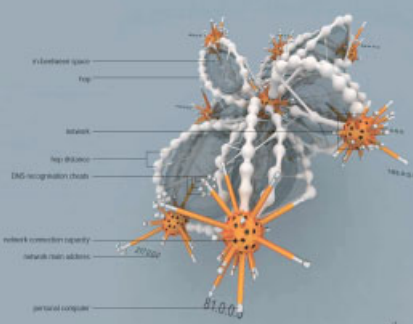
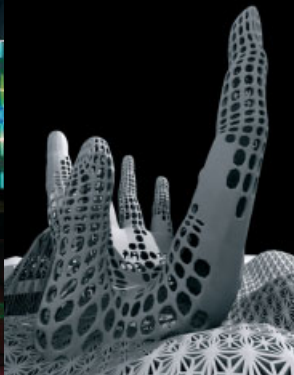
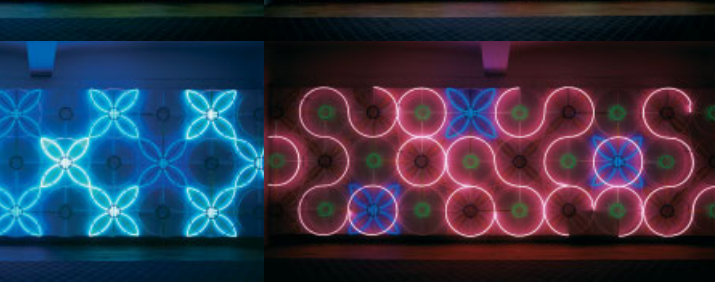
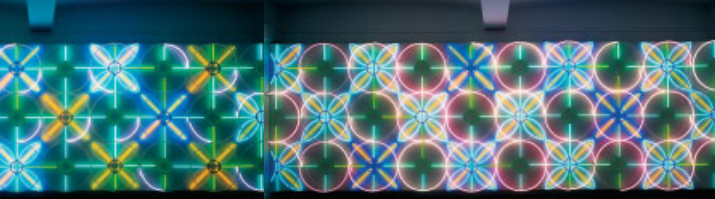
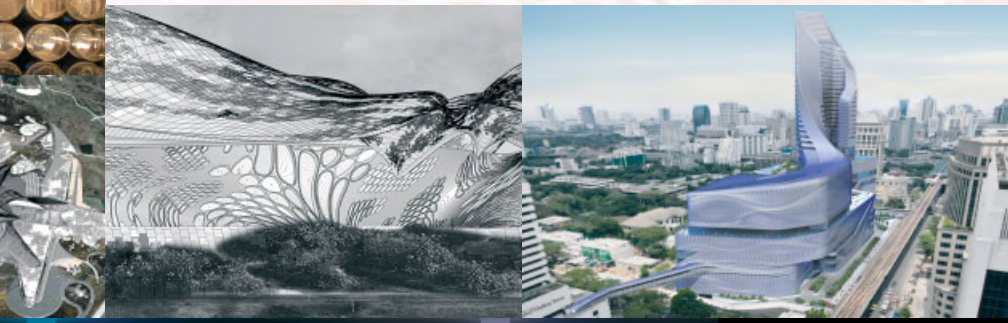
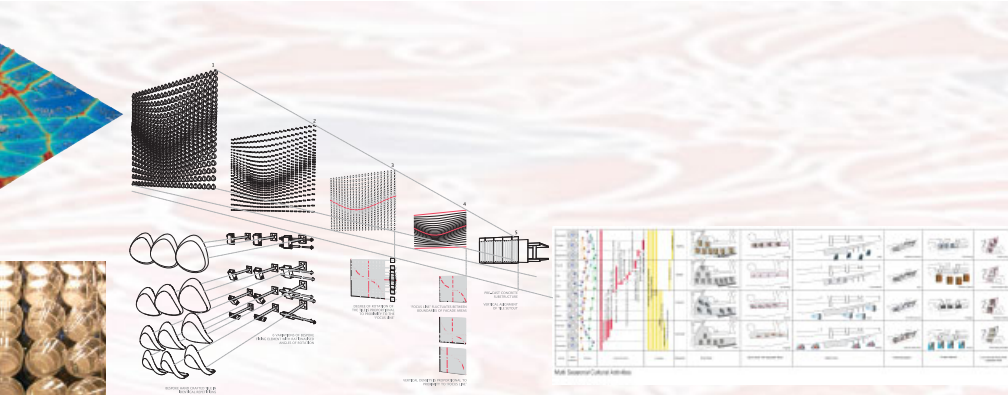


Prologue for a History, Theory and Future of Patterns of Architecture and Spatial Design

By Mark Garcia

Introduction



Left to right:

Top row: UNStudio, Seoul department store, 2007; François Blanciak, Patterned Siteless Architectures, 2008; Ken Yeang, Public Plaza, Macau, 2008; Rare breast-pattern Mammaticumulus clouds over Stepney, London, 14 July 2009; Centre for Advanced Spatial Analysis (CASA), Virtual London pattern of air pollution in central London, 2007; Amanda Levette Architects, Central Embassy, Bangkok, Thailand, 2009; Ken Yeang, Green Square, Sydney, 2008.

Second row: Ken Yeang, Huanan City, Guangzhou, China, 2008; Dietrich | Unterfräher Architekten, Walch's Event Catering, Lustenau, Austria, 2000; German Aerospace Agency, Satellite multispectral photograph of Bolivia; Jun Aoki, Louis Vuitton store, Tokyo, 2002; Gemma Douglas (Department of Architecture, Royal College of Art), UKHQ, 2008; Amanda Levette Architects, Central Embassy, Bangkok, Thailand, 2009.

Third row: HOK, Royal London Hospital, Whitechapel, 2009; The same Modernist building projected with different patterns to mark the opening of the third Luminaire festival in Frankfurt am Main, 2006; Hypermedia- and trans-architectures have shifted patterned architectures into a virtual, digital realm where rapidly changing, interactive screens and projections are transforming architecture and urban/public spaces into spatial pattern-machines/factories; Daly Genik, Art Center College of Design South Campus Building, Pasadena, California, 2004; Astrid Krogh, Danish Parliament Building, 2008; Nigel Coates, Structural 'Henna' pattern for the Finger City building in Mixtacity, Thames Gateway, 2008.

Fourth row: Reiser + Umemoto, Terminal 3, Shenzhen Airport, China, 2008; The Solar One farm near Barstow, California; Alex Dragulescu and Judith Donath (MIT Sociable Media Group), Lexigraphs I, 2008; Astrid Krogh, Danish Parliament Building, 2008; Daniel Libeskind, The Spiral: Extension to the Victoria & Albert Museum, London, 1996.

Fifth row: FAT, Camouflage House, 1996; Zaha Hadid Architects, Stalactites installation, Sonnabend and ROVE Galleries, New York, 2008; Zaha Hadid Architects, Louvre Museum extension, Paris, 2007; Zaha Hadid Architects, Zaragoza Bridge Pavilion, 2008; Zaha Hadid Architects, Port House, Antwerp, 2009.

Sixth row: Zaha Hadid Architects, Kartal Pendik installation, Sonnabend and ROVE Galleries, New York, 2008; Zaha Hadid Architects, Kartal Pendik, Istanbul, Turkey, 2007; SMC Alsop, Dubai Creek Ferry Terminal, 2009; Michael Lin, Floor of Tulips in Atrium City Hall, The Hague, 2002; SANAA, Dior store, Tokyo, 2003; Toyo Ito, Todd's Store, Tokyo, 2004; Klein Dytham Architecture, Central East Tokyo, Nihonbashi, Tokyo, 2004.

Seventh row: Simon Elvins, Silent London, 2005; Neil Banas, Rosette, 2008; Bodys Isek Kingelez, Ville de Sete. Detail of the Afro-futurist critical regionalist patterns on the model of this African city in AD 3009; Reiser + Umemoto, Terminal 3, Shenzhen Airport, China, 2008; Marina Appolonio, 'Spazio ad Attivazione Cinetica', Hesse, Germany, 2007; Michal Slowinski (Department of Architecture, Royal College of Art), 3-D pattern of the Internet and its connectivity in Battersea, London, 2008.

Images (left to right). Top row: © Christian Richters; © François Blanciak; © Ken Yeang; © Mark Garcia; © Centre for Advanced Spatial Analysis, University College London and Environmental Research Group at Kings College London; © Amanda Levette Architects; © Ken Yeang. Second row: © Ken Yeang; © Ignacio Martinez; © German Aerospace Center (DLR)/Global Landcover Facility (GLCF); © Mark Garcia; © Gemma Douglas; © Amanda Levette Architects. Third Row: © Mark Garcia; © Ann Dedert/epa/Corbis; © Mark Garcia; © Nic Lehoux; © Astrid Krogh; © Nigel Coates. Fourth row: © Reiser + Umemoto; © Grafton Marshall Smith/Corbis; © The Sociable Media Group, MIT Media Lab; © Astrid Krogh; © Studio Daniel Libeskind, photo courtesy of Miller Hare. Fifth row: © Fashion Architecture Taste (FAT) Ltd; © Isa Wipfli; © Zaha Hadid Architects. Sixth row: © Isa Wipfli; © Zaha Hadid Architects; © Alsop Architects; © Photo Yvonne Eeuwes, courtesy Stroom, The Hague; © Mark Garcia; © Klein Dytham architecture. Seventh row: © Simon Elvins (original data collected by DEFRA - Department for Environment, Food and Rural Affairs); © Neil Banas, neilbanas.com; © Mark Garcia; © Reiser + Umemoto; © Frank Rupenhorst/dpa/Corbis; © Michal Slowinski.

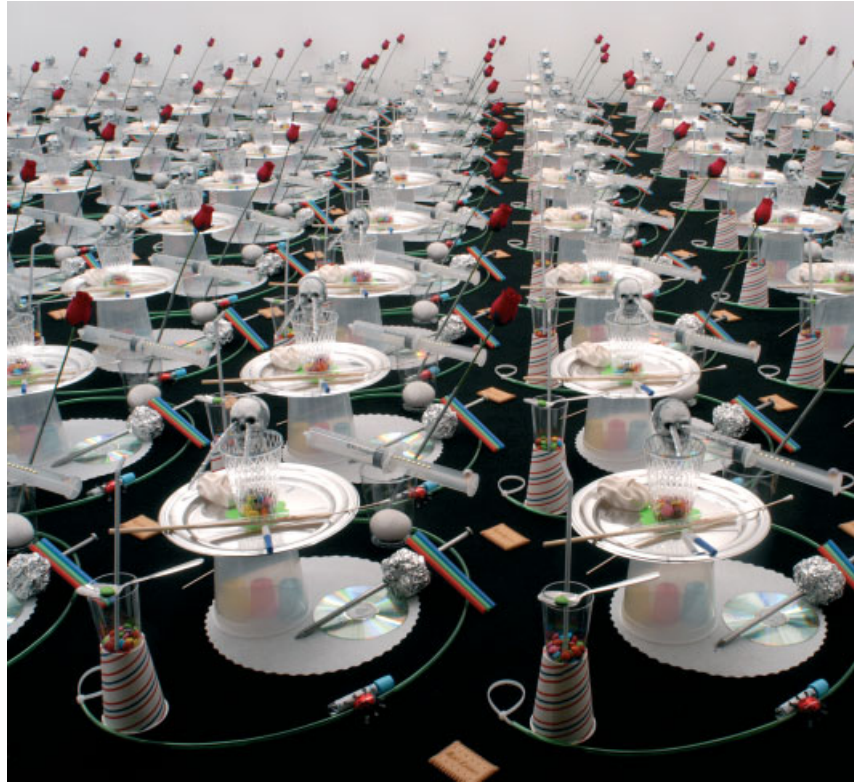
It is not unreasonable to regard patterns as a fundamental ontological reality ... as we apply our intelligence, and the extension of our intelligence called technology, to understanding the powerful patterns in our world (for example, human intelligence), we can re-create – and extend! – these patterns in other substrates ... It's through the emergent powers of the pattern that we transcend ... The power of patterns to endure goes beyond explicitly self-replicating systems, such as organisms and self-replicating technology. It is the persistence and power of patterns that support life and intelligence. The pattern is far more important than the material stuff that constitutes it.

Ray Kurzweil, *The Singularity is Near*, 2005, p 478¹

Paradoxically, the most original and significant patterns in spatial design are now often the most inconspicuous. It is the invisible, immaterial, dynamic, intangible, conceptual and virtual patterns of space that constitute its future. Sufficiently, but not necessarily, dependent on the classical and traditional concept of patterns (as formal, material, ornamental and decorative), the most innovative are now the stealthier patterns of the contents, contexts and consequences of space on ourselves and our world. To understand the origins of this seeming aporia, we need to consider the histories and theories of patterns, and other, wider, multidisciplinary patterns research.

The etymology of 'pattern' is from the Latin *pater*, or *patronus*, meaning father, patron, god or master, from which is derived the notion of pattern as a model, example, matrix, stencil or mould. The contemporary concept of pattern is as a sequence, distribution, structure or progression, a series or frequency of a repeated/repeating unit, system or process of identical or similar elements. Synonyms and related concepts include habit, meme, template, motif, configuration, organisation, arrangement, figure, tessellation, system, process, sample, duplicate, convention and texture. This multiplicity of meanings points to the manifold roles of pattern in the creation, reproduction, evolution and processes of space.

It is therefore unsurprising that humans have evolved so that the bulk of our brain activity is now constituted by trillions of (often unintentional, unconscious) pattern-perception and recognition tasks. Some patterns can be perceived in the mind's eye (as with forms of synaesthesia and Asperger's or Savant syndromes), or directly hallucinated, for example in the case of psychedelics or in psychological, neurological or optical disorders. Certain kinds of pattern cause powerful physiological effects such as stress, nausea, vomiting of blood and convulsions, as



Hervé Graumann, *Vanite 2*, 2003


Defamiliarisation and deconstruction of representation, reference, sign and meaning through 3-D spatial pattern.

in the medical condition known as 'pattern-induced epilepsy'. And compulsive, neurotic and paranoid spatialised pattern recognition defines the psychotic condition of apophenia (the experience of seeing patterns or connections in random or meaningless data).

The intuitive, unintentional, autopoietic recognition and production of patterns (and of their meaning/s) is also part of creative processes.² That the perception, recognition or design of a spatialised pattern can be the basis of new knowledge and understanding is a fundamental principle of information design/visualisation and in graphic, interaction and systems design. As information architect and designer Richard Saul Wurman explains: 'I can see patterns when I understand things. I see the world as visual patterns of connectivity. I think pattern recognition is a fundamental part of a creative mind ... I see everything as patterns.'³ But the most compelling reason for an urgent reappraisal of contemporary and future spatial design patterns is that new technologies are accelerating and expanding the kinds of spatial pattern that can be designed. It is timely, then, to consider the possibilities for rethinking ourselves in relation to the impacts of the technological shifts in the design of our spatial patterns.

Patterns in Spatial Design

Patterns are a fundamental feature of spatial design (interior, architectural, urban and landscape). The physical world and our bodies act as constraints (productive and malignant) on the patterns we design, build and use, and the patterns emerging from the interactions between these multiple systems are produced at a number of different dimensional, temporal and scalar levels, including the spectrum of natural and man-made patterns. As process (method, technique) and as product (object, material form), patterns, like typologies and



programmes, are also repeated and human-imposed spatial design solutions, concepts and effects. Each theory, design and space has its own unique identity patterns that record and fingerprint index the different kinds of spatial patterns that constitute its histories and forms of habitus and territorialisation. This is partly why and how pattern can also become, or be made to be, logo, brand, icon and place. But what kinds of space and place can patterns be designed to make? As the histories and theories of spatial patterns design research suggest, it is new technologies that are most significantly changing and centralising the roles of patterns in the futures of space and place design.

The History of Spatial Patterns

Despite their abstract appearance, even early, Neolithic patterns are thought to be symbolic, diagrammatic and apotropaic. The apotropaic function of patterns (designed to avert evil spirits by engaging them in the unravelling of an impossibly, complex design) signals also the pleasures of pattern remaking and unmaking, as with cryptography, puzzles, jigsaws, riddles and enigmas.⁴ The first significant theoretical reference to spatial patterns in the Western tradition was in Plato's *Timaeus*, in which he described the world as filled with patterns of closely packed atom-like solids and geometric forms. Pattern has always been the DNA, or diagram, of style. Pattern as style, detail, ornament, decoration, adornment, embellishment and structure was (in the Western/European tradition) deeply influenced by religion,

geometry and maths as well as the arts, design and crafts. The concepts and theories through which spatial pattern was theorised include *order, hierarchy, organisation, system, scale, proportion, symmetry, balance, complexity, beauty, unity, function, decorum, representation, symbol, joint, nature, expression, imagination and creativity*. Other pattern-related concepts (such as harmony, rhythm, narrative and colour) were influenced by other disciplines in the mechanical and liberal arts. Patrick Healy has documented the range of these,⁵ but for Paul Emmons the dominant historical meta-patterns of space were alternately ladders/steps, chains, trees, vortices, concentric circles and orbits.⁶

Aside from applied styling, ornament and decoration, designing and building geometrical and trompe l'oeil optical pattern illusions was practised (from ancient Greece and Rome to the present) by many artists and architects. These patternings were produced for symbolic, theological and philosophical purposes and to enhance (or distort) the meanings, affects and aesthetics of perspective space. They are perhaps the earliest form of non-representational and conceptual virtual spaces. Vitruvius approved of realistic trompe l'oeil optical pattern illusions,⁷ and their otherworldly spatial affects (through impossible forms, moiré, interference, parallax, Doppler and other such effects, can be found in many premodern designed spaces like the Mezquita (Great Mosque) of Córdoba (AD 784). Patterns are also fundamental to Islamic architecture because of the central metaphysical concept of *Nizam*, or pattern, a key aesthetic, epistemological and ontological category in Islamic philosophy⁸ where wisdom (*tawhid*) consists of recognising and understanding 'patterns within patterns'.⁹

From the emergence of architectural 'pattern books' (at least as early as the 15th century in Europe) to the present, designed patterns have become ever more important to the production of space. Their significance began to accelerate in the late 17th, 18th and 19th centuries with the rise of global capitalism, the Industrial Revolution, and the imperial/colonial and Enlightenment/scientific projects, becoming increasingly aesthetically diverse, materially sophisticated and mechanically and functionally precise. Theorists, architects and designers including Karl Friedrich Schinkel, Johann Joachim Winckelmann, John Ruskin, Karl Gottlieb Wilhelm Bötticher, Gottfried Semper, Alöis Reigl, Christopher Dresser and Louis Sullivan, wrote treatises on pattern, and world trade exploded mass-produced patterns around the planet. In the first period of significant taxonomic and morphological research and theorising of patterns, the 18th- and 19th-century pattern theorists (influenced by Darwin and Linnaeus)¹⁰ attempted to find ways of generating sublimely infinite and evolving, biological types of variable (aperiodic) patterns from the simplest of elements.¹¹

The 20th century was the first in which designed and made patterns were reclassified as 'art'.¹² The Modern period also produced psychological theorisations of pattern with the founding of the Gestalt (German for 'pattern') school of psychology in 1912. And it was also during this warring period that multivalent Surrealist morphing patterns, camouflage and the use of pattern design for security,



Frank Gehry, Guggenheim Museum, Bilbao, Spain, 1997
Titanium cladding of the museum envelope, acquiring patterns of use, atmosphere, climate and time.

Patterns of ourselves and our identities develop as an integrated system across our bodies, in our spaces and beyond.



A Ndebele home in Botshabelo, South Africa. Ndebele patterns are communicative advertisements, and spatial and design practices, that diagram shifting personal, group, place and other social and auto/biographical narratives.



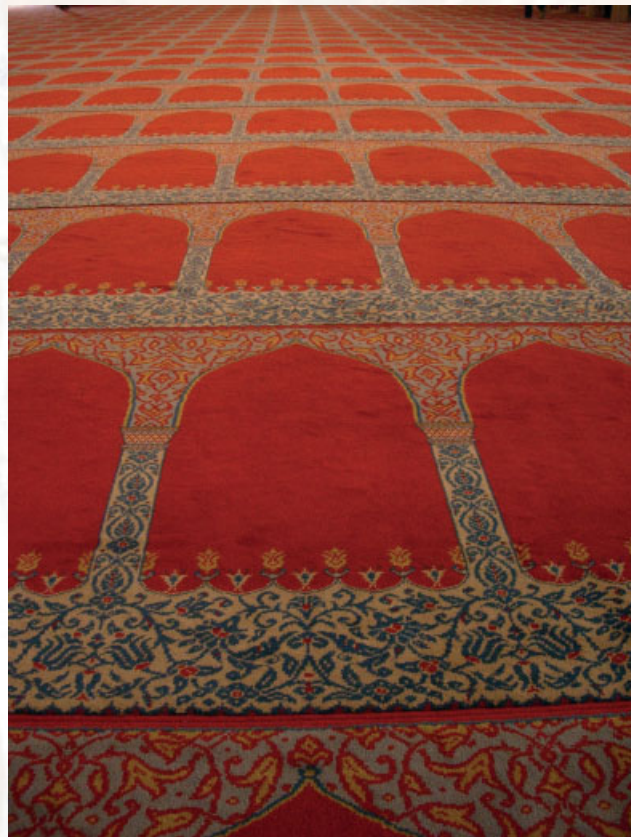
A Tibetan Buddhist *Kalachakra* (wheel of time) sand mandala. Created by a team of lamas, the sand mandala pattern is also a diagram of a world pattern, a cosmogram, and of a Buddhist divine palace. Mandala patterns have been used to structure Asian cities and buildings from the time of the Buddha to the present.



Yayoi Kusama, *Gleaming Lights of the Soul*, Liverpool Biennial, 2008
Japanese artist Kusama lives with a psychological condition in which she literally sees patterns (dots, flowers and nets) in environments everywhere.

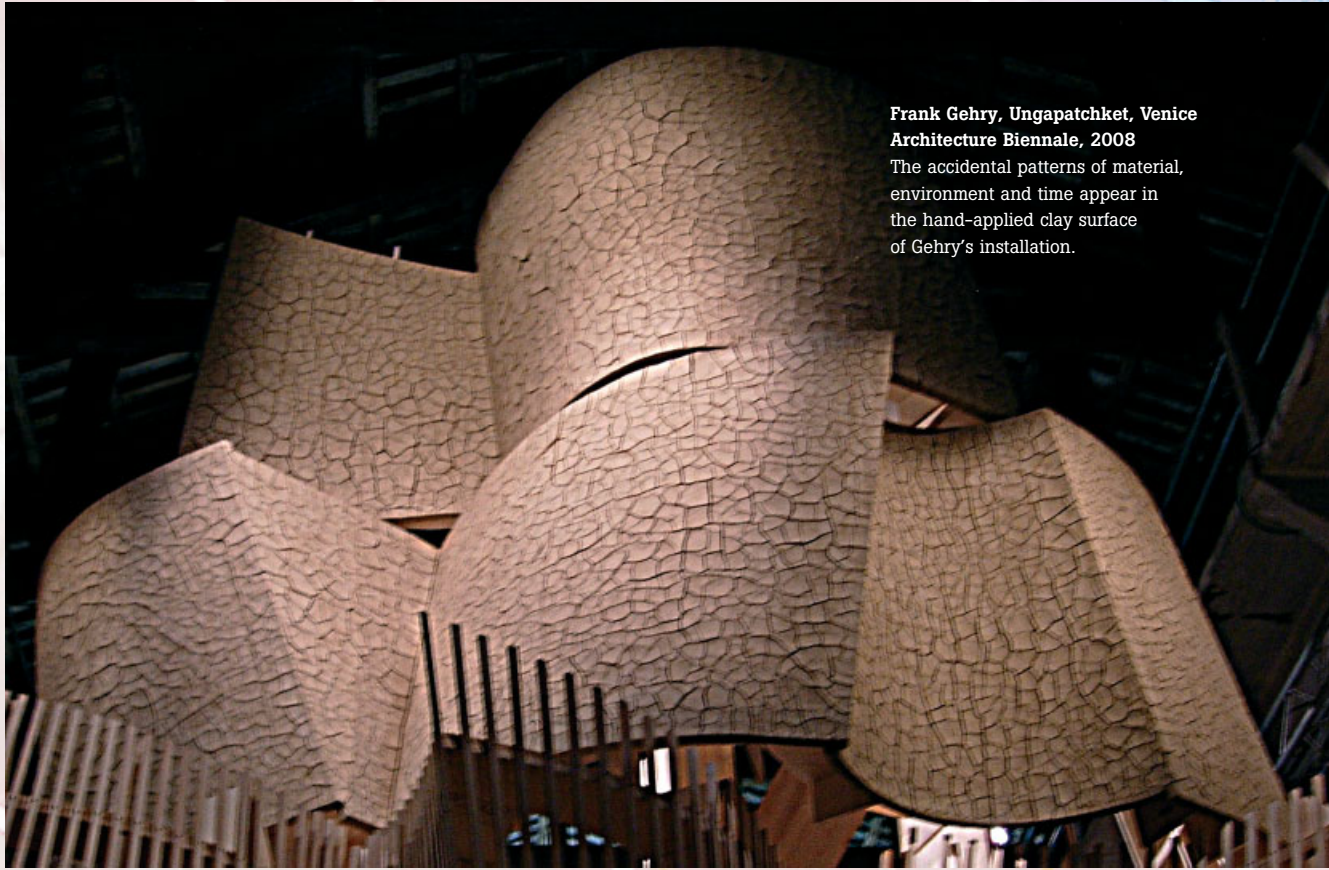


The Mezquita (Great Mosque), Córdoba, Spain, AD 784
Perspectival illusions, after effects, interference and Doppler-type effects emerge when visitors walk around Córdoba's Mezquita.



Suleymaniye Mosque, Istanbul, Turkey, 1550-57
The pattern of individual prayer spaces on the carpet.

Jakob Prandtauer, Benedictine Abbey, Melk, Austria, 1702-36
A late-Baroque spiral staircase articulated with a tromp l'oeil moulding pattern.



Frank Gehry, Ungapatchket, Venice Architecture Biennale, 2008

The accidental patterns of material, environment and time appear in the hand-applied clay surface of Gehry's installation.

privacy, dematerialisation and disguise/disarticulation in space was popularised.¹³ The stereotyping of Modernism as dogmatically antipattern and against decoration and ornament is inaccurate, as numerous examples attest.¹⁴ Aside from the kitsch mass-production of patterns, Modernist patterns were notable for their associations with Fordism, Taylorism and 'scientific management' (and then later with artificial intelligence, cybernetics, computing, complexity sciences and information theory). In the 1930s they can be found in the work (and particularly the urban plans) of Le Corbusier, the Smithsons (urban pattern layers), Kevin Lynch (city types), DG Emmerich (knot road-patterns), Christopher Tunnard and Boris Pushkarev (city 'scatter patterns'), the Metabolists (particularly Fumihiko Maki's serialist concept of the 'field')¹⁵ and Buckminster Fuller's geodesic, building energies and structural patterns. However, aside from Fuller, the most significant role for patterns in spatial design theory came in 1977 with the publication of Christopher Alexander's book *A Pattern Language*.¹⁶ Alexander's 'pattern language' consisted of 253 spatial patterns, which were summarised as diagrams. Examples include 'carnival', 'old people everywhere', 'dancing in the streets', 'beer hall', 'sleeping in public', 'gradual stiffening', 'something roughly in the

middle', 'things from your life' and 'small services without red tape'. Alexander's work influenced, among others, that of Bill Hillier and Julienne Hanson on sociospatial patterns and the subsequent work on 'space syntax' in the 1970s and 1980s, but also, intriguingly, the work of the Sims games designer Will Wright and Italian urbanist Paula Vigano from the 1990s. Since Alexander, many new kinds of patterns, such as fractals, have emerged.¹⁷ However, these have not yet been fully integrated into a coherent history or theorisation of this field.

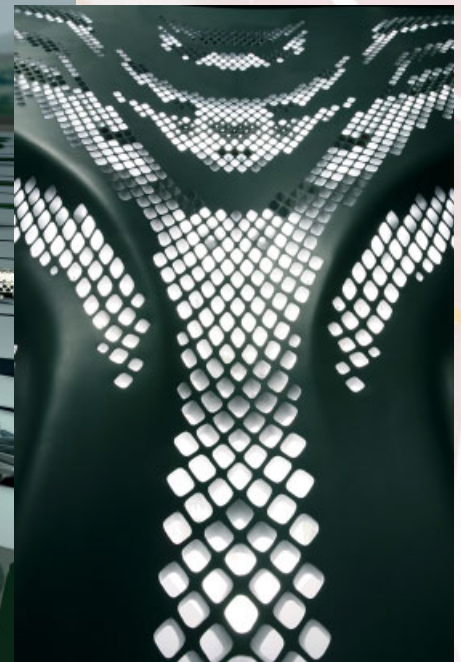
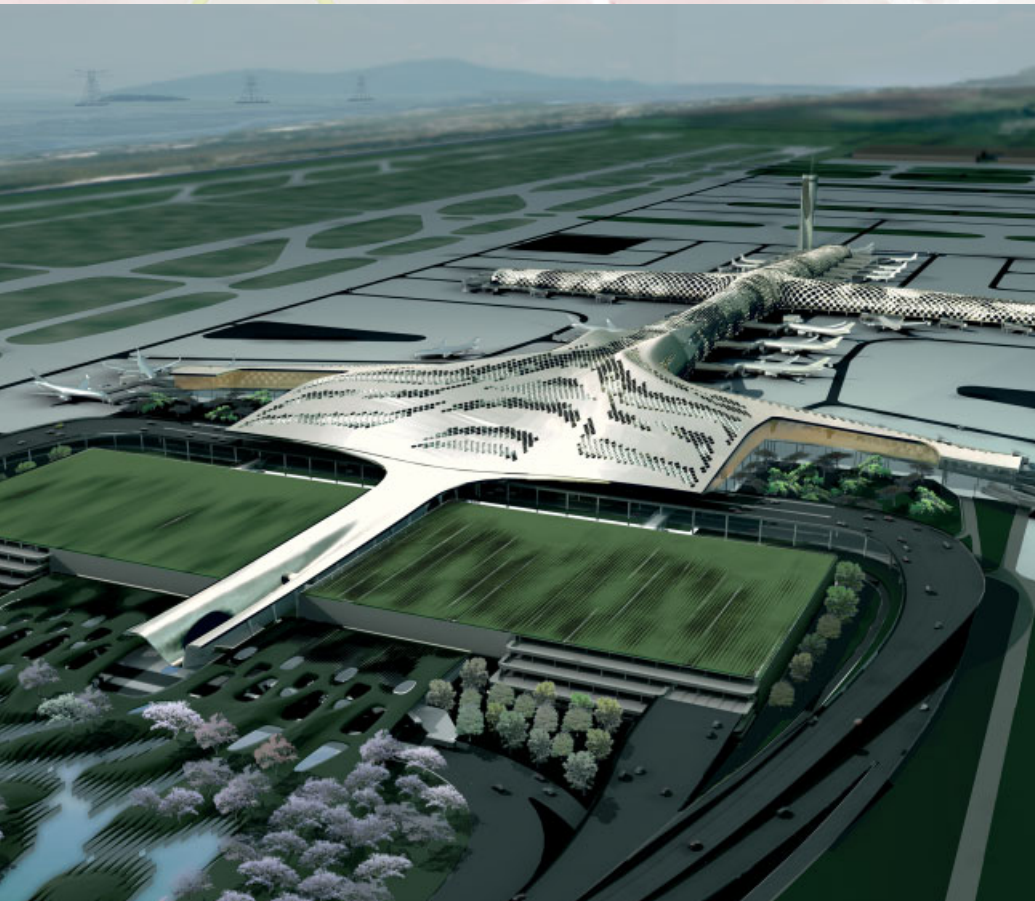
In the 1980s and 1990s, Postmodernist patterns predominated, and especially those of Robert Venturi,¹⁸ Rem Koolhaas, Stan Allen and Sanford Kwinter (fields), along with historicist, folding, sprawl, cross-programming, high-density/proximity, non-places and other Deconstructivist and high-tech patterns. In 1992, Henri Lefebvre's last book *Rhythmanalysis: Space, Time and Everyday Life* was published.¹⁹ Because Lefebvre's keystone concept of 'rhythm' is identical to 'pattern', it stands (together with Gilles Deleuze and Félix Guattari's notions of 'difference and repetition') among the decade's most important theories of pattern in space. Postmodernist patterns opposed the hygienic, white, rectilinear, legible, navigable, functional, light, rational and transparent ones of Modernism with the fragmented, decentred, warped, heterogeneous, disembodied, delirious, disorientating, formless, chaotic and illusory ones that reflected the fragile contemporary subject and the now more problematic spaces of social and everyday life.

Spatial Patterns of the Present

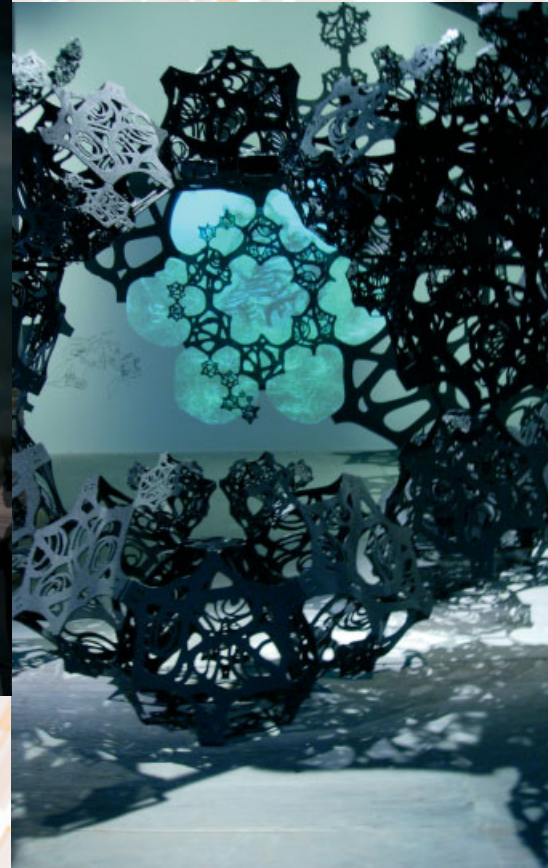
While Herzog & de Meuron, Jean Nouvel, Venturi Scott Brown, OMA, Zaha Hadid, UNStudio, ONL, MVRDV and Will Alsop have been at the forefront of the spatial pattern design revolution, a number of other organisations (including Future Systems, ALA, Klein Dytham, Reiser + Umemoto, Lab Architecture Studio, Sauerbruch Hutton, LAB[AU], NOX, Daniel Libeskind, FAT, MAKE, Hild Und K, Jürgen Mayer, David Adjaye, ETH Zurich, the MIT SENSEable City Lab, MIT Sociable Media Group, Aranda/Lasch, Popularchitecture and P-A-T-T-E-R-N-S) are also now entering the field. Recent books, journals and exhibitions are also indicative of the patterned turn in spatial design. In 2004, *OASE Ornament* (NAI Publishers) was closely followed, in 2006, by Michael Kubo and Farshid Moussavi's *The Function of Ornament* (2006), Reiser + Umemoto's *Atlas of Novel Tectonics* and Princeton's 306090 *Decoration* (2006). Cecil Balmond released *Element*, a manifesto for patterns in engineering, in 2007,²⁰ and Birkhauser published *Patterns in Architecture, Art and Design* (2007) and *Pattern (Context Architecture)* (2009).²¹ The group exhibition 'Pattern Theory' at MKG127 (Toronto) in 2007, and the Harvard

Graduate School of Design 'Patterns: Cases in Synthetic Intelligence Exhibition' in 2008 were also portents in a sample that does not even include many recent pattern compendia and style/swatch catalogues, and sociocultural, geographical, anthropological and ethnographic books on the subject.²²

This rash of books, shows, designs and designers is evidence of spatial patterns as a whole reorienting towards greater, more high-tech and conceptual, dynamic, virtual, intangible, immaterial and invisible functions, effects and types. It is only new technologies that have allowed design to expand the range of types and the accuracy with which we are now able to visualise, diagram and realise these other, stealthier, more inconspicuous new patterns of designed space. Only now can patterns enhance cultural, social, programmatic and environmental, material and structural performance in a single pattern design system. Design has only recently, through new digital design and diagramming techniques, been able to incorporate these stealthier, more inconspicuous new patterns into viable spatial designs.²³ This novel ability to recognise, use and continuously re/design space with these innovative patterns is driving a revolutionary type of more accurately patterned and intelligent spatial designs that goes beyond the old notion of pattern which can include, but also exceed and extend, its historical and limited scope as purely style, ornament and decoration.



Reiser + Umemoto, Terminal 3, Shenzhen Airport, China, 2008
Exterior view and close-up. The parametrically patterned 'dragon's skin' envelope here creates moving internal 4-D 'cloud dapple' light patterns.



Marcin Mostafa, Natalia Paszkowska and Wojciech Kakowski, Polish Pavilion, World Expo, Shanghai, 2010
 above: Macroscale Polish lace pattern: a critical regionalist supergraphic superimposition of a national pattern.

Matthew Richie, Benjamin Aranda and Chris Lasch, The Evening Line, Venice Architecture Biennale, 2008
 right: A fractal multiscale 4-D pattern as an evolving, dynamic environment.

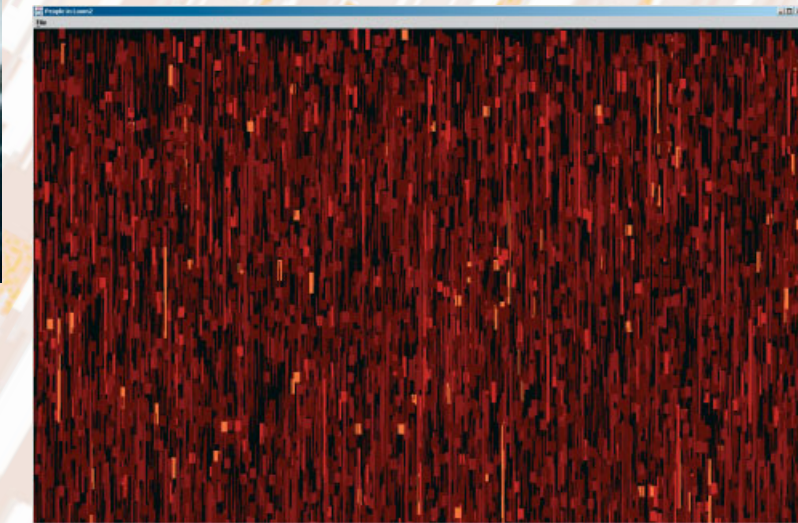
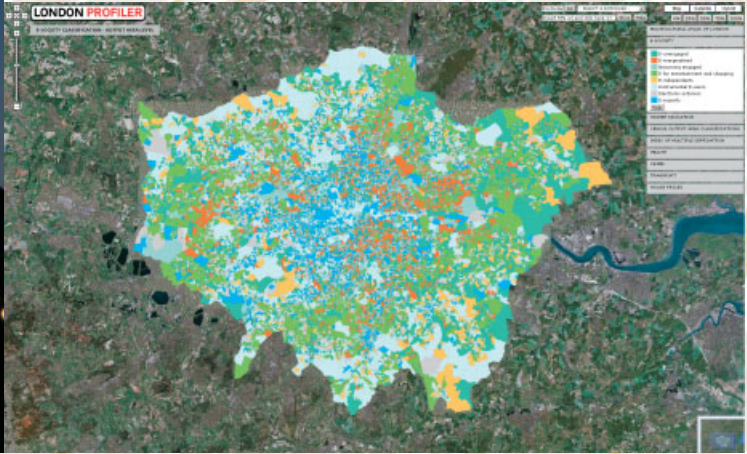
Today's spatial design pattern morphologies are mainly digital/parametric or Postmodern reworkings of ancient patterns (like waves) or new ones (like DNA) found or simulated with new and emerging visualisation and design technologies. Among these we find patterns of *soap bubbles, Fibonacci series, hydrological and vascular systems, protein folds, cellular automata, attractors, force fields, Sierpinski cubes, skins, moirés, knots, messes, fractals, networks, swarms/flocks, atoms and molecular structures (including crystals and quasi-crystals), fluid and gas/smoke/meteorological forms and dynamics, architextiles,*²⁴ *viruses and micro-organisms, blobs, Voronoi cells, Lindenmeyer systems, light, fire, landscapes/geology/geography, rhizomes and various hybrids and permutations of these.*

In many of these designs, the crucial innovation is either technologically enabled patterns and/or patterns as fields, membranes, complex surfaces, deep structures or formless ambient environments and affective atmospheres.²⁵ The most technically sophisticated are designed using genetic algorithms, and parametrically with software programs such as Grasshopper, Generative Components, Processing and L-Systems. More broadly, the most interesting spatial applications of these new

pattern-recognition and application technologies are in the management of urban defence, logistics, transport, resources, services, commodities and crowds, and in disaster control and global communications. This consilience of mathematics, computing and the arts is driving other, high-tech breeds of pattern to create critical new intelligent and high-performance spatial patterns. Some of the most encouraging examples are those being used in socially, politically and culturally engaged interactive architectures (such as those by ONL, Jason Bruges, Electroland, Diller Scofidio + Renfro, ETH Zurich and, particularly, the MIT SENSEable City Lab and the Sociable Media Group).²⁶ Other examples include developments in new aperiodic, fractal and quasi-crystalline structures as well as spaces in which spatial patterns research is cross-fertilising with the fine arts (Neo-geo, world art/critical-regionalism, Op Art), sciences, technology, anthropology, ethnography, and cultural and media studies.

While spatial designers have managed to assimilate the most salient multidisciplinary patterns research of the past decade or so, there is still much to achieve. With new research into optical illusions and effects, materials advances, progress in computing and other visualisation technologies we can now further expand the ranges of pattern we design to include more critical intangible, immaterial, dynamic, invisible, virtual and conceptual and spaces.²⁷ But spatial design is lagging behind the spatial patterns revolutions in other disciplines (marketing, advertising, security, defence, retail, finance

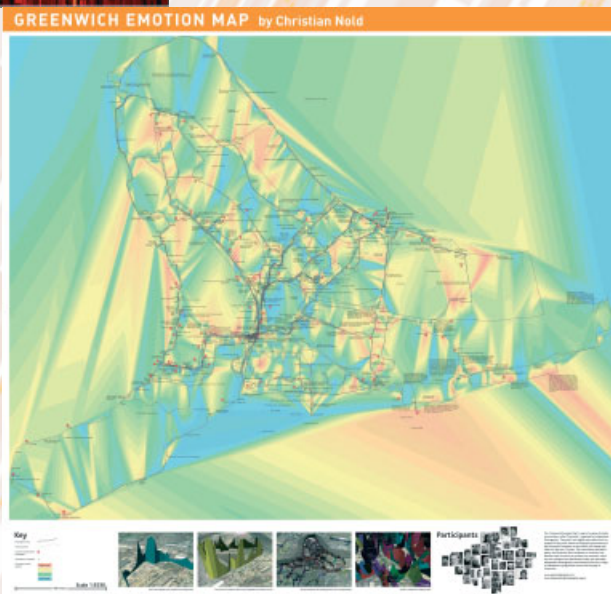
left: Hypermedia and transarchitectures projects have shifted patterned architectures into a virtual, digital realm where rapidly changing, interactive screens and projections are transforming architecture and urban/public spaces into spatial pattern-machines/factories.



Centre for Advanced Spatial Analysis (CASA), E-Society London, 2009
above: 'E-enabledness', Internet connectivity and other such related digital, virtual and computational indicators now form some of the most powerful urban patterns.

MIT Sociable Media Group, Loom 2, MIT Media Lab, 2001
left: Loom 2 is a pattern of emotions in digital media space – a 'landscape/topography' of the mood of social relations in a newsgroup diagrammed as a pattern of 'angry' words and punctuation.

and government) in which national or international scales of research have been undertaken. These have harnessed massive supercomputing, data-collection and mining, and artificial intelligence systems to find, create, synthesise, design and redesign spatial patterns to a breadth, depth, accuracy and detail that is largely non-existent in the spatial design disciplines. These projects use pattern-recognition software to monitor, predict and profile our spatialised desire, psychological, emotional and other preference, consumption and activity patterns. The panopticon is no longer the diagram of a physical space and materials; it is the government-controlled and corporate-traded pattern of the network of our personal real-time, planetary-wide monitoring patterns. Whether of these kinds of problematically pathological patterns or otherwise, spatial designers seem largely unable and unwilling to address this crucial aspect of spatial patterns research.



Christian Nold, Greenwich Emotion Map, 2005–06
 Patterns of emotional responses of inhabitants.

The Future of Spatial Patterns Design


... we're getting a restricted view of actual patterns. And the restricted view says that people do things deliberately, in concert ... where in truth there are actual patterns that emanate from beyond people. And they're certainly not directed at any one of us, you know; they're much broader, and they work through us.

Phillip K Dick (1974) in Preface to *The Father Thing*, 2001, p 1²⁸

The histories, theories and recent multidisciplinary research in this field indicates that spatial patterns design research needs to further combine visual, tangible, ornamental, decorative, structural, material and formal patterns with those that are simultaneously patterned in multicritical, consilient, research-based, interactive, ephemeral, informed, multidisciplinary and technologically innovative ways. This will then yield more valuable and significant multidimensional, multiscalar, multivariate, performative and meaningful kinds of spatial patterns. These will include *high-resolution and accurate, real-time dynamic patterns* and how they relate to patterns of the *personal, historical, social, cultural, political, psychological, economic, ecological, ethical and aesthetic patterns of space*. They might be *relations, information, networks, genealogies, theories, communications, preferences, desires, power, memories, potentials, participation, transactions, flows, inhabitation, identity, ideas, laws, emotions, atmospheres, sensations, events, activities, lifestyles, behaviours, pathologies, injustices, organisms, energies, resources, meanings, rarities, lost, endangered and other re/distributions of the contents, contexts and consequences of space and its possible futures*. Only then (to apply Yale University architectural theorist Daniel Barber's argument)²⁹ will the most ameliorative, significant and innovative spatial pattern designs of the future meet Guattari's injunction for the bridging of his 'three ecologies': the patterns of the personal/psychological, the interpersonal/social and the natural/environmental.³⁰ These stealthier, new multicritical, multidisciplinary spaces of the future will pattern the future in ways that will extend the existing patterns of spatial design in previously unimaginable ways.

The Patterns of Architecture

This issue of *AD* has been designed to provide a representative cross section of the patterns of patterns in spatial design and of the ways in which spatial design is addressing these other, new kinds of pattern.³¹ The contributors were chosen for their specific expertise or

positions in the field and represent academia, industry and commerce, theory and research, design and practising/professional designers. Together, Mark Taylor (interior design), Brian McGrath and Victoria Marshall (urban design), Simon Swaffield (landscape design), Hanif Kara (engineering), Helmut Pottmann (mathematics and geometry), Julian Vincent (biology and biomimetics) and Patricia Rodemann (the psychology of pattern design) investigate patterns across the broad spectrum of spatial design disciplines. Architect-academics Patrik Schumacher (parametric patterns), Alejandro Zaera-Polo (the politics of patterns), Achim Menges and Michael Hensel (high-performance patterns), Theodore Spyropoulos (cybernetics, robotics and artificial intelligence patterns) and Mike Silver (software, programming and CAM, and production patterns) examine the topic from the more particular perspectives of spatial patterns design practices, processes and technologies. The overall pattern of the issue offers both negative critical insights and positive projective, predictive, conjectural and speculative proposals that together show there is a deep connection between evolving ourselves and the evolving patterns of spatial design. Loos was wrong: a new kind of ornament, through pattern, is not impossible,³² for through this new kind of future spatial pattern design, a different future is being patterned in the present. Like Kengo Kuma, we can now see 'that completely new patterns can be generated. They will be entirely different from any pattern we have seen so far, and generate entirely different spaces and architectures ... pattern making holds the greatest promise for the next generation.'³³ 

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Notes

1. Ray Kurzweil, *The Singularity is Near*, Gerald Duckworth & Co (London), 2005, p 478.
2. Some creativity researchers, like David Bohm in his *On Creativity* (Routledge, London), 2004, define creativity in terms of patterns.
3. RS Wurman, 'Seeing the World as Visual Patterns of Connectivity', in G Schuller (ed), *Designing Universal Knowledge*, Lars Muller (Basel), 2009, p 105.
4. DK Washburn and DW Crowe, 'The role of pattern in culture', *Symmetries of Culture: Theory and Practice of Plane Pattern Analysis*, University of Washington Press, 2004.
5. P Healy, 'Ornament Now?', *OASE 65 Ornament*, NAI Publishers (Rotterdam), 2004, pp 40–2.
6. P Emmons, 'Embodying networks: bubble diagrams and the image of modern organicism', *The Journal of Architecture*, Vol 11, No 4, 2006.
7. E Gombrich, *The Sense of Order*, Phaidon (New York), 2006, p 34.
8. See S Akkach in his *Cosmology and Architecture in Premodern Islam*, State University of New York Press (New York), 2006.
9. See Keith Critchlow, 'The use of geometry in Islamic lands', *AD Islam and Architecture*, Vol 74, No 5, Nov/Dec 2004, pp 71–7.
10. For example, P Dominique Douat's *Méthode pour faire une infinité de desseins différents avec des carreaux mi-partis de deux couleurs par une Ligne diagonale, ou observations*, Paris, 1722, or the later work of Wolfgang von Wersin.
11. There is still no meta-taxonomy or multidisciplinary classification of pattern morphologies. Nor is there much coherence between existing and partial pattern taxonomies, and there is no discipline of 'patternology' or 'patternetics'.
12. Gombrich, op cit, p 59.
13. This includes the razzle-dazzle pattern principle invented primarily for use on warships.
14. This was a polemic of the exhibition 'Ornament and Abstraction' at the Fondation Beyeler Markus Bröderlin in 2002. Examples include Mies van der Rohe's choices of luxurious patterned materials, Le Corbusier's patterned commercial wallpapers for Salubra (1931–2) and the tiles of many Frank Lloyd Wright houses.
15. See his references to pattern in his *Investigations in Collective Form*, Washington University Press (St Louis, MO), 1964.



Ingo Günther, World Processor, 1988–2009

Ongoing project to map global patterns showing various international patterns (including CO₂ emissions, energy consumption, population distribution and refugee currents).

16. Christopher Alexander, *A Pattern Language*, Oxford University Press (New York), 1977.
 17. M Batty and P Longley, *Fractal City*, Academic Press (San Diego, CA), 1994.
 18. R Venturi, 'Diversity, relevance and representation in historicism, or Plus ça change ... plus a plea for pattern all over architecture with a postscript on my mother's house', *Architectural Record*, June 1982, pp 114–19.
 19. Henri Lefebvre, *Rhythmanalysis: Space, Time and Everyday Life*, *Éléments de rythmanalyse*, Éditions Syllepse (Paris), 1992.
 20. Cecil Balmond, *Element*, Prestel Verlag (New York), 2007. See also Cecil Balmond, *Informal*, Prestel (New York), 2002; Cecil Balmond, 'Survival Patterns', *306090 Models*, 2007; and Cecil Balmond, 'Cross Catalytic Architectures: In Conversation', *306090 Element*, 2007.
 21. A Gleiniger, G Vrachliotis and A Belting et al (eds), *Pattern (Context Architecture)*, Birkhauser (Basel), 2009; and P Schmidt, A Tietenberg and R Wollheim (eds), *Patterns in Design, Art and Architecture*, Birkhauser (Basel), 2005.
 22. For example, B Massumi, *Parables for the Virtual: Movement, Affect, Sensation*, Duke University Press (Durham, NC), 2002; S Bell, *Landscape: Pattern, Perception and Process*, Taylor & Francis (London), 1999; M Conforti, *Field, Form and Fate: Patterns in Mind, Psyche and Nature*, Spring Journal (Woodstock, CT), 1999; N Thrift, *Patterned Ground: Entanglements of Nature and Culture*, Reaktion (London), 2004; DK Washburn and DW Crowe, *Symmetries of Culture: Theory and Practice of Plane Pattern Analysis, Streets and Patterns: The Structure of Urban Geometry*, Washington University Press (Seattle, WA), 1988; S Marshall and S Routledge, *Streets and Patterns: The Structure of Urban Geometry*, Spon Press (London), 2004.
 23. Recent examples include Simon Heijden's *Lightweeds* (2006), ADA by ETH Zurich (2002), various MIT SENSEable City projects, hypermedia and transarchitectures projects including *TransPorts* (2000), *Hyperbody* (2003) and *Digital Pavilion Korea* (2006) by ONL, media facades by realities:united, and Tom Kovac's *Visualising the Virtual Concourse* (2008).
 24. M Garcia, *AD Architectures*, Vol 76, No 6, Nov/Dec 2006.

25. This debate can be traced back to Robert E Somol and Sarah Whiting's article 'Notes around the Doppler effects and other moods of Modernism', in Michael Osman, Adam Ruedig, Matthew Seidel and Lisa Tilney (eds), *Mining Autonomy, Perspecta*, 33, 2002, pp 72–7; Brian Massumi's article 'Sensing the virtual, building the insensible', in *AD Hypersurface Architecture*, 133, 1998, pp 16–25; and Daniel A Barber's analysis of these in his essay 'Militant architecture: destabilising architecture's disciplinarity', in J Hill and J Rendell et al (eds), *Critical Architecture*, Routledge (London), 2007.
 26. See M Garcia, 'Otherwise engaged: socially interactive space', *AD 4Dsocial: Interactive Design Environments*, Vol 77, No 4, July/Aug 2007.
 27. For example M3Architecture's Creative Learning Centre, Brisbane (2007) and SO-AD's Moiré House (2008).
 28. Phillip K Dick [1974], in Preface to *The Father Thing*, Gollancz (London), 2001, p 1.
 29. Barber, op cit.
 30. Félix Guattari, *The Three Ecologies*, Athlone Press (New Brunswick, NJ), 2000.
 31. Some will not be new inventions, but discoveries, as with the case of Daniel Tammet, the Aspergers savant who sees and makes complex mathematical calculations with patterns of numbers and numerical systems, experienced as forms and animated pattern landscapes in his mind. See D Tammet, *Born on a Blue Day*, Hodder & Stoughton, 2007.
 32. A Loos, 'Ornament und Verbrechen', *Trotzdem: 1900–1930*, G Prachner (Vienna), 1982 [1931], pp 86–7.
 33. A De Looz, 'Smart looks: Kengo Kuma on decoration', *306090 Decoration*, 2006, p 47.

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