

PERMANENT CHANGE PLASTICS IN ARCHITECTURE AND ENGINEERING

THE FOURTH
COLUMBIA CONFERENCE
ON ARCHITECTURE,
ENGINEERING
AND MATERIALS

MARCH 30—APRIL 1, 2011

THE FOURTH COLUMBIA CONFERENCE ON ARCHITECTURE, ENGINEERING AND MATERIALS

Permanent Change: Plastics in Architecture and Engineering is the fourth in a series of conferences on architecture, engineering and materials. Each conference explores the boundaries between architecture, engineering and materials science by bringing together a wide range of leading architects, engineers and scholars in an intensely focused investigation. How is a new generation of professionals and manufacturers fusing engineering and architectural practices, and how do new materials and material concepts change our professions?

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Mark Wigley, Dean
Michael Bell, Professor of Architecture, Conference Chair

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Engineer, Principal
Werner Sobek Engineering and Design, Stuttgart

MARK WIGLEY

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

THE CONFERENCE WILL BE ACCOMPANIED BY INSTALLATIONS:

Plastic Chains
Curated by Rosana Rubio Hernández
Assisted by adjunct curators
Mara Sánchez Llorens and
Carlos Fernández Piñar
AirFlow-er and *Poly-Columnar*
Designed by Yoshiko Sato
Assisted by Shuning Zhao
and John Hooper
On display in Avery Hall, 100 and 200 Levels, March 30–April 1, 2011

Abstract

PERMANENT CHANGE: PLASTICS IN ARCHITECTURE AND ENGINEERING

Plastics have become the most ubiquitous and increasingly permanent materials in construction. The material capabilities of plastics both as a generic material nomenclature and as specific polymers and the processes that underlie them suggest a potential to reshape design and the roles of architects and engineers in construction. While plastics are perhaps the most deeply engineered building materials today, they are still in their nascent stages of understanding in terms of their potential applications and uses. *Permanent Change* sheds new light on these materials and their implications for the fields of architecture and engineering.

Traced through history, plastics in the overarching sense reveal aspects that are often completely contrary to assumptions. *Permanent Change* undertakes to reexamine the histories and reassess the futures of polymers, exploring their origins in industry and science as well as their role in domestic and public realms, up through recent advances in composites and the new forms of fabrication assembly these portend. Materials that originally anticipated easily molded, re-formed shapes have become a permanent measure and control point in design. From their means of production to their assembly and to their presence in design, polymers have continually been redeployed and developed in ways that often do not align with either the early scholarship or technical forecasts of their capabilities. Plastic, as both broad material nomenclature and specific polymer, may no longer be capable of sustaining the breadth of cultural ambitions the term has held at various historical points. As a material that is still being engineered and increasingly leads to composite assemblies, how are the multiple histories and mediatic aspects of its developments being remade?

PLASTIC SPACE: PLASTIC MATERIAL

In architecture and engineering the term *plastic* has historically referred to aspects of space and form; that is, how building forms become virtually active, complex in shape and contour or visually compelling as form. In engineering *plastic* refers to a material's ability to sustain itself and recover at the limits of its elastic capability. Both aspects of the term are deeply historical if not ancient — they are fundamental aesthetic and technical aspects of architecture, engineering and materials.

Yet during the second half of the 19th century, these broader artistic/cultural and technical meanings of the term were essentially revised if not fully replaced. *Plastic* literally came to mean a new and engineered synthetic material rather than the aesthetic or technical attributes of a material. Polymers dramatically affected the historic, i.e., "plastic," modeling of form, shape and color but also garnered the technical capacity afforded by research and development. They are old and unprecedented simultaneously: the hybridization of plastic as quality and as an engineered material conflates experience and material science and leaves both terms inadequate to describe their social meaning and potential. The advent of polymers and the 100-year evolution of the chemical engineering of polymers prior to the 1950s met with a mid-20th-century strain of commercial mass media, mass production and social upheaval that today is quasi-historical but also still evolving and shaping both culture and production. Polymers are everywhere in construction, but they are also not at all evident in architecture in ways that they were prophesied as recently as the 1950s. What is the state of plastics as both a broader term and also as the more specific strains of polymers that are embedded in building today, and how do the current manifestations relate to the waves of promise that drove much of our last century's fascination with the material?

With any shape seemingly possible, plastics have often reproduced or mimed existent forms rather than deliver new shapes: aspects of imitation of forms already known (imagine a 1970s car dashboard molded in thermoplastic simulating the experience of a jet-fighter cockpit) have been a component of plastics as the bearer of artificial or contrived experience. But conversely, they have also allowed and at times prompted newly responsive and ergonomic experiences; easily molded with new efficiency, lightness, ease of production and, often, durability, they drive a consortium of

industrial design devices that have become newly personal, bearing private experience.

If the cultural connotations of *plastic* include artificiality and at times superficiality, the term also connotes all manner of technical innovation if not new levels of authentically original modes of experience. Plastics are ubiquitous and have increasingly become essential to construction and to the entire built world, from transportation to architecture to electronics and equipment. They are as likely to be part of a medical or food production process as embedded in industrial procedures, but they have almost never delivered a capability to shape architecture in a fuller sense. In fact, they have seemingly become more invisible and have enabled architecture to sublimate technical concerns to substrata of performance (weatherproofing, insulation, electrical casing) and consign overall figure and design to a host of linguistic signifiers. That is, polymers are doing work beneath the surface while the surface is free to look like anything it wants. Yet this is once again changing, as composites — polymers, fused with carbon and other materials — are increasingly reshaping the production of planes and other results of technologically sophisticated industrial production, of highly capitalized processes. In these cases we are again at a threshold where polymers are perhaps beginning anew to reshape their own cultural/technical legacy: to revise their promise as both technical and aesthetic revolution in ways that challenge both the design and technical capacities of other materials but also the initial waves of design and engineering that polymers have activated since the mid-19th century. Composites promise change in how things are made and what they can do but also in what they look like, what they connote and the network of professionals who form the development teams.

The more precise annotation for what we call plastics, the subset of polymers — vinyl, PVC, resins, to be specific, but more broadly, composites and the processes that define their formation — are a stark contrast to the easy use of the term *plastic* and the complex range of capabilities for specific materials. Plastics have reshaped construction, yet the ways in which architects and engineers view their role in construction has been the subject of less scholarship than have materials such as glass or concrete. One reason for this may be the gap between the promise of plastics at mid-century and its later implementation. In addition, the lack of a technical vantage or understanding of the chemical engineering and specific "plastic"

behavior of polymers has slowed architectural design and scholarship related to the materials.

Plastics still constitute an essentially new genre of materials and while they are perhaps the most deeply engineered building materials today, they are still in their nascent stages of understanding in light of potential applications and uses. When coupled with a commensurate rise in research and development, they become the recipient of a focused and tremendously sophisticated range of innovations.

Permanent Change brings these materials to a new light: materials that promised tremendous flexibility and complex modeling are now becoming the most ubiquitous and increasingly permanent materials in construction. From silicones to sheathing, to electrical casing and plumbing, vinyl and PVC — plastics of all types are often the most long-lasting warranted and tested materials in construction. They also portend a deep set of ecological issues that are only recently becoming fully addressed. Plastics remain the most easily shaped, contoured and aesthetically and functionally formed materials but they are not alone in complex modeling or innovations in chemical engineering: fiber-reinforced concrete, glazing and new modes of laminated glass and coatings, as well as new metal alloys, all have acquired more elastic capabilities and all are less easily identified as discrete from other materials. What then are the futures of plastics in design, and how can we begin a more comprehensive project of segregating the complex aspects of polymers and the host of issues that they create and portend?

Permanent Change: Plastics In Architecture and Engineering is the fourth in a series of conferences convened by Columbia University. The conference includes new participants and also reconvenes leading engineers, architects and scholars from our previous conferences on glass, concrete and metals.

Michael Bell
Professor, GSAPP, Columbia University
Conference Chair

SCHEDULE OVERVIEW

WEDNESDAY, MARCH 30, 2011

6:30 – 8:00 PM
Wood Auditorium, Avery Hall
CONFERENCE KEYNOTE LECTURE
GREG LYNN
Architect, Greg Lynn FORM, Venice, California
Professor, UCLA and Institute of Architecture,
University of Applied Arts, Vienna

THURSDAY, MARCH 31, 2011

9:30 AM – 5:30 PM
Wood Auditorium, Avery Hall
PRESENTATIONS / PANEL DISCUSSION

6:30 – 8:00 PM
Altschul Auditorium, SIPA
HONORARY KEYNOTE LECTURE
MICHAEL GRAVES
Michael Graves Design Group
Michael Graves & Associates
Princeton, New Jersey

FRIDAY, APRIL 1, 2011

9:30 AM – 6:00 PM
Wood Auditorium, Avery Hall
PRESENTATIONS / PANEL DISCUSSION
CONCLUDING DISCUSSION

6:00 – 7:00 PM
Wood Auditorium, Avery Hall
RECEPTION

**WEDNESDAY
MARCH 30**

6:30 - 8:00 PM

WELCOMING REMARKS

MARK WIGLEY

Dean, GSAPP, Columbia University

Remarks on behalf
of The Vinyl Institute

CONFERENCE KEYNOTE LECTURE

GREG LYNN

Architect, Greg Lynn FORM,
Venice, California
Professor, UCLA and Institute
of Architecture, University of
Applied Arts, Vienna

**THURSDAY
MARCH 31**

9:30 - 10:00 AM

INTRODUCTION TO THE CONFERENCE

MARK WIGLEY

Dean, GSAPP, Columbia University

RAIMONDO BETTI

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

MICHAEL BELL

Professor, GSAPP, Columbia University,
Conference Chair

10:00 - 11:30 AM

**THE EMERGENCE OF POLYMERS:
NATURAL MATERIAL — INDUSTRIAL MATERIAL**

MICHAEL BELL moderator
Professor, GSAPP, Columbia University

CRAIG BUCKLEY
Director of Print Publications,
GSAPP, Columbia University

BILLIE FAIRCLOTH
Research Director, KieranTimberlake

LYDIA KALLIPOLITI
Assistant Adjunct Professor,
The Cooper Union, Irwin S. Chanin
School of Architecture

THEODORE H.M. PRUDON
Adjunct Associate Professor,
Historic Preservation, GSAPP,
Columbia University

The emergence of polymers since the middle of the 19th century occurred in specific phases of development and within a broad range of relationships to natural sources as well as to the seeming and actual inorganic aspects of the urban and industrial world. The natural origins of polymers seem to be virtually forgotten today, at least in terms of the popular perception of plastics as artificial or lifeless, but at the outset polymers such as vulcanized rubber existed at a precipice between industry and nature. They conflated the industrial and natural in ways that today seem misunderstood if not simply forgotten. Is it possible to still see polymers as natural, or have they migrated so far from these beginnings that they have become something else altogether? What is the outcome of how these materials are understood historically; has the history of polymers been irrecoverably lost?

Charles Goodyear's patent on vulcanization in 1844 paved the way for a new industrial procedure for rubber that would lie at the heart of the automobile industry and paved the way for vulcanized rubber becoming intrinsic to urban landscapes. What aspects of the history of polymers have been deflected, undervalued or misrepresented, if not simply lost, in the ensuing period leading up to the 1950s, when one encounters plastics in the full as both material and as a spectacular component of modernization?

The first 100 years of polymers seem distinct from the postwar American and European period during which a conflation of polymers as

material, media and branding seems to increasingly present polymers as almost without history and without origin — as unbreakable, infinitely formable and as segregate from and thereby safe from contaminating partner materials and contagions. Did polymers' relationship to nature decline or was their participatory relationship to their environment simply modified?

11:45 - 1:15 PM
1:15 - 2:15 PM

**PERMANENT CHANGE: HOW LONG DOES A FLEXIBLE MATERIAL LAST?
BREAK**

GEORGE WHEELER moderator
Director of Conservation, Historic
Preservation, GSAPP, Columbia
University; Chemist, Metropolitan
Museum of Art

JAN KNIPPERS
Engineer, Knippers Helbig Advanced
Engineering

CRAIG KONYK
Adjunct Assistant Professor, GSAPP,
Columbia University

WERNER PREUSKER
Attorney, AG PVC und Umwelt e.V.,
Bonn

RITA SCHENCK
Executive Director, Institute for
Environmental Research and Education

Plastics have promised deeply engineered parameters that assure material stability and described if not warranted parameters for degradation over time. Yet plastics have also often been understood to inevitably offer a component of aesthetics or stylistic change — any shape is achievable and plastics are understood to offer both tremendous flexibility but also defined limits. Are plastics different from other materials in terms of life spans in building; are they tested, documented and adhered to for safety and investment parameters in unique ways? Do the wider public or legislative bodies understand plastics well enough to gauge their safety, their uses or post-consumer potentials?

Degradation, loss of elasticity, loss of color — these are all aspects of a material's commodity value and liability determinations. What are the design limits of plastics in this realm? Is there a cleft between life span engineering and formal pliancy that one assumes with plastics? Are there long-term attributes to plastics that alter their environmental determinants; or applications and quantities of use and implementation that register in how a polymer performs in relation to public health, reuse or recycling? How do these attributes come together in plastics in ways that are unique or different from concrete, wood, metals or glass where life span and design potential are also often highly managed?

Plastics have promised a unique relationship to history — altering the life span of building components but also surprisingly engaged in keeping

partner materials in new forms of duration: window gaskets suspending glazing in a differential time span; metals sustained by polymers in acrylic paints. Polymers have altered the relationships of given materials and thereby re-engendered their properties and architectural meaning.

How do polymers alter the readings of permanence in building and what if any relationship exists between historical values associated with the term *permanence* and the performance of polymers today?

2:15 - 3:45 PM

ARCHITECTURE: PLASTIC LIFE, LIFE OF PLASTICS

GALIA SOLOMONOFF moderator
Associate Professor, GSAPP, Columbia University

ANNA DYSON
Director, CASE, RPI/CASE SOM, New York

WINKA DUBBELDAM
Professor of Practice, University of Pennsylvania

SHEILA KENNEDY
Professor of Practice, MIT School of Architecture + Planning

WILLIAM PEARSON
Technical Director, North Sails One Design International Ltd.

In an era of harvesting energy, pushing boundaries, recovering lost energy and convening new means of cross fertilization if not purposeful conflation of means, do plastics add a particular value or are they one of many newly liquid materials in the fields of design and engineering? Has the status of the architectural work gained or lost distinction in this regard — that is, is there an overt architectural significance to plastics today, or are they so fully embedded in work that they assume a less overt but nonetheless more pervasive role?

Are current designers more beholden to performance or strategic purpose than in prior generations and do plastics today signify something far more distributed and codified; or are plastics simply purposed as other materials with their own unique design instincts and parameters?

In the mid-1950s the promise of plastics took on a utopian guise but also a full-fledged image of total design: is it possible that plastics heralded an era of synthetic and ultimately engineered design whose concrete image and form betrayed the flexibility and dexterity that plastics represented at a technical (chemical) level? Did the image of the '50s utopian house of the future become too unilateral and too closed even as it was first envisioned to corral or signify the torrents of heterogeneous practices that were beneath, within and around these new engineered materials? Does design find itself outside of these practices, or possibly within them?

4:00 - 5:30 PM

CULTURAL MATERIAL: COUNTER-CULTURAL MATERIAL

BRIAN KANE moderator
Assistant Professor of Music, Yale University

HERNAN DIAZ ALONSO
Graduate Programs Chair, SCI-Arc; GSAPP, Columbia University; University of Applied Arts, Vienna

FELICITY SCOTT
Director, Program in Critical, Curatorial and Conceptual Practices in Architecture, GSAPP, Columbia University

CHIP LORD
Artist, Founding member, Ant Farm

BEATRIZ COLOMINA
Professor of Architecture and Director of the Program in Media and Modernity, Princeton University

The 1950s and '60s iconic images of plastic architecture such as the Monsanto House of the Future had a corollary in the pervasive yet nonfigural uses of plastics in plumbing, electrical wiring and waterproofing. If this is a divide that perhaps some saw in advance, it seems to have also cast the project of a plastic architecture — a figural plastic/plasticity — into a kind of nostalgic kitsch approached as a signal of a nascent but unrealized former future. The House of the Future seems to be received today as a figural as well as material prophecy come undone — a trajectory that lost ground in light of other imperatives. In its place, have we realized a world of plastic versions of previous building components — that is, vinyl-clad wood windows, vinyl versions of wood siding, etc.? Plastics are employed in ways that sustain former vernaculars and our gaze is cast forward materially and backward formally in time.

There seems to be little overt, i.e., expressive, plastic architecture today, but polymers such as vinyl are called upon increasingly to abet an array of design strategies. As opposed to being the manifest strategy of both meaning and form, plastics enclose former meanings in airtight containers. The deep and pervasive use of polymers in building mechanics and discrete systems — from paint and coatings to wire casing, plumbing, windows and siding — seem to continually reveal a divide where plastics migrate to pragmatic architectural problems rather than expressive proposals of form or shape.

Andy Warhol's *Exploding Plastic Inevitable* forecast the totalizing aspects of plastics as a pan-environment of countless ready-mades; a seemingly endless supply of branded differences that were in the end as homogenous as they were total. The environment was plastic: distributed plastics.

What has changed in regard to the word and associated aspects of the term *plastic* since the post-'60s era? How has its meaning or potential migrated? What work set up the explosion of connotations and is it possible plastic has become both more and less pervasive?

Are we still concerned with the term *plastic* and its negative aspects and would we even concern ourselves with these connotations today — or ever?

6:30 - 8:00 PM

HONORARY KEYNOTE LECTURE

Honorary Keynote Lecture
MICHAEL GRAVES
Michael Graves Design Group
Michael Graves & Associates
Princeton, New Jersey

FRIDAY
APRIL 1

9:30 - 11:00 AM

PLASTIC ENVIRONMENTS: ENVIRONMENTAL PLASTICS

HEIKO TRUMPF moderator
Werner Sobek Engineering and Design,
Stuttgart

ERIK OLSEN
TRANSSOLAR
Stuttgart and New York

WILLIAM F. CARROLL
Vice President, Industry Issues,
Occidental Chemical Corporation

JACK R. ARMSTRONG
BASF, Leader, Construction Markets
North America

HARTMUT SINKWITZ
Director, Interior Design Center
of Competence, Daimler AG

What is the future of polymers in regard to expected and forecast potentials in the chemical engineering of polymers and also as building materials in a wider sense? Will polymers offer a future malleability that allows one to alter their chemical structure after production: that is, can we reengineer polymers and extend, alter or reroute their post-consumer uses? Are there financial or economic imperatives that could sustain or thwart taking polymers back to their atomic origins: to returning the material to chemical origins for reassembly or purpose?

Polymers gain strength and are shaped by way of initial thermal processes and exhibit properties of entropy prior to applications of heat: while thermoplastics can be heated and given shape and then melted again to be re-formed, thermoset polymers cannot be reshaped after their initial formation. Thermosetting of polymers induces molecular cross-linking; once formed the molecular structure becomes permanent, giving the material strength but also the inability to be re-formed. The thermosetting and its inherent cross-linking effectively block the flow of one molecule past another, thwarting potential reuses. Thermoset polymers are not as easy to either reuse or reengineer — to recycle.

· How does design affect the post-production use of polymers?

· Will the future environmental implications of polymers involve a renewed attempt to alter the chemical structure of discarded polymeric materials

or to reengineer what would otherwise be unusable polymers? Are there techniques that will keep polymers out of landfills altogether: can they be reengineered and thus transform the expectations for what would have been discarded material?

· The reuse of polymeric building materials is usually done within a thermal recycling process; the melting, grinding and washing of polymeric materials prior to re-forming has limits and sets parameters for polymer reuse, reapplication and recycling.

· What aspects of polymers — either by way of chemical engineering or the limits imparted by initial chemical engineering — will be critical to the future environmental factors of polymers? How are these stages as applied to polymers different from metals or other predominant building materials?

11:15 AM - 12:45 PM
12:45 - 2:00 PM

STRUCTURAL ASPECTS OF POLYMERS BREAK

LAURIE HAWKINSON moderator
Professor, GSAPP, Columbia University

MARK GOULTHORPE
Associate Professor, MIT School
of Architecture + Planning

JOHAN BETTUM
Professor of Architecture
and Program Director,
Städelschule Architecture Class

HEIKO TRUMPF
Werner Sobek Engineering
and Design, Stuttgart

IGNAAS VERPOEST
Department of Metallurgy
and Materials Engineering,
Katholieke Universiteit Leuven

Designers tend to portray polymers as infinitely moldable and easily shaped, but their limits are highly defined and as such are perhaps more ambiguous and misunderstood by architects and designers than are metals, concrete or glass. Are there tectonic aspects to plastics and do they follow and abide by the attributes of metals and other ductile materials? How do polymeric materials alter our basic concept of architectural or engineering structure and dislocate the work and the potential of architectural design and experience?

Increasingly, aspects of polymers and composites are present in heavy construction and operate in a realm where steel or other metals once predominated. That is, polymers are taking on plastic attributes of steel — or joining with steel and concrete — but with a completely unique array of structural techniques, both at the level of assembly and by way of chemical engineering. But polymers also shape a vast array of other building components where pliancy and movement are critical.

· Has plastic been a component of your practice in ways that are beyond integral use in plumbing, electrical casing or waterproofing? Do you see a new role for plastics and in particular for vinyl or PVC and other materials seemingly relegated to issues of artificiality or lack of historical authority? PVC and other plastics are capable of being engineered for a tremendous range of properties, including heat resistance and stiffness. Do you foresee new uses for plastics in structural engineering?

· The structural properties of polymers achieved by thermosetting, cross-linking and other chemical engineering techniques are rarely discussed in architectural design, but they comprise a unique component and strain of plastics that is distinctly different from thermoplastics. Polymers tend to be discussed in generic terms and/or with degrees of strength, flexibility and other parameters. They often seem to moderate other material conditions more than serve as distinct components. Are polymers a subset of construction or can they be seen as emerging as central to it?

· Composites are increasingly seen as the heir to a wide range of historic building materials such as metals and concrete and in some ways have already changed the discussion of tectonics and assembly in architectural design and engineering: do you expect to see a wider range of composites in design?

2:00 - 3:30 PM

PLASTIC BODIES

PAOLA ANTONELLI moderator
Senior Curator, Department
of Architecture and Design,
The Museum of Modern Art, New York

SANFORD KWINTER
Professor of Architectural Theory
and Criticism, Harvard University
Graduate School of Design

GEORGE JERONIMIDIS
Professor Emeritus and Director,
Centre for Biomimetics, University
of Reading, UK

FABIAN MARCACCIO
Artist, New York

FRANÇOIS ROCHE
Architect, R&Sie(n), Paris

Plastic has long signified cultural change and contemporary life: but what are the term's other uses today?

Does *plastic space* still survive as a useful term or does the term and facts of plastics cast us into a very different contemporary world of ecological concern and transformed meaning of what was once the material of the future?

What is the emergent role of bioplastics in design and how do these materials alter the relationship of plastics to the body and to the long-held popular image of plastics?

Materials such as vinyl have long held a role in all modes of design related to the body — from seating to automobile interiors — but what new roles do polymers play in more invasive or medical/biological roles in regard to bodies?

Have we passed a threshold where the bodily or haptic aspects of plastics — from the ergonomic of the hand-held, to electronic circuitry or the pervasive use of plastics in food packaging — actually comprise a former frontier whose effects, while far from certain, are more traceable or directly corporeal when compared to the bio-engineering of plastics we see today?

3:45 - 5:15 PM

PLASTIC ABSTRACTION: CONCEPT OR MATERIAL

JUAN HERREROS moderator
Visiting Professor, GSAPP, Columbia University; Senior Professor, Escuela Técnica Superior de Arquitectura, Madrid

MICHAEL MEREDITH
Associate Professor, Harvard University Graduate School of Design

JORGE OTERO-PAILOS
Assistant Professor, Historic Preservation, GSAPP, Columbia University

HILARY SAMPLE
Professor, Yale School of Architecture

MARK WIGLEY
Dean, GSAPP, Columbia University

SYLVIA LAVIN
Professor and Director of Critical Studies and MA/Ph.D. programs in Architecture, UCLA

Is plastic the first material for which it is possible to claim that material precedes concept — did plastic emerge without a mandate or with seemingly eased constraints compared to wood, stone, glass or metals? That is, does the term *plastic* as an adjective or material nomenclature fail to live up to what the material could have been or could have prompted?

Embodied in polymers, the aspects, effects and qualities of luster, reflection, surface or even weight all seem to have been often seen in light of other more historically qualified materials: do plastics need an entirely new language of art history, of artistic qualities?

Have plastics found the depth of their potential or were they short-circuited by applications of earlier mandates, or earlier material constraints on image, shape and design? Are plastics still today a material in search of a concept?

5:15 - 6:00 PM

**CONCLUDING DISCUSSION
PLASTICS, VINYL, COMPOSITES AND ENGINEERED MATERIALS:
THE FUTURE OF PLASTICS IN ARCHITECTURE**

MARK WIGLEY
Dean, GSAPP, Columbia University

STEVEN HOLL
Professor, GSAPP, Columbia University

SYLVIA LAVIN
Professor and Director of Critical Studies and MA/Ph.D. programs in Architecture, UCLA

WERNER SOBEK
Werner Sobek Engineering and Design, Stuttgart

RECEPTION TO FOLLOW

PARTICIPANTS

PAOLA ANTONELLI

Paola Antonelli is Senior Curator in the Department of Architecture and Design at The Museum of Modern Art, New York (MoMA), where she has worked since 1994. Through her exhibitions — including “Design and the Elastic Mind,” 2008 — teaching and writing, she strives to promote a deeper understanding of design’s transformative and constructive influence on the world. She is particularly proud of a recent acquisition for MoMA’s Permanent Collection: the @ sign. She is working on several exhibition concepts and on the book *Design Bites*, about basic foods as examples of outstanding design.

JACK ARMSTRONG

Jack Armstrong, Leader of BASF—The Chemical Company’s Construction Markets for North America, graduated with a degree in chemical engineering from the University of Texas and began working for BASF in 1989. His posts have included Regional Marketing Manager for BASF South America, Brazil for Acrylic Functional Polymers, for General Manager for Polyurethane Systems, Americas (based in Brussels, Belgium) and Business Manager for Styropor Expandable Polystyrene Foams, for North America.

His current responsibilities focus on combining BASF’s high-performance building products into integrated systems that result in a whole greater than the sum of its parts. BASF’s goal is to be the undisputed leader as the brand of sustainable solutions.

Armstrong currently serves on the board of directors of the Sustainable Building Industries Council, The Structural Insulated Panel Association and the Building and Construction

Team of the Plastics Division of the American Chemistry Council.

MICHAEL BELL

Michael Bell is an architect and a Professor of Architecture at Columbia University’s Graduate School of Architecture, Planning and Preservation (GSAPP). Bell is the founding Chair of the Columbia Conference on Architecture, Engineering and Materials; a GSAPP collaboration with The Fu Foundation School of Engineering and Applied Science, and the Institute for Lightweight Structures and Conceptual Design (ILEK), University of Stuttgart, Germany.

At Columbia, Bell directs the Master of Architecture Program Core Design Studios and also leads the school’s housing design studios.

Bell’s architectural design work has been exhibited at The Museum of Modern Art, New York; the Venice Biennale; the Yale School of Architecture; the University Art Museum, Berkeley and at Archilab, Orleans, France. Bell has received four Progressive Architecture Awards and his work is also included in the permanent collection of the San Francisco Museum of Modern Art. His recently completed Binocular House is featured in Kenneth Frampton’s *American Masterworks: Houses of the 20th and 21st Century* (2008). Books by Bell include *Post Ductility: Metals in Architecture and Engineering* (2011); *Solid States: Concrete in Transition* (2009); *Engineered Transparency: The Technical, Visual, and Spatial Effects of Glass* (2008); *16 Houses: Designing the Public’s Private House* (2004); *Michael Bell: Space Replaces Us:*

Essays and Projects on the City (2004) and *Slow Space* (1998).

Bell has taught at the University of California at Berkeley and Rice University, and has been a visiting professor at Harvard University Graduate School of Design and at the University of Michigan where he held the Saarinen Professorship in Architecture. Michael Bell Architecture was established in 1989 and specializes in housing and urban redevelopment where housing is a key component. In 2001, Bell led a team of architects who provided research, planning and design for 2,100 units of housing on a 100-acre parcel of oceanfront land owned by the New York Department of Housing Preservation and Development (NYHPD). The project was commissioned by the Architectural League of New York and the NYHPD as a research proposal to help shape city planning. Bell is a partner in the design firm Visible Weather with Eunjeong Seong.

RAIMONDO BETTI

Raimondo Betti is Professor of Civil Engineering in the Department of Civil Engineering and Engineering Mechanics, of which he is Chair, at The Fu Foundation School of Engineering and Applied Science, Columbia University. He specializes in the areas of structural dynamics and earthquake engineering with particular emphasis on the analysis of dynamic soil-structure interaction effects for horizontally extended structures. His research interests include the dynamic response of embedded foundations to earthquake excitation, analysis and determination of Green’s functions for homogeneous and layered semi-infinite domains, effects of the spatial variation of ground motion on the

seismic response of bridges, active, passive and hybrid control systems for the vibration control of structures subjected to earthquake and/or wind excitation and damage detection for bridges using data correlation analysis. He is a member of the Earthquake Engineering Research Institute, the American Society of Civil Engineers and Sigma Xi.

JOHAN BETTUM

Johan Bettum is Professor of Architecture and Program Director of the Städelshule Architecture Class in Frankfurt. He has taught and lectured at the Architectural Association in London, UCLA, the Berlage Institute and Innsbruck University, among many other institutions, and is currently also a guest professor at the EPFL in Lausanne. He studied at the Architectural Association after receiving a Bachelor of Arts degree with a major in biology from Princeton University. From 1998 to 2002, Bettum was a research fellow at the Oslo School of Architecture and headed a nationally funded research project on polymer composite materials in architecture; his doctoral thesis focuses on architecture and fiber-reinforced composites.

CRAIG BUCKLEY

Craig Buckley is the Director of Print Publications at Columbia University’s Graduate School of Architecture Planning and Preservation, where he is also Adjunct Assistant Professor. He is the coeditor of *Clip/Stamp/Fold: The Radical Architecture of Little Magazines 196X-197X*, *Solid States: Concrete in Transition* and *Utopie: Texts and Projects 1967-1978*.

WILLIAM F. CARROLL

William F. Carroll holds a Ph.D. in organic chemistry from Indiana University, Bloomington. He is currently Vice President, Industry Issues, for Occidental Chemical Corporation

and also Adjunct Professor of Chemistry at Indiana University. Carol is a past President (2005) of the American Chemical Society, a Fellow of the Royal Society of Chemistry and chair or member of a number of committees for the National Research Council of the National Academy of Sciences. He has served on expert groups for the United Nations Environment Programme, the US Environmental Protection Agency and three states.

BEATRIZ COLOMINA

Beatriz Colomina is Professor of Architecture and Director of the interdisciplinary Program in Media and Modernity at Princeton University. She is the author of *Domesticity at War* (Actar and MIT Press, 2007), *Privacy and Publicity: Modern Architecture as Mass Media* (MIT Press, 1994) and *Sexuality and Space* (Princeton Architectural Press, 1992). Her most recent book is *Clip/Stamp/Fold: The Radical Architecture of Little Magazines 196X-197X* (Actar, 2010), co-edited with Craig Buckley.

HERNAN DIAZ ALONSO

Hernan Diaz Alonso is the principal and founder of Xefirotarch, an award-winning design firm in Architecture, Product and Digital Motion based in Los Angeles. He received his architecture degrees from the National University of Rosario, Argentina, and from Columbia University’s AAD Program, from which he graduated with honors. Currently, he is a studio design and visual studies professor and is the Graduate Programs Chair at SCI-Arc, Los Angeles. Diaz Alonso is also a design studio professor at Columbia University’s Graduate School of Architecture, Planning and Preservation, and a visiting professor at the University of Applied Arts, Vienna. His architecture designs have received numerous awards and have been exhibited in both architecture

and art exhibitions, including the 2004 Venice Biennale, “Metamorphose”; Archilab, Orleans, France; “The Naked City,” Beijing Biennale; “Glamour,” San Francisco Museum of Modern Art (SFMOMA); and in 2003, “Virus,” Universidad de Costa Rica. His work is part of the permanent collections of FRAC, Orleans, France (Architecture Collection) and SFMoMA.

WINKA DUBBELDAM

Winka Dubbeldam is the principal of Archi-Tectonics, New York, which she founded in 1994. Archi-Tectonics is created as an open network — a team of highly qualified architects and designers, with a close connection to Dubbeldam’s team of engineers and consultants. The team spirit expresses itself in an aim to rethink, reinvestigate and reinterpret all project details. Archi-Tectonics’ recent built work includes the 80,000-square-foot mixed-use GW 497 building in New York City, the 15-story American Loft tower in Philadelphia, the 2500-square-foot GT residence and guesthouse in upstate New York and the 3000-square-foot Prefab Dub Residence in Rotterdam. Current projects under construction are the nine-story residential Vestry Street building, the LRH mixed-use building and a townhouse in Chelsea, all in New York City. Commercial work includes the flagship stores for Ports 1961 in London, Paris and Shanghai, and a school/orphanage in Liberia. The work of Archi-Tectonics has been exhibited recently at The Museum of Modern Art, New York; the Museum of Contemporary Art, Los Angeles; the Venice Biennale and the Tel Aviv Museum of Art.

Dubbeldam’s role as Professor of Practice and the Director of the Post-Professional Program at the University of Pennsylvania and her teaching at Columbia University and Harvard University further assist in the constant innovation for which the office

strives. Dubbeldam is a graduate of the Faculty of Architecture, Rotterdam (1990); she received an M.Arch.AAD from Columbia University in 1992.

ANNA DYSON

Anna Dyson teaches design, technology and theory at the School of Architecture at Rensselaer Polytechnic Institute. She is Director of The Center for Architecture, Science and Ecology (CASE), which hosts the Built Ecologies graduate program. Dyson received a Baccalauréat Général from Université Laval and an M.Arch. from Yale University. She has worked as a design architect and product designer in several offices in Canada, Europe and the United States. As Director of Materialab and then CASE, she has directed interdisciplinary systems research sponsored by the US DOE, NYSTAR and NYSERDA. Dyson has received numerous design awards and holds multiple international patents for building systems inventions.

BILLIE FAIRCLOTH

Billie Faircloth is Research Director at KieranTimberlake, an internationally recognized architecture firm noted for its commitment to research, innovation and invention. She leads a trans-disciplinary research team that conspires to advance building design practices through material, system, process and environment-driven questions. She fosters collaboration between disciplines, trades and industries and their disparate bodies of knowledge. In her professional and academic research Faircloth pursues an answer to the question “Why do we build the way that we do?” Prior to joining KieranTimberlake, she was an assistant professor at the University of Texas at Austin School of Architecture where she instructed design research studios at the graduate and undergraduate level in exploring applications for conventional and emerging material technologies, and conducted seminars

on emerging construction and fabrication technologies. Faircloth received a Bachelor of Architecture degree from North Carolina State University and a Master of Architecture with Distinction from Harvard University.

MARK GOULTHORPE

Mark Goulthorpe is an Associate Professor in the Department of Architecture at MIT School of Architecture + Planning, where he teaches in undergraduate, graduate and post-graduate programs, and conducts ongoing research in digital design and fabrication. His current research centers on robotic fabrication and a variety of composite fabrication methodologies.

He is the author of two books: *Autoplastic to Alloplastic* (Hyx/Pompidou), which examines the shifts in design methodology occasioned by digital technologies; and *The Possibility of (an) Architecture* (Routledge), which theorizes the broad implications of a digital paradigm for architecture. A forthcoming book, *Paramorph*, foregrounds the design and fabrication research that lies behind the evolving projects.

Goulthorpe is also a practicing architect, working with diverse teams under the rubric dECOi. Current projects include a fully CNC-milled office interior for C Change Investments (Cambridge, MA), a carbon-fiber penthouse as an extension to a tower top adjacent to Tate Modern (London); and a Zero+ thermoplastic housing initiative. The dECOi atelier was named one of the Architectural League of New York’s “Emerging Voices” in 2006, selected for the “Design Vanguard” by *Architectural Record* in 2005, won the FEIDAD award for digital design in 2004 (Miran Galerie, Paris) and 2000 (Aegis Hyposurface), was selected for the exhibition “New Trends of Architecture” for the European Capital of Culture in 2004 and has exhibited

a number of times at the Venice and Beijing Biennales.

MICHAEL GRAVES

Michael Graves, the founder of Michael Graves & Associates and Michael Graves Design Group, is credited with broadening the role of the architect in society and raising public interest in good design as essential to the quality of everyday life. Graves has received many prestigious awards, including the 1999 National Medal of Arts, the 2001 Gold Medal from the American Institute of Architects and the 2010 Topaz Medallion from the AIA and the Association of Collegiate Schools of Architecture, in recognition of his 39-year teaching career at Princeton University. Graves was cited by Paul Goldberger, former *New York Times* critic, as “the most truly original voice American architecture has produced in some time.”

LAURIE HAWKINSON

Laurie Hawkinson received her Master of Fine Arts degree from the University of California at Berkeley, attended the Whitney Museum of American Art Independent Study Program in New York and received her Professional Degree in Architecture from The Cooper Union. She is Professor of Architecture with tenure at Columbia University and is currently the Director of the Advanced Studios at the Graduate School of Architecture, Planning and Preservation. Significant completed projects include the Corning Museum of Glass, the Wall Street Ferry Terminal, “Strategic Open Space: Public Improvement Strategy for Lower Manhattan” and the new Land Ports of Entry at Champlain and Massena, New York, as well as current ongoing projects such as the new Emergency Medical Services building for the City of New York. Collaborative projects include the North Carolina Museum of Art Amphitheater and Site Master Plan, the Museum of Women’s

History and the NYC 2012 Olympic Village. She is a member of the Board of Directors of the Wooster Group and serves on the Contemporary Arts Council of The Museum of Modern Art.

JUAN HERREROS

Juan Herreros, an architect and Ph.D., is Design Studio Chair, Senior Professor and Director of the Thesis Program at the Escuela Técnica Superior de Arquitectura, Madrid, as well as a Visiting Professor at Columbia University’s Graduate School of Architecture, Planning and Preservation. He has previously taught at the EPFL (Lausanne), Architectural Association (London), Princeton University School of Architecture and Illinois Institute of Technology. In 1984 he founded, together with Iñaki Abalos, the firm Abalos & Herreros; in 1992 the Multimedia International League, LMI; and in 2006 his current firm, Herreros Arquitectos, through which he pursues his professional and pedagogical activity. His most notable publications are *Tower & Office* (with Iñaki Abalos, MIT Press), *Isla Ciudad* (Actar), *Palacios de la Diversión* (Mairea), *PTb-Cedric Price* (Ministerio de Fomento — COAM), *Vivienda SXXI* (Actar) and various monographs. Herreros Arquitectos is currently working on projects in Spain, Norway, Belgium, Panama, Mexico and Uruguay. Herreros has received the RIBA International Fellowship (Royal Institute of British Architects), the Medal of Fine Arts from the city of San Lorenzo de El Escorial, the 2009 AD Architecture Award and was nominated for the 2010 Medal from the American Academy of Arts and Letters.

STEVEN HOLL

Steven Holl was born in 1947 in Bremerton, Washington. He graduated from the University of Washington and pursued architecture studies in Rome in 1970. In 1976 he attended the Architectural Association in London

and established Steven Holl Architects in New York City.

He has realized cultural, civic, academic and residential projects both in the United States and internationally. Notable work includes the Kiasma Museum of Contemporary Art in Helsinki, Finland (1998), the Chapel of St. Ignatius, Seattle, Washington (1997) and the Nelson-Atkins Museum of Art (2007). Most recently completed are the Linked Hybrid mixed-use complex in Beijing, China (2009)—named Best Tall Building Overall for 2009 by the Council on Tall Buildings—and Urban Habitat (CTBUH), the Knut Hamsun Center in Hamarøy, Norway (2009), the Herning Museum of Contemporary Art in Herning, Denmark (2009) and the Horizontal Skyscraper in Shenzhen, China (2009), one of the first LEED Platinum rated buildings in Southern China.

Steven Holl is a tenured Professor at Columbia University’s Graduate School of Architecture, Planning and Preservation. He has lectured and exhibited widely and has published numerous books, including *Anchoring* (1989), *Parallax* (2000), *Idea and Phenomena* (2002), *Luminosity/Parosity* (2006), *House: Black Swan Theory* (2007) and *Architecture Spoken* (2007). Most recently published is his book, *Urbanisms: Working With Doubt* (Princeton Architectural Press).

GEORGE JERONIMIDIS

George Jeronimidis is Director of the Centre for Biomimetics, at the University of Reading, U.K., where he is also Professor Emeritus, and Co-Director of the EmTech Programme, Architectural Association School of Architecture, London. He has taught Composite Materials Engineering in the School of Construction Management and Engineering, University of Reading, and is Visiting Professor at the Dipartimento di Architettura, Politecnico di Bari, Italy, and

Department of Mechanical Engineering of Zhengzhou University, China.

Jeronimidis was born in Rome, Italy, and received a Ph.D. in Physical Chemistry from the University of Rome in 1970. His previous academic positions include Scientific Officer at Laboratorio su Tecnologie dei Polimeri e Reologia, CNR, Naples (1970–75), Research Fellow in Department of Engineering, University of Reading (1975–80) and Lecturer and Senior Lecturer in the Department of Engineering, University of Reading (1980–95).

LYDIA KALLIPOLITI

Lydia Kallipoliti is Assistant Adjunct Professor at the Cooper Union, Irwin S. Chanin School of Architecture, and a practicing architect, engineer and theorist living in New York. She holds architecture degrees from the Aristotle University of Thessaloniki in Greece, MIT and Princeton University School of Architecture. Kallipoliti is the editor of “EcoRedux: Design Remedies for an Ailing Planet,” a special issue of *Architectural Design* (AD) magazine. She is also the author of the EcoRedux online nonprofit educational resource for ecological experiments during the postwar period, which received an honor at the 14th International Webby Awards and a silver medal at the W3 awards from the International Academy of Digital Arts and Sciences. Her design and theoretical work has been published and exhibited internationally.

BRIAN KANE

Brian Kane is an assistant professor of music at Yale University. His research explores the intersection of music theory, philosophy and contemporary music with a particular focus on sound, signification, the senses, phenomenology and critical theory. His work has been published in *qui parle*, *Current Musicology*, *Contemporary Music Review*, *The Journal of Visual Culture*,

Journal of Music Theory and *Music Theory Spectrum*. He is currently writing a book on *acousmatic* sound.

SHEILA KENNEDY

Sheila Kennedy is Professor of Practice, MIT School of Architecture + Planning and a Principal of KVA MATx, an interdisciplinary design practice with projects in architecture, eco-infrastructure, digital technologies and the emergent public realm. Current work includes the IBA-Hamburg SOFT Housing in Germany, the Minneapolis Riverfront Design Project and the East 34th Street Public Ferry Terminal in New York. Kennedy directs KVA's material research division, MATx, which has created designs for DuPont, Siemens, OSRAM, Herman Miller, Procter & Gamble, The North Face and the United States Department of Energy.

The MATx Portable Light Project, a nonprofit global initiative to create energy-harvesting textiles, is a 2011 Buckminster Fuller Award Finalist, and the recipient of a 2009 U.S. Congressional Award and a 2009 Energy Globe Award for technology that benefits humanity. The work of KVA MATx has been exhibited at the National Design Museum, the Rotterdam Biennial, the Vitra Design Museum, the TED conference and The Museum of Modern Art, New York. Kennedy's work appears in journals of architecture and design culture and on National Public Radio, BBC World News, CBS News and CNN Principal Voices and in *Wired*, *Science News*, *Elle Magazine*, *The Economist*, the *Wall Street Journal*, *Business Week* and the *New York Times*.

JAN KNIPPERS

Jan Knippers, Prof. Dr. Ing., is a partner in Knippers Helbig Advanced Engineering. He completed his engineering studies at the Technische Universität Berlin in 1992, receiving a Ph.D., and founded his own firm

together with Thorsten Helbig in 2001 in Stuttgart and in 2009 in New York City. The focus of their work is on efficient structural design for international and architecturally demanding projects. Jan Knippers specializes in complex parametrically generated geometries for roof and facade structures, as well as the use of innovative materials such as glass-fiber reinforced plastics. Since 2000, he has headed the Institute for Building Structures and Structural Design, Faculty of Architecture and Urban Design at the University of Stuttgart and is involved in many research projects on plastics in architecture.

CRAIG KONYK

Craig Konyk is an architect and Adjunct Assistant Professor of Architecture in the Graduate School of Architecture, Planning and Preservation at Columbia University, where he most recently co-taught with Jorge Otero-Pailos a Joint Preservation and Design Studio-X, which traveled to Rio de Janeiro.

Konyk was invited to participate in the History Channel's "City of the Future" Design Challenge where he presented "Cloud 09," an information-based work/recreation proposal for Manhattan. His design for the UP!house (originally commissioned by *Dwell* magazine and sponsored by The Vinyl Institute), a prototype prefab house that incorporates innovative translucent vinyl wall/ceiling/floor panels, was selected for inclusion in the Cooper-Hewitt National Design Triennial of 2006, a survey of the best in American design of the previous three years.

Konyk's urban design proposal for anchoring Brooklyn's DUMBO neighborhood was exhibited as part of BKLYN DESIGNS 2010. Konyk's installation (co-sponsored by Supima), entitled "FlatField," was open to the public from September 15 to November 15, 2010, under the High Line in Manhattan at HL23. Konyk's firm, kOnyk Architecture, most recently

was honored with a 2010 New York Chapter AIA Design Merit Award for its sustainable Urban Design proposal "Urban Aeration."

SANFORD KWINTER

Sanford Kwinter is Professor of Architectural Theory and Criticism at Harvard Graduate School of Design. A writer and editor, he received his Ph.D. from Columbia University. He has taught at MIT and at Columbia and Rice universities, and was co-founder and editor of the journal *Zone* and *Zone Books* for 20 years. He has written widely on philosophical issues of design, architecture and urbanism and was an editorial member of the ANY conferences and publications as well as of *Assemblage*. He is the author of several articles and books, including *Architectures of Time: Toward a Theory of the Event in Modernist Culture* (MIT Press, 2001), *Far From Equilibrium: Essays on Technology and Design Culture* (Actar, 2008) and *Requiem: For the City at the Turn of the Millennium*. He is currently at work on a book on Africa and the origin of form.

SYLVIA LAVIN

Sylvia Lavin, Professor and Director of Critical Studies and MA/Ph.D. programs at UCLA and a visiting professor at Princeton University School of Architecture, is known both for her scholarship and her criticism in contemporary architecture and design. She received a 2011 Arts and Letters Award in Architecture. She has twice been a Getty Research Institute Scholar and writes for an international spectrum of journals. Her most recent book is *Kissing Architecture*, published by Princeton University Press (April 2011). She is currently completing her next book, *The Flash in the Pan and Other Forms of Architectural Contemporaneity*. Lavin is also a curator of experimental work in architecture and design: recent and forthcoming exhibitions include "Ultra

Expo," JANM, Los Angeles; "Craig Hodgetts: Playmaker" (ACE Galleries); "Take Note," exploring the relationship between architecture and writing, at the Canadian Centre for Architecture, Montreal; and a new project based series of exhibits on architecture and design at the Hammer Museum, Los Angeles.

CHIP LORD

Chip Lord is a media artist and a Professor Emeritus in the Film and Digital Media Department at U.C. Santa Cruz. He has an M.Arch from Tulane University and as a founding partner of Ant Farm (1968-78), Lord produced the video art classics *Media Burn* and *The Eternal Frame* as well as the sculpture *Cadillac Ranch* in Amarillo, Texas. Ant Farm designed and built inflatable structures and produced the *Inflatocookbook* in 1971. Ant Farm received a Progressive Architecture Design Citation in 1973 for the *House of the Century* in Texas.

Lord's practice in video straddles documentary and experimental genres, often mixing the two, and this work has been shown widely at film and video festivals and at museums. Since 1991 he has produced a series of works related to urban geography and public space. His project *Movie Map* was shown in the group exhibition *Auto: Sueño y Materia* in Gijón and Madrid, Spain, in 2009 and a career survey of his video work was shown at the Museo Nacional Centro de Arte Reina Sofía in Madrid in 2005. He recently completed a 25-channel video installation, *To and From LAX*, commissioned by Los Angeles Airport."

GREG LYNN

Greg Lynn is a leading pioneer at the intersection of computing, design and architecture. His architectural designs have been exhibited internationally at both architecture and art venues, including the 2000 Venice Biennale where he represented

the United States in the American Pavilion, and at the Venice 11th International Architecture Exhibition in 2008 for which he was awarded the Golden Lion. His work is in the permanent collections of CCA, SFMoMA and MoMA and has been exhibited at the Centre Pompidou, Fondation Beyeler, Cooper-Hewitt, National Design Museum, MAK, MoCA, Netherlands Architecture Institute, Carnegie Museum of Art, ICA and Secession Museum, among other venues.

Lynn, who founded the firm Greg Lynn FORM in 1994, holds degrees in architecture and philosophy and received an Honorary Doctorate degree from the Academy of Fine Arts and Design in Bratislava. He was the Professor of Spatial Conception and Exploration at the ETHZ (Swiss Federal Institute of Technology Zurich) and in 2002 became an Ordentlicher University Professor at the University of Applied Arts, Vienna. He is a tenured Professor at UCLA's School of Architecture and Urban Design where he is currently spearheading the development of an experimental research robotics lab. In addition, he is the Davenport Visiting Professor at Yale University.

In 2001, *Time* magazine named Greg Lynn one of 100 of the most innovative people in the world for the 21st century. In 2003, he received an Architecture Award from the American Academy of Arts and Letters. In 2005, *Forbes* magazine named him one of the ten most influential living architects. In 2010, he was awarded a fellowship from United States Artists. Lynn has received numerous AIA and Progressive Architecture professional awards, and his Korean Presbyterian Church in New York was officially listed by the New York City Landmarks Preservation Commission as one of the 30 most important buildings built in the city in the last 30 years.

FABIAN MARCACCIO

Fabian Marcaccio is an artist based in New York. His work investigates whether the traditional medium of painting can survive in the digital age. He has used printmaking and transfer techniques to make paintings and became well known in the 1990s for his manipulations of the conventions of painting. More recently, he has relied on digital and industrial techniques to infuse his painting process with spatial and temporal concerns. The results are environmental paintings, animations and "Paintants," which combine digitally manipulated imagery, sculptural form and three-dimensional painted surfaces.

Marcaccio was born in 1963 in Rosario, Argentina, where he attended the University of Philosophy. He has exhibited widely throughout the United States, Europe and South America. In 2004 a retrospective of his work was organized by the Kunstmuseum Liechtenstein, the same year that a solo exhibition of his work was mounted at the Miami Art Museum. He regularly exhibits with galleries in New York, Los Angeles, Paris, Cologne and Barcelona. He has participated in numerous group exhibitions, including the 44th Biennial Exhibition of Contemporary American Painting, Corcoran Gallery of Art, Washington, DC in 1995; Summer Projects at PS1 Contemporary Art Center, New York in 2002 and Documenta 11, Kassel, Germany in 2002. His multidisciplinary collaborations include projects with the architect Greg Lynn that resulted in an exhibition at the Wexner Center for the Arts in Columbus, Ohio, in 2001 and projects with composer Claudio Baroni creating animated operas and a 2005 scored, paintball performance at Weston Hall in Toronto.

MICHAEL MEREDITH

Michael Meredith is a principal in the architecture firm MOS and an Associate Professor at Harvard

University Graduate School of Design. The work of MOS has been widely published and received numerous awards. In 2009, MOS was awarded the PS1/ MoMA Summer Pavilion.

ERIK OLSEN

Erik Olsen is a climate engineer known for his passionate focus on high-comfort, low-impact environments. As Managing Director of TRANSSOLAR Climate Engineering's New York office, he works collaboratively with clients, architects and other engineers worldwide to develop and validate low-energy, architecturally integrated indoor climate and energy concepts. His work ranges from the completely passive Raising Malawi Academy for Girls to the groundbreaking Angelos Law Center at the University of Baltimore. In addition to his specialist work at TRANSSOLAR, he has worked as a consulting mechanical engineer on a wide variety of building types and launched and directed the City of Chicago's Green Permit Program.

JORGE OTERO-PAILOS

Jorge Otero-Pailos is a New York-based architect, artist and theorist specializing in experimental forms of preservation. He teaches in the Historic Preservation Program at Columbia University's Graduate School of Architecture, Planning and Preservation. He is the founder and editor of the journal *Future Anterior*. His works and writings have been featured in international publications such as *Artforum*, *Art in America* and *Architectural Record*, as well as in academic books and journals. His work rethinks preservation as a powerful countercultural practice that creates alternative futures for our collective world heritage.

WILLIAM PEARSON

William Pearson is Technical Director of North Sails One Design International Ltd., the world's largest sailmaking

firm, in charge of technology and global materials development. He has overseen the development of the firm's one-piece molded sails (3DL), and its most recent development of fiber/resin composite sails (3Di). With North Sails he has been at the forefront of the intersection between textiles, composites and fibrous systems for performance applications, and has a keen interest in pursuing cross-platform applications. A trained sailmaker and a former professional yachtsman, Pearson has competed in most of the world's major ocean races, including the Whitbread Around the World Race, and a number of sailing expeditions to remote parts of the world. He has worked with North Sails for 21 years in many capacities internationally. Pearson has a BS in Management from the University of South Carolina, and currently divides his time between San Francisco and Incline Village, Nevada.

WERNER PREUSKER

Werner Preusker is an attorney and is the Managing Director of the PVC and Environment Working Group (Arbeitsgemeinschaft PVC und Umwelt—AgPU) based in Bonn, Germany. AgPU has expertise in environmental and consumer protection in relation to the PVC industry. More than 60 companies in the PVC supply chain support the goals of the AgPU through their membership. As a service partner, the AgPU advises its member companies on the environment, sustainable development and consumer protection. It creates dialogue with decision makers from politics, trade, the economy and NGOs. Preusker is also the spokesperson of PVC+, a PVC information initiative supported by companies that produce PVC, additives, products such windows profiles, pipe, film, flooring and roofing, or recycle PVC products. Previously, he served as Assistant to the Council of Environmental Advisers (1980–83) and worked in the Environmental Department of the

Confederation of the German Chemical Industry (1983–89).

THEODORE H.M. PRUDON

Theodore H.M. Prudon, a practicing architect in New York City, received master's degrees in architecture from the University of Delft in the Netherlands and Columbia University, where he also obtained his Ph.D. He has been on the faculty of the Historic Preservation Program of Columbia University's Graduate School of Architecture, Planning and Preservation for several decades. He is a Fellow of the American Institute of Architects.

Prudon is the author of more than 70 articles in both domestic and international professional and trade journals dealing with preservation. His book *Preservation of Modern Architecture*, published in 2008 by John Wiley, received the Lee Nelson Book Award from the Association for Preservation Technology International. A Japanese-language edition of the book will appear in the fall of 2011.

At present, he serves on the Executive Committee of The Netherland-America Foundation and is active in DOCOMOMO. He is the president of DOCOMOMO US, is a board member of DOCOMOMO International in Barcelona and chairs the organization's International Scientific Committee on Theory and Education.

FRANÇOIS ROCHE

François Roche is a licensed architect (DPLG) in France and received a diploma in architecture from Versailles, U.P.A. no. 3. In 1989 he founded R&Sie(n) with Stéphanie Lavaux and Jean Navarro, based in Paris. The organic, oppositional architectural projects of the firm explore the bond between building, context and human relations. R&Sie(n) considers architectural identity to be an unstable concept, defined through temporary forms in which the vegetal

and biological become a dynamic element. The firm is currently undertaking a critical experiment with new warping technologies to prompt architectural "scenarios" of cartographic distortion, substitution and genetic territorial mutations. R&Sie(n)'s projects have been exhibited at the Tate Modern, London; Columbia University; UCLA; ICA, London; Mori Art Museum, Tokyo; Centre Georges Pompidou, Paris; Musée d'Art Moderne, Paris; Pavillon de l'Arsenal, Paris; Orléans/ArchiLab International Architectural Conference; and the Venice Biennale. Roche has taught at the Bartlett School, London; TU, Vienna; ESARQ, Barcelona; ESA, Paris; and the University of Pennsylvania's Department of Architecture. He has taught at Columbia University's Graduate School of Architecture, Planning and Preservation as an Assistant Visiting Professor.

HILARY SAMPLE

Hilary Sample is a Professor at the Yale School of Architecture. Prior to joining Yale, Hilary Sample taught at SUNY Buffalo, where she was awarded the Reyner Banham Teaching Fellowship, and at the University of Toronto. She is a founding principal with Michael Meredith of MOS, an interdisciplinary architecture and design practice based in New York City. Projects designed in her office have been published widely; have been exhibited at the Venice Biennale, The Museum of Modern Art, New York and the Art Institute of Chicago; and have received numerous awards, including a Design Award from *Progressive Architecture* and New York City Architectural League Emerging Voices. In 2010, Sample received an Academy Award in Architecture from the American Academy of Arts and Letters. Built projects include PS1/ MoMA Afterparty, Hill House and the Floating House. Current work includes a villa in Ordo, Inner Mongolia, a community center in Uganda, a teen center

in Lowell, Massachusetts, and Element House in New Mexico.

Sample was a visiting scholar at the Centre for Canadian Architecture in Montreal. Her research focuses on the intersection of architecture, health, environments, technology and design. She is currently completing a book entitled *Sick City: A Global Investigation into Urbanism, Infrastructure and Disease*. She received a B.Arch. from Syracuse University and an M.Arch. from Princeton University School of Architecture.

RITA SCHENCK

Rita Schenck earned her doctorate in oceanography from the University of Rhode Island. She worked as an environmental manager in industry for many years before leaving to found the Institute for Environmental Research and Education, of which she is currently Executive Director, an independent nonprofit that supports fact-based environmental decision making. Schenck represented the U.S. in negotiating the international standards on life cycle assessment, and the American Center for Life Cycle Assessment (LCA) is the flagship program of the Institute. Among other projects, Schenck developed programs in community energy independence, green collar job education and Environmental Product Declarations, an LCA-based Eco-label. She speaks and writes extensively on environmental sustainability and policy and the need for science in environmental decision making.

FELICITY SCOTT

Felicity D. Scott is Director of the Program in Critical, Curatorial and Conceptual Practices in Architecture of the Graduate School of Architecture, Planning and Preservation, Columbia University, where she is Assistant Professor. She is also a founding co-editor of *Grey Room*, a quarterly journal of architecture, art, media and

politics published quarterly by MIT Press since Fall 2000. In addition to publishing numerous articles in journals, magazines and edited anthologies, she has written the books *Architecture or Techno-Utopia: Politics After Modernism* (MIT Press, 2007) and *Living Archive 7: Ant Farm* (Actar, 2008). She recently completed the manuscript for a book on the Austrian émigré architect Bernard Rudofsky, entitled "Cartographies of Drift: Bernard Rudofsky's Encounters with Modernity."

HARTMUT OLIVER SINKWITZ

Hartmut Oliver Sinkwitz is the Director of the Interior Design Center of Competence at Daimler AG (since 2008). He leads all relevant activities from Advanced Design and Production Design to C&T Design. Prior to joining the Mercedes-Benz Design Team he worked as Car Designer at the Mazda Design Center in Frankfurt (1991–95). He joined Mercedes-Benz Design in 1995 and was Senior Car Designer (1995–2000) before becoming Chief Designer for Smart at Mercedes-Benz, where he led the design of a number of microcars, including the Roadster, ForFour, ForTwo, Crossblade and several show cars.

WERNER SOBEK

Werner Sobek is Mies van der Rohe Professor at the Illinois Institute of Technology and head of the Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart, which specializes in research into new materials and new concepts for lightweight and adaptive structures. Sobek studied architecture and structural engineering at the University of Stuttgart in Germany. His firm, Werner Sobek Engineering and Design, is one of the leading engineering consultancies in Europe. It excels through excellent engineering combined with first-rate design of constructional elements and sophisticated

concepts for sustainable buildings. Werner Sobek has offices in Stuttgart, Cairo, Dubai, Frankfurt, Istanbul, Moscow, New York and São Paulo.

GALIA SOLOMONOFF

Galia Solomonoff is a licensed architect and principal of SAS/Solomonoff Architecture Studio, based in Manhattan. Recent projects range from Dia:Beacon a 300,000-square-foot contemporary art museum, to residences and artist's lofts. Solomonoff earned an M.Arch. from Columbia University (1994), where she was awarded the McKim Prize for Excellence in Design, and a William Kinne Fellows Prize. She received a Bachelor of Science in Architecture degree from City College, City University of New York (1991), from which she graduated magna cum laude. Originally from Argentina, Solomonoff has lived in New York since 1987. She is currently Associate Professor of Architecture at Columbia University's Graduate School of Architecture, Planning and Preservation and is, together with artist Liam Gillick, leading a design/build pavilion studio in spring 2011.

HEIKO TRUMPF

Currently a Principal at Werner Sobek Engineering and Design in New York and Stuttgart, Heiko Trumpf joined Werner Sobek Group in 2006 after finishing his Ph.D. dissertation on the "stability of pultruded glass-fiber reinforced polymer profiles" at the Institute of Steel Structures at Aachen University (RWTH Aachen). He has completed a wide range of international projects, including bridges, high-rises and office buildings, with a passion for outstanding structures, lightweight design and new materials. In addition, he has worked on several international research and development projects together with companies and universities.

In 2004 he graduated as a European and International Welding Engineer. After receiving his Dipl.-Ing. in Civil Engineering at Hanover University in 1997, Trumpf worked as a project manager at Boeger + Jaeckle Consulting Engineers. Since 2007, he has been a lecturer at the Institute of Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart.

IGNAAS VERPOEST

Ignaas Verpoest earned a Master's Degree (1972) and a Ph.D. (1982) in Materials Engineering from the Katholieke Universiteit Leuven (Belgium). A full professor since 1990 in the Department of Metallurgy and Materials Engineering at the Katholieke Universiteit, he directs a group of eight postdoctoral researchers and 20 Ph.D. students, carrying out research in the areas of mesomechanics of textile-based composites, nano-engineered composites, natural-fiber reinforced biopolymers and advanced production methods for composites. He is the author of more than 140 journal papers, close to 400 conference papers and 3 books, and holds 12 patents.

Verpoest is past President of the European Society for Composite Materials, and of the International Committee on Composite Materials. He has won several awards, most recently the Descartes Prize for Science Communication from the European Commission (2004), the International Fellowship of the Society for the Advancement of Materials Processing and Engineering (2009), and an award from the International Committee on Composite Materials (2009).

GEORGE WHEELER

George Wheeler is Director of Conservation in the Historic Preservation Program of the Graduate School of Architecture, Planning and Preservation at Columbia University. He joined the program after 25 years

at the Metropolitan Museum of Art as a research scientist, a position he continues to hold part-time. He has published extensively in the field of conservation, including his recent book *Alkoxysilanes and the Consolidation of Stone*, issued by the Getty Conservation Institute. Wheeler is a Fellow of the American Institute for Conservation, the International Institute for Conservation, and winner of the 1997 Rome Prize in conservation. He holds a Ph.D. in Chemistry from New York University, a Graduate Certificate in Conservation from the Institute of Fine Arts and a Master's Degree in Art History from Hunter College-CUNY.

MARK WIGLEY

Mark Wigley is Dean of Columbia University's Graduate School of Architecture, Planning and Preservation. 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 co-edited *The Activist Drawing: Retracing Situationist Architectures from Constant's New Babylon to Beyond* (2001). Wigley has served as 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 Museum, Rotterdam. He received both his Bachelor of Architecture (1979) and his Ph.D. (1987) degrees from the University of Auckland, New Zealand.

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four concentrations: structural engineering, geotechnical engineering, construction engineering and management and water resources and environmental engineering. On the graduate level, the department offers programs leading to the M.S. degree, the professional degrees of Civil Engineer or Mechanics Engineer and the Doctor of Engineering Science (EngScD) and Doctor of Philosophy (Ph.D.) degrees. These programs are flexible and allow for concentrations in structures, construction engineering, reliability and random processes, soil mechanics, fluid mechanics, hydrogeology, continuum mechanics, finite element methods, computational mechanics, experimental mechanics, acoustics, vibrations and dynamics and earthquake engineering, or any combination thereof, such as fluid-structure interaction.

www.civil.columbia.edu

THE INSTITUTE FOR LIGHTWEIGHT STRUCTURES AND CONCEPTUAL DESIGN (ILEK)

Both in its research and teaching, the Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart unites the aspect of design with a focus on analysis and construction usually associated with structural engineering and the materials sciences. On the basis of a goal-oriented and interdisciplinary approach, the Institute is concerned with the conceptual development of all types of construction and load-bearing structures, using all types of materials. The areas of focus span construction with textiles and glass all the way to new structures in reinforced and prestressed concrete. From the individual details to the whole structure, the

approach focuses on the optimization of form and construction with respect to material and energy use, durability and reliability, recyclability and environmental sustainability. The results of this work are published in the bilingual (German/English) serial from the Institute or published individually in special research reports on particular topics. ILEK offers undergraduate and postgraduate classes to students in Architecture and Civil Engineering. Students from the two sectors work jointly on common projects, thus enabling them to overcome traditional barriers between the disciplines.

www.uni-stuttgart.de/ilek

THE VINYL INSTITUTE

The Vinyl Institute (VI), founded in 1982, is a U.S. trade association representing the leading manufacturers of vinyl, vinyl chloride monomer, vinyl additives and modifiers and vinyl packaging materials. Working to ensure vinyl is the global plastic of choice for infrastructure and diverse applications, the mission of the VI is to advocate the responsible manufacture of vinyl resins, the life cycle management of vinyl products and the promotion of the value of vinyl to society. Specifically, the VI is committed to working with architects and engineers to demonstrate the range of solutions vinyl provides for the design challenges of today and tomorrow. For information about vinyl—its benefits, uses, and issues.

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ACKNOWLEDGMENTS

Permanent Change: Plastics in Architecture and Engineering is the fourth installment of the Columbia Conference on Architecture, Engineering and Materials. The series of conferences originated with the goal of reinvigorating the academic and professional collaborations between the Schools of Engineering and Architecture. In the fall of 2007, Mark Wigley, Dean, Graduate School of Architecture, Planning and Preservation (GSAPP); Christian Meyer, Professor, Department of Civil Engineering and Engineering Mechanics; and Michael Bell, Professor of Architecture, organized the initial conference as a new model of exchange. The first conference in the series, *Engineered Transparency*, on glass, established a focus on materials as a shared substrate of design, academic research, scholarship and industry, and included a wide group of participants in the professional and academic fields of structural and mechanical engineering as well as architecture, materials science and industry. The second conference, *Solid States*, focused on a renewed potential for concrete and was held at GSAPP in fall 2008. The third conference, on metals, was held at GSAPP in fall 2009.

Permanent Change represents an ongoing collaboration between GSAPP and The Fu Foundation School of Engineering and Applied Science. Christian Meyer, professor; and Raimundo Betti, Chair, Department of Civil Engineering and Engineering Mechanics, have each sustained this partnership during the past year. Dean Feniosky Peña-Mora has generously

endorsed our shared work and plans for the next stages.

This conference adds the Institute for Lightweight Structures and Conceptual Design (ILEK), University of Stuttgart, Germany, as a collaborating academic partner. Directed by Werner Sobek, ILEK has contributed to bringing a new scope of research to the conference. Special thanks go to Heiko Trumpf, of Werner Sobek Engineering and Design.

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tions of scholarship and practice in our speakers' work.

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Conference graphic identity, poster and program design: Thumb

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