

Architectural Design

Contemporary
Techniques
in Architecture

WILEY-ACADEMY

4	Editorial <i>Heleen Castle</i>
5	Introduction <i>Ali Rahim</i>
9	Deleuze and the Use of the Genetic Algorithm in Architecture <i>Manuel DeLanda</i>
13	Emergent Structural Morphology <i>Peter Testa and Devyn Weiser</i>
17	Interactive Opportunities <i>David Erdman, Marcelyn Gow, Ulrika Karlsson, Chris Perry/Servo</i>
20	Toroidal Architecture <i>Preston Scott Cohen</i>
28	Gottfried Semper: Stereotomy, Biology and Geometry <i>Bernard Cache</i>
34	Vigorous Environment <i>Michael Hensei and Kivi Sotamaa/OCEAN North</i>
42	Creating Synthesis Partners <i>Kristina Shea</i>
46	The Digital and the Material <i>Michael Weinstock with Cecil Balmond</i>
52	Potential Performative Effects <i>Ali Rahim</i>
64	Predator <i>Greg Lynn</i>
72	Skin Deep - Polymer Composite Materials in Architecture <i>Johan Bettum</i>
77	'Lumping' <i>Sulan Kolatan and William MacDonald</i>
84	Roller-Coaster Construction <i>Alejandra Zaera-Polo/Foreign Office Architects</i>
93	Virtually Crash Testing the Box <i>Jeff Turko</i>
95	Biographies

Contemporary Techniques in Architecture

Guest-edited by Ali Rahim



98+	Interior Eye: Archi-Tectonics, Aida Hair Salon <i>Craig Kellogg</i>
102+	Engineering Exegesis: Lightweight Structures <i>Bas Veldman and Oscar Molder</i>
108+	Beat the Devil <i>Diane Lewis</i>
113+	Building Profile: Climate Prediction Center <i>Jeremy Melvin</i>
118+	Practice Profile: S333 <i>Lucy Bullivant</i>
124+	Highlights from Wiley-Academy
125+	Book Reviews
126+	Site Lines

The sequel to Ali Rahim's highly successful *Contemporary Processes in Architecture* issue of AD, this title is no mere add-on or opportunistic follow on. It was conceived in tandem with the first project. Discussed in abstract with Rahim in its early stages I envisaged it dealing with a discrete area of practice like that of processes, which dealt almost solely with the generative and the creative design stage. Techniques, however, as a 'means of achieving one's purpose', specifically in a contemporary context have not proved nearly so neat. Though the issue reproduces projects, such as the Yokohama Port Terminal and the O/K Apartments, in which the employment of innovative production methods have enabled the dreams of the avant-garde to become a reality, new technologies alone are not the main thrust of the publication. It is to Rahim's credit that he has insisted that this theme must be concerned with far more than 'the technical' and must truly reflect the interface between architecture and contemporary culture – in his own words 'a complex feedback loop'. Δ

In this issue of *Architectural Design* contributors explore the relationship between techniques, and cultural and architectural production, and investigate the connections that link them. Contemporary techniques are part of a complex feedback loop. They produce new effects which act on or influence an object, affecting human behaviour and technical performance. This transforms culture through replication and produces new and different effects – new techniques.

Contemporary techniques thus constitute the beginning, and the end, of the loop, which is perpetuated and proliferated by technology. This proliferation is contingent on an understanding of technology activated within its cultural context. The interaction between technology and the user creates the possibility for qualitative cultural transformation through the transmission of behaviours that are replicated.

Ostensibly contemporary techniques' contribution lies in the progress of a culture that is driven by a machinic process which self-organises, bifurcates and produces new emergent results. It is experimental architects' use of current techniques to generate these organisational processes that enables them to understand the possibilities contained within the design process. This sees the replacement of determinist notions of causality with nonlinear, bottom-up systemic processes which produce emergent effects. For example, Manuel Delanda exploits the possibilities contained within the genetic algorithm, in which evolutionary simulations replace design and software breeds new forms. He emphasises the need to create fertile spaces that are 'rich enough' for the evolutionary results to be exceptional, and sufficiently open-ended to make it impossible for the designer to consider all possible configurations in advance.

The relationship between techniques and material objects is potentially that of dynamic organisations which challenge the stasis of the formal object. For example, Kristina Shea has created a prototype system of synthesis techniques called *eifForm* that relates material objects to aspects of geometry, topology and principles of structural engineering. This has the effect of moving the work away from material specialisations and restrictions, or specific applications, and allows for interaction with dynamic processes that contribute to the rapid generation of design alternatives that are void of material restraints. These new computational techniques lead to the creation

of innovative, free-form, discrete structures and the incorporation of performance indicators beyond structural mass.

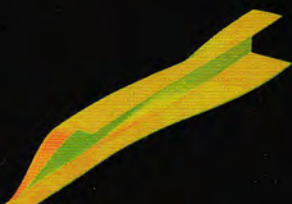
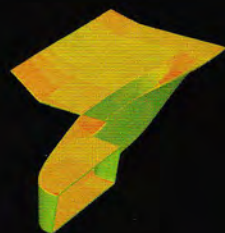
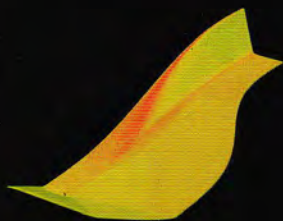
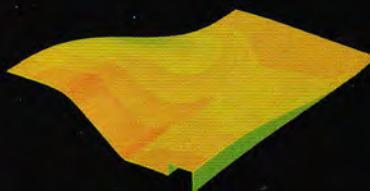
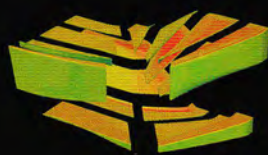
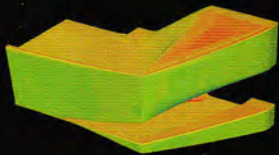
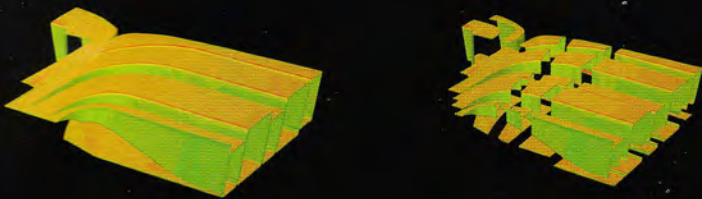
It is in recognition of the fact that contemporary techniques are process based that references are introduced to biology, the live mixing of music, jazz and ecology in this issue; ecology here serve as generative engines to develop techniques, where the environment influences the outcome of the developmental process. For example, Ocean North use ecology as an organisational paradigm to precisely articulate the environment as a dynamically unfolding generative field. Their approach to design, emphasising the primacy of process, changes their approach to building. They seek to 'engender relational dynamics between material form, ambient conditions, social arrangements, habitational potential and the subject'. Cultural transformation is invigorated by the unforeseeable influences and accidents that result from this inclusive approach.

The transformation of contemporary conditions is brought about by exploiting contemporary techniques' potential to exploit new effects. Foreign Office Architects utilise the affective potential of architectural technique to develop alternatives. An example is using sequential, integrative addition to produce undetermined, increasingly more ambiguous spatial and programmatic effects that have the capacity to resonate at many different levels and scales within the architecture.

These effects are also produced at the microscopic level of material consistency. Johan Bettum describes the newly discovered potential of polymer composite materials (PCM) to produce novel aesthetic and spatial effects by varying their molecular consistency. These discoveries correspond to recent trends towards a temporally conditioned approach to surfaces with the consequent focus on materials and materials technologies. Bettum's PCMA projects demonstrate the meaningful and dynamic role that the articulation of surfaces can play in mass cultural transformation.

The effects of programmatic, spatial and material organisation question all previous limits on architecture, inside/outside and figure/ground, while provoking a new flexible system of open organisations. The actualisation of these organisations in projects should be understood in terms of their performative effects, which are measured by their capacity to produce new effects that transform culture. Various techniques, in combination with various material organisations, produce effects that demonstrate maximum cultural efficacy. Some of these effects are known and others are emergent.

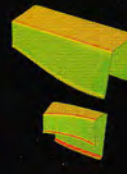
In Preston Scott Cohen's entry for *Eyebeam Atelier*, an analogical reasoning format is used, which is intensified, so that as one moves through different levels it is only possible to apprehend one's relationship with that particular (scanned) space. Meanwhile, the



001

002

003



027

015

016

017

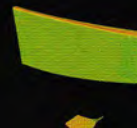


043

036

037

038

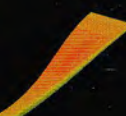
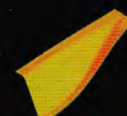
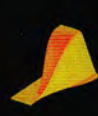


044

045

046

052



053

054

055

061



062

063

064

068

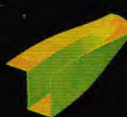
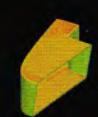


069

070

071

075



076

077

078

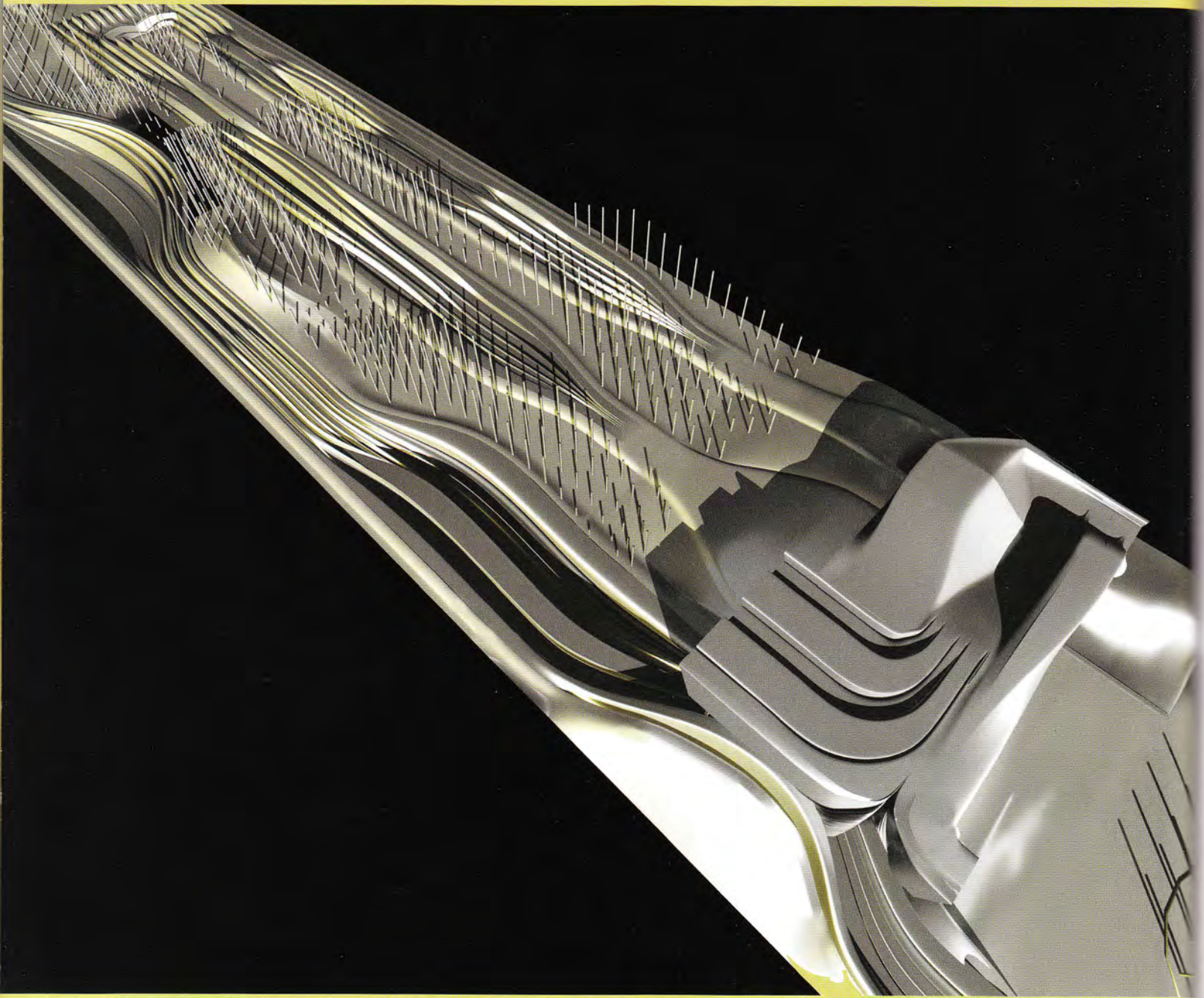
078





Ali Rahim discusses the potency of contemporary techniques, with their ability to influence and transform cultural, social and political relations. In order for this to occur we must conceptualise technology as being immersed in its cultural context and having qualitative effects that proliferate culture. This interaction produces a pattern of behaviours that can result in new levels of performance and in newly effective behaviours or actions. In fact, contemporary techniques themselves are new effects of previous techniques that result in further cultural transformation through a complex system of feedback and evolution. These techniques generate opportunities to produce new effects at the scale of organisation, programme, space and material.

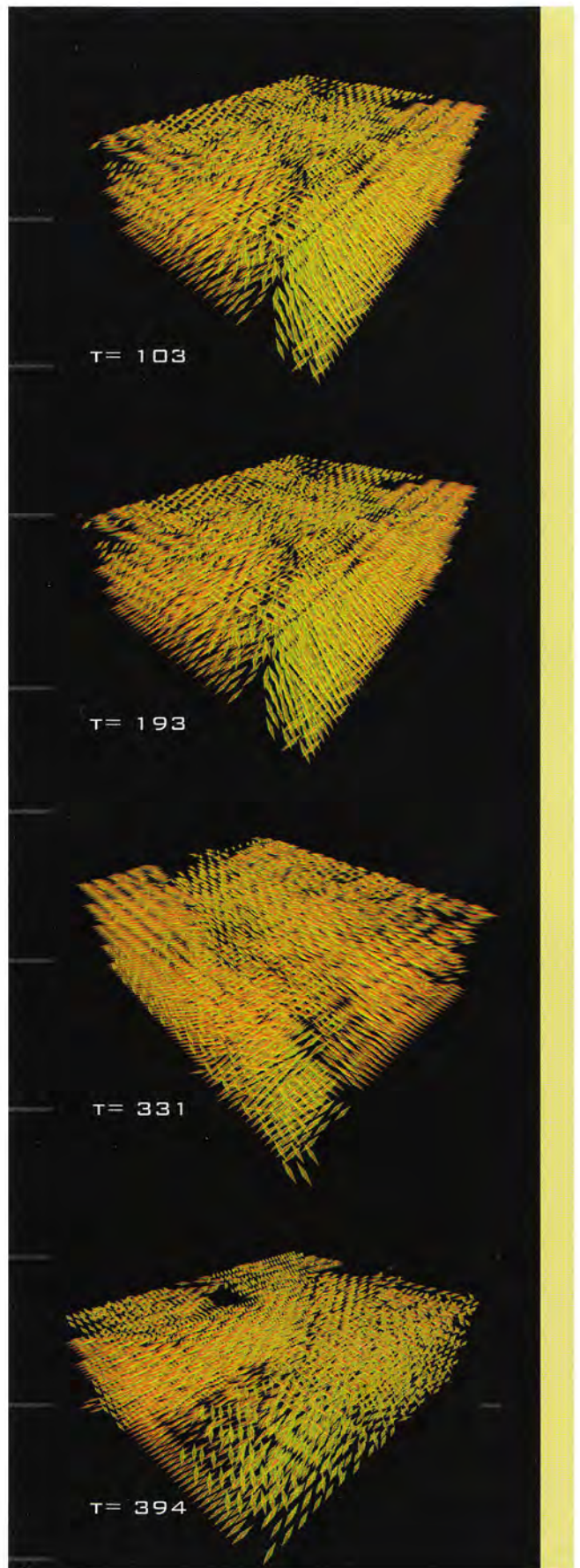
Potential Performative Effects



Contemporary design techniques are temporal, process-driven methods that provide new transformative effects in cultural, social and political production. Such a technique acts on or influences an object, which in turn modifies human behaviours and technical performance. Techniques have always contributed to the production of human and cultural artefacts, but their refinement and acceleration after the Industrial Revolution has emerged as the single most important element in the evolution of cultural endeavours.¹ Our work seeks to harness the potential of contemporary techniques to produce new architectural effects.

At each stage in its development, a technological device expresses a range of meanings not from 'technical rationality' but from the past practices of users. In this way a feedback loop is established between technology and cultural production that leads to a restless proliferation of new effects. That is, technology is not merely technical; it is an active and transformative entity resulting in new and different cultural effects.² Technology, in this sense, is not efficiency-oriented practice measured by quantities but a qualitative set of relations that interact with cultural stimuli. This interaction produces a pattern of behaviours that can result in new levels of performance and in newly effective behaviours or actions. In fact, contemporary techniques are themselves new effects of previous techniques and result in further cultural transformation through a complex system of feedback and evolution. The path of evolution produced by a cultural entity – an object, a building, a company or a career immersed in its context – produces a distinct lineage³ as the result of propagation. Each lineage – economic, political, social, commercial, scientific, technological, etc – exists indefinitely through time, either in the same or an altered state. Time is qualitative in that the past, present and the future are simultaneous and contain maximum potential for optimising the capacity to grow, develop and come into being. The future is undecided, is bound by its past and is accretive. This allows us to be opportunistic with the potential for maximising new effects. Contemporary techniques enable us to access these potentials and separate these lineages. This act of separation is similar to propagation, producing a performative effect.

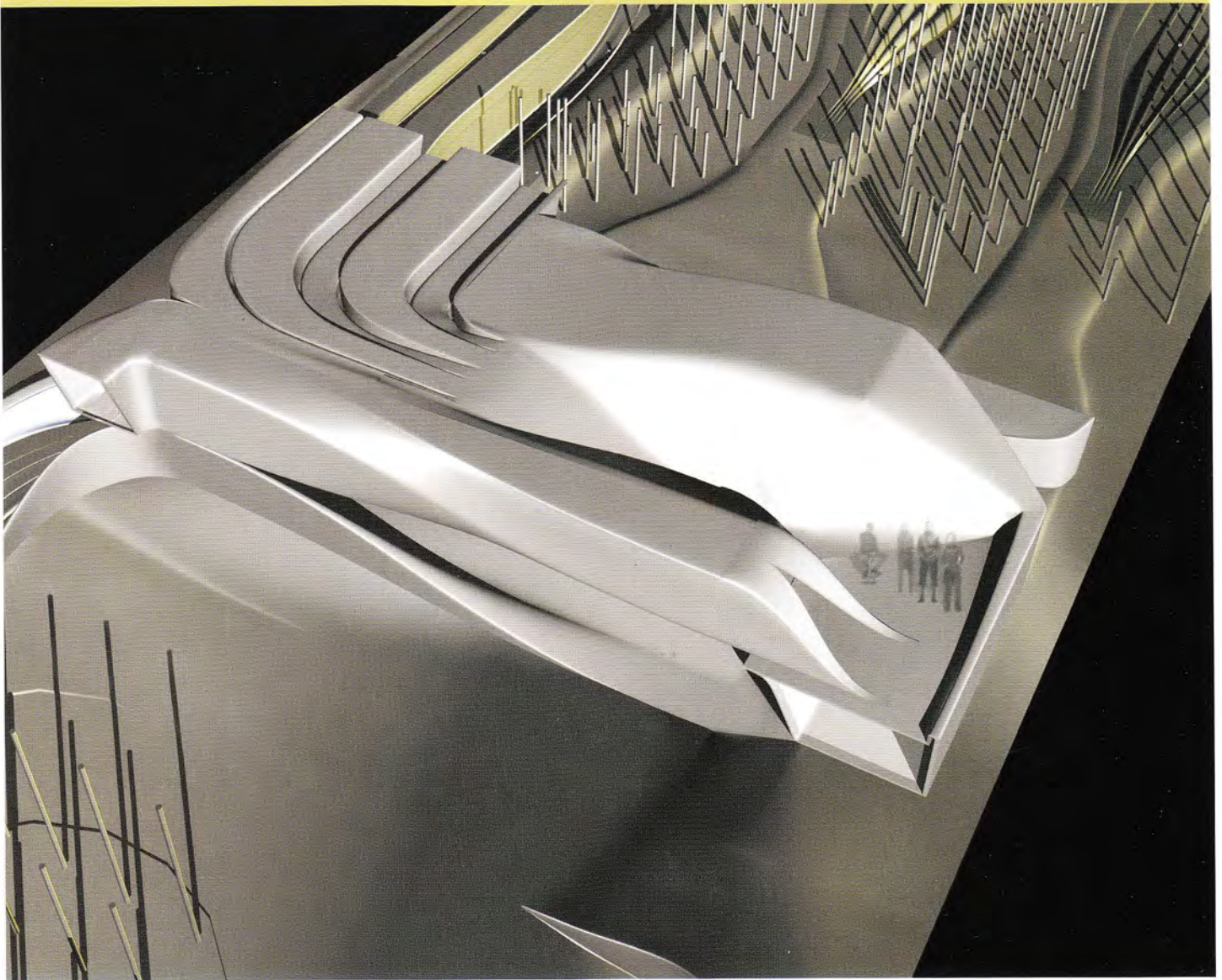
Once lineages have produced effects memes provide for the dissemination of ideas that cross these lineages. Memes are copied behaviours and are transmitted either through people by



Previous spread
The composite materials used to drape the structure range from polymer composites for external enclosure, to polymethyl methacrylate (Plexiglas) for optical-quality clarity slumped on 3-axis CNC milled formwork. The panel sizes are determined by two variables, either the amount of curvature a milling machine can mill or the size of a shipping container.

Composite
Overall configuration of iterations, showing landscape and inhabitation scale.

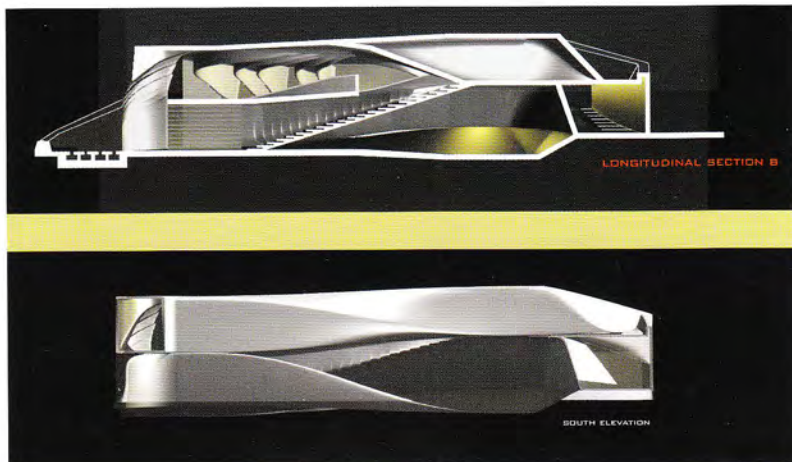
Light
Animations with maximum differential, pointing towards specific tendencies.



Above
Perspective view of inhabitation,
showing the form of the project
responding to spatial effects.

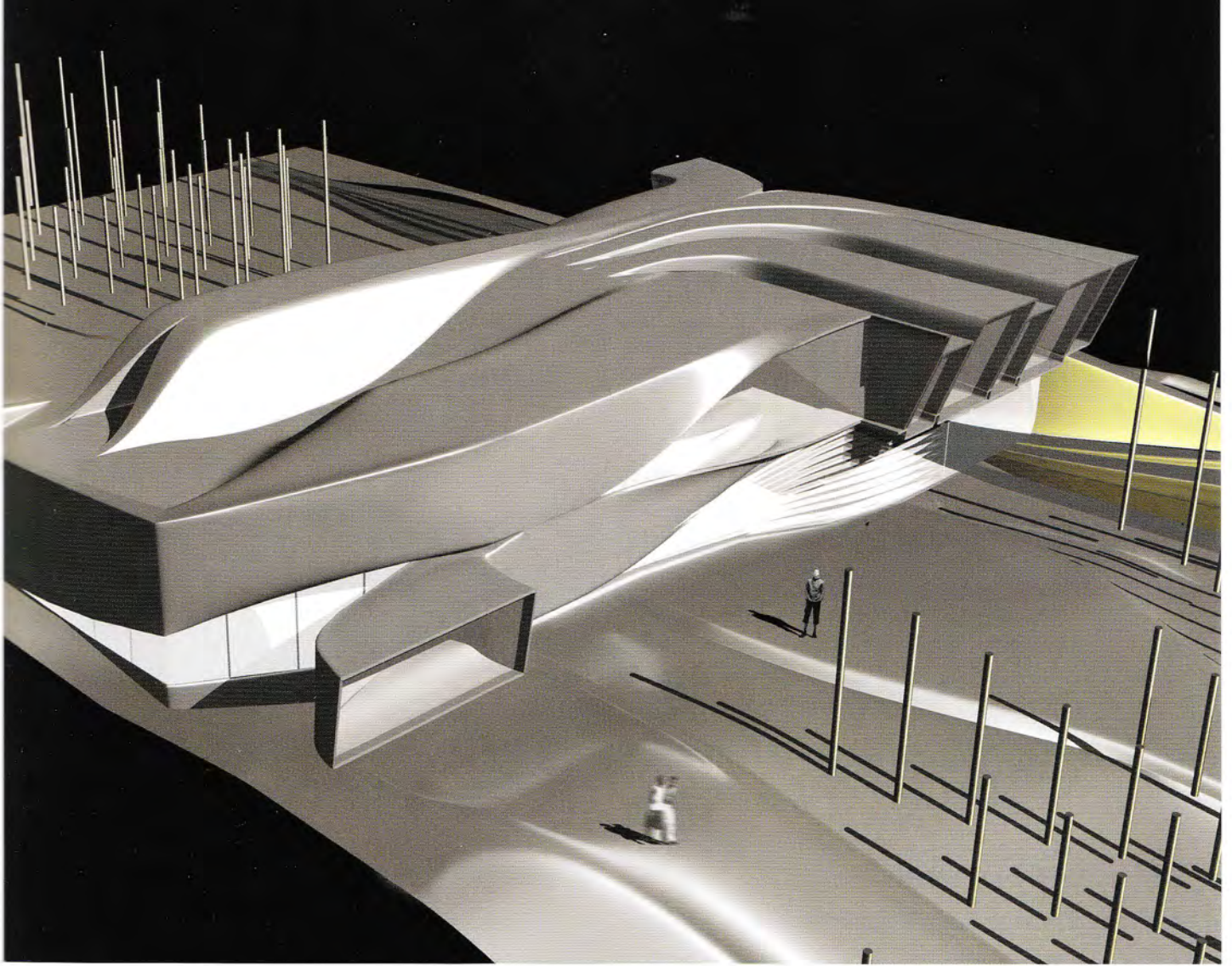
Below and opposite bottom
Cross sections showing the
variations in spatial
modulation to provide for
different activities – sitting,
standing, lying down, eating,
etc – to take place singly or in
multiple combinations.

Opposite top
Exterior view.



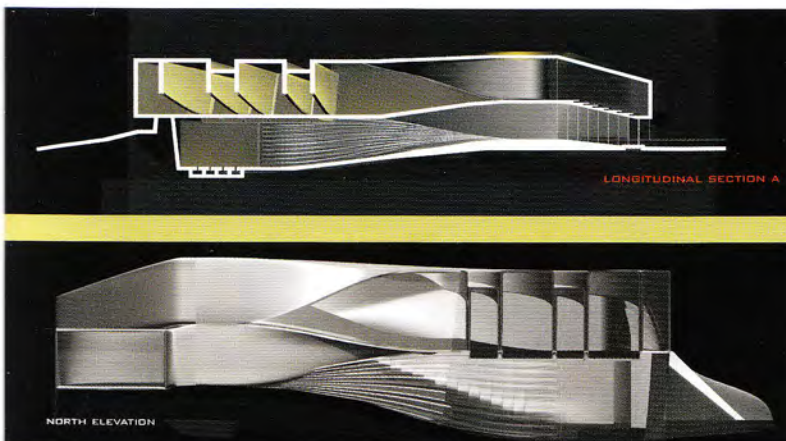
heredity, in which the form and details of behaviours are copied; through variation, in which the behaviours are copied with errors; and through selection, in which only some behaviours are successfully copied. They react to external stimuli and produce or transform a situation through influence and effect. They are performative. To quote Stephen J Gould, '... transmission across lineages is, perhaps, the major source of cultural change.'⁴

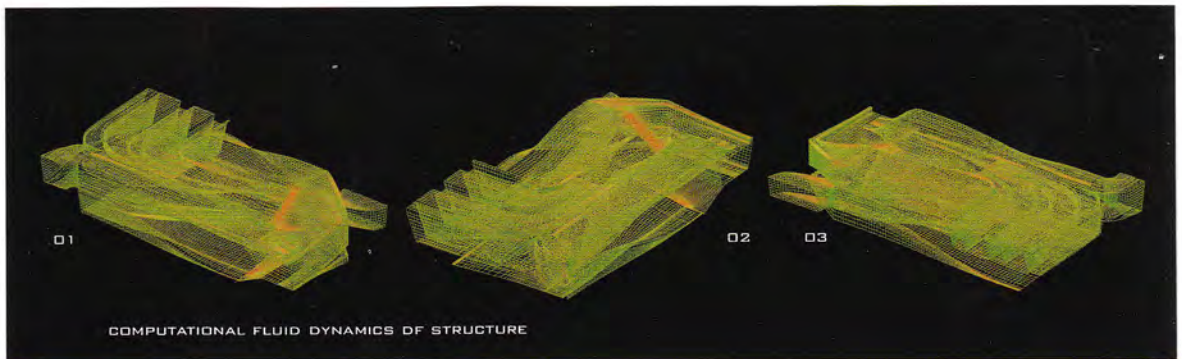
For example, in the evolution of the computer, it is clear that each lineage encompasses the contributions of scholars, philosophers, visionaries, inventors, engineers, mathematicians, physicists and technicians. Each lineage was stimulated over time by vision, need, experience, competence and competition. As these lineages developed simultaneously through time, philosophically and intellectually they organised effects already in existence – the use of machines and automation. Theoretically they organised advances made in symbolic logic and science mathematics, which only then became feasible. These factors, impacted by differing intensities of economic, commercial, scientific, political and military pressures, crossed the technical threshold and spontaneously emerged into the technological object of the computer – an effect.



The computer is a temporally organised technological object. If we were to view these nonlinear organisational processes as fixed in space and time, the resulting objects would be severely limited and would strain to represent meaning through formal expression. This object type would be passive and defined only by its material attributes, which are linear and causal. Such an object is static, and only has the capacity to produce predetermined effects.

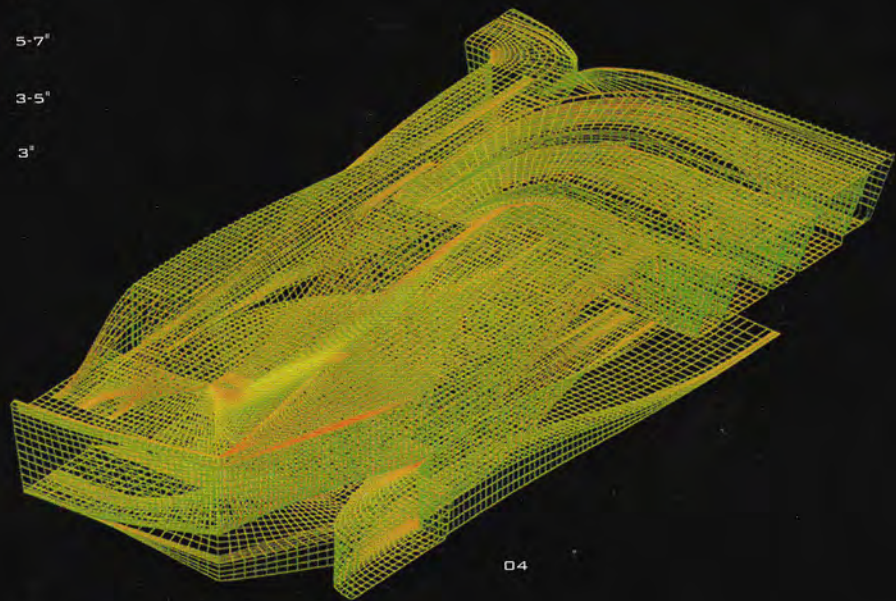
To avoid this stasis, we must view the object in its context, and understand it as part of a continuous temporal organisational process of cultural proliferation. This process is endogenic, machinic and has the potential to spontaneously self-assemble, and produce effects that are qualitative and larger than initially anticipated. The effects – no longer proportional to their causes – are emergent. For example, the Internet was initially created for the purpose of exchanging information between nuclear facilities operated by the military. However, it has emerged as the largest storage bank of information in the world with far greater and more complex performative potential than could ever have been predicted. Once recontextualised, the computer is instrumental in spreading memes, which change behaviours and continue to influence contemporary culture.





PERFORMATIVE CRITERIA IS MAXIMIZED USING
VARIABLE THICKNESSES IN ALUMINUM.

- 7-9"
- 5-7"
- 3-5"
- 3"



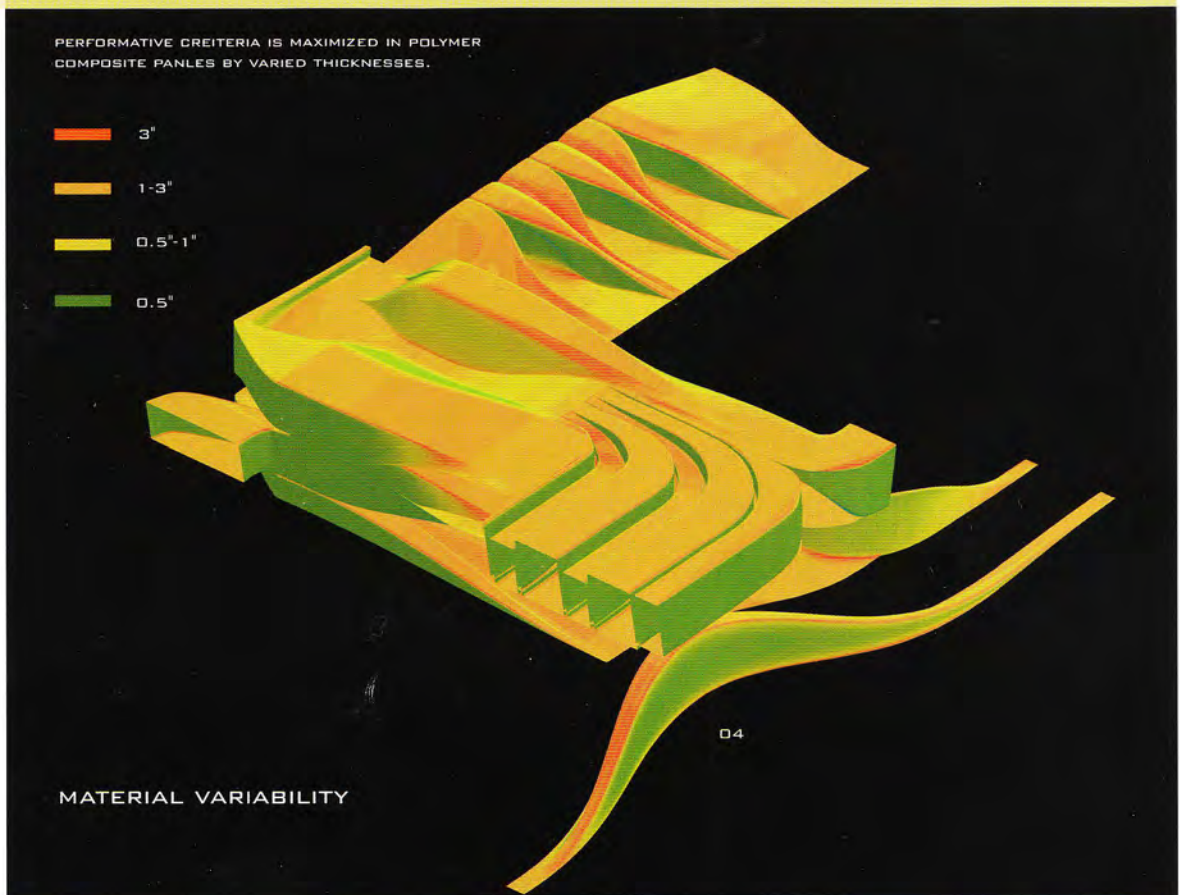
This page
Building and manufacturing
this project is dependent on
recontextualising the
techniques used in the
aeronautics industry. The
structure is made of Nomex
core aluminum formed to
shape on 3-axis CNC milled
formwork. Tested by
Computational Fluid Dynamics
for structural variation in
thickness.

Opposite
The composite materials used
to drape the structure range
from polymer composites for
external enclosure, to
polymethyl methacrylate
[PMMA] for optical-quality
clarity slumped on 3-axis CNC
milled formwork. The panel
sizes are determined by two
variables, either the amount
of curvature a milling machine
can mill or the size of a
shipping container.

Contemporary techniques are organised and guided by probabilities, which are unlimited and allow for the production of performative effects in architecture. Moreover, contemporary techniques are destabilised by temporally located potentials that make possible the development of new organisations. These processes amplify the difference between the possible and the real, and contain a set of possibilities which acquire physical reality as resemblant material form. The static object that produces predetermined effects defines the real, whereas contemporary processes allow for exploration of the possibilities. Actualisation, on the other hand, is emergent and breaks with

resemblant materiality bringing to the fore a new sensibility, which ensures that the difference between the real and actual is always a genuine creation.⁵ This sensibility, which subverts fixed identity, is a flexible spatiotemporal organisation that produces performative effects. Its effectiveness is measured by the capacity to produce new effects. This is tested through an iterative process where the possibilities become genuinely open-ended.

In order to fully maximise the potential provided by contemporary techniques, we use machinic, nonlinear techniques within time-based software where time is irreversible. This software simulates the natural processes of contemporary cultural production, whereby the past and present are simultaneous and the



future is not preconceived.⁶ Our intention in architectural projects is to actualise virtualities contained within the matrices of the software that fully exploit its potential to produce new effects, which modify behaviours and performance.

This process of actualisation allows us to produce temporal organisations through an iterative process that is conditioned by our ideas and concepts. There is a continuous feedback loop within the context of this ongoing investigation. This working method allows us to shape and tune the formations in accordance with our concepts through a process of actualisation.⁷ Knowledge and sensibility are

produced at all developmental stages within the project, the effects of which are organisational, programmatic, spatial and material. One possibility out of many is actualised. Through interaction with the environment our creations transform cultural production. This is an ongoing temporal process of cultural proliferation which self-perpetuates.

In our project for Variations, a residence in Islamabad, Pakistan, we conceptualised an approach that locally affiliated site, organisation, programme, space and material challenges. The form of the project emerged from spatial considerations that influenced all scales of development. This was developed through the study of the site in addition to the intensive schedule of events that it would be necessary to



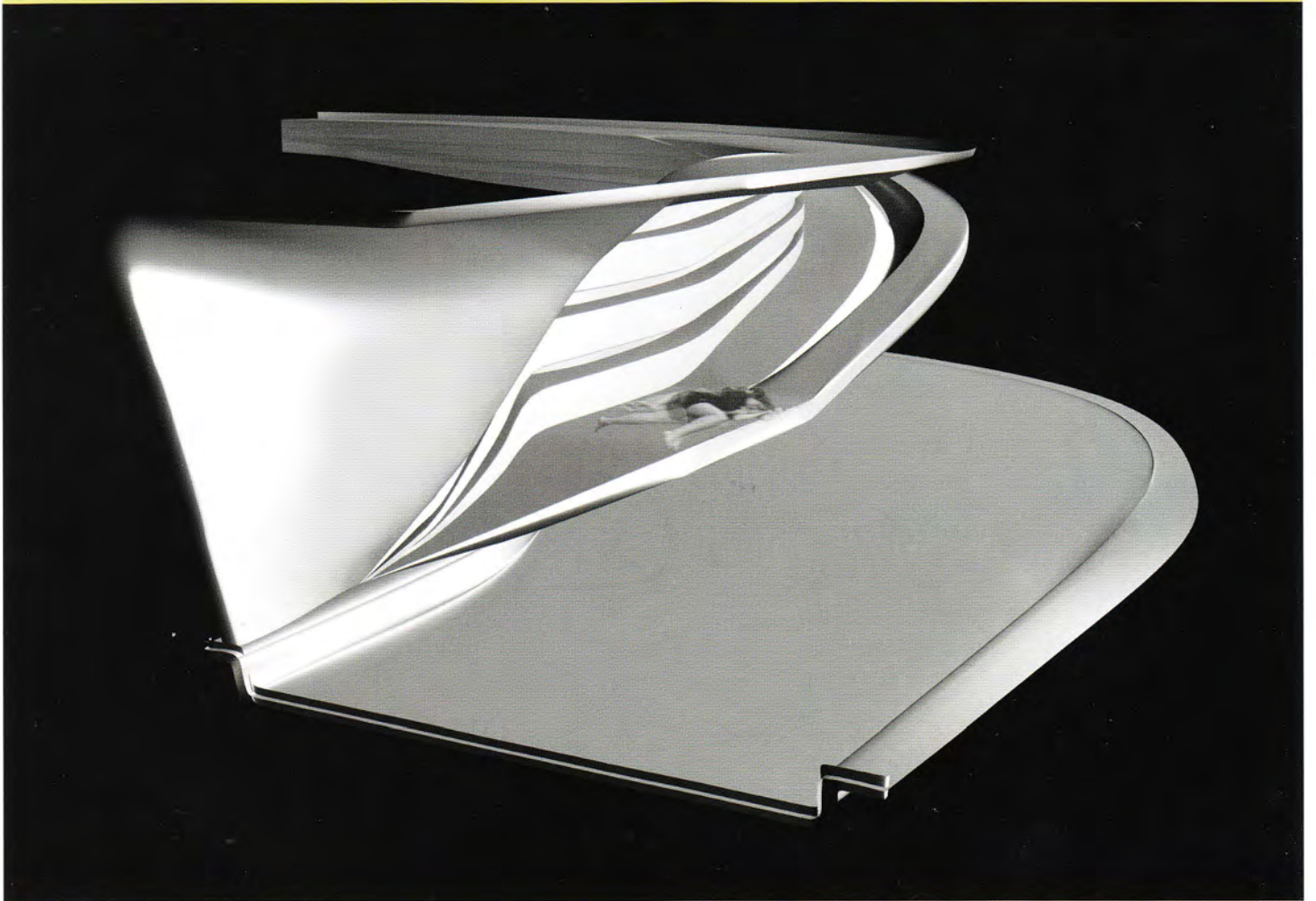
Right
Interior view of the main
circulation spaces showing
that it is possible for multiple
event intensities to occur
simultaneously.

contain within the landscape and inhabitation of the project. We used animation techniques that evolved through time to study the relationship of the scale and intensity of events and their correspondences with the temporal cycles of the site. Specifically, we used inverse kinematics, which coded events as a field condition, and which had an equal capacity to react to particular site cycles measured by their intensity, duration and frequency. These relationships were deterritorialised through the use of vectorial and gradient force fields that responded to different degrees of environmental specificity. For example an existing well on the site was coded with a continuous pointal force which acted on the field condition, and subsequently reacted to the continuous vector of force exerted on it. This provided unlimited potential in the system which grew in complexity, evolved and formed mutual associations between site stimuli and event. These pointed towards future possibilities, and were guided and shaped to form tendencies through an iterative process.

The actualisation process involved applying these tendencies to multiplicities in event intensity and duration, producing a variety of performative effects. A system of differentiated channels modulating water flow was actualised to provide for drainage and irrigation during different seasons. That is, a system of troughs and channels is used to irrigate or drain the land

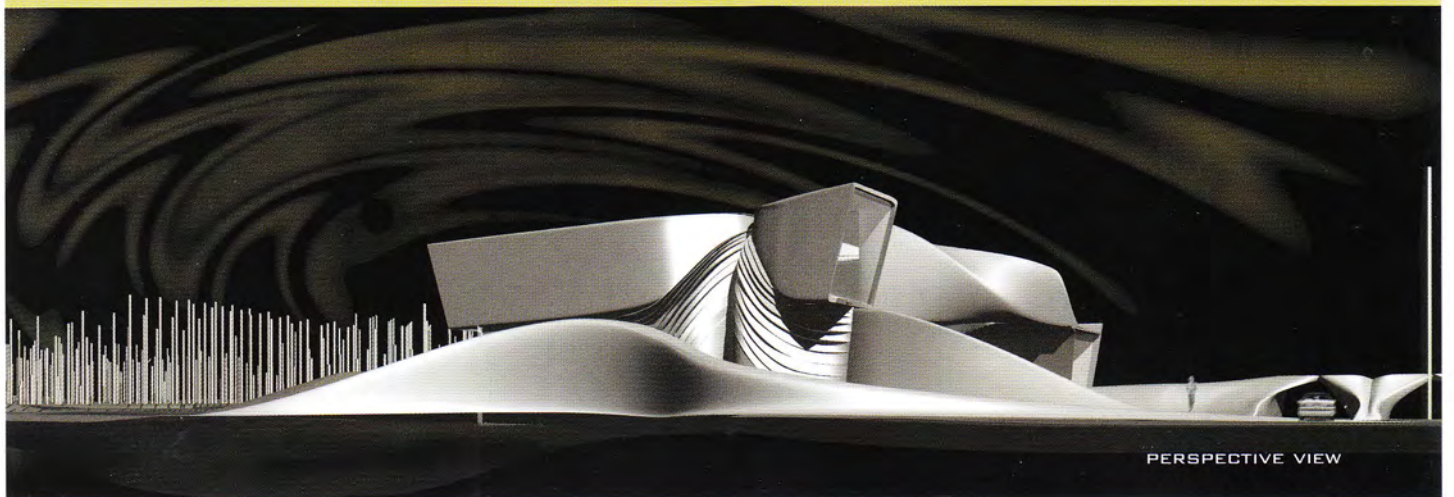
Below
Cross section





Above
Secondary circulation path
allows for abrupt stoppages
of space, providing for unseen
events.

Below
Overall view showing the
gradient effects of light.



PERSPECTIVE VIEW

providing a contingency of effects according to ecological specificity. Ecologically, the effects are controlled to develop through time. For example, localised effects are produced by regulating the direction, amount, drainage and flow of water within the system at any given time. This controls not only the scale and type of vegetation, but also the activities surrounding the system. Water is collected or released according to differing levels of saturation. A pool for swimming in summer becomes a retention pond in winter. This provides for a matrix of possibilities coded into a flexible yet specific organisation of water channels. These channels combine to form an emergent organisation of water flow that produces programmatic, material and ecological effects that influence behaviours.

At the scale of habitation we see a continuity with the landscape where the actualised organisational process has no bounded limits – figure or ground, building or landscape, inside or outside, public or private – but provides a continuous interchange or gradient between the two extremes. This allows for the maximum variety of effective scenarios to occur which merge programmatic events. Different alternative scales of circulation routes through the organisation are used and activated at different times during the day, week and year, producing markedly different effects. For example, the main circulation route provides for multiple events, while the short-cuts of secondary and tertiary scale provide for connections that can collapse two simultaneous events. This continuous differentiation of porosity determines various performative effects at different times during the project. For example, if two events of the same intensity simultaneously occur – dining on the first and second levels – they are joined by the secondary or tertiary scales of circulation, merging with each other. If they are two separate events with different intensities, for example dining and entertaining, they spawn additional unforeseen events.

Spaces are arranged by a more detailed set of performative possibilities. One location may provide for clustering and accumulative behaviour, while another allows for ease of dispersion and continuity of space. For example, while entertaining one is able to flow seamlessly from one space to another. In other instances the space acts as a resistance to disrupt the flow. This disruption causes unforeseen situations to occur. In addition, spaces are modulated by the

transformation of surface specificity which allows for various functions: sitting, eating, sleeping, bathing. For example, seating, which may also be used for sleeping, transforms into leaning spaces, which can become areas for social interaction. This gives the opportunity for that particular use, or the space can be reappropriated for various uses in various combinations.

Within system, surface and space, material is modulated at the molecular level and at the scale of enclosure. At the molecular level, continuous variation is possible within nonisotropic (composite) materials; densities or porosities provide a range of gradient effects. The threshold of the line is moved to a gradient so that opaque, translucent and transparent effects can occur in one surface in continuous variation. This rearticulates the intention to conflate the internal spatial effects while simultaneously producing aesthetic effects of various transparencies and colours. At the scale of enclosure one can vary the thickness of the surface, dependent on its own material logic, for strength and for levels of opacity. By twisting the material one is able to produce a range of lighting effects.

The emergent organisation is made of an aluminum structure, which is draped with composite materials that range from opaque to transparent in appearance. This relies on the technological and material manufacturing capability of contemporary culture, that of the aeroplane, which has been recontextualised to produce new architectural effects.

Spaces are arranged by a more detailed set of performative possibilities. One location may provide for clustering and accumulative behaviour, while another allows for ease of dispersion and continuity of space

The structure develops through the process simultaneously with its material counterpart, and affiliates itself with varying levels of porosity. This aligns different densities of structure with different intensities of programme. In the process, the structure is decoded and freed from dependency on point load transference to one determined by difference in load-bearing pressures. It provides for an open organisation which is specific while simultaneously producing another layer of ambient effects. This potential, when combined with differing densities of composite material panels, provides for a series of emergent lighting effects. This spatiotemporal organisation is performative, and seeks variability at all scales – within programme, space, structure and material. ∆

Notes

1. Larry A Hickman, *Philosophical Tools for Technological Culture. Putting pragmatism to work*, Indiana University Press (Bloomington), 2001.
2. Andrew Feenberg, *Putting Pragmatism to work: Questioning technology*, Routledge (London and New York), 1999. Feenberg describes how the invariant elements of the constitution of the technical subject and object become modified, socially specific contextualising variables in the course of the realisation of concrete technical actors, devices and systems. Thus technologies are not merely efficient devices, or efficiency-oriented practices, but include contexts as these are embodied in design and social insertion.
3. A lineage is the evolutionary path demarcated by a single cultural entity, or combination of cultural entities, through time as the result of replication.
4. Stephen J Gould, *Bully for Brontosaurus*, Norton (New York), 1991, p 65.
5. Gilles Deleuze, *Difference and Repetition* [European Perspectives: A Series in Social Thought and Cultural Criticism], trans Paul Patton, Columbia University Press (New York), 1994.
6. This is constructive. For further discussion, see 'Systemic Delay – Breaking the Mould', *Architectural Design* Vol 70, No 3, June 2000, p6.
7. The idea comes from the French philosopher Henri Bergson who, at the turn of the century, wrote a series of texts in which he criticised the inability of the science of his time to think the new, the truly novel. According to Bergson the first obstacle was a mechanical and linear view of causality and the rigid determinism it implied. Clearly, if all the future is already given in the past, if the future is merely that modality of time where previously determined possibilities become realised, then true innovation is impossible.

Biographies/Credits

Cecil Balmond is the chairman of the Europe and Building board and a main board member of Ove Arup. Having initially studied engineering and carried out research in pure mathematics and chemistry, he is now best known for his collaborations with experimental architects, such as Rem Koolhaas, Daniel Libeskind, Enrique Miralles and van Berkel that have spanned more than 30 years. He teaches at Harvard and Yale, and is the author of *Number 9* (1999) and *Informal*, to be published in March 2002.

Johan Bettum is the leader of the PCMA research programme at the Oslo School of Architecture, Norway, 2000–2002. For more information on its collaborators and sponsors, as well as its objectives see www.ifid.aho.no/pcma/about/aho.html. Bettum lectures and teaches internationally. He has taught at the AA in London and UCLA in the US and is currently Guest Professor at the Städeoschule in Frankfurt, Germany. Bettum is also a partner in the newly started architectural studio, Tupelo Architecture, and a former member of the architecture and design group OCEAN in Oslo.

Project credits for Holiday Inn Express Hotel, Sandefjord International Airport, Norway, 1998–2001. PCMA team: Johan Bettum, Steinar Killi (rapid prototype model and finite element analyses), Lina Aker, Heidi Ekström Devik, Randi-Lise Almas, Magnus Petterson and Dan Sevaldson. Catia sponsorship: IBM Norway. Preliminary design OCEAN north team: OCEAN Oslo Johan Bettum, Bonsak Schieldrop, Kim Baumann-Larsen and Birger Sevaldson; OCEAN Cologne Michael Hensel; OCEAN Helsinki Kivi Sotamaa and Lasse Wäger. Collaborators: Ludo Grooteman, Blue Architecture and Urbanism (Amsterdam), Kjell Dybedal, Kaivert & Clarke (Oslo). Project members: Ville Martin and Corey Rubadue.

Bernard Cache is the leading principal of the Paris-based design and software company Objectile, which he founded in 1996 with Patrick Beaucé and Jean-Louis Jammot. He has taken an important role as a senior consultant in major strategic studies on image telecommunications and digital television for companies such as Philips, Canal Plus and France Telecom. He has written widely on communication policy and economics as well as architecture. He has most recently held academic appointments as Associate Professor of Architectural Design and Computing at the University of Toronto, Visiting Professor at the Universidad Internacional de Catalunya and Visiting Professor at the School of Architecture, UCLA.

Manuel DeLanda is the author of three major philosophical books, *War in the Age of Intelligent Machines* (1991), *A Thousand Years of Nonlinear History* (1997) and *Intensive Science and Virtual Philosophy* (2002). He teaches two seminars at the School of Architecture, Columbia University: 'Philosophy of History: Theories of Self-Organization and Urban Dynamics'; and 'Philosophy of Science: Thinking about Structures and Materials'.

Kolatan/MacDonald Studio. Sulan Kolatan and William MacDonald are partners in Kolatan/MacDonald Studio, which they founded in 1988, in New York City. Both principals teach at Columbia University's Graduate School of Architecture, Planning

and Preservation. In addition to receiving numerous awards, such as the 48th Annual Progressive Architecture Award and 44th Annual Progressive Architecture Citation, 1999 AIA Projects Award and the Forty under Forty Award, the work produced by Kolatan/ MacDonald Studio is in the permanent collections of the Museum of Modern Art in New York, the Deutsches Architektur Museum in Frankfurt, the FRAC in Orleans, the San Francisco Museum of Modern Art and the Avery Library Collection. Currently, their office is working on a residential compound for Ms. Ost and Mr. Kuttner in Virginia (the clients of the O/K Apartments).

Project Credits for Ost/Kuttner Apartments, Principals in charge: Sulan Kolatan and William J MacDonald. **Team:** E Schoenenberger, N Cunningham, S Doub, M Hollis, R Carpenter, P Palmgren, P Walsch. **Clients:** Beatrix Ost and Ludwig Kuttner. **Engineers:** Guy Nordenson and Leo Argiris. **Partners:** Ove Arup Associates. **Contractors:** E Wong and S Sumaida of Foundations Design International, Inc, Seal Reinforced Concrete Inc; J Depp Glass, Inc. **Model:** J Masibay of Breadbox Studio.

Michael Hensel and **Kivi Sotamaa** are partners in the Helsinki-based design office OCEAN north together with Tuuli Sotamaa and Birger Sevaldson. Michael Hensel teaches in the Emergent Technologies and Design Programme at the Architectural Association in London. Kivi Sotamaa is a research fellow at the University of Art and Design in Helsinki. For more information see www.ocean-north.net.

Project Credits for a drift NYT Time (finalist in invited design competition by the *New York Times*, 1999). OCEAN north team: Kivi Sotamaa (project coordination), Tuuli Sotamaa, Birger Sevaldson, Michael Hensel, Johan Bettum. **Consultant:** Tero Kolhinen, Institute of Metallurgie, University of Helsinki.

Project credits for Intencities (Installation Project for ArtGneda 2000, as part of Helsinki Cultural Capital 2000) **Production:** Kaisa Kivela; **Architecture:** OCEANNORTH Kivi Sotamaa (project coordination), Michael Hensel, Tuuli Sotamaa; **Project Members:** Lasse Wager; **Stephane Valcroze,** Toni Kauppila; **Dance:** GRUPPEN FYRA Vera Nevanlinna, Pia Tavala; **Jenni Laitinen,** Sanna Koskela; **Costumes:** Maria Duncer; **Fine Arts:** Janna Räisänen; **Graphic Design:** Klaus Haapaniemi; **New Media:** KATASTROFI Mika Huhtamäki, Juha Huuskonen, Jani Isoranta, Mikko Karvonen, Mikko Wilkman; **New Media:** Juha Fillin.

Greg Lynn has taught throughout the United States and Europe and is presently Professor of Spatial Conception and Exploration at the ETH in Zurich, a studio professor at UCLA (where parts of the Predator was manufactured) and the Davenport Visiting Professor at Yale University. His office, Greg Lynn FORM, is presently designing a 500 unit housing block transformation of the Kleiburg Block in the Bijlmermeer outside of Amsterdam, the Uniserve Corporate Headquarters in Los Angeles along with a variety of design projects including a coffee and tea service for Alessi, a book container for *Visionaire* Magazine and a series of large scale architectural lighting and furniture elements for Max Protetch Gallery in New York City. He is the author of *Animate Form* (Princeton Architectural Press), *Folds, Bodies and Blobs: Collected Essays* (La letter volée) and the forthcoming *Embryological House*. His work has been exhibited internationally in both architecture and art museums and galleries.

The artist **Fabian Marcaccio** collaborated with Greg Lynn on the 'Predator' exhibition at the Wexner Center for the Arts in Columbus,

Ohio (27 January – 15 April 2001). Currently living and working in New York, Marcaccio was born in Argentina in 1963 where he attended the University of Philosophy, Rosario de Santa Fe. During 2002, he is exhibiting at the Gallerie Thaddeus Ropac Gallery, Salzburg, Austria; Joan Prats Gallery, Barcelona, Spain; Gorney Bravin + Lee, New York; and Kevin Bruk Gallery, Miami, Florida (with Teresita Fernandez).

Ali Rahim guest-edited the highly successful *Contemporary Processes in Architecture, Architectural Design*, vol 70, no 3, 2000. He is the principal of Contemporary Architecture Practice in New York City and currently teaches at the University of Pennsylvania.

Project Credits for Introduction, Contemporary Techniques in Architecture. Design research: Ali Rahim (principal), John Cooney, Brian Kimura and Lee Rubenstein (design assistants); Nathaniel Hadley, Yuchuan Chang (assistants).

Project Credits for 'Potential Performative Effects'. Research assistant: Anne Kojima. Design research: Ali Rahim (principal), Yuchuan Chan, Nathaniel Hadley, Beatrice Witzgall (design assistants); Marci Songcharoen, Michel Hsiung (assistants).

Preston Scott Cohen is an Associate Professor at Harvard Design School. He is author of *Contested Symmetries and Other Predicaments in Architecture* (Princeton Architectural Press, 2001). Recent projects include short-list design proposals for the temporary Museum of Modern Art, and the Museum of Art and Technology, both in New York. Recent exhibitions include 'Folds, Blobs and Boxes' at the Carnegie Museum of Art (2001), 'Archilab 2001' in Orleans, 'The Un-Private House' at the Museum of Modern Art in New York (1999) and 'Home' in Glasgow (1999). He is represented by the Thomas Erben Gallery in New York.

Project credits for the Museum of Art and Technology. Eyebeam Atelier project team: Preston Scott Cohen (design); Cameron Wu, Chris Hoxie; CR Studio Architects (associate architects) Lea Cloud, Victoria Rospond, principals: Jon Dreyfous, Chris Hoxie, Jay Stancil, Sally Zambrano-Olmo, Kristin Enderlein, Adrienne Broadbear, Felix Skamser. Visualisation: Chris Hoxie, Cameron Wu. Animation, production design: K+D Lab, Dean D Simone, Joseph Kozinski (principals), Brandon Hicks. Virtual installation pieces by metaphrenie.com. Video production: Robert Michaels. Consultants: Robert Heintges (curtain wall), Guy Nordenson (structural), Karen Sideman (curatorial).

Servo is David Erdman-Los Angeles, Marcelyn Gow-Zurich, Switzerland, Ulrika Karlsson- Stockholm, Sweden and Chris Perry-New York City. David Erdman teaches studios and seminars at UCLA, Los Angeles and RPI, Marcelyn Gow at the ETH, Zurich, Ulrika Karlsson at the KTH, Stockholm and Chris Perry at Pratt, Columbia College and RPI. Servo was one of six design collaboratives which participated in the 2001 Young Architects Forum at the Architectural League of New York and are currently artists in residence at the IASPI Foundation in Stockholm, Sweden. They are currently working on projects for exhibitions at the Wexner Center for the Arts and The Cooper Hewitt Smithsonian National Design Museum.

Project credits for 'Servoline' and 'Nurbrest': Servo. Project Design Assistants: Jonas Runberger, Daniell Norell, Nina Lorber, Ulrika Wachmeister, Alice Deitsch, Johan Bohlin, Oskar Jonsson, John Stack. Consultants: Cult 3D, Prototol AG.

Project credits for 'Cloudline': Servo. Project Design Assistants:

Emily Grandstaff, Jay Hindmarsh, Jung Oh. Consultants: Cambridge Valley Machining, RPI Advanced Manufacturing Lab

Project credits for 'Cloudcurtain' Project Design: Servo. Project Design Assistants: Jeremy Schacht. Consultants: University of California, LA

Kristina Shea is a lecturer in engineering design at Cambridge University (UK) and a co-director of the Engineering Design Centre. Current support is provided by a Philip Leverhulme prize through the Leverhulme Trust (UK). The technique presented originated as a PhD thesis advised by Jon Cagan at Carnegie Mellon University (USA) and was funded by the NSF (USA).

Project credits for 'Creating Synthesis Partners'. Renderings and collaboration for conceptualisation of the marina: Janet Fan (MIT) and Larry Sass (MIT).

Peter Testa and **Devyn Weiser** founded and direct the Emergent Design Group at MIT with Una-May O'Reilly of the MIT Artificial Intelligence Lab. Testa and Weiser are involved in creative partnerships with a number of industries developing new building systems. Their work is widely published and exhibited internationally, most recently at SIGGRAPH '99 and '01. Testa is also Associated Architect with Álvaro Siza on several current projects including the Art Center College of Design in Pasadena.

Project credits for 'Emergent Structural Morphology'. Emergent Design Group, MIT: Peter Testa, Una-May O'Reilly, Devyn Weiser with Markus Kangas, Axel Kilian, Simon Greenwold, Martin Hemberg, Ben Piper, Janet Fan. <http://mit.edu/edgsrc>

Jeffrey Turko is a principal member of Urban-Office and a collaborator in OCEAN north. He has taught at the Architectural Association and is currently teaching at the University of East London. He is also a founding member of the do-group (www.do-group.net), a noncommercial, international trans-disciplinary think-tank that conducts experimental research and design. www.urban-office.com; email: jeffturko@urban-office.net

Michael Weinstock is currently Master of Technical Studies at the Architectural Association in London, and his personal research includes urbanism, ballet (in collaboration with the choreographer Gaby Agis) and the convergence of emergent technologies and architecture.

Alejandro Zaera-Polo and **Farshid Moussavi** are directors of Foreign Office Architects Limited. The practice was founded in 1996 in London when the principals won the competition for the Yokohama International Port Terminal in Japan, which is to be completed in March 2002. As well as their work on Yokohama, they are currently constructing projects in London, Spain and South Korea. They have been widely exhibited and published internationally, and were short-listed in 2001, along with Raphael Viñoly, for their designs for the South Bank Centre in London. www.f-o-a.net

Project credits for Yokohama International Port Terminal (detail design and supervision phase): Farshid Moussavi, Alejandro Zaera-Polo with Kensuke Kishikawa, Yasuhisa Kikuchi, Izumi Kobayashi, Kenichi Matsuzawa, Tomofumi Nagayama, Xavier Ortiz, Lluís Viú Rebes and Keisuke Tamura. Local architect consultant: GKK Architects, Japan. Structural engineers: Structural Design Group, Japan. Mechanical and electrical engineers: PT Morimura. Competition design team: Farshid Moussavi, Alejandro Zaera-Polo with Iván Ascanio, Yoon King Chong, Michael Cosmas, Jung-Hyun Hwang, Guy Westbrook. Competition engineering advisors: Ove Arup & Partners. First executive design phase, design team: Farshid Moussavi, Alejandro Zaera-Polo with Félix Bendito, Jordi Mansilla, Kenichi Matsuzawa and Santiago Trigriner. Second executive design phase, design team: Farshid Moussavi, Alejandro Zaera-Polo with Victoria Castillejos, Dalne Gil, Kenichi Matsuzawa, Oriol Monfort; Xavier Ortiz, Lluís Viú Rebes; José Saenz, Julián Varas and Thomasine Wolfensberger.

▷ Architectural Design

Contemporary Techniques in Architecture

Guest-edited by Ali Rahim

This publication addresses the most far-reaching and innovative developments in digital practice to have taken place in the last five years. It demonstrates how experimental architects are being challenged at a new, rigorous intellectual level and are going beyond the strictures of the conceptual into the realm of the material. As digital techniques are starting to be successfully assimilated and translated into design methodology, they are also, for the first time, being seen through to architectural realisation. This is illustrated here at the scale of space, material programme and construction.

The title includes the work of high-profile philosophers, architects and engineers, such as: Manuel DeLanda, who wrote *1000 Years of Non-Linear History*; Greg Lynn; Foreign Office Architects; and Cecil Balmond of Ove Arup, who has worked with Daniel Libeskind on his proposal for the Spiral Building, London, as well as with Philip Johnson and Studio Baad on the Chavasse Park Project featured here. *Contemporary Techniques in Architecture* takes architectural publishing's treatment of the digital to a new level, by looking at its potential in a realised form as well as a creative medium.

Johan Bettum
Preston Scott Cohen
Foreign Office Architects
Kolatan MacDonald Studio
Greg Lynn
Objectile
OCEAN North
Ali Rahim
Servo

ISBN 0-470-84320-9



9 780470 843208