SEINUK

Ysrael A. Seinuk is Professor and Head of the Structural Department in the School of Architecture at The Cooper Union for the Advancement of Science and Art, where he has taught since 1969. An engineer, author, and lecturer, he is recognized internationally as one of the foremost structural engineers and pioneers in the field of tall buildings and special structures. He graduated as a civil engineer in 1954 from the University of Havana, and is a registered engineer in 20 states, and a licensed civil engineer in the United Kingdom, Israel, and Cuba. He began his private practice in Cuba in 1958 with the design of the 700-room Monte Carlo Hotel, and two 50-story concrete buildings, both with the renowned Spanish architect Martin Dominguez. This work advanced the concept of the mega structure, adopted in many designs years thereafter. Seinuk was one of two Americans invited by the Institution of Structural Engineers in the United Kingdom to be a part of a working group on safety in tall buildings, with the objective of providing guidance and advice on the implications following the structural collapses and loss of life at the World Trade Center on 9/11. He was named as one of the 25 most influential Hispanics in America by *Time* magazine in 2005.

Seinuk is the recipient of numerous awards, including the New York Society of Architects 2007 Distinguished Service Award; in 2006 he was inducted into the HENAAC Hall of Fame whose members have achieved the highest honors as Hispanic engineers, scientists, and

mathematicians. He also received the 2006 Homer Gage Balcom Award for Lifetime Achievements in Structural Engineering from the American Society of Civil Engineers; the 2005 Urban Visionaries Award for engineering from The Cooper Union School of Architecture; the 2005 Engineer of the Year from the Association of Cuban Engineers; and the Leader of Industry Award from The Concrete Industry Board in 1999. His firm, Ysrael A. Seinuk, P.C., has an extensive portfolio of award-winning projects, including such iconic structures as the Carnival Center for the Performing Arts, Miami, which received three engineering awards; Bronx Criminal Court Complex; Trump World Tower, which received multiple awards, including the highest award from the Concrete Industry Board for the year 2000; the revitalization of Grand Central Terminal; 42nd Street Redevelopment; and the Gatehouse for the Philip Johnson Estate.

PIERLUIGI SERRAINO

Pierluigi Serraino is a practicing architect in the San Francisco Bay Area. He holds degrees from the Università degli Studi di Roma "La Sapienza," SCI-Arc, and University of California, Los Angeles. He is Ph.D. candidate in the College of Environmental Design at the University of California, Berkeley. His projects and articles have appeared in *Architectural Record*, *Architectural Design*, *Hunch*, *ACADIA*, *Case d'Abitare*, and *Modernism*, among other journals and magazines. He is the author of several books, including *Modernism Rediscovered* (2000) and *NorCalMod* (2006). Serraino has been a member of the editorial board of Architecture California and is a former Chair of the Architecture + Design Forum at the San Francisco Museum of Modern Art.

SURENDRA P. SHAH

Surendra P. Shah is the Walter P. Murphy Professor of Civil Engineering and Director of the Center for Advanced Cement-Based Materials at Northwestern University. His current research interests include fracture, fiber-reinforced composites, nondestructive evaluation, transport properties, processing, rheology, nanotechnology, and use of solid-waste materials. He is a co-author of the books *Fiber Reinforced Cement Based Composites* (1992) and *Fracture Mechanics of Concrete* (1994). He has published more than 400 journal articles and edited more than 20 books. He is past editor of the RILEM journal, *Materials and Structures*. Shah is a member of the National Academy of Engineering. He has received many awards, including the Swedish Concrete Award, American Concrete Institute's Anderson Award, RILEM Gold Medal, ASTM Thompson Award, American Society of Civil Engineer's Charles Pankow Award, and Engineering News-Record News Maker Award. He was named one of the ten most influential people in concrete by Concrete Construction. Recently, he spent time at the Indian Institute of Technology, Mumbai, as an Honorary Professor under the auspices of a Fulbright Grant. In addition to teaching at Northwestern, Shah has taught at the University of Illinois, Chicago, and served as a visiting professor at Massachusetts Institute of Technology, University of Sydney, Denmark Technical University, University of Singapore, Darmstadt University, and Laboratoire Central des Ponts et Chaussées, Paris. He currently serves as Honorary Professor at Hong Kong Polytechnical University.

WERNER SOBEK

Werner Sobek studied architecture and structural engineering at the University of Stuttgart in Germany. In 1991 he became Professor at the University of Hanover. One year later he founded his own engineering consulting firm. In 1995, Sobek took over the renowned Institute for Lightweight Structures at the University of Stuttgart as successor to Frei Otto. In 2001 he also assumed the chair of structural engineer Joerg Schlaich, fusing the two institutes into the new Institute for Lightweight Structures and Conceptual Design (ILEK), which he directs. ILEK specializes in research on new materials and new concepts for lightweight and adaptive structures.

Werner Sobek's firm is one of the leading engineering consultancies in Europe. It is dedicated to combining the highest levels of engineering and design of constructional elements and sophisticated concepts for sustainable buildings. A particular focus is on special structures in steel, glass, titanium, concrete, textiles, and wood. Werner Sobek has offices in Stuttgart, Cairo, Dubai, Frankfurt, Moscow, and New York. Sobek's designs have received numerous awards and distinctions, including the DuPont Benedictus Award, European Glulam Award, Fritz Schumacher Award, iF Design Award, SEAOI Structural Engineering Award, the "Building of the Year Award" from the American Institute of Architecture, Hugo Haering Award, Fazlur Rahman Khan Medal, and the UIA's Auguste Perret Prize.

BERNARD TSCHUMI

An architect based in New York and Paris, Bernard Tschumi is Professor at Columbia University's Graduate School of Architecture, Planning and Preservation, where he served as Dean from 1988 to 2003. First known as a theorist, he exhibited and published *The Manhattan Transcripts* (1981) and wrote *Architecture and Disjunction*, a series of theoretical essays (1994). In 1983 he won the prestigious competition for the design of the Parc de la Villette, a 125-acre public park at the northeast edge of Paris containing dramatic buildings, walkways, bridges, and gardens. Current projects include the New Acropolis Museum in Athens, as well as an archaeological museum and a cultural center, both in France. He recently completed a 6,000-seat concert hall in Limoges, France, as well as a residential tower in New York City. His most recent books are *Tschumi on Architecture: Conversations with Enrique Walker* (2006) and a biography and monograph by Gilles De Bure, *Bernard Tschumi* (2008).

MARK WIGLEY

Since 2004, Mark Wigley has served as the Dean of Columbia University's Graduate School of Architecture, Planning and Preservation. Prior to joining Columbia in 2000 as Director of Advanced Studios, he taught from 1987 to 1999 at Princeton University, where he became Director of Graduate Studies in Architecture in 1997. He received both his B.Arch. (1979) and his Ph.D. (1987) degrees from the University of Auckland, New Zealand. Wigley has served as guest curator for widely attended exhibitions at The Museum of Modern Art, New York; The Drawing Center, New York; Canadian Centre for Architecture, Montreal; and Witte de With Center for Contemporary Art, Rotterdam.

An accomplished scholar and design teacher, he has written extensively on the theory and practice of architecture, and is the author of *Constant's New Babylon: The Hyper-Architecture of Desire* (1998); *White Walls, Designer Dresses: The Fashioning of Modern Architecture* (1995); and *The Architecture of Deconstruction: Derrida's Haunt* (1993). He is a co-editor of *The Activist Drawing: Situationist Architectures From Constant's New Babylon to Beyond* (2001). In 1990 he received the International Committee of Architectural Critics (C.I.C.A.) Triennial Award for Architectural Criticism.

MABEL WILSON

Mabel Wilson is Associate Professor at Columbia University's Graduate School of Architecture, Planning and Preservation where she directs the Program for Advanced Architectural Research. She recently began Studio 6Ten, an interdisciplinary practice that explores the intersections between architecture, art, media, and theory. Her designs have been exhibited at a number of international and national venues, including the Wexner Center for the Arts, the Smithsonian Cooper-Hewitt National Design Museum's Triennial, and the Storefront for Art and Architecture. Her articles and design projects have been featured in *Assemblage*, *Any*, and *Harvard Design Magazine*, and her scholarly essays have appeared in books on critical geography, cultural memory, visual culture, and architecture. She is currently working on the book *Black History Made Visible*, which examines the social and material production of the displays, expositions, museums, and cities where black Americans remembered their past and envisioned their future. Out of this research she is developing a database and interface, The Visible History Project, which presents this scholarship to a wider audience.

Wilson has also taught at California College of the Arts in San Francisco where she chaired the Graduate Visual and Critical Studies Program, the University of Kentucky, Parsons/The New School for Design, Princeton University, and Ohio State University. She received her B.S. in architecture from the University of Virginia, an M.Arch. from Columbia University, and a Ph.D. in American Studies from New York University.

# ORGANIZING INSTITUTIONS

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# ACKNOWLEDGMENTS

**Solid States** is the second in a series of conferences on architecture, engineering and materials. The series originated as a plan to collaborate; Mark Wigley, Dean, GSAPP, and Christian Meyer, Chair, Civil Engineering and Engineering Mechanics, began discussions to host a joint conference as a new model of exchange between architecture and engineering. The first conference in the series, Engineered Transparency, on glass, was held at GSAPP in September 2007. The third conference, on metals, will be held at GSAPP in autumn 2009.

For information about this and future GSAPP events, please contact Benjamin Prosky, Director of Special Events, at 212 854 9248; *bp2171@columbia.edu*

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