Versioning: Evolutionary Techniques in Architecture
Versioning:
Connubial Reciprocities of Surface and Space

For Office dA, versioning and its accompanying technological shifts offer new opportunities for resolving the relationship between space and form. Principals Monica Ponce de Leon and Nader Tehrani explain how, through their work, they are explicitly attempting to reconcile space and surface, which have conventionally been treated in opposition. Employing geometry and patterning as the agents for this resolution, they are mindful that this is a process of versioning that relies on the selection of often arbitrary strategies, as demonstrated by their Witte Arts Building and the Tongxian Arts Centre.
The Whitte Arts Building,
Green Bay, Wisconsin

Top left:
View of penetrating skylight on second floor.

Top right:
Programmatic diagrams showing penetrating core and skylights.

Middle right:
Sectional model.

Bottom right:
Ground-floor plan.

Left:
Exterior view of the building.
The projects presented here deal with surface and space as reciprocal and codependent entities. To that end, we have sidestepped binary planning strategies that result in figure/ground negotiations with poché space on the one hand or the residues characteristic of the free plan on the other. Deviations of the surface coincide and determine specific spatial deformations, and in turn geometric and formal manipulations may occur only in relationship with tectonic systems that are at once consistent, systematic and resolved.

In part, we set out to address and critique the very problems that provoke our interests in the relationship between space and surface, as evident in the work of architects like Herzog & de Meuron and Gehry. In H+dM we witness an impeccable development of skins, details and material innovation, and yet these are often allied with off-the-shelf planimetric and sectional relationships borrowed from modern architecture. On the other hand, in Gehry we witness extraordinary spatial and formal manipulations clad in metal panels that are rendered indifferent to the very geometries and spatial constructs to which they are meant to correspond. Our project attempts to overturn this dichotomy and to create a condition whereby surface and space are understood as organically linked, with
geometry and patterning as the agencies for their precise resolution.

In broader terms, we are attempting to reconcile two seemingly paradoxical architectural lineages: the rationalist and the empirical. On the one hand, the rationalist tradition—an axis from the Greeks to Schinkel and Mies—displays an interest in constructing a relationship between an architecture's parts and its whole. The manner in which the classical language has been elaborated in order to permit the turning of corners, the transition between a shaft, a capital and an entablature, among other problems, all point to its investment in some idea about resolution, determinacy and exactitude. On the other hand, the empirical tradition—less evident axis from the Baroque to Gaudi, Eladio Dieste and Gehry—traces an interest between problems of expression and structural mechanics. On one end, Dieste struggled in developing structural strategies as vehicles for inventing new form (and vice versa); Gehry, on the other end, is developing techniques that are dedicated to form in its pure expression. Gaudi fits somewhere in between, invested simultaneously in empirical trial-and-error experiments linking problems of structure and expression.

Historically, these two lineages have been set apart, both ideologically and formally. Our projects have attempted to reconcile these two traditions in addressing the formal and structural effects of the empirical tradition through the precision associated with that of the rationalist. To that end, our work relies on the construction of architectural alibis, whereby programming, siting, fabrication systems and other
project contingencies become pretexts for the development of seemingly rational systems. Geometric logics, structural rules and tectonic rigours coexist and coalesce in our projects to produce new formal and spatial effects. While these systems may be misconstrued as 'architectural facts', for us they represent arbitrary reasons for the making of choices, and as such their factual nature may be brought into question. After all, one's alibi may be false, a mere pretext to get away with the crime.

**Syntax: Polyglotomy and Multiple Effects**

Historically, the nature of the discourse on the building's surface has evolved a great deal as a result of technological inventions and corresponding theoretical shifts. Once facades, later elevations and now skins, among other nomenclatures - all refer to the outer membrane of buildings that have held varied responsibilities in framing, configuring, materialising or representing the contents and spaces of buildings. As we track the various tendencies from pre- to postindustrial modes of production, the architectural implications of 'versioning' define paradigmatic shifts in the manner in which space/form is exacted, in the ways architects practise and the contributions it makes to a culture of construction.

The load-bearing structure of the Renaissance or Baroque enjoyed the luxury of ambivalence: selectively telegraphing the interior onto the exterior of a building while simultaneously divorcing the building's contents from its corresponding facade through the agency of poché. The very thickness that provided for structure also created sufficient 'fat' to give dimensional and spatial autonomy between internal and external conditions of a building. San Carlo alle Quattro Fontane and Palazzo Massimo illustrate this argument in succinct ways. The facade of San Carlo maintains a relationship with its interior in the way that it deforms and reacts to the spatial peculiarities of the main hall. At the same time, the objectification of the facade contributes to its reading of autonomy: an appliquéd liner that is pasted onto the mass of the building. Palazzo Massimo, too, negotiates the desire for formal purity as made evident in the symmetry of its facade and the regulation of its fenestration, which stand in tension with the asymmetries of the interior of the building. In both cases, however, the buildings are indebted to, and compromised by, the necessary correspondence between structure and spatial envelope - notwithstanding the ambiguities and the richness of their respective complexities.

With the invention of the Domino and steel frame, the relationship between structure and spatial envelope is dislodged and potentially liberated. Le Corbusier's free plan and free facade were theoretical fragments of these developments, and they formulated new spatial, structural and formal possibilities for architecture. Modernism's open plans also reveal a new form of surplus not evident in the poché of a pre-industrial plan. For instance, in the villa at Garches, Le Corbusier's famous wall lining the bathtub is a device that establishes a direct correspondence between programme and spatial definition. No longer disassociated by the mass of a load-bearing wall, the internal and external conditions coincide without any residue within the space of the wall. The surplus, then, is made evident in an apparent 'still life', the plastic volume defining the tub as framed by the open balcony in the centre of the front elevation. In this paradigm, the structural grid has an independent yet dialectical role: a matrix around which walls or envelopes may slalom in order to define space. Despite the liberation that the column grid unleashes, it also produces a virtual obstacle course that confines, indeed entangles, the plan in its binary system. Thus, the very benefits of the rationalised system of structure are compromised and defined by the limitations of its configuration.

Even with a well-formed understanding of these structural and spatial paradigms, the use of materials, their modes of aggregation and the manner of their appearance still remain subject to a broader discussion about the relationship between tectonics and language. Understanding buildings by means of a series of layers,
we would like here to redefine tectonics as the apparent and finished membranes of construction – and more importantly, their subsequent effects. Thus, architecture's various supplements, be they structural substrates, fireproofing or vapour barriers, among other liners, all recede in this discussion, pointing to the surface of architecture as the arena of primacy. In this light, it would be important to argue that what the Classical order does for Borromini is not significantly different to what white stucco does for Le Corbusier. Both architectures are composed by elements the space of which is defined by the surface of their respective languages. It is in this surface that architecture has found its most potent form of expression despite programmatic, structural and other formal rhetorics. It could be argued that even if the ceiling deck of Philip Johnson's glass house in New Canaan is framed with lumber, it does not diminish the status of industrial production in modern architecture. Nor does it make the role of steel and glass less rhetorical in their implementation – whether in the Glass House or Lever House.

More importantly, the argument follows that there has always been a gap between actuality and effect, and architecture has thrived on this allowance – but in doing so, language and its corollary, syntax, has been the only arbitrator between truth and expression, actuality and effect. At Sant'Andrea in Mantua, Alberti decided not to define pilasters, arches and pediments in the traditional manner, as elements half-embedded on the surface of the church. Instead, having just rediscovered orthographic drawing, Alberti uses decorative motifs such as bands of eggs and darts to 'draw' the outline of the pilasters, while carving, rather than projecting, the pediment and arch. This deviation from a classical language exposed the arbitrariness of that system, turning language into jargon. The technique deployed is at once what creates the illusion, and that which gives away the illusion itself. This technique is not significantly different from Mies's treatment of the Seagram Building, where the steel structure which by code he is forced to encase in concrete is in turn represented by the window mullions of the building's curtain-wall system.

While these examples maintain the dichotomy between facts and fictions, our interest lies in the space between. Mies uses I-beams to stand for those that he conceals, Johnson needs to conceal the actuality of the building in order to represent something else, while Alberti reveals the ruse while representing the orders. We search instead for the production of multiple effects – in the manner of a polyglot – where none is 'correct' but all may have primacy. Our work strives to produce ambiguous readings, blurring the distinction between the 'real' and constructed appearances of buildings: defamiliarising the purported properties of materials and expanding the experiential and semantic effects of architecture. Since there is no 'essential' way of building
and certainly no singular resolution of a technological problem, it would then follow that each act of fabrication is laden with an interpretive bias. Thus, many of our proposals lay bare the mechanisms and devices of architectural conventions, exposing the arbitrariness of their strategies, and coincidentally providing a platform for invention.

For the Witte Arts Building, brick assumes multiple interpretations as corners, walls and windows display inconsistent dimensional depths. In contrast to conventional contemporary brick developer buildings, where brick assumes benign curtain-wall detailing, we give tectonic variations to brick construction, at once radicalising its depth in the vaulted walkway up the stairs while also displaying the vulnerability of its thinness in the dovetailing details of the corner conditions. Here the inconsistency of depth displayed in the brick helps to advance a broader interpretation of contemporary brick-curtain-wall construction – at once working with the common techniques and conventions of today's construction systems while also inventing new ways of working with emerging technologies to spatialise the skin.

**Precision: Geometry and Patterning**

The relationship between tectonics and syntax, as well as their slippery flirtation with actuality and effects, are conditioned by the degree to which an architect precisely manipulates the constituents of a surface, be this its apparent material make-up or the underlying geometric logics that allow form to emerge.

The alliance that Kahn’s Exeter Library establishes with Palazzo della Cancelleria or Palazzo Strozzi makes a case for the precision of material use and its correspondent connection to syntax. Drawing on the idea of rustication, it's apparent effect of weight and the hierarchies of ascending pilasters or wall thicknesses, the library opts for a technique of construction that evades any direct references to the Palazzi or simplistic representational tropes. Instead, the logic of brick construction, its bonding, its methods of stacking and spanning, define the terms of the building's autonomy and its ultimate tectonic effects. Wide and massive at the bottom and narrow on the top, Kahn's ascending brick pilasters diminish in width as a direct result of the radius and the depth of the jack arches that span each bay. Rationalised by means of a unit of brick, the system of aggregation determines the dimensional limits of the study carrels behind the pilasters while concealing the floor slabs behind the jack arches. The study carrels are impressed onto the surface of the elevation, flush with the brick, while the windows above the carrels appear as abstracted voids open to double-height spaces beyond. The tectonic rigour with which the brick patterning is deployed allows Kahn to give semantic depth to an elevation that slyly transforms from a
seemingly load-bearing wall at its bottom to an apparent post and lintel system at its top.

A persuasive argument for the precise use of geometry and its relationship to language can be seen in the work of Eladio Dieste, where formal rigour and material properties commingle to enable the invention of a new structural system. Dieste used what he considered basic facts: that brick and ceramic can resist stress better than concrete, while concrete cannot equal brick or ceramic in lightness. Geometry, however, is what enables the brick or ceramic to substitute for concrete. Double curvatures with variable longitudinal undulations, and catenary curves in the cross sections, allowed the walls to be their thinnest and the material to stand. For Dieste, form was the result of geometric exactitude, rather than the ‘awkward accumulation of material prevalent in the building industry’. Precision in geometry can be understood as resistance, both structurally as well as intellectually to prevailing modes of construction.

These two examples constitute different sides of the same polemic, where precision becomes the operative technique for manipulating the membrane that materialises or represents the contents and spaces of buildings. Kahn has complete control over the brick bonding, but this patterning is ultimately independent of the structural system of the building, causing a divorce between skin and the space of the interior. Dieste, on the other hand, merges notions of skin and space where the surface of the building constitutes its interior. However, in his buildings the geometry of the undulations is derived through a technique of abstraction, independent of the dimensions, disposition and geometry of the tectonic units themselves.

Bricks are cut arbitrarily, at the mercy of geometric rules. As a result of both Kahn’s and Dieste’s emphasis on one paradigm over all others, the articulation of one system seems to preclude the resolution of another.

Our work attempts to test the possibility of simultaneously addressing geometry and patterning as cannibal ingredients in the generation of space. We have pursued this line of research in two ways: creating a direct relationship between the tectonic unit and geometric logic, or developing a seamless tectonic system that absorbs but underplays normative tectonic articulations and differentiations.

Among our projects, the Hookah den at Mantra may serve as an example of the first strategy. The tectonic units of the structure are made up of plywood ‘bricks’, the length of which is determined by the banquets set against them in the interior. The plywood is stacked with simple fasteners without the aid of any additional structural members or reinforcement. Instead, its structural rigidity is produced by its folding geometry. We use the dimension of the ‘brick’ as a measure for the layout, and for ease of manufacturing this size is maintained throughout; the pleats never compromise the dimension of this tectonic unit. In turn, these pleats are also derived in direct relationship to the ‘coined’ plywood overlaps at the juncture of the geometry. Thus the plywood ‘brick’ joint precedes and determines the layout of the geometry in a precise one-to-one correspondence.

Fabrications, the installation at the Museum of Modern Art, on the other hand, works with folded steelplate technology as a grafted skin, using its undulations, wrappings and folds as a vehicle to smooth the differences between the normative tectonic functions of beams, columns and skins. Triangulated geometries give the steel skin rigidity, while folded columnar plates give the structure lateral bracing. The geometry is also calculated according to certain anamorphic principles, giving the proposal either flattened or spatial readings from different points of view. The geometry of the fabrication and its relationship with the museum garden wall are calibrated so as to permit specific forms of inhabitation above (as bleachers) and below (as canopy) the steel plate. Variations in the density of the perforations lighten the steel structure as the geometry unfolds, while allowing the passage of light to the space beneath. The resultant effect is one of fabricated coincidences, where issues of structure, programme, optics, lighting and cladding alike may be reconciled and camouflaged through a continuous membrane; while the strategies are orchestrated and constructed in a ‘seamless and continuous’ fashion – underplaying normative tectonic articulations and differentiations – they are also negotiating fabricational limitations that necessitate the aggregation of constituent elements, varied parts and discrete differences.

Coincidences: Programme, Structure and Other Alibis

Despite the ideological divide between the architectural paradigms represented by the work of Gehry and that of H+DM, these models share a relative detachment between the surface treatment of their buildings and the programmatic and structural contingencies that generate them. H+DM favour conventional structural solutions and the pragmatic arrangement of programme as a vehicle for the development of spatial arrangements independent of building surface. More often than not, structure and programme are suppressed in order to produce their virtuoso weaving of skins. On the other hand, Gehry’s programming and
structure have exceptional qualities. He is known to entice clients with his skillful manipulation of programmatic requirements, but those very programmes often remain disinterested in the forms that house them. Structure is often called upon to do extraordinary things in order to make complex shapes possible, but volumes are created through formal processes that involve the generation of physical models and their subsequent digitisation, independent of the modes of construction or assembly.

Overturning these paradigms, the recently completed Yokohama Port Terminal may be the only significant building to attempt to absorb programmatic and structural mandates into the envelope. Folding becomes the building's operative technique, and all the building's functions - circulation, mechanical, electrical, structural, programmatic, waterproofing, etc - are somehow absorbed by the logic that this technique provides. The building, however, does not come without some invidious complexities and contradictions. For instance, while the ramped/support pier areas are folded and pre-welded steel-plate structures, the main hall is spanned by traditional triangulated trusses that are subsequently clad in steel plates that extend the logic of the fold over the entire system. Thus, the building's structure is actually composite and varied in nature, and the envelope is a rhetorical device that cloaks and binds the sometimes contradictory and differentiated elements into an organic whole.

Most importantly, it is the building's syntax here that overcomes the morality associated with truth and helps to mediate between the heterogeneous elements of the building so that they coalesce into an apparently seamless and nondifferentiated surface. This does not make the conceptual argument of folding weaker, but demonstrates the centrality of language as an arbitrator of tectonics. Without its rhetoric, there is no folding, no spatial continuity, no consistent manner of assembly to conceal the building's differences. Moussavi and Zaera Polo's shrewd negotiations between the play of the superficial and the structural core demonstrate the intelligence of the building within a history of debates on the nature of truth in architecture. Ironically, given the building's masterful laminations of steel and wood, it is precisely in the area of syntax that certain misadventures appear: in those inevitable areas that do not, and cannot, fit comfortably within the diagram of the building - at the edges, crusts and cross-grains of the laminations.

Our agenda, then, attempts to establish a new relationship between constructional systems, programme and the surface they produce: the visible deformations on the body of the building are, at once, the result of programmatic pressures that guide the form, and also the result of geometric and syntactic laws permitted by particular units of construction.

In the Tongxian Arts Centre project, the seemingly benign mandates of circulation, of drainage or of light become the alibis that produce the figural nature of the spaces and forms. The attempt is to make spatial and surfacial strategies collapse into one organic body. Sidestepping conventional architectural typologies, we conceive of the building as a brick monolith that has been metaphorically vacuum-formed into shape. Thus, instead of planning a building with discrete and autonomous spaces - or separate rooms and corridors - we have appropriated the limited but vital space underneath the stairs as a vehicle to provide for circulation passages. Similarly, light is brought into the building from the north in negotiation with drainage patterns of the roof and the necessary clearances for ascending staircases. In other words, all the apparent distortions on the body of the building are the result of the calculation of the necessary headroom for passageways, drainage paths and the minimisation of any other subsequent wasted space. Of course, this ethic of minimisation and reduction is an opportunistic alibi - a fiction, if you will - to give determinacy and new formal possibilities to the idea of architectural limits.

Cast in concrete, the building's structure is poured in a brick mould, the bonding of which is of Flemish origin. While the alternating headers and stretchers of the Flemish bond have historically been used for their lateral stability, on occasion the headers have been withdrawn to make for porous walls while maintaining the grain of their pattern. Understanding this principle reveals that the header dimension, once excavated, is an arbitrary one, and could potentially be expanded or contracted in combination with corbelling to produce formal or spatial deformations that depart from conventional orthogonal projection. In this project we have used the brick as both formwork and finish, thereby securing a direct and unmediated relationship between the bonding, its layout and the ultimate effect. So, too, we have attempted to project a relationship between the skin and structure that is mutually dependent, correspondent and integral. The stretchers and headers of the Flemish bond are manipulated as a vehicle to compress and expand not only wall surfaces, but also the very spaces they define. Spatial construction and surfacial manipulation are construed as part and parcel of the same interdependent set of determinants. Without the surface, there is no space.