

SURFACE-DRIVEN ARCHITECTURE

Moving Beyond the Ornament/Structure Opposition

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Abstract. Contemporary architecture has been influenced by a shift of interest from the dialectic Derridean theories of language to those of Deleuze and Guattari who put more emphasis on transitions, experimentation and material presence.

New digital design tools as well as new construction materials have opened up more possibilities for architects. E-paper, digital screens, printed concrete, composite polymers and dynamic cladding systems, have allowed designers to relish architecture at the surface level. Moreover, the process of architectural design is shifting from the desktop to the virtual world of the computer. NURBS, Blobs, Metaforms, Isomorphic Surfaces and other complex geometries are now possible using surface-driven computer modelling software. Because of this, the resultant architecture display a much more distinct appreciation and mastery of surface-effects.

The following article argues that contemporary architecture is becoming increasingly a process of surfacing, both as a process of revealing and as a process of concealing. Surface, in common parlance, is generally understood as the exterior boundary of things, the outer skin of any object. In this sense, surfaces are actual, material, textural entities that we often encounter first. The surface is also taken to be something that conceals: "it was not what it appeared to be on the surface." However, it is when things surface that they become evident or apparent; they appear out of a previously concealed existence or latency. Thus, surfacing is a process of becoming explicit, of becoming experientially apparent in a movement from virtuality to actuality.

This article argues that the use of emerging computer technologies in architecture, have resulted in a renewed prioritization of surface and surface-effects. It shall be concluded that the surface-driven nature of most contemporary modelling software has resulted in a new

approach to architectural design, one that has the potential of subverting the traditional hierarchy between ornament and structure. As a result, this design strategy has allowed for a much more spirited and creative approach to architecture.

1. The Outbreak of Surface Communication

In broad cultural terms, there has been a paradigm shift in the relationship between humans and technology. Modern technologies are seamlessly fused with our everyday existence. Concepts such as smooth exchange, flow, continuous surface, skin, membranes - are ever present in contemporary culture, from animation to economics. Digital technologies form a surface-scape that rivals our cityscapes and landscapes.

For many, the computer is “just a tool”, a phrase often used by those who are not yet very familiar with it. The computer and other digital technologies may well be tools, but they facilitates unprecedented experimentation with geometry, surface and the temporal aspects of architecture. In addition, as evidenced by the work of numerous designers, the anticipated hybrid of architecture and information space is now a realizable tangent for practice.

In this era of digital and technological advancement architects are addressing the question of boundary and the architectural surface. While in early twentieth century, modernists sought to convey the tension between deep space and surface through the use of transparent materials, today, architects compress allusions to the depth of the interior into the surface of a building. Such shifts in architectural practice are the result of two related factors: the changing attitude towards binary oppositions in philosophy and architectural theory, and more importantly, the development of new technologies for architectural design and construction.

2. From Opposition to Smooth Transition

When reading histories and theories of architecture we are continuously faced with hierarchical oppositional terms that define the limits of architectural production. Dichotomies such as surface/depth, ornament/structure, masking/transparency, delimit architecture often privileging one term over the other.

In architectural discourse, ornament is regularly associated with the upper or outer surface, which can be scraped back to reveal the true inner architectural essence. While the term surface can invoke a discussion of materiality, its derivative, the superficial carries a much more negative undertone. Expressions like “it was not what it appeared to be on the surface” demonstrate the prevalent attitude towards surface as the covering and masking of real and true substance. Thus we are left with a familiar position that privileges depth, structure, clarity and rationality [as

masculine], and devaluates surface, ornament, translucency and play [as feminine]. While some theoreticians (like Gottfried Semper)¹ reverse this relation, architectural theory in general maintains a preference for formal structure over surface effects.

Dualistic thinking continues to haunt architects. In the late 1980s, Derridean and Post-structuralist thought, established a questioning of architecture's conceptual transparency, leading to the movement known as "Deconstructivist Architecture." This was seen as a major shift from the idealism of structuralism, which relied heavily on the *hierarchy* between oppositional terms in language. Post-structuralism argues that the relationship between the signifier and the signified is inherently unstable, thus rejecting the notion that there is a consistent structure to texts. Instead, post-structuralists like Jacques Derrida advocated deconstruction, which claims that the meanings of texts and concepts constantly shift in relation to a multitude of variables. The only way to properly understand these meanings is to deconstruct the assumptions and knowledge systems that produce the illusion of singular meaning. Thus, Deconstruction states that since the relation between signifier and signified is "radically arbitrary," (or rather contingent) what we think of as things are not in-and-of-themselves things. In other words, things are discursively produced as things, and within such textual products, there lay a great deal of contradiction and negation, which needs to be deconstructed.

Unfortunately, such a view, has led to many architects (Peter Eisenman being the best example), to think of architecture as a textual game detached from the realities of everyday existence. This method of turning architecture into text has thus, disturbed many, who see in it an ignorance of the material conditions of people's lives.² Moreover, deconstructivist theories often result in a timid attitude towards meaning and reality, since everything becomes a target for critique and subversion. Thus, "the death of the author," the dominance of deconstruction, and the destabilization of meaning, eventually create an atmosphere of indifference in which the desire to communicate meaning degrades to *superficial* playfulness.

Such abstractions together with the advent of mass imagery, have paved the way for certain nihilistic theories with regards to surface appearances. Our world, Jean Baudrillard tells us, has been launched into hyperspace in a kind of postmodern apocalypse. The airless atmosphere has asphyxiated the referent, leaving us satellites in aimless orbit around an empty centre. We are surrounded by immaterial surfaces that no longer bear a relation to any reality whatsoever.³

¹ See Semper, Gottfried, , 1989, *The Four Elements of Architecture and Other Writings*, Res Monographs on Anthropology and Aesthetics. Cambridge: Cambridge University Press.

² Many of Peter Eisenman's buildings, for example House VI (Cornwall, Connecticut, 1972,) are accused of ignoring the human needs of their occupiers. For a critique of Eisenman's theories and his architecture see Evans, Robin, 1997, *Translations from Drawing to Building and Other Essays*. London: Architectural Association.

³ See Baudrillard, Jean, and Shiela Faria Glaser, 1994, *Simulacra and Simulation, Body, in Theory*. Ann

That, according to Baudrillard, is simulation: the substitution of signs of the real for the real. In this state of hyperreality, where signs refer only to other signs, meaning implodes and we are left gaping. What remains for us, argues Baudrillard, is “Melancholic Fascination” (1994). In this world-view, surface becomes the “superficial abyss” which drowns us all. Thus, architectural surfaces, and the effects created on them, become superficial play rather than an essential act of architectural creation and communication. Architecture as the art of making boundaries and communicative surfaces is reduced to cosmetic excess.

The simplification of the architectural envelope to textual binaries such as surface/depth or ornament/structure, as well as our increasingly nihilistic attitude towards surface appearances, put us in danger of misinterpreting the material presence of architectural production, but even more importantly, have resulted in a marginalization of surface design in architecture. Although deconstruction is still pervasive in academia and remains a powerful method of inquiry, many architects feel unsatisfied with its influence, believing that architecture possesses a material presence that is not accommodated by the textually oriented philosophy of Derrida. For them, the answer comes in the form of Gilles Deleuze and Felix Guattari’s work, which offers a much more positive outlook to our post-industrial condition. Although it is never developed at length in any one place, a theory of surface can be extracted from their work that can give us a start in analyzing our cultural condition under late capitalism, without going back to the nostalgic past, or launching us into hyper-cynicism.

Thus, in recent years there has been a move towards the thinking of Gilles Deleuze and Felix Guattari, in order to generate a theory that addresses architecture in its materiality, and promotes middle-out conditions, experimentation and creativity. Such a turn can be seen in the recent theories and works of Greg Lynn and even Peter Eisenman (who was a clear advocate of Derridean theories.) Deleuze’s concept of “The Fold” has been of particular importance to contemporary architectural theory, but more importantly the pervasion of computer technology has resulted in a clear move into topology with many of the designs produced devoting more emphasis to surface.⁴

The use of digital technologies has had a profound effect on architecture. Architects can now design complex, skin-like surfaces that are not only pleasing to the eye, but also perform structural operations. The development of digital mass media has created a flux of information, images and sounds that emerge from everyday life and which are becoming transliterated into global digital networks. Thus, information culture is spilling out into the built environment, creating a need for surfaces through which data may traverse. Architecture is slowly responding to this by a process of surfacing

Arbor: University of Michigan Press.

⁴ Examples include: Fresh Water Pavilion by NOX (Neeltje Jans, 1997) Greg Lynn’s Embryologic House (2002) and many projects by ASYMPTOTE, UN Studio, Future Systems and others.

of volume-space into activated surfaces, as noticeable in the work of a number of leading and highly influential practitioners.

3. Surface-driven Modelling

The revolution is not so much in architectural form, as in architectural practice. Recently, new digital modelling software, like Form-Z, Maya, 3D Studio Max, Houdini, and Gener8 have enabled architects and designers to introduce new design processes into their work. Moreover, developments in construction techniques and materials have allowed increasingly complex forms and surfaces to be manufactured quickly and efficiently.

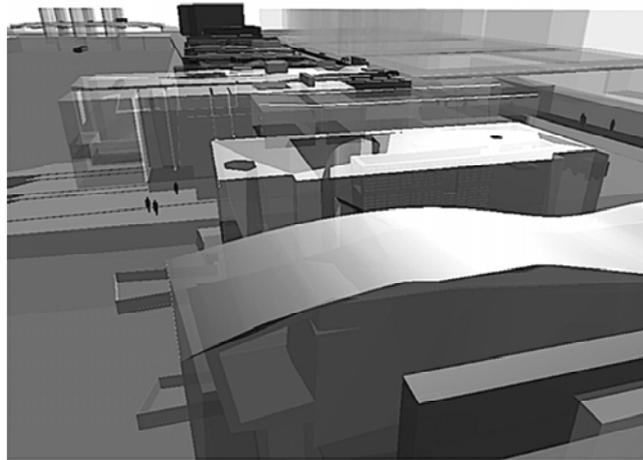


Figure 1. Osthafen Film Studio (S. Yahya Islami & Kamil Malek Shah)
generated using Form-Z RadioZity. Source: author, www.studiomasis.com

Many architects are now switching from desktops to the computer screen, which has effected subtle changes in their work. Moreover, the majority of today's modelling software is surface-driven, pushing the architects towards designs, which exploit the thinness and complexity of digital surfaces. In such surficial environments, folding, contouring, texturing, colouring and deformation, replace more traditional tectonic operations. Architectural design through digital modelling becomes founded on creating surfaces to which colour, texture and materiality is added.

Although other forms of digital modelling are available, surface-driven modelling is the most popular. Wireframe modelling does not provide an adequate level of development, whilst Voxel-driven three-dimensional modelling is too complicated and still expensive. There is also a more subtle issue of representational economy. At an early stage in a design process a designer is usually interested in rapid, un-encumbered exploration of ideas.

Ambiguities do not cause major problems and may even become sources of creative ideas. In this context, two-dimensional surfaces are easier to manipulate and do not mire the designer in demands for details, and therefore work better than representations that emphasize completeness and consistency.



Figure 2. Virtual: Groninger Home – Real: Holiday Home, ICA – (UN Studio). Powerful computer software have enabled architects to produce virtual surfaces that approach photo-realism; new construction technologies are able to materialize complex virtual surfaces as built architecture. Source: www.unstudio.com

NURBS, Blobs, Metaforms, Isomorphic Surfaces and other complex geometries are now possible using surface-driven computer modelling software. Because of this, the resultant architecture display a much more distinct appreciation of surface design. But more importantly, the generated surfaces often take on structural responsibilities too. Such developments result in a new prioritisation of surface, one in which surface and structure merge together and the roles of each affects the nature of the other.

Architects of the past often looked with a painter's eye. Many of the greatest Renaissance architects were also painters, and Beaux-Arts architects were adept at the use of graded watercolour wash to study qualities of shade and shadow. Some architects of the twentieth century have, for both ideological and pragmatic reasons, tended to rely on line drawings that abstract away from colour, texture, and shading to emphasize pure geometry. Digital surface modellers however, create the possibility of recapturing the appreciation of surface, colour and light that has, as a result, been lost.

4. Manufacturing Diversity with Precision and Economy

Triangulation, pixilation and polygonization are ways in which complex computer-generated surfaces are simplified for mass production. The effect of such processes often gives a shimmering ornamental effect to the resultant

built surfaces. For example, if a model is broken down into planar surface facets, a computer-controlled laser-cutter can be used to cut the facets from thin sheet material. This allows finely detailed wooden models of buildings and contoured surfaces to be produced in this way. Alternatively, the computer-controlled milling machines that now find wide application in the manufacturing industry can be employed to produce complex solid parts in metal or high-density foam.

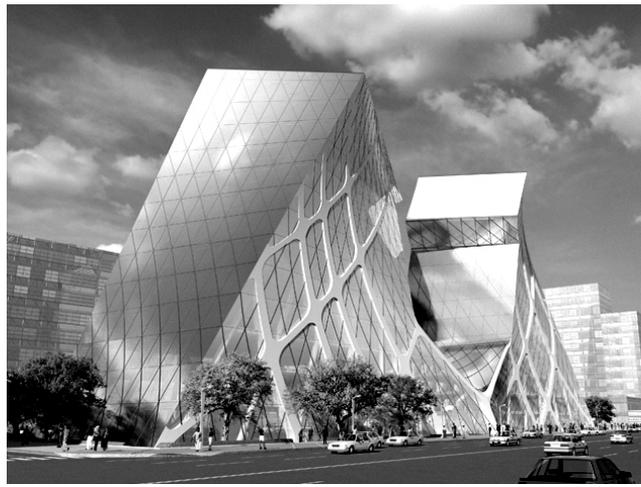


Figure 3. Budapest Bank Tower (ASYMPTOTE) – Triangulation as surface ornament.
Source: www.asymptote.net

Stereolithography is perhaps the most versatile technique, and despite its technical complexity and high cost, it has rapidly found a niche in medical imaging and mechanical parts design. A stereolithography system passes computer-controlled lasers through a tank of polymer solution so that laser-induced polymerization occurs at specified locations. A similar techniques called Contour Crafting is being developed by Behrokh Khoshnevis of the University of Southern California that uses a computer-controlled crane or gantry to build edifices rapidly and efficiently without manual labour.⁵ Using a quick-setting, concrete-like material, Contour Crafting forms the house's walls layer by layer until topped off by floors and ceilings set in place by the crane. The system can even accommodate the insertion of structural components, like plumbing, wiring, utilities, as the layers are built. Khoshnevis claims that his system could build a complete home in a single day, and its electrically powered crane would produce very little construction material waste.

These new design techniques have paved the way for radical design processes followed by their correspondent theories. For example

⁵ See <http://www.contourcrafting.org>

“Topological architecture” or “Hypersurface Architecture” is highly reliant on the computer’s ability to easily manipulate non-uniform B-Spline curves, and the surfaces that can be extruded from them. “Blob architecture” or “Metamorphic Architecture” is a result of the ability to create complex surfaces using Metaballs of differing mass and attraction, which can be connected together to create complex forms and surfaces.



Figure 4. Carbon Tower (Peter Testa) – Using a software called *Weaver*, this building’s external envelope is woven rigid from ultra-light composite metals. The result is a building whose surface is simultaneously a self-contained support. Source: http://archrecord.construction.com/innovation/2_Features/0310carbonfiber.asp

Contemporary thought is supported by contemporary technologies. Today, not only the nature of surface has changed, but also the nature of structure. Architecture can be seen as one conceptual entity, where surface and structure have a more homogeneous relationship with each other. Recent development of polymers, carbon fibres and other hybrid constructional materials, have allowed such views to be possible, where architecture does not separate its surface-effects from its structural function. Such material possibilities work well with new theoretical developments of middle-out conditions, smooth exchange, folding and material presence. There is an emerging phenomenon in architecture and culture that attempts to go beyond schizophrenic or nihilistic interpretations that contribute to the dynamics occurring in our complex world today. As Perrella writes: “Prior to the divisions between things, there is a more pervasive connectedness” (1998).

5. Surfacing and the Aquatic Metaphor

Digital technology is moving towards the thinness of surface. Much of new computer/chip/screen technology is designed to take less space, and in fact to be incorporated into smaller and flatter devices. Surfaces are becoming sensitised, gathering various inputs from their surroundings and displaying

them through their luminosity. EPDs (Electronic Paper Displays), Touch-screen and projective technologies, all allow architectural surfaces to come alive.

New developments promise a *surficial* future for architecture. E-paper, for example, is a screen that has the qualities of normal paper in that it is flexible and can be read in normal lighting conditions. It is economical to produce making it ideal for mass customization. E-paper brings the nocturnal electro-luminous screen to the world of surfaces displayed in daylight. This can have fundamental repercussions for architecture. The development of such technologies can lead to an architecture where every wall surface becomes a digital electronic display that is not restricted to the darkness of the night. Moreover, the notions of surface and screen become indistinguishable. Architectural surfaces become sensitive, dynamic and unpredictable.⁶



Figure 5. Bendable Clock (Citizen) – This unique design is enabled by E Ink(r)Imaging Film. Architecture is yet to exploit such new surface technologies. See www.eink.com

Avrum Stroll defines surfaces as borders (1988). In its role as shelter, habitation, construction and enclosure, architecture is concerned by definition with the problem of border: its major duties necessarily imply the demarcation of boundaries through creation of surfaces. Architecture is faced with an important dilemma: to create borders in a culture that challenges borders; to create surfaces in a culture that attempts to rupture surface appearances. It is in no small part due to this paradoxical situation that architecture is becoming increasingly a subject for cultural philosophy.

⁶ In his 1979 book *Learning from Las Vegas*, Robert Venturi advocated a progression from material effects displayed in light, to the immaterial effects of "lighted signs." (p. 116) His vision however, was bound by the darkness of the night. With e-paper however, it is possible to combine the immaterial with the material in full daylight.

Surfacing as a concept can be explained through an aquatic metaphor, relating potentiality and depth to actuality and surface.⁷ In a stream both the deep currents and the surface effects they create, are essential components of the stream. Yet, while the wave on the surface of the stream is actual and visible, the submerged currents are virtual and hidden from view. The same principle applies to experience and architecture. Surface and depth are material and immanent parts of the same architectural stream; ornament and structure, or image and meaning have the same relationship. In this light, binary oppositions are not separate entities, but in fact connected. Meaning is not masked by surfaces, *it is always in a state of surfacing*; it is continuously becoming surface.

6. Epilogue: Formed Out of Surface

Surface need not be associated with pessimism and shallowness. To engage with surfaces in architecture is not to engage with superficiality. What appears on the surface always reveals, even if its main purpose is masking. Surface and depth are dialectic linguistic terms, which fail short of the material existence of things. It is not so easy to clearly distinguish between the two.

Surfacing as a concept is closer to how we deal with reality on an everyday basis. Surfacing is not only giving something a surface, but also a process of becoming experientially apparent in a movement from virtuality to actuality. Stephen Perrella's "Hypersurface Theory" discusses such issues. Yet for surfaces to fuse the material with the virtual, the apparent with the essence, they need not be "hyper." To be hyper is to be overexcited, superstimulated, excessive, on edge. As Pia Ednie-Brown writes: "Hypersurfacing unleashes the surface into bearing witness to an even more pronounced expression of the conditions of emergence. Hypersurfacing is an act of falling into the surface" (1999). Before we fall into the surface, however, we should acknowledge that every surface is always surfacing.

Architecture is, and has always been, an act of surfacing. The cave paintings at Lascaux, Egyptian hieroglyphics, Muslim geometries and calligraphies, the white facades of the International Style, the reflective titanium skin of the Bilbao Guggenheim, the shimmering facades of virtual architecture, all relish the power of surfaces.

Deleuzian theories together with the emerging digital technologies, have resulted in a condition where there has developed a new prioritization of surface, one in which surface and structure merge together and the roles of each affects the nature of the other. Surfacing as a design strategy eliminates the modernist hierarchy between ornament and structure and allows a much

⁷ Similar to Bergson's stream metaphor for perception and memory, present and past, actual and virtual. Experience is the theatre of these dynamics, where the invisible, or deeper layer, is always responsible for the emergence of whatever comes into view.

more creative and spirited approach to architecture, something that Gottfried Semper hinted towards in the nineteenth century.



Figure 6. Surfacing and Hyper-surfacing: Islamic tile decoration (Isfahan, Iran) and digitally/mechanically controlled surface effects (Aegis Hyposurface, dECOi architects)
Source: www.architectmagazine.com

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