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DESIGN in the
terrain of
water

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DESIGN

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Edited by

ANURADHA MATHUR / DILIP DA CUNHA

with REBEKAH MEEKS
MATTHEW WIENER

FOREWORD

"Water is everywhere before it is somewhere..." With these seven words set in fluid meter, Anuradha Mathur and Dilip da Cunha launched a dialogue that grew and then swelled as others rushed to join in. Colleagues known and not yet known came from places far away along the dimensions of space, time, and discipline, to convene at the School of Design, University of Pennsylvania, and when the last of the presentations and papers had vanished from the air of the gallery in Meyerson Hall, still no one wanted to leave.

The lingering allure of that collective event has persuaded the conveners to reassemble the moment, the words spoken and the ideas exchanged, in printed form, in order to extend a philosophical and cultural conversation that is already changing our shared perspectives—on lines drawn on maps, on territorial borders, on the disappearance of boundaries we ourselves have established—in favor of a regenerative rethinking of the terrain of water.

The work presented in this book distills and reframes the remarkable latent energy and the untapped potential of questioning the boundaries between water and land. Just as society struggles to replace balkanization with inclusion and to supplant place of origin with new inhabitation, just as across the fields of design we explore the reduction of barriers between disciplines in order to improve our response to seemingly intractable social and cultural problems at local and global scales, this exploration of terrain becomes newly and critically important.

In the opening contribution to this book, Mathur and da Cunha address the question of the line as a tool to gain literacy about terrain and as a way of projecting ourselves into the future rather than acting only within the bounds of more time-proximate determinants. They describe the centuries-old invention of river-based maps that defined locations even though the river and its locations were always changing and will continue to change.

So, too, the convening they called *Design in the Terrain of Water* and this publication represent a singular moment amidst a water-challenged decade that both inspires and necessitates an interweaving of science and culture, of design and poetics, of activism and advocacy, to respond to a world that is more inconstant and risk-filled than we want it to be.

Water inundates. It also challenges us to think in four dimensions, not three, where the impulse of time-based thinking can enable a realignment of resources in favor of the longer-term, not that shorter one in which we simply build exactly what we have lost, not realizing how truly impossible that is. Traveling along this new dimension we may inhabit not just again, but better, and with greater resilience, as we embrace the indeterminate nature of design in the terrain of water.

MARILYN JORDAN TAYLOR

PREFACE

Design in the Terrain of Water makes room for water that is *everywhere* before it is *somewhere*: water that is in rain before it is in rivers, soaks before it flows, spreads before it gathers, blurs before it clarifies; water that is ephemeral, transient, uncertain, interstitial, chaotic, omnipresent. This is water to which people are increasingly turning to find innovative solutions to water scarcity, pollution, aquifer depletion, and other problems that are assuming center stage in local and global politics, dynamics, and fears. It is also water that is celebrated and ritualized in ordinary and everyday practices across many cultures.

This book brings together the work of eminent professionals, designers, artists, scientists and theorists, who respond to the challenges that water everywhere poses: its visualization, infrastructure, politics, and science.

At a moment when design disciplines are beginning to embrace measures such as flexibility, agility and resilience, we believe this book will make a timely contribution. These are measures that we associate more closely with water and watery imagination than with the terra firma that grounds aspirations of prediction and control that have proved elusive, perhaps even detrimental. The book asks if in this time of uncertainty and ambiguity brought on by increasing openness of economies, cultures, and ecologies, we need to re-invent our relationship with water. Should we look to the past, present and future and ask if in seeing water somewhere rather than everywhere we miss opportunities, practices and lessons that could inform and transform the design project? What role does representation and visualization play in confining water to a place on land? Can we look at projects in history and projects emerging today—cities, infrastructures, buildings, landscapes, artworks—with a cultivated eye for waters everywhere? What is it to see water as not within, adjoining, serving or threatening settlement, but as the ground of settlement?

This book is structured as a dialogue between two waters – water that is somewhere, framed, held in place and distinguished from land; and waters that are everywhere, challenging conventional representation and demanding invention. These two waters are visualized as horizons in the works and reflections of the contributors to *Design in the Terrain of Water*. In the horizontal structure of this book these two horizons run a parallel course, breaking occasionally with ambiguity, complexity, and measures that are not easy to define, separate, or delineate. Water here simmers as a force within political and geographic dynamics, even as it submerges boundaries between places and disciplines. As a collection of visual and textual essays, this book presents a way to image, imagine, build, and advocate design in the terrain of water.

The idea of this book comes out of a symposium at PennDesign in April 2011 that gathered a unique spirit and momentum that we have tried to sustain and advance through this publication. The symposium itself was structured by the themes of activism and advocacy; imaging and imagining; and structure and infrastructure. In the process of developing this publication we became acutely aware that many contributors' works and ideas are exemplary of more than one of these themes and that these themes are too often inseparable. We then took the more chaotic path of assembling individual contributions united by a drive to engage water, not as an element to extract, an embellishment to design, or a commodity that is scarce. Rather, it is a terrain that challenges assumptions, reminds us of our fallibility, accommodates complexity, and locates our horizon.

We have many people to thank for their support and work in making this book possible. Dean Marilyn Taylor put her faith and energy behind us from the very start, encouraging us to conceive and curate the symposium in

2011 and then to make this book. Many of our colleagues at PennDesign, in particular David Leatherbarrow and William Whitaker were generous with their time and advice at critical stages of this project. We would also like to thank the staff in the Dean's Office and the Landscape Architecture Department, particularly Megan Schmidgal, Chris Cataldo, and Diane Pringle. We would like to acknowledge the symposium core team who initiated this project with us and were engaged in multiple aspects of the event and exhibition that opened in conjunction with it: Catherine Bonier, Michelle Lin, Jessica Ball, and Yadiel Rivera-Diaz.

We are especially indebted to Rebekah Meeks and Matthew Wiener who brought extraordinary skill, dedication, and insights to the book. Reva brought energy and an eye to developing with us the initial structure and layout of the book and Matt brought a focus, diligence, and design ability to seeing it to a finish. We are grateful to Gordon Goff for his enthusiasm for the project, and to his team for coordinating with us to make this a quality publication. Most of all we would like to thank all our contributors who were willing to indulge our many requests and worked closely with us to not just present their projects and research, but to draw out particular qualities and ideas that would advance the conversation on how water is imaged, imagined and engaged in design.

Last, but not the least, our daughter Tara. She is now thirteen and has been with us in many terrains of water, most recently the Himalaya Mountains in June 2013 when waters were everywhere, washing away mountain sides, settlements, infrastructure, and people, seemingly in defiance of being placed somewhere. We were fortunate to return unhurt; many thousands did not. This book is dedicated to them and the many others who experience the fury of confined waters.

ANURADHA MATHUR / DILIP DA CUNHA



ELIZABETH MOSSOP

MISSISSIPPI DELTA PROJECT

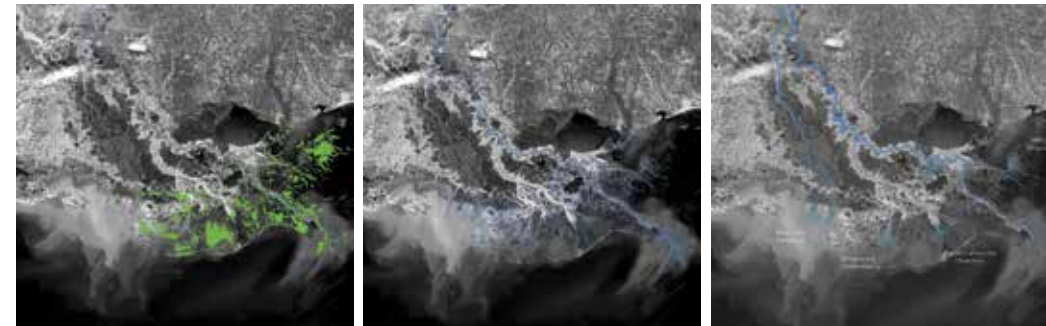


ISSUES OF WATER AND RIVERS AND DELTAS EPITOMIZE

THE DISJUNCTURE BETWEEN NATURAL SYSTEMS AND THE HUMAN SYSTEMS OF ADMINISTRATION, PROPERTY, AND POLITICAL STRUCTURES. WITH ITS GENERALLY STRONG DISTASTE FOR PLANNING, THE US HAS BEEN SLOW BOTH TO ALIGN PLANNING OR ADMINISTRATIVE BOUNDARIES WITH THE NATURAL BOUNDARIES OF WATERSHEDS, AND TO CREATE MULTIFUNCTIONAL MANAGEMENT AGENCIES (WITH SOME NOTABLE HISTORICAL ANOMALIES SUCH AS THE TENNESSEE VALLEY AUTHORITY). QUESTIONS OF FLOODING, LAND LOSS, AND STORM PROTECTION IN THE MISSISSIPPI DELTA ARE PLAGUED BY AN INABILITY TO EVEN CONCEPTUALIZE THE ISSUES IN A SYNTHETIC WAY. THE MOST DIFFICULT TASK SEEMS TO BE HOW TO BRING TOGETHER A DISCUSSION OF THE FORMS AND PROCESSES OF HUMAN INHABITATION AND ACTIVITY, AND THE BROADER QUESTIONS OF ECOLOGICAL SUSTAINABILITY, WITH THE SCIENCE AND ENGINEERING OF RIVER MANAGEMENT AND COASTAL PROTECTION. IN THIS CONTEXT, THE ACADEMY CAN PLAY AN IMPORTANT ROLE IN TRYING TO CONTRIBUTE TO PUBLIC DISCOURSE BY DEVELOPING INFORMED SPECULATION THAT IS GROUNDED IN BOTH ACCURATE DATA AND A REAL UNDERSTANDING OF THE LOCAL POLITICAL AND CULTURAL CONTEXT.



DISAPPEARING DELTA: The Mississippi Delta is a landscape shaped by the underlying conditions of the river system and the imposition of the engineering control system. The dominance of the latter has resulted in a rapid rate of land subsidence throughout the delta region.



Louisiana State University's Coastal Sustainability Studio (CSS) brings together scientists, designers, and engineers to collaborate on specific projects with the aim of developing techniques for reducing environmental vulnerability and enhancing community resilience along the Louisiana coast. This drives a project approach that incorporates political and economic realities as well as research-based investigation into possible scenarios, thus placing the work in an interstitial zone between academic speculation and the politically sanctioned proposals of the various levels of government. The CSS is also unique within the regional context because of its central involvement of designers and planners and the cross-disciplinary methods that are applied to projects at all scales.

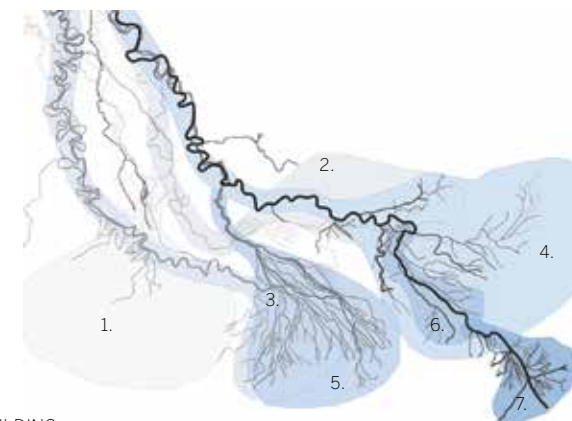
constructed at strategic locations along the gulf, at the endpoints of the five historic basins of the delta. Each diversion would be designed as a hybrid between soft and hard infrastructure, strategically placed with regard to ecological, economic, and settlement patterns. The spillway gates would be periodically opened when the Mississippi is high, providing a steady pulse of sediment that over the century will build up, maintain, and protect large expanses of land.

In order to test this strategy, it is necessary to also zoom in and explore how these issues operate at the metropolitan and neighborhood scales. The project's area of focus is the Central Wetlands Unit, the Lower Ninth Ward and Saint Bernard Parish on the eastern border of the city with Lake Borgne. It is an area of great vulnerability to storms, particularly because of its location in relation to major industrial shipping infrastructure. Our work here is informed by a long-standing interaction with the community and a specific consultation process over the course of the project. The L9 Centre for Sustainable Engagement and Development is our partner in this work and has collaborated with us to focus the four main project goals: a balanced regenerative ecosystem, intelligent storm protection, a productive innovative economy, and a dynamic and sustainable community.

For these goals to be achieved, the neighborhood as we know it will have to evolve—to become better integrated with natural systems and flexible to changing water levels. Its architecture will have to become nimble, and increased open space will be needed to absorb seasonal floodwaters. Much of the Lower Ninth Ward, for example, was formerly wetlands, and will need to be re-imagined as a flexible urban/protective/middle zone once again.

The confinement of the Mississippi River by flood protection levees interrupted the annual cycles of flooding across the river's floodplain, and the deposition of the silt that provided both the raw material for agriculture, and continued to build new land in the delta. The resulting withdrawal of this delta-building sediment, combined with the impacts of the oil industry and catastrophic storms, has resulted in the dramatically escalating land loss we see here. Current projections of continued land loss combined with sea level rise over the next 100 years dramatically changes the picture for the existing communities of south Louisiana and forces a major rethinking of options for the future. Without massive land-building efforts, the coastal region will disappear within a relatively short time.

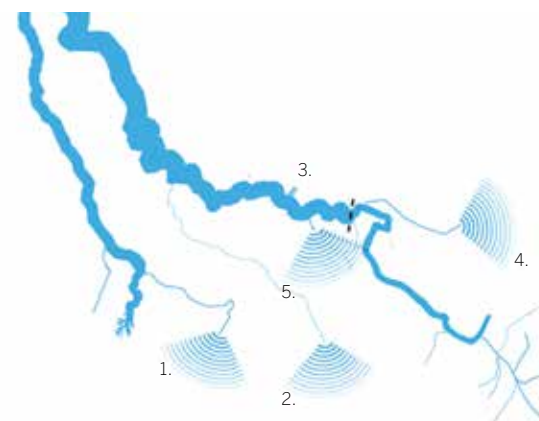
So at the regional scale it is necessary to return the Mississippi River to its role as delta builder. The primary action proposed is a series of five spillway diversions



DELTA SYSTEM	STAGES
1. SALE CYPREMORT	4600 BCE
2. COCODRIE	4600-3500 BCE
3. TECHE	3500-2800 BCE
4. ST BERNARD	2800-1000 BCE
5. LAFOURCHE	1000-300 BCE
6. PLAQUEMINE	750-500 BCE
7. BALIZE	550 BCE

DELTA BUILDING

SEDIMENT SPILLWAYS



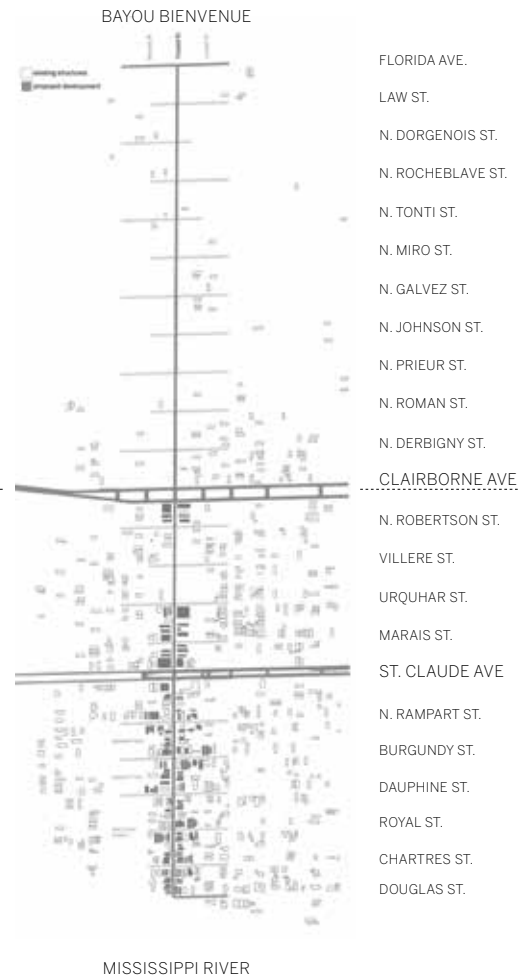
SPILLWAY DIVERSION	CAPACITY
1. TERREBONNE	100,000 CFS
2. BAYOU LAFOURCHE	100,000 CFS
3. BONNET CARRE	250,000 CFS
4. MRGO/BAYOU LA LOUTRE	100,000 CFS
5. DAVIS POND	100,000 CFS

9TH WARD: Looking at historical maps of the Lower Ninth Ward illustrates what has happened over time to the protective buffer of wetlands that used to exist between the settlement and the bayou. Prior to Hurricane Katrina in 2005, this landscape demonstrated an idiosyncratic settlement pattern encompassing both the colonial urbanism of New Orleans and the post WWII suburban expansion.





Landscape of the Lower 9th Ward



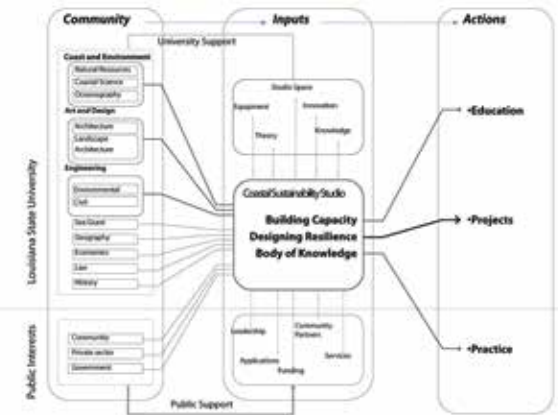
It cannot be overstated how politically contentious post-storm proposals to change the form of New Orleans urban development have been. With little faith in any level of government to act in the interest of all citizens, it has been impossible to consider alternatives to a restoration of the pre-storm status quo. So it needs to be stated very clearly that this work is aimed specifically at empowering the local community to take an effective role in shaping the discussion of these issues. A key driver has been the need for primarily incremental solutions that can be flexible at the scale of individual properties and also the assumption of a viable land tenure system. The proposals have come about through an extensive process of engagement and discussion and are a testament to new understandings of the urban conditions six years on from the storm. There is a broad understanding that new solutions are required for these neighborhoods although it is far from clear how this change will be achieved.

Much of the neighborhood is now open land with emergent vegetation, in some areas there are new houses and in others there has been significant restoration and reoccupation. There has been a succession since the storm, of flooding, debris, clearing, and regeneration and there remains a transition from more to less density, between the river and the bayou. The bayou is largely open water with the ghost of the cypress swamp still visible, edged by a sea wall built in the 60s after Hurricane Betsy that protects the neighborhood. Unfortunately, the wall com-

pletely disconnects the neighborhood from its traditionally close relationship with the bayou (where residents once trapped and fished in the extensive wetland environment), making an artificial delineation between water and land.

So rather than preparing yet another New Orleans master plan, we identified key topics of speculation through consultation, research, and analysis. And from this developed a series of themes for our investigation: housing and neighborhoods, productive landscapes, recreation, industry and jobs, and wetland restoration. Each area of focus was analyzed through precedent research, community and site investigation, and design speculation and then developed into a series of single-issue scenarios. The individual scenarios were then evaluated against a series of environmental performance criteria, including carbon footprint, sea level rise, storm and flood defense, investment, and potential return.

We have further combined a series of these scenarios into a complete vision of the place intended to animate a possible long-term future for the neighborhood within a re-generated coastal environment. This is a snapshot of selected scenarios, rather than a comprehensive or exclusive plan. It is a key means of communication with our stakeholders to illustrate how different scenarios could make a new neighborhood.

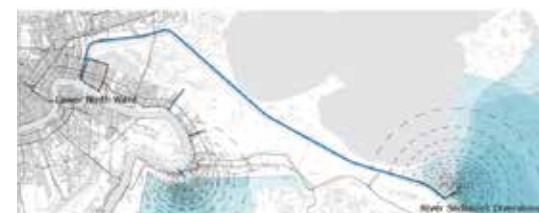


INVOLVING COMMUNITY:

Proposals are aimed specifically at community engagement and empowerment. They reflect a new understanding of urban conditions after the storm, and the role of local community members in shaping new solutions for their neighborhoods.



SNAPSHOT PROPOSALS: The northern part of the Lower Ninth Ward (and the extension into Saint Bernard Parish) is uniquely located on the edge of water and settlement. This position and its relationship with the Central Wetlands Unit offers a number of opportunities for both enriching the Lower Ninth Ward as a vibrant community and protecting it from future hurricanes and storm surge.



The vision is driven by the concept of a robust wetland zone that supports the needs of a thriving and resilient natural environment alongside a growing and sustained human settlement. The northern part of the Lower Ninth Ward is transformed to take greater advantage of its location on the edge of water and settlement. Dense housing and community buildings are concentrated in infrastructural corridors reaching to the wetland where schools and institutions utilize the unique qualities of the location. Large open spaces between these neighborhood concentrations return productivity to the land-



scape through community and large-scale agriculture and increase the resilient capacity of the neighborhood environment by dramatically increasing open space areas for stormwater retention.

Claiborne Avenue is important as the line that separates the neighborhood roughly between above and below sea level. Traditionally, it separated the urban from the rural parts of the neighborhood. Claiborne Avenue once again takes on the role of threshold between different types of dwelling. To the south the neighborhood is densified while to the north the neighborhood is developed along infrastructural corridors along Tennessee, Caffin, and Tupelo streets that historically extended into the wetlands at the north of the neighborhood. New housing and commercial space along the main corridors are elevated to withstand flooding. The space in between becomes farmland and open space for recreation and stormwater retention. The



farmer's market would become an important hub in the neighborhood that links the productive landscape of the Lower Ninth Ward to the urban consumers of New Orleans and the region beyond.

Returning the massive amounts of vacant land in the northern parts of the Lower Ninth Ward to productive and resilient use was a major focus of the project. A combination of backyard farming, community gardening, large-scale commercial farming, and aquaculture are possible ways to utilize land that has too great a flood



risk for rebuilding. Galvez Street becomes a focus of agricultural activity and contains both small farm cottages to the south and larger commercial farming operations to the north.

The lowest and emptiest part of the neighborhood becomes public open space. The low point in the northwest corner becomes a wetland park with significant water storage and cleansing in the landscape, taking pressure off the overstretched pumping and drainage infrastructure. A regional park provides sports and recreation facilities much needed by the city and there is the opportunity to take advantage of the bayou's proximity for educational and tourist facilities. Subsidence has created roughly four hundred acres of open water at the western end of Bayou Bienvenue, which is a great potential recreational amenity for fishing, birding, kayaking, canoeing, sailing, and crabbing, while the rest of the Central Wetlands Unit

would be reforested as cypress swamps. All of these offer a substantial range of economic development possibilities based in tourism and recreation.

The development of this project has allowed the illustration of some key ideas in relation to techniques for exploring resilience at the intersection of water systems and urban development. The complexity of current issues related to the settlement of the Mississippi Delta requires this broad disciplinary collaboration that can bring together the three poles: research and data, planning

and design, and cultural issues. We also have to be able to zoom in and out from regional, to metropolitan, to neighborhood to site strategies as the means of testing the validity of both broad-scale strategies and understanding the implications of physical design decisions. Using design scenarios as the basis for the development of future visions provides a flexibility missing from many master-planning processes, as well as being a useful means of communicating to communities the possibilities of how different strategies combine in an integrated plan. The process has also reinforced the overriding importance of appropriate methods of communication. Strategic thinking, development alternatives, and physical proposals have to be translated into models and images that will have resonance with key stakeholders and communicate ideas effectively.

PARTICIPANTS

KAZI ASHRAF: Ashraf is a professor at the University of Hawaii at Manoa, and director of the Urban Design Action Group (UDAG) in Dhaka, Bangladesh. His recent publications include *The Hermit's Hut: Architecture and Asceticism in India* (University of Hawaii Press, 2013), and *Designing Dhaka: A Manifesto for a Better City* (LOKA, 2012).

ILA BERMAN: Berman is a principal of Scaleshift design and the O'Donovan Director of the University of Waterloo School of Architecture. She is an architect, theorist, and curator of architecture and urbanism. Her research investigates the relationship between culture, the environment, and the evolution of contemporary material and spatial practices. Berman's work includes *URBANbuild local global*, and *New Orleans: Urban Operations for a Future City* and the forthcoming book: *Expanded Field*. She is the recipient of an AIGA award and Communication Arts Award of Excellence.

WILLIAM BRAHAM: Braham is the director of the Master of Environmental Building Design program and the TC Chan Center for Building Simulation and Energy Studies at the School of Design, University of Pennsylvania. His most recent projects include the Carbon Reduction Action Plan for the University of Pennsylvania and the book *Architecture and Energy: Performance and Style* (Routledge, 2013).

LINDSAY BREMNER: Bremner is the director of Architectural Research at the University of Westminster in London, having formally taught at Temple University in Philadelphia and the University of the Witwatersrand in Johannesburg. She is an award-winning architect and writer and has published, lectured, and exhibited widely on the post-apartheid transformation of Johannesburg. She is engaged in two on-going research projects: *Geo-architecture*, which investigates relations between geology, politics and architecture and *Folded Ocean*, which researches the organizational and spatial logics of the Indian Ocean world.

TEDDY CRUZ: Cruz is a professor in Public Culture and Urbanism in the Visual Arts department at University of California, San Diego, where he directs the Center for Urban Ecologies. Cruz was the recipient of the Rome Prize in Architecture and the first James Stirling Memorial Lecture on the City Prize. His work has been exhibited at MoMA in New York City.

DILIP DA CUNHA: Da Cunha is an architect and planner. He is Adjunct Professor at the School of Design, University of Pennsylvania. With his partner Anuradha Mathur, he is currently working on a project titled *The Invention of Rivers*. It stems from questioning the natural status given to rivers and the imaging and imagining that this assumption has inspired. They are authors of *Mississippi Floods: Designing a Shifting Landscape*, (Yale University Press, 2001); *Deccan Traverses: The Making of Bangalore's Terrain* (Rupa & Co., 2006); and *Soak: Mumbai in an Estuary* (National Gallery of Modern Art / Rupa & Co., 2009).

HERBERT DREISEITL: Dreiseitl is director of the Liveable Cities Lab at the Ramboll Group, he is founder of Atelier Dreiseitl and a 2011 Loeb Fellow at the Harvard Graduate School of Design. As a water artist, landscape architect, and interdisciplinary planner, Dreiseitl's internationally recognized design projects include the Tanner Springs Park in Portland, Oregon (2010), and the Bishan – Ang Mo Kio Park in Singapore (2012). He is currently working on the Copenhagen Strategic Flood Masterplan (2013).

IÑAKI ECHEVERRIA: Echeverria founded his eponymous design firm in 2008. Since then, the office has been awarded a number of important public and private commissions, including the Parque Lago Texcoco (35,000 acres), the Papalote Children's Museum in Monterrey, diverse projects for Liverpool, the largest luxury retailer in Mexico and other public and private commissions. Echeverria is Professor of Design at the Universidad Iberoamericana, Director of the Berlin Summer Workshop at the Aedes Network Campus Berlin, and was recently awarded a Gold Medal at the Puerto Vallarta Biennale.

NATALY GATTEGNO: Gattegno is a principal of Future Cities Lab, an experimental design and research office based in San Francisco, California that has been awarded the Architectural League of New York Young Architect Prize and the Van Alen New York Prize. Future Cities Lab has been widely exhibited most recently at the San Francisco Museum of Modern Art and the Yerba Buena Center for the Arts. Gattegno is a faculty member at the California College of the Arts.

MARGARITA EUGENIA GUTIÉRREZ: Gutiérrez is the founder of the Biogeochemistry Group, and is currently a professor in the school of chemistry at the National Autonomous University of Mexico (UNAM), where she teaches on the chemistry of inorganics, soils, and hazardous wastes. She has coordinated over 60 projects for the mining industry, in addition to a cooperative project between Germany and Mexico for the management of hazardous waste between 2002 and 2006. Gutiérrez was a visiting professor at the University of Maryland College Park in 2001.

ANNA HERINGER: Heringer was a Loeb Fellow at the Harvard Graduate School of Design and the honorary Professor of the UNESCO Chair Earthen Architecture Programme. Her work in Rudrapur, Bangladesh, in partnership with Eiki Roswag, received the Aga Khan Award for architecture. Heringer is also the 2011 recipient of the Global Award for Sustainable Architecture.

ALISON HIRSCH: Hirsch is an assistant professor of Landscape Architecture at the University of Southern California. She is the co-founder of foreground design agency, a transdisciplinary practice working between the fields of architecture, landscape architecture, urbanism, and the visual arts. Hirsch is the author of *City Choreographer: Lawrence Halprin in Urban Renewal America* (University of Minnesota Press, March 2014).

WALTER HOOD: Hood is an Oakland, California based environmental designer, artist, and educator. He is a professor at the University of California, Berkeley's Landscape Architecture and Environmental Design Department, which he chaired from 1998 to 2002. His studio practice, Hood Design, has been engaged in environmental and landscape design, urban design, art installations, and research commissions since 1992.

PETER HUTTON: Peter Hutton is an experimental filmmaker who has made over 20 films, including silent film studies of cities, landscapes, and seascapes through out the world. He has taught at Hampshire College, SUNY Purchase, Harvard University, and currently at Bard College. Hutton's work has been presented in major museums and festival both in the US and in Europe. In 2008 the Museum of Modern Art presented a retrospective on Hutton's work. His film *Study of A River*, which was presented at the Terrain of Water conference, was selected by the Library of Congress in 2009 for permanent preservation.

DOUGLAS JEROLMACK: Jerolmack is an associate professor in the Department of Earth and Environmental Science at the University of Pennsylvania. Jerolmack created the Penn Sediment Dynamics Laboratory, and was the first recipient of the American Geophysical Union's Luna B. Leopold Young Scientist Award in 2010.

DIÉBÉDO FRANCIS KÉRÉ: Kéré is the principal of Kéré Architecture and is a Professor at the Accademia di Architettura in Mendrisio. His Primary School in Gando project (2001) received the Aga Khan award for Architecture, while his recent projects include a school extension, library, and Woman's Association Center (also in Gando). Kéré is also the winner of an urban design competition for a former barracks terrain in Manheim, Germany.

TILMAN LATZ: Latz is a landscape architect and architect and is the head of Latz+Partner, an international landscape architecture firm based in Kranzberg, Germany. He is a guest professor at the University Kassel, has taught studios at the University of Pennsylvania School of Design, has been a guest critic on a number of juries, and has given professional and educational lectures for audiences around the world.

PIETRO LAUREANO: Laureano is an architect and urban planner, and a UNESCO Consultant for arid regions, water management, Islamic civilization, and endangered ecosystems. Laureano is founder of the IPOGEA Centre for Studies on Traditional Knowledge and the International Traditional Knowledge Institute, based in Florence, Italy.

DAVID LEATHERBARROW: Leatherbarrow is a professor of Architecture at the University of Pennsylvania, where he also serves as Chairman of the Graduate Group in Architecture. He is the author of scholarly publications including: *Architecture Oriented Otherwise* (Princeton Architectural Press, 2009), *Topographical Stories: Studies in Architecture and Landscape Architecture* (University of Pennsylvania Press, 2013), and *On Weathering: The Life and Time of Buildings*, co-authored with Mohsen Mostafavi (MIT, 1993).

ANURADHA MATHUR: Mathur an architect and landscape architect, is professor of Landscape Architecture at the School of Design, University of Pennsylvania. She and her partner Dilip da Cunha are currently working on a project titled 'Structures of Coastal Resilience' for Norfolk, VA funded by the Rockefeller Foundation. They are authors of *Mississippi Floods: Designing a Shifting Landscape*, (Yale University Press, 2001); *Deccan Traverses: The Making of Bangalore's Terrain* (Rupa & Co., 2006); and *Soak: Mumbai in an Estuary* (National Gallery of Modern Art / Rupa & Co., 2009).

REBEKAH MEEKS: Meeks is a multidisciplinary designer located in Fayetteville, Arkansas. She graduated with a MLA from the University of Pennsylvania in 2012 and a BArch from the Fay Jones School of Architecture in 2008.

ELIZABETH MOSSOP: Mossop is a landscape architect and urban planner. She is a founding principal of Spackman Mossop and Michaels landscape architects in the US and Australia. She is a professor and former director of the Robert Reich School of Landscape Architecture at Louisiana State University where she is director of the Urban Landscape Lab and a member of the Executive Committee of the Coastal Sustainability Studio.

SIMON RICHTER: Richter is professor of Germanic Languages and Literatures at the University of Pennsylvania and past president of the Goethe Society of North America. Richter's many publications include *Missing the Breast: Gender, Fantasy and the Body in the German Enlightenment* (University of Washington Press, 2006) and *Women, Pleasure, Film: What Lolas Want* (Palgrave, 2013). Richter's current research focuses on the cultural history of sustainability in Germany and Northwestern Europe.

ANNE WHISTON SPIRN: Whiston Spirn is an author, landscape architect, photographer, and a professor in the department of Landscape Architecture and Planning at the Massachusetts Institute of Technology. Spirn is the former Chair of Landscape Architecture and Regional Planning at the University of Pennsylvania, and has been a director of the West Philadelphia Landscape Project since 1987. She was the 2007 John Simon Guggenheim Memorial Foundation Fellowship recipient in the Social Sciences.

JOHN TODD: Todd is a professor emeritus of Natural Resources at the Rubenstein School of Environmental and Natural Resources at the University of Vermont, and a Fellow at the Gund Institute for Ecological Economics. He is the founder and president of Ocean Arks International and a principal of John Todd Ecological Design, Inc. based in Woods Hole, Massachusetts. Todd is the 2008 winner of the International Buckminster Fuller Challenge, and was named a "Hero of the Earth" by Time Magazine in 1999.

MARION WEISS: Weiss is the Graham Chair professor of Architecture at the University of Pennsylvania and a founding partner of WEISS/MANFREDI, a multidisciplinary design firm in New York. Her firm's projects include the Olympic Sculpture Park: Seattle Art Museum, Brooklyn Botanic Garden Visitor Center, Barnard College Diana Center, and the University of Pennsylvania Singh Center for Nanotechnology. Two monographs on their work have been published by Princeton Architectural Press and a new monograph in Korean and English by Pro Architect was recently released in autumn 2012.

CHRISTIAN WERTHMANN: Werthmann is a professor of Landscape Architecture and Design at the Leibniz University Hannover, and was the 2010 recipient of the Hans Fischer Senior Fellowship of the Technical University in Munich. His studio research report, titled *Tactical Operations in the Informal City* received the 2010 Award in Communication Excellence by the ASLA. Werthmann's most recent investigations are concerned with landscape based strategies for low income communities living in high risk areas.

MATTHEW WIENER: Wiener is currently pursuing a masters degree in landscape architecture at the School of Design, University of Pennsylvania. He graduated from Vassar College in 2009 with a B.A. in environmental science. Under Anuradha Mathur and Dilip da Cunha, Wiener is working on a project titled 'Structures of Coastal Resilience' for Norfolk, VA funded by the Rockefeller Foundation.

KONGJIAN YU: Yu is a visiting design critic in Landscape Architecture at the Harvard Graduate School of Design, in addition to the founder and Dean of the College of Architecture and Landscape Architecture at Peking University. Yu is also the Founder, President and Principal of Turenscap, an international design firm whose projects have received awards that include the 2009 ULI Global Award for Excellence, ten ASLA Awards including two Awards of Excellence in general design.

ENDNOTES

ANURADHA MATHUR / DILIP DA CUNHA_WATERS EVERYWHERE

¹ *Meteorologica* (Cambridge MA: Harvard University Press, 1952), Book II, Ch. II, 133 and Book I, Ch. IX, 69, 71

² Luna B. Leopold, *A View of the River* (Cambridge MA: Harvard University Press, 1994), 1

³ Charles H. Kahn, *Anaximander and the Origins of Greek Cosmology* (New York: Columbia University Press, 1960), 81

⁴ James S. Romm, *The Edges of the Earth in Ancient Thought: Geography, Exploration, and Fiction* (Princeton: Princeton University Press, 1992), 10-11

⁵ Steven Schultz and Jay A. Leitch, “Floods and Flooding,” in Stanley W.

Trimble (ed.), *Encyclopedia of Water Science* (Boca Raton: CRC Press 2008), Vol. 1

⁶ Niccolò Machiavelli, *The Prince*. (New York: Oxford University Press, 1984)

⁷ *Book of Ecclesiastes* in the Bible, New International Version (1984), Chapter I, verse 7.

⁸ Seneca, *Naturales Quaestiones* Book III, 4.1-6.1, translated by Thomas H. Corcoran (Cambridge, MA: Harvard University Press, 1971), Vol. 7, 217

⁹ Frank Dawson Adams, “The Origin of Springs and Rivers,” *The Birth and Development of the Geological Sciences* (Baltimore: The Williams & Wilkins Company, 1938), 460

¹⁰ Herodotus, *The Histories*, Book II: 97, translated by Aubrey de Sélincourt (London: Penguin Books, 2003), 132

¹¹ This is pointed out by Diodorus Siculus: “Herodotus says that the size of the Nile at its swelling is its natural one, but that as the sun travels over Libya in the winter it draws up to itself from the Nile a great amount of moisture, and this is the reason why at that season the river becomes smaller than its natural size.” *Diodorus of Sicily* with an English Translation by C.H. Oldfather, Book I.38.8 (New York: G.P. Putnam’s Sons, 1933), Vol. 1, 135

¹² *The New Encyclopædia Britannica* (Encyclopædia Britannica Inc., 2007), Vol. 26, 843

LINDSAY BREMNER_MUDDY LOGICS

¹ Anuradha Banerjee, *Environment Population and Human Settlements of Sundarban Delta* (New Delhi: Concept Publishing, 1998).

² William Langewiesche, *The Outlaw Sea* (New York: North Point, 2004); Alfred Nijkirk, “Shipbreaking USA,” *Recycling International*, March 2006, <http://www.environmental-expert.com/Files/6496/articles/6415/Shipbreaking.pdf>;

“American Ship Breaking. It All Comes Apart at the Bottom of America,” *The Lay of the Land, Center for Land Use Interpretation*, Spring 2010, http://www.clui.org/lotl/pdf/33_spring2010_color-200dpi.pdf;

and “Annex 3 Dismantling Sites in Europe and the OECD,” *sgmer.gouv.fr*, http://www.sgmer.gouv.fr/IMG/pdf/Annex_3_Dismantling_site_in_Europe_and_OECD.pdf [accessed March 10, 2011].

The United Kingdom, United States and the Netherlands were the major shipbreaking nations until after World War II. In the nineteen fifties, shipbreaking yards opened in Belgium, followed by Spain, Greece, the former Yugoslavia, Mexico, Colombia, Japan and Taiwan.

By the nineteen sixties, Taiwan was the leading shipbreaking country, with yards clustered around Kaohsiung. These closed in 1986, following a fatal explosion and the South Asian nations took over as the worlds primary ship breakers The United States still operates two ship breaking yards – at Chesapeake Virginia, and Brownsville Texas, where ships from the three federal Ghost Fleets (surplus ships built in the 1950’s and held in reserve to be activated in times of war) are taken apart. In Europe, yards still operate in the ports of Gand in Belgium, Scheepssloperij in the Netherlands, Grenaa and Esburg in Denmark and Klaipeda in Lithuania.

³ <http://www.greenpeace.org/india/campaigns/toxics-free-future/ship-breaking> [accessed April 09, 2012]. The world’s major ship breaking yards today are at Gadani Beach in Pakistan, Alang in India, Aligia in Turkey, Bhatiary (just north of Chittagong) in Bangladesh and Panyu City, Guangdong, and Xiagang in the Yangtze delta in China.

⁴ http://en.wikipedia.org/wiki/Gadani_ship-breaking_yard#History [accessed April 09, 2010].

⁵ M. Maruf Hossain and Mohammad Mahmudul Islam, “Shipbreaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management,” *Young Power in Social Action*, <http://www.ypsa.org/publications/Impact.pdf> [accessed December 12, 2011].

⁶ Ataur Rahman and A. Z. M. Tabarak Ullah, “Ship Breaking, A Background Paper,” *International Labor Organization’s Sectoral Activities Programme*, Dhaka 1999, <http://ilo-mirror.library.cornell.edu/public/english/protection/safework/sectors/shipbrk/shpbreak.htm> [accessed April 08, 2010] and

Syed Tashfin Chowdhury, “Bangladesh shipbreakers survive headwinds,” *Asian Times*, March 01, 2011, http://www.atimes.com/atimes/South_Asia/MC01Df02.html [accessed March 28, 2011].

This number has increased dramatically to 108, since the 2008 economic recession. In 2009, about 2.4 million tons of iron were obtained from ships scrapped in Bangladesh, compared with 650,000 tons from 2007 to 2008 and 1.22 million tons in 2006. Opportunities are set to increase further as the European Union completes a phase-out of single-hull tankers operating in its waters.

⁷ Aage Bjorn Andersen, Erik Bjornbom and Terje Sverud, *Technical Report DNV RN 590, Decommissioning of Ships, Environmental Standards, Ship-breaking Practices / On-site Assessment, Bangladesh Chittagong Report No. 2000 3158, Revision No. 01* (Hovik, Norway: Det Norske Veritas, 2000).

⁸ Gary Cohn and Will Englund, Baltimore Sun, “The Shipbreakers,” *Pulitzer Prize for Investigative Reporting*, 1998, <http://www.pulitzer.org/works/1998-Investigative-Reporting> [accessed February 23, 2010].

⁹ Jacob Baynham, “Muddy Waters. Are US shipping companies still selling their clunkers to the toxic scrap yards of South Asia?” *slate.com*, September 18, 2009, <http://www.slate.com/id/2228712/pagenum/all/> [accessed February 22, 2010] and Rajesh Joshi, “US Environmental protection Agency to let Anders sail,” *Basel Action Network, ban.org*, August 28, 2009, http://www.ban.org/ban_news/2009/090828_usepa_to_let_anders_sail.html [accessed February 22, 2010].

The Jones Act (Merchant Marine Act of 1920, Section 27) forbids sale of United States government ships to foreign companies and the Toxic Substances Control Act (TSCA) forbids the export or the distribution in commerce of polychlorinated biphenyls (PCBs), which are highly toxic compounds of chlorine and benzene and were once widely used in ship construction.

¹⁰ 97 percent of the ships that are taken apart in Bangladesh are recycled.

¹¹ Jennifer Ashraf, “Sunset Splendour at Bhatiary,” *The Daily Star Home* 2, 49, June 14, 2005, <http://www.thedailystar.net/lifestyle/2005/06/02/page02.htm> [accessed April 09, 2010].

¹² “Sitakunda Upzala,” *Banglapedia.org*, 2006, http://www.banglapedia.org/httpdocs/HT/S_0420.HTM [accessed April 10, 2010]. It has two hundred and eighty mosques, eight mazars, forty nine Hindu temples, four ashrams, and three Buddhist temples.

¹³ “Sitakunda Upzala,” *Banglapedia.org*, 2006, http://www.banglapedia.org/httpdocs/HT/S_0420.HTM [accessed April 10, 2010].

¹⁴ Group: 01 (Warrior), “Report on the Impact of the Small Scale Real Estate Business on the Urbanization Patterns of Third World Cities: A Case Study on Chittagong Division,” *scribd.com*, December 20, 2009, <http://www.scribd.com/doc/24494329/The-Impact-of-the-Small-Scale-Real-Estate-Business-On> [accessed April 10, 2010].

¹⁵ Aage Bjorn Andersen, Erik Bjornbom and Terje Sverud, *Technical Report DNV RN 590, Decommissioning of Ships, Environmental Standards, Ship-breaking Practices / On-site Assessment, Bangladesh Chittagong Report No. 2000 3158, Revision No. 01* (Hovik, Norway: Det Norske Veritas, 2000).

¹⁶ Greenpeace and International Federation for Human Rights in co-operation with Young Power for Social Action, “End of Life Ships – The Human Cost of Breaking Ships,” *fidh.org*, 2005, <http://www.fidh.org/END-OF-LIFE-SHIPS-THE-HUMAN-COST-OF-BREAKING> [accessed April 10, 2010]. Workers come from Nandail (north of Kishorganj), Saria Kandi (near Bogra) Chandan Baisha, Dac Bangla and Kolni Bari (south of Saria Kandi).

¹⁷ For details of the relations between the industry and government ministries and departments, and the structuring of the industry see Ataur Rahman and A. Z. M. Tabarak Ullah, “Ship Breaking, A Background Paper,” *International Labor Organization’s Sectoral Activities Programme*, Dhaka 1999, <http://ilo-mirror.library.cornell.edu/public/english/protection/safework/sectors/shipbrk/shpbreak.htm> [accessed April 08, 2010].

¹⁸ Brian Foote and Joseph Yoder, “Big Ball of Mud,” *laputan.org*, August 28, 2001, <http://www.laputan.org/mud/mud/html> [accessed November 15, 2010].

¹⁹ *Ibid.*, 2.

²⁰ *Ibid.*

²¹ *Ibid.*, 9.

²² *Ibid.*, 5.

²³ *Bangladesh Environmental Lawyers Association*. <http://www.belabangla.org/> [accessed 10 December 2011].

²⁴ “Bangladesh Environment Conservation Act, Act 1 of 1995. Section 12” PICOM, <http://www.picom.gov.bd/pdf/env1995.pdf> and “Bangladesh Factories Act, 1965, Act 4 of 1965.” *International Labor Organization*. <http://www.ilo.org/dyn/natlex/docs/WEBTEXT/47346/65073/E65BGD01.htm> [accessed 10 December 2011].

²⁵ M. Maruf Hossain and Mohammad Mahmudul Islam, “Shipbreaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable management,” *Young Power in Social Action*. <http://www.ypsa.org/publications/Impact.pdf> [accessed December 12, 2011]. Lack of occupational health and safety standards, training or personal protection result in high levels of exposure by workers to accidents and they or their families are paid limited or no compensation when they are injured or killed. Workers are subjected to extended working hours, less than minimum wages, and are not permitted to form trade unions and the use of child labor is common.

²⁶ “Import Policy Order 2009-2012.” DITP, <http://www.depthai.go.th/DEP/DOC/53/53002565.pdf> [accessed 10 December 2011]. This included Import Policy Order 2009-2012, which required that ships be pre-cleaned before entering Bangladesh. Ministry of Commerce, Government of the People’s Republic of Bangladesh.

²⁷ Maria Sarraff et.al. “Ship Breaking and Recycling Industry in Pakistan.” World Bank Report No 58275-SAS, 17. *The World Bank*, <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1296680097256/Shipbreaking.pdf> [accessed 12 December 2011].

²⁸ Syed Tashfin Chowdhury, “Bangladesh shipbreakers survive headwinds,” *Asian Times*, March 01, 2011, http://www.atimes.com/atimes/South_Asia/MC01Df02.html [accessed March 28, 2011].

NATALY GATTEGNO_AQUEOUS TERRITORIES

¹ R Chevallier, ‘The Greco-Roman Conception of the North from Pytheas to Tacitus’, *Arctic*, Vol 37, No 4, December 1984, 341.

TERRA INCOGNITA_AURORA_GLACIARIUM_HYDRAMAX

Design: Jason Kelly Johnson & Nataly Gattegno
Project Team: Carrie Norman, Thomas Kelley
Project Collaborators: Noah Keating, Troy Rogers
Assistants: Kezia Ofiesh, Paul Fromm, Sarah Fugate, Hank Byron, Taylor Burgess, Ed Yung, Ben Fey, Dayoung Shin, Kyle Kugler, Jim Staddon, Gin Harr, Yuki Staddon, Matt Young, Brad DeVries, Kyle Sturgeon.
Map Resources: The University of Michigan Map Library
Photography: Zechariah Vincent
Support: The Van Alen Institute, The University of Michigan TCAUP, Graham Foundation for Advanced Studies in the Fine Arts Grant, Columbia University Avery CNC Fabrication Lab, NYC College of Technology - CityTech

HYDRAMAX

Design: Jason Kelly Johnson & Nataly Gattegno
Project Manager: Ripon DeLeon; Project Interns: Gavin Johns, Cameron Eng
Collaborative Sponsor: MIGA Motor Company (Dr. Mark Gummin)

ALISON HIRSCH_IMAGING CHANGE

¹ Robert E. Cook, “Do Landscapes Learn? Ecology’s ‘New Paradigm’ and Design in Landscape Architecture,” in Michel Conan, ed., *Environmentalism in Landscape Architecture*, (Washington, DC: Dumbarton Oaks, 2000). 119-120.

² Halprin defines “Wildness” in his essay “Wildness as Art,” in an unpublished book manuscript, *Environment as Art Experience* (1974). He begins, “Wildness or wild nature, if you will, is where we can perceive the pure world

and react to it in a state of unmodified as yet by our technological changes. It is the last pure stronghold on earth of ‘what is’, without our value system imposed... ‘Wildness’ is a state of being... an effable quality existing in those places in our world in which humans have not made changes... in which natural forces have created all that exists without our intervention. It is not nature but ‘nature unaffected by humans’ that creates the quality of wildness. Wildness is different than wilderness – wilderness is a place, an area, a situation in which wildness may exist. Wildness is the quality, the experience, the essence of wilderness... Everything we are has origins in wildness. And only there can we see *undisturbed process at work...*” (Halprin Archives, 014.I.B.2302). Emphasis in original.

³ Yet like his predecessors, he also hoped to generate forms that would resist cultural obsolescence - that would sustain relevance despite the forward march of time.

⁴ Kevin Starr, *Americans and the California Dream, 1850-1915* (New York: Oxford University Press, 1973), 180.

⁵ “Dance Deck in the Woods,” *Impulse* (1956), 24.

⁶ John Dewey, *Art as Experience* (New York, Minton, Balch & Co., 1934), 15-16.

⁷ Marshall Berman, *All That is Solid Melts into Air: The Experience of Modernity* (London: Penguin Books, 1988), 348.

ANNE WHISTON SPIRN_RESTORING WATER

Parts of this essay are adapted from “Restoring Mill Creek: Landscape Literacy, Environmental Justice, and City Planning and Design,” *Landscape Research* 30:5 (July 2005): 359-377 (available at <http://www.annewhiston-spirn.com/pdf/SpirnMillCreek2005.pdf>). For more on the West Philadelphia Project and for the photographs featured here, as well as others, see: www.annewhistonspirn.com and www.wplp.net.

KONGJIAN YU_COMPLETE WATER

1. See Kongjian Yu and Dihua Li, *The Road to Urban Landscape: Talks to Mayors* (Beijing: China Architecture & Building Press, 2003). Published only in Chinese.

2. Chen Kelin, Lü Yong, and Zhang Xiaohong, “No Water Without Wetland,” *China Environment and Development Review* (2004), 296–309. See also John McAlister, “China’s Water Crisis,” *Deutsche Bank China Expert Series*, March 22, 2005.

3. Kongjian Yu, “Elegy to Water,” editorial, *LA China* 12, October 4, 2010, 20–24.

SIMON RICHTER_THE HYDROLOGICAL MOMENT

¹ J. W. von Goethe, *Faust*, lines 11,559-11,856, my translation.
² Oswald Spengler, *The Decline of the West* (New York: A. A. Knopf, 1939).
³ The 2008 Veerman Commission of the Netherlands recommends increasing flood plains along the built up shorelines of the Maas and Rhine by 10%. This entails an aggressive use of eminent domain.

⁴ Gaston Bachelard, *Water and Dreams: An Essay on the Imagination of Matter* (Dallas: Pegasus Foundation, 1983), 6.

⁵ Philippe Ariès, *The Hour of Our Death* (New York: Oxford University Press, 1991).

⁶ Sigmund Freud, *New Introductory Lectures on Psychoanalysis* (New York: W. W. Norton, 1965), 71.

⁷ Bruno Bettelheim, *Freud and Man’s Soul* (New York: A. A. Knopf, 1983), 64.

CHRISTIAN WERTHMANN_POLLUTION + PROPAGANDA

The author would like to acknowledge Joseph Claghorn for editorial work, and Fernando de Mello Franco and Giselle Mendonça for historical image sourcing.

MARION WEISS_CULTURAL WATERMARKS

Museum of the Earth
1999-2003
Client: Paleontological Research Institution
Site Design / Architecture: WEISS/MANFREDI Architecture/Landscape/Urbanism

Marion Weiss and Michael A. Manfredi (Design Partners), Christopher Ballentine (Project Manager); Lauren Crahan and Armando Petruccelli (Project Architects), Michael Blasberg, Christopher Kimball, Christopher Payne, and Giselle Sperber
Structural Engineering: Weidlinger Associates Consulting Engineers
MEPPF Engineering: MG Engineering P.C.
Civil Engineering: T.G. Miller, P.C.
Landscape/Horticulture: Elemental Landscapes
Lighting Design: Brandston Partnership Inc.
Exhibition Design: Weiss/Manfredi (Entry Hall) and Jeff Kennedy Associates (Exhibition Hall)
Cost Estimator: AMIS Inc.
Owner’s Representative: John Fontana, PE.
General Contractor: Hueber Breuer Construction Co., Inc.

Olympic Sculpture Park

2001-2007

Client: Seattle Art Museum

Competition Winner:

WEISS/MANFREDI Architecture/Landscape/Urbanism

Site Design / Architecture: WEISS/MANFREDI Architecture/Landscape/Urbanism

Marion Weiss and Michael A. Manfredi (Design Partners), Christopher Ballentine (Project Manager), Todd Hoehn and Yehre Suh (Project Architects), Patrick Armacost, Michael Blasberg, Beatrice Eleazar, Hamilton Hadden, Mike Harshman, Mustapha Jundi, John Peek, and Akari Takebayashi. Competition and Exhibition team: Lauren Crahan, Kian Goh, Justin Kwok, Lee Lim and Yehre Suh,

Structural and Civil Engineering: Magnusson Klemencic Associates

Mechanical and Electrical Engineering: ABACUS Engineered Systems

Lighting Design: Brandston Partnership Inc.

Geotechnical Engineering: Hart Crowser

Environmental: Aspect Consulting

Aquatic Engineering: Anchor Environmental

Graphics: Pentagram

Security and AV/IT: ARUP

Catering & Food Service: Bon Appetit

Kitchen: JLR Design

Retail: Doyle + Associates

Architectural Site Representation: Owens Richards Architects, pllc

Project Management: Barrientos LLC

General Contractor: Sellen Construction

McCann Residence

2004-2011

Client: Joseph and Anne McCann

Area: 4,900sf

Site Design / Architecture: WEISS/MANFREDI Architecture/Landscape/Urbanism

Marion Weiss and Michael A. Manfredi (Design Partners); Hamilton Hadden, Michael Blasberg (Project Architects)

Architect Consultant: Michael DeCandia Architects

Michael DeCandia (Design Partner); John Cunniffe (Project Architect)

Civil Engineer: Thomas W. Skrable, PE

Brooklyn Botanic Garden

2004-2012

Architect & Site Design: WEISS/MANFREDI Architecture/Landscape/Urbanism

Urbanism

Michael A. Manfredi, FAIA and Marion Weiss, FAIA (Design Partners);

Armando Petruccelli, RA (Project Manager); Hamilton Hadden, RA, Justin Kwok, LEED-AP, Michael Steiner, LEED-AP (Project Architects); Christopher

Ballentine, Cheryl Baxter, Michael Blasberg, RA, Paúl Duston-Muñoz (Project Team); Patrick Armacost, Jeremy Babel, Caroline Emerson, Eleonora Flamma,

Kian Goh, Michael Harshman, Aaron Hollis, Hanul Kim, Hyoung-Gul

Kook, Lee Lim, Jonathan Schwartz, Na Sun, Jie Tian, Yoonsun Yang (Additional Team Members)

Consultant Team

Structural and Civil Engineering Consultant: Weidlinger Associates Consulting Engineers

MEPPF/IT Engineering Consultant: Jaros, Baum & Bolles Consulting Engineers

Geothermal/Geotechnical Engineering Consultant: Langan Engineering and Environmental Services
Landscape: HM White Site Architecture

Lighting Design Consultant: Brandston Partnership Inc.

Cost Estimator: AMIS Inc.

Environmental Consultant: Viridian Energy & Environmental, LLC

Retail Consultant: Jeanne Giordano Ltd.

AV/Acoustics/Security Consultant: Cerami & Associates, Inc

Security Consultant: TM Technology Partners

Food Service Consultant: Ricca Newmark Design

Curtain Wall Consultant: R.A. Heintges & Associates

Code & Life Safety: Code Consultants, Inc.

Traffic Consultant: Sam Schwartz LLC

Construction Manager: The Liro Group

General Contractor: E.W. Howell

WILLIAM BRAHAM_WASTE, WORK, & WORTH

¹ Charles Dickens, “Philadelphia,” *American Notes and Pictures from Italy* (London: Chapman and Hall, 1874), Chapter VII.

² Water and Sewage Works, *Municipal Engineering*, Vol. 18, January-June, 1900. 119.

³ Randal C. Archibold, “From Sewage, Added Water for Drinking,” *New York Times* (November 27, 2007). <http://www.nytimes.com/2007/11/27/us/27conserve.html>, [accessed April 15, 2013].

⁴ A. Buenfil, *Emergy Evaluation of Water* (Unpublished PhD Dissertation, University of Florida, 2001).

DAVID LEATHERBARROW_HORIZON OF ALL HORIZONS

¹ Leon Battista Alberti, *On the Art of Building in Ten Books* (Cambridge, MA: The MIT Press, 1988).

² This observation follows those made by Francis Ponge, in poem called “Water,” in *The Voice of Things* (New York: McGraw-Hill, 1974).

³ W.H. Auden, *Thank you Fog* (Random House, 1974).

⁴ With the western coast of Ireland as her topic, shore life has been studied fully and beautifully by Anna Ryan, in *Where Land Meets Sea* (Farnham, Surrey: Ashgate Publishing, 2012). For the American context, see Anuradha Mathur and Dilip da Cunha, *Mississippi Floods: Designing a Shifting Landscape* (New Haven, CT: Yale University Press, 2001).

⁵ Le Corbusier, *Journey to the East* (Cambridge, MA: MIT Press 2007).

⁶ Ibid.

⁷ Still the best account of this wonderful building is Bruno Reichlin, “The Pros and Cons of the Horizontal Window,” *Daidalos*. But see also Le Corbusier’s own report: *Une Petite Maison* (Zurich, Switzerland: Birkhäuser Architecture 1954).

⁸ *Une Petite Maison* (Zurich, Switzerland: Birkhäuser Architecture 1954).

⁹ The most thorough study to date on this building is Brian Brace Taylor, *The Salvation Army Building*

¹⁰ Hashim Sarkis, *The Mat Building*, (Prestel Publishing, 2002). 23

¹¹ Le Corbusier, *Oeuvre Complete (Fondation Le Corbusier, 1995)*.

¹² Le Corbusier, *Oeuvre Complete (Fondation Le Corbusier, 1995)*.

¹³ Ibid.

¹⁴ Le Corbusier, *When the Cathedrals Were White* (New York: McGraw-Hill, 1964).

¹⁵ I describe this encounter a little more fully in a chapter called “Skylines,” in *Architecture Oriented Otherwise* (New York: Princeton Architectural Press, 2009).

¹⁶ Le Corbusier *When the Cathedrals Were White*. (New York: McGraw-Hill, 1964).

¹⁷ Le Corbusier, *Poem to the Right Angle* (Fondation Le Corbusier, 1989)

IÑAKI ECHEVERRIA/MARGARITA EUGENIA GUTIÉRREZ_

SOFT ENGINEERING

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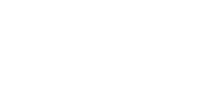
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IMAGES



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