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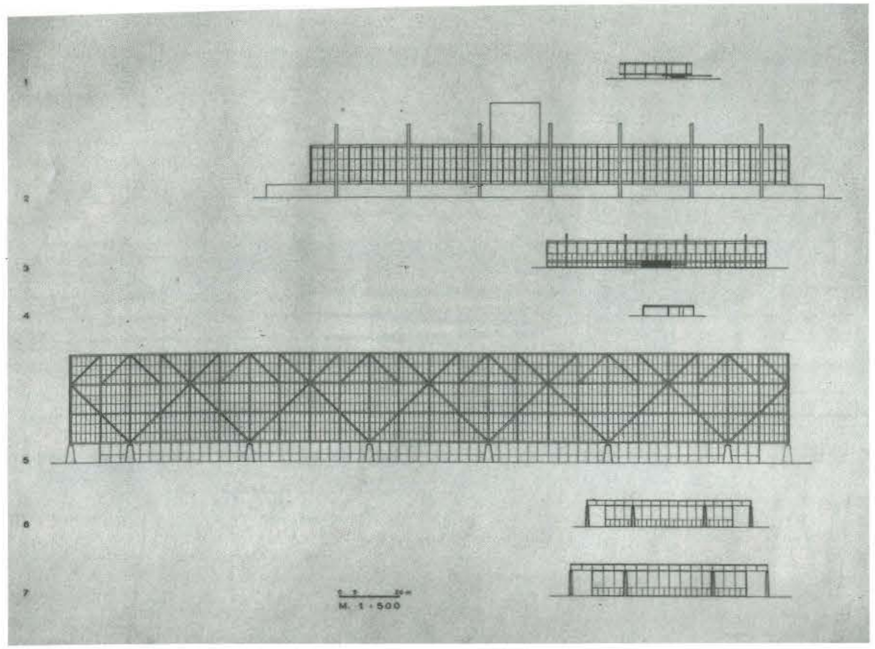
Ornament and its Other



Elevations for seven clear-span buildings drawn to scale: Farnsworth House, Plano; NationalTheater; Manheim S. R. Crown Hall, Chicago; 50 × 50 House; Convention Hall; Bacardi Building, Santiago, Cuba; New National Gallery, Berlin. Produced in the office of Mies van der Rohe, 1969. Digital Image © The Museum of Modern Art/Licensed by SCALA / Art Resource, NY.

A diagram showing the relationship of seven clearspan buildings at different scales: for Mies van der Rohe, a sustained project in maintaining a limited number of spatial models across proportional shifts in scale. As much a project in conservation as in novelty, Mies's manipulation of matter was conducted within the constraints of a classicizing geometry. The problem: how to maintain stable relationships across scales between structural necessity, on the one hand, and a universalizing aesthetic on the other. In fact, as biometricists had already concluded, there can be no simple linear rescaling of geometry in relation to matter.[1] With an increase in scale different structural demands come into play, requiring either a material or geometrical response. Returning to Mies's desire for proportional consistency across scales, let us outline his options when mass, weight, and force change proportion. He can simply deploy larger members and deeper roofs, or he can change materials to increase their loadbearing capacities while holding proportions constant. Universal consistency of proportion requires Mies to generate models along the lines of the latter option, which resist showing obvious structural difference.[2] The resulting work represents a sustained series of delicate successes in maintaining this poise. What are the implications for such work today? How can the modernist model be extended without simply repeating it or updating it with new materials, or even worse, devolving into various forms of mannerism?

Recently my office has been involved, both professionally and pedagogically, in the exploration of just this problem: the consideration of an expanded conception of universal space as a field of ubiquitous difference. Mies's exhaustive treatment of a limited number of models led us to look specifically at his work as a springboard for these explorations. Central to this endeavor is the assumption that there exists a parity between ornament and structure as well as a new understanding of decoration in relationship to spatial typologies. For Mies, decoration occurred in two places: in the infill zones that formed a negative to structure, and in the fetishization of shadow reveals, articulations and meticulous detailing of the structural elements themselves. In seeking to extend his model we sidestep the dialectical process of Mies and instead regard the structural as a subset to the ornamental rather than the other way around. Thus for us, decoration is an effect, an ambient expression of the structure/ornament complex. From this way of working, new forms of material expression flow.

Material Models

We begin with Phyllis Lambert's firsthand account of Mies's use of Gothic and Classical spatial types in his pedagogy and work. Lambert identifies a trajectory in the migration of the two-way grid from the 50 × 50 House to the New National Gallery, to the Convention Center exemplifying a classical/labyrinthine model, and a separate trajectory to the oneway system leading from the Farnsworth house, to Crown Hall to the Manheim Theater exemplifying a Gothic/axial model.[3]

If Mies understood the creation of space as fundamentally the framing of a void, we see space itself as a matter field. Where Mies looked to classical models in his endeavors, we look to material models: the behavior of soap bubbles, the unfolding of crystals in stratified rock under great pressures, or the biological solutions to structural challenges of nature.

Clara Wong illustrates the use of a material model of this type in her adaptation of principles derived from the cellular pattern of structural ribs on the wing of a dragonfly into a new structural skin for the Farnsworth House. Unlike Mies's dialectical separation of structure/infill and structure/ornament, the dragonfly wing, while possessing distinct articulations of structure and surface pattern (ornament) nevertheless develops this relationship in a continuous field of progressive differentiation. Moving from pure structural tubes at the wings' leading edges to a complex pattern of polygons which comprise the wing membrane, intermediate geometries between box tube and polygon ramify and can be deliberately harnessed as patterns for secondary structure.

Classical Constraints

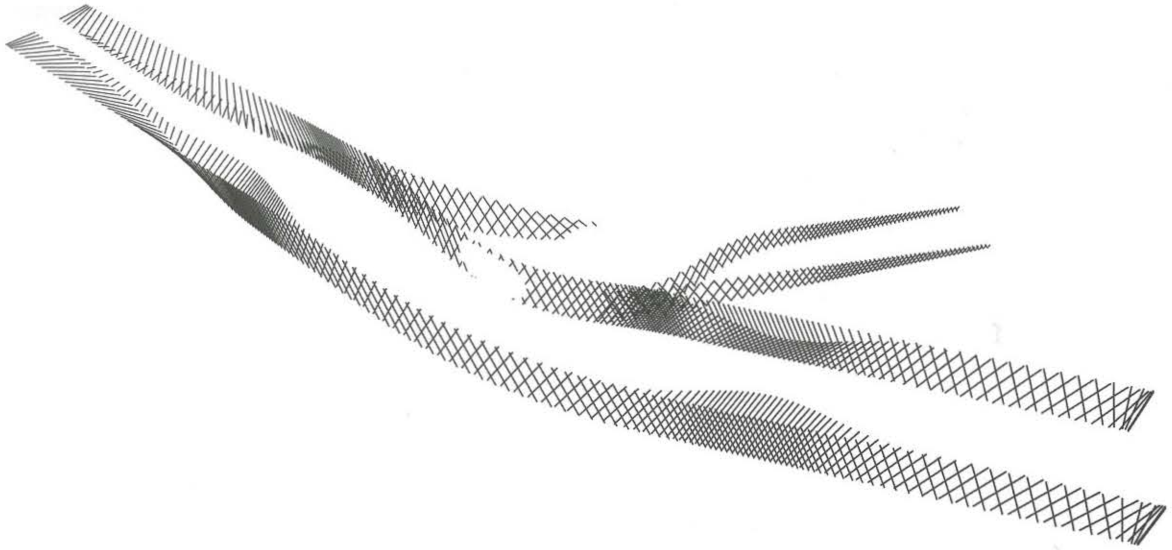
Just as Mies looked to classical constraints in the development of spatial typologies, we accept the constraints of crude typologies (an inexact conception of organization and form: a roughly planar box, a roughly linear edge) as a platform for experimentation in new material models. Students are likewise freed from the necessity of generating something entirely new when working from Mies's projects. The ready-made specificity of the model sets the conditions for novelty to emerge. We find that the virtues of working this way in practice are that programmatic, spatial and structural constraints motivate greater invention. The crude typology, the loose fit between program and space, allows us to focus on properly architectural issues.

For Mies, the classical/modernist spatial model came with built-in constraints: the generative and the constraining dimensions of architecture were indissolubly linked. We see the two as necessarily separate, and therefore bring separate models to them. For the constraining dimension we use the classical/modernist model passively, as what Manuel Delanda calls a "proscriptive constraint:" it tells us not what we can do but what we can't.[4] To the generative dimension we bring more proliferate and expansive material models (with inherent, active constraints). This work aspires to be neither a supplement, an addition, nor a distortion of Mies. Rather it combines two models which, like roots in a flower pot, or like the practice of footbinding, produce something new through the interaction of pressure and constraint.

This interaction, though not strictly of Miesian origin, is illustrated in our design for the Fenqihu Station on the Alsihan Mountain Railroad in central Taiwan. Though the waffle slab is based on the unstructured grids that result from a Voronoi algorithm (at once a geometry and a structural pattern) the station is in fact a box building. All the variations of the unstructured grid, as it accommodates the massive structural piers passing through it, opens or closes to allow lighting conditions for a variety of programs, and deepens or shallows to carry more or less load when necessary, take place within a strictly defined constraint.

Material Expression and the Space of Ubiquitous Difference

Architects deal with a continuous field whether they like it or not: but continuity should not presuppose homogeneity or a lack of differentiation. Crucial to material expression is an understanding of the universal as a space of ubiquitous difference.



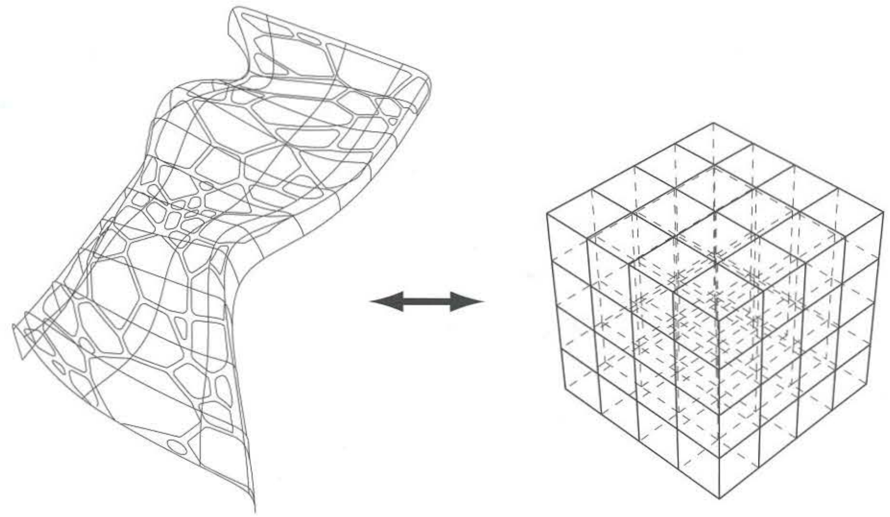
Rod Net Truss forming the structural facade of the Erwanping Station on the Alishan Mountain Railway, Reiser+Umemoto, 2005. Composed of a mesh of approximately 900 steel rods, the truss densifies where stresses are greatest. Clear distinctions between areas of structure and areas of ornament, as in a modernist structure/infill arrangement, are abandoned in favor of a spectrum or range, where densities forming column-like zones of structure transition into areas of ornamental grillwork.

We are not, it is important to note, advocating a mere heterogeneity, which would suggest that the difference is just an accumulation of local accidents of history, materials or anything else. Though this may be (as physicists point out in discrediting the Cartesian paradigm) the way that the universe is constructed, it is important in the context of an architectural project to cast ubiquitous difference in a very specific way: we must avoid the trap of merely illustrating concepts. By deploying ubiquitous difference as an active principle, it both works on the systems of repetition already inherent in architecture and is capable of manifold architectural consequences across the levels of program, structure, and space.

We work with an understanding that this materialist notion of space may be achieved architecturally through either the repetition of identical elements registering difference, or of progressively differentiating elements that are similar. The two forms of difference and their respective effect, are illustrated in projects by Emmet Truxes and Steven Lauritano: Truxes deploys a uniform hexagonal module over a variable trajectory in three dimensions, while Lauritano relies on a fixed trajectory to contain modules of serial variety. Each use of difference draws on a material model which unfolds within a series of constraints and produces its own decorative consequences.

Mies's model relies on the persistence of clear boundaries to represent both structural elements that do the work of moving forces and the infill that they frame. Whether or not these members do, precisely, function in distinguishing the work of statics from everything else is another matter, its architectural manifestation would seek to foreground this distinction. Our new understanding of ubiquitous difference allows us to work with the levels of architecture, with hierarchy, in such a way that it is both globally coherent yet locally differentiated. As a result, the boundaries between structure and infill/ ornament are contingent, not preordained. Indeed what is predominantly structural at one scale, in relation to one context or to serve one program, becomes otherwise when these relationships shift.

We do not reject readings of this work as a new form of expressionism, however, expression itself must be considered beyond its historical connection to subjectivity. It is a material expressionism invested not only in the sensation of materials but in the behavior of matter itself.

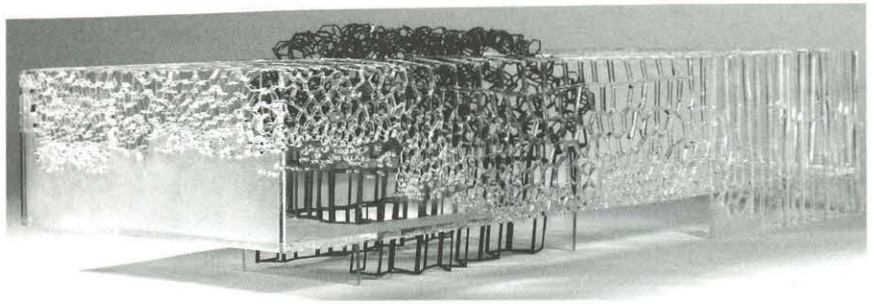


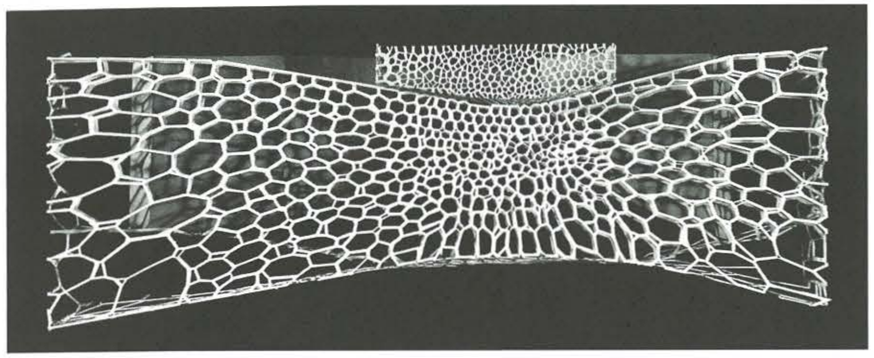
Unstructured Grid vs. Cartesian Space, Reiser+Umemoto. We encourage the development, both in our own work and in the work of students, of an understanding of the universal as a space of ubiquitous difference.

Notes

1. *J.B.S. Haldane illustrates this material concept elegantly in his study of the cross sections of bones. The thigh bone in an average sized man, he explains, could not be linearly rescaled to that of a 60ft. giant and still function. Because the volumetric change exceeds the linear change, the giant's bones would collapse under 10 times more proportional force than the human's. The total weight of the giant, as Haldane describes, would increase by a thousand times, while the cross sections of the bones would increase only by a hundred. The natural economy of means in the animal kingdom responds to scalar variety in kind: "Suppose that a Gazelle, a graceful little creature with long thin legs, is to become large, it will break its bones unless it does one of two things: it may make its legs short and thick, like the rhinoceros, so that every pound of weight has still about the same area of bone to support it. Or it can compress its body and stretch out its legs obliquely to gain stability, like the giraffe." See J.B.S. Haldane, "On Being the Right Size." In James R. Newman.* The World of Mathematics. *New York: Simon and Schuster, 1956. pp. 952–953.*
2. *Phyllis Lambert describes the evolution of these "spatial typologies" across scales. For example, in the Farnsworth House Mies deploys a one-way clear span system, with a beam within the plane of the roof to carry the load between columns. When the model is scaled up to the institutional Crown Hall, the beam emerges from the roof as a plate girder of proportional depth. At the super-scale of the Manheim Theater Proposal, the girder becomes a proportionally taller truss in order to maintain that depth. See Lambert, Phyllis. "Clear Span." In Phyllis Lambert, ed.* Mies in America. *New York: Canadian Center for Architecture and Whitney Museum of American Art: 2001. p. 423.*
3. *Lambert identifies the classical/labyrinthine trajectory as originating in the Barcelona Pavillion, and the Gothic/linear trajectory as originating in the Tugendhat House. See Lambert, Phyllis. "Clear Span." In Phyllis Lambert, ed,* Mies in America. *New York: Canadian Center for Architecture and Whitney Museum of American Art: 2001. pp. 423, 424.*
4. *Delanda, Manuel.* Intensive Science and Virtual Philosophy. *New York: Continuum, 2002. pp. 29–30.*

Jesse Reiser *is Professor of Architecture at Princeton University, and practices with partner Nanako Umemoto, as Reiser+Umemoto RUR Architects PC in New York. The firm's recent work includes a complex of five buildings and a footbridge on two sites on the Alishan Mountain in Taiwan, part of a $12 billion initiative by the Taiwanese government to redevelop the country's most popular tourist locations. The firm's work has been exhibited widely, most recently at 2004 Venice Biennale and the 2004 Beijing Architecture Biennale, and has received numerous awards, including the 1999 Daimler/Chrysler Award for Excellence in Design. Reiser's book,* Atlas of Novel Tectonics *(2006) is available from Princeton Architectural Press.*



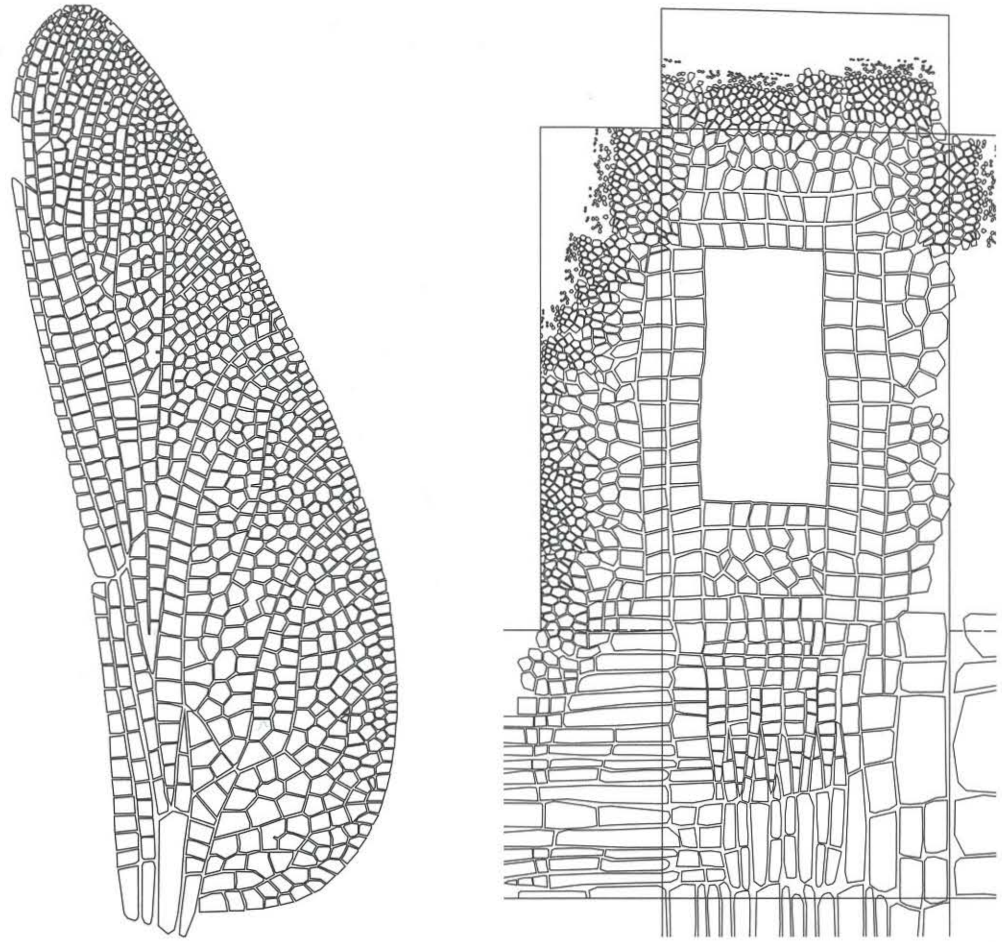


Cellular pattern of a dragonfly wing deployed on the skin of the Farnsworth House, Clara Wong, Princeton University School of Architecture, 2005; Voronoi grid pattern deployed on the skin of the Manheim Theater, Sectional Model, Clara Wong, School of Architecture at Princeton University, 2005.

Ms. Wong explains: The new skin of the Farnsworth House investigates the combination of structure, quasi-structure and ornament, using the box as a constraint and the grid as a material model. By departing and aligning with the grid through branching, as in the dragonfly wing, surface conditions change smoothly to accommodate structure, quasi-structure and ornamental pattern. The change from quadrangular to hexagonal grids and the change in scale accommodate structure and program on the skin. The cells range from big to small, from door to window to surface ornament, while the veins vary from thick to thin, from structure to pattern.

The new skin of the Mannheim Theater is based on the surface geometry of the Voronoi and its interaction with the foreign object of the fly tower. The Voronoi surface functions as both structure and decoration. Whereas its regularity is governed by mathematical principles, its irregularity simultaneously allows change in the density of the pattern. The pattern becomes denser as the surface modules become smaller, increasing the structural strength of the surface.

The Theater needs several layers of skins, from those of audiovisual purposes in the inside, to soundproofing, circulation and structure, to those accommodating other programmatic spaces outside the main Theater hall. The first and second layers of Voronoi skins strengthen each other structurally and create in-between spaces for programs like lobbies. The outer Voronoi skins not only act as a frame supporting the inner skins of the hall, they are also consistent with the surface treatment of the innermost skin. Unlike Mies's use of Cartesian geometry to hide structure and program, the organic shape of the inner hall that arises from programmatic necessities in the new design is visible through the porous outer skins.



From Studies of the Application of the Cellular Pattern of a Dragonfly wing to the Skin of the Farnsworth House, Clara Wong, Princeton University School of Architecture, 2005. The indiscernible boundary between rectilinear structural tubes at the leading edge of the wing and the polygonal geometry of the wing surface forms the logic for an unstructured grid.

Next spread: Voronoi grid waffle slab and bridge piers forming the roof of the Fenqihu Station on the Alishan Mountain Railway, Reiser+Umemoto, 2005. A model in practice for the use of unstructured grids is our deployment of the Voronoi algorithm is a concrete waffle slab forming the roof of a public train station in Taiwan. The grid further gathers around programmatic and structural elements: two immense concrete piers supporting a steel footbridge, a roof access stair, and an interior volume containing a ticketing office and toilets.