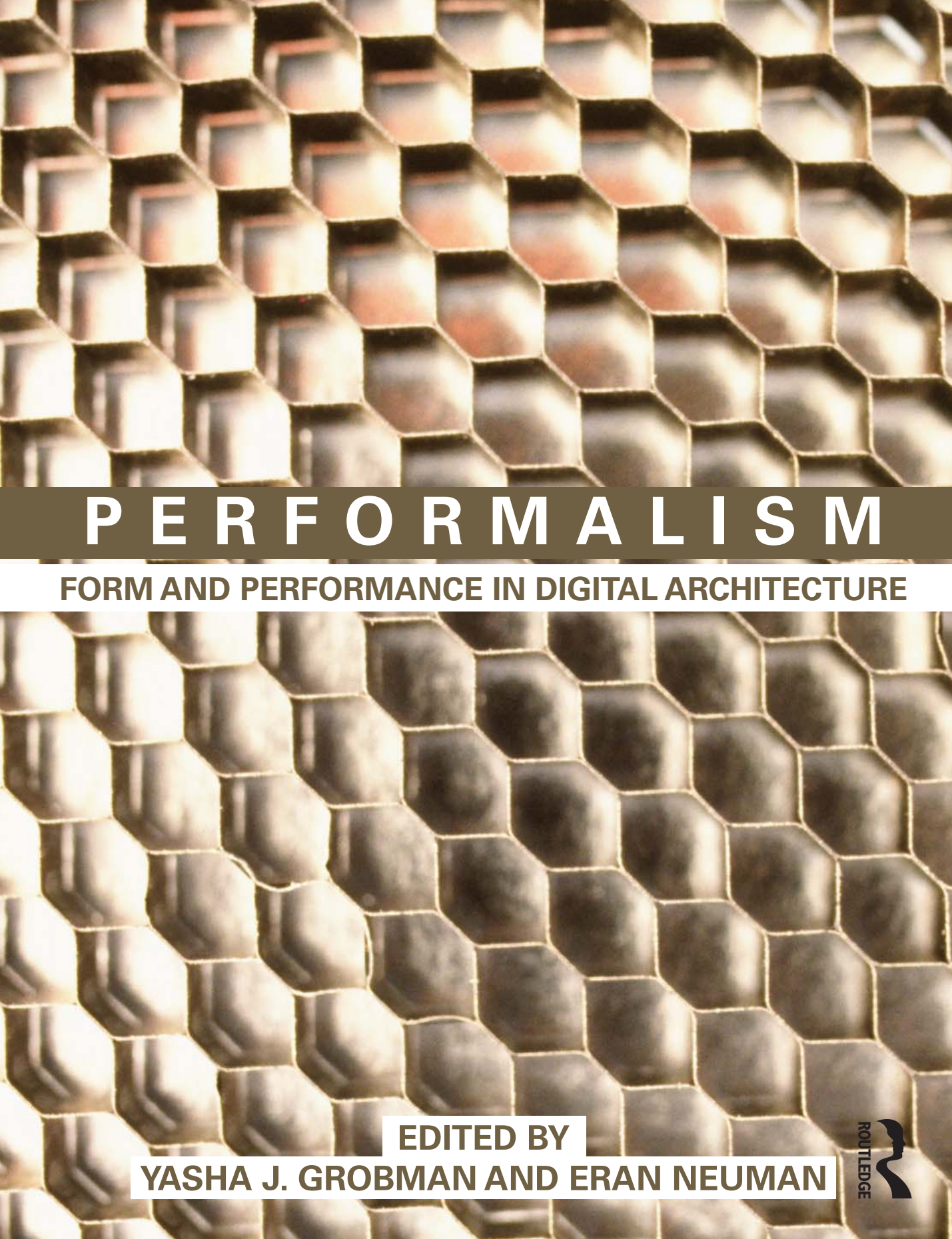

PERFORMALISM

FORM AND PERFORMANCE IN DIGITAL ARCHITECTURE

EDITED BY
YASHA J. GROBMAN AND ERAN NEUMAN

ROUTLEDGE

PERFORMALISM:

FORM AND PERFORMANCE IN DIGITAL ARCHITECTURE

TODAY, with the advent of digital media technologies and the ability to conceptualize, express and produce complex forms using digital means, the question of the status of the architectural form is once again under consideration. Indeed, the computer "liberated" architecture from the tyranny of the right angle, and enabled the design and production of non-standard buildings, based on irregular geometry. Yet the questions concerning the method of form expression in contemporary architecture, and its meaning, remain very much open.

Performalism takes up this discussion, defines it and presents changes in form conception in architecture, followed by their repercussions. In the context of the architectural discourse, this book posits that today we can define architectural form and performance as an "ism". Supported by a wealth of case studies from some of the top firms across the globe and contributed to by some of the top names in this field, this book critically examines the implications and influences of computer-based design on form as performance.

Highly illustrated throughout, and with a unique emphasis on professional practice, this book is essential reading for all architects, aspiring and practicing.

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PERFORMALISM:

FORM AND PERFORMANCE IN DIGITAL ARCHITECTURE

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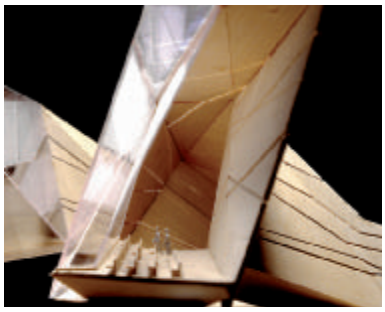

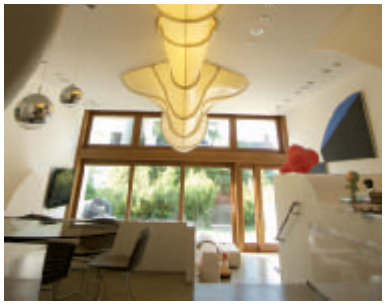

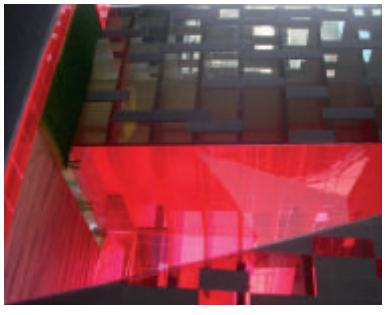

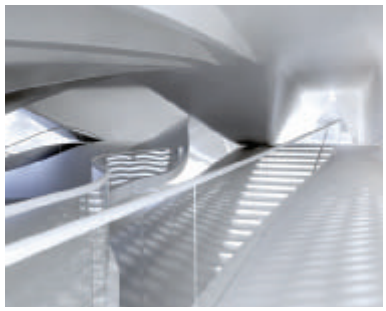

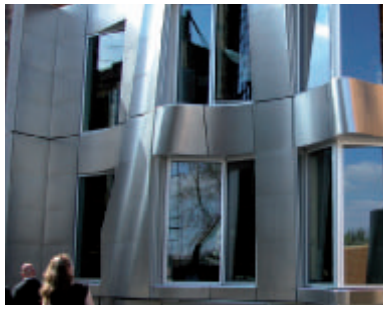

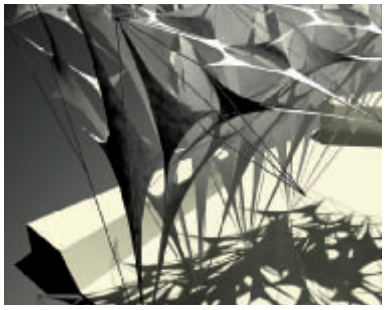

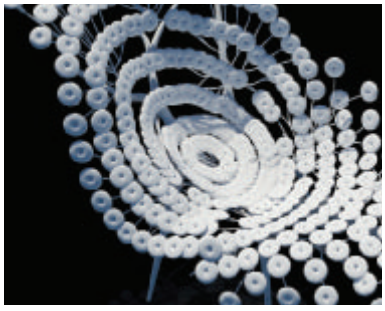

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THEORY AND ESSAYS

CHAPTER ONE

Performalism: a manifesto for architectural performance

Eran Neuman

Yasha J. Grobman

TALKING IN "ISMS" might be risky. "Ism" assumes that behind a described phenomenon stands a group, a movement, or a collective, whose members share points of view, ideologies, and modes of production. It entails that members included in an "ism" partake in a cause and a distinctive doctrine and theory. It alludes to a moment in history in which dispersed notions crystallize into a coherent idea and change political, cultural, and social notions brought to a rupture within certain realities, proposing new ways to look at, transform and engage with these realities. At times an "ism" demarcates a perception of life in absolute terms, seeking a singular way to relate to and produce life. The risk of talking in "isms" lies in the reduction of a certain phenomenon into several limited concepts.

The need to characterize phenomena and at the same time reflect the complexities related to these phenomena led, throughout the course of history, to the definition of "isms" according to the modes of operation performed by their members. That is, not only according to the shared modes of production, but also through an analysis of the attribution of discursive mechanisms. Many "isms" professed avant-garde ideas by performing avant-garde actions. Means and ideology were unified; together they provided ways to define those "isms." Sometimes "isms" used manifestos as a vehicle to spread their ideas, call for change and search for a future. The manifesto, as Mary Ann Caws claims, was "crafted to convince and convert." From the Communist Manifesto to the Futurist one, from Surrealism to Situationism, it functioned as a political and critical tool worded in the first person plural ("We should finally like to state . . . " as Umberto Boccioni professed) and outlining modes of operation that would conclude in the new and about the future. An analysis of these manifestos assisted in characterizing those "isms."

Performalism takes the risk. It proposes defining a phenomenon common in architecture today while also providing a sort of manifesto for this phenomenon: a retro-manifesto. Observable and distinct, even though it contains discrepancies, this phenomenon can be categorized according to the points of view of those occupied with similar ideas and forms of production. The present book outlines the ways in which prominent

architects today utilize discursive formations and modes of operation in and about the new. Through those architects' projects, texts and words, the book does not only map out attitudes in architectural production today, but it also proposes a way of looking into architectural realities existing in the interstice between form and function, object and subject, space and flesh, perception and cognition, politics and ideologies, and defining these realities as a modality for performative architectural existence today.

WHAT, THEN, is performance in architecture? What is architecture occupied with in recent years? How does it perform? What, in effect, makes it an "ism?"

With the advent and assimilation of digital technologies, architecture underwent a big transformation. Having broader and more complex means of expression and production, architects who were interested in realizing the potential of computation in design began to explore what were perceived as odd forms, basing them mainly on the outcome of visual properties, on an image, while neglecting to incorporate other aspects of architecture. This tendency was expressed, for example, in projects by such architects as Marcus Novak and Stephan Perrella whose formal approach, even when examining cultural aspects of form, was primarily based on form's visual properties. Frank Gehry's initial occupation with built digital projects, as executed in the "Fish" and the Guggenheim Museum in Bilbao, rejected aspects of modernism, such as "form follows function, " and defined a new level of freedom in the relationship between form and its formal appearance, showing the possibility of realizing this odd form.

The initial interest in form in terms of visual and formal properties in many ways brings to mind a parallel historical phenomenon. In the early twentieth century, as a result of the Industrial Revolution, overwhelmed by the new technological possibilities, artists and architects began experimenting with new forms. Despite the different historical and cultural circumstances from which they derived, Russian Formalism, Dadaism, Cubism and Futurism can be considered to recall the formal exploration of the time. Albeit focusing on the autonomy of form, these formal explorations enfolded social and political agendas by questioning the relation between form and content. Nevertheless, these explorations were later criticized by Marxist ideologists for having emphasized the formalist aspects in art and architecture rather than directly addressing cultural, social, and political aspects of form making. In a similar manner, artists and architects today, overwhelmed by yet another technological revolution – the Digital Revolution – started experimenting with new forms.

Similarly, in the 1990s, some architectural critics and practitioners claimed that these new experiments reflected a reductionist attitude, one that excludes complex aspects of a formal conception in architecture, relying solely on a few image-related parameters. Reacting against this attitude, they called for the incorporation of other parameters into the conception and making of architectural form, such as those derived from environmental and programmatic aspects. Basing form on function ("form follows function") was not an option because functionalist form making was conceived as yet another reductionist attitude. The logic of form as an outcome of function was mechanistic, relying mainly on the utilitarian aspects of form and not necessarily addressing the complexity of form as a cultural, social, and political product.

For architects, performance provides a wider frame for the conception of the architectural form because it incorporates and lingers in-between the functionalist and image-based approaches of form making and conception. It also suggests breaking dichotomies between the performance of form as an object and the performance of the human subject. Form in this case is animated, acting and interacting with the surrounding objects/forms and the human subject, creating possibilities for the emergence of new realities. It is an integral part and the outcome of inclusive processes based on nature as well as culture. As such, a performative perception of form would call for its optimization as a product of technical utilization, while at the same time it would aim to incorporate symbolic,

perceptual, and behavioristic aspects of form as a figure that displays a visual and sensual appeal. Form in this case would be more flexible, adjustable, and free.

IN THE SEARCH for a new logic in the conception of form and a new relationship between the different parties in the triangle Form–Function–Subject, Performalism proposes that computer-based architecture transforms notions in the architectural discourse from function to performance. The work presented in this book addresses the question of form as an outcome of performance. It claims that digitization shifts form-making to a complex, dynamic operation based on performative aspects. As a heuristic device, the book includes works from both ends of performance of form in architecture: on the one hand, an image-based conception of form and on the other, a functionalist attitude toward architectural form. In-between, the book presents a range of works that treat the question of architectural form from neither end, but try to explore various conceptions of form as an inclusive procedure, addressing perceptual and behavioral aspects. To that end, the book presents the multi-faceted perception of form as a result of several performative procedures.

In Peter Eisenman's conception of form, which is an outcome of diagrammatic procedures, performative and conceptual inputs are used both as an initial field-grid and as disturbances that modify the field-grid and generate the subsequent formal expression. Performance in this case relates mainly to the design process itself rather than the specific parameters of the final formal expression.

Greg Lynn FORM's mode of form generation is an investigation of the potentials of computer complex form manipulations and manufacturing. Here performance is conceived as a development of communication mechanisms between designers and machines and between environments, played by internal and external vectors.

Preston Scott Cohen's complex initial form has strong geometric origins. His approach to performance emphasizes a level of virtuosity that goes beyond function as a result of the need to address multiple constraints, with often contradicting demands that are addressed simultaneously.

Archi-Tectonics' work addresses the architectural figure by developing a formal strategy that goes beyond the parametric design into the aesthetic and integrates both. Form is generated through the deployment of three different typologies of matrix: armature, smart skin, and interface. Each of these organizers operates as a mechanism for "associative parametrics" – the feedbacks that link component assemblies in responsive feedbacks, and link built organizations and their context or environment.

Contemporary Architecture Practice addresses formal affects, effects, and atmosphere rather than concentrating on the environmental performative aspects of form during the initial form-generation process. In the following stages, performative aspects (environmental and perceptual) are being used while developing innovative form-conception and manufacturing methods.

The work of R&Sie(n) exploits the formal possibilities introduced by computation and pushes the performance of form to the limit, to a moment in which form performs as a schizoid process. Here performance is examined in terms of tools that are designed to perform by themselves as facilitators of the final architectural product.

KOL/MAC ARCHITECTURE addresses the relation between form and performance by employing strategies based on models from nature through tools such as fuzzy logic software. Their design process emphasizes emerging possibilities to use this logic to create complexity in architectural and urban systems, while avoiding the reductivism which is frequently linked to computer form generation methods.

In Gehry Partners, LLP / Gehry Technologies' form development process, performance and performative simulation tools, such as Digital Projects, are realms for analyzing and actualizing designs that were initially developed in a rather traditional method, using physical models.

Franken Architekten's formulations of form as registration of force vectors are attempts to optimize the

architectural form beyond its technical modalities. The dual idea of performance in this case includes a source of generative forces that shape the initial form and a manufacturing-oriented constraints system.

OCEAN's pluralistic approach to performance spans from the notion of performance in art to the "definition of performance as a systemic approach to functions." Its common aim is to "understand and instrumentalize the notion of performance for alternative design approaches to address pressing issues such as managing complexity, sustainability and by promoting heterogeneity, responding to the rapid homogenization of the built environment." Form is created through a direct performative exchange with its specific environment. Performance in this approach is the mutual effect that an architectural object and its environment generate and share.

The formal strategy of Open Source Architecture (OSA) is based on a principle of dissipative emergence that concludes in highly informed models all favoring the appearance of form in terms of information flows. Form in OSA's work benefits from the abstract nature of information that is mutually approached as language (typology) and system (topology).

Gramazio & Kohler's complex forms derive from an investigation on the connection between craft and computation. The control over the data flow between the virtual and the physical forms allow them to introduce new types of control over the building process that is based on parametric performance-oriented information. The introduction of the robot as part of the architectural design process introduced a new type of material dimension of the architectural form.

Reiser + Umemoto perceive the architectural form as an entity generated within the dynamics of a material field. Their notion of performance emphasizes a possibility to determine a material system's fabric and effect with great precision. The performative ramifications of this approach are used for the creation of highly specific atmospheres and ambiances.

Foster + Partners' optimization of form is a natural balance of multi-criteria parametric processes. Combining structural and ecological parameters, Foster + Partners develop an argument for an internal logic of geometry as aesthetics, and vice versa, which are based on performative aspects.

THE BOOK CLAIMS that the work and discourse of the respective architects presented creates a group, an "ism," not only because of the prophetic and futuristic aspects embedded in the work and rhetoric, but also due to the old-new realities it reveals. Both Sylvia Lavin's arguments that performance of architecture today offers five new points for architecture, an alternative to those defined by modernism, and Antoine Picon's outlining of performance in and through architectural histories suggest that while performance is a new conception in architecture, it is actually a practice that is being pursued anew. As such, the work presented reflects a moment in history in which dispersed notions about form-making crystallize into coherent ideas about form, ideas that change political, cultural, and social notions.

Another important old-new reality, which is elevated by the suggested discourse, is the material dimension or more specifically the dynamic nature of materials. Michael Hensel's argument on the material aspects of the notion of performance in architecture calls for a shift to a dynamic perception of special and material organization. The four domains of agency which he mentions as a base for the "intricate process of interaction" (i.e. the subject, the environment and the spatial and material organization complex) negotiates with the idea of the relationship between performance- and image-based design which is at the core of the suggested discourse. Martin Bechthold's chapter discusses the ramifications and limitations of a possible integration of diverse disciplinary know-how such as engineering in the performance-oriented design processes. His notion of performance thinking in architectural design promote integrative performance thinking while being aware of the risks of a logocentric approach to performance, which concentrate on image-based aspects in "numerically controlled environments" in order to generate the architectural form. He thus calls for the avoidance of

escapism which will reinforce the old stereotype of architecture design as a limited process which uses the scientific realm for inspiration only.

Christopher Hight explores the diverse nature of the parametric and performative design in relation to difference between the notions of performativity and performalism as a political action. Performativity in this sense refers to an empirical optimization of the architectural form which "depends upon ideas of evolutionary biology, in which designs evolve, generations of components descend in phylogenetic trees, and form is otherwise developed vis-à-vis fitness criteria." Performalism "might be taken, therefore, as a call for reformulating the project of performance in reference to political issues. That is to say, to enfold and to disrupt the performance of architecture as a mode of practice and as a way of formulating objects of its knowledge, the problems it studies."

Aaron Sprecher discusses two notions in contemporary architectural discourse: the morphogenetic and the atmospheric. While the author considers these two notions in terms of their experimental limitations, an alternative approach to the status of the architectural object is presented here. This approach aims to unleash the full potential of assessment and analysis regarding the notion of performance in today's "informed architecture."

As an "ism," performalism may allude to autonomous and reciprocal procedures – procedure for its own sake (as in formalism – form for the sake of form). The works presented in the book apply performative aspects in architecture for the sake of performance. Nevertheless, since the idea of performance initially attempts to incorporate multiple layers of reality, the outcome exceeds the limitation of autonomous operation and provides a wide range and inclusive possibilities for formal existence in architecture.

As a manifesto, the book calls for performance in architecture. Living at a time in which digital tools allow the design and integration of architectural properties and aspects in high resolutions, we can reach a highly personalized yet shared architecture. Performance as a conceptual and practical mode of operation provides us with the means to create an architecture that is in-between the individual and the collective, in-between utilitarian and symbolic functions, the intuitive and the rational, the sensual and the analytical. In this architecture, objects and subjects act as performers, creating environments for future growth.

References

Boccioni, Umberto "Technical Manifesto of Futurist Sculpture," in *Manifesto: A Century of Isms*, ed. Mary Ann Caws (Lincoln and london: University of Nebraska Press, 2001), p. 177.

Caws, Mary Ann "The Poetics of the Manifesto: Nowness and Newness," in Caws 2001, p. xix.

Sprecher, Aaron "Alive and Kicking: Energetic Formations," in *Performalism*, eds Yasha Grobman and Eran Neuman (Tel Aviv: Tel Aviv Museum of Art, 2008), pp. 74–81.

CHAPTER TWO

The various dimensions of the concept of "performance" in architecture

Yasha J. Grobman

THE TRANSITION TO computerized object-based design[1], and the improvement in the processing ability of computers, have led, in the past decade, to a significant increase in the quantity of information embodied in the form and the process of architectural design. Information-rich architecture based on "smart forms"[2] exists in a new dimension that is built on information hierarchies, from the level of the single parameter through to algorithms and programs that define relationships among numerous parameters. The use of parameters or algorithms as bases for production of forms, and in the architectural design process, as well as the increasing complexity of programs of architectural creation and the growing use of computers in architectural design, calls for a re-examination of the system of laws in which architectural creation is conducted.[3] This time, however, in contrast to precedents such as the design methods of Christopher Alexander[4] and others who attempted to arrive at a comprehensive, logocentric, theory, attempts are being made to define these laws in terms of specific, local, understandings. This kind of understanding continues the parametric logic of the computer in a way that makes possible a deconstructive use – i.e. disassembly and creation of new programmatic and formal complexities.

In this way a new kind of architectural database is gradually developing, which – in contrast to classical databases, such as those that focus on typologies – contains tools and methods of form creation that are based on a computer code. This database exists and develops in the free world of the open code on the Internet, and, as in other disciplines (computer science, for example), makes possible free adaptation and downloading of architectural codes for local, particular, needs.

This chapter proposes a definition of the concept of performance in architecture based on the logic of parameters, while making a first examination of the possibilities of using the various dimensions of performance in computer-based architecture, and a first examination of the meanings and implications of these possibilities.

STATIC INFORMATION AND DYNAMIC INFORMATION: FORM, FUNCTION AND PERFORMANCE

IN ORDER TO examine the way computer code is used in architecture we need to define the kinds of information or the kinds of parameters on which it is based. A possible basic division relates to two kinds of components – static and dynamic. Static components describe a fixed, inert, situation that may be connected to the architectural object or form. Dynamic components focus on an action – on a changing of the form or on the relation between the form and the space it is in. The latest developments in the use of computers in architecture are mainly to do with parameters of the latter kind.

Another possible distinction divides information into descriptive and performative. The increase in the quantity of information embedded in the architectural form began in the descriptive dimension, when software borrowed from other disciplines made possible the presentation and alteration of complex forms. Today, however, its major influence is expressed in the performative dimension, which relates to advanced possibilities of form development that are connected with simulation, optimization and generation of an architectural form through examination and alteration of relationships in the realm of performance.

As in code development in the computer sciences, alteration of parameters has a meaning mainly when it is channeled to achieve a particular goal. A computer code without a goal is like a meaningless collection of words or lines. According to the modernist discourse, which preceded the computer era, the "goal" of a form means a search for its function or actualization. The emergence of the computer was one of the major reasons for the diversion of the architectural discourse to forms of thinking that go beyond form or function, in a way that does not discard the discussion of these, but attempts to define the connection between them. It may be argued that the connection between form and function is meant to define the way in which the form sustains the function, and that a connection of this kind may be actualized by means of an examination of the performances, so that by means of the performances required by the function it becomes possible to arrive at the form. Indeed, the prevalent and narrow definition of the concept of performance relates to the quantitative-binary character of the computer code, and focuses on measurable, empirical, performances. A broader definition of the concept, however, contains three dimensions of performances: an empirical dimension, which focuses on directly measurable performances that usually relate to physical data such as strength, temperature, the quantity of light, etc.; a cognitive dimension, which relates to mental functions and processes and focuses on the way it can be translated into space, and, conversely, the way space can be translated into human cognition; and a perceptual dimension, which relates to the idea of passive perception (in which the senses play an important role) and focuses on the way it can be translated into space, and, conversely, the way space can be translated into human perception.

The empirical dimension is immediately translatable into computer language, but translation into computer language of the cognitive and the perceptual dimensions, which can be measured principally by a statistical method (which, for example, examines numerically the preferences or the aesthetic evaluations of a group of people in a particular space), still constitutes a complex problem for which there are no immediate solutions.

FORM-BASED DESIGN AND PERFORMANCE-BASED DESIGN

PERFORMANCE-BASED architectural design has to relate to the three dimensions of the concept. The personal interpretation of a program may prefer one particular dimension of performance over the others in different parts of the design process. The final product in the process of creating a form depends not only on the dimensions chosen and on the kind of parameters of which use was made, but also on the order of their appearance in the design process. It is possible, of course, to concentrate and to use only one dimension of

performance throughout the entire design process. But a project that has been developed in a one-dimensional manner is based essentially on inadequate information and will not sustain its function satisfactorily. It is probably impossible to prove directly that computer-based design, which makes use of the various dimensions of performance, leads to a better outcome than the use of a different design method that may or may not entail use of computer. Proof of a claim of this kind would require a hierarchical definition of parameters and a comparison of the various outcomes, and such a definition would in its essence be subjective. At the same time, it can be claimed that the more aware a designer is of the way the form he has created functions in terms of the three dimensions of the concept of performance, the better he can control the object being designed and adapt it to his wishes and to the way he interprets the program.

Form-based design, which develops a form while ignoring or not relating to the three dimensions of performance, is possible in certain parts, mainly at the beginning of the process of creating the architectural form. A method of this kind, such as a "shape grammar,"[5] may lead to a greater complexity of form, which will have to be given meaning during later stages of the design process while examining the way that the form fulfills the requirements of the various dimensions of performance.

THE USE OF THE VARIOUS DIMENSIONS OF PERFORMANCE FOR THE SIMULATION, OPTIMIZATION, AND PRODUCTION OF FORMS

ONE OF THE foreseeable effects of the transition to computerized design and production is a rise in the architect's status in the set of forces operating in the building discipline. If before this transition the architect was responsible for the design and production of drawings that it was the building contractor's job to realize, in object-based design and production the architect in fact produces the file from which the real object is produced, without any need for mediators.

One of the ramifications of the enhancement of the architect's status consequent on the transition to object-based design and production and the increasing connectivity among computer programs is the proliferation of possibilities of using tools and processes such as simulation, optimization, and production of forms, which until now were the exclusive domain of researchers, advisers, and engineers. Although at the start architects used simulation primarily for visualization, with the increase of programmatic complexity and simultaneously of the performative demands from the architectural form, the use of simulation of performances has expanded. The incorporation of the simulation processes as part of the architectural design process performed by the architect does not do away with the need for professional advisers, but it does lead to a professionalizing and a fine tuning of the examined parameter.

The expanding use of computer codes for optimization and production of architectural forms entails much potential, but also a danger. The products of the processes of optimization and production cannot be predicted in advance, demonstrating the validity of Peter Eisenman's vision about the need for loss of the human eye's control in the design process.[6] At the same time, since it is impossible to define the totality of the architectural problem,[7] it is also impossible to solve it empirically as is done in modern science. Hence it is hard to speak of optimization of form in the scientific/empirical sense. In an optimization process that entails more than one parameter belonging to the empirical dimension of performance, there needs to be a subjective definition of preferences in order to arrive at the "optimum." And even then the optimum will always be specific, since, as already noted, the order in which the processes are activated, and the kinds of parameters chosen, change the final product.

Hence, because of the subjective definition and the complexity of the architectural problem that entails reference to many parameters, the idea of optimization in architecture takes on a different meaning. The problem is even more difficult in the cognitive and the perceptual dimensions of the concept of performance, because the

initial definition of the parameters is done subjectively by a statistical translation of human desires and impressions.

Heretofore, processes of producing architectural forms have focused primarily on the production of forms that relate to the building's envelope. Likewise, a considerable portion of form-producing processes focuses on function by relating to a single parameter, such as wind, or sun, or stability of the construction. It appears that the development of methods that incorporate a number of parameters to create a form on the basis of the concept of performance is the next stage in the development of form production in architecture.[8] At the same time, production of complex typological forms which, beyond the building's envelope, also include a division into secondary interior spaces, probably remains at the present stage a challenge for future generations. Today, the architect at a certain stage of the production process has to "freeze" the formal configuration and switch to a process of analogical design that relates to the additional dimensions of performance which at present cannot be incorporated into the production process.

THE ARCHITECT OF THE FUTURE AND THE MORAL DIMENSION OF PERFORMANCE

THE TRANSITION TO computer-based design hints that the architect of the future will require a greater mastery of mathematics and of computer languages in a way that will enable him/her to at least adapt existing tools to his/her own needs, if not to improve skills of writing new code. These skills will not require the qualifications of a programmer or a mathematician, but will need an understanding and an ability to use computer-based parametric processes that already today are being used on interdisciplinary levels.

At the same time, a reliance on parameters in architectural design that is based on the use of a code should raise questions regarding the moral dimension of this kind of design. A danger exists of a transition to a pre-set, deterministic design that is based on parameters while neglecting the human aspect which, as already mentioned, is still difficult to express in parameters. Indeed, the use of algorithms can lead to the creation of new ideas, forms, and perceptions.[9] But the attempt to imitate the way we think in terms of parameters is by its very nature limiting, and may lead to the preference of certain forms of thinking and to the neglecting of others that are not easily translatable into computer language.

In addition, parametric thinking that relies on a limited number of computer languages tends by its nature to the universal. It is based on uniform languages and patterns that need to communicate with one another and to serve the global consumer. Although as a language it constitutes an opening for local-specific possibilities of expression, the paucity of computer languages, the binary logic of current computers and the aspiration for uniformity may lead to the ignoring of subjective, local-specific needs, and of forms of thought that are not commensurate with the logic on which the language is built. For this reason it is important to continue developing computer-based processes while understanding that these are being added to the developing database of tools and methods of architectural design in a way that will enable the architect to choose and to adapt the chosen tool/method to the particular problem, while remaining aware of the advantages and the disadvantages of the unique situation.

The attempt to translate the connection between the form and the function through the various dimensions of performance constitutes a great challenge for architecture. Response to the challenge will cause a further heightening of the architect's spatial awareness, by increasing the information about the architectural form and decreasing the entropy of the architectural problem. What is important in this response to the challenge is the way, not the goal. The way, in this case, is by its nature not linear, and it must allow for the concurrent existence of many directions of development.

Notes

1 As distinct from design based on lines defined by two points in space.

2 A "smart form" incorporates quantitative information connected to the form's performance as well as information on the form's geometry. See Guedi Capeluto "Energy Performance of the Self-Shading Building Envelope," *Energy and Buildings* 35 (2003), pp. 327–336.

3 In the early 1960s the computer was perceived as an intelligent problem-solving machine that in the not-too-distant future would equal and even surpass human capability. That period saw the development of a large number of theories and models for the automatization of the design process and the optimization of its products. See Alfredo Andia, "Managing Technological Changes in Architectural Practice: The Role of Computers in the Culture of Design," Ph.D. dissertation, University of California, Berkeley, 1997.

4 Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1964), p. 9.

5 A "shape grammar" is a design method that was first presented by Georgy Stiny and James Gips in 1971. The method is based on a multiplication of changes of forms by means of rules, in order to create complex compositions. See Georgy Stiny and James Gips "Shape Grammars and the Generative Specification of Painting and Sculpture," *Information Processing* 71, ed. C.V. Freiman, North-Holland, Amsterdam, pp. 1460–1465; reprinted in *The Best Computer Papers of 1971*, ed. O.R. Petrocelli, Auerbach, Philadelphia, 1972, pp. 125–135; see also www.shapegrammar.org/biblio.html.

6 Peter Eisenman, "Visions Unfolding: Architecture in the Age of Electronic Media," *Domus* 734 (1992), pp. 17–21.

7 Bruce Archer, "Whatever Became of Design Methodology?" *Design Studies* 1 (1979), pp.17–19; reprinted in *Developments in Design Methodology*, ed. Nigel Cross, John Wiley & Sons, Chichester, 1984, pp. 347–349; Gabriela Goldschmidt, "Capturing Indeterminism: Representation in the Design Problem Space," *Design Studies* 18 (1997), pp. 441–445; Peter Rowe, *Design Thinking* (Cambridge, MA and London: MIT Press, 1987).

8 See Yasha J. Grobman, "Building the Digital World: Architectural Design Methods Based on the Use of Digital Tools – Performance-Based Form, Generation and Optimization," Ph.D. dissertation, 2008, Technion (IIT), Haifa.

9 Kostas Terzidis, *Algorithmic Architecture* (Oxford: Architectural Press, 2006), p. 20.

CHAPTER THREE

Architecture as performative art

Antoine Picon

LAUNCHED A FEW years ago, the characterization of architecture as performative has enjoyed a certain success among theorists and practitioners.[1] The present catalogue is another instance of this success. But the notion remains somewhat unclear. Above all, its practical consequences are far from evident. What does it imply for architecture to be more and more often defined through performative criteria, from energy consumption to more qualitative characteristics like the capacity to generate feelings?

These ambiguities might very well stem from the fact that the notion of performalism is both grounded in some of the most ancient ambitions of the architectural discipline, while conveying new aspirations, often inseparable from the rise of digital culture.

From its Renaissance origins, architecture inherited a concern with effectiveness that other arts did not possess. A close cousin of the engineer, the architect was supposed to design for the benefit of the Prince, his employer, following his intentions and contributing to the success of his endeavors. Architecture thus performed at various levels, fulfilling practical requirements as well as answering symbolic needs. This performance-oriented attitude was further reinforced at the early dawn of modernity, namely, the second half of the eighteenth century, when architecture redefined its mission in relation to the rising values of public utility and welfare. At that time, as Manfredo Tafuri brilliantly argues in *Architecture and Utopia*,[2] the architectural discipline began to present itself as the science and art of comprehensive planning, the only one to be truly able to perform at the superior level of achievement required by the rapid pace of modernization.

Throughout this long history, the quest for effectiveness has been placed under an enduring dichotomy between material and immaterial, or, to use late eighteenth-century vocabulary, physical and moral performance. Despite the constant reference made by theorists and practitioners to the Vitruvian triad, solidity, utility and beauty, one may observe that the first two terms refer mostly to material or physical properties, while the latter deals primarily with the immaterial and moral. More than triadic, the architectural field is actually

profoundly dual, a property that Le Corbusier – perhaps because of his Cathar origins – understood perfectly well when he distinguished the "machine to inhabit" from the "machine to move."[3]

Contemporary performalism is still following this track. While some theorists and designers interpret it in terms of structural or energetic efficiency, others look for a way for architecture to perform more akin to philosophical concepts borrowed from thinkers ranging from Edmund Husserl to Gilles Deleuze. In that respect, one might be tempted to affirm that there is nothing new in the state of affairs. But this would be a very superficial assessment of the present situation, for it involves a series of spectacular breaks from the recent past.

Herzog & de Meuron, Beijing Stadium, China, 2008

The first aspect is a radical critique of a notion that had conveyed, for the better and for the worse, a large part of architecture's claim to contribute to the improvement of physical conditions. From the early twentieth century onward, the notion of function had constituted a key element in architecture's discourse on utilitarian design. In the past decades, the Koolhaas-inspired injunction for architecture and architects to be "realistic" has been often coupled with a dismissal of modernist functionalism in favor of programmatic flexibility and even indetermination. Behind that dismissal, one finds practical reasons like the dramatic acceleration of the cycles of use and reuse of the built environment, or the increased complexity of programs that are no longer thinkable in narrow functionalist terms. These factors had been pointed out by Rem Koolhaas in his *Delirious New York* manifesto.[4] Since the publication of the book in the late 1970s, they have led to strange inversions of the modernist creed, such as the more and more often ornamented – in the new sense given to the term ornament today – exterior surfaces becoming more strategic than the internal partition of spaces. An architecture of ornamented boxes is often replacing the former design of functional sequences.[5]

The increasingly complex and systemic character of technical performance criteria, from the structural to the environmental level, has also played a role in this estrangement from the functionalist approach. Being "green" for a building today is not reducible to classical

analytical approaches of performance.[6] Functionalism was inseparable from a world in which technical requirements could be dissected and analyzed in a relatively simple way.

Radical though it may seem, the critique of function is innocuous compared to the refusal of anything related to meaning that characterizes many contemporary architectural discourses and practices. The tendency is especially pronounced in digital architecture and it is often directly related to an approach in terms of performance. Instead of relating to a set of values and images that are not part of the designed and/or built object, architecture is supposed to justify itself through what its sheer presence produces.[7] There is no longer a moral benefit to be gained in relation to a meaning that would pre-exist architecture, but a process of mutual adaptation between the project and its users that can be interpreted as an autonomous production.

There again, the reinterpretation of ornament appears as a key phenomenon in the replacement of meaning by a dynamic process involving perception and affect. In many contemporary buildings, one may wonder whether what performs is not ultimately ornament or something akin to it. In the case of Jacques Herzog and Pierre de Meuron's Beijing Stadium, the whole structure may be considered as a giant ornament, an ornament that conveys no definite meaning but wonder and delight at the complexity of the structural maze.

Through the challenge of function and meaning, what is ultimately questioned is the claim of architecture to epitomize order, or, according to Peter Eisenman, presence, a presence stabilized by external uses, symbols and values. Indeed, function and meaning reinforced the foundational character of architecture by anchoring it in the depth of human needs and aspirations. Deprived of these anchors, architecture can become truly autonomous.

The convergence between the deconstructivist and the autonomy projects is by no means a total novelty, as the itinerary of Peter Eisenman bears testimony to.[8] The inheritor of these researches, performalism is also indebted to the accent they put on doing, on operations. To perform is in many cases to operate. Like the computer that follows instructions, the performalist approach to architecture does not require a subject, to the contrary. One could characterize contemporary performalism as the quest for an architectural process without a subject, an approach there again reminiscent of Eisenman's theoretical positions.

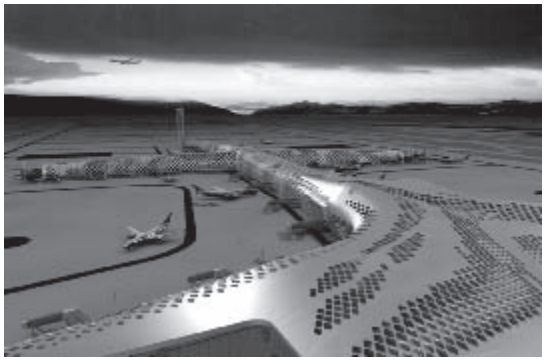
The critique of function and meaning as well as the quest for a process without subject converge on the assimilation of architecture's effect to the unfolding of a situation. In that perspective, architecture becomes similar to something that happens, to an event. The increasing intensity of the link between architecture and digital culture is partly responsible for this new turn. To understand better this connection, it may be useful to ask oneself what exactly one sees on a computer screen.

For the designer the answer seems at first simple to give: what one sees are forms. But actually, these forms are in constant flow until the moment the designer and his partners decide that they should become definitive. What one sees is rather a moment or a series of moments in a process organized along geometric flows. The pervasive presence of geometric flows explains the recurring reference made by theorists like Greg Lynn to Muybridge of Marrey's experiments with the recording of movement.[9] In other words, what one sees on a computer screen is something that happens. In the digital realm, form, architectural form, represents an occurrence; it happens.

For someone working on the financial markets, this temporal, event-like structure of what one sees on a computer is even more evident. What a trader deals with using the latest digital equipment are situations on disputed markets that are comparable to battlefields.

From the start, digital culture was about seeing events. It is worth remembering that one of the first major applications of computer networking techniques, the North American antimissile system SAGE, designed under the direction of MIT computer scientist Jay Forrester, was meant to allow operators to see situations such as a nuclear strike. The profound connivance between nascent digital culture and the Cold War had to do with the role they both gave to events and their possible integrations into scenarios. In the Cold War

Greg Lynn FORM, Embryological House, 1988–1989



Reiser + Umemoto, Terminal 3, Shenzhen International Airport, Shenzhen, China, 2008

perspective analyzed by a historian like Paul Edwards, the computer screen was an integral part of the war room.[10]

The relation between digital culture and events runs even deeper. As the French philosopher Pierre Lévy remarked in a path-breaking essay entitled *La machine univers*, a bit of information is not a thing but an occurrence, an atomistic event.[11] It corresponds to something that happens rather than something that is following traditional ontological categories.

Contemporary performalism is very much about the capacity of architecture to become an event, to participate in a world which is more and more often defined in terms of occurrences rather than as a collection of objects and relations. In a penetrating essay published a few years ago, the philosopher Paul Virilio rightly evokes the growing domination of "what happens."[12] As a performing art, or to be more accurate, an art the productions of which are now supposed to perform at various levels, from the ecological footprint to the realm of affects, architecture has become a component of this domination.

But the paradox of such domination is that the multiplication of events does not seem to provoke significant change. A real event is usually bringing some totally unexpected results. In our world, where things constantly happen, there seems to be relatively little unexpected consequences. Currencies go up and down. Wars break out and end, but nothing seems really to change in our lives despite the accelerated pace of the world. In such a context, a context that is endorsed in the name of "realism," one may wonder what architectural performalism is really about. Is it about change or about the stabilization of things as they are? This is probably where the demise of function and meaning may represent in reality a daunting challenge. For they did not only anchor architecture in the depth of social practices and ideology, but they also represented a possible departure point for the invention of a different future.

My aim here is neither to advocate the abandoning of the performalist approach nor to call for the resurrection of the former notions of functions and meaning. We have probably reached a no-return threshold on that matter. But the question remains of how to fully take advantage

of the commensurability between architecture and event. This entails distinguishing between the mere occurrence that simply happens and the fully-fledged event, imparted with a true potential for change. Philosophers like Alain Badiou may help us to make such a distinction.[13] Once the present state of confusion between occurrence and event is overcome, the true potential of digitally produced architecture, its virtuality, in one word, may become finally visible to all. The paradox of today's obsessive use of the term virtual in the architectural debate is that we are still uncertain as to what it is about. The performalist approach represents an incentive to clarify it.

Notes

1 See for instance Branko Kolarevic and Ali M. Malkawi (eds.), *Performative Architecture: Beyond Instrumentality* (New York and London, 2005).

2 Manfredo Tafuri, *Architecture and Utopia: Design and Capitalist Development* (Cambridge, MA, 1976).

3 Cf. Joseph Abram, "Machine," in Jacques Lucan (ed.), *Le Corbusier, une encyclopédie* (Paris, 1987), p. 243.

4 Rem Koolhaas, *Delirious New York: A Retroactive Manifesto for Manhattan* (Rotterdam, 1978).

5 Cf. Farshid Moussavi and Michael Kubo, *The Function of Ornament* (Barcelona, 2006).

6 See for instance Jacques Ferrier, *Useful: The Poetry of Useful Things. Utile: La poésie des choses utiles* (Basel, Paris, 2004).

7 Jesse Reiser and Nanako Umemoto are quite typical of this attitude. See their *Atlas of Novel Tectonics* (New York, 2006).

8 See among others Peter Eisenman and Jacques Derrida, *Chora L Works*, eds Jeffrey Kipnis and Thomas Leeser (New York, 1997); Peter Eisenman, *Diagram Diaries* (New York, 1999).

9 Greg Lynn, *Animate Form* (New York, 1998).

10 Cf. Paul Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA, 1996). The relation between the computer and the war room was treated in a spectacular way by director John Badham in his 1983 film *War Games*.

11 Pierre Lévy, *La machine univers: Création, cognition et culture informatique* (Paris, 1987), p. 124.

12 Paul Virilio, *Ce qui arrive* (Paris, 2002).

13 Alain Badiou, *L'être et l'événement* (Paris, 1988).

CHAPTER FOUR

Performing the contemporary, or: towards an even newer architecture

Sylvia Lavin

THE IDEA OF performance in architecture today is a much-used and little-defined concept, a common result when desire outstrips reason: architecture wishes to perform but is afraid of being caught in a charade. Yet architecture and performativity share certain features that include not only a long and complex historical relationship but a disciplinary trajectory where both fields confuse disciplinarity as such as well as catalyze it. Like architecture, as it meanders from urbanism to urban planning to building to the environment and design, performance has been understood to include everything from language to theater to human behavior. Especially during the late 1960s and early 1970s, performance and architecture used this expansiveness to resist calls for medium specificity and used this refusal to make invention possible. On the other hand and at the same time, both fields responded to this very amorphousness by instituting strategies for self-definition that were and are specific to each discipline. Indeed, one could go so far as to say that architecture gave to performance the liberties that come with discipline and performance gave to architecture the means to evade the restrictions that disciplinarity imposes. To look at this historic juncture today is not to look at an old problem but is to invent a means to protect contemporary design from the falsely verifiable and scientific fictions that are nowadays increasingly pervading the rhetoric of performativity. Fresh opportunities will arise when architecture tries out strategies developed by and for performance, but only if architecture understands these strategies precisely as charades, not as pseudo-positivistically measurable achievements, but rather techniques of cunning, scenography, special effects, theater and energy. Architecture that performs in this sense is free to be both more than real and less than true.

Perhaps the greatest and certainly the best-known example of architecture becoming performative during the heady days of happenings, events and theatrical experimentation is Cedric Price's Fun Palace.[1] Programmatically committed to new systems of participatory theater and architecturally to systems of transformation, ephemerality and novelty, the Fun Palace delivered a serious blow to then prevailing models of

Pietro Derossi, L'Altro Mondo, Rimini, 1968

C. Ray Smith, Apartment, New York, 1967

Cedric Price, Study for Fun Palace, *c.*1964

architectural monumentality, technological determinism and burgeoning corporate dominance. The Fun Palace mobilized multiple notions of performance and freed architecture and its devotees from centuries of obligation to truth, permanence and reason.

That the Fun Palace was never built no doubt contributed to its capacity to play such a mythologically heroic role, but like all true heroes, the Fun Palace lived on through its offspring and imitators. In fact, since the Fun Palace was a building in search of an identity, it could be said, in the spirit of theatrical dissimulation that its imitators are just as real or more so as the purported original. According to Peter Cook of Archigram, a nightclub, not known to many people today, that opened in 1968 in Rimini – Byzantine birthplace of the architecture of special effects, a resort town on the Adriatic, host to circuses and vaudeville acts, home of Federico Fellini and setting of his film *Amarcord* – was the most compelling realization of the promise of Price's Fun Palace.[2] This "Other World Club (L'Altro Mondo)" repeated Price's architectural experiment outside the laboratory of ideas, an experiment, Cook argued, that had intended to dislodge the category of the building as the primary building block of architecture and substitute for it instead an event: a performance. The other world that was brought into being in the Other World was constructed through the active reflections of stage lights against aluminum walls, reconfigurable plans and structures, the pulse and throb of music, and a crowd that was choreographed into motion rather than programmed into behavior. The architecture of this world was an architecture that only came into being when filled with action, when it exploded in a cloud of agitated particles, some human, others luminous and still others sonorous. Brief, unverifiable, evocative rather than memorable, spectacular rather than optical, effective rather than signifying, the Other World was not a place but a performance of flickering magical apparitions where, as one critic claimed, "perhaps the new image of man was caught . . . between one flash and another."[3]

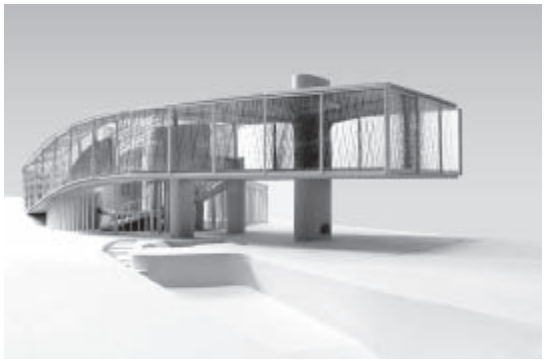
Stage lights have a powerful effect, even today when theatrical performance is an increasingly arcane activity. Their brilliance and artificiality create a shifting ontology

for all that they illuminate – they highlight performativity itself, raising with a flick of the switch the exciting specter of time, energy and the imaginative possibilities of the false. Today, architecture seeks to mobilize this kind of special effect and relies on techniques such as reflective titanium surfaces of skins and the shifting luminosities of led displays, but it tends to reserve these effects for exteriors and public buildings. Yet the pre-history of the architecture of performativity enables us to make available a larger terrain of action for the superarchitecture of illumination.

By the mid-1960s, *House Beautiful*, for example – even then not a record of vanguardism – announced the arrival of "turned-on décor," what the editors described as a preempting of projective devices from stage and display windows for private uses, transforming floors, ceilings and walls with "high fantasy," ideal "for a party or for your own delight."[4] That these images, projected directly on to walls without screens and thus materially part of the architecture, were ideal, under apparently opposite conditions, for both the collective party and for personal delight, suggests less the traditional narrative of the loss of sanctity of the public and private spheres but rather that the distinction was becoming irrelevant in the face of new forms of sociability that were performative. Home was what the lighting effects said it was and domesticity and the urban were no longer stable and isomorphic with public and private spheres but were rather the flickering effects of either being switched on or off. Turned-on décor made living itself a form of performance. In an interior that is turned on, the subject is also "on," his stage presence required, on the verge of being transfigured into a domestic star. Even if alone, turned-on décor grants you fifteen minutes of fame.

Festival of Britain, concourse at night, 1951

Using the ethos and techniques of theatricality produced turned-on architecture characterized by a lack of optical fixity, the obfuscation of the difference between figure and ground, and by the transformation of the contrast between public and private into the staging of an endless variety of performances. For Reyner Banham, by the mid-1970s, this sort of promiscuous undoing of conventional architectural mandates had become the very precondition for architectural experimentation and



Reiser + Umemoto, Sagaponac House, Long Island, New York, 2007

UNStudio, Villa NM, New York, 2000–2007 (photo: Christian Richters)

Preston Scott Cohen, Inc., Tel Aviv Museum of Art, the New Addition, Tel Aviv, 2005–2011

reinvention. Writing in 1976 about the Festival of Britain that had taken place in 1951, he credited this exhibition (certainly not remembered today by many people in the UK and by very few outside) for having made it possible to imagine a fundamentally new, contemporary rather than merely still modern, architecture.[5]

The key to this success lay in the fact that for the young visitors in 1951 who would become the architects of the rock and roll era during the 1960s, it was "a turn-on . . . a zone of enjoyment, its design an occupation of pleasure." For some, the turn-on factor made the festival flimsy and effeminate: according to Richard Hamilton its design was counterfeit, without the coherence of a true style, simply corridor after corridor of frilly whimsy. But it was the turn-on factor that made the festival enormously popular during its brief life and that above all made it seem contemporary: indeed, the architecture and design of the festival was and is still called Contemporary in an explicit rejection of the canons of high modernism. It therefore makes sense that when Banham attempted to redeem the festival in the 1970s, he was careful to recover only the festival's atmosphere, not its architecture or design or its urbanism. Its tangle of overly articulated buildings, compulsive attention to surface detail and emotively expressive structure transformed urbanism itself into a Rabelaisian festival, a world that operated not on the modernist principles of regularity and regulation but rather through its heady sense of possibility – by its performance and staging of contemporaneity.

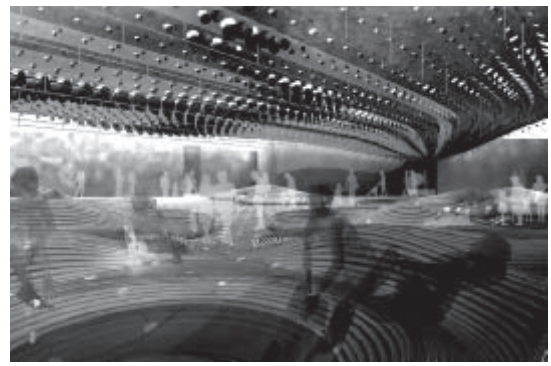
The prehistory of architecture's convergence with performance brought design into direct and productive confrontation with forms of duration – quick, furtive, provisional – that exploded most of what Philip Johnson called the crutches of modern architecture.[6] Architecture's discovery of the performative thus made available the possibility of a contemporary architecture as distinct from an eternally modern architecture. Having had this door opened, or rather these lights turned on, it now becomes urgent to take advantage of this opportunity, to step on to the stage. Now it is possible to disengage our discipline from the five criteria of modernist architecture and their various forms of stability, and turn architecture on and towards a newer and still unfolding

series of criteria for contemporary architecture. While the performance of architecture may be more acute as a wish than a rigorous theory, the desire pervades the architecture of today that seeks to populate architecture with a new cast of characters, press current technologies into new cultural formations, find lyricism and fantasy in the aberrant and spectacular, and use architecture as the most believable form of magical thinking. Here, then, follows an offering, a toast and precipitant manifesto for an even newer architecture.

ANOTHER FIVE POINTS for a newer architecture are: the parcours, the free skin, artificial light, urban garden, and décor.

1 The parcours is a means of organizing the plan that co-ordinates circulation with event. Related to the tradition of the promenade architecturale, the parcours takes its cues not from the slow meandering pace of the donkey but from a new species of urban athletes called traceurs, skateboarders who move through the city but who do not use boards. Instead, they slide down handrails, jump up walls, fall through windows and propel themselves forward using architecture as a motor. Their movement, or the sport of parcours, is both pure circulation and event, socially co-ordinated and interstitial, flowing and ruptured. Parcours is extreme performance but relies on only residual technological support. The parcours organizes plan and program and thus is a major means of sectional inflection. Shape is neither arrived at through a priori formal modalities, either highly particular or generic, nor the result of an internally generated "process." Rather, the x/y axis of the parcours leads to differentiated individual volumes held together through a unifying over-all form.

2 A free skin results in and is made possible by the parcours. The skin is free from formal and expressive obligations to the interior and is free to develop its own qualities and performance criteria. The free skin rejects the techniques of collage and the



GNUFORM, MoMA, PS1, New York, 2006

Greg Lynn FORM, Slavin House, Venice, California, 2004–present

pictorial illusionism of Cubism. The free skin gives new intelligence, instrumentalities and plasticity to surfaces. The free skin can be turned on and is itself a turn-on.

3 Artificial light. If modernism liked cameras and picture windows, contemporaneity likes high definition plasma TVs, big flat LED panels and computer screens, not because they provide better or truer pictures but because they glow in the dark. They are less instruments of optical clarity than of atmospheric luminescence. They don't need to provide a view or a picture and perhaps are at their most effective when nothing is on but the equipment. Windows, materials and views are opportunities for types of opacity produced when rays of light are artificially refracted, interrupted and otherwise acculturated. Artificial light is colorful and animate, characterized by oscillating ranges of grisailles as well as luminous hues that create ambiences and environments that transgress traditional categories of formal codification.

4 The urban garden is an integrated theory of urbanism, landscape, infrastructure and planimetric design. When all these elements come together, they produce a new form of post-cosmopolitan experience. Like a coral reef, the urban garden relies on the individual cooperation of each of these different aspects of design but produces an overall condition – often an urban event – out of this collective. The urban garden provides a way to organize the relation of interior to exterior that is programmatic and performative rather than optical.

5 Décor. Modernism may have had an international style but it had no fashion sense. Contemporary architecture gives architecture fashionability through an intricate assembly of parts across different scales that move promiscuously across any available surface. This emergent form of décor allows the two elements originally located across modernism's most cherished taboo, decoration and structure, to cross the line and get hitched. Like gay marriage for a Republican, décor is both an extension and complete transformation of a once sacrosanct order.

Notes

1 On the Fun Palace see *Cedric Price: Works II* (Architectural Association, 1984) republished as *Cedric Price: The Square Book* (London: Wiley-Academy, 2003); *Cedric Price: Opera*, ed. Samantha Hardingham (London: Wiley-Academy, 2003).

2 Peter Cook, *Experimental Architecture* (New York, 1970), p. 84 and p. 141.

3 From Tommasso Trini's review of two Piper Clubs designed by Pietro Derossi with Giorgio Ceretti, one in Turin, the other, L'Altro Mondo, in Rimini, *Domus* 458 (1968).

4 "Projection: The New Turned-on Décor" *House Beautiful* (September, 1967). See also "Instant Interiors," *Progressive Architecture* 48, no. 6 (1967), pp. 176–181, and C. Ray Smith, *Supermannerism: New Attitudes in Post-Modern Architecture* (New York, 1977).

5 Reyner Banham, "The Style: 'Flimsey . . . Effeminate?," in *A Tonic To The Nation: The Festival of Britain 1951*, Mary Banham and Bevis Hillier (eds.) (London, 1976).

6 Philip Johnson, " The Seven Crutches of Modern Architecture " [1954] in *Philip Johnson: Writings* (New York, 1979), pp. 136–140.

CHAPTER FIVE

Informationism: information as architectural performance

Aaron Sprecher

THIS PAST CENTURY has been marked by many architectural theories that exercised a vision on the intricate relation between the form and its associated affect. This search toward guiding principles for an architecture that is responsive to human perception has created a perennial obsession for bridging principles regarding the natural phenomena and the design of human environments.[1] With the development of information theories and related technologies in the postwar period, the notion of architectural performance got inherently associated to the ability for a given system to exchange information with its environment. The role of information as a regulating force in the relation between form and performance prompted the emergence of critical practices in the spheres of art and design. Most importantly, the interdisciplinary development of cybernetics and its focus on the nature of communication between animals and machines, organic and non-organic systems, conveyed a new status to the architectural object. The form was indeed no longer considered as a fixed entity but instead turned into a reactive system, a sort of semi-organic machine that would behave as a living organism.

For the American mathematician Norbert Wiener, "Cybernetics takes the view that the structure of the machine or of the organism is an index of the performance that may be expected from it."[2] In other words, the way information is organized, dispersed and translated regulates the performative aspects of an organism in regards to its environment. The perception of nature in terms of information assets[3] had great consequences in many domains of human research including architecture. Ahead from the full-fledging "informatization"[4] of the real, architects conducted a multitude of design experiments built on the newly discovered potentials of responsive, automated and computational tools. The proliferation of such experiments led to the emergence of two prominent critical projects regarding the notion of architectural performance; respectively the morphogenetic and atmospheric projects.[5] What matters here is the fact that both projects are to be found again at the forefront of the architect's anxiety to fuse the architectural object with its environment. Their resurgence questions the intricate relation between the notions of form and performance.

In what follows, I will briefly show that the nature of information and technology stands at the core of this relation and has triggered the emergence of a third model that is neither morphogenetic nor atmospheric per se. This model that I would call *informationism* proposes to look into the nature of information as a condition to assess the synergy between form and performance.

The morphogenetic project dealt with the mathematical nature of the form and its capacity to translate architectural desires, environmental constraints and technical limits into integrated morphological solutions. If the modernists have rejected the ornament, this project became critical in the sense that it reinstated the ornament as an intricate component of the ensemble.[6] The promoters of this concept greatly employed observations from nature as a foundation to generate form-finding strategies; meaning the possibility of generating the form as a function of environmental influences and the prevailing role of material and structural capabilities. Two of the most influential examples of morphogenetic use were featured at Expo 67 in Montreal. Buckminster Fuller's geodesic dome for the US Pavilion aimed at establishing a universal geometry that would defeat gravity and exemplify the "optimum efficiency" of organic forms such as those found in radiolarians.[7] Located on the other side of the fairground, the West German Pavilion by the architect Frei Otto featured an ethereal membrane for which calculations stemmed from the study of minimal surfaces as found in the formation of bubbles. These two projects exemplified the potentials offered by the morphogenetic model to generate complex geometries while assuring an economy of material and structural efficiency.

The proponents of the atmospheric project investigated the capability for environmental conditions to influence the human senses, physiology and biological system. The architectural performance thus considered led to experiments using climate-controlled devices, light and sound systems, electro-mechanical sensors, material effects and even drugs. These projects aimed to stimulate and intensify the human perception of space. This fascination for influencing the chemical fluids of the exposed living organism led to the dissection of the architectural object into a "baroque ensemble of domestic gadgetry [that] epitomizes the intestinal complexity of gracious living."[8] The instigators of such experiments, Nicolas Schoffer, the Quickborner Team, François Dallegret, Maurice Demers among others,[9] envisioned an environment saturated with machines networked to a multitude of pipes, thermostats, sensors, filters, screens, radars, antennas and wires of all kinds. The atmospheric project is critical because it questioned the functionalist approach of the form as envisioned by the modernists. For the protagonists of this critical project, the objective was literally to obliterate the form and generate a "life without objects,"[10] in other words, a reality exacerbated by (de)regulated functions. The atmospheric project was not so much concerned with the formal expression of nature but the literal conditions of its emergence and evolution.

While their presence declined in the 1980s, the morphogenetic and atmospheric projects have gained once more a prominent position in contemporary architectural research. Among the many reasons for their revival, the exploitation of the increasing capabilities offered by information technologies plays a significant role.[11] As in its early years, the morphogenetic approach is still based on the principle that adaptive components are combined with the objective of generating material systems.[12] Often comparing the object to a living organism, its approach seeks ways to create an architectural condition by which the object adapts, reacts and mutates according to the external environment and internal parameters of the designed system. Here, the representation, the image, of the object is the main consideration in assessing the experimental system at work. Regarding the atmospheric approach, this project promotes the non-representational qualities of the design performance. It distances itself from the physical aspects of the object while producing attractive diagrams that supposedly describe the influence of stimulating apparatuses on the subject. The experimenter here fosters an approach where the expanding influence of climatic and sensorial gears act on the physical, chemical and biological components of the human subject.[13]

What matters here is the fact that technology and its inherent transdisciplinary nature has propelled a convergence between the morphogenetic and atmospheric projects.[14] While they had many crossovers historically, both approaches remained distinctive in terms of their research scopes. The nature of the experimental territory, scale of investigation and physical expression distinguished their objectives, therefore engaging with critical discourses on the nature of architectural representation. With the increasing expansion of information networks and computational capabilities, these critical projects are now converging toward a unique environment in which architecture and many types of knowledge-based expertise continuously exchange, analyze and produce information of all kinds. The expression of this condition is exemplified by the transformation of the design studio into a quasi-scientific laboratory where designers acquire terms and practice discourses that are often borrowed from the sciences. This does not mean that design has turned into a new science, but its tools and operations are increasingly scientific.

The delocalization of the design activity across multi-dimensional grids of knowledge calls for a projective method that would assure the assessment of its critical value, the nature of its performance, production and experiments. Such a method is what I have called informationism. Neither morphogenetic nor atmospheric per se, the relation between form and performance thus conceived looks at the nature of information and its related technologies as the prevailing function for both the description and representation of the experimental facts.[15]

Informationism refers to the notion of architectural performance as a direct function of the affluence of information assets, its established system of influences that process, assess and generate a confluence of qualities.[16] By bringing the degree that information triggers in the existence of the object to the forefront of the experimental protocol creates a context by which the object, its environment and the experimenter are positioned in a non-hierarchical yet specific relationship. Here, information streams are perceived as energetic forces that provide a ubiquitous condition for the experimenter to act and react at all scales and on all performative aspects of the form including, but not limited to, its emotional, sensorial, formal and structural capabilities.

The question remains as to the parameters by which one may assess the affluence, influence and confluence of information in the design procedure. It is here suggested to define the notions of memorization, association and connection as three requisites to estimate the role of information in the performance of a given architectural system.

Memorization refers to the ability of architecture to embed information within the deepest composition of matter. While memorization has shaped our "technological heredity,"[17] the wide spread of information technologies with its nana-degree of precision has significantly intensified the human ability to inform matter, in other words, to give shape to matter. This condition has now provided a limitless platform for the expansion of human production in which architectural formations are increasingly recombinant hybrids of organic and inorganic systems. For memorization, everything is information, therefore alive and potential energy.

Yet, approaching architecture solely in terms of memorization is insufficient because it would consider the architectural formation as an entity that is passively shaped by its environment.

Beyond the notion of memorization, architecture has always revealed its degree of performance as a function of associating multiple parameters. The association of cultural, social and political parameters was then invested with a search for ideal models whilst forms were produced out of selective modes of adaptation. While such selective modes are still at play, the current exponential increase of computational capability to associate information has created multi-dimensional information systems of architecture. The computational paradigm has now triggered a reassessment of former ideal models and the emergence of iterated models that best exemplify the mutating aspects of reality. Evolutionary processes, agent-based systems and fluid dynamic engines, among others, represent now critical design procedures. Both simulated and stimulated by complex systems, these procedures have already

replaced life at the core of an architectural anxiety to integrate and even to disappear within Nature. First perceived as a modus operandi that intensifies the form, information associability is about to reach a very different goal: a shift from forms to pure kinetic energy.

Memorization and association of information represents two parameters that regulate the informationist model. Yet, these two components alone would still consider architecture as a closed system of interactions, a sort of thermodynamic engine that levels embedded information and its potential arrangement.

The third notion, connection, has displaced architecture from its traditional disciplinary core toward a boundless platform of "fused knowledge."[18] Architecture has been a vector of interaction between heterogeneous human environments at all times. Yet, with the tremendous development of information networks, architecture has turned into an open source where its produced formations are no longer autonomous but instead dependent on multi-dimensional sources of knowledge. The architectural formation thus conceived has a degree of performance that depends on its symbiotic relationship with multiple domains of human activities. As an open source, the contemporary architectural formation acts as a source that transfers energy across n-dimensional grids of information.

The notions of memorization, association and connection of information stand at the core of informationism and its model for assessing architectural performance. These notions render an experimental context by which the qualities offered by the morphogenetic and atmospheric models merge into a multi-dimensional system of knowledge. With informationism, the morphogenetic component and the atmospheric apparatus find their expression respectively in the information bit and associated system. Informationism calls for unleashing the full potential of information as a common currency to the emotional, sensorial, material and physical aspects of the architectural performance. Only then will architecture be able to integrate the "ambient" spheres of reality.[19]

Notes

1 Just to name a few, Patrick Geddes's "Life-conserving Principles" (1915); Hugo Haring's "The House as an Organic Structure" (1932); Peter Collins's "The Biological Analogy" (1959); and Kisho Kurokawa's "The Philosophy of Metabolism" (1977) among others. See W. Braham and J.A. Hale (eds.) (2007) *Rethinking Technology: A Reader in Architectural Theory*, New York: Routledge, pp. 22, 55, 66, 129, 229.

2 N. Wiener (1954) *The Human Use of Human Beings*, Doubleday & Company, New York, p. 57.

3 We follow here Norbert Wiener's definition of information that is "the content of what is exchanged with the outer world as we adjust to it, and make our adjustment felt upon it." See Wiener (1954), p. 17.

4 The term "informatization" was first introduced by Simon Nora and Alain Minc in a report to the French President in 1980. See: S. Nora and A. Minc (eds.) (1981) *The Computerization of Society*, MIT Press, Cambridge, MA.

5 The term "atmospheric" associated to architecture is coined by Yves Klein in the "Chelsea Hotel Manifesto" of 1961. "Due to the fact that I have invented the architecture and the urbanism of air – of course, this new conception transcends the traditional meaning of the terms 'architecture and urbanism' – my goal from the beginning was to reunite with the legend of Paradise Lost. This project was directed toward the habitable surface of the Earth by the climatization of the great geographical expanses through an absolute control over the thermal and atmospheric situation in their relation to our morphological and psychical conditions." See: http://www.yveskleinarchives.org/documents/chelsea_us.html. The association of morphogenetic theories to architecture has been the subject of multiple publications in recent years. While it commonly refers to computing architecture today, the premises of a morphogenetic architecture can be traced back to the advent of modern biology and the experiments on the relation between evolutionary models and morphological studies. See, for instance, W. Thompson D'Arcy (2009, re-edition of 1917) *On Growth and Form*, Cambridge University Press, Cambridge; G. Lynn (1998) "Folds, Bodies and Blobs: Collected Essays," in *La Lettre Volée*, Brussels.

6 Robert Somol describes this condition among the modernists. "One could say that what modernism displaces from the classical is the question of ornament. Modern architects repress ornament and reinvest it in articulation, i.e., in detailing." See: P. Eisenman and R. Koolhaas (eds.) (2009) *Super-Critical,* Architectural Association, London, p. 55. It is argued here that the morphogenetic project has not only reinvested in the ornament but has also positioned it at the forefront of its ideology (note of the author).

7 On the way nature builds and the analogies with Buckminster Fuller's geodesic dome. See: R. Buckminster Fuller (1964) in Joachim Krausse and Claude Lichtenstein (eds.),*Your Private Sky: R. Buckminster Fuller, the Art of Design Science*, Springer, Frankfurt, 1999, p. 444.

8 R. Banham illustrated by F. Dallegret (1965) "A Home is not a House" in *Art in America*, New York, Volume 2, pp. 70–79.

9 On the works of François Dallegret and Maurice Demers, see "Total Environment", an exhibition curated by Professor Alessandra Ponte, Canadian Center for Architecture, Montreal, Canada, March 27 to August 23, 2009.

10 Superstudio (2007) "Microevent/Microenvironment" in *Rethinking Technology: A Reader in Architectural Theory*, W. Braham and J.A. Hale (eds.), New York, Routledge, p. 196.

11 Both the morphogenetic and atmospheric projects take advantage of new capabilities offered by computational fluid dynamics (CFD) software and the fact that most computer-aided design (CAD) software includes interfaces to script and bridge computational protocols of various types of information.

12 The experimental protocols produced by such researchers are commonly referring to the role of designed components organized in material systems. See for instance: M. Hensel, A. Menges and M. Weinstock (eds.) (2010) *Emergent Technologies and Design: Toward a Biological Paradigm in Architecture*, Routledge, London.

13 The technique of mapping is almost exclusively used by the proponents of the atmospheric project in order to describe the internalized condition of the object. See for instance: P. Rahm (2009) *Architecture Meteorologique*, Archibooks, Paris.

14 This condition is exemplified by the emergence of architectural terms such as *Morpho-Ecologies*. "The ME [Morpho-Ecologies] approach brings together Uexkull's Umwelt-theory and Banham's gradient threshold paradigm in the relative notion of space – the idea that space is constructed through social operations and the local individual and collective experience of space-time conditions." Michael Hensel and Achim Menges, "Towards an Inclusive Discourse on Heterogeneous Architectures," in *Morpho-Ecologies*, M. Hensel and A. Menges (eds.), London: Architectural Association, 2008, (*AA Agendas* no. 4, 52).

15 The French epistemologist Anne-Françoise Schmidt describes two distinctive natures of experimental fact. "The category of 'fact' is both a hybrid of science and philosophy and immediately doubles into pre-scientific (brute fact) and scientific (scientific fact), which cannot be separated from one another without denying what Poincaré called 'the value of science.' The 'fact' is the minimal prerequisite for philosophical duality; it is dialectic, i.e. difference reduced to the empirical degree of description." The experiment induces a fortiori a confrontation between logic and intuition, as well as the representation (the fundamental classification of core knowledge) and the description (the connection between disciplines) of the experimental fact. See: A-F. Schmidt (2005) "The Hypothesis of a Non-Epistemology," p. 8 in *Laboratoire de Philosophie et d'Histoire des Sciences*, Archives Henri Poincaré, also online at http://www.onphi.net.

16 A. Sprecher (2008) "Af-fluence In-fluence Con-fluence," in *Esempi di Architettura*, guest-edited by Maurizio Meossi, Saonara, Italy, pp. 101–111.

17 F. Kiesler (2007) "On Correalism and Biotechniques in Rethinking Technology," in *Rethinking Technology: A Reader in Architectural Theory*, W. Braham and J.A. Hale (eds.), New York: Routledge, p. 71.

18 Open Source Architecture (2006), "Protocol for a Fused Technology in AD magazine," *Collective Intelligence in Design*, guest-edited by Christopher Hight and Chris Perry, London, pp. 30–35.

19 P. Sloterdijk (2000) *Essai d'Intoxication Volontaire, Paris*: Hachette Littérature, p. 91.

CHAPTER SIX

The collapsing of technological performance and the subject's performance

Eran Neuman

IN RECENT YEARS the intellectual discussion of the term "performance" has defined it mainly in two different contexts. One of these refers to technological performance, in which measurement is made of the efficiency of performance of an action; the action is perceived as optimal[1] when its outcome maximally and successfully corresponds to the parameters that defined it from the outset.[2] The second context refers to actions that are performed by individuals, and the way individuals develop a personal identity and become subjects following the performance of a certain action; from this point of view the personal identity of the performer of any action crystallizes as a consequence of having performed the action. According to gender discourses, the very fact of performing the action and repeating it crystallizes the subject's consciousness about her/himself.[3]

Although both these meanings make use of an identical term, historically they have not been perceived as having any affinity with one another.[4] In this chapter I wish to examine the connection between the two and to propose a possibility of creating an affinity between technological performance and the subject's repetitive-behavioral performance. My claim is that the two meet in the architectural realm and constitute the two sides of architecture: on the one side, the technological performance produces the concrete architectural realm, while on the other side, the appearance of the subject who utilizes the various strata of the architecture is characterized as a consequence of the action that is made possible in that given architecture. Architecture, therefore, constitutes the platform from which certain actions can be performed, and can lead to the crystallization of an identity of one kind or another. Actually, architecture offers a range of possibilities of action, some of which the subject performs, and by this performing his/her identity is constituted.

Further on I will show the ways in which an affinity is created between the two so that they become dependent on one another, until finally, in the digital era, they collapse into one another and produce a single performative conception that contains both the technological and the subjective.

IN MANY SENSES the relation between the technological performance and the subject's actions in the architectural realm is successive and linear. The technological performance precedes the appearance of the architecture: the parameters for the production of architecture are determined, architecture is produced, and then, as noted, measurement is made of whether the performance of the architecture is optimal. The subject's performance is conditional upon the conclusion of the technological performance, and occurs after the architecture has been produced and already exists. The linear relation between the two exists both in the time dimension – one action following another – and in the conceptual dimension. Hence, the actions of those who utilize architecture are meant to appear after the architecture is already characterized to a certain extent, and thus they can expose levels from the diversity of possibilities that the technological performance of architecture offers, and can actualize them so that they become a part of the actual index.

Since the relation that is produced between the technological performance and the subject's performance in the architectural realm is linear, the complexity of the parameters that define the future architecture and the degree of success in embodying these in the creation of architecture together determine the range of possibilities available for the subject's performance. In contrast to the modernist conceptions, in which the architectural function was limited and was perceived as mainly a value of utility, today the technological performative conceptions attempt to contain additional dimensions of the architectural function, such as symbolism and diagrammatic function (an action in an open process of becoming).[5] Of course, this expansion of the parameters for creating a more complex space has an impact on the complexity of the form that embodies them. When the attempts to embody numerous functions in the architectural realm are successful, the architecture that the subject encounters provides more diverse possibilities for creation of identity. The more numerous and more complex the functions of the space, the more the space available to the subject will increase in complexity.

Although technological performance and the subject's performance are the two sides of architecture – one of them producing possibilities, the other making use of them – the connection between them is not necessarily based on relations of cause and effect. It is not a necessity that the architectural realm that is based on the optimal technological performance will function as a mechanical apparatus that produces subjects in a direct way.[6] In most cases, the optimal architectural space offers a complex, diverse and broad range of possibilities of action, which is capable, up to a certain point, of allowing the appearance of random and accidental actions. Beyond this point, the instrumental relation between the architectural realm that is based on technological performance and the subject who utilizes it can cause resistance; for example, the subject may resist the optimal dimension that the technological performance is attempting to arrive at in the given architectural realm, and may seek to use this space in different ways that were not defined at the outset and that create an opening for random and accidental actions.[7] In such situations, a chance emerges that the linear relation between the two kinds of performance will become circular: a subject who resists the optimality of the architecture as a derivative of the parameters of a given technological performance can redefine the parameters of the architecture and bring about a change of the space by his/her behavior within it, and in this way new possibilities for the subject's performativity become contained in the space. One linear process follows another linear process and together they constitute a circular process. This circularity re-determines the kind of relations prevailing between the two kinds of performance – new parameters produce a new space that makes possible new subjective performance. A process such as this is capable of so moving the creation of the architectural space and the way it is used, that a dialectic can be produced in it by means of a change of the relation between the two performative modes of the architectural realm: the technological performance produces a space which the subject does not use, and therefore a definition of new conditions for the architectural technological performance is required, and in the end a new architecture is created, and the process is repeated.

Resistance to an architectural space that is based on technological performance may appear because of a lack of congruence between the parameters that defined the architectural space and the human needs. At times, on the way to creating an architectural realm, the technological performance quantifies a limited number of parameters that do not take complex political, social and cultural aspects into consideration. In such cases, the optimization of the architectural realm focuses on questions of performance of the architectural object as a mechanical apparatus that is meant to arrive at a high level of performance with no connection to the subject who is to use it. This space may attain a high optimization in the way it satisfies the parameters that defined it, but a process such as this is tautological, autonomous and reflexive, and does not connect with other actions in the world. When, however, the technological dimension of the architectural space contains political, social and cultural parameters, the space's potential increases in the way in which technique can turn into an operative possibility for complex existence in the architectural space.[8]

IN THE COURSE of the twentieth century, some currents within modernist architecture, for example, related to technological performance of the architectural realm as a derivative of universal conceptions.[9] The parameters that defined the architectural space were not particular ones,[10] so its expression did not necessarily take into consideration the context in which it was created. The universal approach frequently reduced, to the point of erasing, the potential stratification that might have developed out of the technological performance of architecture, and related to the optimal dimension of architecture in terms of ergonometric and mechanical efficiency. This limiting of the technological performance and its almost total distillation into questions of mechanical efficiency stemmed from a lack of flexibility and dynamism of the parameters that produced architecture; in the early twentieth century, the parameters for the creation of a space were mostly fixed and absolute, and did not contain a possibility of development of diverse identities by the users of the space.

After World War II, postmodern performative conceptions appeared. These added personal and historical parameters to the way of creating the architectural realm, and not necessarily as derivatives of utility, efficiency and ergonometry. The discussion of the politics of identity, for example, led to the creation of architectural realms that were particular and attempted to make possible a multiplicity and diversity within the space itself; such were the attempts at a multi-functional architecture that architects sought to develop in the 1960s. The major criticism of these conceptions was that even when the space was richer and more stratified than the spaces that existed prior to the War, there would still be people who would not find their performative level of existence in it.

Hence it is possible that today, when digital media are being used in architecture, architects are attempting both to preserve the efficiency entailed in the creation of architecture based on technological performance, and to extricate themselves from the limitations that stem from this – a modernist universality or an inherent limitation such as that which exists in the postmodern architectural realm. The process of digital planning seeks to develop an open system in which the parameters that produce the architectural realms will be flexible, dynamic, and frequently changing. This change makes possible the creation of spaces that are simultaneously specific and diversified, which of course has an impact on more particular use of architecture. The parameters that take the subject's specific needs into consideration create a space that is a priori customized for her/him. The digital media make possible interactivity, dynamism and response, so that the technological performance can be optimal in relation to the optimality of the subject's performance.

The possibility inherent in the digital media, of creating unique architecture personally customized to the performance needs of the utilizing subject, leads to the collapsing of the technological performance and the subject's performance into one another. The linear-then-

circular process in the creation of an architectural space begins from a defining of parameters that is dependent on a concrete subject, and the space that is created when the technological performance aspires to optimization of the space according to these parameters, after which the subject utilizes architecture that was created according to the parameters that he/she determined in advance. It is therefore the case that in contrast to the modernist or postmodernist implementations of that conception, in the digital era a unity exists between the technological performance and the subjective performance, since they are derived from the same parameters, produce the same architecture, and also utilize it. The parameters that precede the architectural creation also succeed it and are congruent with the subject's needs. These parameters can be as open and as flexible as the subject wishes.

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Notes

1 The use of the term "optimal" does not refer to the way the term is used in the exact sciences. It does not mean to set an optimum for an action, but intends rather the examining of the relation between an action and the outcome it produces, the premise being that the intention of a certain action is meant to produce an outcome that follows the pre-definitions for the action. An action that follows the instructions for the action in the maximal way and produces the outcome that was pre-defined for it will be optimal.

2 Bruno Latour, "Laboratories," *Science in Action* (Cambridge, Mass.: Harvard University Press, 1987), p. 98; or, Branko Kolarevic, "Prologue," *Performative Architecture: Beyond Instrumentality*, Branko Kolarevic and Ali M. Malkawi (eds.) (New York and London: Spon Press, 2005), pp. 1–4.

3 Judith Butler, *Bodies that Matter: On the Discursive Limits of "Sex"* (New York: Routledge, 1993). Performative gender conceptions developed concurrently with the neo-Marxist theories of Michel Foucault and Louis Althusser, who discussed the way power mechanisms produce subjects who are characterized according to various ideological conceptions. Althusser, for example, focused on the state as an apparatus that produces subjects. In the performative context of the above-mentioned discourse, space, too, functions as an apparatus that produces subjects (for a discussion of the state apparatus, see Louis Althusser, "Ideology and Ideological State Apparatuses" [1970], tr. from the French by Ben Brewster, in *Lenin and Philosophy and Other Essays* (New York: Monthly Review Press, 1971).

4 For an elaboration of the question of technological, cultural, and subjective performance, see Jon McKenzie, *Perform or Else: From Discipline to Performance* (London: Routledge, 2001).

5 In recent years the architectural discourse has related to the creation of architecture based on diagrammatic action, of the kind that resists and extricates itself from the paradigm of representation and makes possible the existence of an architectural function that exists beyond the symbolic and the use dimensions. The architectural function in this situation is in a process of becoming, of being created.

6 In fact, the performative conceptions come out declaratively against the mechanical conceptions that posit a direct connection between cause and effect. Architectural performativity attempts to contain broad parameters that are not based solely on utility. These conceptions come out against architectural functionalism.

7 The question of the space that is based on technological performance and that offers the subject a range of possibilities of action can lead to the conclusion that the space is deterministic. The space produces options for actions within it, and any action that we can perform, even if it is not normative, is included in the range of possibilities that the space creates, for were this not the case this action could not have been performed. In this conception the randomness or accidentality of certain actions is only an illusion. The optimization of the technological performance comes out against this deterministic thinking. It sees parameters as the basis of the way that technological performance is meant to be performed, and determines a range of actions congruent with the parameters, which are not final or absolute, because even though they produce a framework, this can be deviated from.

8 On exposure by technological means as a poetic act, see Martin Heidegger, "The Question Concerning Technology," in *The Question Concerning Technology and Other Essays*, tr. William Lovitt (New York: Harper Torchbooks, [1954] 1977), pp. 3–35.

9 The universalist-modernist conceptions in architecture found expression both in the development of a universal program (Mies van der Rohe) and in standard-universal conceptions of production (Walter Gropius).

10 Cultural and political questions were raised and discussed by modernist architects, whether at congresses of the CIAM (Congrès International d'Architecture Moderne) or in researches and private works that they performed, but they related to these questions not in a local but in a universal way.

CHAPTER SEVEN

High-performance anxiety

Christopher Hight

I can't seem to face up to the facts
I'm tense and nervous and I can't relax.
Can't sleep, 'cause my bed's on fire.
Don't touch me, I'm a real live wire.
"Psycho Killer," Talking Heads

PERFORMATIVITY IS THE latest manifestation of a persistent disciplinary anxiety disorder. It appears to have manifested in the early twenty-first century in much the same way Denise Scott-Brown and Colin Rowe diagnosed widespread "physics envy" in the previous century.[1] This earlier "psychosis" was characterized by an acute sense of inadequacy in relationship to the maturation of scientific society, leading to attempts to "elevate" architecture by making it as exact and sure as the then dominant science of physics.[2] This compensatory mechanism, they argued, conflated categories and reduced architecture as a mere copy of the father/model which of course it both wanted to become and to kill. Trapped within this false-identification, architecture was blocked from full maturation as a discipline in modernity. The very need to overcome a perceived inadequacy ironically stultified development and in part led to what (at the time of diagnoses) seemed a premature death but which we now understand as long-term coma.

Upon waking, the patient was shocked to find physics has become a shrunken and somewhat neglected shadow of its former self with the biological sciences usurping the pinnacle of knowledge. If Father Physics seemed a bit frail, architecture attached its ambitions to biology and evolutionary sciences. The recent discourses on performativity parametric design is often employed as a way to "optimize" or otherwise manage the environmental and structural performance. Such work depends upon ideas of evolutionary biology, in which designs evolve, generations of components descend in phylogenetic trees, and form is otherwise developed vis-à-vis fitness criteria. Program, site, structure and environmental performance offer performance criteria that are integrated through complex geometry in a manner analogous to how a species evolves and differentiates vis-à-vis its environment according to selection criteria. Indeed, in this work design is on the one hand presented as the neutral management of these criteria, but simultaneously these are employed to provide the criteria for the specification of exceptional, and exceptionally varied, architectural form. Frequently aesthetics remains implicit, or tacitly naturalized as an expression of this performativity in the same way one

understands an organism's form as optimized for its environment. The primary means to achieve such formal complexity, parametric and scripting, treat the design process as a form of artificial evolution and the building as if it were a new sort of nature.

This occurs at a time when architects express deep anxiety not only about their position within the cultural world, but architecture's very existence as a discipline. This is evident from Thom Mayne exhorting the AIA to "change or perish" at a national meeting,[3] or Kieran and Timberlake arguing that architecture needs to adopt the same design and fabrication workflows as the airline and automobile industry and previous theoretical arguments of Greg Lynn that architecture's stubborn recourse to humanist idealities made it increasingly irrelevant to the contemporary world of hybridity.[4] If industrialization and mechanical reproduction seemed to threaten architecture's authority and even viability in the last century, today post-Fordism and media are understood as offering similar challenges and require at least as great a transformation in order to avoid, or so the biological metaphor continues, a mass extinction event. The references to biological and evolutionary performance on the one hand operated within the oldest metaphors of architecture as a body and as an organism while the new sciences involved seemed to offer a new bestiary of models and concepts of organization. In this way, performativity both emerged and marked a break with neo-avant-garde digital programs of the early 1990s where it was presented not simply as a way of evolving a particular design, but as a mechanism of innovation for the discipline, or one could say, an evolutionary leap that will proliferate new creatures in a digital post-Fordist equivalent of the Precambrian explosion. Under such thinking, the paradigm shift has occurred and we are now in a new normality that requires no further breaks but rather increases the competence of the labor force now bringing these projects to fruition.

Architects allied to the now established discourse of performativity are on the one hand constructing increasingly sophisticated works but the proliferation of this approach within schools and corporate practice raises questions. The singularity of the developing oeuvres included in this book remains intact but can no longer rest on claims of novelty or exception. The Voronoi is the "new generic," roughly equivalent to regulating geometries of old and the monstrous blobs have an established and privileged niche rather than operating as mutant usurpers. Indeed, one even hears its protagonists arguing for such a program of refinement. It is not simply the fact that most of the work is produced in the lingua franca of a few software programs and the smooth geometries of calculus that has led to the proliferation of such designs across schools. I wish to recall Deleuze's distinction between difference and diversity. The former provides the mechanism through which the latter is produced.[5] The precariousness of performativity today is that lacking a theory of differentiation in favor of normative criteria of design will lead to a rapid stagnation rather than evolution, a story that should seem all too familiar. An architectural project once intellectually allied to Deleuzian ontology now appears to be tending towards convergence and minor variation rather than schizogenic proliferation.

Performativity has become, and Bob Somol seems to argue inevitably, a prematurely normative framework for the production of what is heretofore by its own arguments an exceptional architecture. Bob Somol has recently litigated on behalf of more "-ism" as a way of foregrounding the relationship between architectural design and politics. He describes architecture as a recombination of three rhetorics: fiction, politics, and science. In his formulation, these roughly correspond to aesthetic, ethical and ontological qualities, respectively. For him the suffix "-ity," with its implication of an inherent quality of natural condition or material quality (ductil-ity, sustainabil-ity), invokes scientific truth claims. One of the targets of Somol's critique is recent work in parametric, scripted and otherwise programmed digital design processes, exactly those aligned with "performance," or as it is usually termed "performativ-ITY." He notes how this discourse not only employs references to science and nature but does so in that it requires "elegant" and "intricate" integration to the extent that such work requires extreme control and even re-imagining not only of the design process, but also of fabrication

and construction. While examples of performativist architecture are being constructed, often through state-of-the-art technologies, the work continually pushes towards a retreating horizon of imminent technological innovation. This futurism, Somol, suggests, places this idiom in the domain of "science + fiction = science fiction." In contrast, Somol champions architecture as a literature of Political Fiction, a genre he argues is aligned with "-isms" of all sorts.[6]

Therefore, at the moment when performativity risks becoming a strangely normative agenda for the production of exceptional architecture, the suffix of this current book's title shifting from *Performativity* to *Performalism* might be taken, therefore, as a call for reformulating the project of performance in reference to political issues. That is to say, to enfold and to disrupt the performance of architecture as a mode of practice and as a way of formulating objects of its knowledge, the problems it studies. The performativity of architecture is put on to the table and perhaps necessary reconfigurations of that topography of knowledge and its practices.

PERFORMANCE ON THE FIELD

AS AN EXAMPLE of such a project, I would like to describe the implications of design research I and my colleague Michael Robinson have been undertaking at Rice that employs the computational paradigms of performance to questions on the nature of design practices in the city, and of urban scaled operations that blur the boundaries between disciplines in a century that will unavoidably require a political discourse about supposedly "natural phenomena."

The performativity between two branching networks – the freeway and bayou systems – is perhaps the most distinctive trait of expression of Houston's hyper-capitalist form of urbanism. The freeways, of course, are iconic of this prototypical "sprawl" city, a center for the US petrochemical industry. Houston and Harris County has twenty-one main bayous, hundreds of tributaries and thousands of tertiary channels, ponds, marshes and hog-wallows. A large part of eastern Texas drains through the area into the Galveston Bay. In its natural state, the area was a spongy field that operated like a lymphatic system, draining, detaining, circulating and cleaning water from frequent torrential rainfall, in turn creating rich habitats. While at the macro-scale Houston is relentlessly flat, small undulations in the prairie and capillary action of its dense flora created a micro-topography that held water for long periods. The expansion of the motorized metropolis in the post-World War II era, however, transformed this crenellated surface into a geometric plane of asphalt and monocultural lawns. As drainage rates accelerated across this smooth and impervious plane and as development infringed on the expansive edges of the waterways, flooding became more frequent. To alleviate this flooding, the bayous were turned into drainage ditches and the complex network of waterways and slurry of land and liquid rationalized into a hierarchal infrastructure. Fractal recursion gave way to Cartesian geometry and calculus of speed and risk. These concrete bayous are the prodigal brother to the freeway for they allowed the city to grow at rapid speed according to optimized metrics of drainage. The bayous have taken a back seat to the freeways and the city literally turned its back on them while building right up to their banks. Houston, once called the Bayou City, became the Space City.

Now in the "green" twenty-first century, our sights have returned to these drainage infrastructures as the bayous and flood management has become "matters of concern" once again (as Bruno Latour might put it). In 2001, Tropical Storm Allison, still the most financially costly natural disaster in North America, overwhelmed the county's drainage infrastructure and flooded the city for days. After the storm, the agency responsible for water management, the Harris County Flood Control District (HCFCD), redrew the flood plains and embarked upon a plan to improve the drainage capacity of the system. The bayous became objects of political and economic discourse in a new way. Perhaps the most important project is the widening of the Brays Bayou Channel. The Brays Bayou watershed is the most urbanized in Harris County, home to 750,000 people and growing quickly. In ten years its population could double. In traveling the

length of Brays Bayou, one moves along a time-line of American urbanization and the city of Houston, from the mouth in the oldest industrial zone to the newest master-planned communities in the outlying county.

Concurrent to the widening of the channel, grass roots organizations are working with the HCFCD to transform the banks into a linear park linking the diverse neighborhoods along its length of over twenty miles. This corresponds to another major transformation in the collective imagination regarding the bayous. The Army Corps of Engineer's canalization of Brays epitomized a top-down approach that now appears dated and flawed, and the bayou's "ugly" appearance now appears to be a hindrance to urban development. Aspirational lifestyles and globalized capital now demand Houston offer "natural" amenities thought attractive to young urban professionals. Some wish Brays could be returned to its "natural" appearance. However such fantasias are thwarted by the fact that slowing the flow even by 3 percent during storm events could cause massive flooding to the city that evolved around known drainage speeds. The flow in Brays is, according to the Army Corps, "supercritical" and any obstacle in the flood way can cause major impact. Even the frequency of mowing the upper, grassy banks is dictated in order to reduce friction and therefore maintain water velocity. To imagine returning Bray's to a "natural" condition would require a total and utopian reconstruction of the city and the most invasive deconstruction imaginable, combining the aesthetics of Olmstead with the ruthless power of Moses.

DESIGNING ENTANGLEMENTS/ ENTANGLED DESIGN

THE WIDENING WILL require the reconstruction of almost all of the crossings over the bayou. Each crossing offers the opportunity to create or express the dynamic and complex relationship between natural processes, infrastructure and urbanism. Design can give a figure to what Sloterdijk calls the entanglements of the social-political and natural upon which our lives depend and our imaginations of the twenty-first century rely. At the same time as the bridges are rebuilt, there may be opportunities to expand storm water detention and remediation of the contaminated surface flow.

This third year studio examined how to retrofit the crossings over Brays Bayou to create distinctive hybrid designs that entangle infrastructure, landscape and urbanism. We combined contemporary interests in ecology, material performativity and complex geometry to develop strong design sensibilities that can then inform strategic approaches to the larger issues of the watershed and program. The course included a site visit of the entire bayou led by the Harris County Flood Control District as well as lectures and critiques by expert consultants in landscape, structural engineering and flood mitigation.[7]

Teams used parametric modeling to design performative fields that perform as a wetland remediation landscape. The 15-foot elevation difference from street to bayou bank is strategized as what James Corner calls "a thickened surface." Ponds, banks and edges are developed as an embossing and inscription of this zone to perform as a three-stage system that captures the run-off from the over 10,000-car Reliant Center Parking Lot that borders the southern edge of the site, and cleans it before it enters the bayou. Phylograms were developed not as abstract formal logics but in relationship to performance and other design criteria as part of a recursive and non-linear selection process. Planting and ecological succession as well as strategies to manage erosion informed material translations.

Lastly, teams integrated and revised the crossing strategies of Phase 1 and the performative fields of Phase 2 to develop a landscape/urban node that links the already planned and designed linear park at the bayou level with the Reliant Center/Medical Center conurbation at the street level creating an urban space of flow and program nexus that knots the city and the Brays ribbon park together. Teams also projected the larger-scale implications of their approach to the scale of the entire bayou and city.

The primary site is an approximately 13-acre zone bounded by Main Street and includes a crossover of

Braeswood Boulevard, a road that weaves east to west along the length of the bayou's banks. A large parking lot south of the site serves the Reliant/Astrodome sports and entertainment complex – over a square mile of asphalt and concrete. All this water runs off into the bayou through our site. A light rail stop is roughly 500 feet away from the southeast corner of the site. There is no road on the north east side of the site across the bayou but there are parking garages serving the Texas Medical Center, the largest medical complex in the world. The site straddles two city council districts, property owned by the private Texas Medical Center, the city, the county (the Reliant complex, etc.) and the bayou managed by the Harris County Flood Control District. Thus it encapsulates the complex overlay of public and private political territory in Houston and the contemporary city in general. Stranded between the expanding medical center complex and the entertainment arenas, this leftover wedge could be an important urban nexus for visitors to the city. As it stands the site is a bit of green and bayou surrounded by grey asphalt surfaces. It is one of many that lay along Brays Bayou and which could become urban attractors in the city and reshape its urban qualities.

OPEN ARCHITECTURES

WE WERE NOT so much interested in "solving" the problem of the bayou as in treating the studio as a laboratory in which to develop projective experiments that re-frame the problems through design while expanding disciplinary knowledge.

Within recent advanced architectural design, parametric design has largely been associated with the production of aesthetics of intricacy, affect and variation on the one hand and on the other with discourses of functional performance and constructional logics or engineering. Both flavors involve relationships to extrinsic forces or factors (subjective and natural) yet these are focused upon the production of a discrete object, albeit one made from a multitude or one might even say, populations of components rather than classical part-to-whole hierarchies.

Such autonomous design worlds may seem antithetical or at least reductive to the necessarily open systems that configure natural and urban system alike. However, in the studio we explore parametrics and performative design criteria as staging dynamic relationships across heterogeneous agencies, including the subjective, the social-political, the technical factors and natural forces. A moiré between two graphic fields (e.g. dots and stripes) might be a useful analogy as a calibration between otherwise heterogeneous orderings. Rather than the design of discrete objects or even contained landscapes, this approach to parametric design seeks to produce fields that enfold exteriority and impurity, modulating irreducibly heterogeneous factors and forces in relationship to each other in order to produce greater differentiation rather than simple variation, and in doing so articulate a coherence through design in which these often invisible phenomena manifest as both affect and operation and thereby can become a matter of concern. In this way, we discover a renewed political agency for autonomous design directed towards innovation of the metropolitan realm rather than historic understandings of the city, or equivalent romantic images of nature.

Parametric design moreover can be deployed to test and develop designs in relationship to dynamic and performative processes, such as flooding, remediation and the management of ecological succession. The simplest of relationships, such as the modulation of slope in relationship to water level, will modulate soft-control complexity in relationship to natural processes, such as erosion or rapidity of transition from wet to wetland to upland vegetal conditions and thus habitat and remediation. Such designs operate within informational flows as Maxwell's demons momentarily reversing entropic probabilities. They map relationships in time and through geometry to produce something besides themselves.

While traditional landscape approaches were dominated by geometries that either mimicked nature (English gardens), or abstract ordering (French

landscape), more recent landscape urbanist approaches have either embraced the graphic marks produced by industrial processes or else eschewed formal-spatial paradigms entirely in favor of processes. In contrast to all of the above, the use of parametric design develops geometric, spatial and formal coherence immanent to the diverse forces that flow across the site, and even to construction logics and material constraints (such as the angle of repose) while modulating them to produce emergent conditions that exceed the geometric relationships determined by these processes and which may even begin to supplant their initial clarity (as the flora and fauna beginning to establish themselves or as other processes such as erosion and weathering soften what were once hard edges). Because such approaches do not avoid representation but rather seek abstract forms of representational affect in relation to subjects, program and social subjectivities are a third factor enfolded into these considerations. The design therefore maps to natural forms and influences them without pure mimicry in the way Deleuze and Guattari once described the co-evolutionary phylogenetic dance between wasp and orchid.

The designer therefore determines a set of performative relationships not only to make the drawing, but to project through drawing how the design precisely informs imprecise processes (inexact, yet rigorous). The agency of the designer is thus suspended between the architect's formal precision, the landscape architect's soft-control of process and the engineer's management of infrastructural relations. The promise is a design that approaches a figuration (but not a figure) that constructs different ecologies amidst the social, natural and subjective worlds.

Notes

1 Colin Rowe, *As I was Saying*, Vol. 3. Cambridge, MA: MIT Press, 1995, p. 168.

2 Rowe, p. 169.

3 Thom Mayne, "Change or Perish," AIA National Convention, Las Vegas, 2005. http://www.aia.org/aiaucmp/groups/aia/documents/document/aias076762.pdf.

4 Stephen Kieran and James Timberlake, *Refabricating Architecture*, New York: McGraw Hill, 2004.

5 Gilles Deleuze, *Difference and Repetition*, London: The Athlone Press, 1994.

6 Bob Somol, "Cartoon Plan," OSU, October 21, 2009; see also, "Less -ity, more -ism," Rice School of Architecture, April 12, 2010.

7 The design was informed by research undertaken by Natalia Beard, Christopher Hight, Michael Robinson and as part of the www.hydraulicity.org research project.

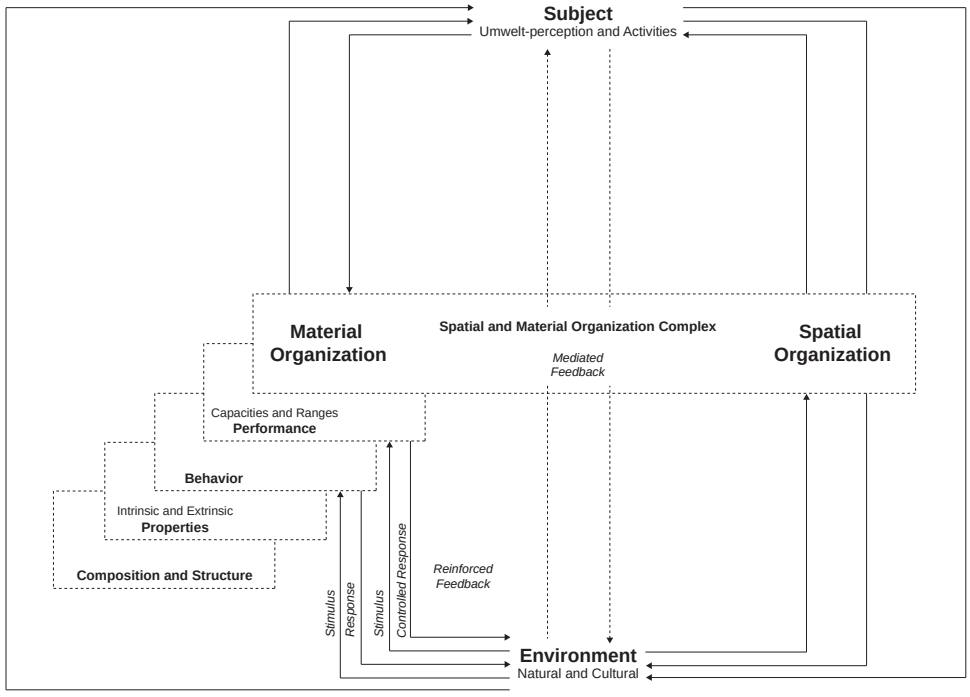
CHAPTER EIGHT

Performance-oriented design from a material perspective: domains of agency and the spatial and material organization complex

Michael U. Hensel

WHEN APPROACHING THE question of "performance" from a material perspective it may seem that this would either entail commencing a design from a particular focus on material, or, alternatively, elaborating an already pre-defined design from a material angle. This would, however, be a rash deliberation bound only to restate the already practiced and, in so doing, to persistently conflate "function" and "performance", while precluding an altogether more promising and complex possibility. It is therefore of importance to establish first what is meant by "performance" before approaching this notion from a material perspective. I have recently elaborated a specific approach to this question in a paper on "performance-oriented architecture" (Hensel, 2010), suggesting that "performance" entails first the indivisibility of formal and functional aspects, and second, the interaction between four domains of agency: the subject, the environment, and the spatial and material organization complex. This approach shifts the emphasis from perceiving the spatial and material organization complex as a static configuration that alone defines an object to intricate processes of interaction and the capacities and transformations that arise from these interactions. The emphasis shifts in other words to "active agency." In an earlier essay the American writer and theorist Sanford Kwinter laid the foundations for such an approach by stating that:

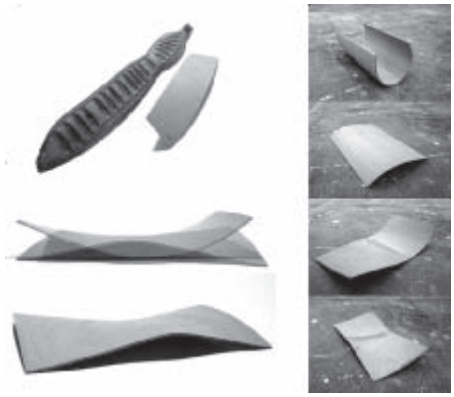
> Thus the object – be it a building, a compound site, or an entire urban matrix, insofar as such unities continue to exist at all as functional terms – would be defined now not by how it appears, but rather by practices: those it partakes of and those that take place within it. On this reconception, the unitariness of the object would necessarily vanish – deflected now into a single but doubly articulated field (relations, by definition, never correspond with objects). What comes to the fore are, on the one hand, those relations that are smaller than the object, that saturate it and compose it, the "micro-architectures" for lack of a happier term, and on the other, those relations or systems



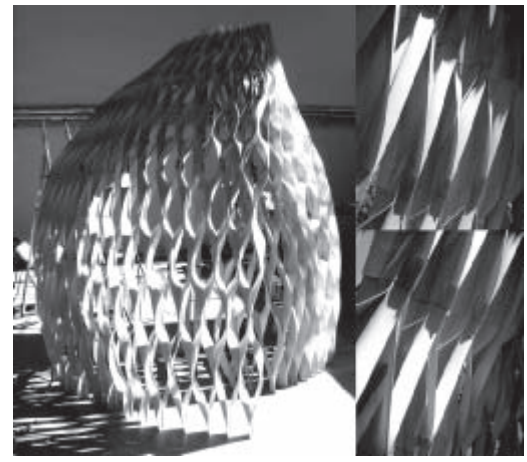
The aim is to posit a notion of *performance-oriented design* that is based on four domains of active agency: subject, environment and the spatial and material organization complex. With regards to the material constituent, the chemical composure and micro- and macro-structure of materials underlie material properties, which in interaction with a specific environment results in material behavior. In most cases the latter leads to dimensional instability, for instance, such as the swelling and shrinkage of wood to its hygroscopic characteristic, this is in the context of the western industrial tradition generally seen as negative and to be avoided. Material behavior can, however, be utilized in a positive manner that reinforces feedback as a key characteristic of performance-oriented design. This can be termed performative capacities which operate in specific targeted ranges. This is generally the case with smart materials and, moreover, biological materials with their specific composition, structure, properties and behavior. A potential inroad to a biological paradigm for architectural design needs thus to operate intensively within the spatial and material organization complex in interaction with a specific environment and the human subject.

> that are greater or more extensive than the object, that comprehend or envelope it, those "macro-architectures" of which the "object," or the level of organization corresponding to the object is but a relay member or part.
>
> (Kwinter 2001: 14)

Kwinter thus emphasized the characteristic complexity of interaction that is a key trait of the interrelation between the proposed four domains of agency over time, which are invariably saturated by "micro-"systems and enveloped by "macro-"systems. Does this entail then that "objectness" is shifted further downwards in scale of magnitude to materiality and reconnected sideward and upwards to the local organization of space? Kwinter argued that "to limit the concept of 'architectural substance' to building materials and the geometric volumes they engender and enclose" would be a mistake (Kwinter 2001: 14). While architecture cannot be thought to be outside the spatial and material organization



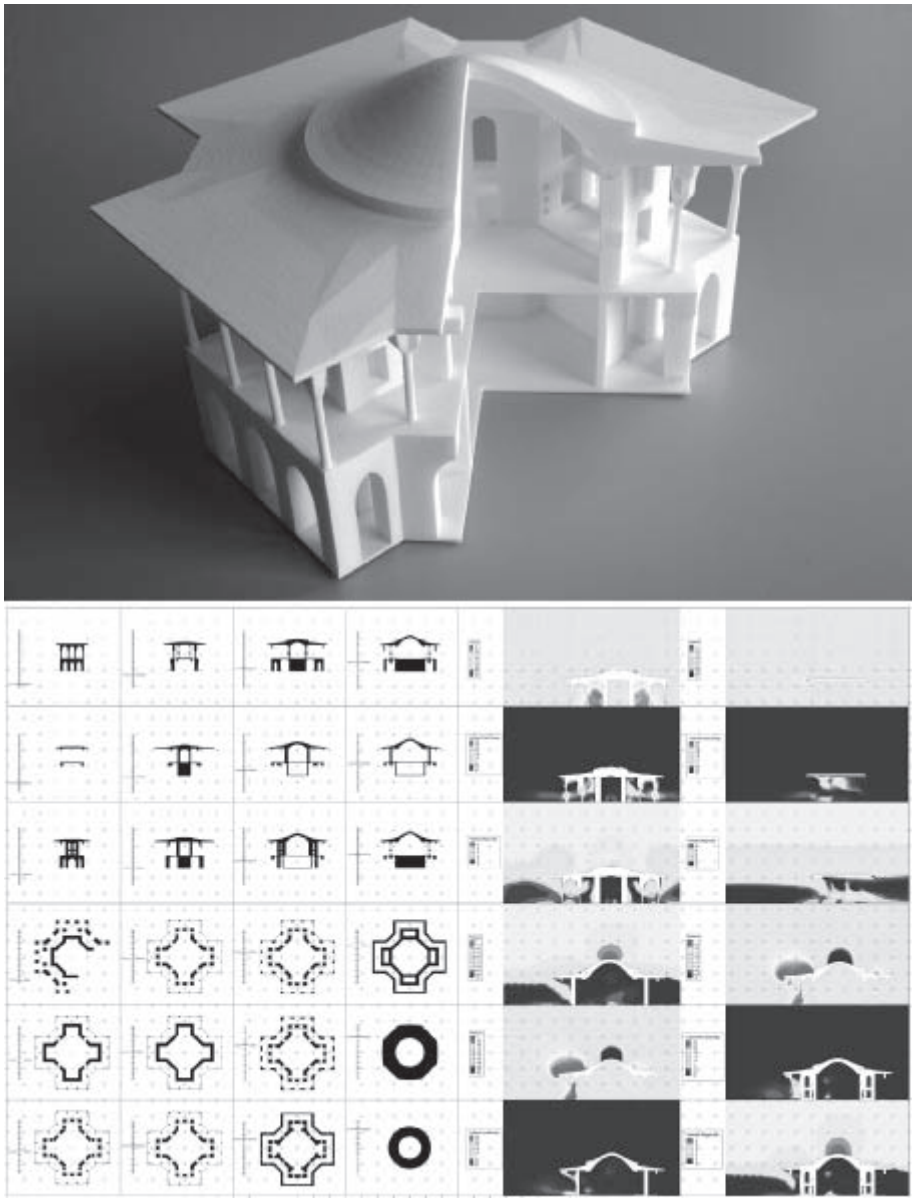
The Responsive Wood Master-Studio 2009 conducted by Michael Hensel and Defne Sunguroğlu Hensel at AHO – Oslo School of Architecture and Design focused on generating empirical data on the dimensional instability and behavior of wood that could be instrumentalized as a performative capacity. Inspired by the material composition of seedpods of the Flamboyant Tree (*Delonix regia*) master's student Linn Tale Haugen investigated the possibility of utilizing the self-forming capacity of beech veneer laminates with an even number of layers. (Generally laminates are made of an odd number of layers to ensure form and dimensional stability, so that flat panels do not bend and warp upon gain or loss of moisture content.) Varying the number of layers, fiber direction per layer and also the veneer sheet geometry an extensive amount of empirical data was generated that made it possible to establish which configuration of sheets would be needed to accomplish a particular double-curvature of the laminate in the process of wetting and drying. The process can remain reversible if the surface remains untreated, or, alternatively, the geometry can be fixed by sealing the surface on both sides.



The Responsive Wood Master-Studio 2010 conducted by Michael Hensel and Defne Sunguroğlu Hensel at AHO – Oslo School of Architecture and Design focused on developing structures and spaces articulated by assemblies of thin wooden strips, a material element that is not usually associated with this capacity. Both self-shaping based on the hygroscopic behavior of wood and traditional forming of wood were utilized to accomplish complex structural webs made from veneer. Master's students Wing Yi Hui and Lap Ming Wong, for instance constructed a small pavilion from 0.75 mm thin pine veneer. The dome-shaped pavilion gains its structural capacity from both the global geometry of the assembly, as well as the multiple load-paths of the structural web. At the same time the veneer is so thin that it is translucent and in the sunlight the internal structure of the wood becomes visible.

complex there is no obvious need to limit it to these two interrelated domains, since both participate in infinitesimal scales of saturation and limitless enveloping. A more relevant enquiry must then focus on how such dynamic intricacies can be instrumental for the purpose of architectural design. At any rate, when approaching this question from a material perspective, it is necessary to do so based on the clear recognition of its "active agency", on what it is doing in interrelation with the other domains of agency.

In order to approach the problem at hand it is useful to examine some architectural examples that may point in a promising direction. One noteworthy example are *mashrabīyas*, a term used both for Islamic wooden latticework screen walls and for projecting oriel windows enclosed by such latticework. The late Hassan Fathy described the carefully calibrated and integral "functions" of a *mashrabīya* as regulating the passage of light, air flow, temperature and humidity of the air current, as well as visual access. All this is accomplished by the careful articulation of the sizes of the balusters that make up the latticework and the interstices between them (Fathy, 1986). Fathy continued to describe how different parts of the screen wall cater for different hierarchies of the integral functions. For instance, if interstices need to be smaller at seating or standing height to reduce glare, the



Threshold articulation and environmental performance analysis of the Baghdad kiosk (*Bağdad Köşkü*) (1638–1639), a small building mainly used as a summer or winter recreational residence, which is located at the Fourth Courtyard of Topkapi Palace in Istanbul, Turkey. Top: rapid prototype model. Bottom Left: vertical and horizontal sectional sequences indicating the intricate articulation and variation of the combined spatial and material deep threshold of the kiosk. Bottom Right: Computational Fluid Dynamics (CFD) analysis of airflow velocities, pressure zones, and turbulent kinetic energy indicating the environmental effects and interaction of the kiosk. This approach extends the question of the spatial and material organization of the building threshold to its exchange with the local environment.

Research by Defne Sunguroğlu Hensel in collaboration with Dr. Øyvind Andreassen and Emma M. M. Wingstedt at FFI – the Norwegian Defense Research Establishment, 2010.

resultant reduction in airflow would be compensated for by larger interstices higher up in the latticework where resulting glare may not be a problem. While fulfilling their various functions in a nuanced and interrelated manner, the actual formal articulation of the pattern of the balusters can absorb very different aesthetic preferences too. This serves to show how formal and multi-functional requirements and preferences can be integrally solved instead of being disentangled into separate single-function building elements. More importantly however, with regards to the theme pursued here within, we shall examine the function of modulating the humidity of the air current. Fathy described this as follows:

> Its cooling and humidifying functions are closely related. All organic fibers, such as the wood of the *mashrabīya*, readily absorb, retain and release considerable quantities of water … Wind passing through the interstices of the porous-wooden *mashrabīya* will give up some of its humidity to the wooden balusters if they are cool at night. When the *mashrabīya* is directly heated by sunlight, this humidity is released into any air that may be flowing through the interstices … The balusters and interstices of the *mashrabīya* have optimal absolute and relative sizes that are based on the area of the surfaces exposed to the air and the rate at which the air passes through. Thus if the surface area is increased by increasing baluster size, the cooling and humidification are increased. Furthermore, a larger baluster has not only more surface area to absorb water vapour and to serve as a surface for evaporation but also more volume, which means that it has more capacity and will therefore release the water for evaporation over a longer period of time.
>
> (Fathy, 1986: 48–49)

It is of key significance that wood is used for the purpose at hand. Wood is a heterogeneous material that displays dimensional variability. It changes its dimensions in response to temperature changes in its surrounding environment and, likewise, in response to disequilibria between its internal moisture content and "the water vapour pressure of the surrounding atmosphere" (Dinwoodie, 2000: 49). When wood takes up moisture from the atmosphere it swills and when it gives it off again it shrinks.

In so doing the behavior of wood coincides with that of so-called passive "smart materials", which respond within specific limits to external stimuli. This likeness is by no accounts a trivial matter.

However, standardization of fabrication and expected functionality, tight tolerances in material properties and behavior and questions of liability have led to an almost complete eradication of explicitly stimulus-response driven material preferences. Thus materials have in the mind of architects become disassociated from a large range of their dynamic capacities, although this has not always been so as the example of the *mashrabīya* demonstrates. If then a revised approach to the material capacity is desired the outlined current predicament must be overcome.

Returning to the *mashrabīya* it is also evident that such an integral approach must be based on a number of conditions to do with spatial organization and environmental modulation. These two domains are even more closely related when a building envelope does not hermetically separate an inside from an outside space; if, instead of a dividing material threshold for the sake of a homogenous interior environment a set of layered intermediary spaces and micro-environmental gradients would be desired. (For an elaboration on this topic see Hensel and Sunguroğlu Hensel, 2010a and 2010b.) Clearly the position of the *mashrabīya* relative to the spatial and material organization of a building and in relation to the local environment (selection of specific stimuli, exposure and orientation, etc.) is of key importance. Furthermore, it is necessary to understand the interaction between the spatial and material organization complex and a specific environment. This is not sufficiently addressed as a series of one-way causal relations, all separately thought of and dealt with through a set of mechanical models that focus on single functional criteria and material characteristics.

Instead it is necessary to conceive of this as feedback-based exchanges that require behavioral models as the means of instrumentalization: the local environment affects the spatial and material organization complex and vice versa.

Let us once more consider wood. As a grown material it is one of the new hallmarks and clichés of material sustainability. Two reasons are typically raised with regards to the sustainability of wood as a material, first of all and as already mentioned above, it is a material that can be grown, and secondly, wood binds CO_2. However, essential characteristics of the material are deemed undesirable: its internal differentiation which results from growth-related variables and its resultant behavior. If we consider, for instance, how wood may be utilized with regards to its hygroscopic behavior, we also need to take into consideration all properties and characteristics that affect its response to moisture disequilibria, i.e. its species-specific density, its anisotropy, porosity and cellular differentiation. It is, however, the internal differentiation of wood that comes into conflict with the prevailing considerations concerning standardization, tolerances and liability. This explains why the preferred mode of working with wood is moving into the direction of homogenizing the material by chipping or shredding it and gluing it back together. First the tree is killed and then the wood is killed, to the extent that we end up with a compound material that has largely eliminated the behavior of wood and thus the potential for "active agency" and performative capacity.

If we choose to pursue an alternative path we need to consider how wood comes to be the way it is. The specific differentiated internal structure of wood depends obviously on the circumstances under which a tree from which the wood is harvested has grown. (The various resulting modifications of the internal structure of wood can indeed be very broad. Various recent publications give evidence of increased interest in this matter. See for instance Schweingruber, 2007). This implies that the consideration of the natural environment must be twofold, first with regards to the one that has directly impacted on the internal differentiation of wood in its growth phase, and second, the two-ways exchange between the harvested wood in a designed assembly and the environment in which it is placed. The numerous variables related to the growth process can thus become a matter of design consideration as does the resultant material behavior based on its differentiation and heterogeneity.

To be sure, wood as a material and the *mashrabīya* as a building element for a specific cultural and environmental context have served here only as fitting exemplars for the sake of initiating an overarching approach to material, one that aims to seek out an argumentative trajectory vis-à-vis a particular take on performance-oriented design. In so doing it was possible to point towards a more complex design synthesis forged out of intricate interactions between the spatial and material organization complex and local environments in a variety of time-scales, and in relation to what Kwinter termed "micro-architectures" and "macro-architectures." What cannot be elaborated here is the "active agency" of the subject and its relation to the other domains of agency, as this would go beyond the available space. The interested reader may refer to the aforementioned recent paper by the author (Hensel, 2010).

References

Dinwoodie, J.M. (2000) *Timber: Its Nature and Behavior*. 2nd edn. London, New York: E & FN Spon.

Fathy, H. (1986) *Natural Energy and Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*. Chicago: The University of Chicago Press.

Hensel, M. (2010) "Performance-oriented Architecture: Towards a Biological Paradigm for Architectural Design and the Built Environment," *FORMakademisk Online Journal*, http://www.formakademisk.org/index.php/formakademisk.

Hensel, M. and Sunguroğlu Hensel, D. (2010a) "Extended Thresholds II: The Articulated Envelope," *Turkey: At the Threshold*, London: AD Wiley, pp. 22–25.

Hensel, M. and Sunguroğlu Hensel, D. (2010b) "Extended Thresholds III: Auxiliary Architectures." *Turkey: At the Threshold*, London: AD Wiley, pp. 76–83.

Kwinter, S. (2001) *Architectures of Time: Towards a Theory of the Event in Modernist Culture*, Cambridge, MA: MIT Press.

Schweingruber F.H. (2007) *Wood Structure and Environment*, Berlin, Heidelberg, New York: Springer.

CHAPTER NINE

Performalism or performance-based design?

Martin Bechthold

THE DERIVATION OF form through performance-based analysis, while new in architectural discourse, has a long standing history in the engineering domain. Engineering decisions, in fact, are largely made based on analytical evaluation. Performance-based form making is maybe most evident in structural engineering with its shaping of structures according to the forces and moments present, but less explicit relations between form and performance are common in other building engineering disciplines. A recent example of this latter type has been the shaping of the urban grid and building massing according to specific conditions of daylight exposure and shading patterns in Abu Dhabi's Masdar City. How does architectural performalism compare to performance-based design in engineering?

The omnipresence of performance-based thinking in engineering is at the very core of this discipline, and engineering performance design has left visible traces on to architectural form from very early on. The pervasive presence of arched and vaulted systems in Roman architecture, for example, well illustrates the symbiotic nature of architectural form and performance-based engineering design – notwithstanding the Romans' lack of quantitative understanding. Gothic cathedrals, with their daring vaults, slender columns, and flying buttress structures, are another example of a performance-based approach to architectural form based on structural engineering. These structures not only symbolized religious values, but at the same time optimized, based on the available knowledge, the use of materials for a chosen structural task.

As engineering knowledge matured the engineering profession ultimately diverged from architecture in the early eighteenth century. After this juncture engineering became increasingly scientifically minded and less design oriented, complementing and serving the more artistically and culturally minded architectural design. The split of the professions also marked the emergence of a radically different attitude towards performance. Quantifiable efficiency as a measure of performance dominated in the engineering domain, while performance often remained a rather elusive notion in architecture. Structural engineering science,

Santiago Calatrava's early work, although conforming more consistently with the ideals of engineering efficiency, was never enslaved to it. Project shown: Subway station in Valencia, Spain (photo: the author)

for example, quantified the behavior of load-bearing elements to achieve overall stability, strength and stiffness of the building structure. As the field matured lightweight structural design emerged in the twentieth century as one of the most advanced specialty fields in structural engineering, creating systems that maximized load-bearing capacity while minimizing the structure's mass. The criteria for and indicators of performance were clear and shared in the discipline. Engineering design that deviated from this dogma was quickly criticized by peers. Pier Luigi Nervi and Santiago Calatrava are but two engineers that have been reproached by their peers of compromising the efficiency dogma, allowing formal or sculptural aspects to dominate over engineering logic.[1]

Compared to the narrow pursuit of performance in the engineering context performalism in architecture remains extremely broad, encompassing almost too wide a range of design approaches. It ranges from the loose use of performance as an alibi for formal investigations, to more analytically spirited design collaborations of architects with engineers and consultants in the quest to synthesize performance with other design requirements. The common denominator of performalism, and its operative connection to engineering, is computation. Clearly, the widespread use of computation tools in architecture and in engineering has affected both fields profoundly. First introduced to facilitate tedious engineering calculations, and only later introduced in architectural practices, computation is now an indispensable part of both engineering and architectural design processes that range from conceptual design to realization. Is performance computation the mode through which engineering and architectural design merge again, three centuries after the divergence of the disciplines?

Early computer-based engineering calculations and simulations greatly expanded the scope of engineering, allowing for the study and design of more complex systems that would have been difficult or uneconomical at best to pursue with other methods. Ove Arup & Partners, for example, in 1969 used mainframe computers and Fortran programs to aid in the translation of the Sydney opera roof shapes into a buildable structure. Engineers Ove Arup and Jack Zunz note

> It was clear in these early days that to achieve a solution at all, to make it possible to build the structure, extensive use of electronic, digital computers were necessary. It would otherwise have been impossible to cope with the sheer quantity of geometric problems, let alone with the complexity of the analytical work.[2]

But computation not only aided in dealing with complex geometries, instead it contributed to deriving new structural efficiencies. The numerical analysis of complex structures with hand-methods had always relied on highly abstracting the actual system into an analytical model used for analysis. As a result, engineers worked with larger safety margins and higher redundancies that often led to oversized structural elements.

Computational analysis today still relies on the representation of the actual structure as an abstracted model. But with increasing processing power and more advanced simulation tools, the differences between the actual systems and their structural models is now smaller than ever. Structural efficiencies have increased accordingly.

The mild curvatures of the shell roof at the Rolex Learning Center by SAANA necessitate several intermediate supports for the largest shell, thus creating a hybrid structure that would have been difficult at best to be designed without computational analysis (photo: Matan Mayer)

Computation has also facilitated the design of hybrid structures that cannot be understood as any of the established structural systems. Examples include the Munich BMW world with a roof that transitions from triangulated space truss to a grid shell,[3] or the Rolex Learning Center (EPFL Lausanne, Switzerland), with its shell-like roof that conforms neither with pure shell theory nor with classical beam theory.[4] The behavior of such hybrid structures is most accurately captured through computational analysis. Computation has been the vehicle through which these hybrid structures are made possible in newly efficient ways.

Accepting the fact that computation has been an enabling technology for the engineering discipline in the pursuit of performance-based design we should return to architecture. What has been the influence of computation on architecture and, more specifically, on the role of performance in design? Early CAD systems mostly increased the productivity of architects, without significantly altering either design methods or

design practice. Over the past decade computation in architecture has become more sophisticated. Design decisions can be guided through realistic visualizations of spaces and forms (visual simulations), data-rich four-dimensional models provide participants with unprecedented layers of information, and connections to digitally fabricated environments, while not seamless, are nevertheless much improved. Design automation through scripted procedures and programmed routines has lately spread from engineering to architecture. Young architects especially are more computer-savvy than ever. Computer-based design practices have enabled firms to deepen their understanding of performance aspects of buildings, and in some cases those studies have driven architectural form. This mode of performalism is usually deeply collaborative, involving the expertise of a broad range of design professionals.

In other cases, design computation of performance parameters seems like a mere alibi for the pursuit of pre-existing formal objectives. This is, at least in part, the fall out of architects' preoccupation with patterns and textured surfaces, computationally generated, and fabricated using numerically controlled environments. To veil such approaches as performalism serves the new "ism" and the profession poorly, as it merely reinforces the old stereotype of the architect as a technically incompetent artist (even though it requires significant and technical expertise to actually implement highly complex designs). Performance should be taken seriously – the Latin origin of the verb "perform" actually means "to complete thoroughly!"[5] When performance serves as a mere justification of formal interests the term is better left behind unless it is made clear that performance is used only on an inspirational level. There is nothing wrong with the pursuit of formal interests in architecture. Why justify forms with pseudo-science? There is no crime, and no alibi is needed.

A "thoroughly complete" approach to performance-based design may benefit from shared performance indicators – a notion long employed in the engineering discipline. Structural engineering, for example, has long employed indicators such as stiffness to mass ratio or mass to floor area ratio to evaluate the efficiency of long spanning roofs.[6] Engineering is also quite explicit about stating which of the many design parameters and phenomenon is driving the design. For architects, a comparable specificity has been traditionally difficult. Design as an abstraction of making, as performative response to the environment, and as a cultural and social activity is far too complex to be driven by a handful of parameters.

That is not to suggest the abandonment of performance as a design parameter. Despite a muddled attitude towards performance it is crucial to move performance-thinking back to the core of the disciplinary consciousness. What could be more timely (and is hopefully not too late) at the age of a globally warming planet and dwindling natural resources? Performalism as serious performance-based design should be here to stay, less as an "ism," but as an ethical obligation to the profession and to society.

Notes

1 See the article by Stephan Polónyi in "Gestalten In Beton: Zum Werk von Pier Luigi Nervi," *ARCUS.7*, P. Müller, Köln, 1989.

2 Ove Arup and Jack Zunz, "Sydney Opera House," first published in *Structural Engineer*, March 1969, reprinted in *The Arup Journal*, October 1973: 8.

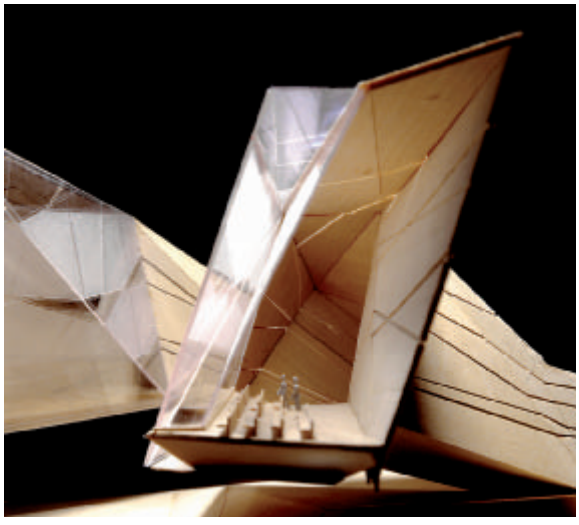
3 See Daniel L. Schodek and Martin Bechthold, *Structures*, Upper Saddle River: Pearson Prentice Hall, 2008.

4 See also "Das Rolex Learning Center der EPFL in Lausanne" in *Stahl- und Betonbau* 2010, 4: 248–259.

5 Etymology of "to perform:" Middle English, from Anglo-French parfurmer, alteration of performer, parfurnir, from par-, per- "thoroughly" (from Latin per-) plus furnir "to complete" (Merriam Webster online, accessed June 3, 2010).

6 Mass to floor area ratio is a useful way to evaluate the efficiency of certain roof structures such as roofs of stadiums. The Beijing Olympic stadium, by the way, is faring rather poorly in terms of efficiency.

THE ARCHITECTURAL PROJECTS

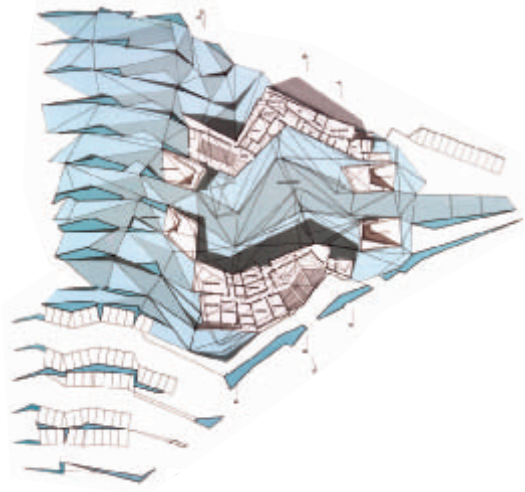


Church of the Year 2000, Rome, 1996
In the Church of the Year 2000, a form of nature is used to symbolize a condition between proximity and distance in the pilgrimage church. The most precise condition of between in nature is the condition of the liquid crystal, which is a state of suspension between the static crystal and the flowing liquid state. The forms of the church literally grow out of the molecular order of a crystal. They represent the gradual distortion of an original crystal phase to a nematic state, which is a between phase in the molecular order prior to the isotropic, or liquid, phase.

CHAPTER TEN

Eisenman Architects

THE IMPLICATIONS OF PERFORMALISM / PETER EISENMAN

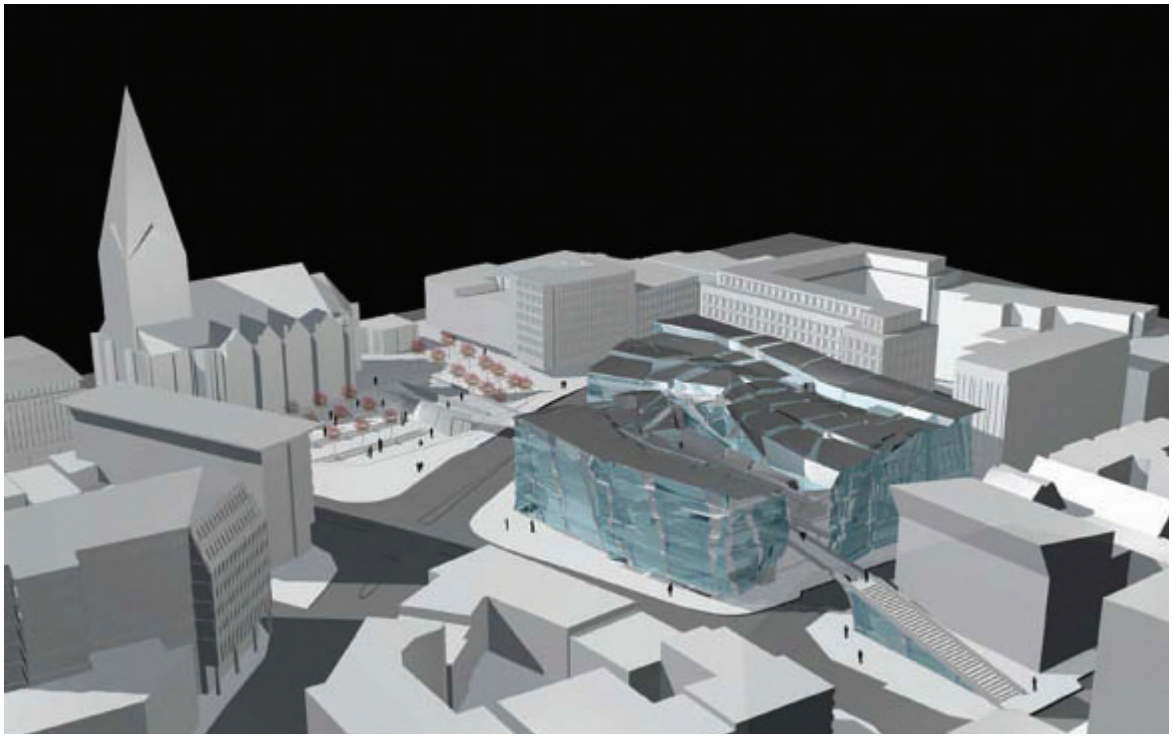


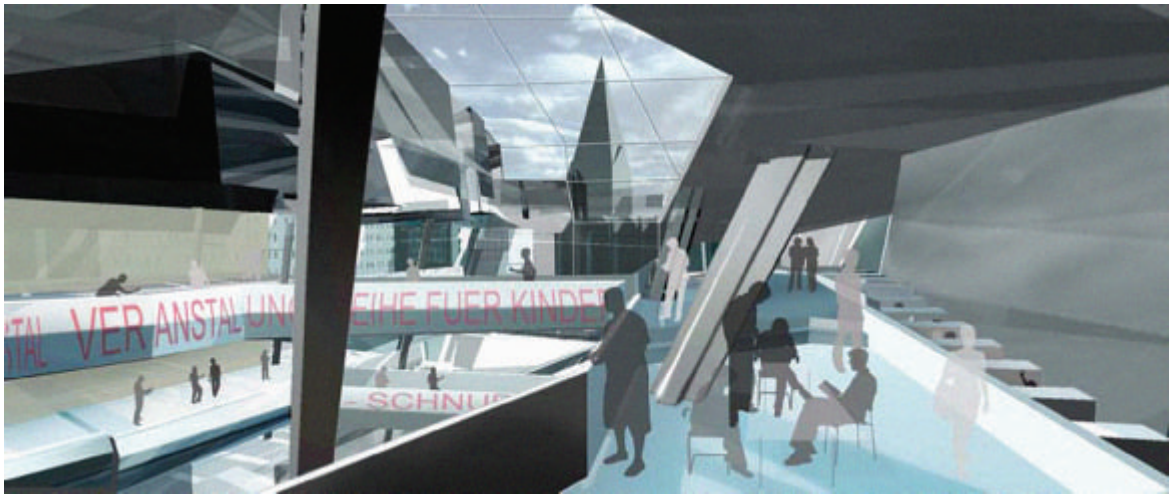
Ground level plan

THE CONCEPT OF PERFORMALISM, like its predecessors, postmodernism and postcritical, is ultimately an accommodation of late capital. The term *projective*, its counterpart today, is also an attempt to find an active design role that is useful to consumption. Performative design and projective design are theoretical placebos to overcome the thought-to-be negative connotations in modernist theories (see Benjamin, Tafuri, Cacciari, Jameson, Hayes, Aureli, and so forth). But it is precisely the critical nature (as opposed to merely negative) that makes their commentaries even more important today.

The key issue in performalism is, what is the nature of the design activity? What is implied in the term is a design activity that is synthetic and that only deals with the new, or the look of the new. Critical analytic activity, on the other hand, is something other than synthesis. Clearly that is not the major thrust of the activity proposed in performalism.

Our work has never subscribed to any category of "ism" and is not viewed as synthetic. Thus performalism is not an ambition in our work. But new terms are tricky, especially words that are new combinations, or portmanteau words. Take, for example, one of the more well-known recent such words, *deconstructivism*, made popular in the Museum of Modern Art exhibition of 1988. As a combination of two words, *deconstruction* (already a problem in itself, but in the philosophical sense) and *constructivism*, a style of Eastern European avant-gardism in the 1920s, this portmanteau word was at least meant to give form and ideology to a new group of formal appearances, which, at the time, seemed refreshingly to overcome the kitsch, banal historicism of a corrupt postmodernism that was nothing more than an accommodating placebo for capital.

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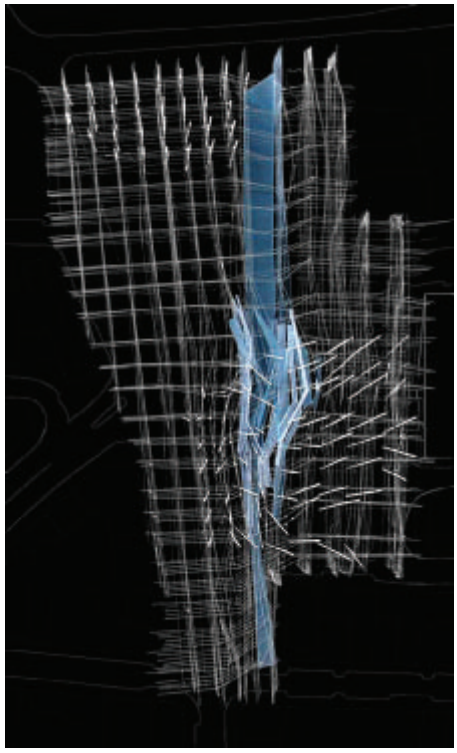
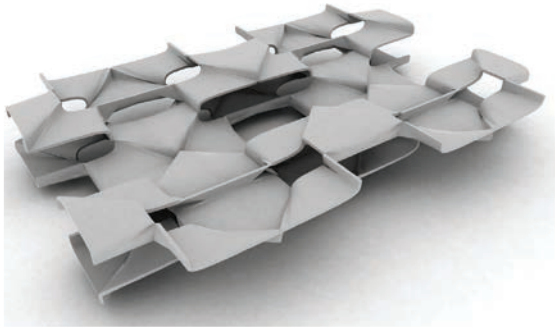
Domplatz Hamburg, Hamburg, 2005
Mixed-use public library
There is no better place to signal and symbolize the paradigm shift of the first digital age than in a library, because its cultural program records the movement from the machine age to the digital age. The Domplatz Hamburg library also records the passage of time and archaeology of Hamburg in its structuring system, which is developed from the mapping of the columnar organizations of the St. Petri and St. Marien churches and their projection on the Domplatz site. This produced a misalignment, which created an internal vortex of energy that allows for a central public passage through the building and skews the structural grid from this center outward, so that the columns no longer look like structure.



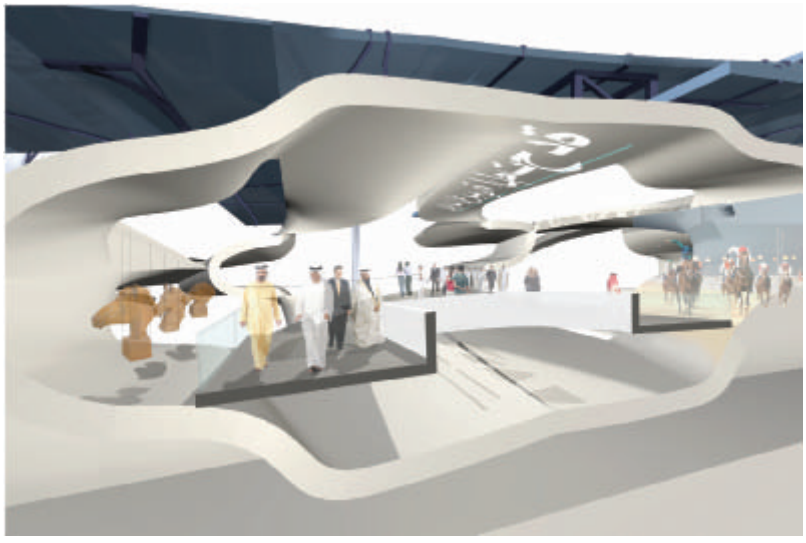
Twenty years later, enter *performalism*, another portmanteau term made up of *perform* and *formalism*, or so it would seem for architecture. But the explanatory subtitle for the exhibition with this name belies the title word, because form and performance are quite different from a type of formalism. What is being proposed by performalism is far from the autonomous critical matrix of a formalism. If performalism stood for "through formalism" (in the Latin meaning of per) that would be a different story. But as it stands, there is little formalism in performance.

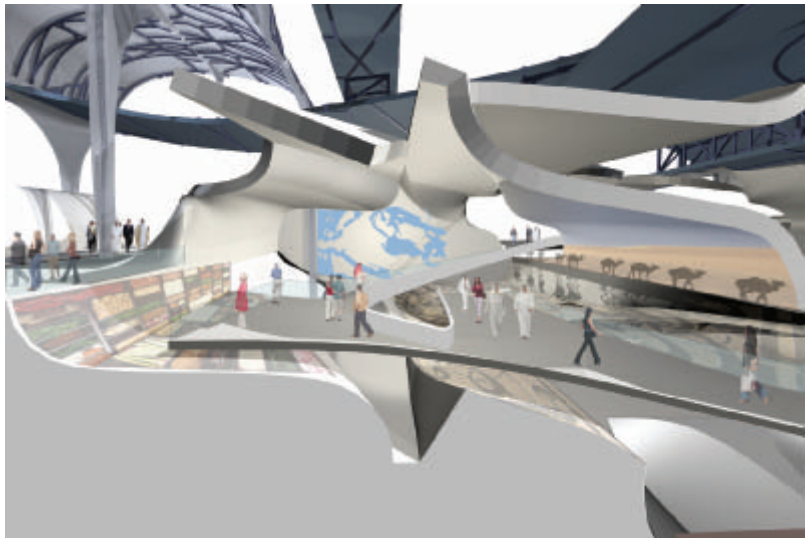
The operative verb is *perform*. According to the authors of performalism, it has two trajectories: one is the performance of the object – the architecture – and the other is the performance of the subject – the human in the space. But the criteria never state what it is that constitutes architecture or list the requirements for its performance. If one didn't know better, one would think performalism is in the grips of an old-fashioned functionalism, except for the "newness" of a digital architecture. The statement *techniques turning into operative possibilities* certainly seems like a new functionalism, not an ideological or critical resistance to the creeping in of international capital.

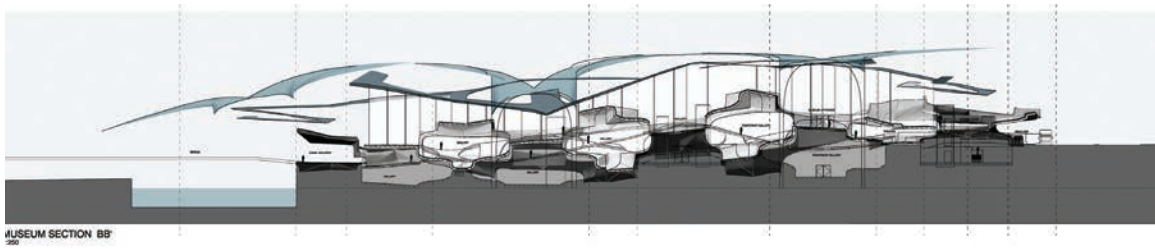
While my work, and perhaps that of Bernard Tschumi, may have been the only work that fulfilled both the ideological and stylistic duality of deconstructivism, it adheres to very few of the ideas of performalism. My work has most often been seen as counter to any explicit performance, as well as a plea for a certain formal autonomy, which may be one of the few possible critiques that architecture can make of capital and the placebo of design.



Sheikh Zayed National Museum, Abu Dhabi, 2007
The proposal for the Sheikh Zayed National Museum denies the homology of the plan for a new attitude toward section. Using the shifting patterns of the arabesque, a complex yet repetitive geometric form with characteristics similar to the natural forms of the shifting desert landscape, this single-surface design holds many sectional possibilities, not just a single plan layer. Using contemporary modeling technologies and three different arabesque patterns, a formal system that responds to its unique site conditions was produced. The system is self-generating and free from the conventional aspirations of the plan as a basis for building.







Cross section ↑
Axonometric drawing of layers ↘

upper roof: sun screen
provides shade for occupied enclosure

perforated metal roof
– screens conditioned enclosure
– cool roof
– light in color
– matte finish

lower roof: enclosure
provides enclosure for public spaces

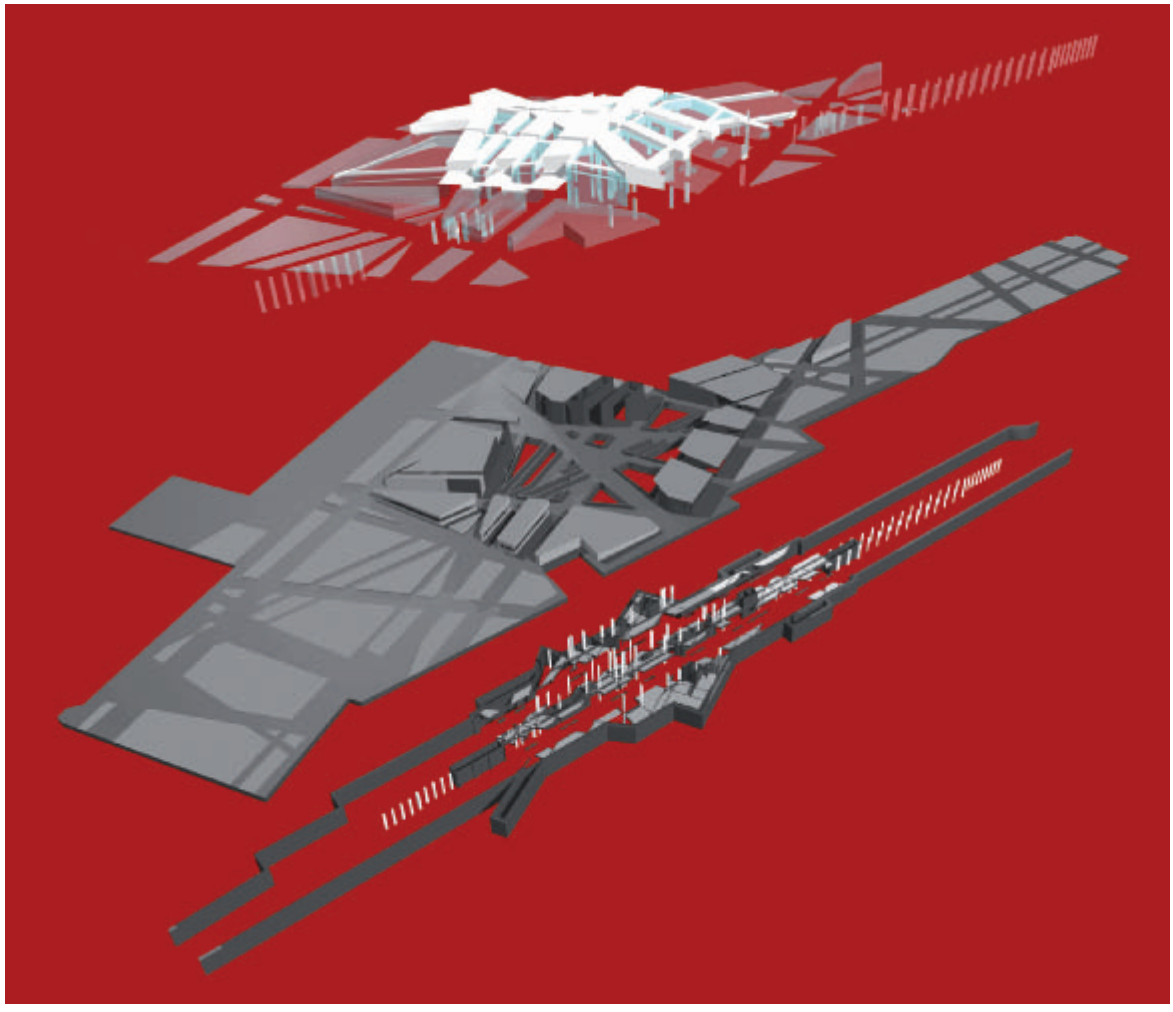
light gauge roof with glass skylights
displacement ventilation system
– flexible system
– supplied from concrete shells
– hot air vented at top

bottom layer
provides enclosure for gallery spaces

cast-in-place concrete shells
– large thermal mass
– pressurized ventilation system
– temperature and humidity controlled environment

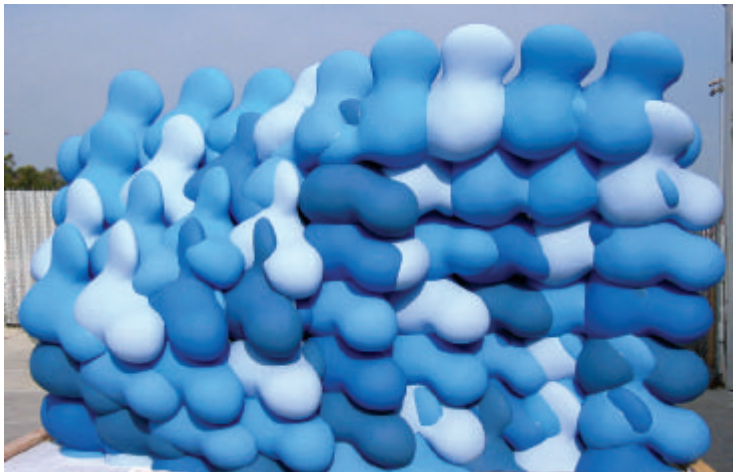
composite


BINARIO
1



Axonometric projection

Santuario Station, Pompeii, Italy, 2006–present
Santuario Station, in central Pompeii, is one of two new railroad stations for arrivals and departures that flank the decumanus of the excavated ancient city. The new station is an extension of an urban concept developed from a reading of ancient Pompeii as a three-part city: an early foundation, later development, and an in-between condition; between the regular grid of the Roman city and the irregular pre-Roman city, an interstitial zone exhibits characteristics of both. Built in dark volcanic stone and white concrete, and roofed partly with a translucent fabric that will allow a white, natural light to penetrate the interior, Santuario Station emerges from the new landscape, stitching together the two conditions of the modern city and connecting the ancient city with the new one. The new grid laid over the interstitial zone of the tracks also produces a new patterned landscape of gardens, parks, and pavilions that joins north and south Pompeii in a new whole.



BLOBWALL©, 2007, brick prototype
BLOBWALL© is a collaboration between Greg Lynn and Panelite. It is an innovative redefinition of architecture's most basic building unit, the brick, in lightweight, plastic, colorful, modular elements custom-shaped using the latest CNC technology. BLOBWALL© is a free-standing, indoor/outdoor wall system built of a low-density, recyclable, impact-resistant polymer. The blob unit, or "brick," is a tri-lobed hollow shape that is mass-produced through rotational molding.

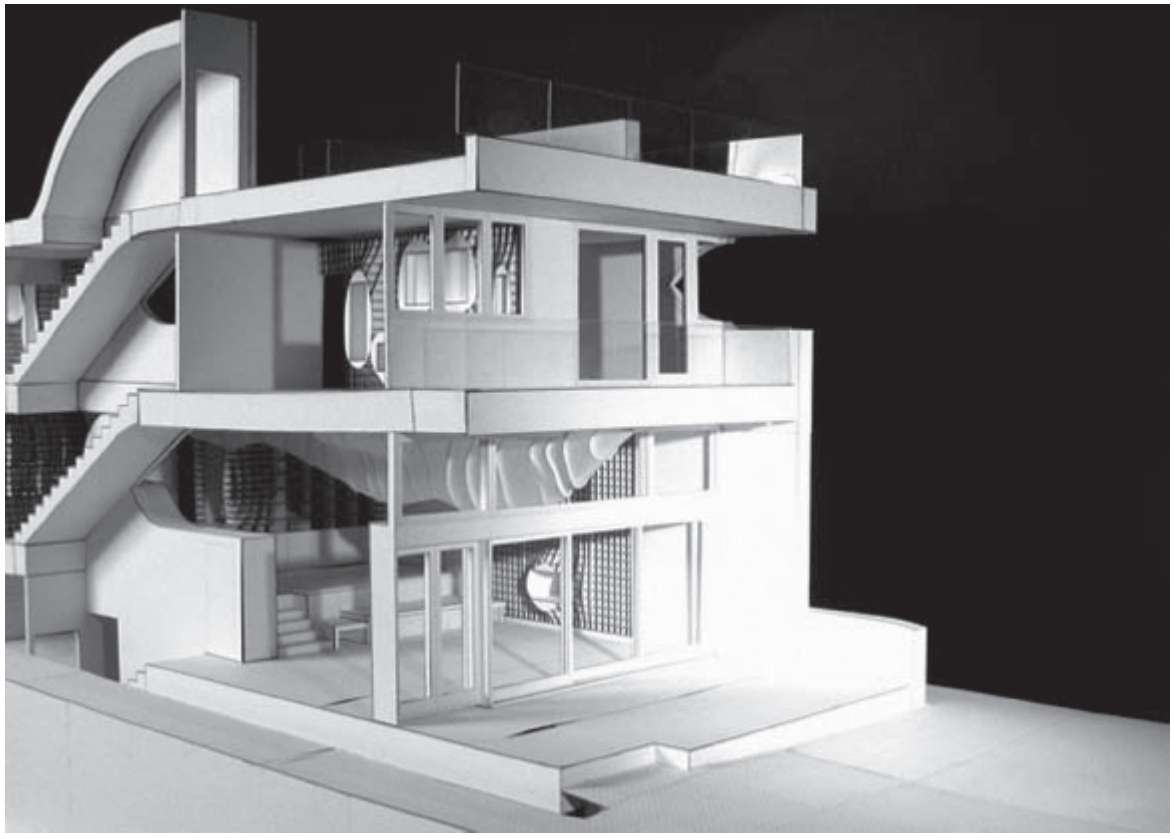
CHAPTER ELEVEN

Greg Lynn FORM

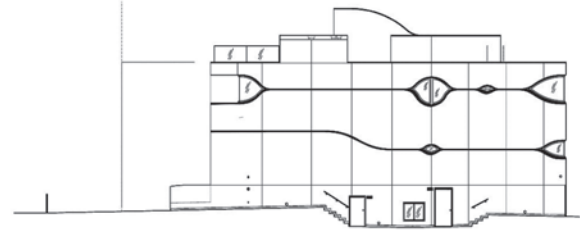
THE IMMEASURABILITY OF CULTURAL PERFORMANCE / GREG LYNN

PERFORMANCE IN ARCHITECTURE is of a high order but not in the quantifiable way that performance can be captured in say engineering or even in a musical performance. It turns out that architecture is not frozen music at all; it is much more diffuse as it involves environments and spaces too vast, borderless and of long duration. Performance connotes function and its optimal satisfaction. The functions of architecture are not just adequate space with light, air and shelter but the mood, conviviality and atmosphere of not just occupants, not just the city or metropolis but culture in general. More than most fields, architecture is a cultural practice and its practitioners are cultural figures so performance must be measured by the direction and distance that culture is moved by design. Whether Neo-Classical, Baroque, Modern, Post-Modern, Deconstructive or Blobular you will find that not only the stylistic but the cultural discourse of these movements was introduced through architecture into the other arts as well as design. This is not due to the originality or innovation of architects but their address to a cultural audience rather than an audience of specialists, cognoscenti or officials. So to the matrix of functional satisfaction, spatial pleasure, energy efficiency, material intelligence and sustainability one must also add cultural relevance. A classic building, that is a building that captures the moment in which it is conceived most poignantly, would be the apex of high performance and would also be the most worthy of sustaining, the least disposable and the most valuable to culture. This often translates into monetary value of the type that is easily captured and quantified in real estate values but is more complex to quantify in cultural value. The value of the Sydney Opera House to the city, the country, the musicians, and the neighborhood, to the travel agencies, media companies and governmental agencies that use its likeness is all part of its performance. It is not an icon but a cultural object that has many facets and immaterialities from the media sphere, to the urban sphere, from the waterfront, to its immediate surroundings, from its urban plaza, porte cochère, lobbies and interiors to the waterfront; it is performing many roles. The performance is measurable but the most important measure is of the intricacy of its effects. The mistake most often made in measuring the performance of design is the isolation and compartmentalization of easily measured discrete qualities. What one finds is that the most high-performance objects are usually the most intricately and diffuse objects that perform at many registers at one instant. That is the most resistant to simple measure.

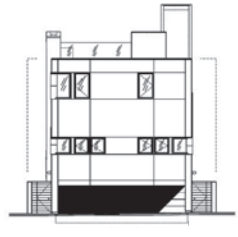
Bloom House, Los Angeles, 2004–2008
The Bloom House is an infill house situated on a 3-foot × 90-foot lot with views of the Pacific Ocean. The exterior is a box fenestrated with a series of curved, eyelet-shaped wood windows that were produced with the latest computer-controlled extruding machine. The interior of the house is massed with curvilinear surfaces that emerge from ceilings and walls to define enclosures, furniture and light. These interior elements, which include vacuum-formed Corian, CNC-milled molds for the fiberglass lantern and laser-cut wood framing, make use of current fabrication technologies.



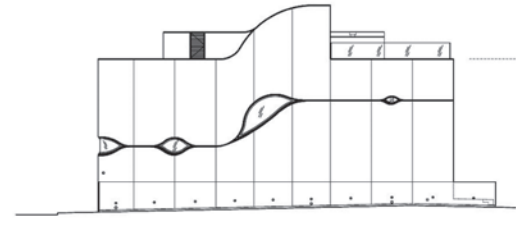
North elevation



West elevation

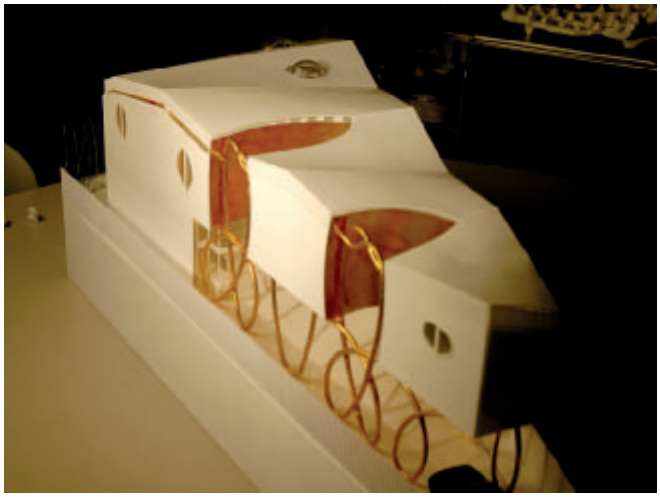


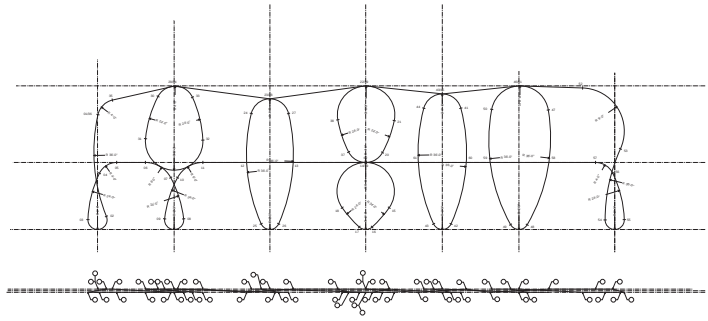
South elevation



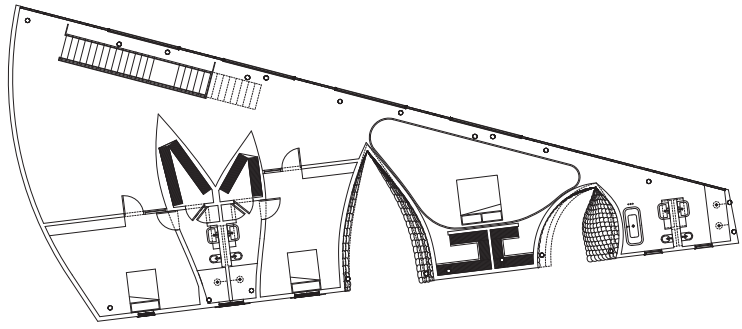
East elevation

Slavin House, Venice, California, 2004–present
The Slavin House folds inside and outside rooms into a singular porous environment that occupies the entire triangular site it sits on. A one-story high occupiable structural truss defines the mass of the house, composed of only two continuous extruded and radially bent steel tubes, braided and looped through one another that function simultaneously as horizontal and vertical members: beams and piloti. The integrated structure allows a 100-foot-long ground floor interior living area.

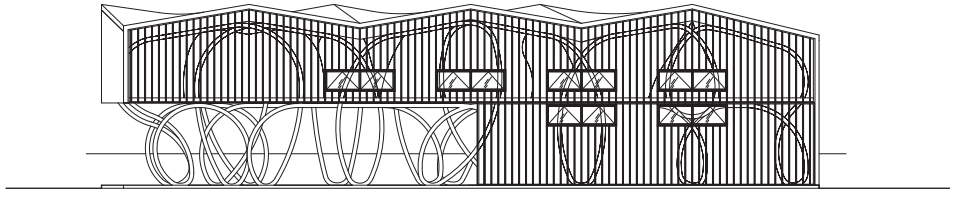




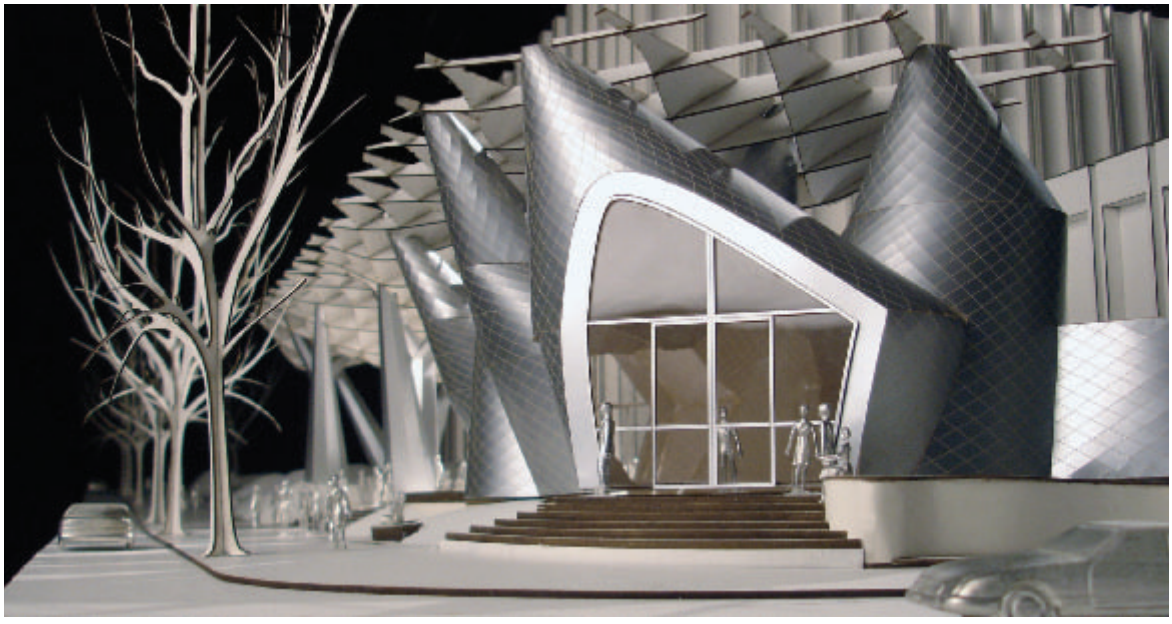
Bent tube radii diagram

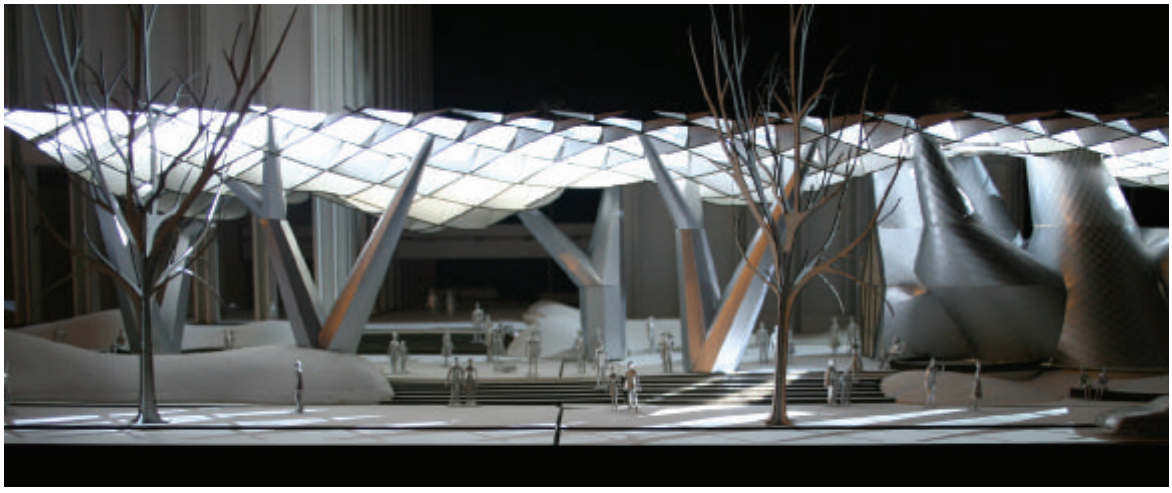


Upper floor plan



North elevation





5900 Wilshire Boulevard Restaurant and Trellis Pavilion, Los Angeles, 2006–present

The 5900 Wilshire Boulevard Restaurant and Trellis Pavilion addresses the mid-Wilshire corridor with a new dynamic restaurant pavilion. Situated in a very prominent location within the Miracle Mile district of Los Angeles, directly across from the newly renovated Los Angeles County Museum of Art, the project creates a gateway across Wilshire Boulevard. The undulating and sensuous exterior volumes are clad with stainless steel panels and form a cathedral-like vaulted ceiling on the interior. The exterior roof lattice acts as a sun shade canopy during the day and emits computer-controlled mood lighting at night.

Taiyuan Museum of Art, China, 2007
The difficulty faced by this project was the need to organize a museum according to a dialectic of continuity and discontinuity. The building supports simultaneously chronological and disconnected curatorial programs.

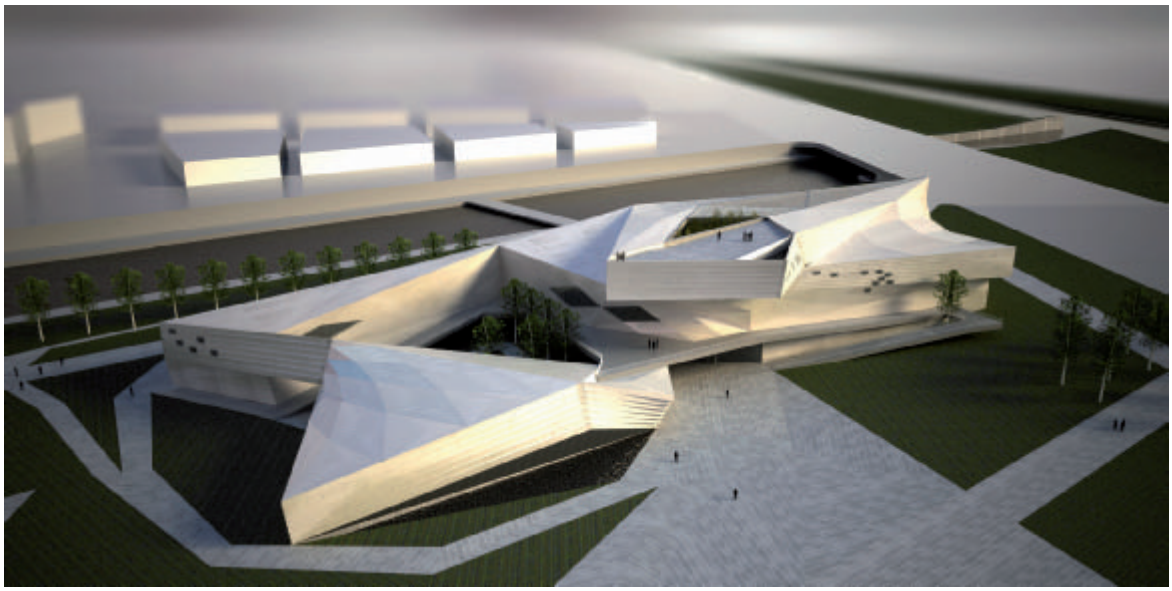
The interior of the building's form, the geometric equivalent of a knot, produces the impression of a highly prescriptive sequence of galleries, while at the same time providing the stacked and serial distribution of spaces that give visitors the freedom to follow either a predetermined itinerary or to skip from one gallery to another in a non-linear fashion. The knot is doubled in order to act as a bow tie that ties the park space of the surrounding island to the promenades of the courtyard and atrium within.

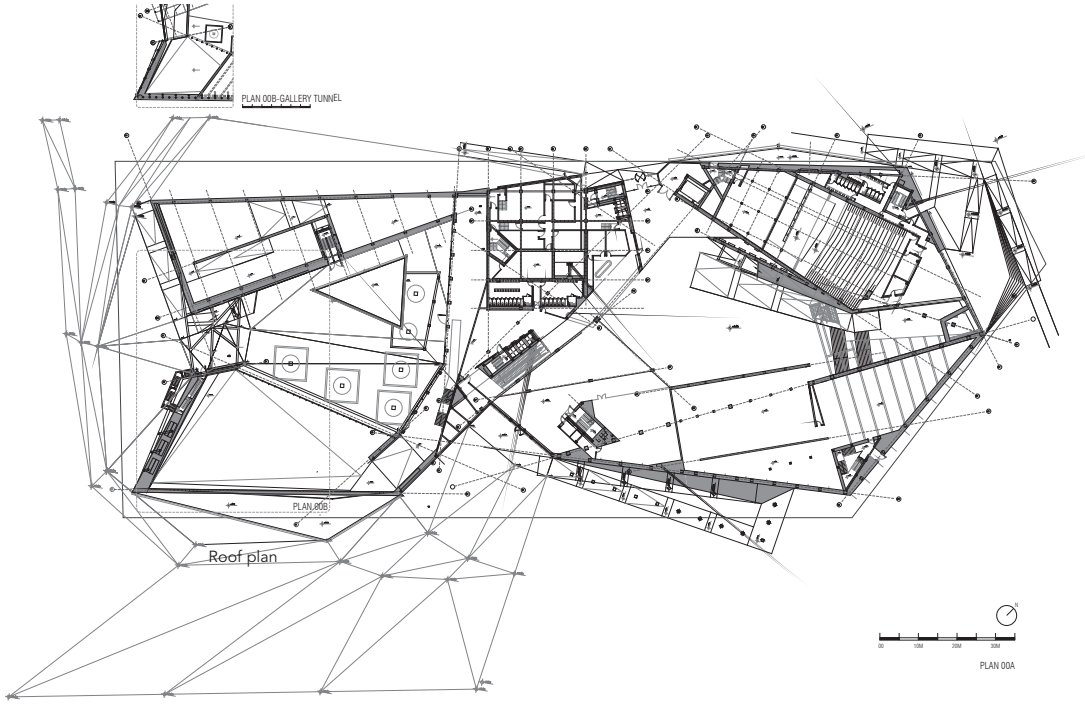
CHAPTER TWELVE

Preston Scott Cohen, Inc.

ARCHITECTURAL ACROBATICS / PRESTON SCOTT COHEN

PERFORMANCE COMMONLY BRINGS to mind two definitions. The first is the execution of a function; this may or may not include a judgment as to the competence and efficacy with which it is done. The second is the presentation of something theatrical which has the potential to be histrionic and spectacular, such as a play, a dance, an opera, or a musical production. It goes without saying that architects who espouse the performative prefer the former. Function is, of course, elemental to any modern architectural work. Without it, architecture is thought not to exist. And yet architects tend these days to be unsatisfied with the term "functionalism." They use the term "performative" to denote functionalism while surreptitiously suggesting more, in particular something with a technological aura. When the term performance is used in advertising it is meant to invoke rockets and cars with the gleam of cutting edge engineering. Yet, aerodynamics is the expertise of NASA, not GM. In relation to cars, performance has as much to do with market advertising as science. The situation is similar in architecture, but worse. This is not to deny that technological advances have profound effects on the way architecture functions and is produced. Rather, the problem lies in the claim for the performative in architecture which is, more often than not, based on scientistic discourse.



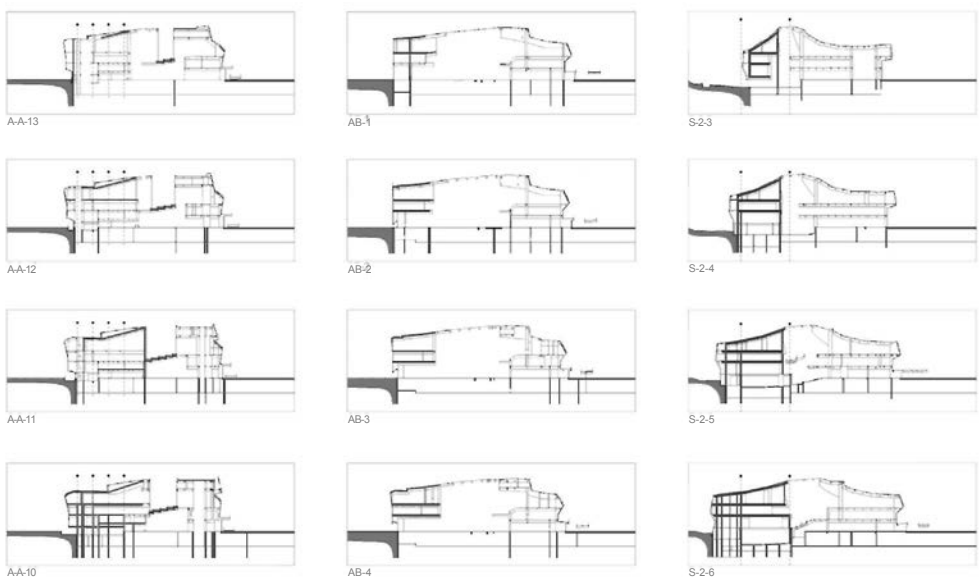

PLAN 00B-GALLERY TUNNEL
PLAN 00B
Roof plan
PLAN 00A

DESPITE THE SEDUCTIVENESS of this scientistic functionalism, it cannot suppress the definition of performance that its proponents would rather deny. Indeed, the theatrical meaning of the term brings to mind the functionalist's nemesis, the actor. But an architectural actor would not be just any actor. His performance would be devoid of character development and the temporal arc of narrative. It would resemble not the work of a dramatic performer, but one who makes the subject of his performance the performance itself, such as an acrobat. The acrobat's performance transforms the everyday functions that naturally result from being in the world, like standing, lifting objects, or biking, so that they exceed their normal compass. Riding a unicycle while balancing a heavy pole makes gravity more difficult to negotiate than usual. Gravity and the limit of a body's strength are commonplace constraints, but when combined in such a way that negotiating them becomes difficult or, moreover, when they are displaced to the trapeze, the resistance to them is transformed into a spectacle of dexterity. Whether by combination or displacement, normal actions are converted into remarkable constraints.

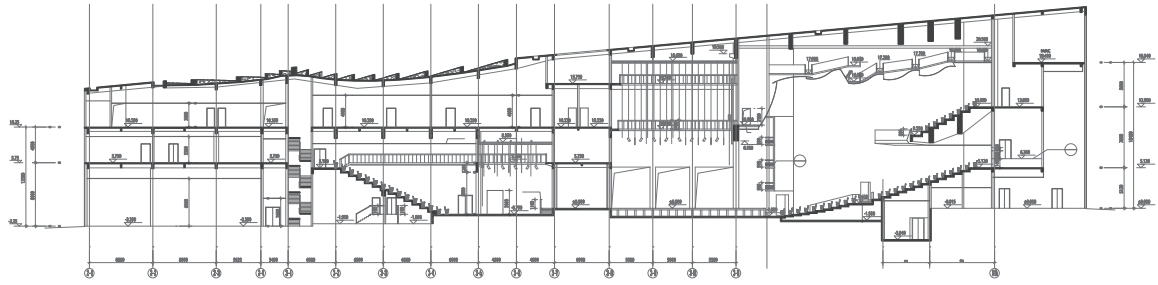
In order to be deemed specifically performative, architecture must operate like an acrobat who transports the constraint of gravity into the air in order to problematize his act, or who multiplies the number of actions he performs at once, or in the most extreme case, does both. To justifiably attribute performativity to architecture, there must be a level of virtuosity that exceeds function either by displacement or by overcoming multiple constraints simultaneously.

While it is true that a structural gesture like the cantilever can be performative from a limited functionalist's point of view, an architectural performance it does not make. Structural engineering is but one of the constituents that can produce performativity. The aspects of architecture that emanate from engineering would need to become entangled with a wider scope of problems such as the limitations of a site, program, sequence and circulation, provision of services, and the more encompassing problem of geometric form.

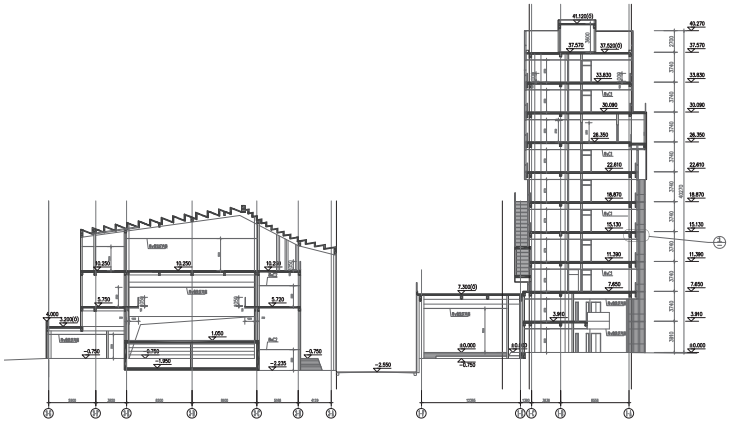
Geometry has the uncanny ability both to be a constraint and to manifest the remarkable combination of other constraints. When a building tries to assume a particular shape according to the constraining laws of geometry and to choreograph all the aforementioned constituents while accommodating normal functions, it endeavors to be performative. Behaving in this way, geometry becomes for architecture what the laws of physics are for the acrobat.



Sections



Section

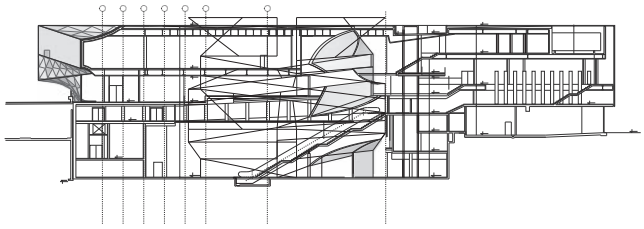


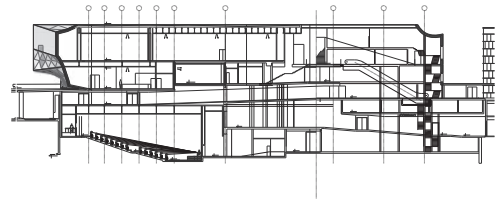
Section

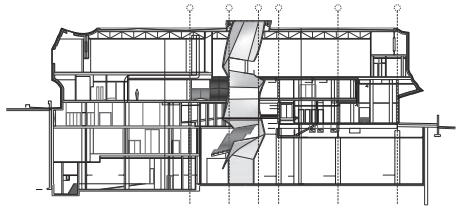
Nanjing University Student Center, Xianlin, 2007–2008
This building offers a singular expression of the tension between two opposing paradigmatic forms of symbolic and programmatic significance for a new campus: a curving roof that assumes the form of an extended landscape and a tower that performs as a beacon and observation point. It is at once an umbrella that unifies diverse activities and a centralized object that singularly dominates the campus. Derived from a continuous spine curve, the figure of the building is parceled into a series of hyperbolic paraboloids, the ruling lines of which become reinforcing beams. As such, the roof creates the effect of a remarkable, variable form, despite the logic of regularity that underlies its economy of means.

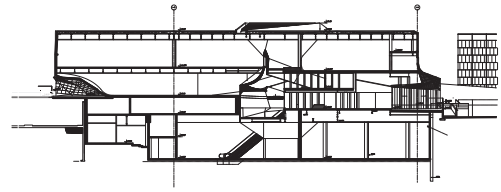
Tel Aviv Museum of Art,
the New Addition, 2005–2011

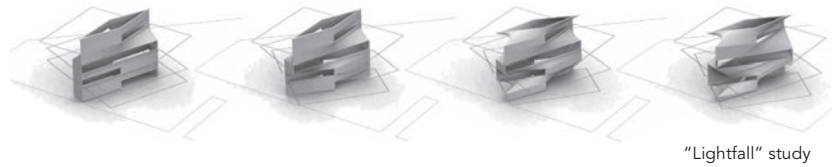
The new building for Tel Aviv Museum of Art represents an unusual synthesis of two opposing paradigms of contemporary museum architecture: the classic white box museum that provides an optimal arrangement for curatorial flexibility, and the museum of an exceptional form that produces a space of social spectacle. This balancing act is performed by a series of orthogonal galleries and structural systems aligned to different axes, stacked one above the other and connected by a continuous space of promenades and event spaces. The whole ensemble is unified internally by the "Lightfall," a spiraling geometrical device akin to an enormous, inverted lantern of a Baroque dome, which reorients visitors and reflects light down to the lowest reaches of the building.



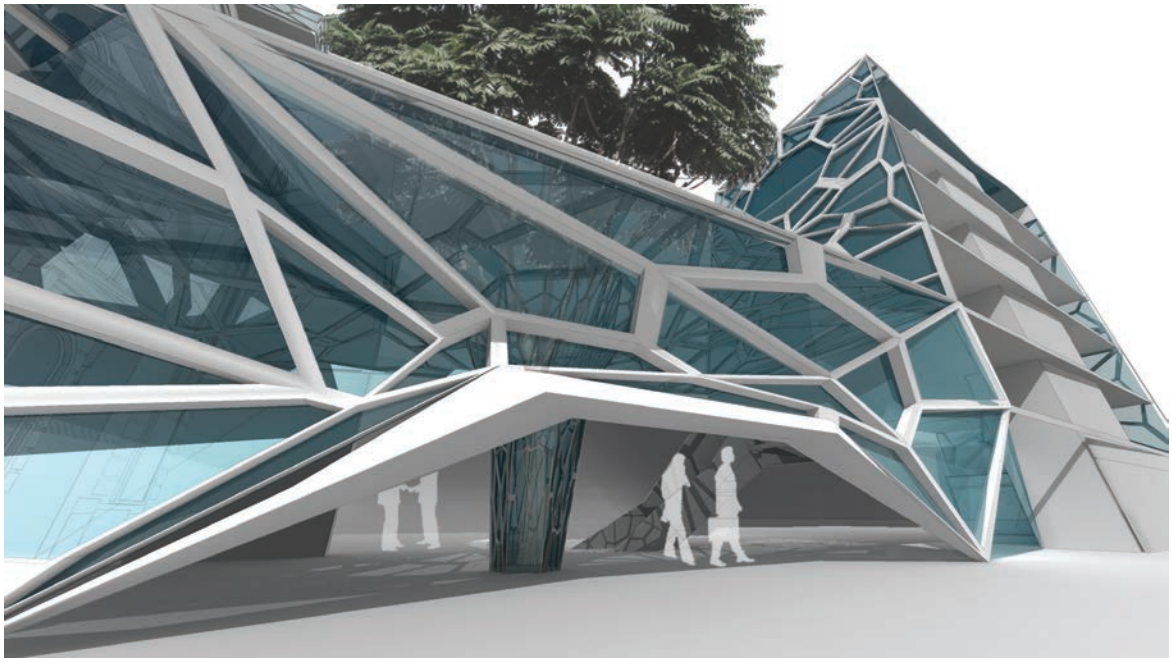


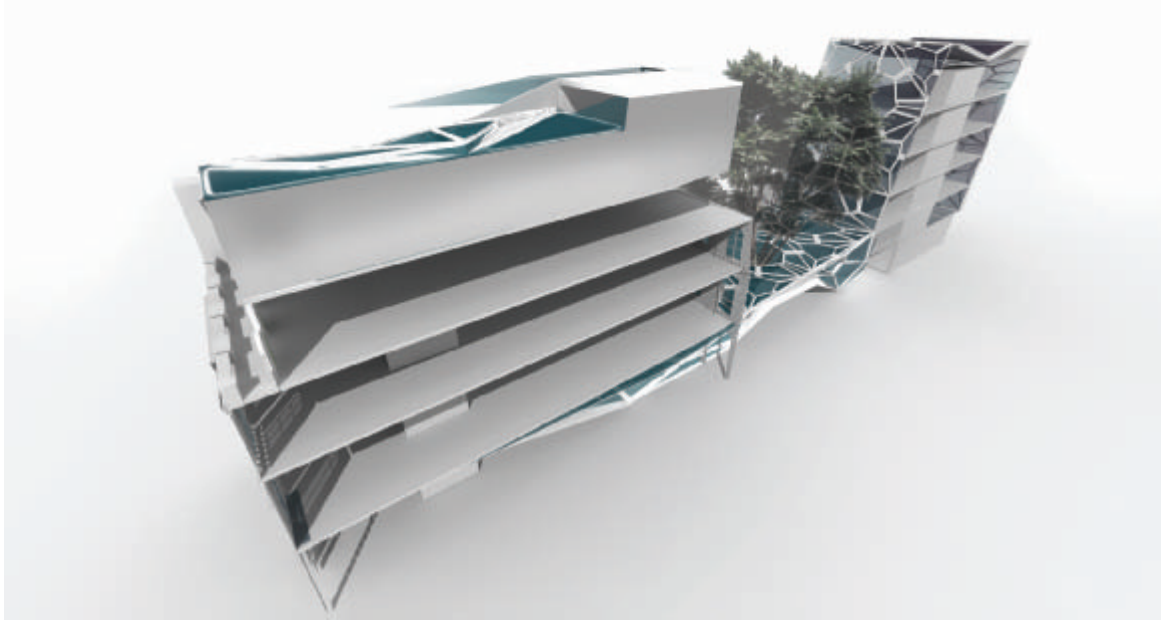






"Lightfall" study





Brussels Townhouse, Brussels, 2007–2008
Smart Skin – the townhouse has a structural glass skin with a pattern created by subdivision surfaces. This glass layer folds over a new commercial space in the (green) courtyard and consequently wraps up and over the new building, which incorporates a new commercial space of six floors. The suppleness of the skin becomes the binding element to connect existing and new spaces.

CHAPTER THIRTEEN

Archi-Tectonics

MEANING-FORM: A PERFORMATIVE ARCHITECTURE / WINKA DUBBELDAM

> The first real challenge lies in the statement and creation of problems (the right problems), the second challenge lies in the discovery of genuine differences in kind; the third, [in] the apprehension of real time.
>
> (Gilles Deleuze)[1]

MEANING-FORM

THE UNDERSTANDING OF architecture as "meaning-form" departs from the tradition of architecture as style into a new concept of architecture as process. While architecture has often expressed a formalistic, mechanistic way of thinking, we at Archi-Tectonics are interested in a more organismic approach that emphasizes dynamic system-building. Major technological developments in the past century have instigated extreme cultural shifts. While new forms of transportation and media dramatically changed our general worldview, the introduction of digital generative design in the early 1990s opened new possibilities specifically in the development of three-dimensional form. We further evolved these potentialities through performance-driven design, which learns from the behavior of organisms. An organism is described as a total hierarchical assemblage of systems. A super organism refers to a unit of many individual organisms working together as a single functioning body. Therefore the basis of the organismic paradigm is the notion that an organism is characterized by its immanent patterns of organization. These organizing phenomena occur on all levels: not only in nature, but also in social and political systems. Ultimately this notion is reflected in the spaces we create.

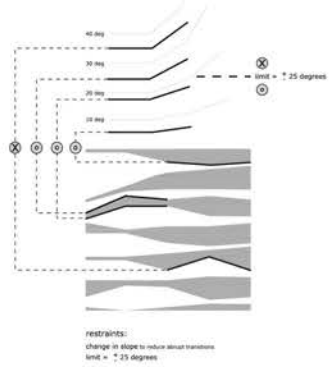
BE CURIOUS

THE NOTION OF the "right" problem as discussed by Gilles Deleuze prioritizes concept-development over problem-solving, curiosity over absolute knowledge, and immediacy over stasis. This investigative approach has been the red line through the research and design conducted over the last decade at Archi-Tectonics. The work can be described as an open network, a network of projects linked through three fields of investigation: interface (urban data), surface (smart skin), and armature (smart space). These fields are not isolated, but rather create a synthesis of interests that overlap and inform each other and afford a rethinking, re-investigating, and regenerating of architectural concepts. The focus is not on form but on the performative, not on aesthetics but on intelligence. Helene Furján further elucidates in her essay, "Inside the Matrix: The Work of Archi-Tectonics".[2]

The work of Archi-Tectonics is generated through the deployment of three different typologies of matrix: armature, smart skin, and interface. Each of these organizers operates as a mechanism for "associative parametrics": the feedbacks that link component assemblies in responsive feedbacks, and that link built organizations – bundled component assemblies – and their context or environment.

Q Tower, Philadelphia, 2008, mixed-use building
The Q Tower is a 24-unit tower, which has been developed as a "smart" tower, with integrated systems reactive to its inhabitants.

The collaboration with the MIT Media Lab is aimed toward developing the tower as a "learning" structure. Furthermore, each unit is designed to be different; algorithmic rule sets allocate room type and variation based on programmatic relationships, transparency percentage, and change in transition angles. The FTF (file-to-factory) method was used so that computer-driven equipment manufactures components directly from the parametric software.



FORM-FORMATION

ARCHITECTURE BY NATURE is a slowly evolving profession. Mathematics, already by the mid-nineteenth century, understood that absolute values are relative to the "phase state" of the object, as developed in topological deformations and higher-dimensional studies. Mathematical philosophy describes this process as "meaning-form." Edmund Husserl contrasted abstract, ideal geometries or "phoronomic shapes" with shapes derived from the surrounding world, "formations developed out of praxis and thought of in terms of [gradual] perfection."[3] Yet phoronomic shapes are generative in character (phoron: a combining form meaning bearer, producer), and particularly interesting because they generate meaning-form. Archi-Tectonics used this concept originally to develop smart skins, which integrate various functionalities within. We then developed armatures, seemingly complex organic formations that are both formed by and reintegrate these functionalities. As an organic formation the armature criticizes the traditional hierarchical use of space, and instead transforms and guides it in a series of fluid zones.

Over the past ten years our research has focused on re-thinking, re-searching and re-evaluating the generation of these per-formative models. This refers to performance in the traditional sense – maintenance-free skins, low energy use and "green" structures – but even more to the creation of generative environments, where the boundary is blurred between industrial design intelligence and built form. Archi-Tectonics' systematic approach is described by Furján as "a need for optimizable solutions, intelligent relations between components, responsive adaptations of component assemblies to environmental or functional variation, and the development of new modes of fabrication and assembly as they are all demanded by the convergences of design and engineering disciplines in the wake of advanced digitization."[4]

FINALLY

AS ARCHI-TECTONICS WORKS through a series of design-research processes, we continue to hone in on the Deleuzian "right problem," allowing the narrative of the larger concept to inform the development of individual parts. Deleuze introduces the notion of Perplication, a state of Problem-Ideas in which the idea is the first principle of the theory of problems. The state of Problem-Ideas, "with their multiplicities and coexistent varieties, their determination of elements, their distribution of mobile singularities, and their formation of ideal series around these singularities," is not unlike the notion of "meaning-form" as discussed by Edmund Husserl.[5] These notions have informed and inspired our design-research as it evolved, and helped us develop innovative spatial constructs and organic modulations which exhibit intelligence, integrate performance, and anticipate spontaneous interaction.

Notes

1 Gilles Deleuze, *Bergsonism*, New York: Zone, 1991.

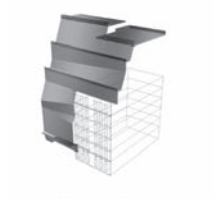
2 Helene Furján, "Inside the Matrix: The Work of Archi-Tectonics," in Yasha Grobman and Eran Neuman (eds.) *Performalism*, (Tel Aviv Museum of Art Catalogue), Tel Aviv: A.R. Printing, 2008.

3 Edmund Husserl, "Appendix VI: The Origin of Geometry," in *The Crisis of European Sciences and Transcendental Phenomenology: An Introduction to Phenomenological Philosophy*, David Carr (trs.), Evanston, IL: Northwestern University, 1970, 376.

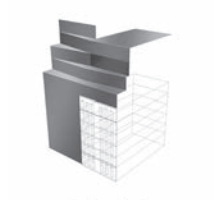
4 Furján, ibid.

5 Gilles Deleuze, *Difference and Repetition*, Paul Patton (trs.), New York: Columbia University Press, 1994, 351.

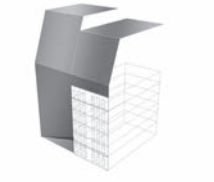
GW497 Project, Soho, New York, 2000–2004
The GW497 Project, Soho, New York City, uses code as a self-generative system. The building code is here re-interpreted; the vertical plane of the traditional façade is intersected by a diagonal surface, creating folds, balconies and set-backs. The angled façade's performance analysis resulted in the differentiation between the façade's intelligent components; the glass panels are bent in Barcelona and the custom-angled mullions are extruded in Hong Kong.



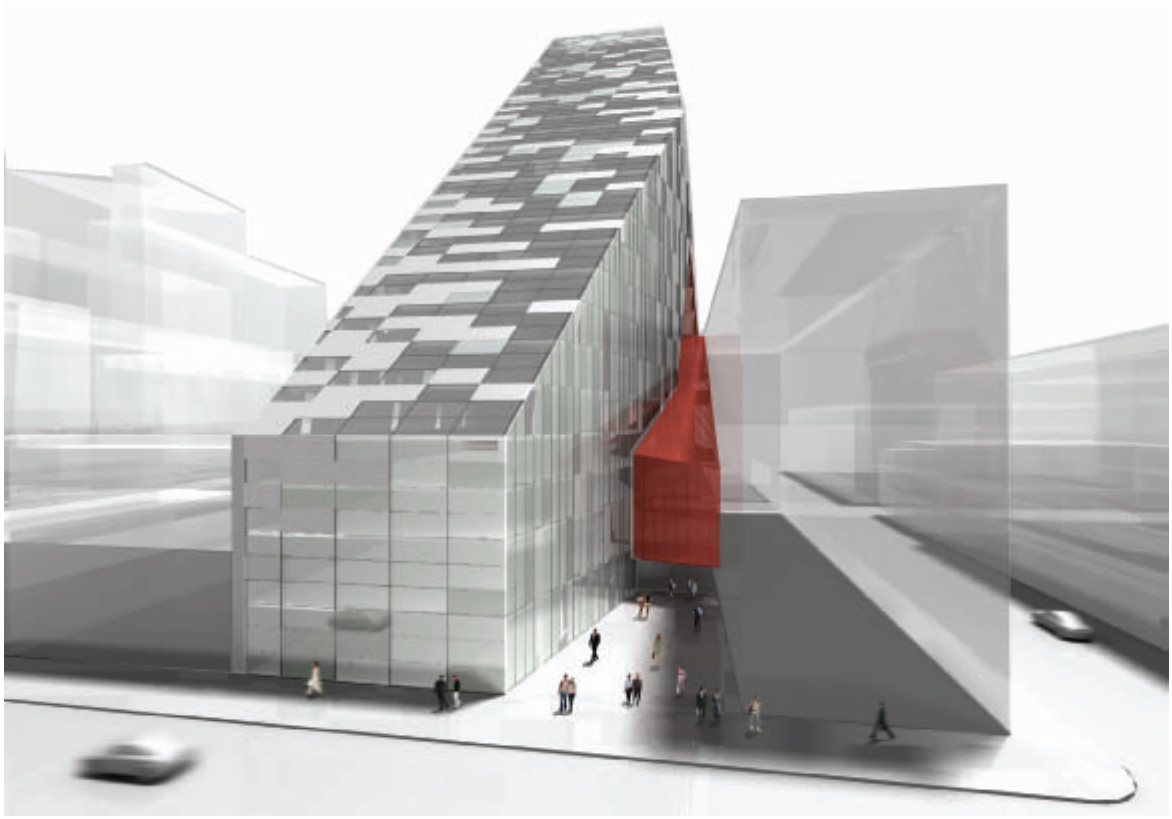
Inflection 2



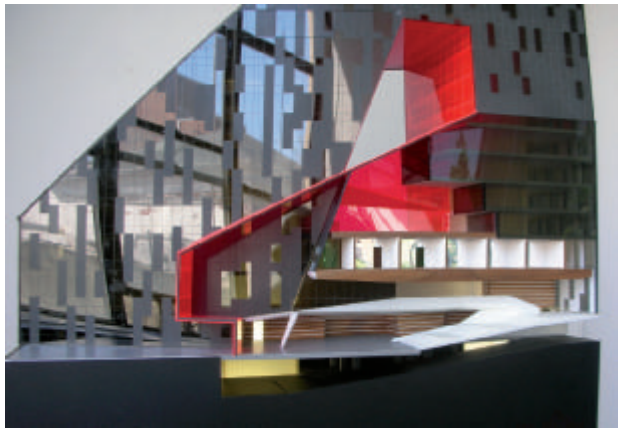
Setback variation

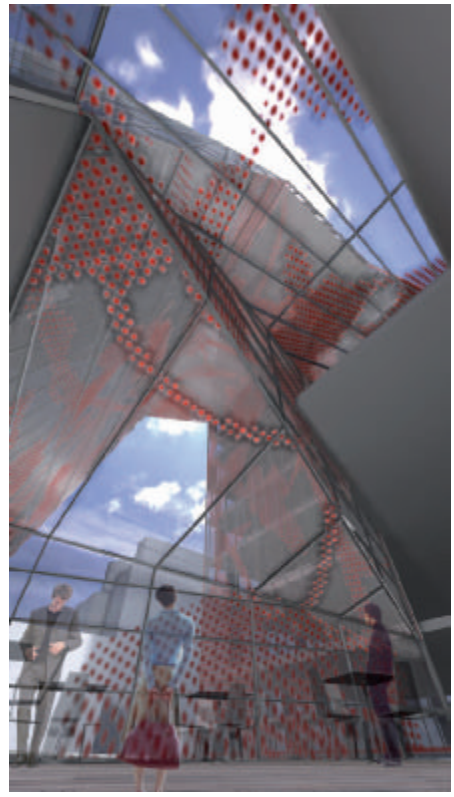


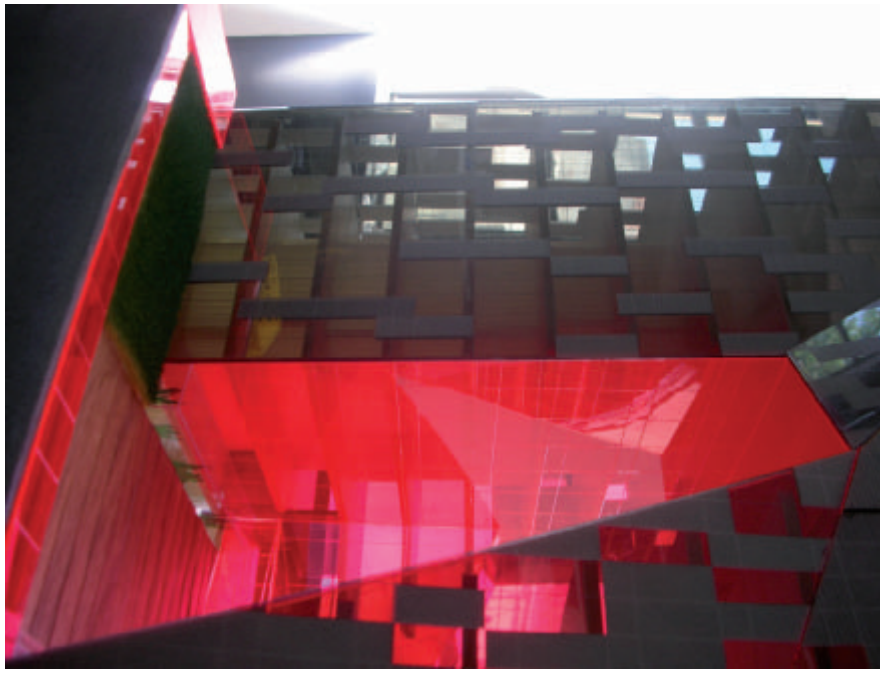
Sky exposure plan

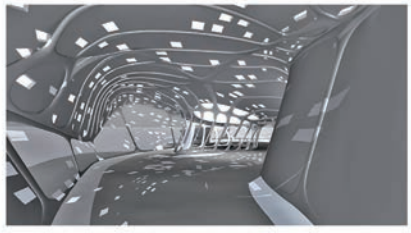


Chestnut Hotel and Condominium Tower, Philadelphia, 2007
The knot tower is a literal meeting and intersecting of several programs and spatial environments; a six-star hotel, condominiums with hotel service, restaurant and spa. Its "unwinding" shape creates an open area in the middle, a place to relax from the hectic life, with a terrace where one is surrounded by etched crystalline glass surfaces with the shimmering of the pools below.
The façades of the "knotted" structure are composed of a pixellation of glass and stone, similar in color, but different in texture and opacity.



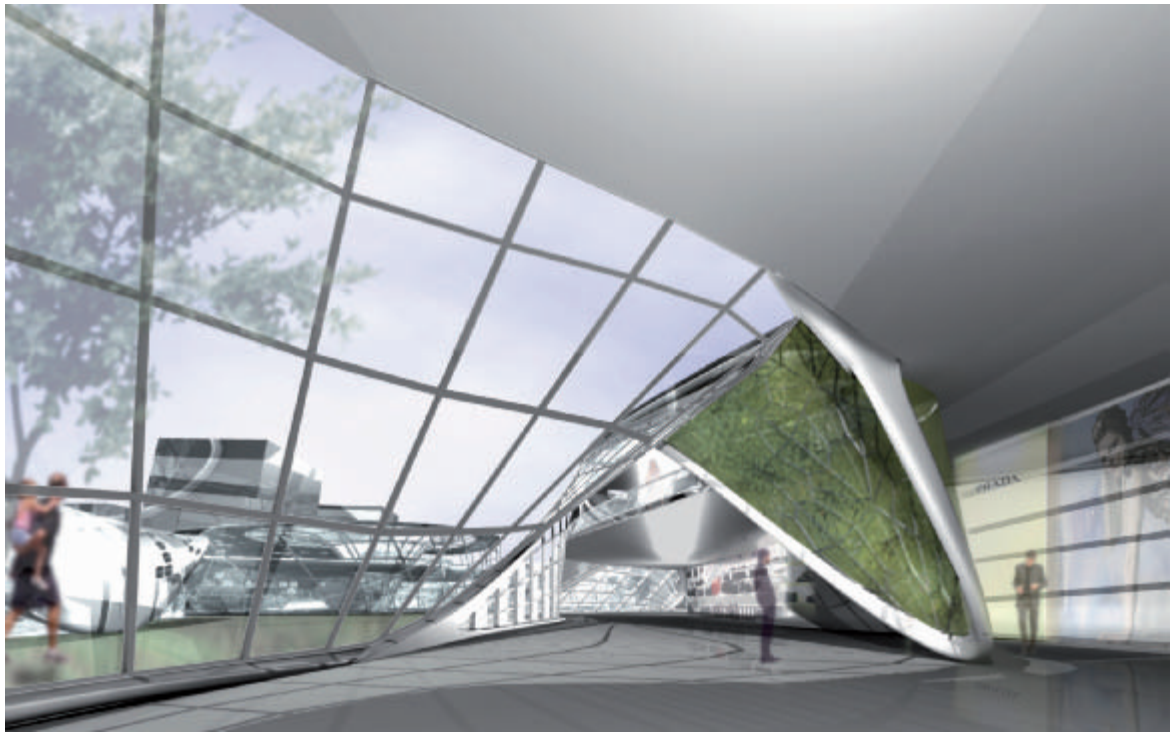


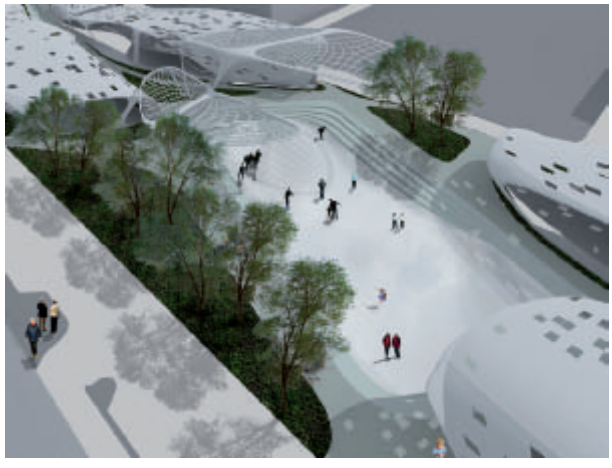


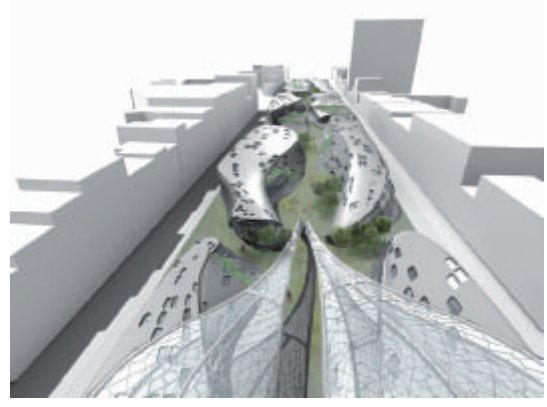


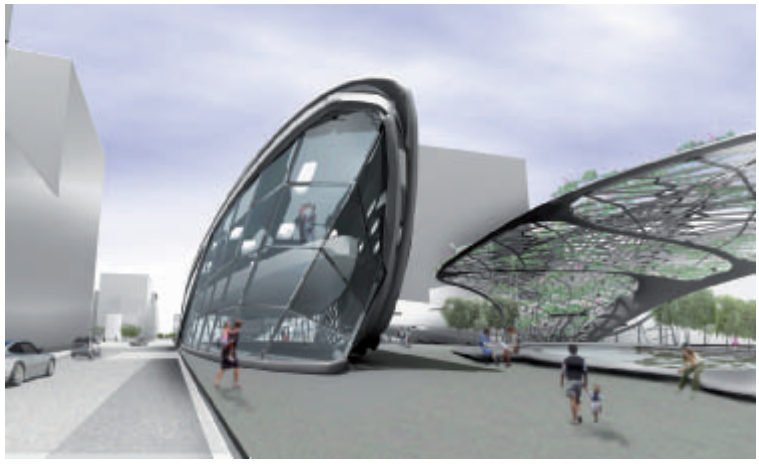
Envelope and structure concept

Smart Ecology: Shopping Brussels, Brussels, Belgium, 2009
The project consists of ten pavilions in a new park located on a tunnel under Avenue Louise in Brussels. The integration between the built structures and the park is based on a piece of music specially composed for the site. The pavilions, which function as greenhouses and shopping spaces, are self-sustainable, using solar collectors for energy and collected rainwater for the plants both inside and out. The structural skin of the building is a continuous concrete membrane, which incorporates all heating and cooling systems.

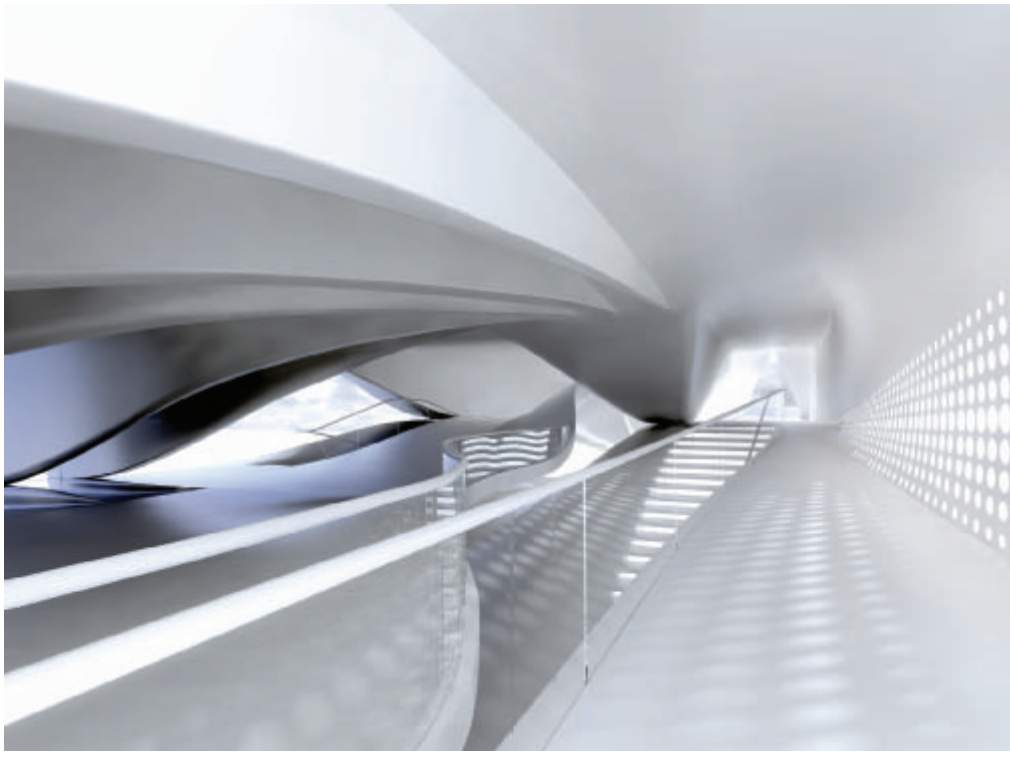


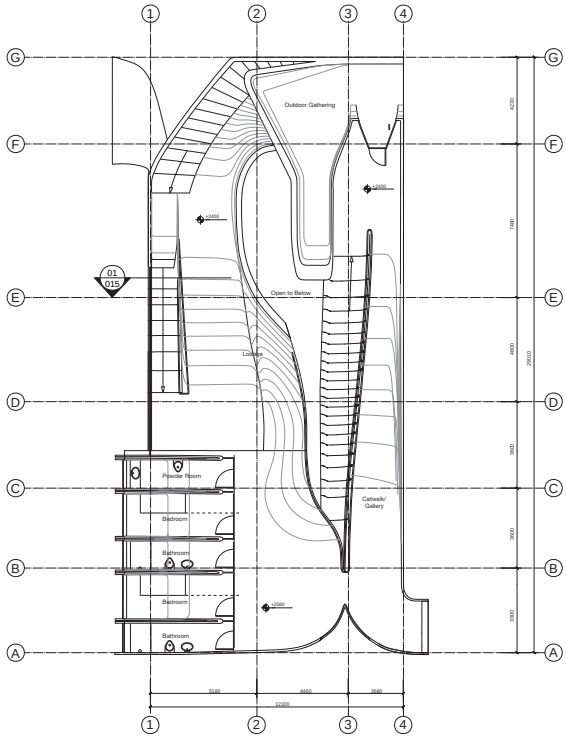




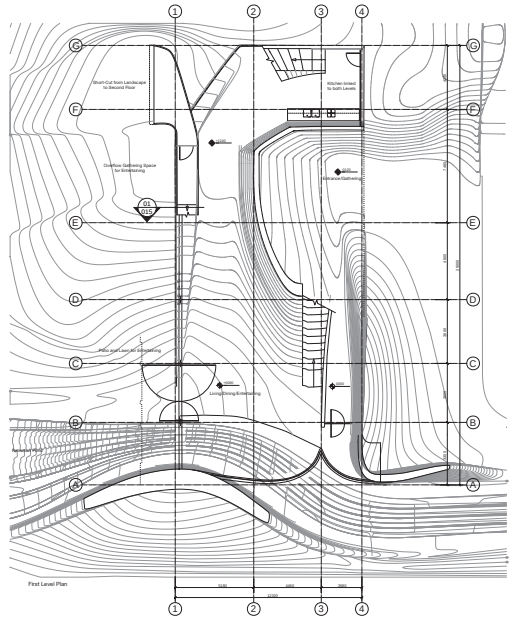


Roof plan





Second level plan



Ground level plan

CHAPTER FOURTEEN

Contemporary Architecture Practice

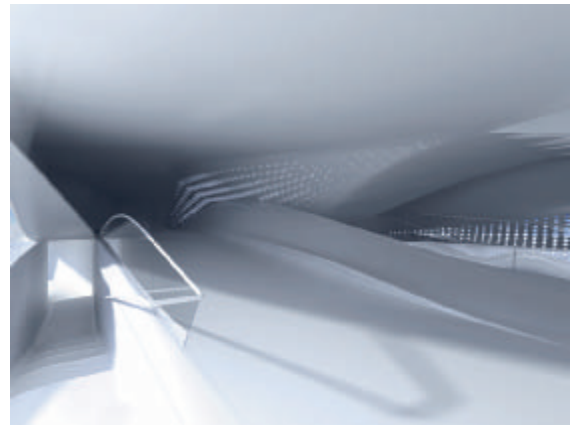
PERFORMANCE AND CONTEMPORARY ARCHITECTURE PRACTICE /
ALI RAHIM AND HINA JAMELLE

ARCHITECTURE CAN GENERATE cultural change by virtue of its ability to intensify and inflect existing modes of inhabitation, participation, and use. To accomplish this, architecture must be responsive, engaging in a relationship of mutual feedback with its users and contexts. In other words, it must contain performative affects – the capacity both to affect and to be affected. Affects differ from effects, which generally imply a one-way direction of causality: a cause always precedes its intended effect. Affects, in contrast, suggest a two-way transfer of information and influence between a formation, or work of architecture, and its users and environment.

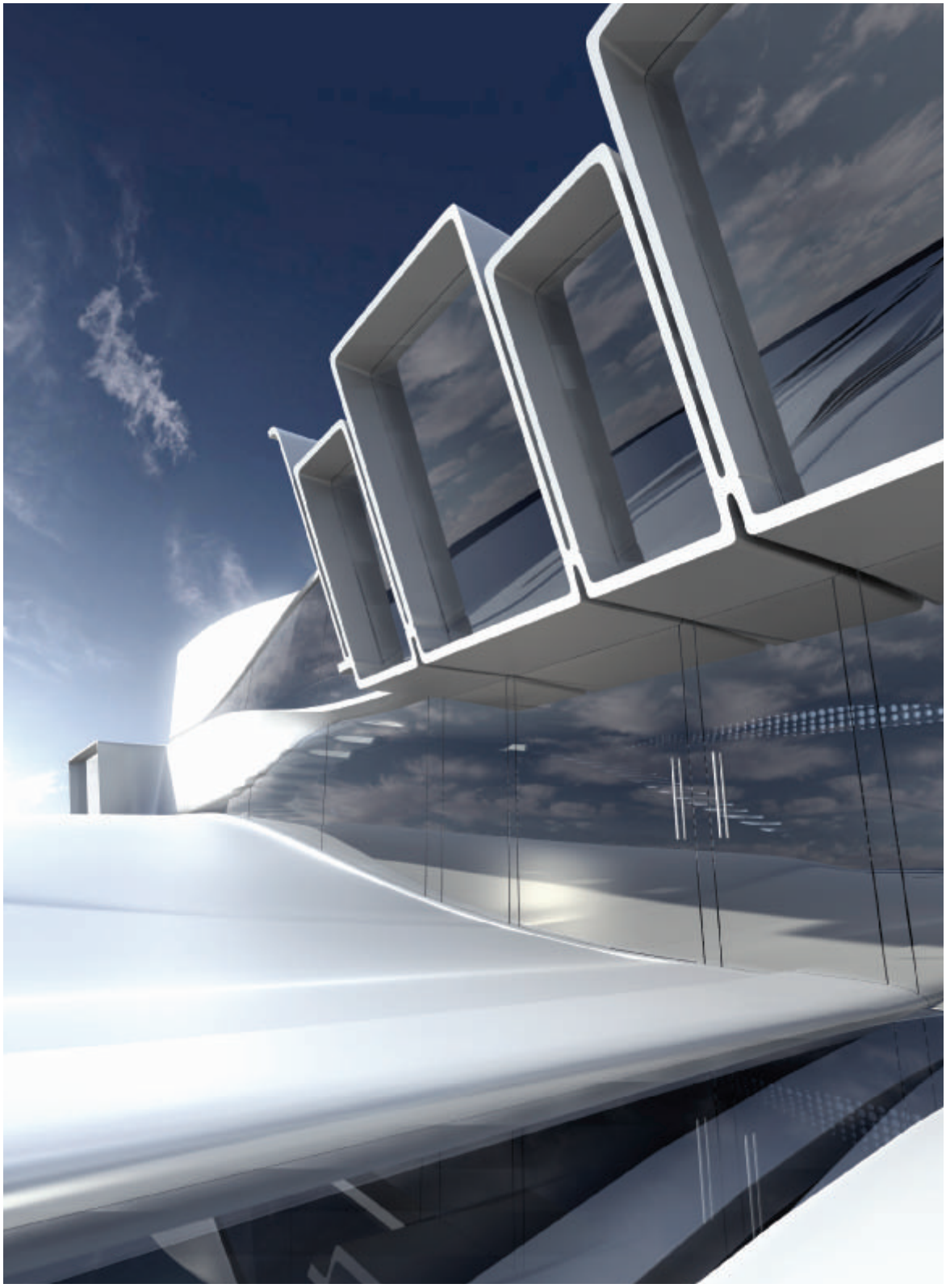
While all works of architecture arguably have performative affects, certain projects are more prolific than others. We are interested in producing affective formations – works of architecture that maximize their affects and hence their responsiveness to users and contexts.

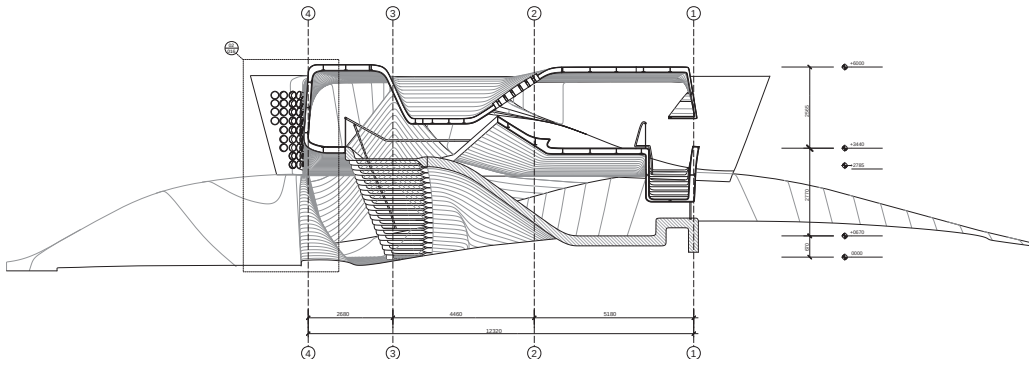
Affects, and hence affective formations, are generated through techniques. Once produced in the course of a project's development, affects can shape the technique itself and thus influence the final form of the object. To understand this, one need only think of a technique such as the application of paint to a surface: the deposit of pigment creates an affect that is embedded in the resulting differences in color and texture. This affect then directs and inflects subsequent strokes.

Although there are several ways to create affective formations, we use generative methods including dynamical systems with scripting and transformational procedures such as shape shifting. Temporal techniques contain elements of virtuality – a space of potentialities that can lead to the generation of unexpected effects. Affects form a crucial link in the capacity of the virtual to instigate new outcomes and behaviors in users. There are specific instances of the



Fashion Designer Residence, London, 2002
A weekend home for a fashion designer explores different event-based temporal cycles for the client's lifestyle that ranges from relaxing to frequent corporate entertaining, including preview shows of the designer's seasonal collections. The public areas have surfaces designed for maximum programmatic use inflecting the topological surface to allow for many different activities to take place – eating, lying down, sitting, catwalk viewing, reading, etc.





Cross section

virtual. Using techniques that consciously highlight the role of the virtual therefore increases the likelihood of producing an affective formation. Virtualities, and hence affects, develop under specific conditions of temporal techniques: in dynamical systems and scripts, affects arise in the differences between rates of change in pressure trajectories, while in transformational procedures, affects emerge from the interaction between pressures applied directly to an object and the object's own material resistance . In both cases, the greater the differences in the pressures, the greater the degree of transformation in the surface or object. And the more intense the transformations, the more affects are contained within the formation. Affects are embedded in the formal properties produced by transformations generated as part of temporal techniques – for example, elongations that result from stretching, bent surfaces created by folding, and openings caused by tearing.

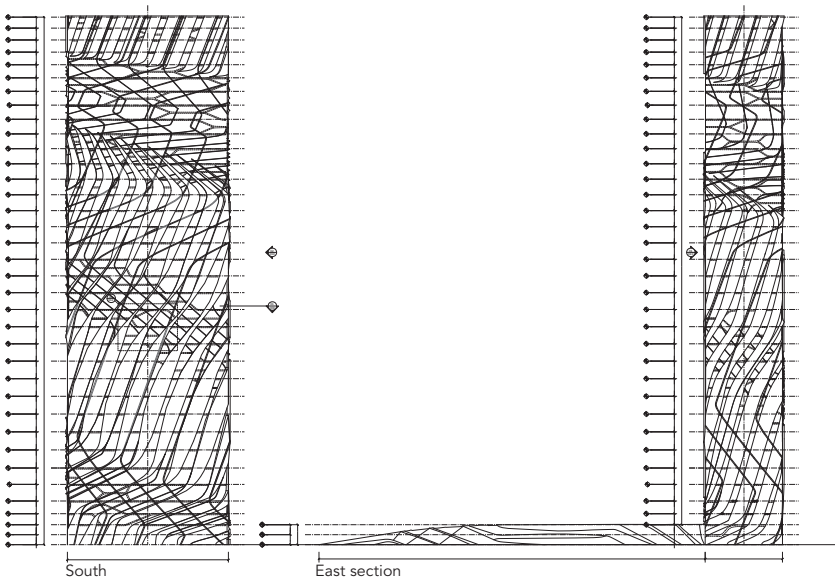
Each transformation generates multiple affordances – specific properties of a formation, that indicate how one can interface with the formation.[1] The empty space within an open doorway is an affordance: it indicates the possibility of moving across the threshold. Affordances are essentially all the "action possibilities" latent in the environment; they are objectively measurable, and exist independently of an individual's ability to recognize those possibilities. Affordances activate the affects produced through temporal techniques.

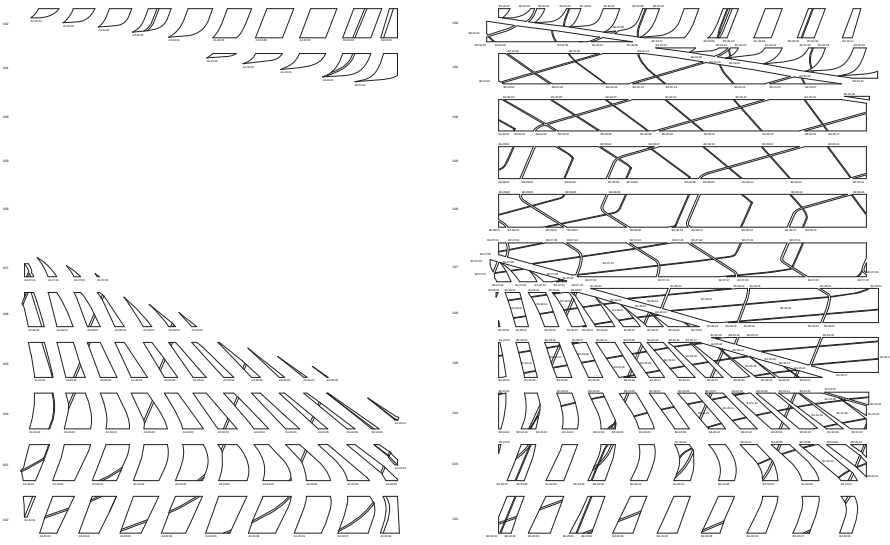
Affective formations enable and encourage individuals to form new kinds of connections with spaces. Because they are produced from intense processes of transformation, affective formations often present unfamiliar landscapes to users. Affects within the formation cause users to sit, walk, or sometimes engage in less prosaic activities. Each individual can be said to contain his or her own affects, which interact differently with the affects contained in the formation. As each person responds uniquely to a formation, he or she activates certain affordances within the object. His or her behavior then influences the reactions of adjacent users.

Context also plays a crucial role. An affective formation placed in the environment of a museum may give rise to one kind of reaction: visitors may assume it is a piece of artwork and stand at an appropriate distance. The same object placed in a nightclub will likely inspire entirely different responses and uses. A formation set in the countryside will generate different interactions than if it is placed in the city. The goal for the designer is not to fully comprehend and control all the complexities of affects and affordances, but rather, to inflect formations with affects, coaxing forms and occupations in useful directions.

Note

1 The concept of affordances was first introduced by psychologist James Gibson in 1966, and later explored more fully in *The Ecological Approach to Visual Perception* (Mahwah, NJ, [1979], 1987).

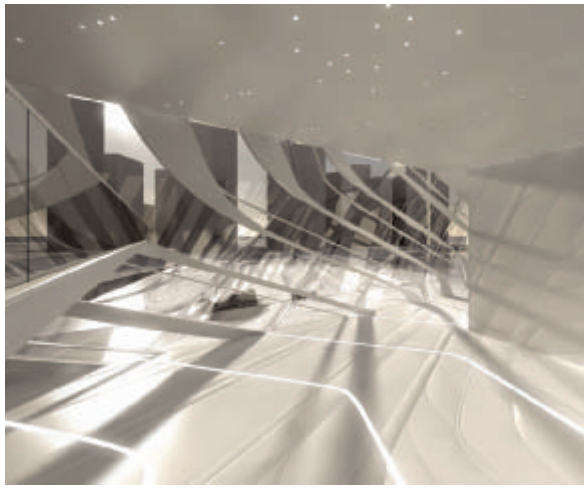


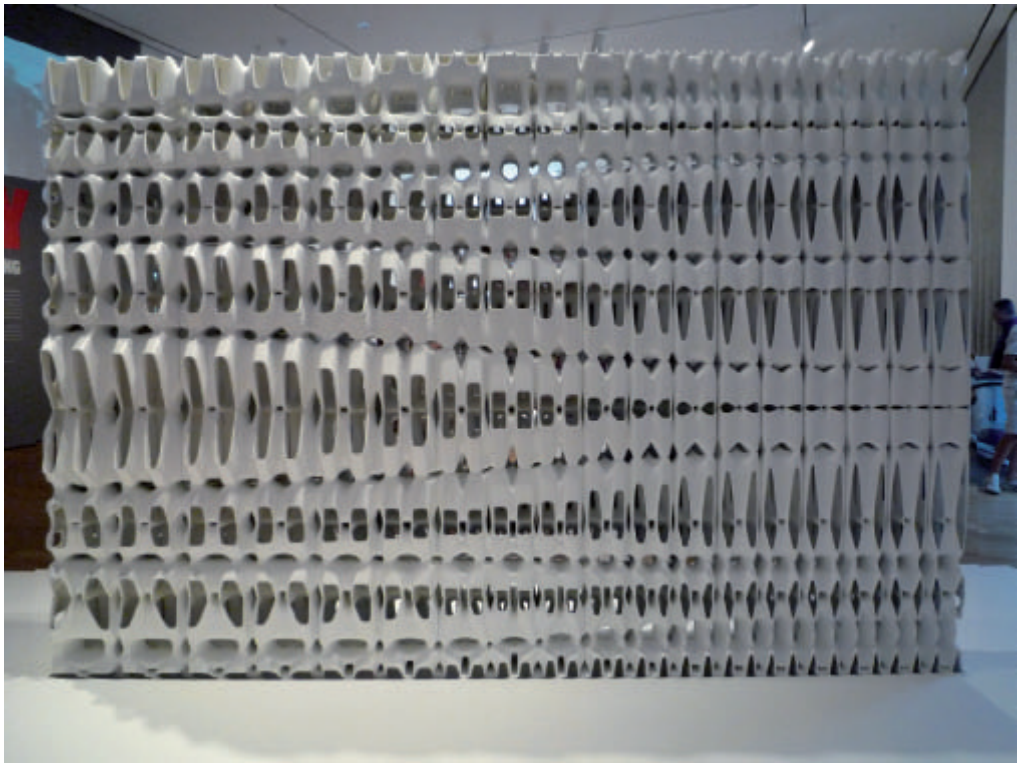


Façade pattern detail

Commercial Office Tower, Dubai, 2009

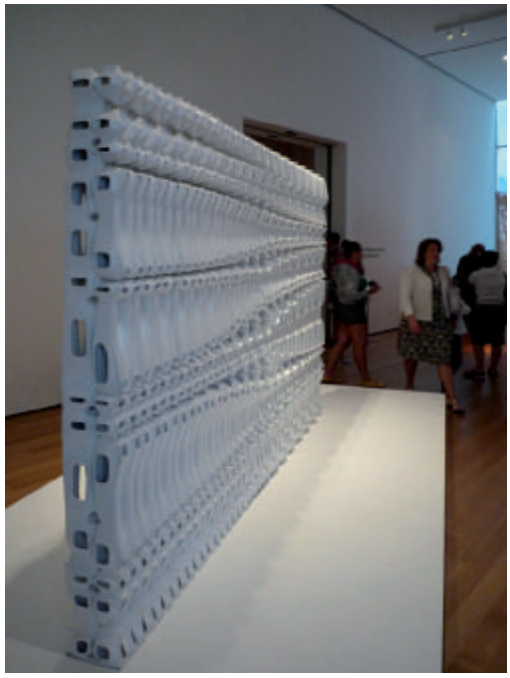
A 463,000-square-foot, 35-story, 150-meter commercial high-rise is located in the commercial marina district, which is part of a larger ongoing land reclamation project. Through formational variation and circulation strategies, the project escapes a singular spatial hierarchy that distinguishes organizational structure from employees. Within the project envelope, the material transformations between concrete and glass modify the effects of lighting on the interior so that each space affords distinct and varying psycho-social conditions.

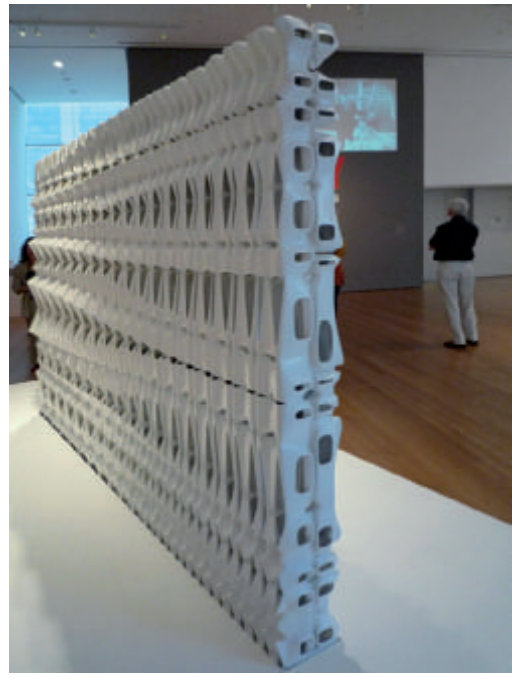


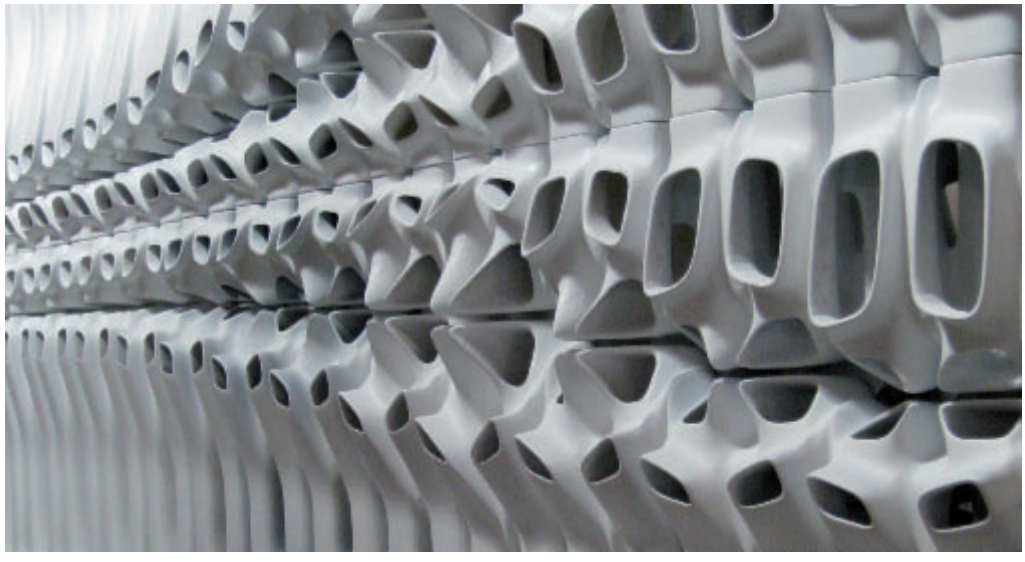


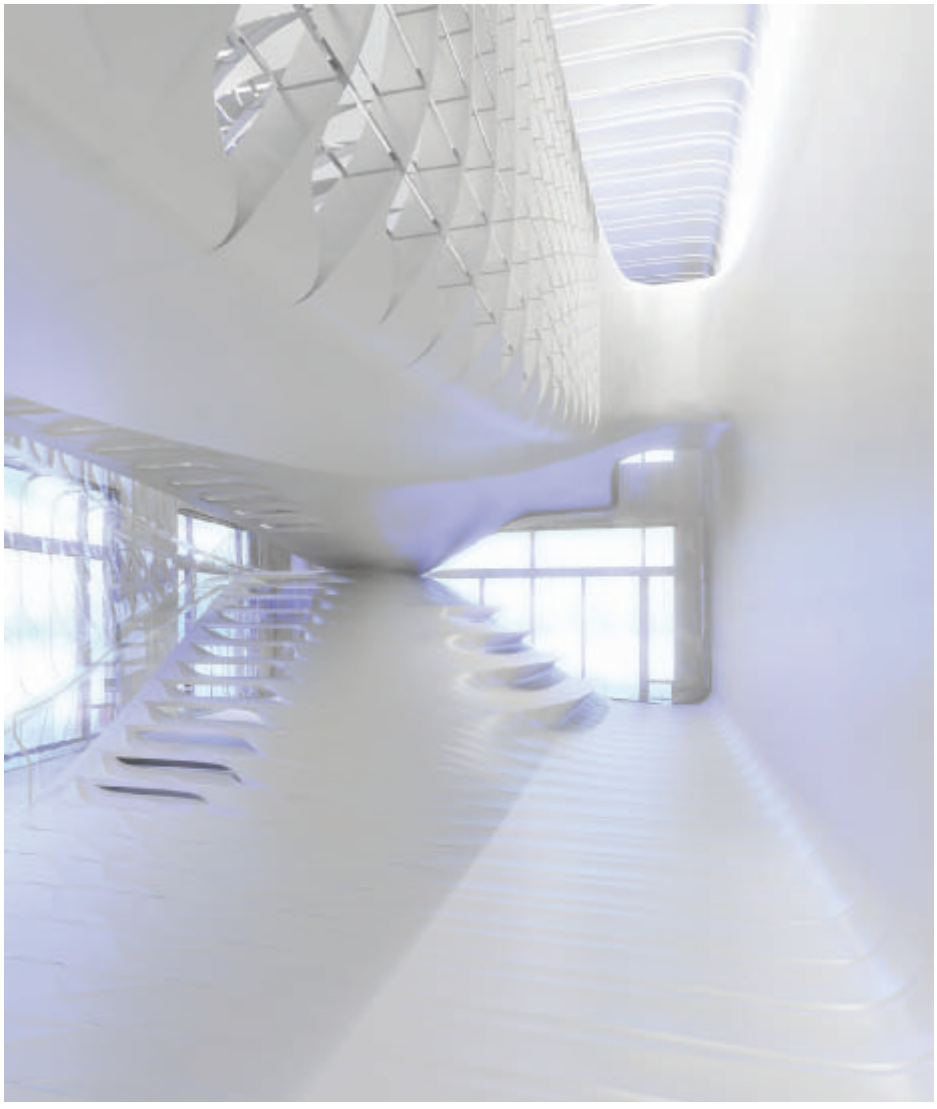
Migrating Formations, New York, 2008
The wall uses the latest robotic manufacturing techniques and reveals the potential of future architectural construction. Space, structure and skin are incorporated in a single form.

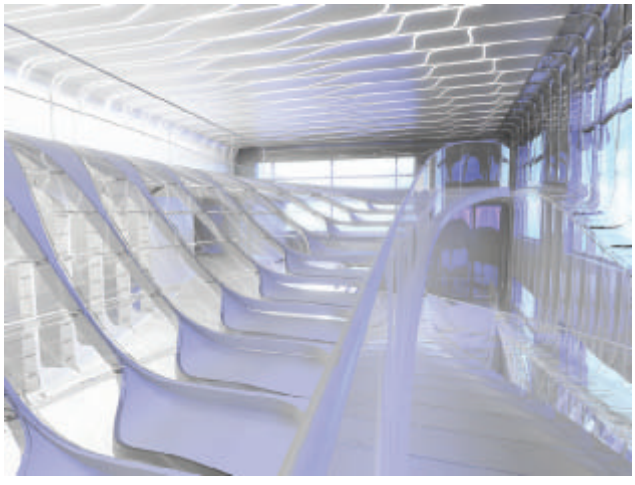
The formal variation of "Migrating Formations" responds to light, shade, opacity and structure. Each side of the wall produces different qualities – from bulbous to angular features. The integration of these qualitative differences is controlled with the desire to develop the greatest sensorial affect while yielding an elegant aesthetic. The wall was designed to achieve two specific things 1. to show the future of digital technology, by robotically constructing the entire wall without formwork, molds, fasteners and connections and 2. to develop the maximum amount of variation (formal, spatial, opacities) on both sides of the wall (which are different) yet maintaining our desire to yield an aesthetic sensibility of elegance.



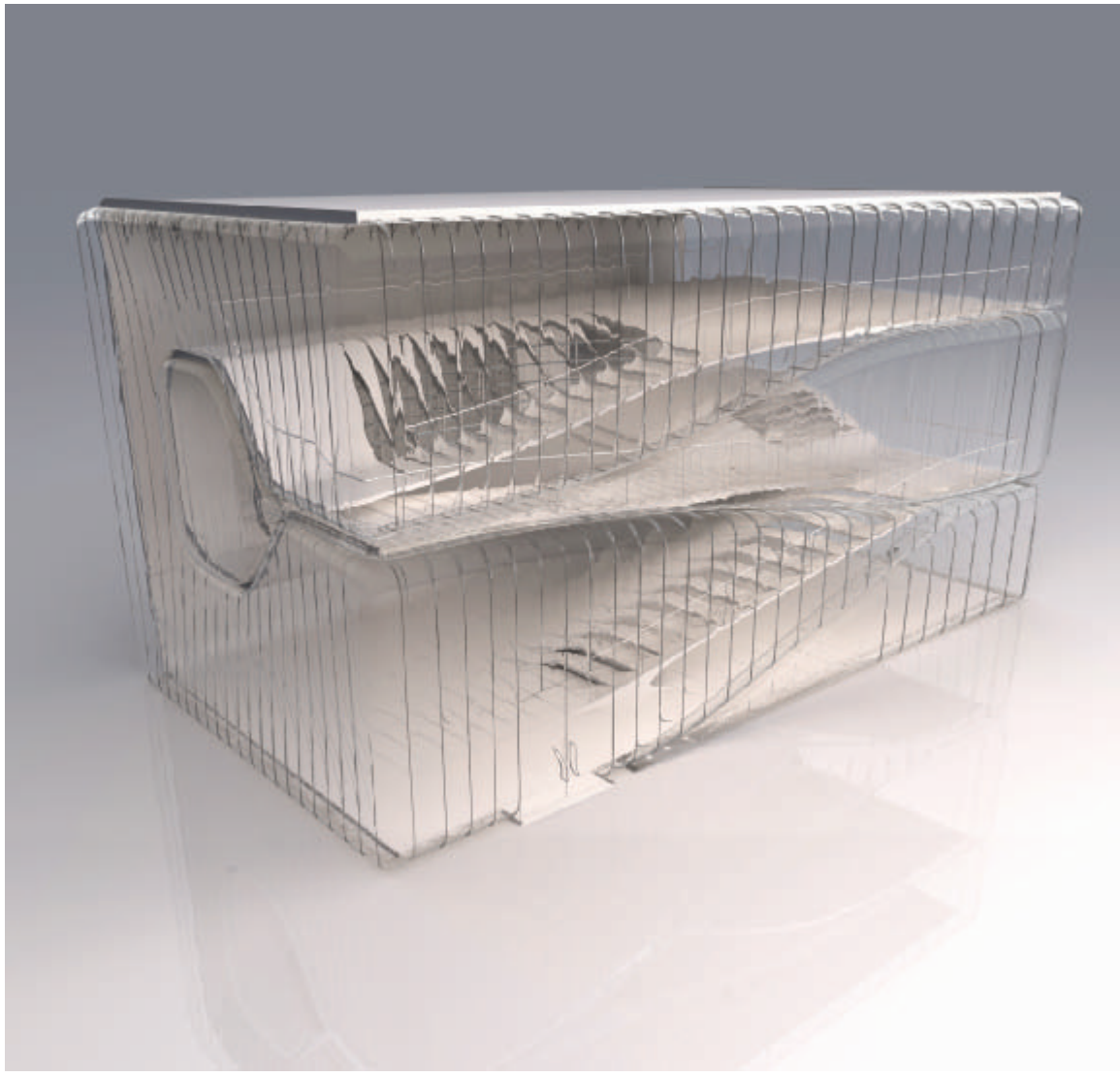


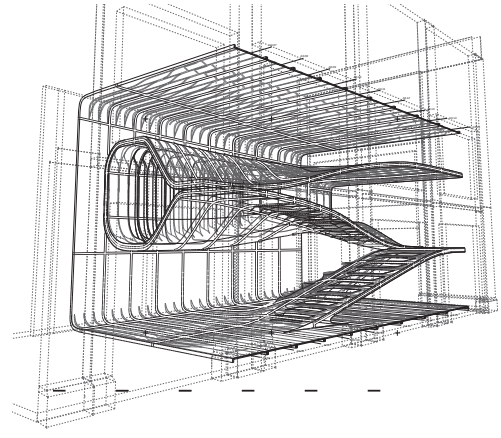






Reebok Flagship Store, Shanghai, 2005
A 10,000-square-foot flagship store for Reebok responds to the company's latest brand strategy: "Wear the Vector: Outperform." The goal for the concept store is to translate the Reebok brand to three-dimensional life. The vector has direction and force and is animated with time, capturing the full authentic potential of the vector. The vector transforms the form of the architecture, freezing the speed and path of motion through the interior space. The façade, section, floor pattern and lighting are all created by and respond to the vector.





Panel locations

CHAPTER FIFTEEN

R&Sie(n)

"(UN)POSTURES" / FRANÇOIS ROCHE AND ANNA NEIMARK

AN: Do you have a portrait to go with this interview?

FR: No! You ask if I have a portrait to go with the interview! For fifteen years now, we have censured our own portrait to represent R&Sie(n), we use an avatar. This digital hermaphrodite is not only a kind of fantasy or a coquetry; it's a strategy of de-personalizing. The avatar de-personifies the architect. It allows us to talk from somewhere else, not directly from "me." The identity of this character has allowed us to be as we want. I can lead my daily life without being a representation of what I am expected to be. It's a way for us at R&Sie(n) to detach ourselves from the fragile egotism of the architect.

AN: Do you see the avatar as a construction of a character, as in fiction?

FR: In a way. The character allows us to construct a schizophrenic identity that constantly changes its personality. There is an American movie from the 1970s, *Sybil*, about a girl with sixteen different personalities that offer her the possibility of being multiplied many times over. Schizophrenia is a strategy of *resistance*. *Resistance* is a term that I am borrowing from the French philosopher Gilles Deleuze. The tactic of using the multiple identity disorder allows one to speak from somewhere unpredictable using a language that is unpredictable and with an appearance that is unpredictable.

AN: Do you use the separation of the architect from his public representation as a way to create new modes of architectural narrative?

FR: Architecture is a tool for articulating narrative. It's not a final static product. In *Hybrid Muscle* we designed a little building in Thailand's countryside and we added an animal to animate the project. The albino buffalo labored in lieu of an engine to generate electricity that powered light bulbs and laptops. We were interested in designing the animal into the architecture. So what was in reality a staged performance seemed traditional in this countryside setting. It looked like a ritual that blurred the boundary between the modern hygienic building and the animal that made it dirty. So the

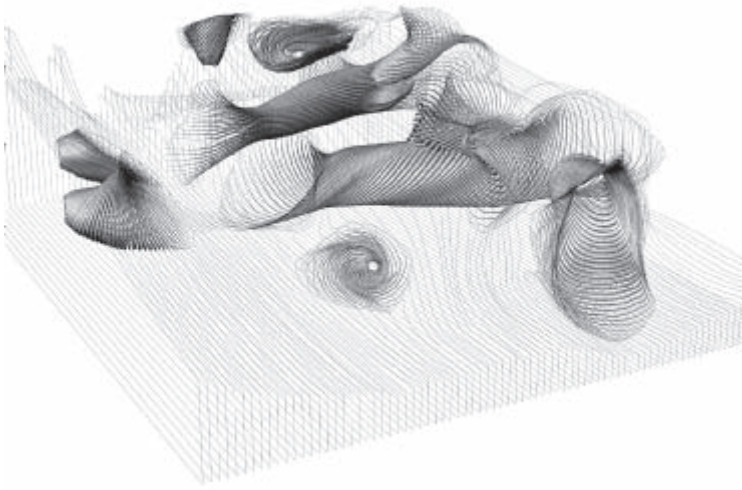
He shot me down, Korea, 2006–2007
This is a museum project located in front of the military zone, in the demilitarized zone of Korea. It is emerging from a ballistic and paranoid situation, where the Cold War is still active. The parametric impact developing porosity and traceability is shooting on a green extension of nature, including a "witch machine" bringing on its back the decomposing biomass/bio-grass/bio-leaves to plug the rotten insulation substance on the external façade of the square protuberances.

animal was constantly shitting and stinking, but it was also producing electricity. We could have put a photovoltaic cell in place of the animal, but it was more interesting to create this uncomfortable relationship. And in the end, the juxtaposition of the animal and the building did not appear exotic; the ceremony seemed to be totally normal in the local situation.

AN: In addition to the narratives in your projects that you call "scenarios" or, in this case, "ritual," you introduce digital scripts that also structure many of your architectural decisions. Are the scripts complementary or contradictory to the narrative-based scenarios?

FR: Any algorithm has a fundamentally linguistic dimension. For instance, how could I ask my mother to buy two baguettes, if I add a little bit more to also get some candy without scaring my mother on the real price of the baguette?

This childish problem is an algorithm, but with a non-deterministic approach, with a fuzzy logic. This is not so far from the French philosopher



Alain Badiou's rewriting of the tale of Bluebeard through mathematics. Badiou uses algorithms to develop a strategy that articulates subjectivities and fuzzy logic through the theory of belonging. Bluebeard and his five wives constitute a global system that cannot be reduced to the addition of any particular relation between the monster and its five victims. The assembly of each element in this closed system is greater than the whole. The addition of indeterminacy to the choice of the next victim cannot be described by a probabilistic approach that considers the sum of its parts. In other words, $\Sigma Fx < \cap Fx$, if Fx is the relational function between the monster and each wife.

AN: Are you treating the digital script as a verbal act of communication?

FR: Not quite. We do not say "if, then, therefore" all the time; we mostly settle for "maybe" or for "perhaps." But it is difficult to integrate "maybe" and "perhaps" into computational language.

AN: The "maybe" and the "perhaps" are conditionals that can destabilize a script. Can you invite unpredictability, the "maybe" or the "perhaps," into your digital inputs?

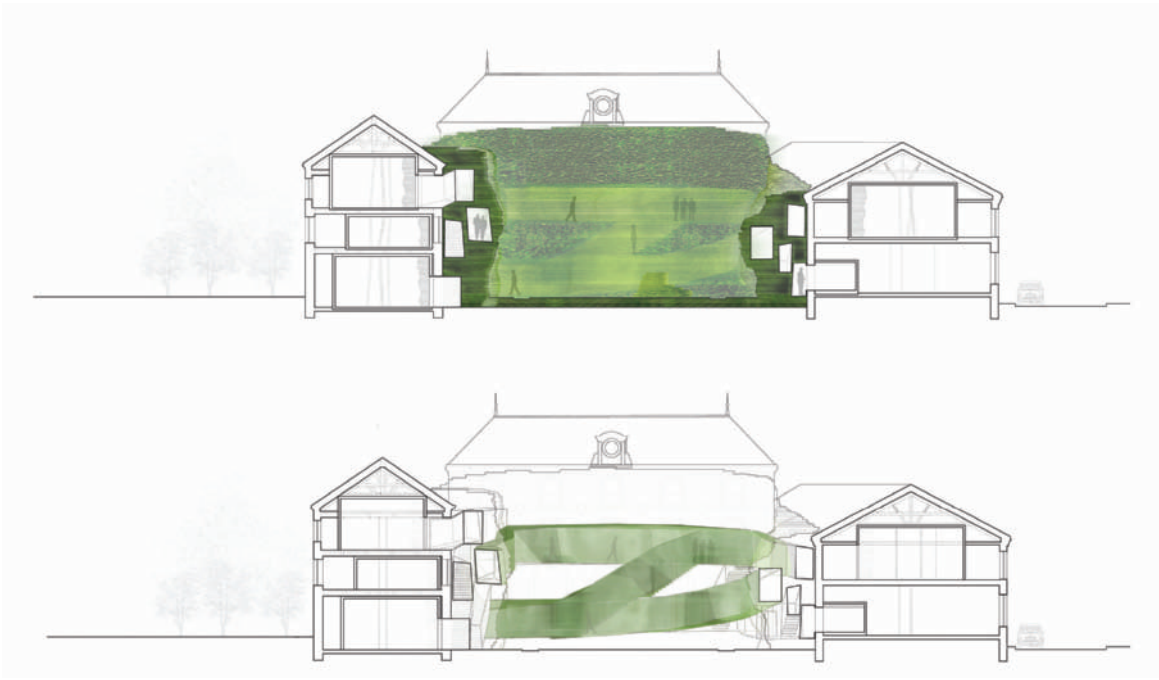
FR: It all depends on the input that drives the machine. Is it purely an input of trajectories which are totally predictable, totally computational? Or can we integrate a strategy of conflict into the script, a strategy of disruption into the linear process? For example, in the 1920s, Maurice Maeterlinck conducted research on the morphology of the termite mound. He discovered that termites, which are blind, need to construct and deconstruct their mound in order to constantly regulate the temperature in the queen's chamber, to keep it at equilibrium, thereby ensuring the reproduction and the survival of the termite community. So the termites constantly close the door or open it to bring in fresh air or to isolate the chamber according to the outside temperature. Depending on the position of the sun, day after day, they modify the position of the chamber using a kind of phenomenal GPS. They smell themselves; they smell their own trajectories and redefine their position or the conditions in which they are working. And because they are opening and closing the door all the time, the direction of the wind inside the mound is constantly changing. Of course, their pheromones are incredibly sensitive to the wind, and so the termites constantly struggle to redefine the zero point of their GPS, to regulate their own position. They construct something that modifies the way they position themselves. This conflict produces incredible structures constantly reorganizing the shape of the termite mound because its construction can never be stabilized by a predictive design. It's always a work in progress.

AN: You would need to collaborate with a termite to destabilize your own inputs! Your proposal is that machines can be imbued with intelligence. Could you describe what you mean by the *skyzoid machine*, a term that appears frequently in your lectures?

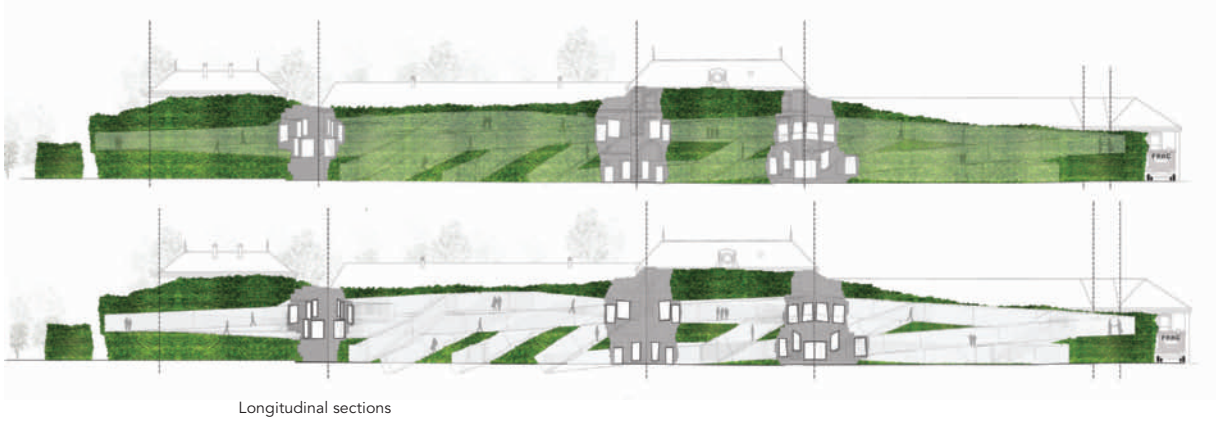
FR: Our concept of the *skyzoid machine* is based on Marcel Duchamp's "Bachelor Machine". It's a machine which is not cybernetic. In other words, it's a machine that does not define itself only by its efficient mode of production. The *skyzoid machine* pretends to do something while doing something else, thus creating a confusion about the degree of its functionality, the extent by which it belongs to science. Immediately, it questions the limits of the technology and its place in production. So the machine actually participates in creating a blurriness.

AN: Do you mean that even the machine participates in the production of culture?

FR: Yes, the machine's role is not to simply produce something in the phantasm of efficiency. The machine is both a freak and an operating system at the same time. We try to introduce an unpredictable behavior, or a fuzzy logic, to explicate the confusion between what "they" pretend to do and what "they" are actually doing. In other words, the *skyzoid machine* completely changes your relationship to reality, leading to paranoia. Because all paranoia produces a parallel reality in your mind, filtering perception, you can perceive it and describe it through fiction. Lewis Carroll's *Alice in Wonderland*

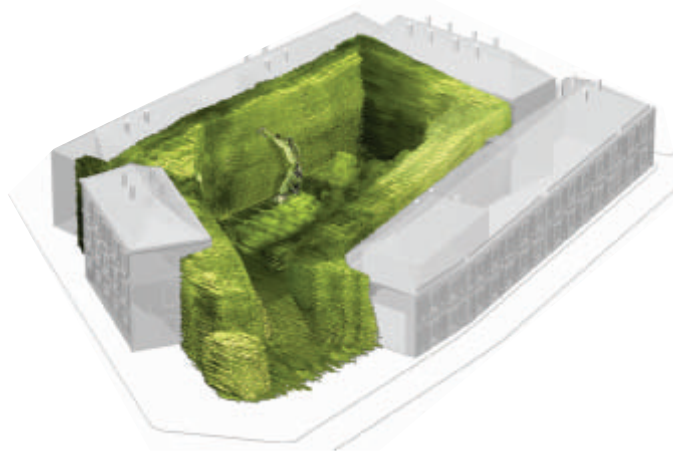


Cross sections



Longitudinal sections

Olzweg, 2006, proposal for FRAC Regional Contemporary Art Museum, Orleans, France
This stochastic and indeterminism project is from the FRAC, Orleans, France, where a "Bachelor Machine," in the sense of Marcel Duchamp, is step-by-step smearing an existing building with a strategy of a permanent lack of achievement. For a museum of radical architecture where uncertainties are becoming the aesthetic protocol, the algorithm driving the machine includes a spectrum of randomness. The machine is the vector, the vehicle, for a constructive subjectivization.

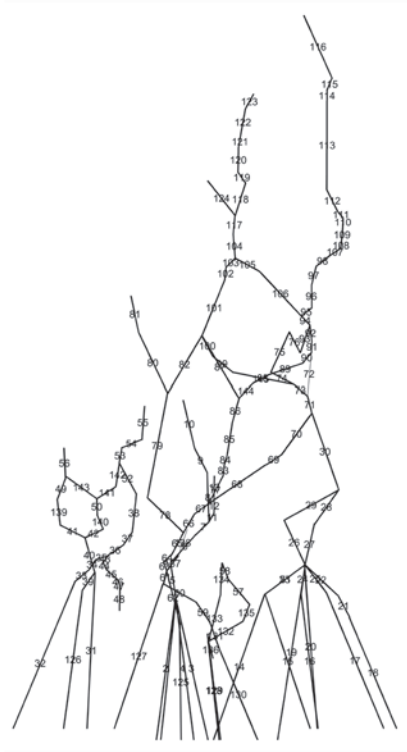



R&Sie(n)
Artiste : Pierre Huyghe

operates on an immediate level when it introduces illogic through pure logic, what in French one would call *le malentendu*. *Malentendu* – the wrongly heard or misunderstood – is a tool of linguistic exchange; it is a kind of stutter. We need misunderstanding or stuttering in order to communicate.

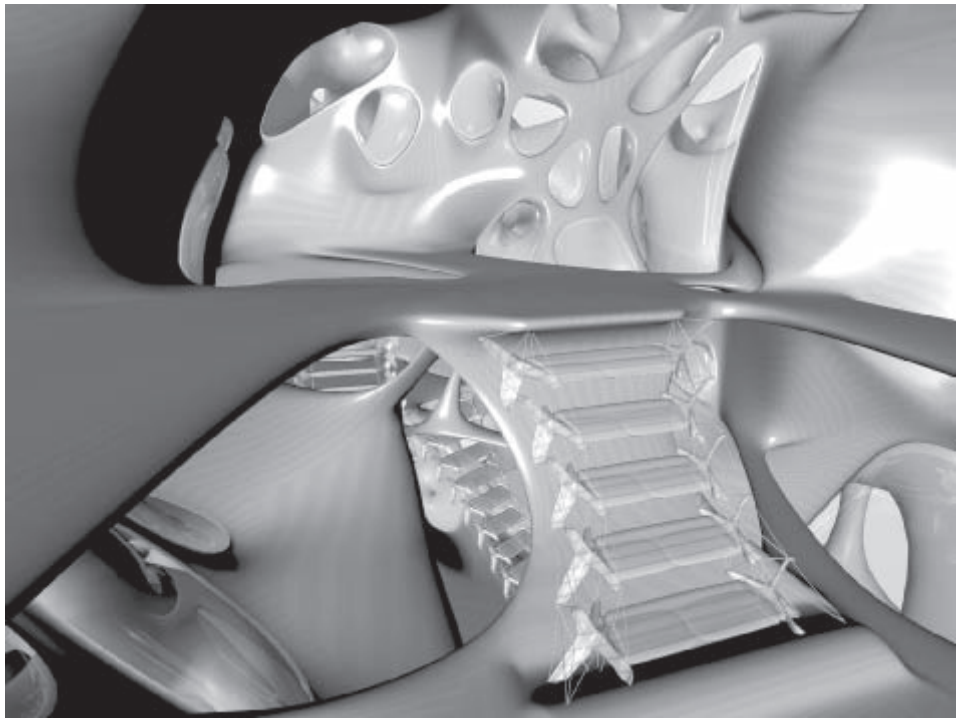
AN: The stutter defines a moment of misunderstanding between the physiology of the brain and the structure of language. Something misfires. The machine breaks down. It's a kind of mental or biological sabotage. For the project *Terra Incognita* that you worked on with Pierre Huyghe, you created an automaton – an albino penguin – a machine with intelligence or with emotion, whose operational functions broke when they became rusty. Do you see this as a contemporary version of the eighteenth-century Shitting Duck automaton by Jacques de Vaucanson?

FR: Yes! It's not so far from Vaucanson! You know when he presented the Shitting Duck there was a huge debate about the mechanism inside. Everyone asked: Is it possible to mechanically model the fantastic process of digestion? But after he revealed that there was no mechanism inside, that the duck automaton held two disconnected chambers for food and shit, that no chemical reaction took place, he was right away rejected by the scientific community. Immediately, he was denounced as a charlatan. It's quite an interesting story. Before, he was a genius! Before, he was a prophet! But at the instant of disclosure, he went from prophet to impostor. Where is the real? In the trick, in the mechanism of the trick, in the illusion to recreate life as the Golem of Rabbi Loew, or in the morale of the bourgeoisie which disqualified Vaucanson, for his misleading?

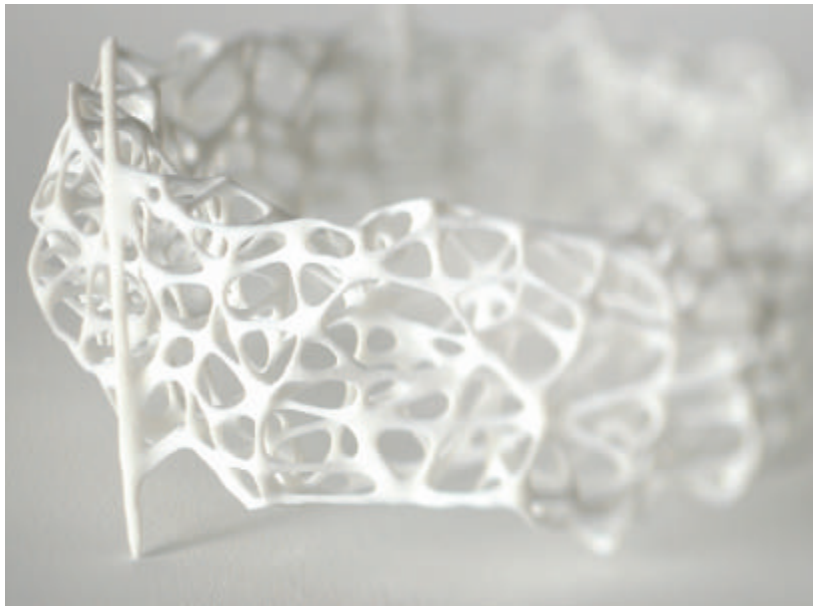


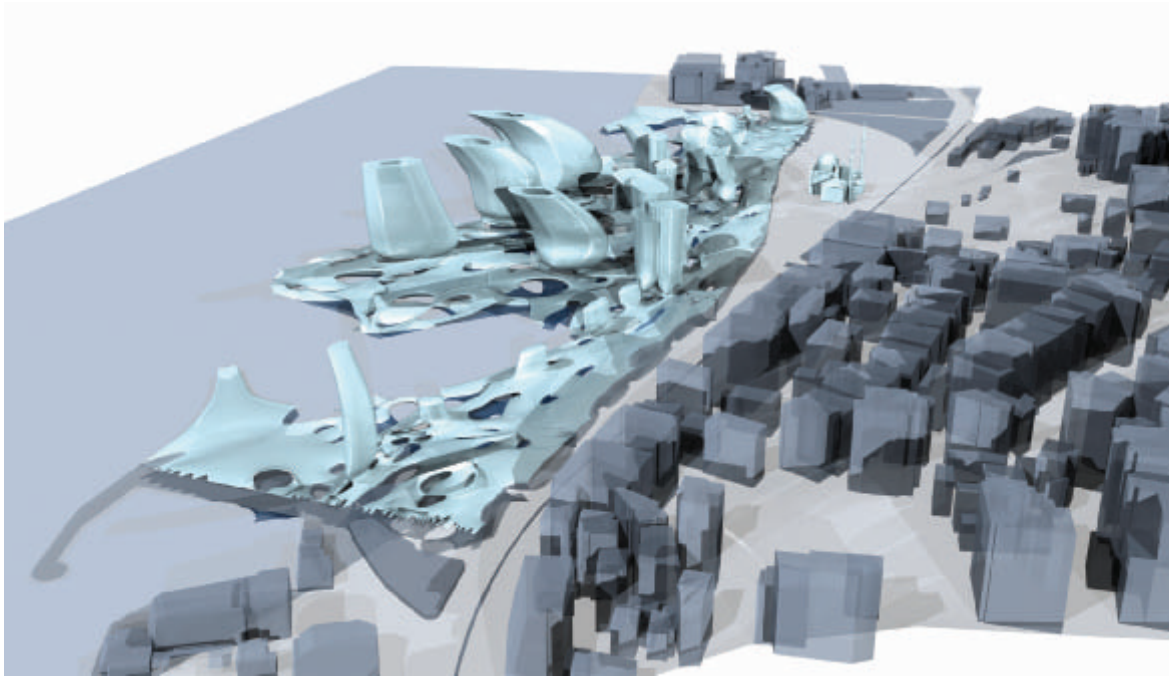
Algorithmic diagram

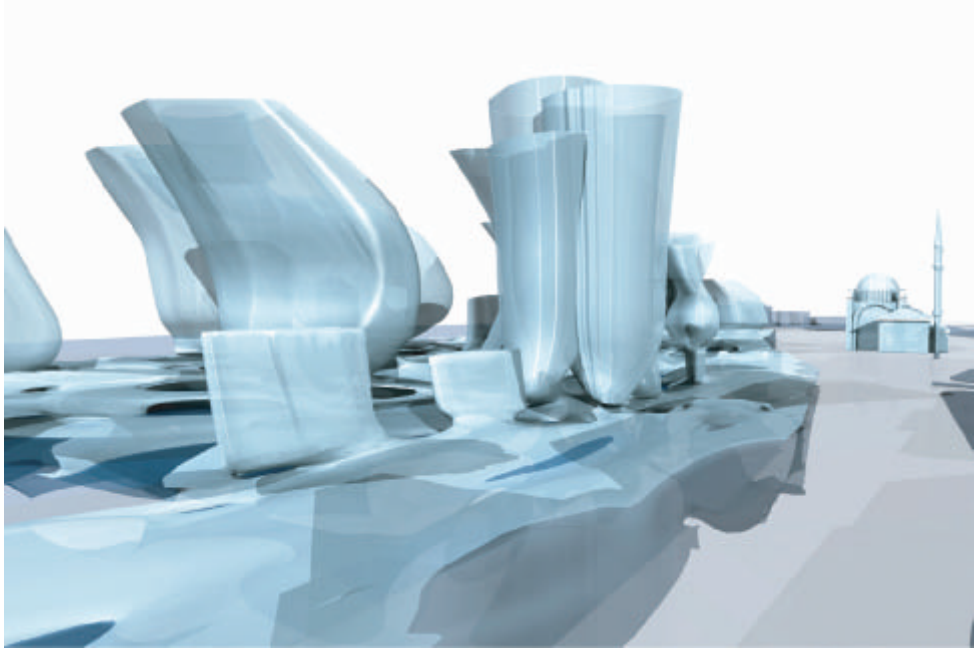
Reticular structure



I've heard about, 2005–2009
In this entropic experiment about self-organized urbanism, two inputs are used to drive a constructive machine. The first one operates from the requests of the inhabitant and the second one from the re-reading of their own physiology and chemical neurobiology, by a non-invasive analysis of the rate of cortisol (the stress hormone) in their blood (by a nanotechnology process).







CHAPTER SIXTEEN

KOL/MAC ARCHITECTURE

FORM NEVER FOLLOWED FUNCTION / SULAN KOLATAN AND WILLIAM MACDONALD

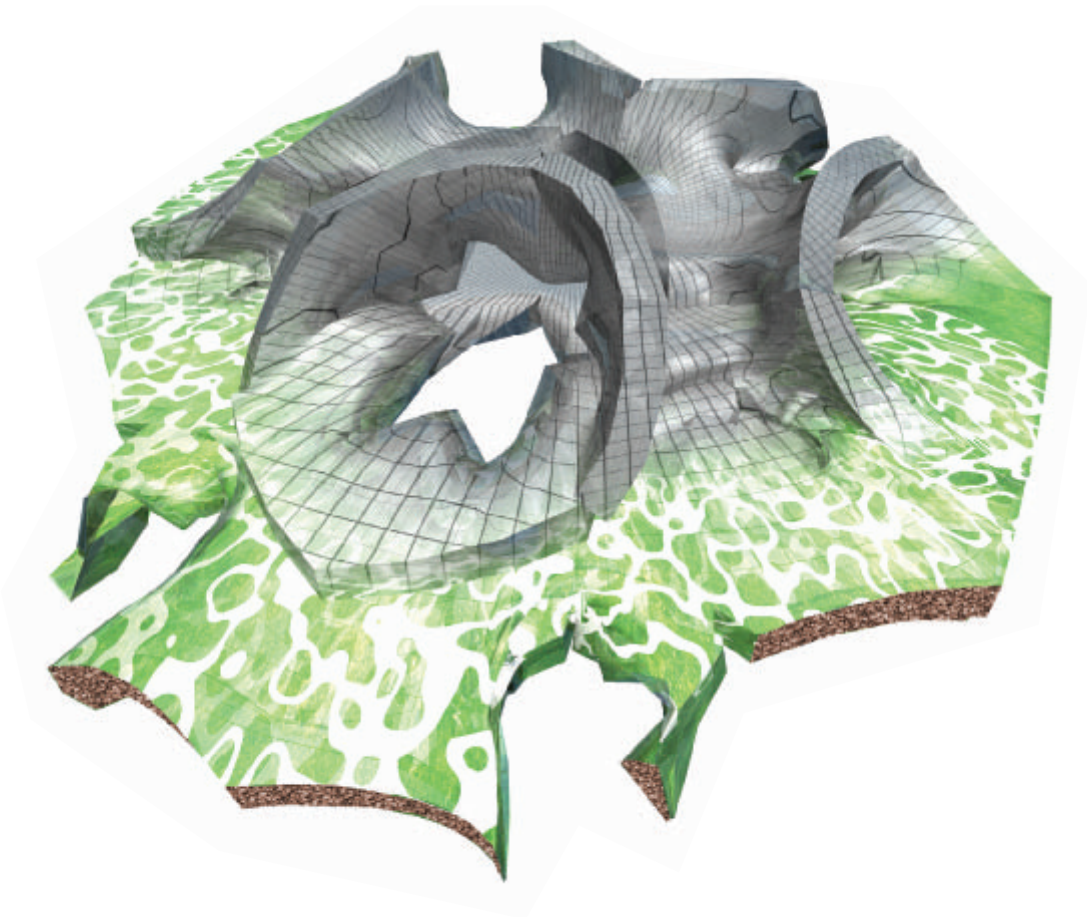
SINCE THE MID-NINETEENTH century architectural discourse on the relationship between form and performance has been primarily driven by Louis Sullivan's formulation "Form follows Function." Though the inspiration for this edict came from an observation of nature, ironically, in the early twentieth century the advent of Darwinian theory suggested the presence of an inverse logic in nature, namely, that form arrives first and function follows; so that forms with lesser functional viability in a particular context are eliminated by way of natural selection. However, the problem with the form-follows-function rule lies as much in the question of sequence as in its reductive nature, or its reductive understanding of nature. The modernist notion that function constitutes an objective demand coupled with the optimization paradigm of the Industrial Age contributed significantly to this interpretation. Current theoretical and scientific knowledge suggests a very different definition of function and its relation to form. First, function is seen as always tied to multiple and changing contingencies. Second, it is recognized that optimization, while effective under certain circumstances, most often yields design solutions that are too specialized in favor of a single functional goal at the neglect of others. Both of these statements highlight a much more complex relation between form and function as we understand now, one which cannot be explored through simple deterministic approaches or conditional logic.

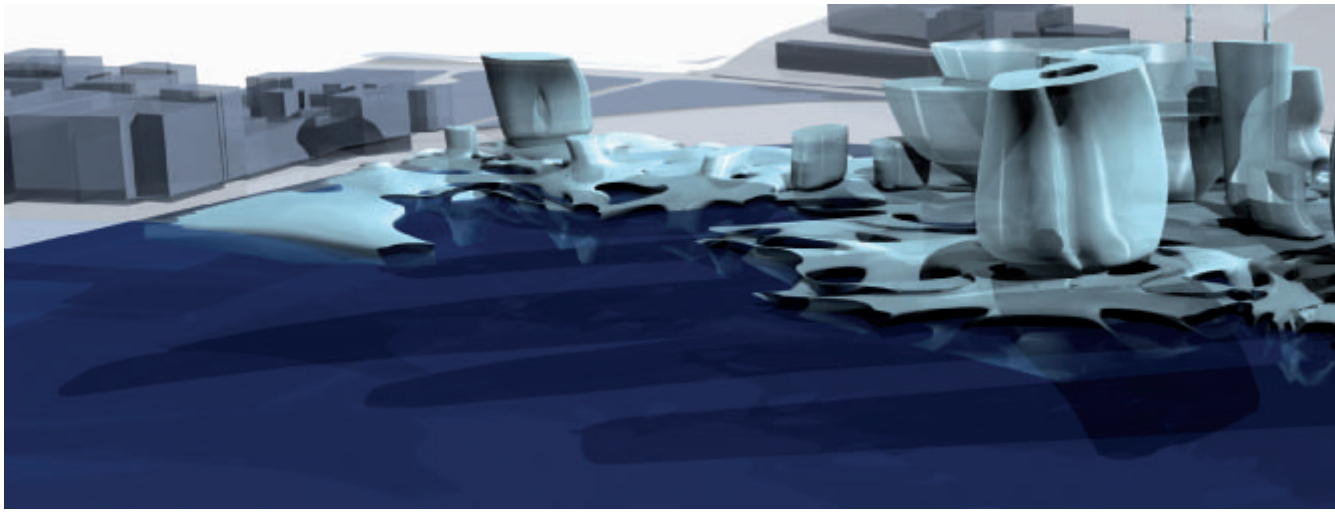
Galataport, Istanbul, 2007, coastal urban development
Based on the ecological urban patch paradigm, the MUTEN Galataport project starts out by considering the entire urban surface as a continuum with no discrete separations between horizontal, vertical and inclined surfaces. The design's geometry produces a permeable complex surface with the potential to positively affect its eco-systemic relation to water, wind and solar energy.

MORPHOLOGICAL ADAPTATION AND DYNAMIC ECOMORPHOLOGY

GIVEN THIS BROAD background, our design approach addresses the relation between form and performance by employing strategies based on nature models through tools such as fuzzy logic software, thus employing computational decision-making mechanisms necessary to complex environments.

For scientists, a true understanding of function is incomplete in the absence of ecologically or historically (evolutionary) relevant contexts. Our own interest in nature – now specifically in non-zoocentric plant biology – as a source of design methodology conjoined with urban ecology has led us to focus on the relationship



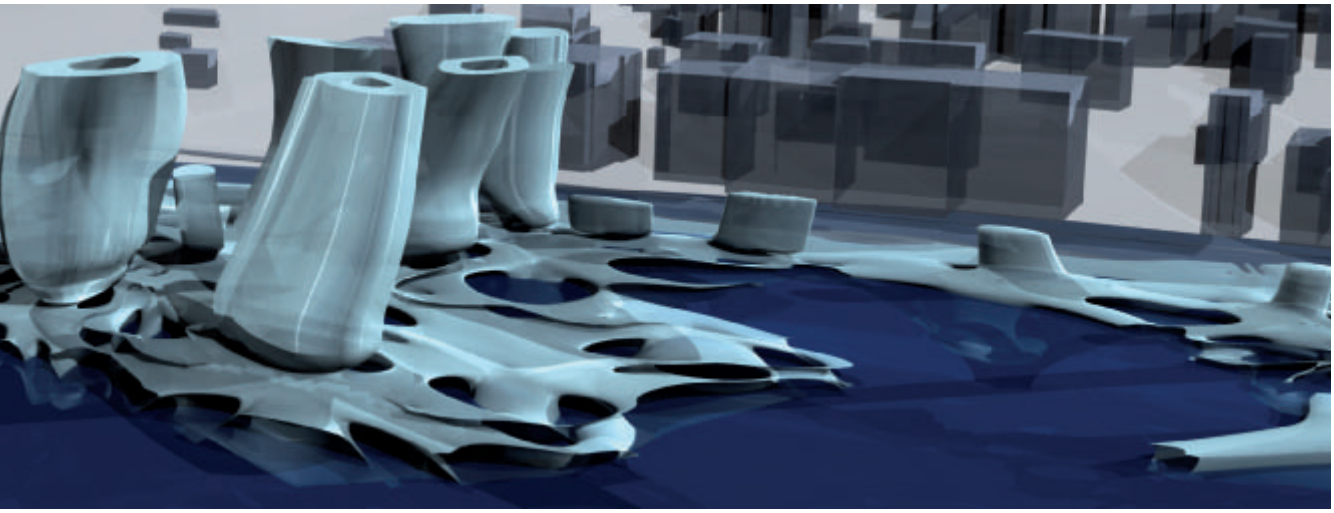


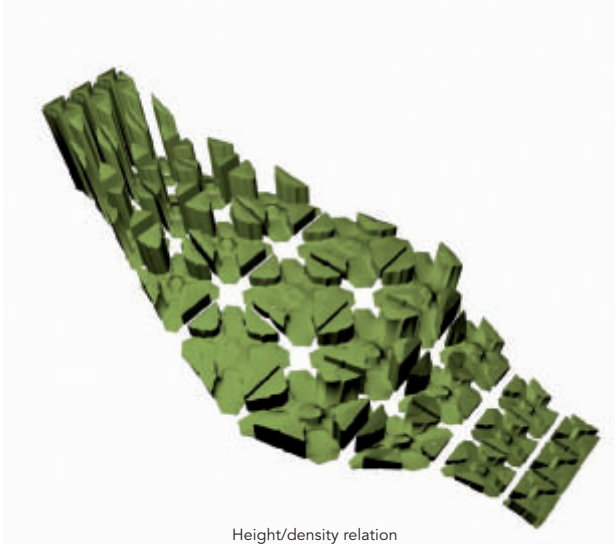
between the ecological role of an individual architectural/urban system and its morphological adaptations over time. Co-evolution with the environment and performance in relation to an ever changing compound set of internal and external demands constitute some of the criteria used. Others are diversity and beauty of form.

As computation in general is increasingly approximating natural processes, our generative methodology allows us to explore the nature/nurture interrelationship, not through a reductive paradigm but by *manageably* creating complexity in urban and architectural systems.

URBAN SURFACE AS CONTACT SURFACE: SMART FORM AND HIGH PERFORMANCE

FROM THE ABOVE stated point of view, the interface between topology and urban ecology has been a productive inquiry in our work. Unlike traditional urban design approaches, urban ecology does not distinguish between various urban typologies but emphasizes the continuity of urban surface and its performances. It looks at the city as a *contact surface* configured by a multitude of contiguous patches. One could argue, as we do, that it views the world topologically. Furthermore, it evaluates the performance of this surface with regard to materiality, density, capacity, color and form. Taking this into account, our design methods are built on linking computationally generated (smart) form with condition-based high performance.



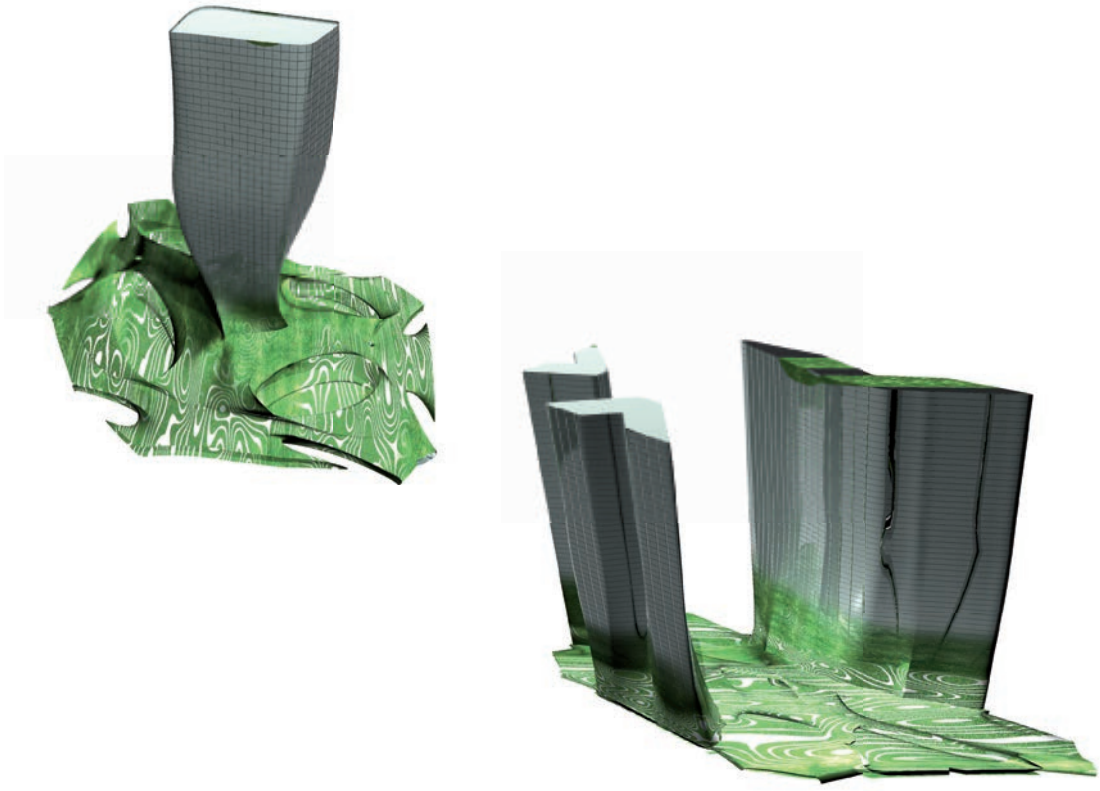


Height/density relation

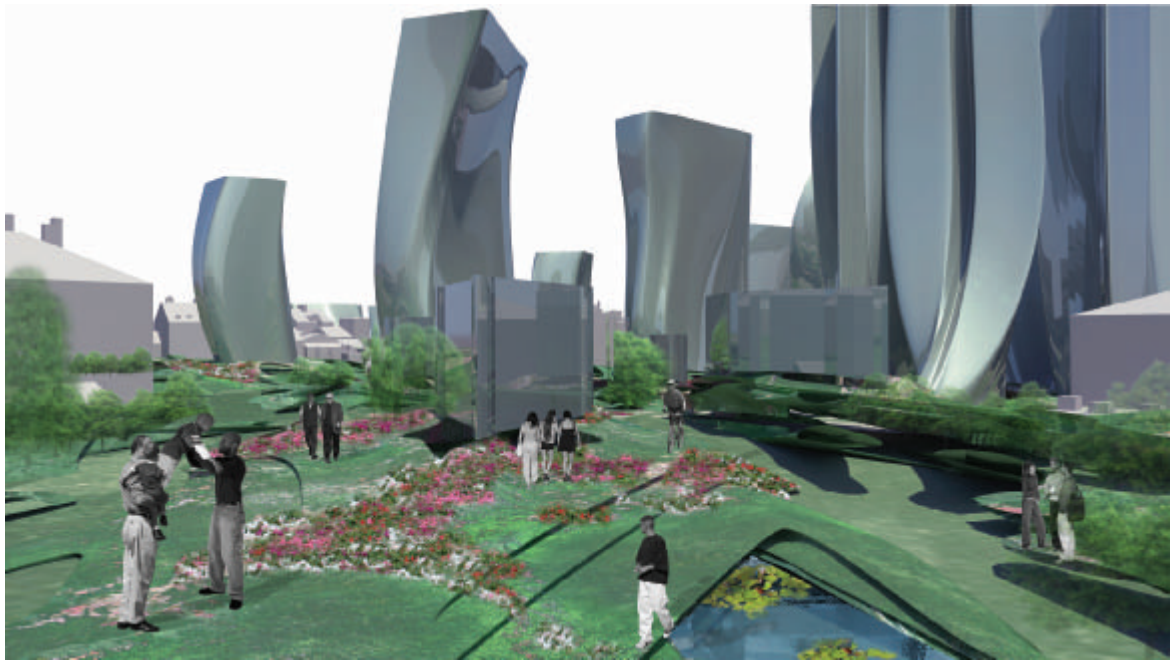
Carlsberg Urban Design Competition, Copenhagen, 2007, urban redevelopment of former brewery

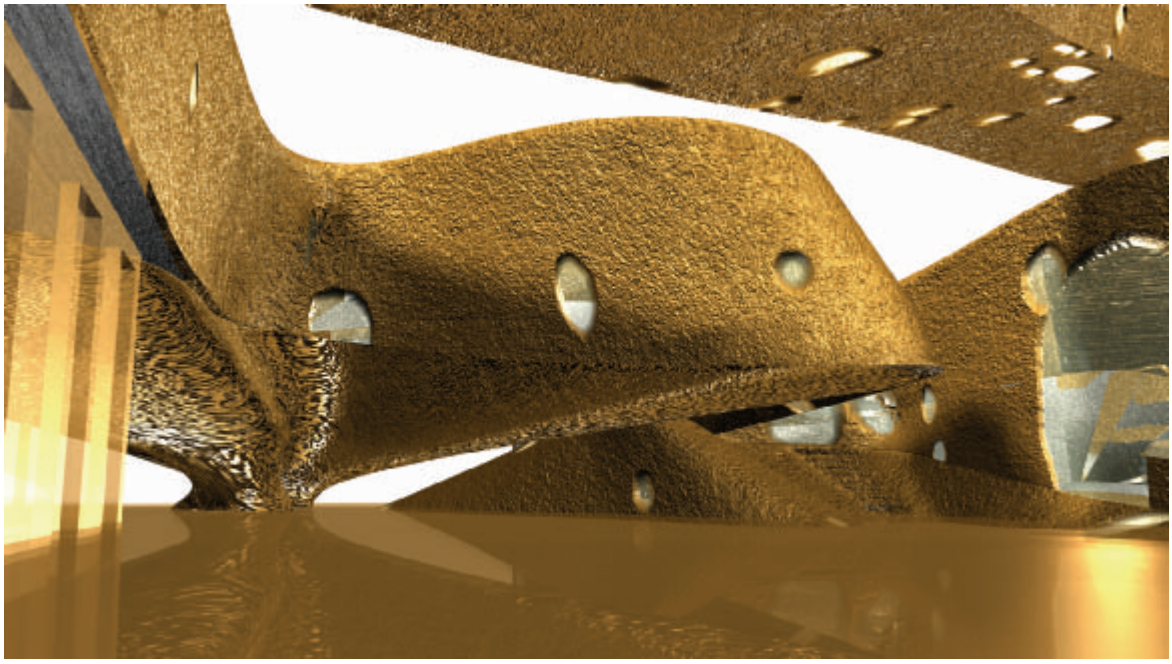
Unlike conventional master planning methods tied to the concepts of master plan, urban systems layers and phasing, the method for the Carlsberg project combines digital intelligence with advanced material and structural engineering.

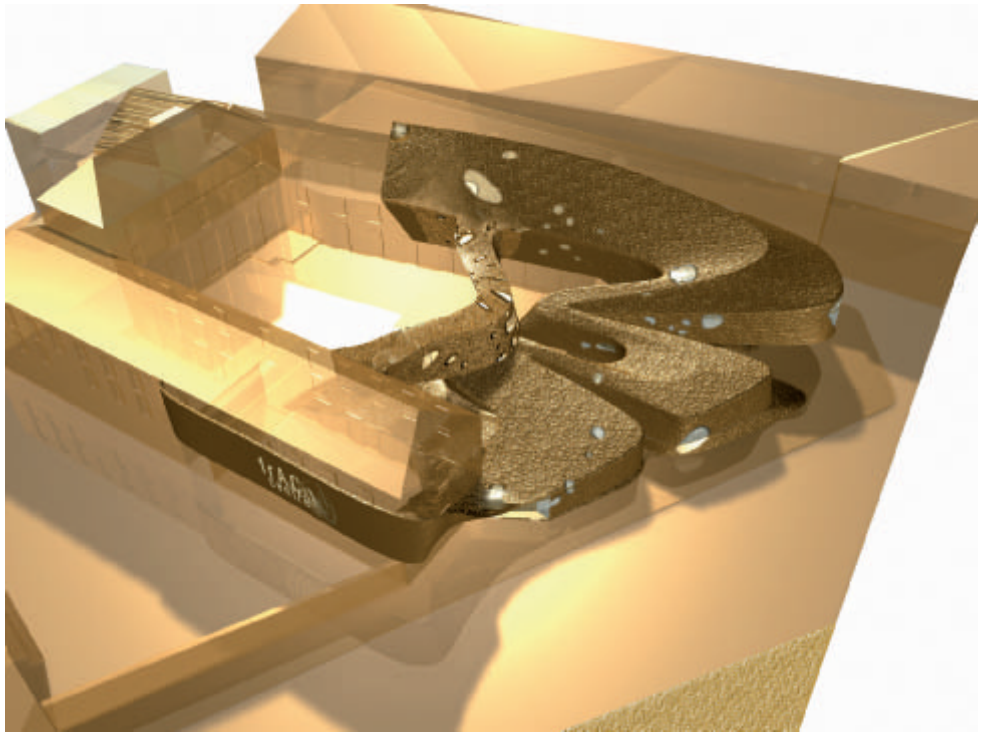
Adaptation and emergence are two qualities that are critical to this method with the viability of particular urban systems determined by circumstances that either support or weaken them.



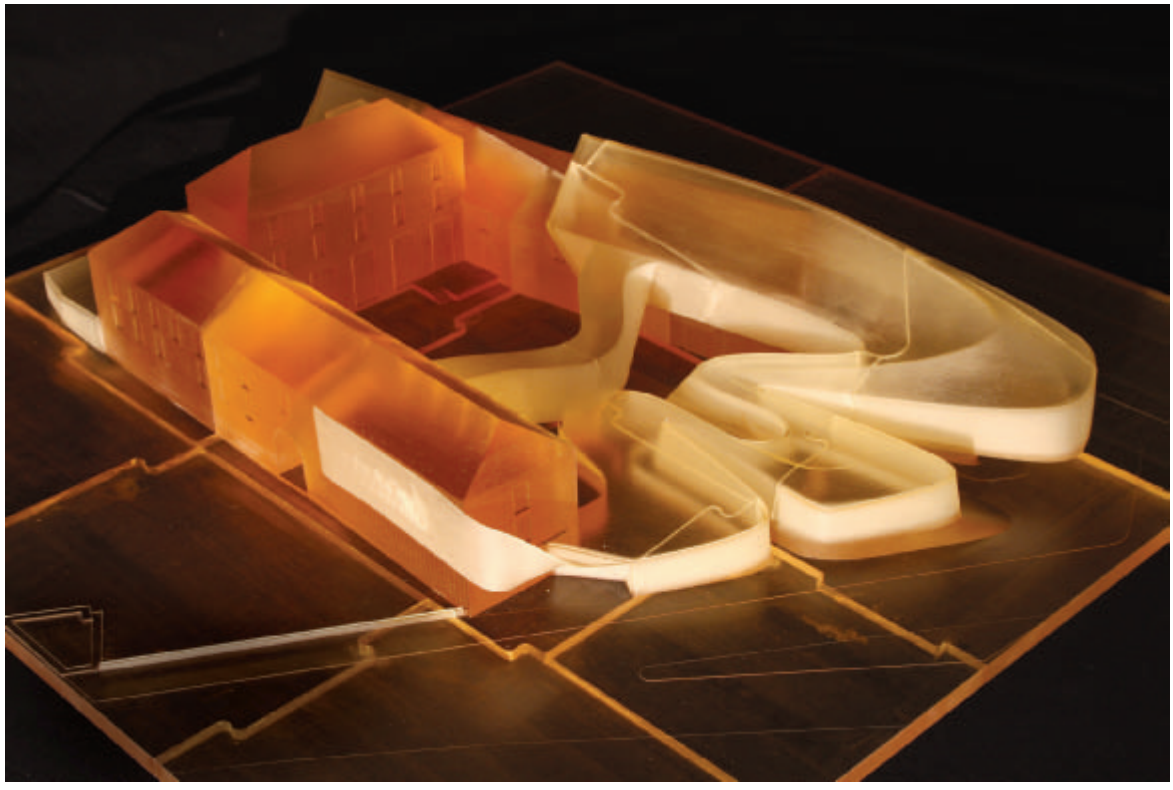
Cell types

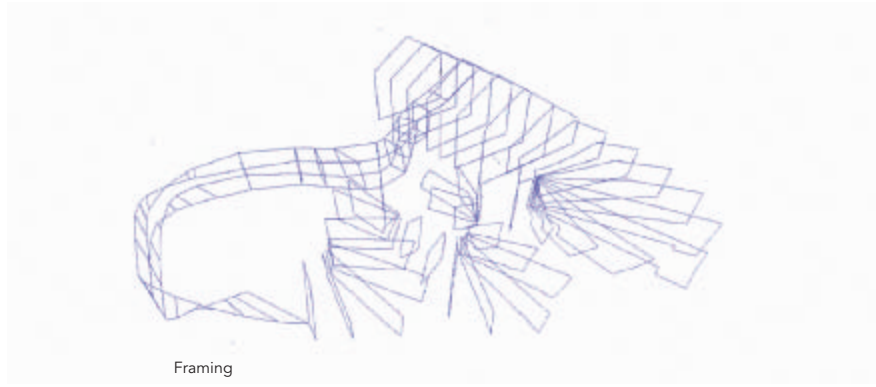




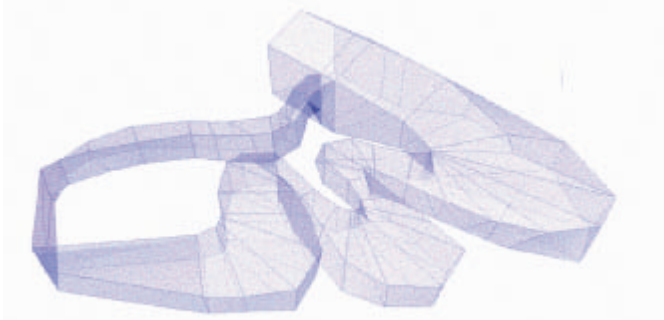


FRAC Center Competition, 2006, proposal for FRAC Regional Contemporary Art Museum, Orleans, France
Due to the many pre-existing and disjunctive elements on site, the strategy for this competition project follows the notion of chimerization – the merging of multiple identities into a single differentiated system. There are two main elements with which this is accomplished: first, a continuous floor that connects the primary existing levels and creates a new entrance sequence; and second, an exterior envelope that merges with contiguous surfaces and forms.

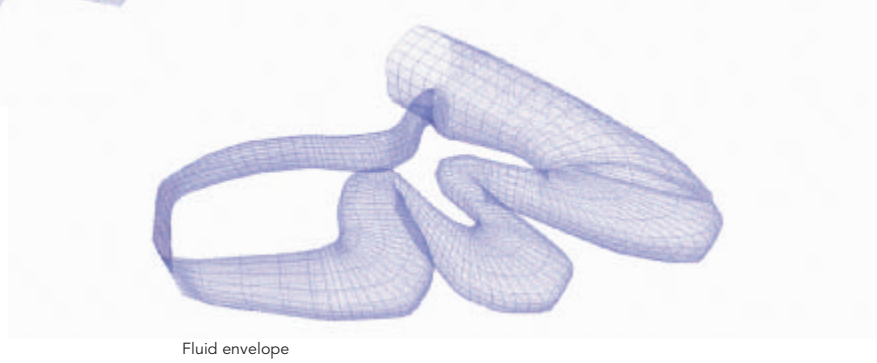




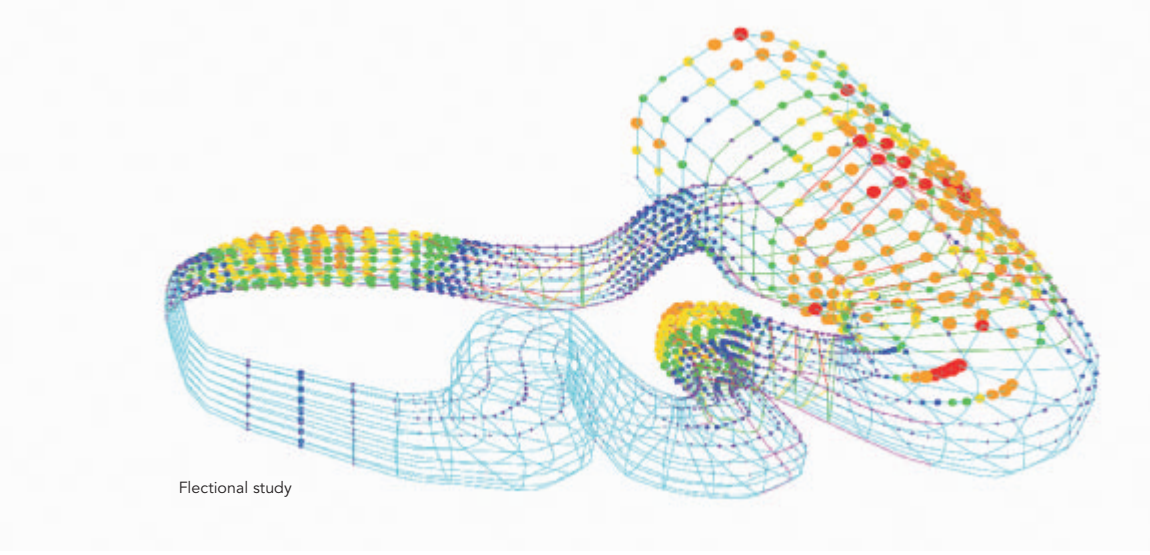
Framing



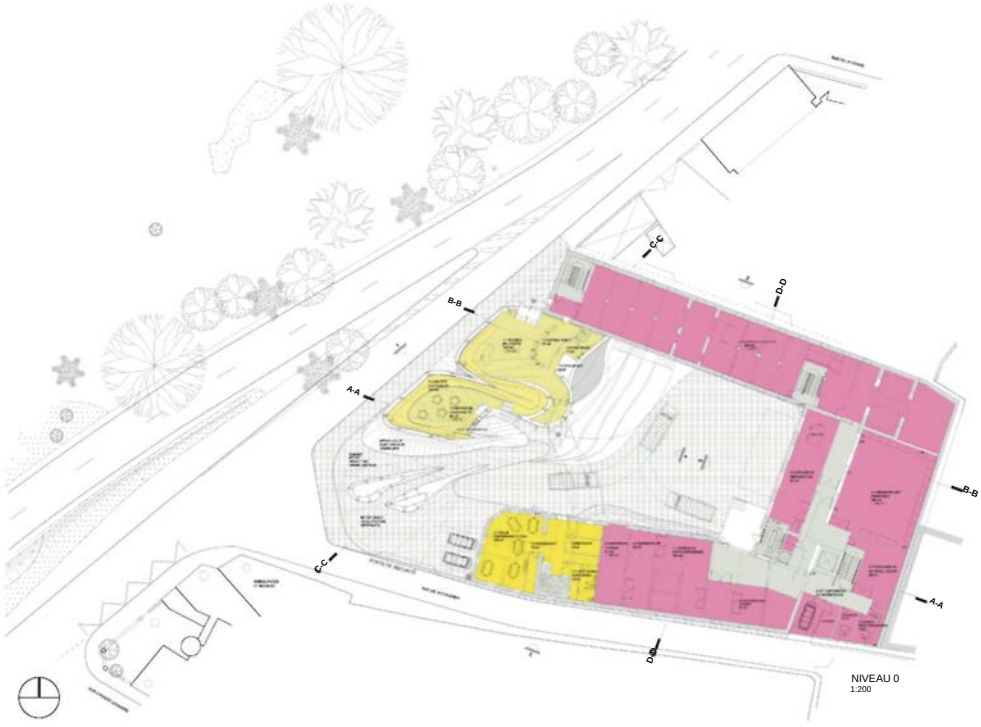
Tesselated envelope



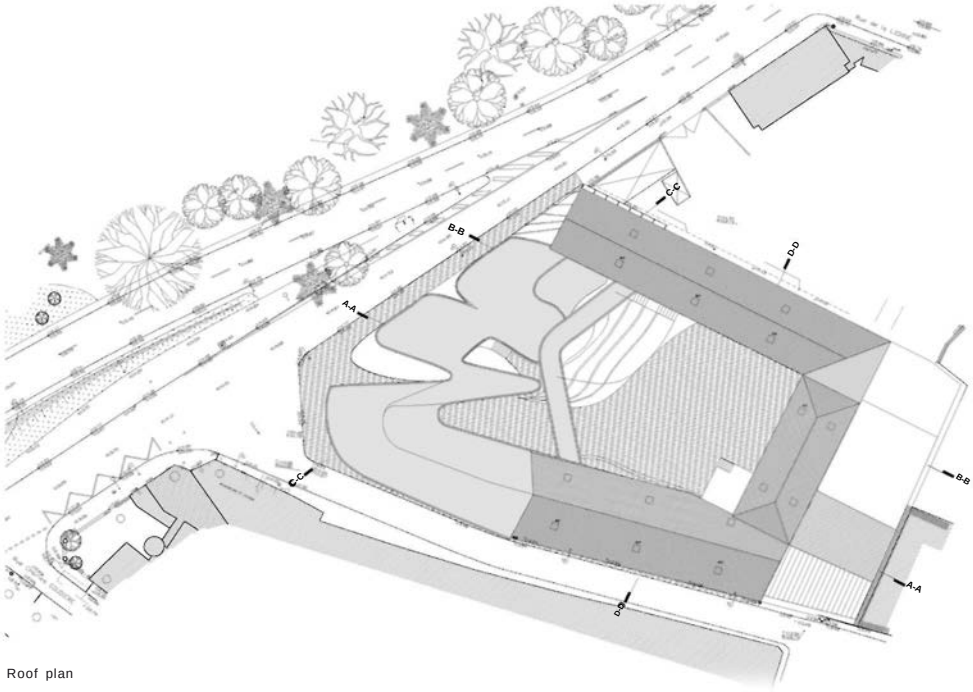
Fluid envelope



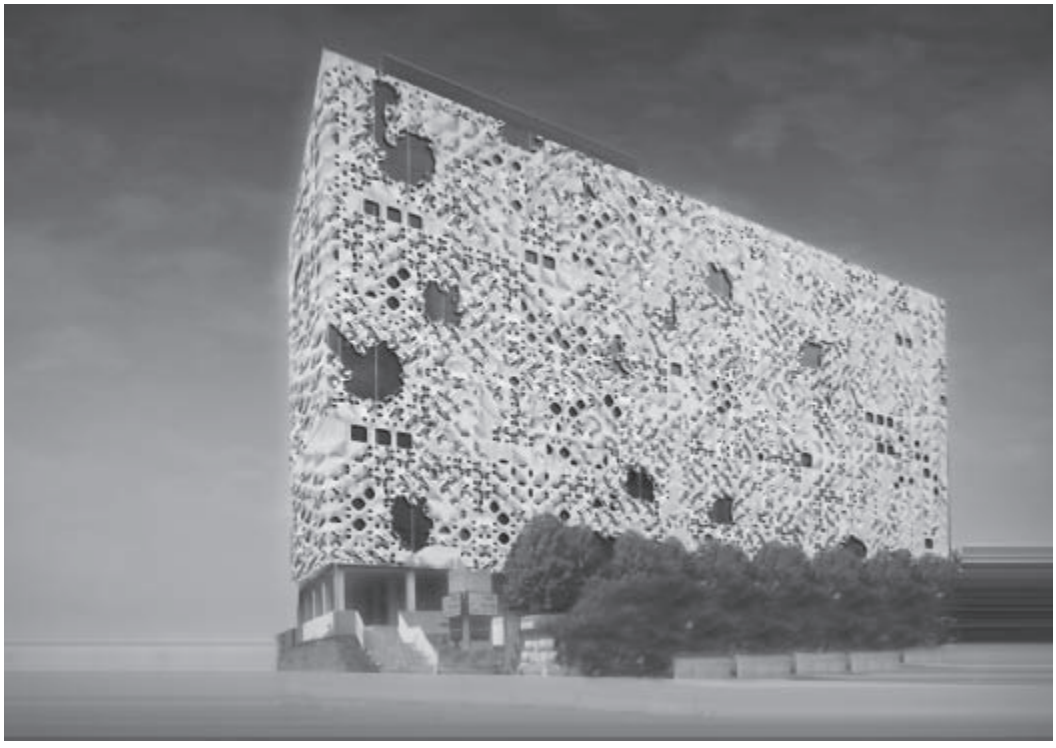
Flectional study

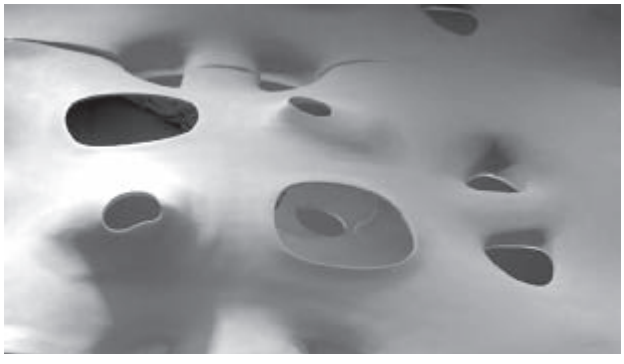


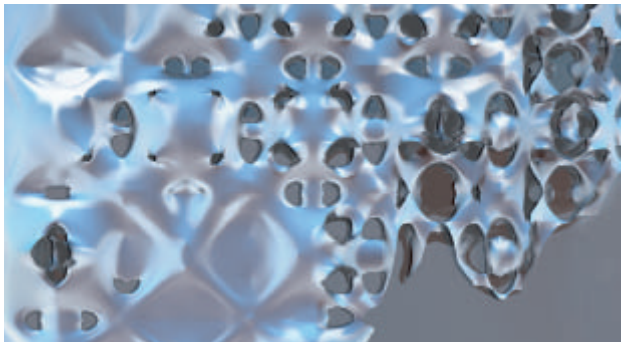
Ground plan



Roof plan



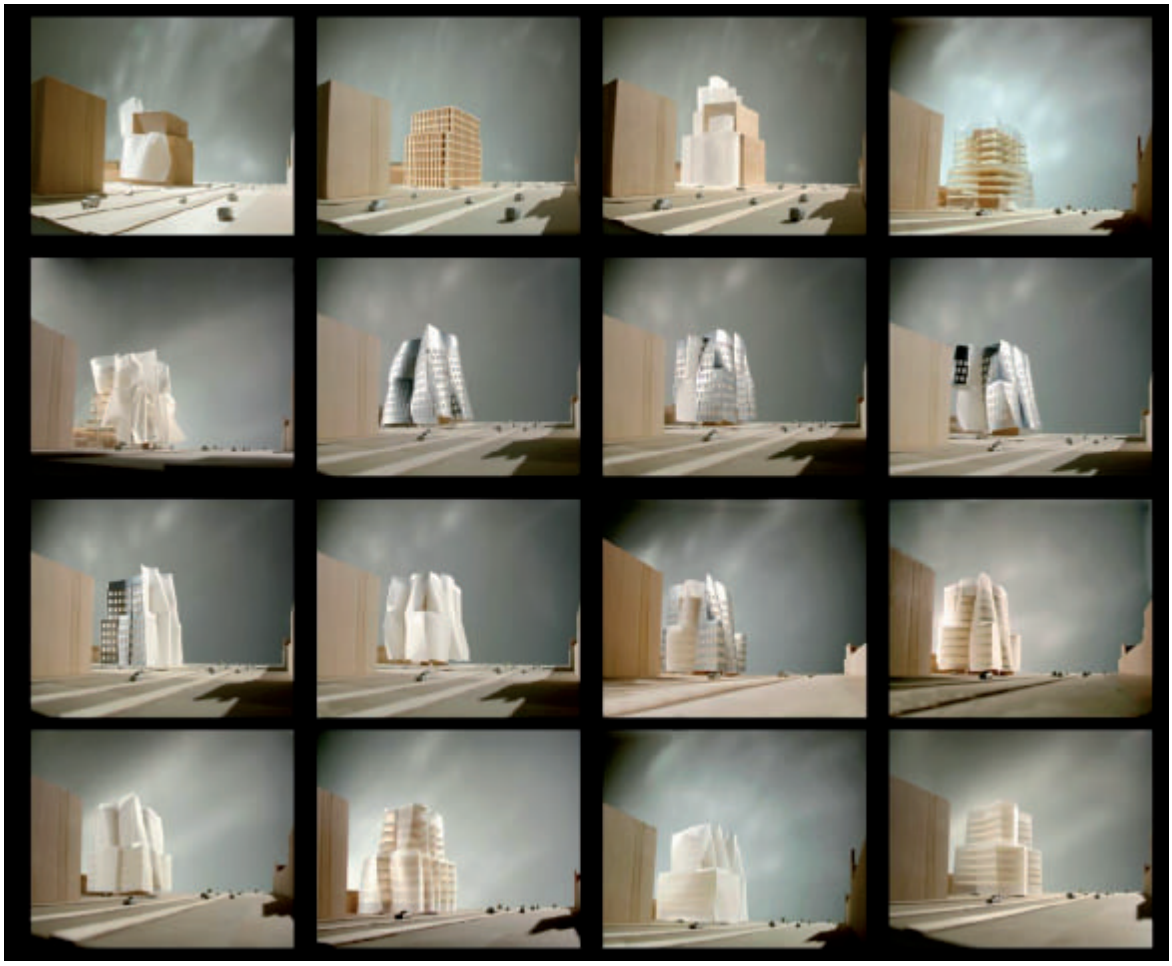


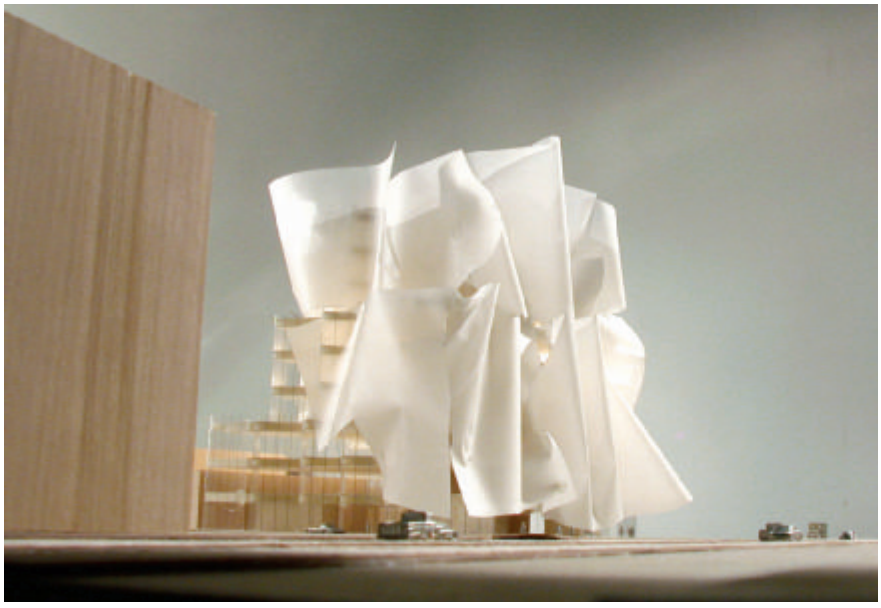


INVERSAbrane, 2006, high-performance exterior building, membrane prototype
INVERSAbrane is a project focused on going beyond the current "green" curtain wall standard through strategic linking of advanced geometry, material and structural engineering, digital fabrication technologies and emerging expertise in ecology and biomedia. Its performance is based on excess surface that maximizes contact with the environment and creates a unique opportunity for eco-systemic exchanges between building and city.


INVERSAbrane by KOLMAC
[h and conductivity. Negative ionization of the carbon collects pollutants to wash off with the next]


OXYGEN
HUMIDITY
NEGATIVE CHARGE
MIL/HR
MILLIBARS
AIR QUALITY CONTROL
HAZARDOUS AIR POLLUTANTS
SOLID PARTICLES
INVERSAbrane by KOLMAC
[egative ionization of the carbon collects pollutants to wash off with the next rain shower.]





CHAPTER SEVENTEEN

Gehry Partners, LLP / Gehry Technologies

PERFORMANCE OF DELIVERY SYSTEMS / DENNIS R. SHELDEN AND SAMEER KASHYAP

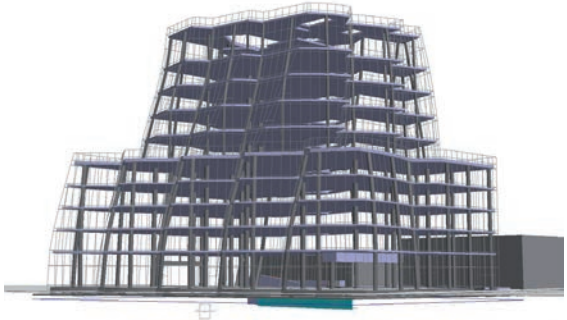
GEHRY TECHNOLOGIES' WORK is focused on project execution, and enabling the realization of architectural innovation through technology enabled processes of delivery. Our work addresses the performance of delivery systems – the methods, tools, and people that are assembled to realize architecture. These systems encompass the broadest spectrum of practice, including digital tools and the information they generate, geometric theory and technique, codes and contracts, the assembly of professional firms, and the individual and integrated working methods of these firms.

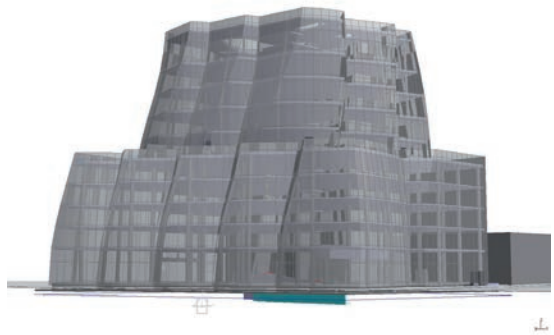
From the designer's perspective, delivery systems are the instruments that allow design to project through the process of realization in the built environment. The performance of these systems is measured in the fidelity of operation, the efficacy by which the spectrum of performance can be brought into the collaborative design environment, and the accuracy by which design intent is aligned with the potential for realization.

Information and knowledge are critical to this view of achievement. Building performance requirements place an ever increasing demand on design and on building delivery. These demands have contributed to calcifying already entrenched, linear approaches to the sequencing of design problem solving, in order to "appropriately" limit the necessary set of design concerns at each point in time. However, this need not be the case. Project information – made accessible to design through modeling and simulation – presents the opportunity to bring all aspects of the system into design's sphere of interest and control. By providing these broad views of project performance within the design feedback loop, made fluidly visible and responsive to design operations, with immediate feedback, a vast and powerful palette is made available to design.

This palette includes the performance and lightness of structures, to foster elegance: the performance of

IAC Building, New York, 2007
Located in the West Chelsea neighborhood of New York City, the new IAC headquarters is the company's NYC flagship building. The project, between 18th and 19th Streets, across from the Chelsea Piers and entertainment complex, was completed in January, 2007. The IAC headquarters is a nine-story tower with a sculpted glass façade on a 29,380 square-foot site on the east side of 11th Avenue. The glass façade of the concrete structure is insulated with a special coating and patterned ceramic particles embedded in it to improve energy efficiency.





Design to manufacturing BIM 3D model

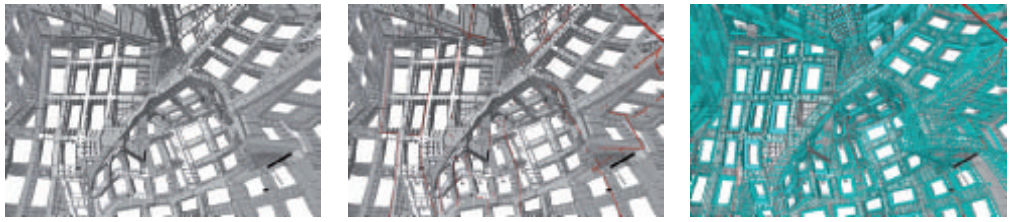
mechanical systems, efficiencies of material use in construction and resource consumption in operations, in service of our place in the environment; the optimal allocation of cost to maximize the value of building; and the operations of the project team as a whole to align and execute toward a set of common aspirations.

This view of delivery systems as potential elements in the designer's palette requires a different approach to the collaboration between designers, owners and the building team. A critical component of high-performance project execution is the compression of traditional linear process of design development. We draw on automation to create efficiencies for exploring the development of building systems to high levels of definition, and the ability to bring these explorations within the sphere of considerations of early design iteration. Parametric techniques are used to imbue building models with fabrication and performance intelligence. Process knowledge is integrated into design level descriptions. Communications and design collaboration are incorporated as aspects of delivery. This level of definition implicitly requires the engagement of expertise from across the spectrum of project execution in design. These technical systems create a broadly distributed environment for the creation of and access to project information, allowing a concurrency and immediacy to knowledge of project performance.

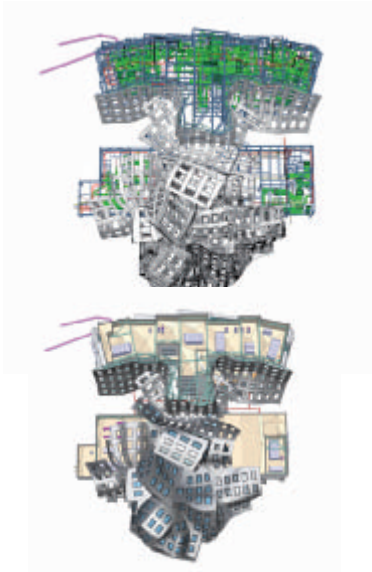
Our goal is to incorporate as broad a possible spectrum of project performance information into the sphere of design, with a focus on engineering and fabrication, process control, and financial performance.

This focus on the performance of delivery systems might seem to be simply about the tools of design, albeit in a broad sense, not directly about the work itself. But these systems are implicit in defining the potential languages of architectural form. Increasingly, design and the development of project specific delivery systems are interrelated activities.

Our approach does not serve any specific formal language, nor necessarily any specific party in the project. It is available to any and all who wish to assume higher levels of authority, of responsibility, of performance. These tools are of potential utility to architects who seek to expand their authority beyond the limits that have been imposed – and accepted – by the practice of architecture in the recent past. We believe that the means now exist for architects to move beyond the limits of contemporary practice, to re-engage as the central authority for project execution, and to do so armed with the tools and the knowledge to confidently innovate across all aspects of project performance.



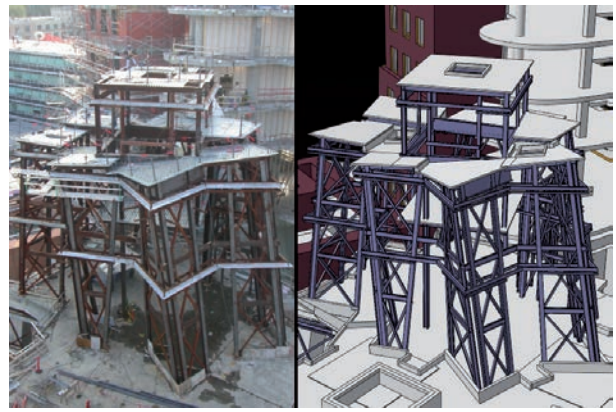
Design to manufacturing BIM 3D model – detail

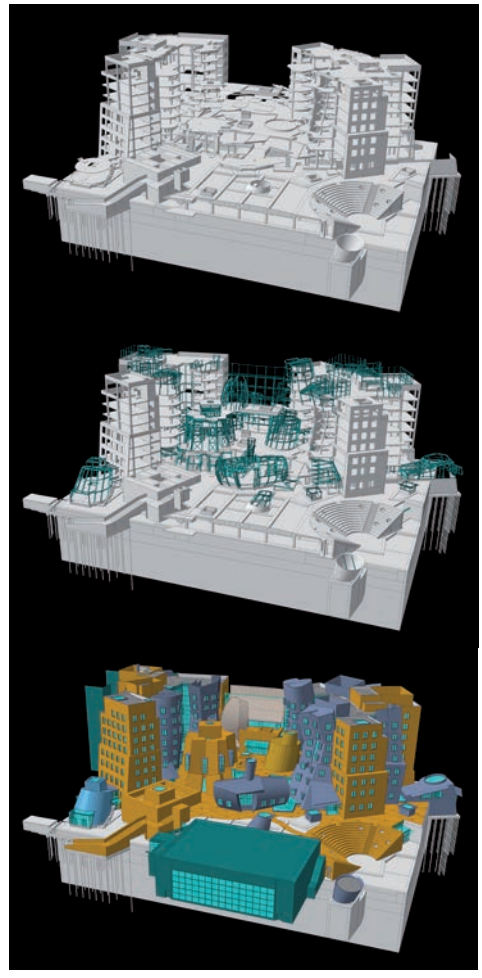


Design to manufacturing BIM 3D model

Cleveland Clinic Lou Ruvo Center for Brain Health, Las Vegas, 2007–2009

The Cleveland Clinic Lou Ruvo Center for Brain Health is located on a prominent "gateway" site of the 61-acre Symphony Park development in downtown Las Vegas at the corner of Grand Central Parkway and Bonneville Avenue. The research facilities, clinical facilities, and offices are located within a four-story block that has been articulated as a series of offset rectangular shapes in white plaster and glass. While not in the immediate view of the project from the corner of the site, this is the actual front of the building serving as employee, patient and public entrance. The more public building uses are detached from the medical facilities across a dramatic covered trellis courtyard near the corner of the site. These program functions are entered via an exterior breezeway through the medical office building. The Activities Center is contained within an expressive metal and glass form that is articulated as a curvilinear metal façade and roof with punched-window/skylight openings.





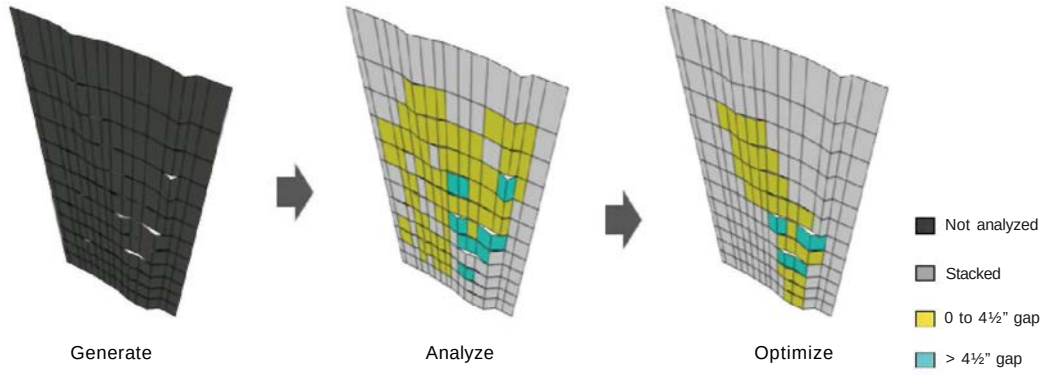
Design to manufacturing BIM 3D model

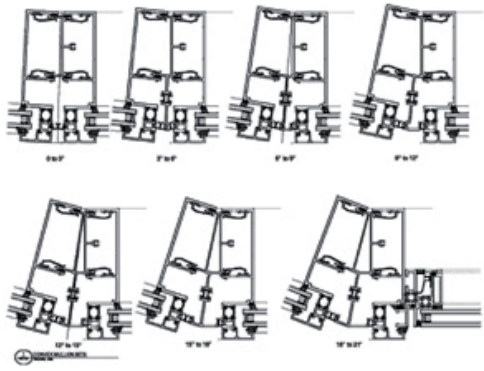
The Ray and Maria Stata Center for Computer, Information and Intelligence Sciences, MIT, Cambridge, MA, 2004

The Ray and Maria Stata Center at the Massachusetts Institute of Technology is intended primarily to provide research laboratories and offices for the Computer Science and Artificial Intelligence Laboratory (CSAIL), the Laboratory for Information and Decision Systems (LIDS) and the Department of Linguistics and Philosophy (L&P). In addition, the Stata Center also includes more general facilities for use by the MIT community as a whole. One of the fundamental objectives driving the design involved the need to combine semi-private research facilities for building occupants with more general facilities for use by the MIT community.

Beekman Street Housing, New York, 2010
Beekman Street Housing is set on a 42,000 square-foot-site in Lower Manhattan. The building is a 75-story mixed-use tower, which houses a New York City public school, office space for the New York Downtown Hospital, and over 900 residential units. The classical proportions of the tower are conforming to the New York City setback rules creating a tall wedding cake design typical in the city. The stainless steel clad apartment tower sits on a podium clad in buff colored brick. The wall of the apartment tower undulates in soft folds reminiscent of fabric. The surface geometry of the curtain wall was mapped by a computer software platform developed by Gehry Technologies called Digital Project. Many of the subcontractors on the project used this computer model to fabricate and build some of the major components of the building, which greatly minimized the number of RFIs on the project, resulting in significant cost and time savings on the superstructure and curtain wall construction.

Rationalization process






VOLKSWAGEN

CHAPTER EIGHTEEN

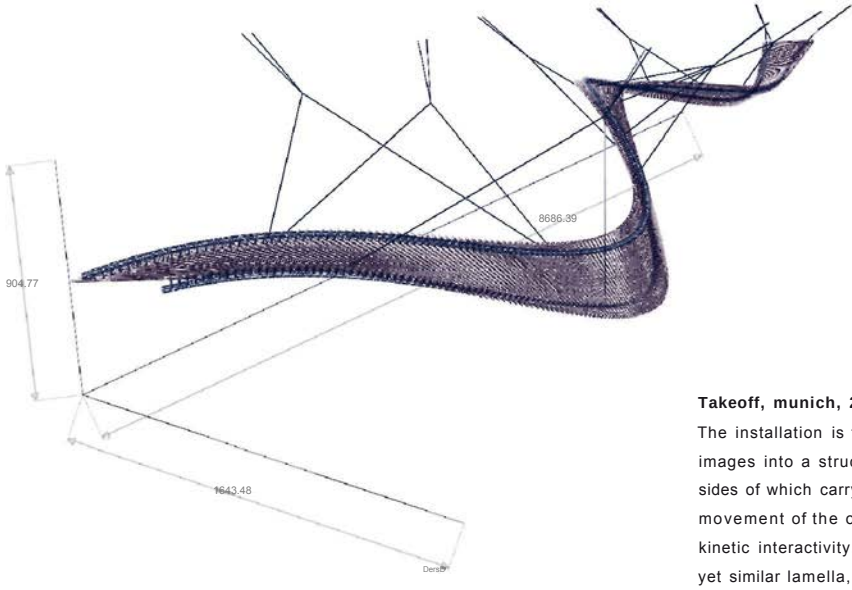
Franken Architekten

PERFORMANCER / BERNHARD FRANKEN

Performance, a measurement of some output or behavior in engineering.
(http://en.wikipedia.org/wiki/Performance_%28disambiguation%29)

THE TERM "PERFORMANCE" refers to several ambivalent levels of meaning. In architecture it describes, for example, optimizing the support function or energy balance of a building or an architectural element. This optimization relies on a rational method of creating form, which places it above all criticism. For the International Auto Show 1999 in Frankfurt we constructed for the BMW Group a building in the guise of two drops flowing into each other – the so-called "Bubble." It was not the result of emulating a drop but was generated using a parametric design process. It was produced through the specific search for a law of generation and the input of various constraints in a series of experiments. To generate the shape we used the computer program Explore by AliasWavefront, which permits the simulation of drop formation based on physical laws. A water drop is defined by a delicate balance of gravitation, cohesion and surface tension. The shape describes a moment of fusion of the two drops and the formation of a soft transition between them.

Bubble, Frankfurt, 1999, BMW trade fair pavilion
Driving powered by sun and water using hydrogen is presented in the form of a supersign: a water drop. For the construction of the pavilion, 305 different acrylic-glass plates were heat-formed on to individually CNC-milled foam blocks, and then trimmed at the edges. The sub-structure is based on orthogonally transposed sections made from 3,500 individual sheet aluminum pieces.



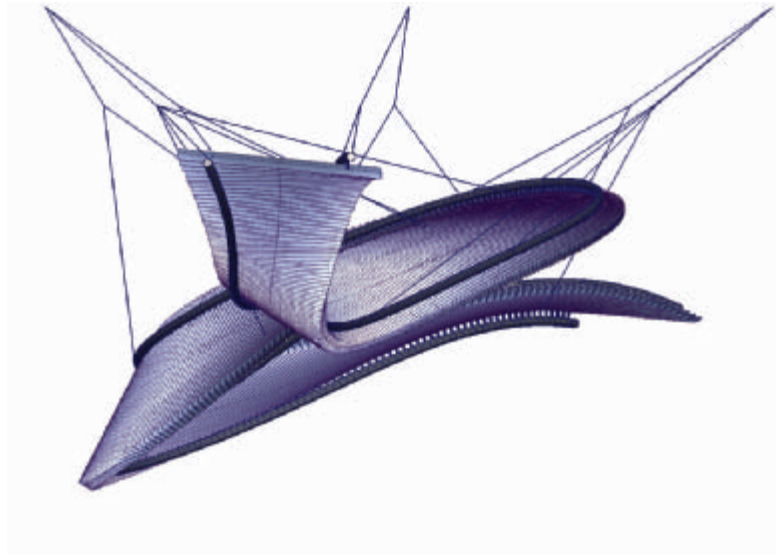
Takeoff, munich, 2003, installation in munich airport
The installation is transforming the idea of shifting images into a structure composed of lamella, both sides of which carry different images. It is the movement of the observer that gives rise to a visual/ kinetic interactivity. The strip consists of 360 different yet similar lamella, and two 3D bent steel tubes at the sides.

Performance, the execution of an experiment in science, i.e. the carrying out of predetermined actions in a controlled environment.
(http://en.wikipedia.org/wiki/Performance_%28disambiguation%29)

The experiment described above does not seek to replicate the actual framework conditions of the later building but rather merely optimizes the virtual forces in the chosen information environment. Its rationality is only apparent, since only gravitation and wind forces are at play in the Bubble, there is neither surface tension nor cohesion. The shape allows us to conclude that there are forces in the Bubble, which only occur in the virtual (computer-aided) space that precedes the generation of the form and not in the physical space of the Bubble itself. In other words, these forces are not of a natural origin, not of this world, and yet they act in accordance with the laws of nature. In the physical space these "missing forces" produce what is in terms of statics a weak point in the skin, which must be offset through bending moments. Performance-oriented form generation does not optimize the form according to structural aspects and differs clearly from formally related skin or network structures as created say by Frei Otto. While the latter trend in architecture relies directly on models in nature and principally derives its forms using the laws of statics, we rely on forces, which the designer derives from his subjective decisions based on constraints, contextual, programmatic or poetic considerations.

A performance art is an event in which one group of people (the performer or performers) behave in a particular way for another group of people (the audience).
(http://en.wikipedia.org/wiki/Performance_%28disambiguation%29)

The Bubble was part of a BMW presentation on the topic of clean energy, the use of hydrogen fuel in vehicles. Thanks to its shape and transparent skin of acrylic glass the metaphor of a water drop as a symbol of hydrogen fuel technology was immediately recognized and accepted by the public. People cannot perceive forces directly via their sense organs but need a clear demonstration of their impact. A bent bamboo cane graphically illustrates the force of the wind. Indeed, experience has made us very keen perceivers of the deformations occasioned by "natural" forces. As such a spherical dome would not be read as a water drop, since it will not produce the deformation close to the ground determined by gravitation. In other words, in relation to the Bubble performance meant producing the communicative performance of shape. In architecture form can lend shape to thoughts, visions and messages, and infuse buildings with narrative elements. Space begins to relate stories.

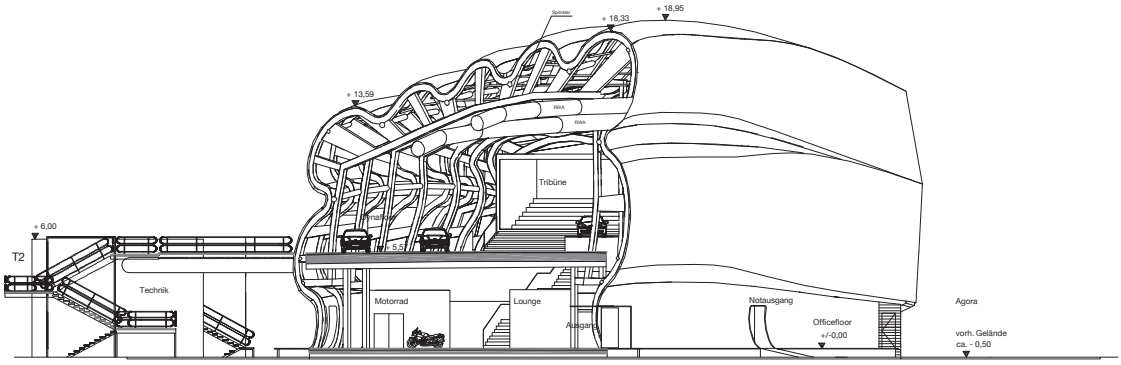


> Void ratio, in materials science, is defined as the volume of voids in a mixture divided by the volume of solids.
>
> (http://en.wikipedia.org/wiki/Void_ratio)

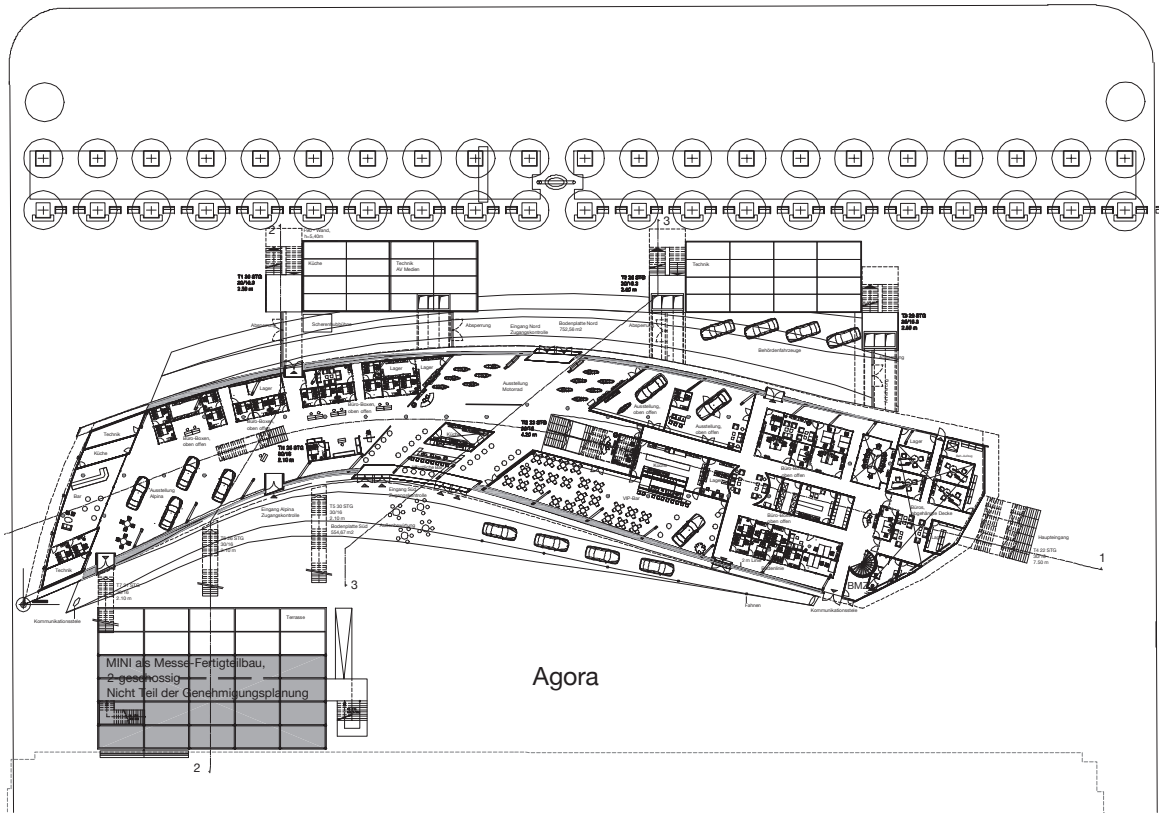
The Bubble was the first build project in the office´s history. Ten years later we are working on projects that are of a quite different nature in program, scale, form and construction. For example the "U-Silk City" project in Hanoi, Vietnam is a 12-hectare urban expansion in the south of the Vietnamese capital. It is the largest project under construction in Vietnam and comprises nine up-market 28–50-story residential high-rises and a wide range of public leisure and retail facilities in the interlinking, greened pedestal story.

However a parametric design strategy based on performance was applied in this project as well. A building depth of up to forty meters and single-sided light exposure depths of up to fifteen meters stipulated in the existing master plan actually make residential use impossible. In order to solve this problem voids are cut into the façade, increasing the surface area and providing more light for the space inside. The voids are positioned in a parametrically generated rhythmic structure, this becoming "dancing voids." Varying types of footprint for any possible position of a void while at the same time keeping the load-bearing structure and the shafts form the basis of the manner in which they are programmed. The various types are configured by a self-developed scripted program according to pre-defined probabilities which determine, for example, after which number of vertical repetitions there can be a horizontal jump by the void of one or two positions. In this way each of the residential high-rises has its own rhythmic structure and composition of nine similar yet nonetheless unique buildings. The programming enabled us as the designers to generate a huge number of variations of each façade optimizing not only the lighting performance inside of the apartments but at the same time the appearance of the building from the outside. This creates a new typological approach to the construction of multi-story residential buildings.

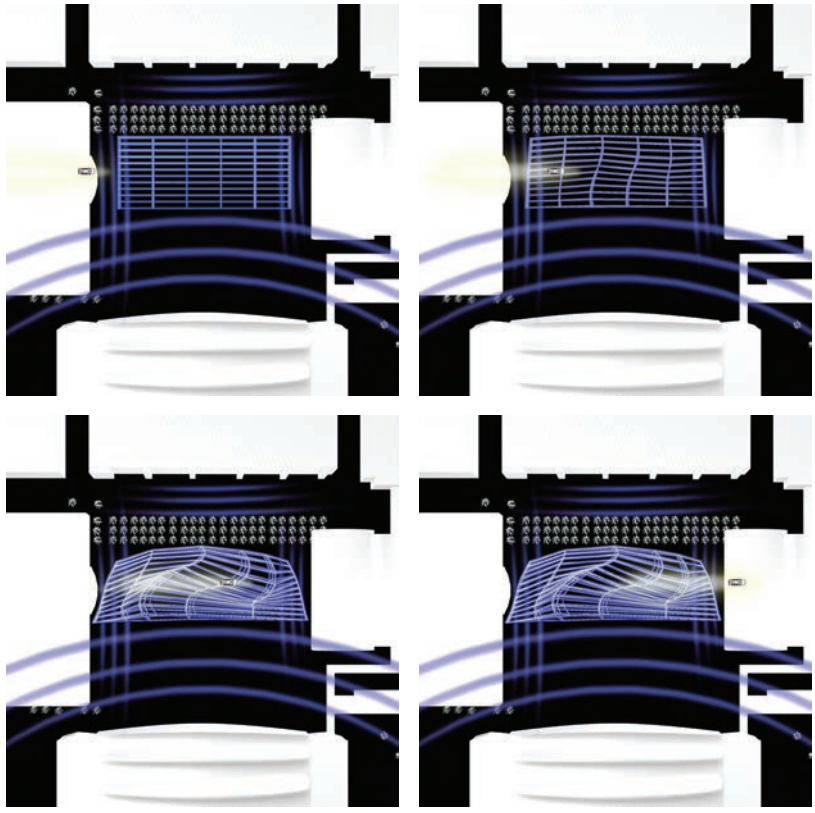
Dynaform, Frankfurt, 2001, BMW trade fair pavilion
The space of the pavilion around the automobiles is accelerated to conjure up the feeling of motion. The membrane constructions incorporated the first membrane in the world to be spanned unilaterally over frames made out of 30,000 individual pieces, as CNC plasma-cut hollow box girders.



Section 2–2



First floor plan



Form generation diagrams

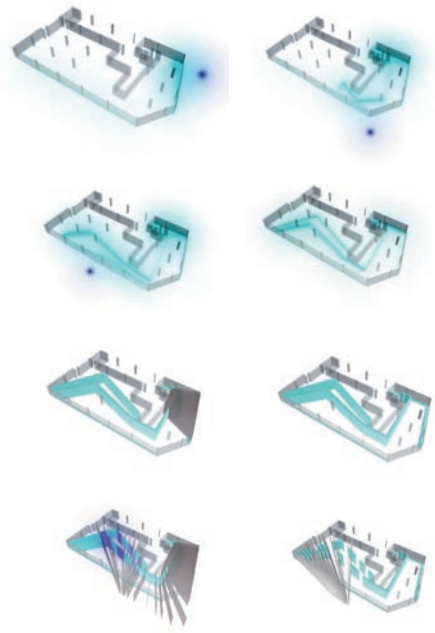
Home Couture, Berlin, 2004, Raab Karcher, flagship store
The sensory shopping experience in a lounge-like atmosphere was the focal point. One highlight was the visual and kinetic façade installation which calls to mind a view of the tiles at the bottom of a swimming pool.

The compact volume lowers the heat input and the solid stacking the use of surface area. The voids increase the shade on the façade in the tropical sun, which in summer beats down almost vertically. In North Vietnam's cold winter, the low-lying windows increase the heat input. Usage as a "sky garden" references architectural utopias of the vertical city and by means of shade, oxygen production and evaporation improves the micro-climate. Ventilation in the shafts is improved.

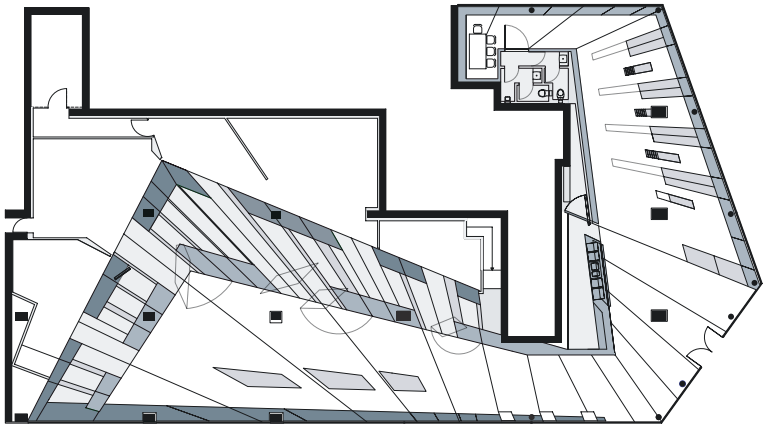
The position of the void controls the distribution and rhythm of the floor-to-ceiling façade elements, which vary in intensity of color in line with the programming. Silk is a product that dominates Vietnam's history and society. An association with the reference to silk in the name given to the project is triggered by the façade texture, which surrounds the building like a robe, is made of anodized aluminum panels, which are irregular in their rhythm and oscillate in gentle colors.

The parametric design approach of the U-Silk City project leads to a performance optimization of lighting, energy consumption and narrative quality.

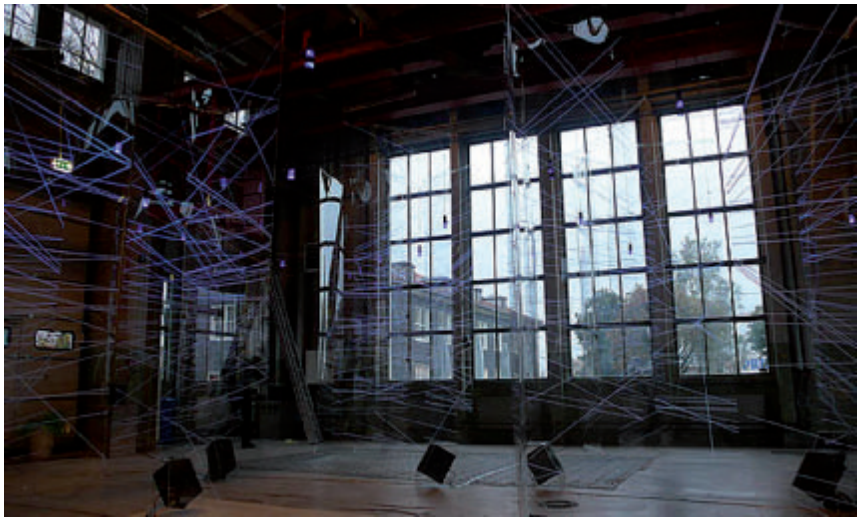
Optimizing just one of the ambivalent facets of performance results in a limited reading of architecture, which only caters to a seeming rationality but neglects the narrative levels of architecture. True performance meets romance.



Form generation diagrams



Plan



CHAPTER NINETEEN

OCEAN

OCEAN DESIGN RESEARCH ASSOCIATION /
JEFFREY P. TURKO, DEFNE SUNGUROĞLU HENSEL AND BIRGER SEVALDSON

WE WITHIN OCEAN Design Research Association come from a pluralistic, heuristic and holistic approach; we support various discussions, views and perspectives on how to interpret "performance" as a notion in architecture and design. The different perspectives found within OCEAN span from a perspective related to the interpretation of performance in art where this notion is tied to the conception of actors, both human and non-human, to the definition of performance as a systemic approach to functions. Despite these differences, our common interest focuses on how to understand and instrumentalize the notion of performance for alternative design approaches to address pressing issues such as managing complexity, sustainability, ecology and, by promoting heterogeneity, responding to the rapid homogenization of the built environment. We use the notion of "performance" as an embodying definition that underlies some of our research areas focusing on material, spatial organization and advanced design processes utilizing complex relations between structure, environment and the multiple layered and combined effects when seeing these designs in interaction with spatial experience and habitation patterns. Partial investigations on material, spatial, experiential and habitation performances address functions in a systemic way by looking at functionality as interacting and mutually interrelated responses to inputs. The following

Barely, Oslo, 2007–2008
Barely is an audio-visual installation that creates a just perceivable layer above the existing visual, sound and spatial environment. It plays with what exists, rather than introducing the new, highlighting what is already present in the individual's temporal and spatial relationship to the subject rather than attempting to introduce the artificial.

Barely can be looked upon as our comment to the "noise-entropy" of modern society. By addressing the sensory level that is just above what is perceivable both when it comes to sound and visual stimuli, we turn the attention of the visitor to rediscover reality.

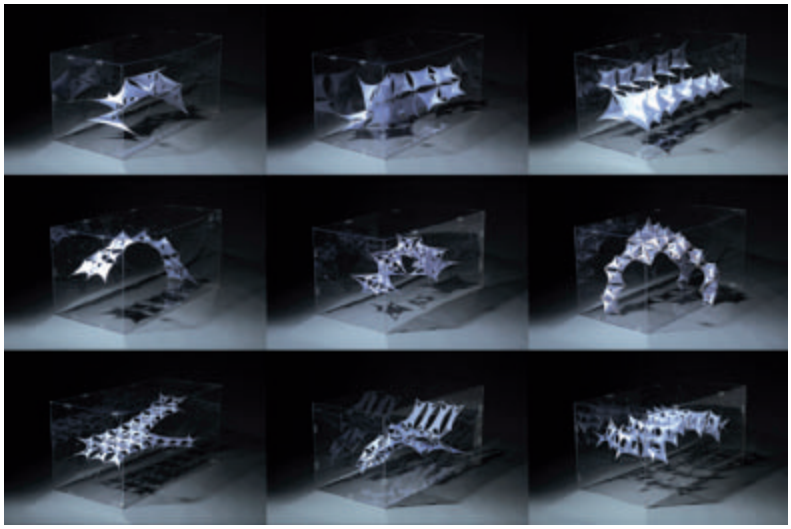
The increased complexity of the urbanized soundscape and landscape is "masking" itself and tending to noise-entropy. The internet and our multi-media environment provide ample opportunity to escape from these everyday phenomena. Barely is intended to give the visitor an opportunity to rediscover and explore reality. It will encourage reflection, contemplation and create a detailed enough experience for lengthy visiting time.

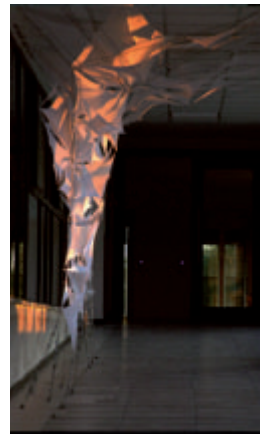
Membrane and cable-net systems, 2008–2009

The research into lightweight combination of spatial nets and membrane arrays focuses on developing particular construction methods and spatial strategies providing intermediary climatic and spatial conditions for highly interiorized built environments or for environments in need of spatial supplement.

Both cable-net and membranes belong to form-active tension systems with the possibility of combined form finding of both systems, resulting in a flexible spatial mesh structure. While the spatial nets extend and diversify the possibilities of combinatorial configurations of membrane arrays, the distribution, number and position of anchors together with stresses involved in the anchorages, need to be considered. Respectively, possible wide ranges of structural morphologies and their intricate local articulation have been investigated while exploring the reduction of the necessary number of anchor points.

Based on physical and digital form-finding methods and structural, environmental analysis, different system articulations have been tested with regard to environmental performance. Derived from membrane arrays, set within planar and complex spatial cable-net arrangements, in some instances being supplemented with compression elements, the design has been found to be instrumental for producing specific ventilation patterns and rich light, shadow conditions.

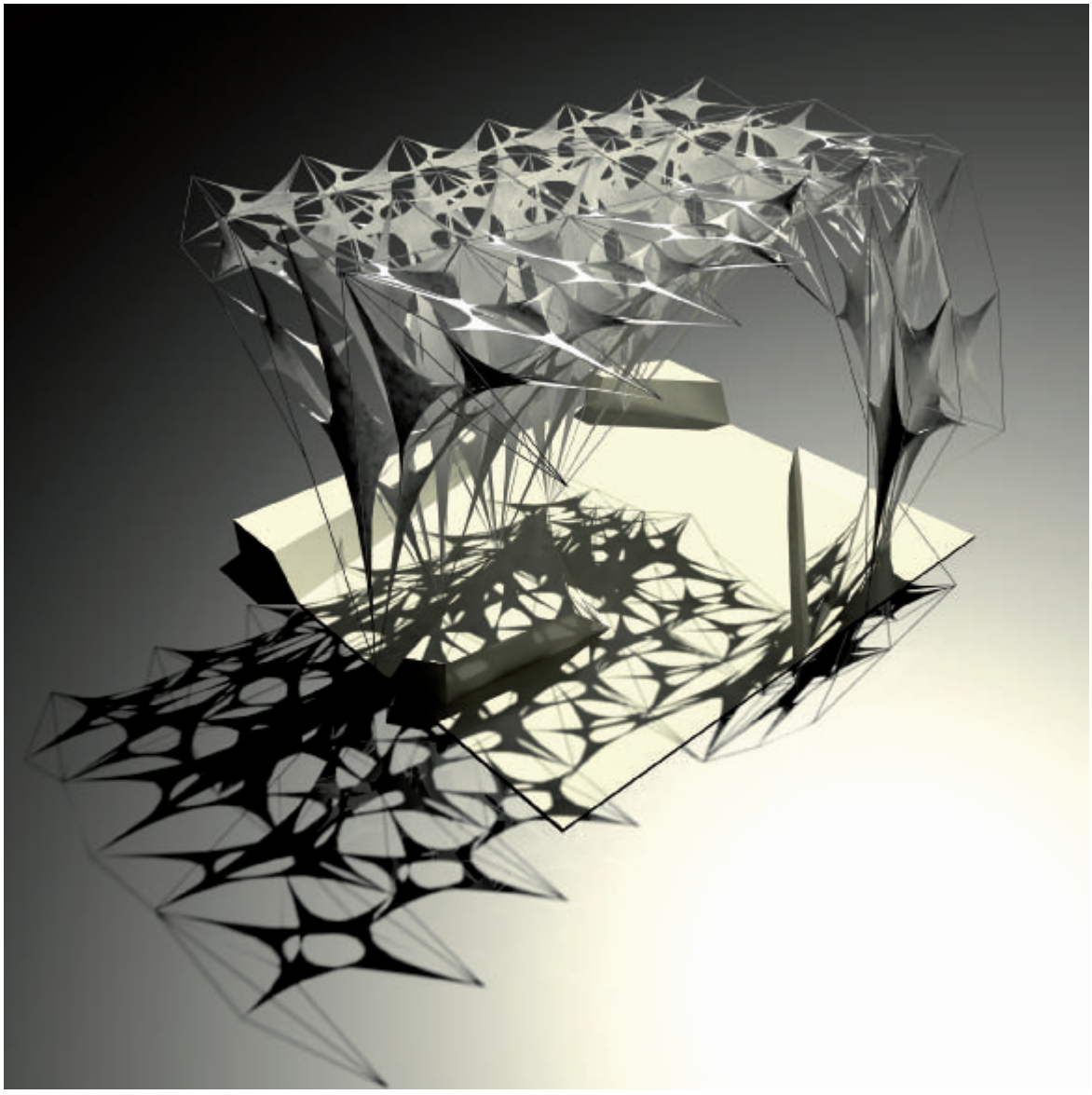




projects illustrate some of these themes within the category of membrane morphologies.

Membrane structures owe their importance to the thinness and lightness of its material to which the possibilities and capacities of structural, environmental, habitational and architectural effects are directly related. The structural use of its material properties led to a variety of membrane geometries of double curvature based on the principles of form found from active tension systems (Frei Otto, Jörg Schlaich et al.). These structures offer incredible load-bearing capacities and extraordinary architectural results, usually in the form of tents, umbrellas and convertible/covered membrane roofs. Structural optimization has been the main criterion for the decision making for these designs along with spatial spans that were necessary to sustain the program.
The notion of performance raises interesting discussions on the potential further development of such constructs: what kinds of possibilities arise when structural and environmental potentials of membrane systems are developed in order to offer differentiated and carefully modulated spatial and environmental conditions?
For us, one of the most interesting and relevant applications of membrane systems today is their utilization as architectural features to improve context-specific conditions of the built environment, which are environmentally malfunctioning or in need of spatial supplement. In order to develop systems where versatility and local adaptation are the main design objectives, membrane spaces research offer promising design potentials (see www.membranespaces.net).

Their application as intermediary spaces offers provisions for a higher degree of environmental modification. Such constructs make the negotiation of climatic transitions and the articulation and controlled perforation of hermetically sealed building envelopes possible. The membrane constructs provide a more intelligent exchange across degrees of climatic exposure for completely interiorized building contexts and built environments across hot and cold climates. For instance, in the examples of hot extremes such approaches are necessary in order to reach solutions that are less dependent on mechanical means of cooling in the form of fully conditioned and controlled interiors.



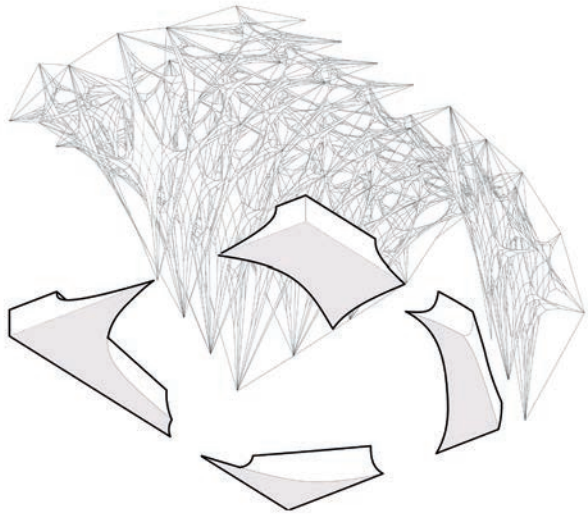
Membrella (MM-Tent), 2008
The Membrella project aimed to present a new type of working space that is a spatial experience of modulating light and varied transparencies.

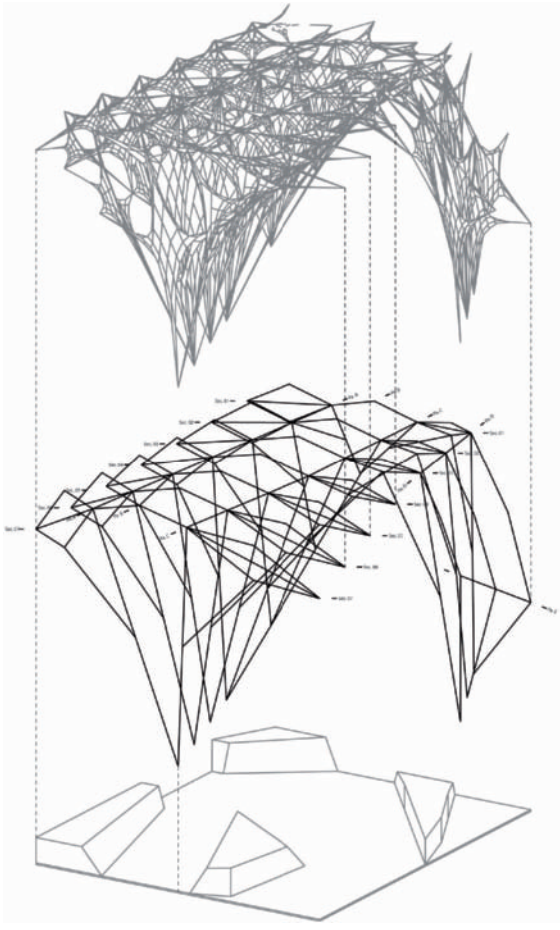
The minimal fabric patches combine together into a lattice-like surface that sculpts the space into defined zones that can be occupied. This is then defined further in combination with a sculpted base of occupiable surfaces that can be used for sitting and resting. The latticed volume creates varied diffused light conditions, modulating light much like the canopy of a tree. Producing a gradient of light conditions for users that need minimal light for the use of computers and brighter light conditions for reading. The structure of the Membrella is an umbrella structure. Rods act as compression members that create the flexible skeletal system for the MM-Tent. When unfolded, it snaps into place with the fabric patches supporting the structure much like muscle in tension.

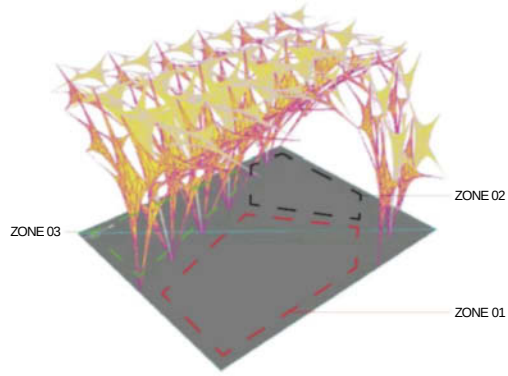
The desired lighting conditions are achieved in different zones. The design will then be assessed by physical tests on various places within zones of the erected pavilion.

The aim of the Membrella project, on the other hand, is to develop spatial effects that produce diversified conditions providing varied ways of inhabitation. The proposed membrane structure offers shelter while modulating light that results in illuminated spatial conditions of gradience and in a twofold manner potentially mediates environmental conditions such as direct sunlight to produce an area of varied comfort. Additionally its performance-driven criteria is coupled with how it relates to occupation scenarios. Therefore, how it performs as a space of diversified conditions only gets fully tested in the interplay with human actors. We see the human inhibitors as real-time contributors to the unfolding of the dynamic territorial and environmental spatial conditions. So the human as performer is involved in the shaping of the performance of the construct.

Spatial experience from a performance approach has been explored through the analysis of space such as the one produced by the Barely installation, which raises two questions. First, what happens if the discussion of performance embraces environmental parameters like the visual quality, sensory input and the generation of emotional responses to this articulation? Barely creates a highly complex experiential space that changes radically by the impact of light and sound. The sound level is low, just above the background noise level. This triggers an active and intense listening experience. The visitors are totally immersed and seemingly introvert but together they create an atmosphere of undisturbed intense listening and experiencing. Likewise the slow movement of visitors through the space creates micro-disturbances that subtly animate the reflective foils and bring the installation to shivering life.






ZONE 02
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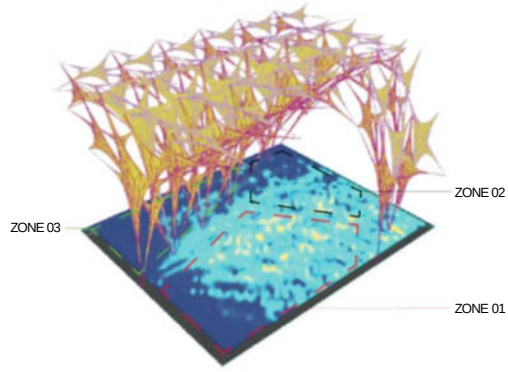
ZONE 02
ZONE 03
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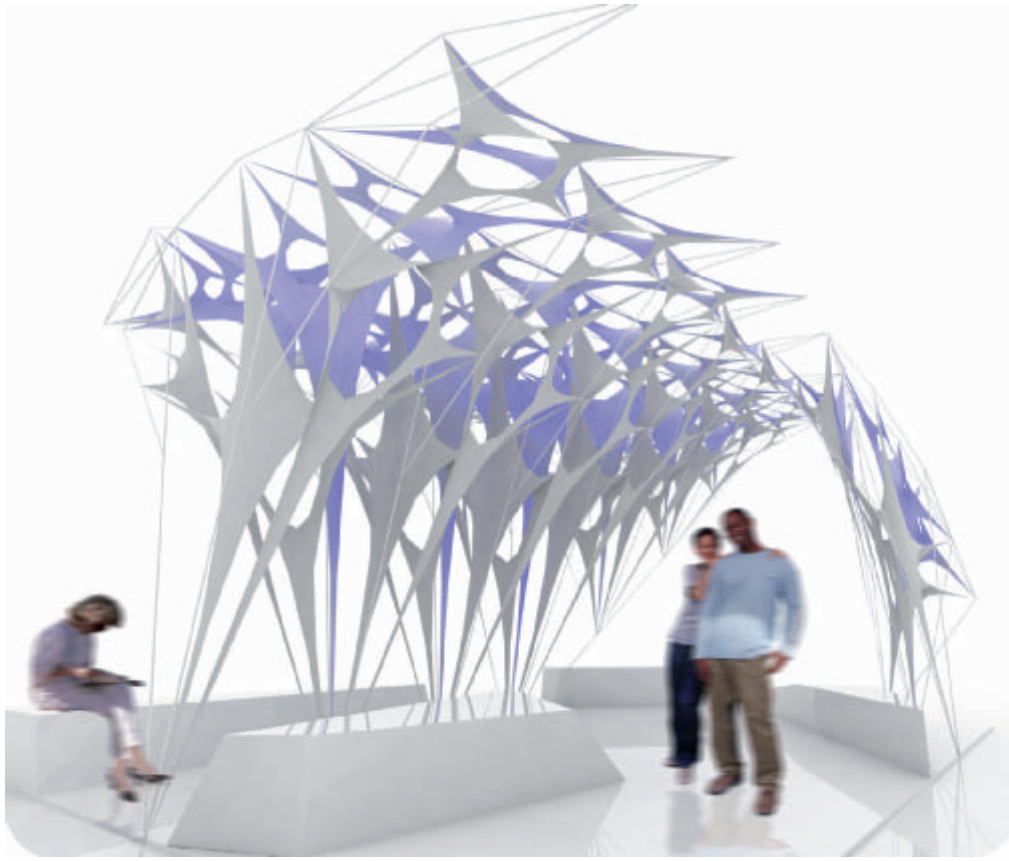
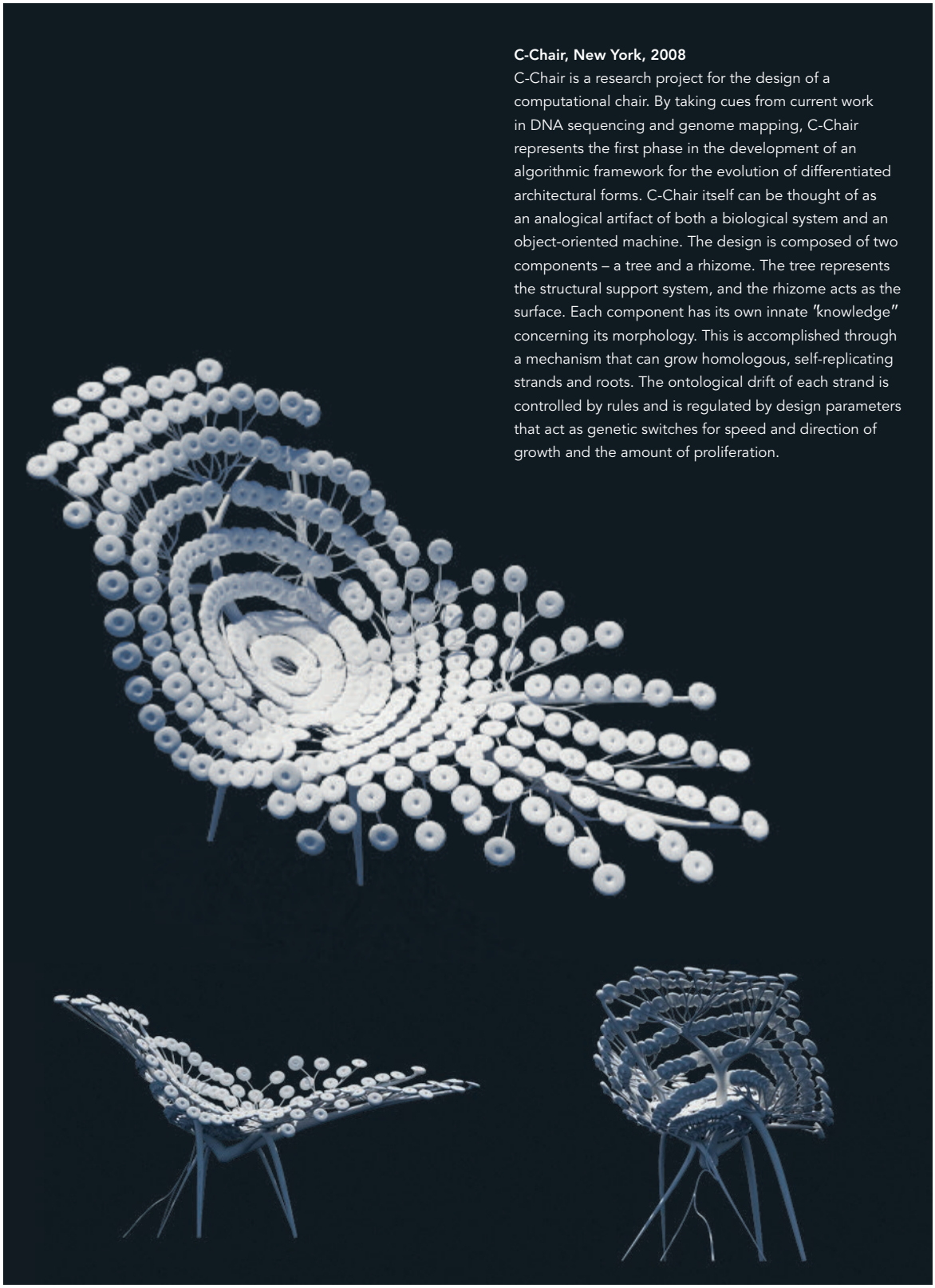
Second, what happens when the space starts to produce its own impacts and departs from only responding to environment? This is clearly the case with Barely, especially if we look at its sound-making part. The sound just above the level of background noise has an influence on the visitor that is very strong when it comes to achieving an increased level of awareness. But it is also obvious in both daylight where the surroundings are reflected and distorted and in the night when the UV reflective lines take fully over the space. Still the visitor is essential by changing these effects radically through altering the viewpoint. This example demonstrates and extends the discussion of performance to embrace not only interaction with and between environments but also between the built artefact and inhabitants, where a notion of performance more related to the one inspired by performing arts is demonstrated. Michael Hensel first described this relation between the different notions of performance. (2010, www.formakademisk.org, vol. 3, nr. 1)

Proactively we aim to incorporate diverse relationships of spatial production and occupation into performative processes that integrate structural, material, spatial/habitable dimensions as well as experiential and sensory-driven effects. It may be best to end this discussion of performance at this point and let the projects convey our varied viewpoints and outcomes and speak for themselves. But to put it simply, we strive for outcomes that "will rock you" spatially, environmentally, socially and experientially.



C-Chair, New York, 2008

C-Chair is a research project for the design of a computational chair. By taking cues from current work in DNA sequencing and genome mapping, C-Chair represents the first phase in the development of an algorithmic framework for the evolution of differentiated architectural forms. C-Chair itself can be thought of as an analogical artifact of both a biological system and an object-oriented machine. The design is composed of two components – a tree and a rhizome. The tree represents the structural support system, and the rhizome acts as the surface. Each component has its own innate "knowledge" concerning its morphology. This is accomplished through a mechanism that can grow homologous, self-replicating strands and roots. The ontological drift of each strand is controlled by rules and is regulated by design parameters that act as genetic switches for speed and direction of growth and the amount of proliferation.

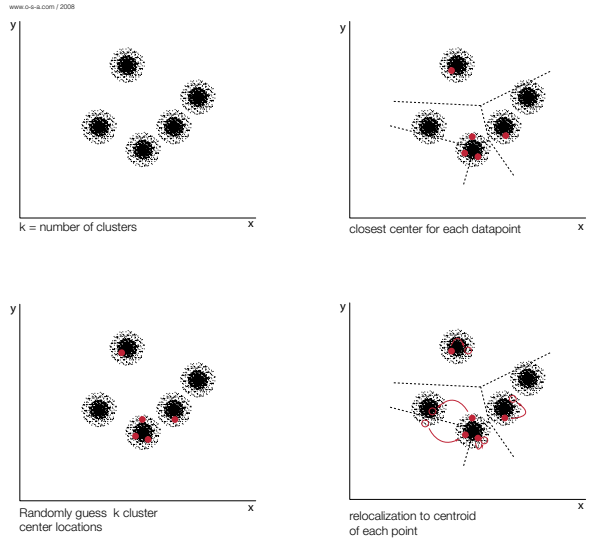


CHAPTER TWENTY

Open Source Architecture

INTENSITY, EXTENSITY AND POTENTIALITY: ARCHITECTURE AND THE INFORMED REALITY / AARON SPRECHER

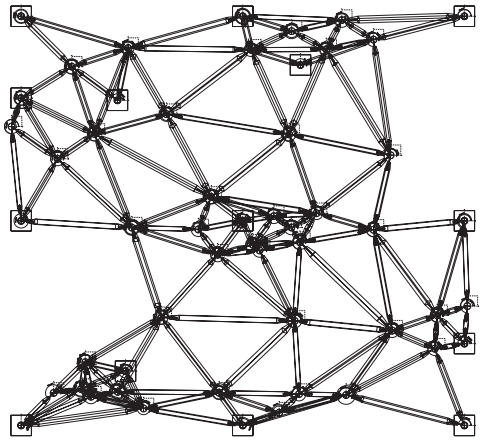
TRIGGERED BY THE INTEGRATION of information technologies some fifty years ago, the design studio has gradually transformed into a scientific laboratory where design researchers acquire languages and models that are often borrowed from the sciences. This disciplinary shift is epistemological because it implies that architecture has replaced some of its former assumptions with a new form of experimental knowledge that is porous to other domains of human activity. From the beginning, the technological procedures aimed at producing models that were ever more efficient, accurate and responsive. The change in practice does not imply that architecture has turned into a new science but rather that its tools have become scientific. These scientific procedures have gradually transformed the fixed and idealized condition of the architectural object into one that activates behavioral, responsive and adaptive designed systems. A consequence has been the emergence of a model of architectural performance that is more than ever linked to the notions of intensity, extensity and potentiality.



INTENSITY

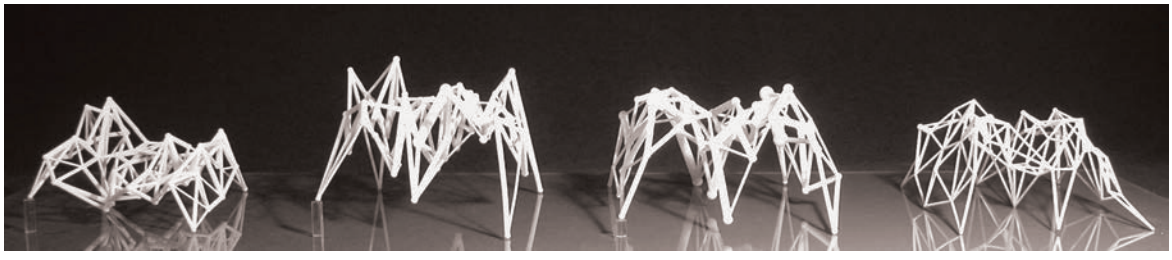
From the point of view of today's informed architecture, the notion of intensity suggests that the discipline has transformed the nature of its object. This object has mutated into an organism shaped by intensive computational operations that continuously inform,

influence and modify its nature. The architectural entity is now shaped by information systems that adapt and evolve at the rate of Moore's Law. The capacity to manage the complexity of information inherent to this entity has become dependent on the exponential development of our calculation capabilities. The architectural organism is now the object of an accelerated evolution; it has become endowed with an exponential capacity to absorb and process complex sets of operations. This condition has now provided a limitless platform for the expansion of human production in which architectural organisms and organizations represent as many platforms for the emergence of designed systems. Such systems do not distinguish organic from inorganic matters, living from inert organisms, static from dynamic systems; relentlessly combining all elements of the real. Within this "informed" landscape, everything is information, everything is energetic and intense.



EXTENSITY

THE NOTION OF extensity associated with the architectural model suggests that architecture is no longer an autonomous discipline but instead responsive to a wide range of mutating parameters across all human domains of knowledge. With its transdisciplinary character, the architectural organism has now embraced the information networks that are no longer limited to the computational platform but also extend in the immensity of our reality, environment, nature and even bodies. One of the consequences of this transdisciplinary state is expressed by the current proliferation of new design activities in emerging fields such as material and fabrication research, interactive and immersive media, and most noticeably, biologically-inspired modeling. In other words, the expansion of information and its associated technologies implies that architecture is increasingly porous to other fields of knowledge. Its concerns are no longer constrained to a particular dimension but instead extend at all scales simultaneously, from the intrinsic structures of material to the macro-scale of environmental phenomena. Architecture has now embraced a model of extensity by creating a continuum of knowledge that expands at all scales.

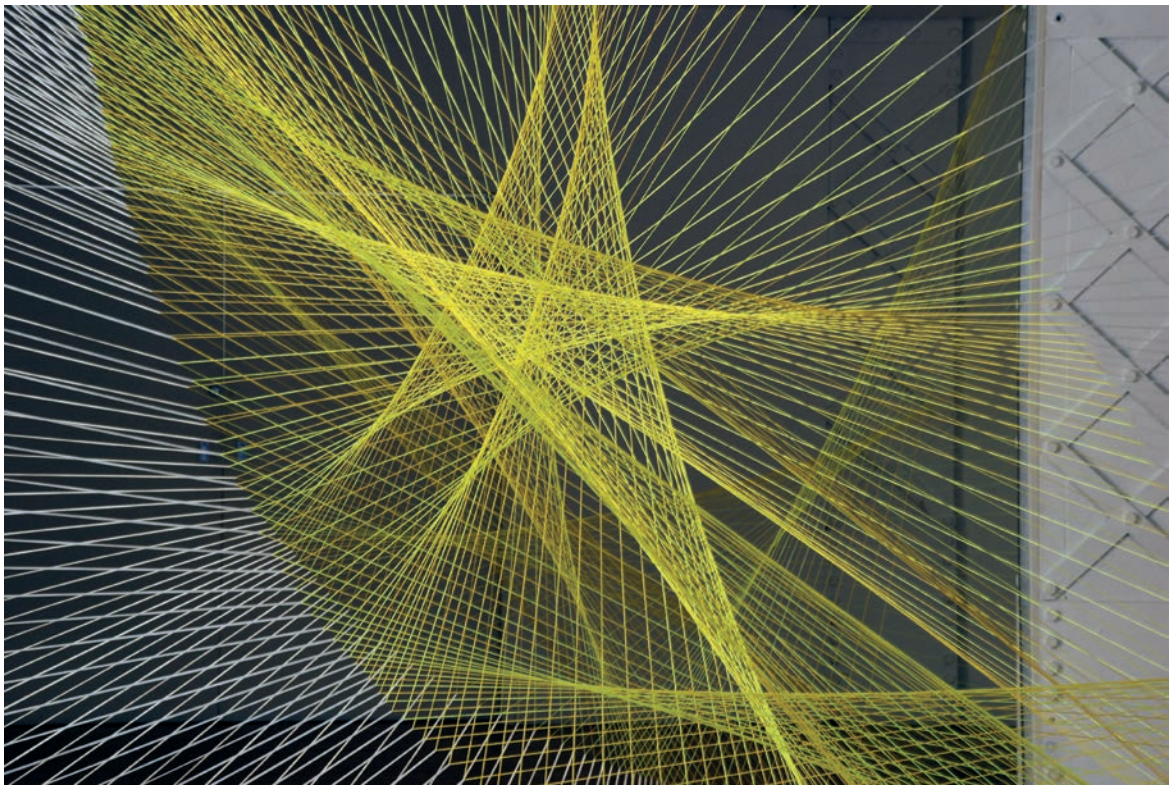


POTENTIALITY

FROM THE POINT OF VIEW of today's computational architecture, the notion of potentiality is essential because it implies that the architectural object can no longer be addressed in terms of idealized and fixed conditions. Instead, it has mutated into a system that is increasingly non-linear, meaning that it does not reflect a structure of cause and effect but rather induces evolutionary processes. Such processes have emerged in recent years across a wide range of newly formed scientific domains such as bioinformatics, computational biology and genomics.

While these recent research domains have emerged in various contexts, they have in fact deeply influenced the architectural perception of nature and the environment. Architecture has been increasingly porous to these notions in recent years. One of the main consequences of this porosity has been expressed by the integration of new modes of design thinking pressured by the computational tool. In particular, automated processes such as structural shape annealing mechanisms and new forms of human-computer interactions are now seen as new modes of investigation offering the possibility to increase the integration of heterogeneous sets of information and parameters.

Hylomorphic, Rudolph Schindler's King Road house, West Hollywood, 2006

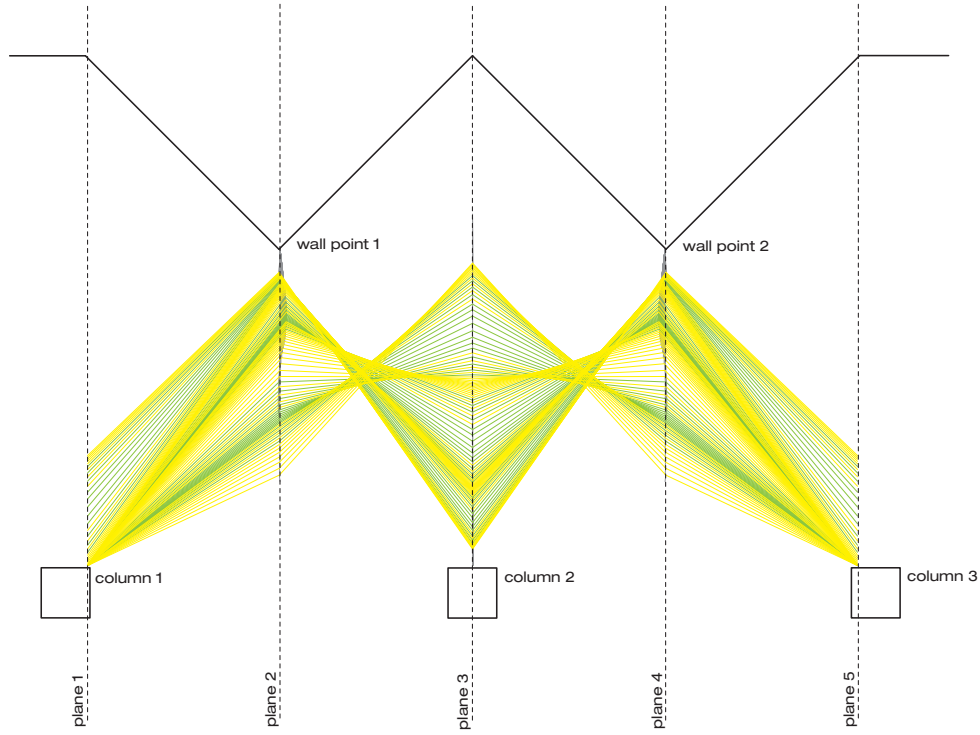


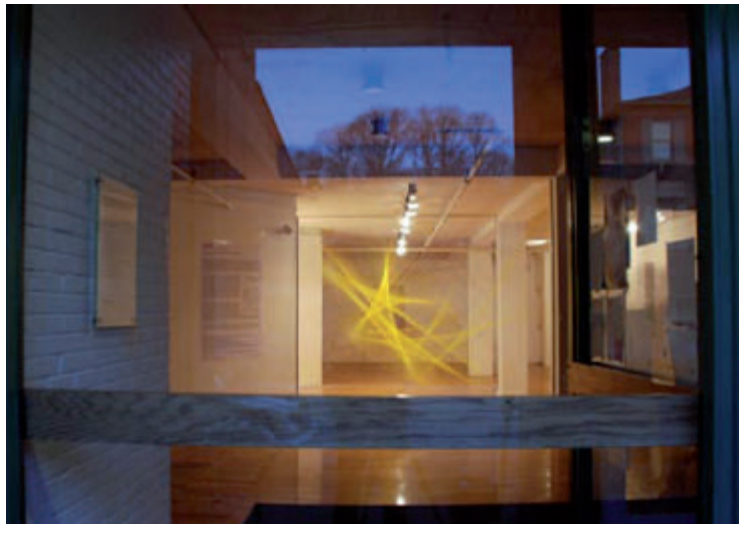
N-Nature, Rhode Island School of Design, Providence, Rhode Island, 2009
The project attempts to create a system that simultaneously analyzes and codifies the behavior of the existing gallery space through color and lines, negotiating and integrating multiple forces to find a balanced condition. The geometry of the unique components in the gallery initiates the development of a mathematical model based on vector and force that negotiates the unique conditions. The addition of constraints in the system uncovers latent forces and geometrical conditions, providing a filtering device to reduce the potential solutions.

As a means of analyzing the space, we sought to develop a single system that integrates form, structure, codification and minimization of material. The resulting geometry is created from the process of weaving multiple lines, resulting from the combination and balance between a specific mathematical equation, the physics of tensile forces and the geometry of the existing space. The lines are color-coded according to their function and density.

These new modes of design thinking share a similar objective, namely the increase of the capability to integrate a wide variety of knowledge within a singular model. While this knowledge stems from various sources, each of these sources presents a potential model for describing reality. This augmented vision renders a world of instable phenomena, an energetic flux of probabilities.

In the past forty years, roughly since the advent of information sciences and technologies, architecture has undergone a profound transformation of its status. And yet, from Dallegret's "Environment-Bubble" and Superstudio's "Microevent/Microenvironment" to today's morphogenetic desires, it remains fascinated with the prerogative aspects of nature. Considering the three notions of intensity, extensity and potentiality that act in the most profound structures of our informed world, architecture is no longer interested in representing nature but rather in procreating its performative conditions of evolution, adaptation and duration. The architectural organism is now sensitive, mutative and responsive to its own existence, or as Peter Sloterdijk expresses, it now embraces the ambient "spheres" of our world.





Parasolar, Tel Aviv, 2009

Parasolar is an installation erected as part of the Centennial celebration of the city of Tel Aviv, exhibiting fifty-seven student projects. Located in a 2500-square-meter plaza, the scale of available area compared to the quantity of information and available resources was vastly disproportionate. It is within this context of responsive efficiency that the project was conceived computationally and materially. Surrounded on all four sides by buildings, the plaza provides varying solar/shading conditions throughout the day. Seeking to respond to the environmental conditions, the project is organized according to solar intensity while using minimal amounts of energy and materials. In order to achieve the most performance per energy unit, we focused on developing a single procedure that integrated the influence of solar conditions into a skin that is simultaneously structure, cladding, sign and envelop. The ideal material and structure for this was pneumatics.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CHAPTER TWENTY-ONE

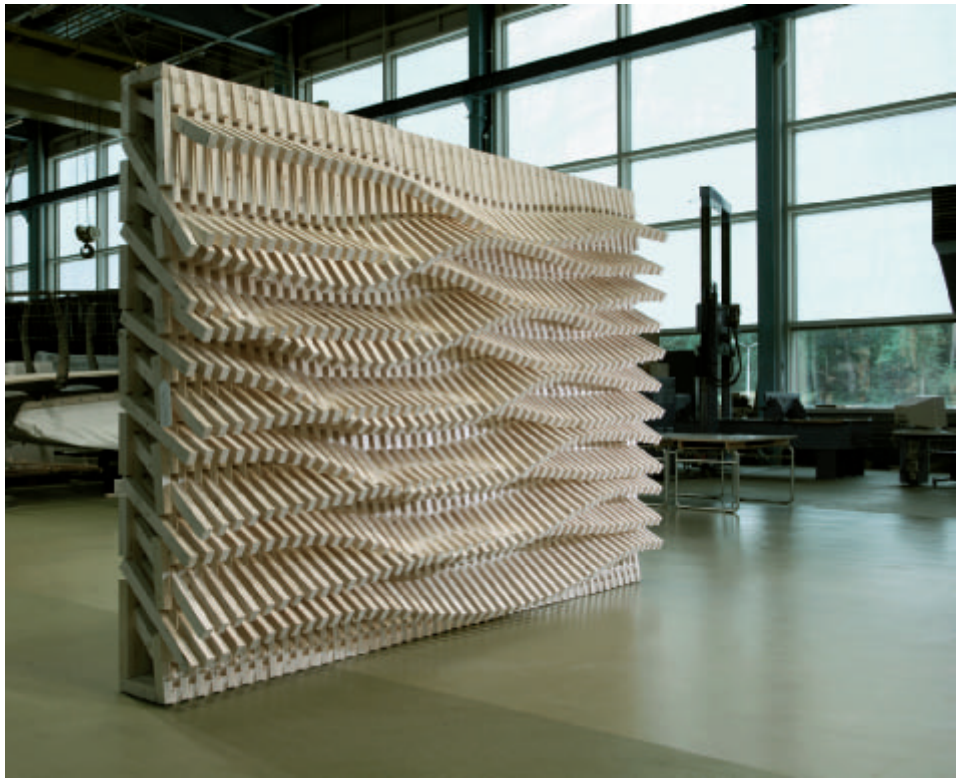
Gramazio & Kohler

DIGITAL MATERIALITY / FABIO GRAMAZIO AND MATTHIAS KOHLER

AT GRAMAZIO & KOHLER we engage with digital technologies both on a practical – and on a conceptual level. A critical view acknowledging the potentials as well as the limits of digital technology allows its selective and accurate use. As authors and researchers we thereby trust in our own senses and an integral understanding for architectural coherence. We are convinced that no algorithm, no optimization, no simulation, no system and no machine alone can lead to architectural quality. Technological performance will always be complemented and preceded by human desire, intelligence and sensibility.

Recognizing this cultural dimension and the diversified nature of architecture, we distrust a merely positivist, potentially unifying application of technology in design. Instead we strive to create meaningful moments where a tangible presence establishes itself from the synthesis between digital technology and built architecture. As we are not interested in producing vague speculations, we design strategically at a 1:1 scale, acknowledging the fact that the performance of materials and therefore many constructive principles are bound to their scale. The same applies to digital technology. We do not understand the digital as a metaphor for an

Architonic Concept Space, 2008
The Eroded Cubes are manifold sculptures that can be used as seating, table or wall objects combining additive and subtractive aesthetics. Their ambivalent expression fluctuates between that of an accumulative sculptural form and that of an eroded, seemingly amorphous mass. These objects are created from volumetric pixels, or "voxels," that are bound within modular cubes of three sizes (0.5m, 1m, and 2m). Necessary parameters, such as interlocking segments and functional cavities, were considered throughout the shape selection and generation. An industrial robot assembled and glued these spatial structures, which were coated with an industrial strength rubber finish, from blocks of varying lengths, lastly producing objects whose mass is smaller the larger they are.



The Sequential Wall, ETH Zürich, 2008
This project investigates the architectonic and constructive potential of additive digital fabrication in timber construction. We designed a process in which a robot first cut commercially available wooden slats to length and then stacked them in a free arrangement. Such free arrangements allow high-resolution and subtle movements and transitions to be designed, running counter to the modular expression of the stacking. Straight lines flow seamlessly into curved ones, and on the wall's surface an interplay is produced between the rhythmic repetition of the directional wooden slats and the fine gradation of their lengths.

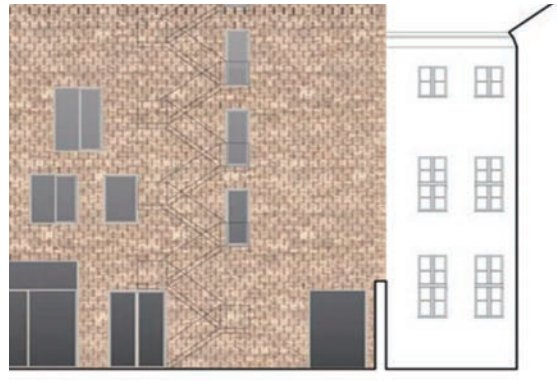
In the follow-up course the students were challenged to integrate the functional requirements to an external timber wall – for example its loadbearing and insulating behavior as well as its constructive waterproofing – into their design systems as generative parameters. Functional and formal characteristics were so tightly intertwined that they became mutually dependent.

architectural world of unlimited possibilities resolved by complex simulations. Rather, we are interested in its operational and conceptual characteristics offering unforeseen ventures in conceiving architectural designs.

We are convinced that architecture has so far only marginally benefited from the so-called digital revolution. Our work addresses the uncovering of this unused potential by connecting the digital explicitly to the material nature of built architecture. We investigate the conceptual affinity between construction and computation. This connection is achieved by directly linking two crafts, the craft of constructive design and the craft of computer programming. By mapping the savoir-faire of construction into a programmed logic we gain direct control over the making of buildings. This synthesis, enabled by the techniques of digital fabrication, allows the architect to directly control the buildup of material through design data. For the first time in history, architects explicitly control the building process.

Wall section

Façade detail and elevation

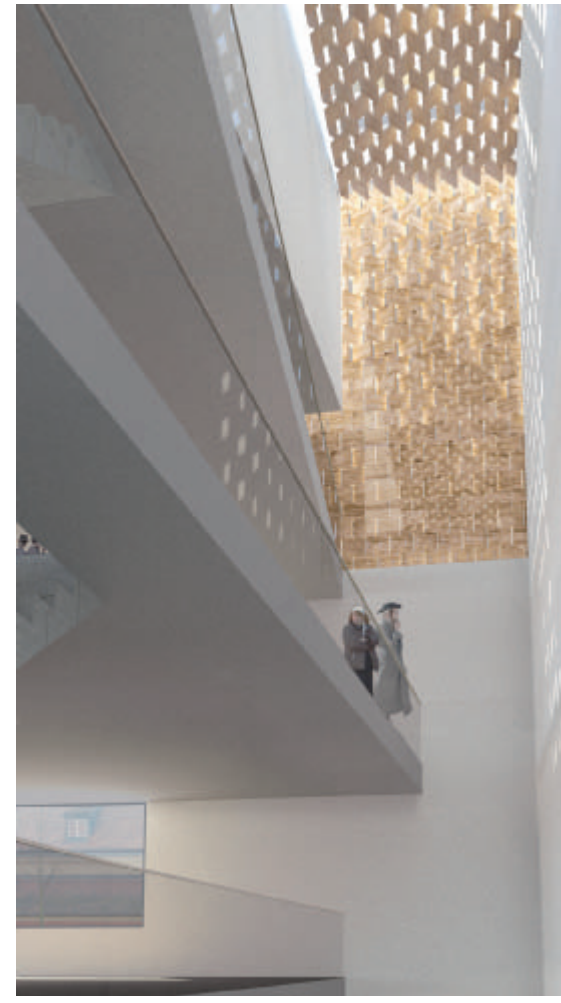


Rear courtyard elevation

Orthodox Synagogue, Potsdam, 2009
As the heart of the community center, the synagogue will not be hidden in the block courtyard. Instead, it sits directly on the street integrated with the all the functions that a Jewish center represents.

The interior atmosphere is made possible by the gradual opening of the travertine façade which stands behind a glass wall on the top two floors. Both the synagogue benches and ceiling are of wood and make reference to the historic synagogues of Eastern Europe. The floor and front wall remain neutral. The daily and seasonal change of light will animate the serene space.

The path from the street-level entry hall to the synagogue as the conclusion of the building determines not only the spatial organization but the façade as well. As a reinforced concrete structure, the long sides of the building are dressed in a façade of travertine stones, which are punctuated by windows on the first and second floors. The south-side street-level façade is closed, except for the glazed and setback entry foyer that visually links the street to the garden. In favor of filigree, the façade loses its massiveness as it rises. This transformation, which begins after the increasingly spacious middle rooms, is achieved with a linear stacking structure at sixty degrees whose rotation creates a Star of David motif. The façade gradient transforms the wall into a textile, the profane into the celebratory. This process culminates at the synagogue, allowing light to pass through the side walls. Both monumental and ephemeral, the idea of the Temple and the Tabernacle are united in the atmosphere of the synagogue. In another material and scale, the fading wall motif continues on to the ceiling in the form of a wooden screen.



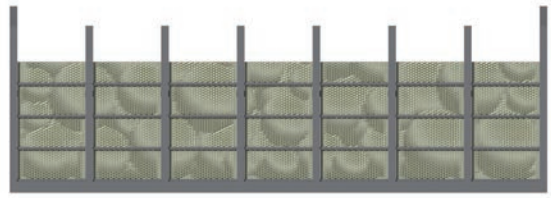
Gantenbein Vineyard Façade, Fläsch (Switzerland), 2006, non-standardized brick façade

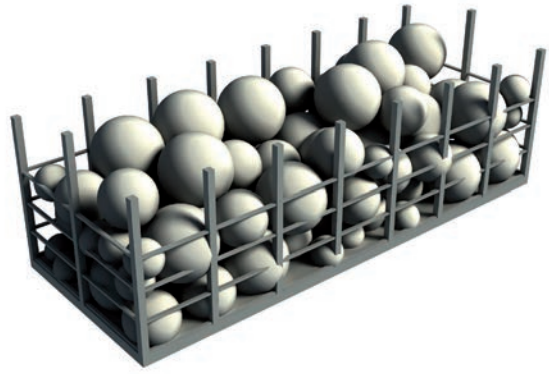
The project was realized as an extension of a small but remarkably successful vineyard. Bearth & Deplazes Architects designed the project, which was already under construction when they invited Gramazio & Kohler to design its façade.

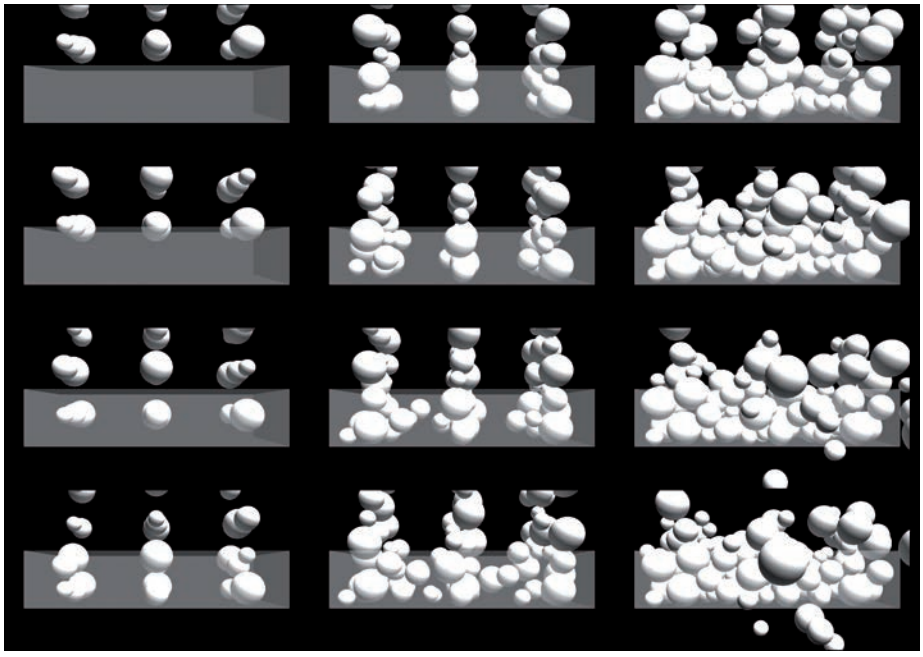
The initial design proposed a simple concrete skeleton filled with bricks: The masonry acts as a temperature buffer, as well as filtering the sunlight for the fermentation room behind it. The bricks are offset so that daylight penetrates the hall through the gaps between the bricks. Direct sunlight, which would have a detrimental effect on the fermentation, is however excluded. Polycarbonate panels are mounted inside to protect against wind. On the upper floor, the bricks form the balustrade of the roof terrace.

The robotic production method developed at the ETH enabled laying each one of the 20,000 bricks precisely according to programmed parameters – at the desired angle and at the exact prescribed intervals.

To create the façade, a generation process was designed. The concrete frame construction by Bearth & Deplazes was interpreted as a basket and filled with abstract, oversized grapes of varying diameters, digitally simulating a gravity affect. The digital image data was then transferred to the rotation of the individual bricks.







Therefore a digital design culture does not lead into an abstract and intangible realm of geometry and algorithms, but brings architecture closer to the materiality and sensuality of building. This reconnection with the material basis and the constructive knowledge of architecture fundamentally challenges prevailing design methods as well as the current building culture. Furthermore, it leads to a paradigm shift, which transforms the very materiality of architecture. A new materiality, the "digital materiality" arises. It evolves through the interplay between digital and physical processes in design and in construction.

Although it is one of the marvels of digital materiality that can become expressive in highly elaborate ways, it is neither an aesthetic application nor a superficial material refinement. It is the logical consequence of significant changes in the production conditions of architecture. It is our firm conviction, that digital materiality is about a fundamental rethinking of construction in architectural design. Functional aspects are synthetically integrated and boundaries between the structural order and its ornamental expression are blurred. Digital materiality leads to an architectural language which originates in the design of processes rather than the design of final forms. Digital and material orders enter into a dialogue, in the course of which each is enriched by the other. Digital materiality leads to new expressions and – surprisingly enough, given the technical associations of the term "digital" – to a new material sensuality in architecture.

CHAPTER TWENTY-TWO

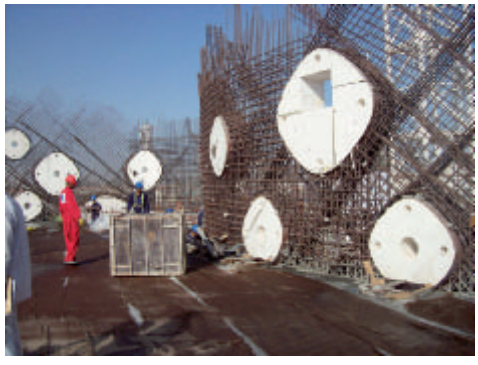
Reiser + Umemoto

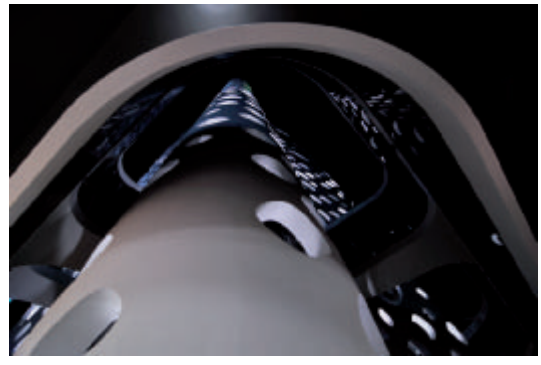
ARCHITECTURE PERFORMING ITSELF / JESSE REISER AND NANAKO UMEMOTO

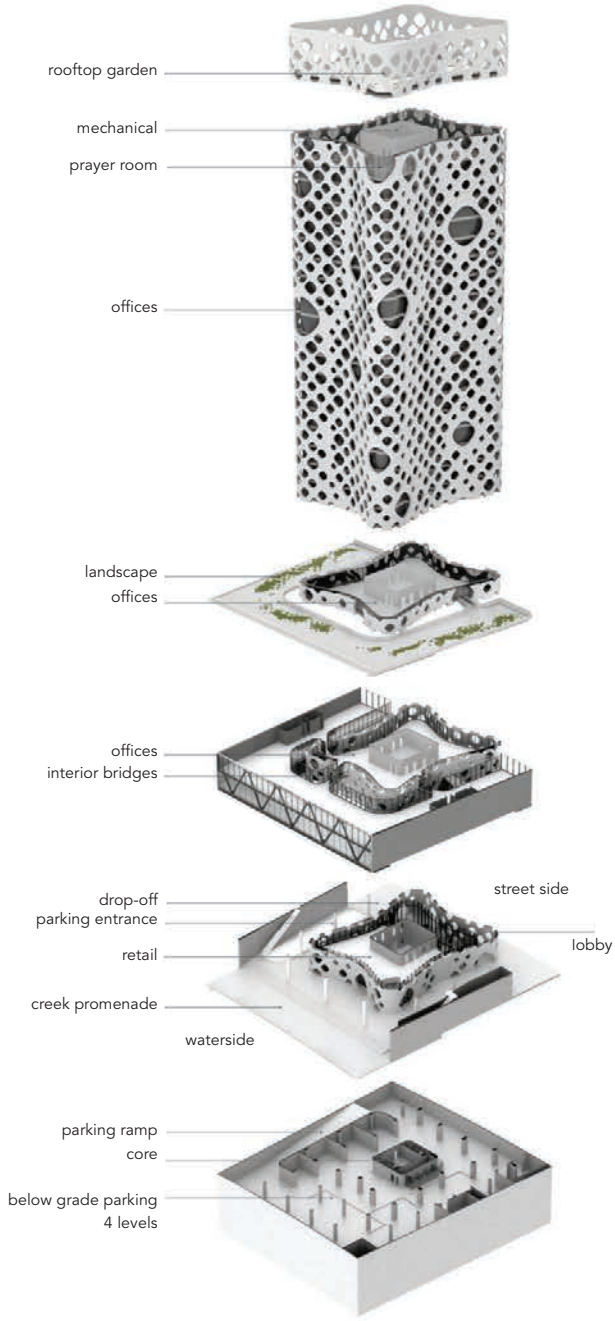
WE ARE CURRENTLY witnessing the wholesale resurrection of twentieth-century functionalism and attendant concepts of performance, but now enmeshed in the macro to microscopic reach of digital technology. The claims of performance as an instrumental dimension of architecture are surprisingly persistent and are especially attractive for those who would still believe in a tight link between program and function. Alas, for those who don't, there is still the architecture, how it performs itself.

Two salient issues sustain our work, both emerging from the concept that architecture is the material practice par excellence. The first issue, too lengthy to expound here, regards the generation of architecture within the dynamic of a material field. The second relates to the expression of that architecture, the performance of its effects, and the politics of its reception.

O14, Dubai, 2006–2009, office tower
O14 is a 22-story tower sheathed in a 40-centimeter-thick concrete exoskeleton shell perforated by over 1,300 modulated openings to create a lace-like façade, performing as a sunscreen open to light, air and views. The shell performs in both lateral and gravitational capacity to free the building from columns and shear walls. The openings on the shell modulate depending on structural requirements, views, sun exposure and luminosity. The exoskeleton's separation from the enclosure creates a chimney effect that reduces the cooling loads by 30 percent.







Tower isometric

> Many people prowl round Mount Sinai. Their speech is blurred, either they are garrulous or they shout or they are taciturn. But none of them comes straight down a broad, newly made, smooth road that does its own part in making one's strides long and swifter.
>
> Franz Kafka[1]

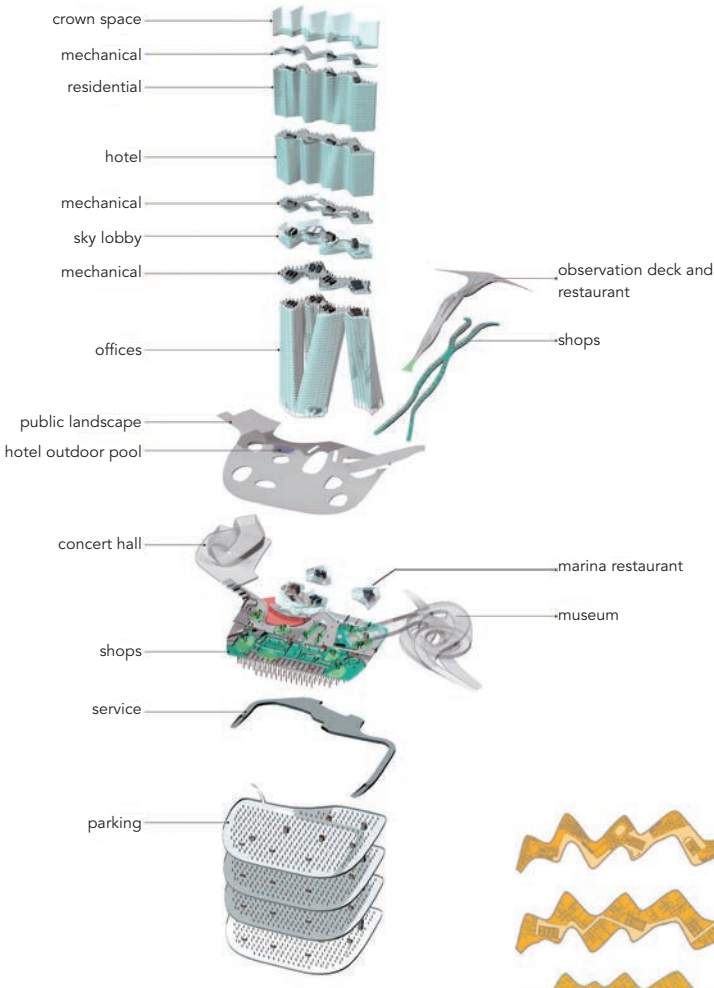
The ambient dimension of architecture, of which atmosphere and affect are aspects, has always been within the architect's control in as much as those aspects flow directly from the fabric of a building. In contrast, such perceived stabilities as program, besides being generally out of the architect's sphere of control, are actually much more transient.

The ambient dimension however, like any material effect, influences meaning and interpretation but does not determine it and is not affected by it. The rabbi gives the example of the Israelites coming to Mt. Sinai ahead of receiving the Ten Commandments and seeing the mountain ablaze with signs and wonders; they knew that something was imminent, but were not clear what. All that was for certain was that something elemental and intense was happening. Some expressed fear, others expressed confusion, and still others waited in joyful expectation. People expressed contradictory emotions within and among them; the only common factor was that of intensity.

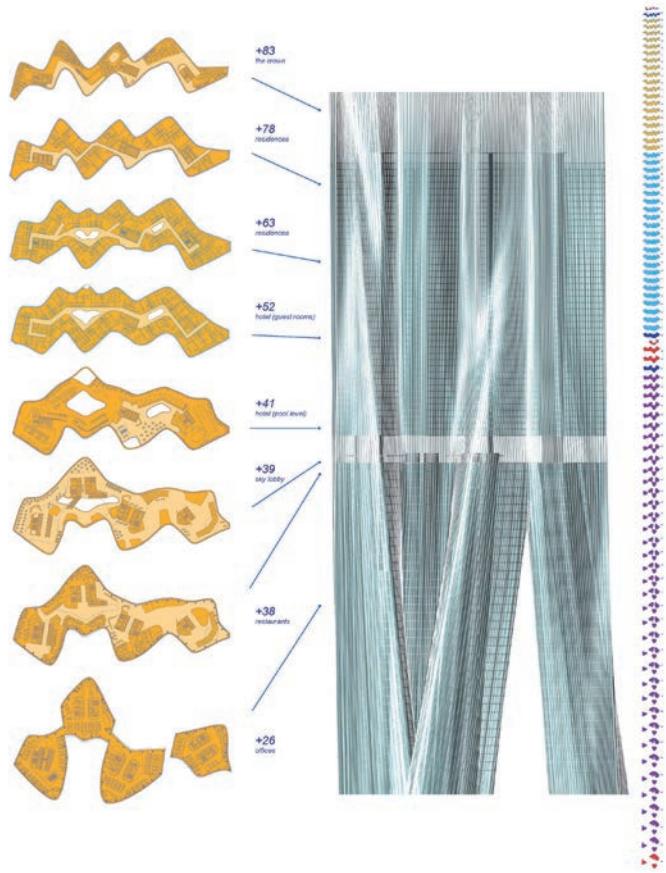
Architecture, too, seems to operate on this level. As a material system its fabric and effects can be determined to great precision and can be modulated to create highly specific atmospheres and ambiances. This is arguably the most permanent feature of architecture and that which is achievable with the highest degree of precision. It is no accident that the history of religious architecture is replete with examples of the same building housing different religions, over time and even at the same time, with very different outlooks.

Note

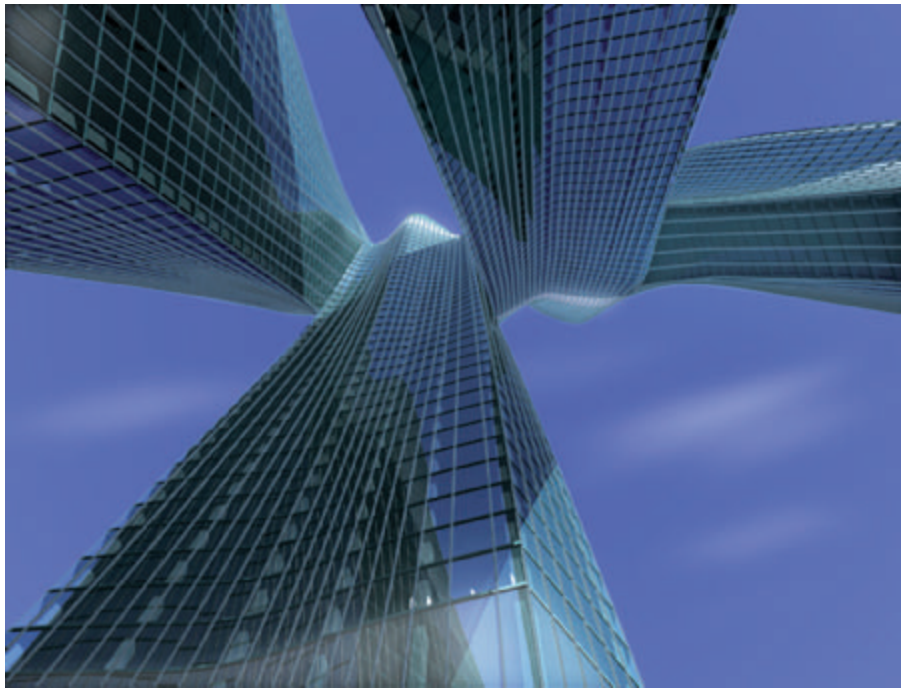
1 Franz Kafka, "Mount Sinai," in *Parables and Paradoxes,* (New York, [1935] 1974).

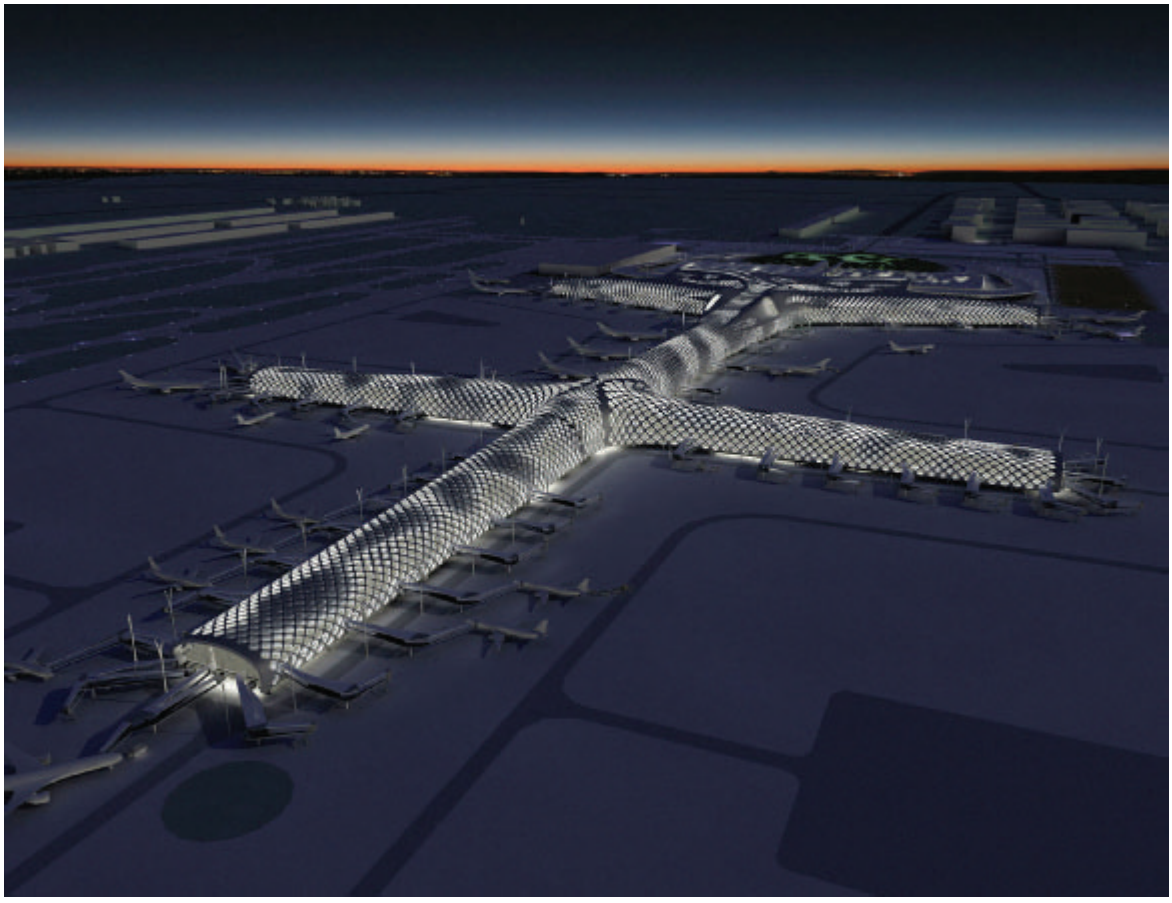


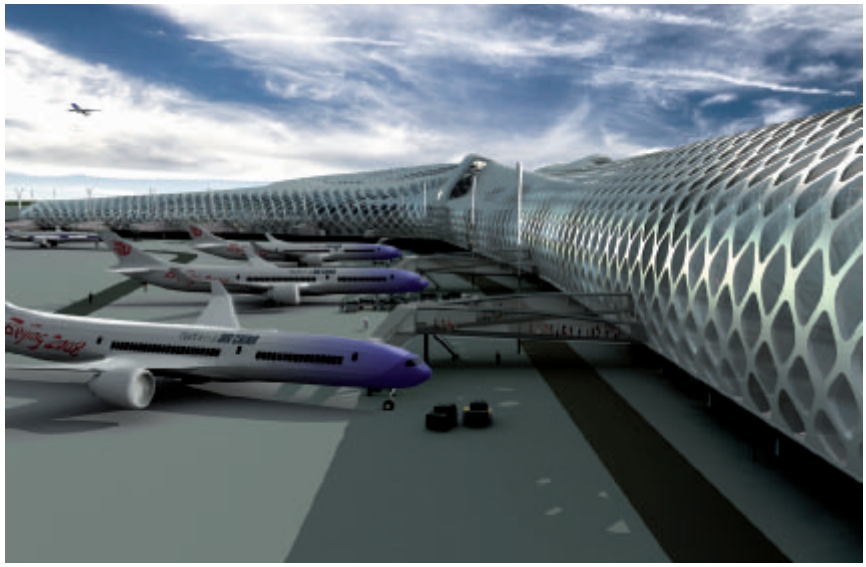
Tower isometric



AEON, Dubai, 2005, multi-purpose tower
AEON rearranges the proximities of two very familiar building typologies, slab and tower, into a new configuration. Four separate office towers rise up to merge into a single, folded slab building to form hotel and residences in a continuously changing envelope. While comprised of the traditional components of office towers, hotel, residences and retail, AEON is a complex that is not reducible to those elements alone. It is a dynamic hybrid that creates a synergy through specific fusions of these functions and unprecedented new spaces.





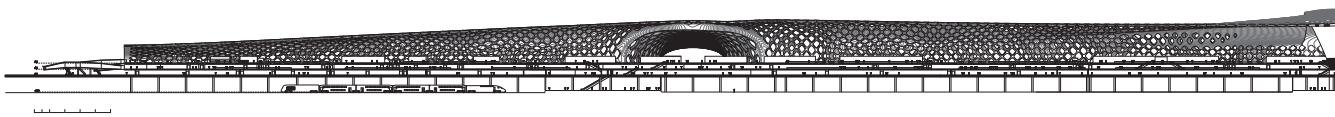


Terminal 3, Shenzhen International Airport, China, 2007
The architecture for Terminal 3, Shenzhen Airport will epitomize intelligent environments; an architecture that embraces everything from life and work, to culture and ecology. The "high-tech" architecture which has colonized emerging economies world-wide has had its day – a new architecture which resonates in culture, symbolism and an intelligent future has come to the fore.

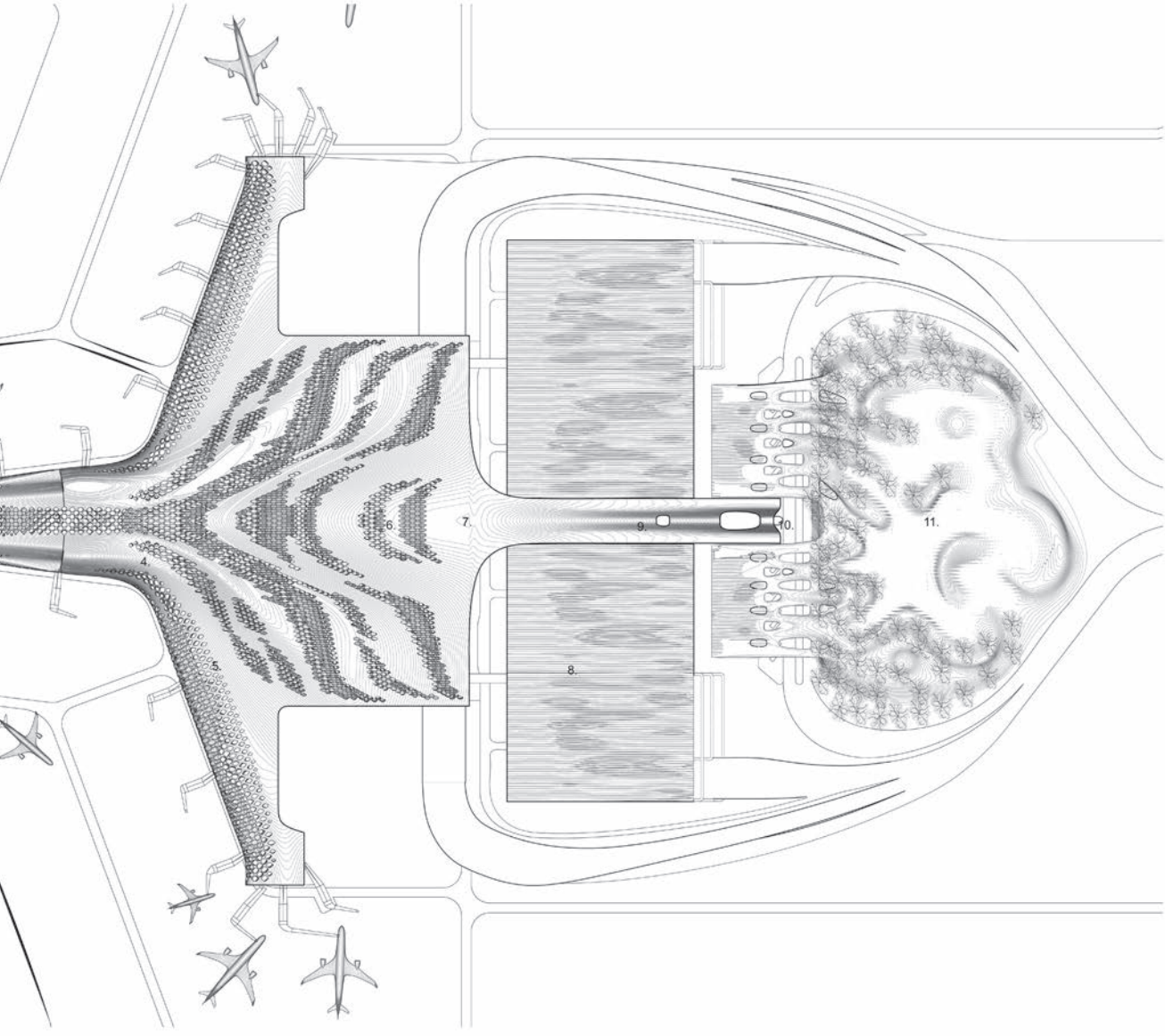
The airport is comprised of a hybrid of a smooth concrete shell structure in the terminal area and glazed concrete diagrid vaults in the concourses. The sweeping form of the terminal leads the traveler onward and upward.

The spaces of Shenzhen Airport are determined by the orchestration of a linked series of ambient zones created by the continuous modulation of form and light.

Variation of light and the apparent (virtual) form is accomplished by locally varying the cross-sectional angles of the openings across a range of degrees.



Longitudinal section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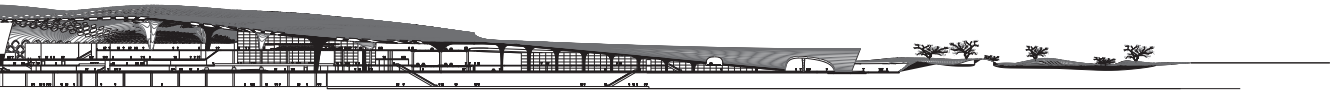
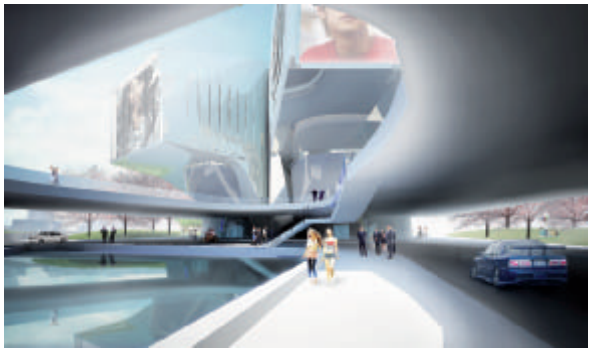


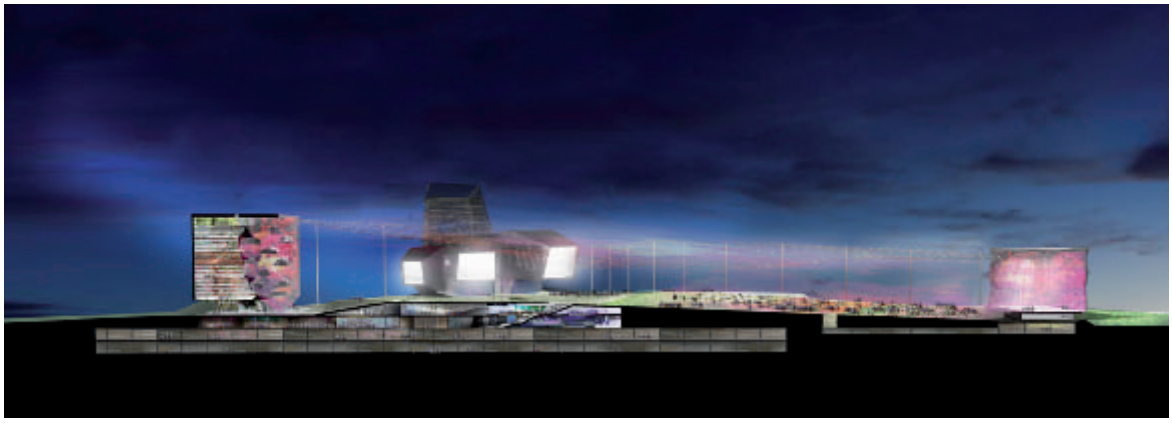


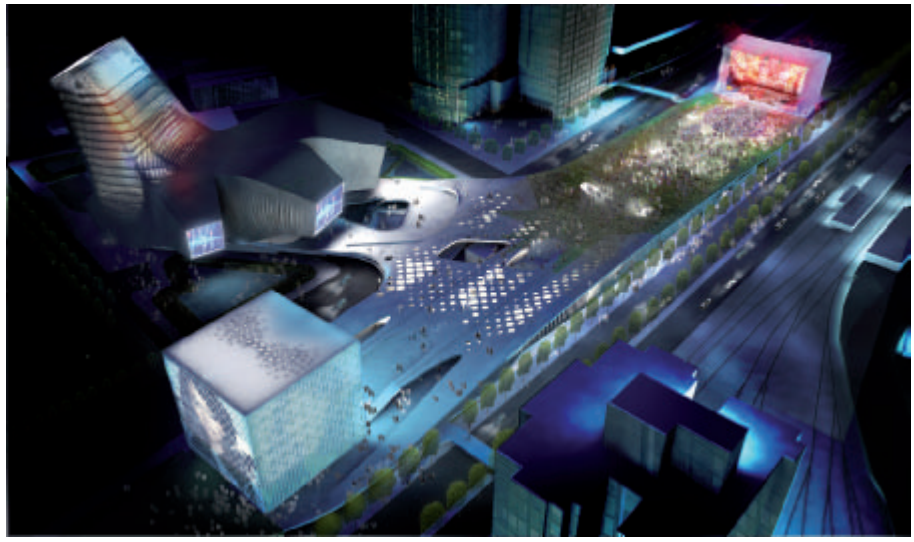
Taipei Pop Music Center, Taiwan, China, 2010
The Taipei Pop Music Center features a gradient of mixed-use spaces, from the fully public realm to the interior of the auditorium, allows the visitor to partake of the event dynamic however they choose to visit this complex.

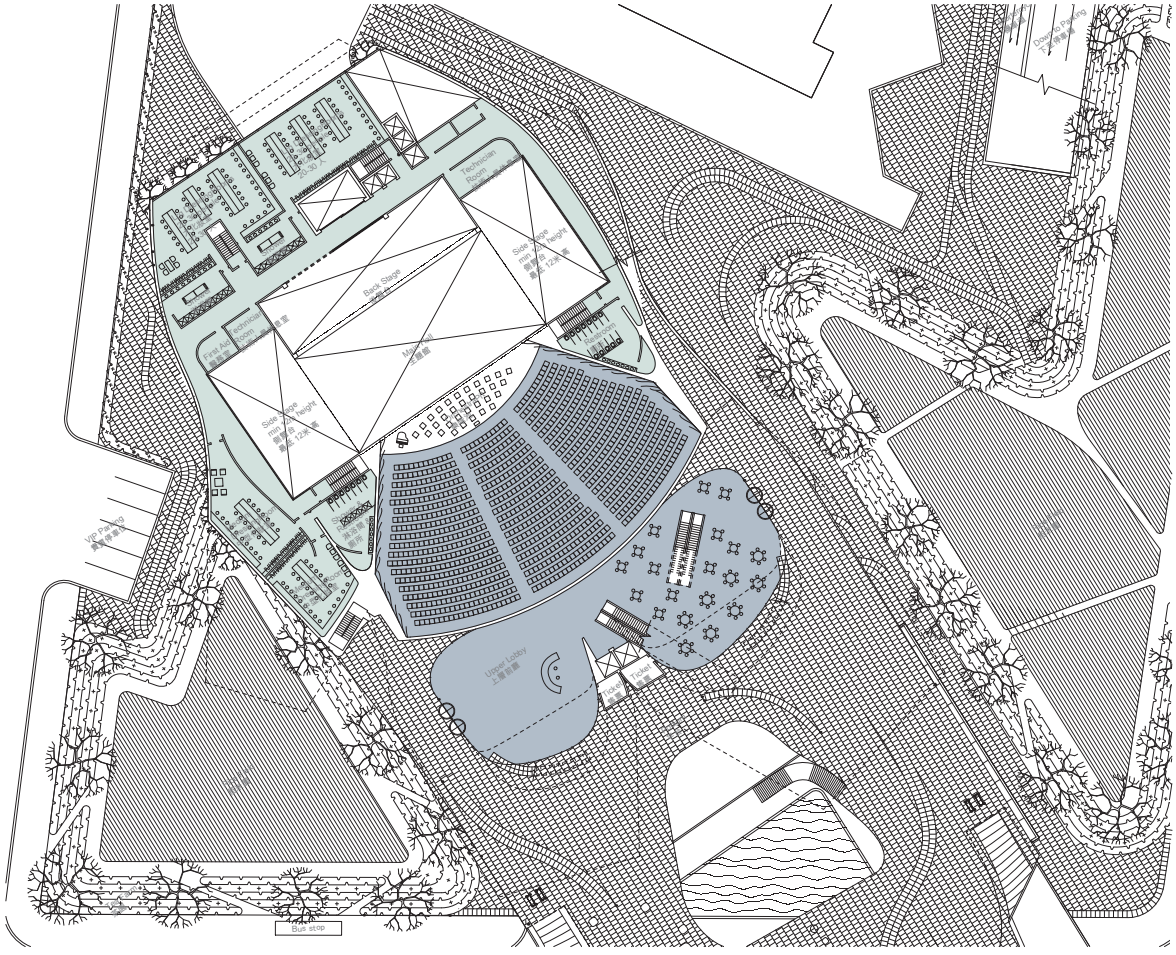
The Main Hall features a 3000-seat indoor auditorium and a tower dedicated to the pop music industry. This hybrid of theater and tower will allow direct communication on an everyday basis between producers, artists, and the music industry community.

The form of the Outdoor Amphitheater is a hybrid of circus and city, and with the addition of a mobile stage, The Robot Theater, the design can adapt to a spectrum of event scales, public uses and mass events. In its most compact crystalline form, the Robot Theater docks with the Hall of Fame, creating an intimate performance space for Hall of Fame induction ceremonies and other VIP events. A technological net provides solar screening and LED lighting to the Outdoor Amphitheater, and connects the Hall of Fame, Robot Theater, and Main Hall together.

As opposed to a singular or inflexible performance venue, the Taipei Pop Music Center allows both high-end, in-demand performances to coexist with small, up-and-coming artists.







Main Hall plan – plaza level plan

CHAPTER TWENTY-THREE

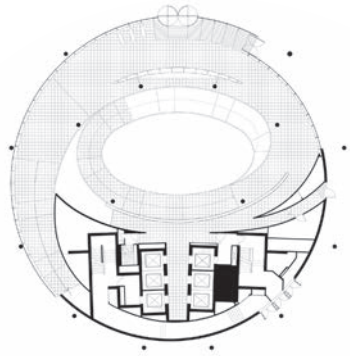
Foster + Partners

PERFORM: PERFORMANCE AS PRODUCER OF ARCHITECTURAL FORM / GUEDI CAPELUTO AND ABRAHAM YEZIORO

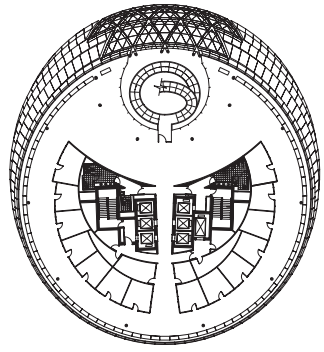
FREQUENTLY, AND QUITE naturally, the architectural discourse regarding buildings whose design is based on digital technology focuses on the aesthetics and the form. These technologies make it possible to research complex geometries and to arrive at unique forms that are generally difficult to arrive at with traditional design. Moreover, digital design sometimes tends to ignore aspects connected with the building's performance (functioning). Nonetheless, examples exist where the basic idea underlying the proposed solution and its final form stems directly from questions about the building's performance in relation to various aspects.

The issue of integrating evaluation of the building's performance into the design process is not a new one. Various models of computerized simulation aimed at examining a building's functioning began appearing as early as the 1970s. Among architects, these attempts were not widely taken up as design tools that could be used during the entire design process. The simulations required precise and extensive information about the building that was not available to the architect at the start of the process. They therefore came to be used as evaluation tools during the advanced stages of the design, when most of the important decisions about the project's functional and formal characteristics had already been made. Likewise, use of these models required specific software programs and much computing power to run them, which at that time was not available to architects; as a consequence, these models were left for the exclusive use of external consultants, in isolation from the process of creating the building.

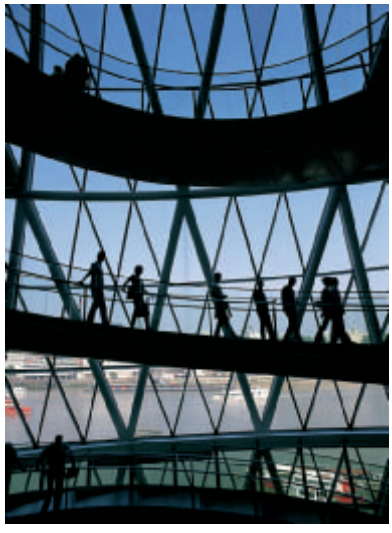
GLA (Greater London Authority) City Hall, 1998–2002
The Greater London Authority headquarters is one of the capital's most symbolically important new projects. The new building expresses the transparency of the democratic process and demonstrates the potential for a wholly sustainable, virtually non-polluting public building. The headquarters occupies a prominent site on the River Thames beside Tower Bridge. It houses an assembly chamber, committee rooms and public facilities, together with offices for the mayor, assembly members, the mayor's cabinet and support staff, providing 12,000 square meters (net) of accommodation on ten levels.



Ground level plan



Sixth level plan



At the office of Foster + Partners an original attempt was made to incorporate quantitative and qualitative aspects connected with the building's performance as producers of form. These aspects have to do with social, technological, environmental (e.g. energy, light and radiation, acoustics, winds) and other subjects. A unique design process, based on a parametric design of buildings possessing a complex geometry, was developed for this purpose. This method does not seek a single solution to a given design problem; rather, it seeks for a range of solutions that relate to this problem from the point of view of the building's functioning/ performance.

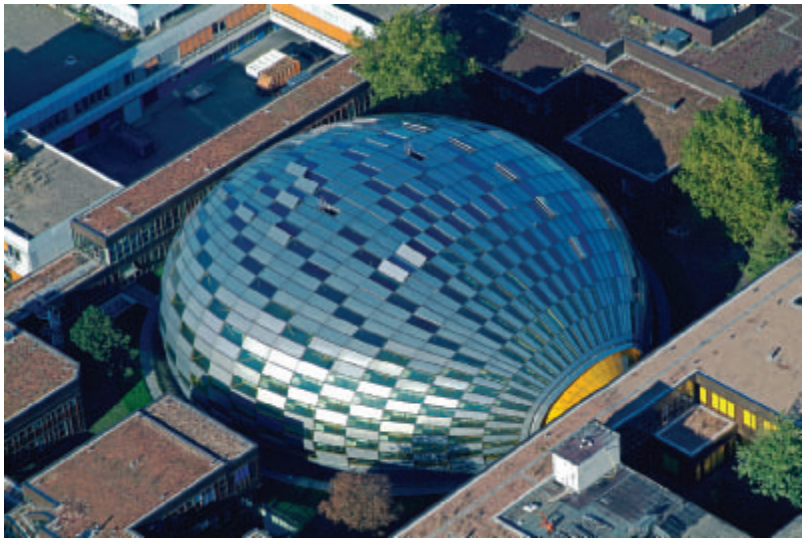
A distinct advantage of this approach is that the office can discuss qualitative aspects of the solutions and how to make them suitable to the performance aspects, *as part of the creative process*. In fact, a connection is created between the digital model of the building and the algorithm or mathematical model that defines the problem of performance, enabling the designer (by means of a comfortable and intuitive interface) to develop the design solution in such a way that it will meet the conditions defined in the mathematical model. Changes in the model influence all of its components, and update it in accordance with "connections" that were defined in the model; this leads to greater flexibility of design. This method makes it possible to examine many design alternatives in a reasonable time, while retaining the building's performances. A rationalization of the form and an understanding of the geometry pave the way for economically and technologically implementable solutions, for example building slightly curved forms by means of simple plane panels, which may be created economically and efficiently with existing technologies while retaining a freedom of form.

This principle is demonstrated in an exceptional way in the City Hall in London – the GLA Headquarters – which strikes a balance between ideal form and simplicity of construction. The distorted spherical form, intended to make the exterior envelope smaller and thus to reduce energy losses and to achieve self-shading, is very expensive and complex to build using existing technologies. Sectioning the form into slices makes it possible to simulate and to model each of the layers as an inclined cone that is relatively simple to express mathematically in the algorithm of the parametric model, and which can be built by means of ordinary plane panels using a proximate geometry.

In this way, *a new paradigm of the creative process in design* is created, according to which the building's functioning in relation to various aspects blends with the process by means of digital models and becomes the producer of the architectural form itself, while examining many design alternatives out of a range of solutions.

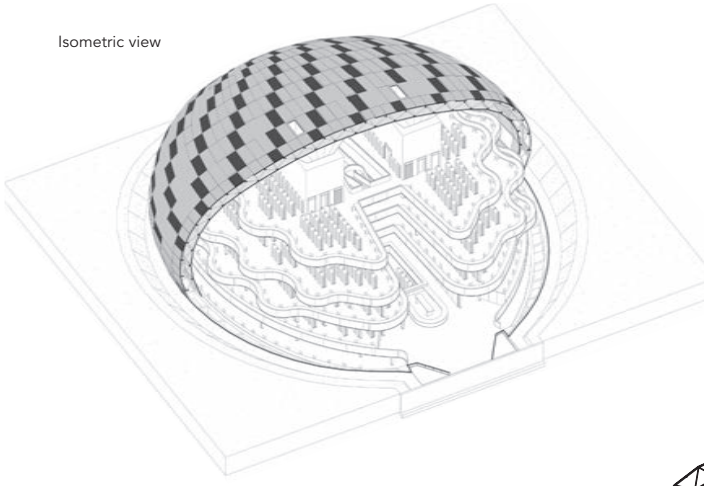
It should be emphasized that the process proposed in the Foster office is complex and entails the designer's grappling with conflicts that might arise due to opposing demands. The inclusion of many factors in a single model may limit the degrees of freedom of the solution, and at times may lead to contradictions. But limiting the model to relating to the performance of a selected aspect may lead to inadequate performance in relation to other parameters.

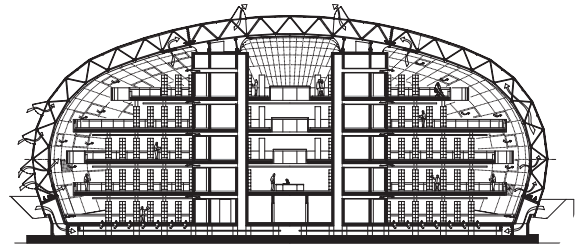
There is room to expect that the next generation of digital tools and models for design will make it possible to look at the design problem from many angles and to bridge functional conflicts that might arise along the way; it will thus be possible to arrive at a range of solutions that will suitably satisfy the required functions, even when at first glance certain parameters will be opposed to other parameters.



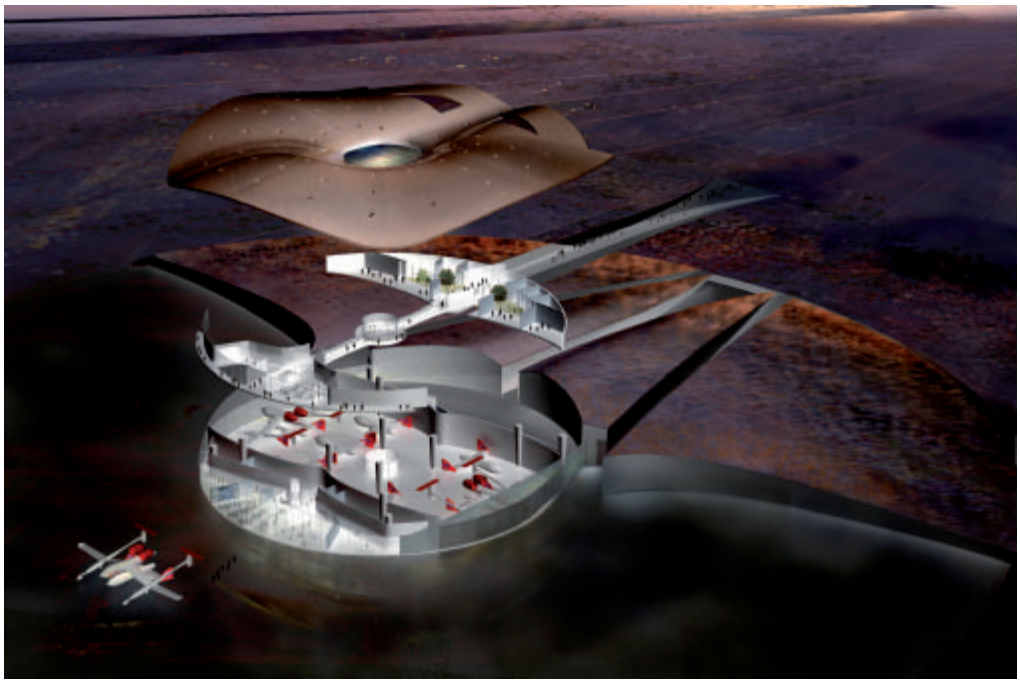
The library, Free University, Berlin, 1997–2005
The new library for the Faculty of Philology in the Free University, Berlin occupies a site created by uniting six of the university's courtyards. Its four floors are contained within a naturally ventilated, bubble-like enclosure, which is clad in aluminum and glazed panels and supported on steel frames with a radial geometry. An inner membrane of translucent glass fiber filters the daylight and creates an atmosphere of concentration, while scattered transparent openings allow momentary views of the sky and glimpses of sunlight. The bookstacks are located at the center of each floor, with reading desks arranged around the perimeter. The serpentine profile of the floors creates an edge pattern in which each floor swells or recedes with respect to the one above or below it, generating a sequence of generous, light-filled spaces in which to work. Amusingly, the library's cranial form has already earned it a nickname of its own – "The Berlin Brain."

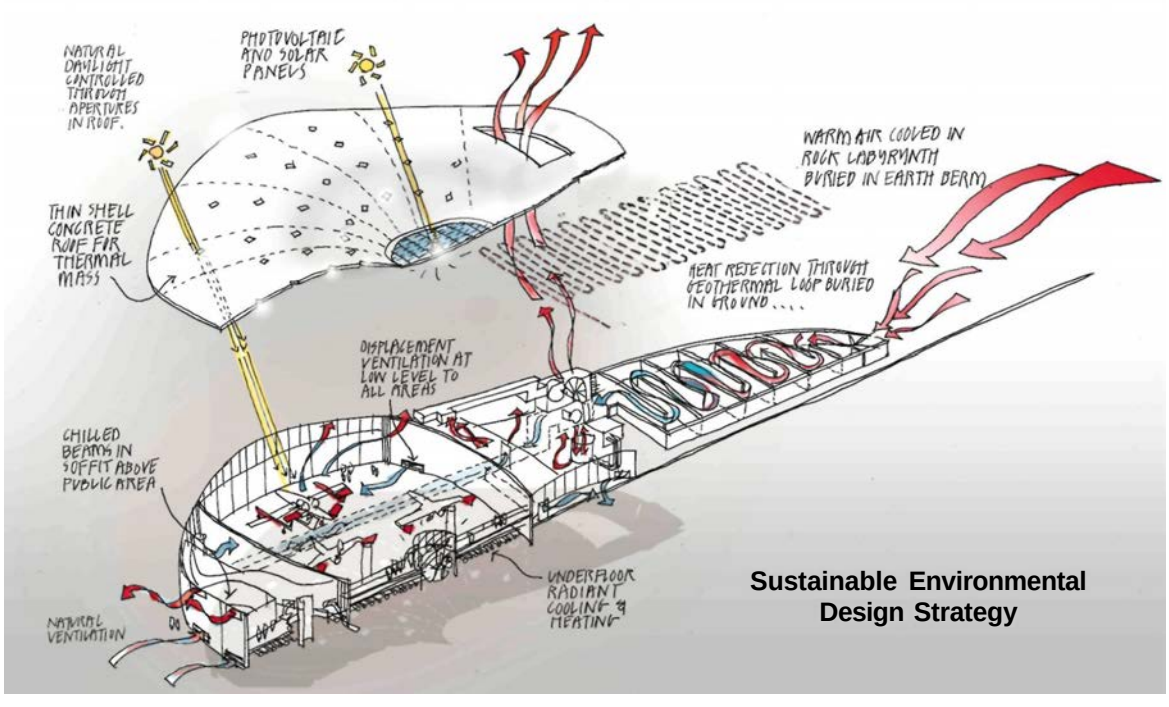
Isometric view





Cross section




NATURAL DAYLIGHT CONTROLLED THROUGH APERTURES IN ROOF.
PHOTOVOLTAIC AND SOLAR PANELS
THIN SHELL CONCRETE ROOF FOR THERMAL MASS
WARM AIR COOLED IN ROCK LABYRINTH BURIED IN EARTH BERM
HEAT REJECTION THROUGH GEOTHERMAL LOOP BURIED IN GROUND....
DISPLACEMENT VENTILATION AT LOW LEVEL TO ALL AREAS
CHILLED BEAMS IN SOFFIT ABOVE PUBLIC AREA
UNDERFLOOR RADIANT COOLING & HEATING
NATURAL VENTILATION
Sustainable Environmental Design Strategy

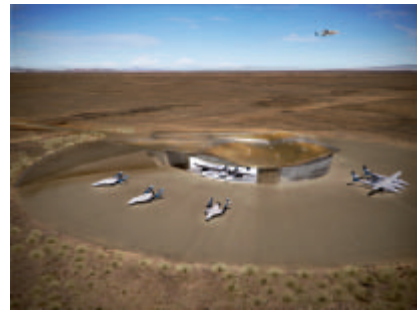
Spaceport America, New Mexico, USA, 2006–2011

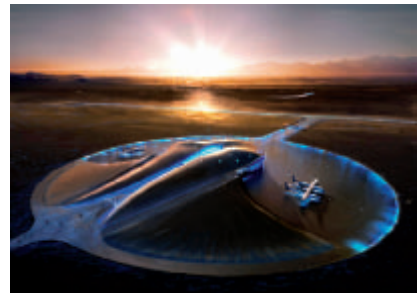
The New Mexico Spaceport Authority Building is the first private spaceport to be built in the world. The sinuous shape of the building in the landscape and its interior spaces seek to capture the drama and mystery of space. It is a project designed by the first space tourists. Using local materials and regional construction techniques, it is both sustainable and sensitive to its surroundings.

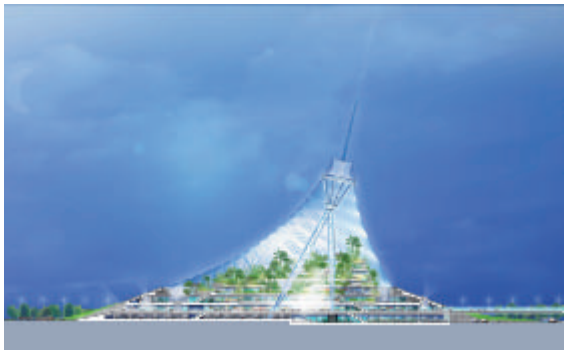
Organized into a highly efficient and rational plan, the Spaceport has been designed to relate to the dimensions of the spacecraft. The astronauts' areas and visitor spaces are fully integrated with the rest of the building to convey the thrill of space travel. The more sensitive zones – such as the control room – are visible, but have limited access.

Designed to have minimal embodied carbon and few additional energy requirements, the scheme has been designed to achieve the prestigious LEED Platinum accreditation. The low-lying form is dug into the landscape to exploit the thermal mass, which buffers the building from the extremes of the New Mexico climate as well as catching the westerly winds for ventilation. Natural light enters via skylights, with a glazed façade reserved for the terminal building, establishing a platform for the coveted views on to the runway.

Co-architects: SMPC Architects, URS Corporation (local).

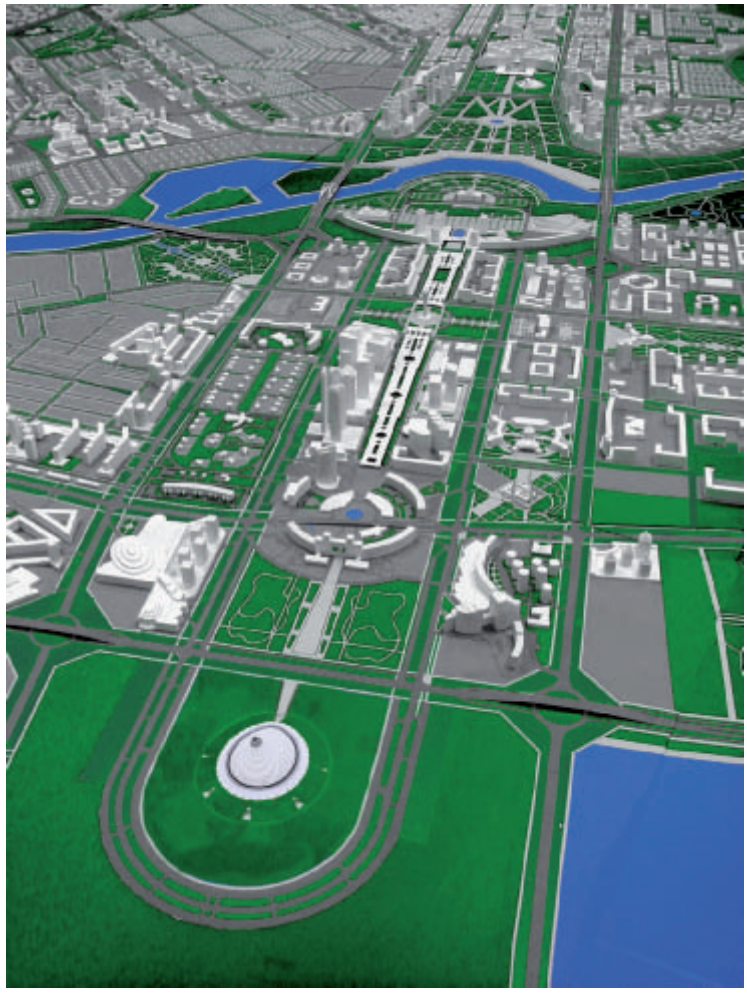






Khan Shatyr Entertainment Center, Astana, Kazakhstan, 2006–2010
The Khan Shatyr Entertainment Center represents a major new civic, cultural and social venue for the people of Astana, bringing together a wide range of activities within a sheltered climatic envelope that provides a comfortable environment all year round.

The tent-like, cable-net structure is located at the northern end of the new city axis and soars 150 meters from an elliptical base to form the highest peak on the Astana skyline. The building encloses an area in excess of 100,000 square meters within an ETFE dome, designed to shelter the enclosed accommodation from weather extremes and to allow daylight to wash the interiors. Contained within it is an urban-scaled park, along with a wide variety of entertainment and leisure facilities, including retail, cafes, restaurants, cinemas, and flexible spaces that can accommodate a varied programme of events and exhibitions. The different levels form undulating terraces, the uppermost terrace forming a water park.



Project credits

TEN

EISENMAN ARCHITECTS

PROJECT TITLE: **Church of the Year 2000**
TYPE: Pilgrimage church
YEAR: 1996
LOCATION: Rome, Italy
PROJECT MANAGER: Eisenman Architects

PROJECT TITLE: **Domplatz Hamburg**
TYPE: Mixed-use public library
YEAR: 2005 (design)
LOCATION: Hamburg, Germany
PROJECT MANAGER: Eisenman Architects

PROJECT TITLE: **Sheikh Zayed National Museum**
TYPE: Museum, history
YEAR: 2007
LOCATION: Saadiyat Island, Abu Dhabi, United Arab Emirates
PROJECT MANAGER: Eisenman Architects

PROJECT TITLE: **Santuario Station**
TYPE: Station
YEAR: 2006–present
LOCATION: Pompeii, Italy
PROJECT MANAGER: Eisenman Architects

ELEVEN

GREG LYNN FORM

PROJECT TITLE: **Blobwall©**
TYPE: Brick prototype
YEAR: 2007
LOCATION: Los Angeles, California, USA
PROJECT MANAGER: Greg Lynn FORM
ARCHITECTURAL TEAM: Jackilin Bloom, Adam Fure, Chris Kabatsi, Daniel Norell
MACHINEOUS AND PANELITE: Andreas Froech, Jeff McKibban, Emmanuelle Bourlier, Christian Mitman

PROJECT TITLE: **Bloom House**
TYPE: Residential
YEAR: 2004–2008
LOCATION: Los Angeles, California, USA
PROJECT MANAGER: Greg Lynn FORM
EXECUTIVE ARCHITECTS: Lookinglass Architecture & Design, Los Angeles, California; Emil Mertzel and Nick Gillock

PROJECT TITLE: **Slavin House**
TYPE: Residential
YEAR: 2004–present
LOCATION: Venice, California, USA
PROJECT MANAGER: Greg Lynn FORM
ARCHITECTURAL TEAM: Jackilin Bloom, Chris Kabatsi, Florencia Pita, Deborah Chiu, Brian Ha, Mo Lai, Daniel Norell, Martin Sobota

PROJECT TITLE: **5900 Wilshire Boulevard Restaurant and Trellis Pavilion**
TYPE: Commercial
YEAR: 2006–present
LOCATION: Los Angeles, California, USA
PROJECT MANAGER: Greg Lynn FORM
ARCHITECTURAL TEAM: Jackilin Bloom, Adam Fure, Chris Kabatsi, Brittney Hart, Kimberly Watts, Paul Locke, Aaron Leppanen, Gabriella Jannotta, Brian Ha

TWELVE

PRESTON SCOTT COHEN, INC.

PROJECT TITLE: **Taiyuan Museum of Art**
TYPE: Cultural
YEAR: 2007–2012
LOCATION: Taiyuan, China
PROJECT MANAGER: Preston Scott Cohen, Inc.
ARCHITECTURAL TEAM: Scott Cohen (design architect), Amit Nemlich (project architect), Ruan Hao, Collin Gardner (project team)
CHINESE ASSOCIATE ARCHITECT: ADRISEU

PROJECT TITLE: **Nanjing University Student Center**
TYPE: Educational
YEAR: 2007–2009
LOCATION: Xianlin, China
PROJECT MANAGER: Preston Scott Cohen, Inc.
ARCHITECTURAL TEAM: Scott Cohen (design architect), Amit Nemlich (project architect), Annie Barrett, David Saladik, Adam Modesitt (project team)
CHINESE ASSOCIATE ARCHITECT: Institute of Architectural Design Planning, Nanjing University and Atelier Zheng Lei

PROJECT TITLE: **Tel Aviv Museum of Art**
TYPE: Cultural
YEAR: 2003–2011
LOCATION: Tel Aviv, Israel
PROJECT MANAGER: Preston Scott Cohen, Inc.
ARCHITECTURAL TEAM: Scott Cohen (design architect), Amit Nemlich (project Architect), Tobias Nolte, Steven Christensen, Bohseung Kong (project team), Cameron Wu, Chris Hoxie, Andrew Saunders (competition project team)
CONSULTANTS/CONSTRUCTION: CPM Construction Management Ltd., Tillotson Design Associates (lighting), YSS Consulting Engineers Ltd., M. Doron-I. Shahar and Co., Hezkelevitch Engineering (general contractor)

THIRTEEN

ARCHI-TECTONICS

PROJECT TITLE: **Brussels Townhouse**
TYPE: Retail and office building
YEAR: 2007–2008
LOCATION: Brussels, Belgium
PROJECT MANAGER: Archi-Tectonics
PRINCIPAL IN CHARGE: Winka Dubbeldam
ARCHITECT OF RECORD: Clerbaux Architects, Brussels
ARCHITECTURAL TEAM: David Barr, Isik Ulkun, Pilar Echezarreta, Robert Mezquiti, John Cerone

PROJECT TITLE: **Q Tower**
TYPE: Mixed-use tower, apartments with high-end restaurant below
YEAR 2008
LOCATION: Philadelphia, Pennsylvania, USA
DESIGN ARCHITECTS: Archi-Tectonics
PRINCIPAL IN CHARGE: Winka Dubbeldam
ROBOTIC CONSULTANT: Ted Selker, MIT Medialab, Cambridge
ARCHITECT OF RECORD: Zimmers Architects
PROJECT ARCHITECT: Thomas Barry
ARCHITECTURAL TEAM: Pilar Echezaretta, Patrick Wong, Monty Forman, David Barr, Vincent Appel, Greg Getman

PROJECT TITLE: **GW497 Project**
TYPE: Residential lofts and commercial on ground floor
YEAR: 2000–2004
LOCATION: Soho, New York City, New York, USA
DESIGN ARCHITECT: Archi-Tectonics
PRINCIPAL IN CHARGE: Winka Dubbeldam
PROJECT LEADER: Ana Sotrel
ARCHITECT OF RECORD: David Hoston
ARCHITECTURAL TEAM: Michael Hundsnurscher, Tanja Bitzer, Deborah Kully, Nicola Bauman, Ty Tikari
PHOTOGRAPHY: Floto and Warner

PROJECT TITLE: **Chestnut Hotel and Condominium Tower**
TYPE: Commercial
YEAR: 2008
LOCATION: Philadelphia City Center, Pennsylvania, USA
DESIGN ARCHITECT: Archi-Tectonics
PRINCIPAL IN CHARGE: Winka Dubbeldam
ARCHITECT OF RECORD: J. K. Roller Architect
PROJECT LEADER: Bitto Sanchez-Monasterio
ARCHITECTURAL TEAM: Brian Holland, Patrick Wong, David Barr, Hiroyuki Miki, Tanjo Kloepper, Matthew Halsall
STRUCTURAL ENGINEER: Thornton Tomaseth
MEP ENGINEER: Edwards & Zuck
FAÇADE CONSULTANT: Israel Berger & Associates
LIGHTING CONSULTANT: L'Observatoire International

PROJECT TITLE: **Smart Ecology**
TYPE: Ten retail pavilions integrated in a new urban park
YEAR: 2009
LOCATION: Brussels, Belgium
AREA: 300,000 sq. ft. (27,900 m^2)
CLIENT: Prowinko
DESIGN ARCHITECT: Archi-Tectonics
PRINCIPAL IN CHARGE: Winka Dubbeldam
ARCHITECT OF RECORD: Clerbaux Architects, Brussels
ARCHITECTURAL TEAM: Pilar Echezarretta, David Barr, Isik Ulkun, Robert Mezquite, John Cerone
STRUCTURAL ENGINEER: ABT, Delft, the Netherlands

PROJECT TITLE: **Fashion Designer Residence**
TYPE: Residential
YEAR: 2002
LOCATION: London, UK
OFFICE: Contemporary Architecture Practice, New York

PROJECT TITLE: **Commercial Office Tower**
TYPE: Commercial
YEAR: 2009
LOCATION: Dubai, United Arab Emirates
OFFICE: Contemporary Architecture Practice, New York

PROJECT TITLE: **Migrating Formations**
TYPE: Prototype
YEAR: 2008
LOCATION: New York, USA
CLIENT: Museum of Modern Art (MoMA) New York
OFFICE: Contemporary Architecture Practice, New York
Design; Contemporary Architecture Practice, New York
DIRECTORS: Ali Rahim, Hina Jamelle
TEAM: Andreas Singer, Jae Jang

PROJECT TITLE: **Reebok Flagship Store**
TYPE: Retail
YEAR: 2005
LOCATION: Shanghai, China
OFFICE: Contemporary Architecture Practice, New York

FIFTEEN

R&SIE(N)

PROJECT TITLE: **He shot me down**
TYPE: Museum project
YEAR: 2006–2007
LOCATION: Korea
PARTICIPATING ARCHITECTS: R&Sie(n), François Roche, Stéphanie Lavaux, Jean Navarro

PROJECT TITLE: **Olzweg**
TYPE: Proposal for FRAC Museum Competition
YEAR: 2006
LOCATION: Orleans, France
PARTICIPATING ARCHITECTS: R&Sie(n), François Roche, Stéphanie Lavaux, with Pierre Huyghe, artist

PROJECT TITLE: **I've heard about**
TYPE: Entropic experiment
YEAR: 2005–2009
LOCATION: MAM-Paris/MOT-Tokyo
PARTICIPATING ARCHITECTS: R&Sie(n), François Roche, Stéphanie Lavaux, Jean Navarro, Benoît Durandin

SIXTEEN

KOL/MAC ARCHITECTURE

PROJECT TITLE: **Galataport**
TYPE: Coastal urban development
YEAR: 2007
LOCATION: Istanbul, Turkey
DESIGN PRINCIPALS: Sulan Kolatan, William MacDonald
PROJECT TEAM: Robert Cervellione, Ben Martinson
CLIENT/SPONSOR: Garanti Bank/Garanti Galeri
ENGINEERING CONSULTANT: Arup AGU, London

PROJECT TITLE: **Carlsberg Urban Design Competition**
TYPE: Urban redevelopment of former brewery
YEAR: 2007
LOCATION: Copenhagen, Denmark
DESIGN PRINCIPALS: Sulan Kolatan, William MacDonald
PROJECT TEAM: Frank Bitonti, Robert Cervellione, Ben Martinson
CLIENT/SPONSOR: Carlsberg

PROJECT TITLE: **FRAC Museum Competition**
TYPE: Proposal for FRAC Center Competition
YEAR: 2006
LOCATION: Orleans, France
DESIGN PRINCIPALS: Sulan Kolatan, William MacDonald
ASSOCIATE ARCHITECT: Atelier Christian Girard
PROJECT TEAM: Robert Cervellione, Melissa Woolford, Hinki Kwong, Orlando Lineros, Mariana Renjifo
STRUCTURAL ENGINEER: Ove Arup, Paris, France
LIGHTING DESIGN: L'Observatoire, New York, USA
EXHIBITION DESIGN: Duck Sceno, Paris, France
CLIENT/SPONSOR: Garanti Bank/Garanti Galeri
ENGINEERING CONSULTANT: Arup AGU, London

PROJECT TITLE: **INVERSAbrane**
TYPE: High-performance exterior building membrane prototype
YEAR: 2006
LOCATION: DuPont, USA
DESIGN PRINCIPALS: Sulan Kolatan, William MacDonald
PROJECT TEAM: Theo Calvin, Christian Bruun, Chris Whitelaw
STRUCTURAL ENGINEERS: Ove Arup, New York, USA; Buro Happold, New York, USA
CLIENT/SPONSOR: DuPont
ENGINEERING CONSULTANTS: Arup AGU, London

SEVENTEEN

GEHRY PARTNERS, LLP / GEHRY TECHNOLOGIES

PROJECT TITLE: **IAC Building**
TYPE: Commercial
YEAR: 2007
LOCATION: New York City, New York, USA
PROJECT MANAGER: Gehry Partners, LLP
DESIGN MANAGER: Frank Gehry
DESIGN PARTNER: Craig Webb
PROJECT ARCHITECT: John Bowers
PROJECT TEAM: Laura Bachelder, Susan Beningfield, Walter Carter, Sarah David, Jacques Gelinas, Craig Gilbert, Faris Hermiz, Gregory Kromhout, Meaghan Lloyd, Sven Neumann, Lucianna Vidal, Jeffrey Wauer, Brian Zamora, Jeff Guga, Danelle Briscoe, Rogan Ferguson, Ali Jeevanjee, Randolph Jefferson, Eric Jones, R. Mitchell, Julianna Morais, Judith Mussel, Apurva Pande, Diego Petrat, Whit Preston, Timothy Paulson, Tadao Shimizu, Jason Tax, Karen Tom, Kevin Westerbeck

PROJECT TITLE: **Cleveland Clinic Lou Ruvo Center for Brain Health**
TYPE: Medical clinic, research center and banquet hall
YEAR: 2007–2009
LOCATION: Las Vegas, Nevada, USA
ARCHITECT: Gehry Partners, LLP
DESIGN PARTNER: Frank Gehry
PROJECT PARTNER: Terry Bell
PROJECT DESIGNER: Brian Zamora
PROJECT ARCHITECTS: Kristin Ragins, David Rodriguez, Michael Sedlacek
PROJECT TEAM: Ron Rosell, Eun Sung Chang, Natalie Magarian, Michael O'Boyle, Mok Wai Wan, Sameer Kashyap, Yvon Romeus, Sarah David, Andrew Galambos, Natalie Milberg, Izaburo Kibayashi
DIGITAL CONSULTANT: Gehry Technologies

PROJECT TITLE: **The Ray and Maria Stata Center for Computer, Information and Intelligence Sciences**
TYPE: Educational
YEAR: 2004
LOCATION: Cambridge, Massachusetts, USA
AWARDS: 2005, Build New England Award
ARCHITECT: Gehry Partners, LLP
DESIGN PARTNER: Frank Gehry
PROJECT PARTNER: Jim Glymph
PROJECT DESIGNER: Craig Webb
PROJECT ARCHITECT/PROJECT PARTNER: Marc Salette
ASSISTANT PROJECT DESIGNER: Rachel Allen
ASSISTANT PROJECT ARCHITECTS: Larry Tighe, David Rodriguez
CORE PROJECT TEAM: Helena Berge, Henry Brawner, Vartan Chalikian, Christine Clements, Edward Duffy, Yono Hong, James Jackson, Thomas Kim, Jason Luk, Yannina Manjarres-Weeks, Frank Melendez, Emiliano Melgazo, Ngaire Nelson, Gaston Nogues, Yanan Par, Doug Pierson, David Plotkin, Derek Sola, Karen Tom, Steve Traeger, Monica Valtierra-Day, Yuwen Wang, Jeff Wauer
PROJECT TEAM: Chris Banks, Christopher Barbee, Herwig Baumgartner, Saffet Bekiroğlu,Tom Bessai, Tomaso Bradshaw, Tina Chee, Susannah Dickinson, Brian Flores, Raymond Gaetan, Craig Gilbert, Jeff Guga, Dari Iron, Michael Kempf, Kurt Komraus, Irwin Larman, Dennis Lee, Frank Medrano, Clifford Minnick, Robyn Morgenstern, Scott Natvig, Janine Nesseth, Robert Seelenbacher, Dennis Shelden, Bruce Shepard, Suren Sumian, Birgit Schneider, Gavin Wall, Bryant Yeh, Brian Zamora
ASSOCIATE ARCHITECT: Cannon Design
PROJECT MANAGER: Debi McDonald
PROJECT TEAM: Christine Clements, Edward Duffy, Tom Tostengard, Frank McGuire, Nancy Felts, Karl Leabo, Dave Ordorica, Julie McCullough, Peter Heffernan
STRUCTURAL ENGINEER: John A. Martin & Associates

PROJECT MANAGER: Ron Lee
PROJECT ENGINEERS: Les Cho, Martha Gonzalez, Marcello Sgambelluri, Jose Hebreo, Renie Beasley
EXTERIOR ENCLOSURE STRUCTURAL CONSULTANT: Martin/Martin & ABS, Steven Judd, Tait Ketchun, Kevin Wright, Michael Smith, Ken Peterson
CBI CONSULTING LOCAL STRUCTURAL ENGINEER: Craig Barnes

PROJECT TITLE: **Beekman Street Housing**
TYPE: Mixed use
YEAR: 2004
LOCATION: New York City, New York, USA
ARCHITECT: Gehry Partners, LLP
DESIGN PARTNER: Frank Gehry
PROJECT PARTNER: Terry Bell
PROJECT DESIGNER: Craig Webb
PROJECT ARCHITECT: John Bowers
PROJECT TEAM: Saffet Bekiroğlu, Susan Beningfield, Berenika Boberska, Henry Brawner, Gesa Buettner, Sarah David, Shikha Doogar, Liron Elkan, Manoucher Eslami, Craig Gilbert, Jaeson Greer, Joanne Heinen, Faris Hermiz, Mark Homes, Claire Imatani, Betty Kassis, Michael Kilkelly, Kumiko Koda, Gregory Kromhout, Julie Lai, Irwin Larman, Shawn Leong, Yeekai Lim, Sabrina Lupero, Gerhard Mayer, Alvar Mensana, R. Scott Mitchell, Julianna Morais, Judith Mussel, Amy Nicholson, John Passmore, Steve Price, Rui Sato, Jennifer Seely, Michael Sims, Ian Stuart, John Szlachta, Stacey Thomas, Karen Tom, Monica Valtierra, Lucianna Vidal, Shailesh Virlley, Anne Whitacre, Leslie Wilson, Yuichiro Yamaguchi
DIGITAL CONSULTANT: Gehry Technologies
STRUCTURAL ENGINEER: WSP Cantor Seinuk

EIGHTEEN

FRANKEN ARCHITEKTEN

PROJECT TITLE: **Bubble**
TYPE: Trade fair pavilion
YEAR: 1999
LOCATION: Frankfurt, Germany
PARTICIPATING ARCHITECTS: Bernhard Franken for ABB Architekten
PROJECT TEAM: Bernhard Franken, Sonja Albrech, Nils-Peter Fischer, Kirstin Fried, Niklas Führer, Thilo Kurzemann, Hans-Herbert Kuss, Michael Lulay, Thomas Remdisch

PROJECT TITLE: **Takeoff**
TYPE: Installation
YEAR: 2003
LOCATION: Munich, Germany
PARTICIPATING ARCHITECTS: Franken Architekten
PROJECT TEAM: Bernhard Franken, Frank Brammer, Nils-Peter Fischer, Tasso Effraimidis, Oliver Tessmann

PROJECT TITLE: **Dynaform**
TYPE: Trade fair pavilion
YEAR: 2001
LOCATION: Frankfurt, Germany
PARTICIPATING ARCHITECTS: ABB Architekten/Bernhard Franken as a consortium
PROJECT TEAM: Bernhard Franken, Frank Brammer, Carsten Trojan, Tanja Schaile, Tasso Effraimidis, Nils-Peter Fischer, Christopher Heinzerling, Andreas Kreutz, Tino Kubitza, Thomas Raab, Thomas Remdisch, Samad Sakkaki

PROJECT TITLE: **Home Couture**
TYPE: Retail, interior design
YEAR: 2004
LOCATION: Berlin, Germany
PROJECT TEAM: Frank Brammer, Bernhard Franken, Oliver Tessmann, Sören Chun, Zofia Kulicka, Sabine Schlempp, Christina Spilotti, Gregor Torinus
PARTNER: Surface, Kardorff Ingenieure

NINETEEN

OCEAN

OCEAN Research Design Group

MEMBERS: Natasha Barrett, England, Oslo; Michael U. Hensel, Germany, Istanbul, Oslo; Pavel Hladik, Czech Republic, London; Birger Sevaldson, Norway, Oslo; Defne Sunguroğlu Hensel, Turkey, Istanbul, Oslo; Jeffrey P. Turko, USA, London

SUPPORT MEMBERS: Daniel Coll i Capdevila, Spain, London; Mattia Gambardella, Italy, London

HONORARY MEMBERS: Mark Burry, George Jeronimidis

PROJECT TITLE: **Barely**

TYPE: Sound and space installation

YEAR: 2007–2008

LOCATION: Oslo, Norway

PART 1

COMPOSITION AND SOUND DESIGN: Natasha Barrett

PROJECT LEADER: Birger Sevaldson

PROJECT TEAM: Natasha Barrett, Daniel Coll i Capdevila, Andrea Di Stefano, Michael U. Hensel, Aleksandra Jaeschke, Birger Sevaldson, Defne Sunguroğlu, with Kim Baumann Larsen

CONSTRUCTION TEAM: Carl Nilssen-Love, Sandor Agyagasi, Daniel Nytoft Berlin

RIGGING: Håkon Klementsen, Oslo Kru

SPONSORED BY: Kulturrådet, Ultima 2007, Fond for utøvende Kunstnere, NoTam

COMMISSIONED BY: Ultima Festivalen 2007

VENUE: Kanonhallen, Oslo

PART 2

COMPOSITION AND SOUND DESIGN: Natasha Barrett

PROJECT LEADER: Birger Sevaldson with OCEAN Research Design

CONSTRUCTION TEAM: Carl Nilssen-Love

SPONSORED BY: Gallery ROM

COMMISSIONED BY: Gallery ROM

VENUE: Gallery ROM, Oslo

PROJECT TITLE: **Membrane and cable-net systems**

TYPE: Installation, Bylgia installation

YEAR: 2008–2009

LOCATION: FRAC Center, Orleans, France

PROJECT COORDINATION: Michael U. Hensel, Defne Sunguroğlu Hensel

PROJECT TEAM: Jeffrey P. Turko, Daniel Coll i Capdevila, Toni Kotnik, Michael U. Hensel, Defne Sunguroğlu Hensel

MEMBRANE AND CABLE-NET SYSTEMS WORKSHOP, IZMIR, TURKEY, DIRECTED BY: Michael U. Hensel, Defne Sunguroğlu Hensel

A detailed credit list can be found at www.performanceorienteddesign.net

PROJECT TITLE: **Membrella (MM-Tent)**

TYPE: Design competition

YEAR: 2008

PROJECT COORDINATION: Jeffrey P. Turko, Daniel Coll i Capdevila

PROJECT TEAM: Pavel Hladik, Mattia Gambardella

TWENTY

OPEN SOURCE ARCHITECTURE

PROJECT TITLE: **C-Chair**
TYPE: Furniture
YEAR: 2008
LOCATION: New York City, New York, USA
DESIGN CONCEPT: Open Source Architecture with Paul Kalnitz
COMPUTATIONAL SCRIPTING: Open Source Architecture with Paul Kalnitz, Howard Blair, Gulru Ustendag, Syracuse University

PROJECT TITLE: **Hylomorphic**
TYPE: Installation
YEAR: 2006
LOCATION: MAK Center for Art and Architecture, Los Angeles, California, USA
DESIGN CONCEPT: Open Source Architecture
COMPUTATIONAL PROTOCOL: Open Source Architecture
SOFTWARE: eifForm, Kristina Shea, Marina Gourtovaia
STRUCTURAL ENGINEERing: Judith Leuppi, Arup, Los Angeles
LIGHTING DESIGN: Heather Libonati

PROJECT TITLE: **N-Nature**
TYPE: Installation
YEAR: 2008–2009
LOCATION: Rhode Island School of Design, Providence, USA
CLIENT: Rhode Island School of Design
DESIGN CONCEPT: Open Source Architecture (Aaron Sprecher, Chandler Ahrens, Eran Neuman) and JBohn Associates (John Bohn)
MATHEMATICAL MODELING AND MATHEMATICS: Edward C. Mosteig, Department of Mathematics, Loyola Marymount University, Los Angeles
COMPUTATIONAL SCRIPTING: Paul Kalnitz, Open Source Architecture
MEASUREMENTS AND DESIGN ASSISTANCE: Kevin Deabler, RoDE Architects Inc, Boston, MA
PRELIMINARY PROTOTYPE: Open Source Architecture and JBohn Associates
FINAL PROTOTYPE: Open Source Architecture and JBohn Associates with the assistance of students from the University of Southern California: Alberto Arifin, Ryan Bourgeois, Chris Hyun, Eunice Lee, Carolyn Mei Ng, Bernice Ngo, Tanya Zurita
EXHIBITION ASSISTANCE: Rachel Stopka, Joseph Combs, RISD School of Architecture, Providence, RI
MANUFACTURING: SCI-Arc Shop with the support of Katsumi Moroi (shop master), Rodney Rojas (digital fabrication supervisor), Dan Riley (shop supervisor), Thor Erickson, Will Rollins, James Peterson, Andy Riiska, Anthony Lagunay (shop assistants)

PROJECT TITLE: **Parasolar**
TYPE: Installation
YEAR: 2008
LOCATION: Tel Aviv
CLIENT: Tel Aviv Municipality
DESIGN CONCEPT: Open Source Architecture (Aaron Sprecher, Chandler Ahrens, Eran Neuman)
PROJECT TEAM: Aaron Sprecher, Chandler Ahrens, Yaron Kanor and Tamir Lavi
FABRICATION: Holon Plastic

TWENTY-ONE

GRAMAZIO & KOHLER

PROJECT TITLE: **Architonic Concept Space**
TYPE: Installation
YEAR: 2008
LOCATION: ETH Zurich
CONCEPT, DESIGN AND FABRICATION: Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich
PROJECT TEAM: Ralph Bärtschi, Gabriel Cuéllar, Michael Lyrenmann

PROJECT TITLE: **The Sequential Wall**
TYPE: Installation
YEAR: 2008
LOCATION: ETH Zurich
CONCEPT AND DESIGN: Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich
COLLABORATORS: Silvan Oesterle (project leader), Ralph Bärtschi, Michael Lyrenmann
INDUSTRY PARTNER: Häring Timber Engineering, Isoflock
STUDENTS: Michael Bühler, David Dalsass, Simon Filler, Milena Isler, Roman Kallweit, Morten Krog, Ellen Leuenberger, Jonas Nauwelaertz de Agé, Jonathan Roider, Steffen Samberger, Chantal Thomet, Rafael Venetz, Nik Werenfels

PROJECT TITLE: **Orthodox Synagogue**
TYPE: Synagogue
YEAR: 2009
LOCATION: Potsdam
CONCEPT AND DESIGN: Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich
CLIENT: Brandenburgischer Landesbetrieb für Liegenschaften und Bauen
COLLABORATORS: Gabriel Cuéllar (project leader), Raffael Gaus, Boris Gusic, Peter Heckeroth
CONSULTANCY: Hubertus Adam (art historian) and Jan Otakar Fischer (art historian)

PROJECT TITLE: **Gantenbein Vineyard Façade**
TYPE: Façade
YEAR: 2006
LOCATION: Fläsch, Switzerland
CONCEPT AND DESIGN: Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich
IN COOPERATION WITH: Bearth & Deplazes Architekten, Valentin Beath, Andrea Deplazes, Daniel Ladner, Chur/Zurich
CLIENT: Marta and Daniel Gantenbein
COLLABORATORS: Tobias Bonwetsch (project leader), Michael Knauss, Michael Lyrenmann, Silvan Oesterle, Daniel Abraha, Stephan Achermann, Christoph Junk, Andri Lüscher, Martin Tann
SELECTED EXPERTS: Jürg Buchli (structural engineer), Nebosja Mojsilovic, Markus Baumann, IBK ETH Zürich (structural tests)
INDUSTRY PARTNER: Keller AG Ziegeleien

TWENTY-TWO

REISER + UMEMOTO

PROJECT TITLE: **O14**
TYPE: Office tower
YEAR: 2006 (design), 2007–2009 (construction)
LOCATION: Dubai, UAE
PRINCIPALS: Jesse Reiser, Nanako Umemoto
DESIGN TEAM: Mitsuhisa Matsunaga, Kutan Ayata, Jason Scroggin, Cooper Mack, Michael Overby, Roland Snooks, Michael Young
ASSISTANTS AND INTERNS: Tina Tung, Raha Talebi, Yan Wai Chu
STRUCTURAL ENGINEER: Ysrael A. Seinuk, PC, New York, NY
ARCHITECT OF RECORD: Erga Progress, Dubai, UAE
WINDOW WALL CONSULTANT: R. A. Heintges & Associates, New York, NY

PROJECT TITLE: **AEON**
TYPE: Multi-purpose tower
YEAR: 2005
LOCATION: Dubai, UAE
PRINCIPALS: Jesse Reiser, Nanako Umemoto
ARCHITECTURAL TEAM: Kutan Ayata, Mitsuhisa Matsunaga, Wolfgang Gollwitzer, Jason Scroggin, Keisuke Kitagawa
ASSISTANTS AND INTERNS: Yusuke Okabayashi, Akari Takebayashi, Jonathan D. Solomon, Tomohide Ichikawa, Hironori Nishikawa, Yuji Oda, Tina Tung, Cooper Mack, Christina Yessios
CLIENT: Creekside Development Corporation, Dubai, UAE
GENERAL CONTRACTOR: Dubai Contracting Company (DCC), Dubai, UAE

PROJECT TITLE: **Terminal 3, Shenzhen International Airport**
TYPE: Airport
YEAR: 2007
LOCATION: Shenzhen, China

DESIGN STAGE (PHASE I)
PRINCIPALS: Jesse Reiser, Nanako Umemoto
DESIGN TEAM: Mitsuhisa Matsunaga (leader), Kutan Ayata, Michael Overby, Roland Snooks
ASSISTANTS AND INTERNS: Steven Lauritano, Juan De Marco, Neil Cook, Michael Loverich, Lindsey Cohen, Luis Costa, Yan Wai Chu, Roselyn Shieh, Max Kuo, Robin Liu, Devin Jernigan, Robert Soendergaard, Penelope Tang, Victor Chei

TECHNICAL DEVELOPMENT STAGE (PHASES II AND III)
PRINCIPALS: Jesse Reiser, Nanako Umemoto
TECHNICAL DEVELOPMENT TEAM: Mitsuhisa Matsunaga (leader), Kutan Ayata, Michael Overby, Juan De Marco, Neil Cook, Michael Loverich, Lindsey Cohen, Jonathan Solomon, Luis Costa, Devin Jernigan

PROJECT TITLE: **Taipei Pop Music Center**
TYPE: Commercial
YEAR: 2010
LOCATION: Taipei, Taiwan, Republic of China
PRINCIPALS: Jesse Reiser, Nanako Umemoto
DESIGN TEAM: Neil Cook, Michael Overby, Samuel Brissette
ASSISTANTS AND INTERNS: Juan De Marco, Devin Jernigan, Jacob Bekermus, Giancarlo Valle, Shosuke Kawamura, Yasuhito Furuyama, Erin Kelly, Becky Quintal, Kate Wollman, Elise Renwick, Farzam Yazdanseta, Wei Wang, Edwin Lam, Sean Stevenson
STRUCTURAL ENGINEERing: MEP/Sustainability, theater, acoustics, lighting, façade; ARUP, New York, NY
LOCAL ARCHITECT: Fei and Cheng and Associates, Taipei, Taiwan

TWENTY-THREE

FOSTER + PARTNERS

PROJECT TITLE: **GLA (Greater London Authority) City Hall**
TYPE: City hall
YEAR: 1998–2002
LOCATION: London, UK
PARTICIPATING ARCHITECTS: Foster + Partners

PROJECT TITLE: **The library, Free University**
TYPE: Library
YEAR: 1997–2005
LOCATION: Berlin, Germany
PARTICIPATING ARCHITECTS: Foster + Partners

PROJECT TITLE: **Spaceport America**
TYPE: Spaceport
YEAR: 2006–2011
LOCATION: New Mexico, USA
PARTICIPATING ARCHITECTS: Foster + Partners

PROJECT TITLE: **Khan Shatyr Entertainment Center**
TYPE: Entertainment center
YEAR: 2006–2010
LOCATION: Astana, Kazakhstan
PARTICIPATING ARCHITECTS: Foster + Partners

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