

Architecture's Textural Space: Textiles and Architecture essay for the *Lost in Lace* exhibition

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Cliché or otherwise, architectural design has been and continues to be transformed by computerisation. While such a generalised observation doesn't begin to reflect the sheer range of design technologies, and the parallel 'Anything goes Sensibility' which has emerged across the discipline, the arrival and popularisation of computer-aided design during the 1990's set in motion a sea change for architects and architecture. This perceived liberation which new technologies for better or worse, facilitated, triggered completely new building forms. In the aftermath of Frank Gehry's decade-defining 1997 Bilbao Guggenheim Museum, computer aided design continued to rewrite both spatial and visual architectural language. The museum's titanium clad organic forms announced a new tectonic expressionism while its success in regenerating a declining industrial Spanish city, coined 'the Bilbao Effect.' Both aspects were central to nearly fifteen years of head turning 'wow' buildings which, more often than not, relied on spectacular façades brought into material being through computer assistance. Bilbao also provided a mythology and a template; iconic buildings could help turn struggling districts and towns into economic success stories. For architects, the public face of buildings, while always important, became a (if not the) critical key visual reference point and centrepiece in a raft of other more traditional design considerations. All over the developed world, buildings with ever more spectacular façades have vied to out match each other. And behind this spectacle was the form-finding dexterity and manipulations of the computer enhanced design.

In the years after Bilbao, Frank Gehry repeatedly underlined how influential the folds and fabric of clothing was to his spectacular organic looking buildings, citing the influence of Renaissance art and particularly paintings by Bernini and Michelangelo. In doing so, Gehry touched on a field which has continued to influence, cross fertilise and spread a net of connected strands, which might, for want of a term, be called architecture's textural space*. Again and again, albeit in distinctive and contrasting ways, textiles, whether in woven clothing, synthetic and natural fibres, or embroidery and lace making, or the ambiguous phrasings of fabric and fabrication, has re-appeared across the landscape of architecture, often in relation to attention grabbing quasi-iconic buildings. Some of this has been connected with the emerging field of

textile artists, whose work – with acknowledged influence from **Japan**¹ - often works with architectural space, drawing on qualities of light, ambience, sensuality, that can be overlooked by architects. Some of it is related to the pluralism implicit in new and also mixed media, the blurred and frayed boundaries of our brave new twenty-first century art, designer, sculptor worlds with its all up-for-grabs scenes. Some is connected with ongoing new media and other technological transformations, in high performance materials for instance, or CNC routers and laser printers, and how such technologies introduce customisation; of buildings or of fashion clothing, and facilitate the aforementioned blurred boundaries for art-workers to nimbly hop between. Some, also, is to do with the new possibilities opened up in terms of form, particularly though not only, biomorphic, evolutionary form, and in ecological biomimetic responses, that might integrate the woven and synthetic fibre into buildings, so they work, as much as appear, like nature itself. There are also the various non-Western building traditions, where fibre-based structures were the mainstay for nomadic on-the-move tribes and cultures, refined over centuries to be easily moved and easily transported; so different to the solid air of permanence which Classical, and for that matter Modernist, buildings evoke. It has only been in the last fifty years that these traditions, tent structures for example have been studied in a sustained way, for instance by Frei Otto, the remarkable German architect-engineer visionary. These too can be considered part of this indistinct textural space, most easily defined by its in-between-ness, linking architecture to textiles. Much of it, particularly, when one investigates the architectural strands, is a function of technology; a double façade with mottled lace motifs? Let's do it because we can and we have the technology! It also reflects an architectural sector in need of decorative inspiration, with centuries of woven patterns out there for the using. There are other aspects too though, which speak to meta-questions; for instance, the extent to which the character of loose, impermeable fabric materials, are at odds with the upright, straight standing walls of Classical (and Modernist) architecture - (despite Semperian appeals to the walls origins being found in weaving.) Or, questions such as, when does a wall cease to be a wall? All these comprise the shifting target of textural space, binding the architectural to the textile, builders to makers, sculptors of space to lattice weavers. The outline which follows is but a necessarily incomplete series of

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traces linking the terrains, textiles and architecture. The incompleteness relates to its bridging status, the joining of the one with the other, so that its presence in architecture's textural space is being repeatedly remade, re-negotiated and re-woven. This may be a sign of its vitality, though also of the dynamic between the ephemeral and the permanent.

One starting point, then, is the fundamental difference and formal centrality of lives depending on buildings staying standing. Buildings aspiring to pliability and fluidity with rippling and billowing fabric, do so by extensive slight of hand and illusion; in contrast designers sculpting with new forms and materials, are not so constrained. Machiko Agano's *Textural Space*, first shown at Brighton's Fabrica Gallery in 2001, was a wholly arresting fibre art and sculptural installation, evoking delicately spun lace webs, and echoing architectonic language while not confined to the demands of building. Scale, too, is a significant contrast, even as the actual forms being investigated seem to share converging and, to an extent, a common language. One example, evoking shared form making drawn from the natural and biological world is the work of Norwegian textile sculptor Anniken Amundsen. Amundsen's *Transition* and *Mutation* pieces, part of 2004's *Through the Surface*, are otherworldly and organic although also characterised by a recognisable architectural language of biomorphic form. Indeed both these designer-makers illustrate how the tacit world of textiles can overlap with the architect's use of computer aided modelling to explore adventurous organic, biological and biomorphic form. Similarly, Gehry's garment folds are witness to the originally surprising, though these days less so, source of clothing and dress as architectural influence; while Gehry Technologies initial development of Catier computer-aided design programming were instrumental in the rise of biomorphic design, and the biologically inspired forms that sprang from the late nineties and early naughties, in contrast to the mainstream of geometrical orthogonal modernism. Other architects of the period closely identified with the development of biomorphic form include Zaha Hadid, Foreign Office Architects, and Greg Lynn. Lynn, having theorised the terrain in his influential 1998 *Fold's, Bodies and Blob's*, perhaps surprisingly didn't make more of folds direct relation to fabric, and to the realm of **textiles**². This said the building façade is hardly limited to

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organic forms, and architects associated with late twentieth century Modernism, such as Herzog deMeuron and SauerbruchHutton, have shown equal absorption in developing showy skins, drawing on every sort of visual source. In short, one reading is that computer-aided design has acted as mid-wife to a huge boom in the dressing of buildings.

Another distinction between designer-makers of the textile sculpting variety and their architectural peers, is the heightened awareness of the sensory dimension of the textile works. Architects often speak of the materiality of buildings, although pragmatism and at times aesthetics can limit extending how materials are used to deepen tacit experience; how space works with ambience, mood and atmosphere. This is a significant consideration in the Japanese tradition of textile art, where textile pieces are made to enhance particular interior spaces, nurturing specific moods. This is also reflected in the related Japanese sensibility towards light and darkness summarized in the book, well known in the West, *In Praise of Shadows* by Jun'ichirō Tanizaki³, which works with integrating shadow and darkness as well as light. Ignored across much contemporary architecture some textile art has explored how interior spatial design can draw interest and subtle texture into building's shadowlands. In related vein the Finnish architectural theorist, Juhani Pallasmaa has written extensively on how architecture has become sensorially diminished, most fully in his *The Eyes of the Skin*⁴, contending that the eye's dominance over the other senses has created a culture dominated by the visual; with architecture feeding this appetite for the eye and the optical rather than a balanced combination of the senses. In textiles, lace is characterized by its open holes between the lacework, and while buildings do of course explore open spaces, there are both practical and economic considerations regarding their use, which often limit explorations of the sensory explorations of darkness. Again artists, particularly light artists, are arbiters of apprehending space with an openness to the experience of the moment. James

of Complexity and Chaos Theory, and a turn towards biological epistemologies informed by the power of computational programming in the last half of the nineties. See for instance the *Zoomorphic* exhibition linking the turn to organic forms in architecture to different animal species, Victoria & Albert Museum 2003

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Turrell, Olafur Eliasson and others spring to mind, although particularly relevant here is the Finnish light artist and sculptor, Helena Hietanen, who in the late 1990's developed her Technolace sculptures using fiberoptic wires as material and Finnish lace-making patterns as source for her actual designs. In the early 2000's Hietanen also began experimenting in collaboration with Helsinki architect Mikko Heikkinen of Heikkinen-Komonen Architects, although this did not proceed as far as initially hoped. Envisaging an entire building dressed in Technolace would have been strikingly dramatic. Perhaps it will happen still.

For the most part, however, lace and related textiles have been put to more conventional, decorative and technologically rooted design uses. Different architects have explicitly sought to develop façade skins and surfaces to buildings which owe much to lace design and patterning. For these architects, lace motifs as a design source are generally situated within the wider frame of textiles, fabrication and the woven. In Britain, the London based Foreign Office Architects sought out a lace related fabric design. The result has been lace derived filigree swirls and flourishes as the patterning starting point for the outer skin design of the Leicester branch of a John Lewis department store. This outer façade of the building's double glass 'lace curtain' has been digitally embossed with a particular 'arts and crafts' fabric design, uncovered in John Lewis's archives and dating back to 1803; an acknowledgement of the long history of textile manufacture in the city. Adorning the four storey glass box with such a fabric screen, was described by FOA's founders, Farshid Moussavi and Alejandro Zaera Polo as "layered transparency" although the double façade is also there for functional reasons. The ornamental patterning shades the building from sun glare and regulates temperature.

A second Midlands example, this time opening in 2013, is Birmingham's new library, designed by Dutch architects, Meccanoo. An almost prototypical regeneration project the library's skin references Birmingham's industrial past, with a façade aimed at conveying connections to the city's nineteenth century metal working past. There is an art nouveau touch to the design's that also reveals the overlap between the influence of textile design, particularly lace embroidery and a past era's metalwork. The motif for the outer façade is of a circular filigree composed of overlapping aluminium rings which will rise from ground to the eighth floor, which although not formally inspired by textiles or lace, provides a vivid related example of contemporary façades to Foreign Offices textile motif's in near-by Leicester.

Another high profile example is the Jean Boudain stadium in Paris, designed by brothers architect Rudy, and engineer Romain, Ricciotti, and due for completion in 2012. The stadium is covered with a semi-open, double curvature canopy, and the brothers respective firms have been working together with another technologically advanced material, Ultra High Performance Fibre Reinforced Concrete (BFUP) in order to create a highly perforated concrete mesh for the undulating, organically formed lace-like canopy encircling the stadium. The result is a biomorphic stadium façade with an apparently gossamer thin canopy mottled with holes and giving off a delicate fabric lace-like appearance. Other high profile European architects have also played with lace as a design starting point; both Rem Koolhaas's OMA and Jean Nouvel have developed so far unrealised designs for the Middle East, Jeddah's International Airport in the case of OMA, and for Nouvel a local Louvre Museum in Abu Dhabi.

One final major project, by the Polish practice, WWA, was the Polish double-façade pavilion at the 2010 Shanghai Expo. Beginning with the theme of folk culture motifs, the lace shaped motifs were cut out of the pavilion's outer façade, with CNC and laser-cutters detailing the motif openings on plywood mounted on steel construction modules. Here the fabric metaphor is symbolic and implicit, as although the folk culture motifs are part of Polish textiles and by association, lace-making traditions, the connection is neither underlined nor made explicit. What the Polish pavilion shared with Foreign Offices Leicester glass palace is how once night has fallen, these double-façade buildings can be turned into lanterns, their interior light flooding out through the outer façade designs.

Laser-cut customization is at the design heart of the Italian architect and designer and *Lost in Lace* contributor, Elena Manferdini's design approach and specifically her Fabric Tower, one of a group of fantastical buildings in preparation for the Chinese city of Guiyang. The double-façaded residential high rise is to be draped in a steel mesh lace design, seemingly falling in random ripples to ground-level, inspired – apparently - by the headdresses of the regions indigenous Miao women. Manferdini fits the discipline-busting approaches that computer aided design and related technologies are making almost normal practice, applying software skills, laser cutting technologies and a mind tuned to fashion to inform product design and clothing ranges alongside her practices architectural projects. Their skills are focused on software and technologies, rather than the particular discipline, as well as to adapting the technologies to suit the spectrum of design contexts.

The Fabric Tower introduces a mixture of the biomorphic and the textile related to the high rise. As with other buildings influenced by textiles there is an affinity to natural form, though their relation to how the natural world works – rather than how it looks - is mainly very limited. Herzog de Meuron's Beijing Olympic stadium 'Bird's Nest', or Gehry's titanium clad Bilbao museum may both look like twenty first century organic wonders – the former even receiving a avian nickname with obvious weaving overtones - but the buildings do not work like the natural world, and their carbon footprints are considerable. While textiles and clothing are human derived activities, the receptivity of architects is surely at least partially related to how applied to buildings there is an overlap with comparable biomorphic qualities. There are different if related approaches to resolving such ecological mismatches, which generally look to biological form for solutions. biomimetic, rather than biomorphic design, examines how the natural world works for guidance and examples of how to design, and both adaptability and flexibility are central to the workings of the natural world and to biomimicry. Intelligent second skins, which respond to light, sun, rain and temperature in ways similar to the natural world are already part of the architectural design repertoire; their integration with designed surfaces, including those of textiles and lace, seems like only a matter of time. Not only this, but the latest generation of digital fabrication is on the cusp of developing 3D printing techniques where buildings are grown rather than built, breathing and working like quasi-living systems.

One living system particularly relevant to biomimicry and the most obvious instance of lace in nature, is the spider and the intricate lace webs spun by arachnids. A now almost historical approach into how biological form can inform and influence architectural design and engineering was developed by the genuinely pioneering German engineer, Frei Otto. All through the sixties and seventies Otto, based at the Stuttgart Institute of Lightweight Structures, led research into the efficiency, and other properties of different biological forms, including the technology of animals, nets and branches. One focus was on the spider's lace webs. The research fed into a related focus of the Institute's researches, for instance, tents and other tension stressed structures. Otto would help design some of the most astonishing and ground-breaking structures throughout this period: the German pavilion at the Montreal Expo (1967), the extraordinary Munich Olympic stadium (1972), and the Mannheim Multihall Gridshell (1975.) These structures are related to fabrics and textiles in a completely different way, being concerned with how 'metal string' or rope and other

woven material can be used in tension, and how wood can imitate aspects either in tension or compression. Otto's inspiration owes much to the Non-Western traditions of tent architecture and tent design, which can be traced back to various nomadic tribes on the move rather than to populations committed to settled living, which require dwellings and other buildings characterized by solid permanence.

What is particularly striking is that Otto and his colleagues were working before computers, and that his sources were both non-western and from the biological world. Where this lightweight tradition has advanced in recent years, it has been principally due to the modeling and form-finding capacities of computer programming. The Weald and Downland museum gridshell building by Edward Cullinan Architects, is one example of the continuing influence; the Gridshell structure graphically representing one continuous woven or lattice wall and roof. The use of engineered timber for impressive rippling diamond latticed canopies and structures has repeatedly resulted in impressive looking buildings, fabrics of woven timber such as German eco-pioneer, Thomas Herzog's 2000 Hannover Expodeck, Glenn Howells 2005 Savill Park gridshell, and other shell structures; lamellas, ribbed shells and diagrids all making the connection between wood and the woven. Most recently, arguably Otto's most successful successor, the Japanese architect, Shigeru Ban, is continuing the lightweight direction of timber woven structures inaugurated by Otto, including 2010's Pompidou Museum, Hazely Golf club in Korea as well as Ban's unrealised runner-up design for Zagreb's new airport.

One last and also technological example is a small residential dwelling in the Dutch new town of Almere. Home to many building experiments, the dwelling, known as the House of Lace, was constructed by artist Rob Veening, using PTFE (Teflon) coated fibre glass fabric left over from a factory producing conveyor belts for the food industry. Working in collaboration with architects B29 Studios and engineers CC-Studio, Veening cut the rolls into strips before assembling them as prefabricated timber boards. The all white two-storey and recycled house is sustainable in spirit and manufacture, umbilically linked to fabric and clothing, and looking, according to one architectural observer, like, "a fashion show finale, an haute couture lace wedding dress."⁵

⁵ Kirsten Hannema in the July/August 2011 edition of A10 magazine, House of Lace, p11 www.a10.net

In the course of less than two decades a significant segment of the architectural world, driven by technological developments, has undergone a series of discipline transforming changes. The rate of change is continuing and if anything accelerating. In parallel once disparate disciplines have converged, and once discreet fields such as textiles, have become both relevant to and interconnected with building and design. So far an adequate vocabulary hasn't emerged to frame this provocative building terrain into a comprehensible whole. As and when this happens the meeting points between textiles and architecture may well have graduated into an autonomous discipline. How this will be expressed linguistically, whether, for instance, focused on the in-between novelty of the architectural textural space nested within other 'architectural spaces,' or that of language which subsumes architecture altogether into other fields containing architectural dimensions, will reflect the mindset and accommodation to categorical difference. As it is the current reach of examples underline the extent of architectural change, as much as the obsolescence and artificiality of traditional boundaries.

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