Hardbodies

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I. STRETCHER

> "We can also learn from brick. How sensible is this small handy shape, so useful for every purpose! What logic in its bonding, pattern and texture! What richness in the simplest wall surface! But what discipline this material imposes!"
>
> -Mies van der Rohe[1]

We start to build by piling up, relying on the weight of the material alone to hold it in place. We begin with stones, piling one upon the other, carefully selecting pieces that fit together without leaving gaps, later cutting them to assure a tighter fit. We realize that molding clay is easier than cutting stone. We shape the clay into a brick that fits the human hand. Its longest dimension equals the comfortable span of a hand - eight inches. We proportion its dimensions - one-third to one-half to one - so that it combines easily with other bricks in different positions. We temper the material, rendering it more resistant to the deteriorating effects of sun, rain, and wind. Its colors reflect its origins in the earth as well as its transformation by fire.

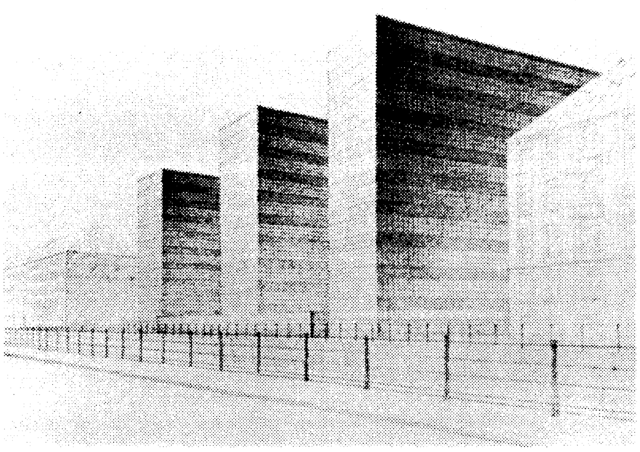

Fig. 1. Reichsbank competition perspective, 1933, Ludwig Mies van der Rohe.

II. ROWLOCK

In 1933 Ludwig Mies van der Rohe participated in a competition for the design of a new Reichsbank building in Berlin. His proposal was the only modern scheme among the six prize winners. It was a modified E-shaped building in plan, with the closed end facing the main street, curving gently to reflect the geometry of the site. The three fingers that ran perpendicular to the main block converged slightly at their ends as a result of the curve. The character of the building is most clearly revealed in the competition perspectives, which show the front and back street elevations. The building appears to emerge directly from the site with only minimal designations of base and top. The extruded quality of the building is emphasized by the cladding, which consists of alternating horizontal bands of brick and glass. While similar brick and glass banding can be found in a number of German industrial buildings of the period, the materials in those projects are always treated as infill within an expressed structural frame. In the design for the Reichsbank Mies created a true curtain wall. The frame is suppressed, allowing the material striations to continue uninterrupted along the walls, around the corners, and around the building. Pulling the frame completely into the building results in a radical new interpretation of its mass. The solid brick spandrels appear to defy the laws of gravity. The building reads as a layer cake of transparent and opaque tiers, with brick supported by glass supported by brick supported by glass—a kind of laminated joint between earth and sky, locking them together where they meet at the horizon line. The Reichsbank design symbolizes a radical transformation in our understanding of buildings and the materials of which they are composed. This transformation is not due simply to the ability of the frame and curtain wall system to make the solid parts of the building appear to float, it is also achieved by Mies' selection of brick as the solid cladding material.

III. HEADER

The essence of building with masonry, stereotomy, lies in the repetitive use of a standard unit. Variations in stereotomic construction are achieved by different combinations of relationships between units, yet they all continue to act the same. When combined the units form walls which react to forces in a monolithic fashion, resisting gravitational loads through compression and environmental forces through mass. Frame construction, tectonics, is characterized by columns and beams which react differently to gravitational forces; columns act in compression while beams act in tension and compression. Each element in tectonic construction is sized according to specific structural and dimensional requirements. The frame is then clad by various materials that respond to different environmental forces. It is a system of articulated parts, each performing a specific task.[2]

The replacement of the masonry bearing wall by the skeletal frame as the dominant structural system of the 20th century may be seen as a triumph of tectonics over stereotomy. As the structural, environmental and economic requirements for buildings has increased dramatically, the superior ability of the skeletal frame and cladding to respond to those requirements has become evident. The demise of the masonry bearing wall can be traced to its evolution from solid wall to cavity wall.[3] Voids in masonry walls were originally devised in order to prevent the penetration of water from outside to inside. These voids allowed the masonry wall to be understood for the first time as a grouping of component parts rather than a monolithic mass. It became a layered system; inside and outside, structure and cladding. As more efficient structural systems were developed the inside structural layer of brick was replaced and the transformation of the tectonic role of brick in architecture was complete.

Brick is now used almost exclusively as the outside cladding of a wall, a curtain backed up by an internal structural wall of concrete blocks, cast-in-place concrete or even a steel frame. As cladding brick still offers some functional advantages; it is extremely durable and requires little maintenance. However brick also has liabilities. It is pervious to moisture, particularly at the joints, and it weighs far more than most other cladding materials.

Nowhere is the schism between actual contemporary building practice and our idealized image of the same more evident. In spite of the fact that the employment of brick as it was originally intended has virtually disappeared, we continue to use it. The predominant reasons for using brick today however are aesthetic or emotional. We use brick because of its color, texture, size, and proportion - and the associations that those physical qualities evoke. Brick has changed from being an extremely rational and pragmatic building material to a romantic and extravagant one.

IV. SOLDIER

Are these reasons enough to use brick in architecture today? Does it have a legitimate role in contemporary building practice? In order to try to answer these questions we can begin by classifying current uses of brick. Using a material-based building taxonomy derived from Gottfried Semper we can divide "brick buildings" into those which use brick as structure and those which use brick as cladding.[4] We can further subdivide the latter category according to the three ways brick cladding is treated: as an imitation of structure, as a representation of structure, or as pure cladding which neither imitates nor represents structure. A final classification of "brick buildings" are those that use materials that only look like brick.

Brick as Structure

Using brick as structure has been made extremely difficult for all of the reasons that originally led to its demise. We can use brick in this way only in situations where its liabilities can be mitigated. Warm and dry climates are more suitable in this regard. In northern climates the issues of insulation from the cold and migration of water through the walls makes the use of brick problematic. In more active seismic zones the difficulty of providing adequate lateral reinforcement for masonry walls virtually precludes their use as structure. We can use brick without compromise in free-standing walls that are not part of a building envelope, or as a paving material where its structural role is diminished, but exemplary uses of brick as structure in modern architecture are rare.

One example of a modern building that employs a monolithic brick structure in a convincing way is St. Peter's Church in Klippan, Sweden, designed by Sigurd Lewerentz and built in 1963. Lewerentz's use of bearing brick is overtly non-traditional. While the solid brick walls carry most of the loads, the roof is partially supported by a paired steel wide-flange column near the center of the building. The roof is composed of shallow brick vaults, but these are only the third layer of structure, after the major roof beams and the steel purlins from which the vaults spring. The window headers consist of recessed steel channels. Despite the use of steel, it is clear that the essence of the building is predicated upon its construction of brick. It comprises all the interior surfaces in the building - ceiling, floor, walls. Its mass is emphasized by the small punched openings through which shafts of light, almost palpable in their presence, penetrate the dark interior.

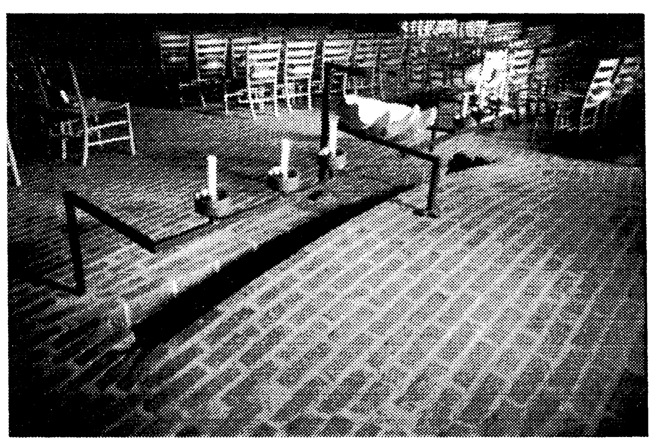

Fig. 2. St. Peter's Church, 1966, Sigurd Lewerentz.

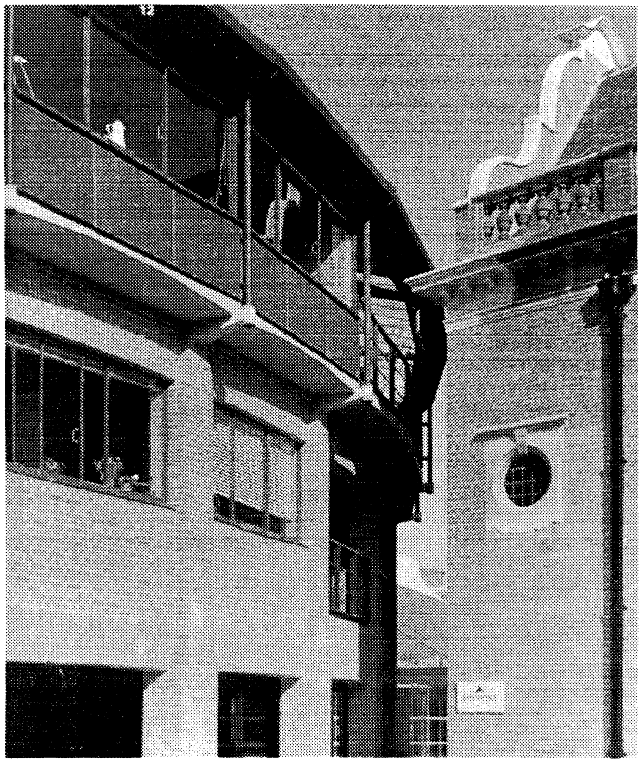

Fig. 3. Glyndebourne Opera House, 1994, Michael Hopkins and Partners.

The mortar joints are flush, not tooled. No brick is cut to accommodate the half-module spaces that are common in running bond walls - the gaps are simply left open or filled with extra mortar. Brick is fundamental to the character of the building; replacing it with any other material would radically transform it.

In a series of recent building projects in England, Michael Hopkins and Partners have explored the use of structural brick walls and piers to support both precast concrete floors and wood/steel trussed roofs. The most notable example is the Glyndebourne Opera House, completed in 1994. Like St. Peter's Church, the brick structural walls are supplemented at Glyndebourne by additional internal structure; the building relies upon a ring of interior concrete columns to support some of the floor loads. Hopkins allows the brick in the walls to do more of the structural work than Lewerentz did; for instance, he uses traditional flat brick arches to span the window openings. There is however a critical conceptual difference in the use of brick that separates Glyndebourne from St. Peter's. At Glyndebourne the primary reason for using brick is really a contextual one; it is adjacent to a red brick Neo-Elizabethan manor house. The use of brick in the new building allows the two structures to coexist peacefully in spite of the bulk of the Opera House. Having built a reputation upon the honest use of building materials, Hopkins felt compelled to find an appropriate role for this traditionally structural material. The fact that he has succeeded in a convincing fashion does not fully justify the use of structural means to achieve primarily scenographic ends.[5] In this case, unlike St. Peter's, the essential order of construction in the building would not be significantly compromised by the substitution of a more efficient and economical material.

Brick Imitating Structure

In architecture, each generation must relearn the lessons of its predecessor. Architecture's recent encounter with historical nostalgia has left in its wake a profound confusion about the appropriate use of materials, an understanding that was much clearer a generation ago. A prime example of this malaise can be seen in current uses of brick as cladding.

There is a persistent desire today to treat a brick wall the way it "wants" to be, even though it isn't doing what it "wants" to do. Many architects feel that a brick wall should look like a bearing wall, regardless of the fact that it is most likely hung from hidden structure, and they go to great lengths in order to create this illusion. The locus of most of their efforts is at door and window penetrations. In order to imitate structural authenticity, these penetrations are kept relatively small and vertically-proportioned—"punched" openings topped by simulated headers. The headers may take the form brick arches, stone lintels, or brick soldier courses. Occasionally, the need to provide visual support for the mass above a window is resolved in the window frame itself, by making it much wider at the head. The fact that these "virtual" headers often do not extend into the walls on either side of the openings only emphasizes their purely symbolic nature. Ultimately these attempts to disguise the current reality of architectural construction with an imaginary ideal seem futile and reactionary. They prevent us from understanding a building's conception and construction in the present by donning a mask that evokes images of a romanticized past.

Brick Representing Structure

In his influential essay, "Structure, Construction and Tectonics," Eduard Sekler argues that materials can legitimately be used for the sake of tectonic expressiveness.[6] He illustrates the representational role materials can assume with examples of the wide-flange steel "columns" that Mies van der Rohe frequently applied to a building's exterior in order to reveal the true structural frame behind, hidden under a fire-protecting jacket of concrete. Brick is often used in a similar fashion, providing a skin to cover an actual bearing wall of cast-in-place, pre-cast or block concrete. The primary purpose for using brick in these cases is to create a surface that is more sympathetic contextually, more appropriate in scale, or more pleasing to the senses than the structural wall behind.

Sekler emphasizes that when using material in a representational manner there should be no confusion between real and symbolic structure. In Mies' buildings, the applied columns always terminate before reaching the ground. The representational role of brick cladding can be revealed in a

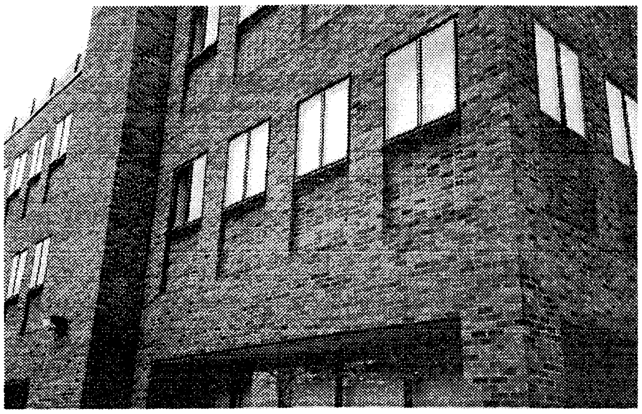

Fig. 4. Benson Hall, University of Washington.

number of ways. It may be pulled back at the edges of openings to expose the true structural wall behind. It may be laid in stacked bond rather than the running bond which is more traditionally associated with bearing walls. The vertical and horizontal mastic-filled control joints, a ubiquitous feature of modern brick cladding, may also be emphasized.

Many who recognize the dilemma of employing an older building material as part of a modern construction system believe that treating brick in a representational way is the most "honest" way to deal with the disjuncture. In fact it is probably the most compromised. It recognizes neither direct but often disquieting treatment of brick as pure cladding, nor the complete material deception of an imitative approach. Efforts to make brick walls that reveal their true nature in subtle ways remain in a tectonic twilight zone, pretending to be brick walls to the casual observer while slyly revealing their true nature to the cognoscenti.

Brick as Cladding

In both of the preceding modes of using brick as cladding it is treated in a symbolic way. It stands for something else. It tries either to imitate the real brick structures of an earlier time, or to represent the true structural systems that it covers. If brick is to be used in modern construction as a cladding material why not fully express that use? The deliberate expression of brick as a curtain wall may indeed be the most structurally honest way to use brick today. It was clear to Mies that brick could be used as cladding without making any pretenses about its structural lineage. The irony of suspending this most earth-like of materials in mid-air with no apparent support was very likely the reason he selected brick for the Reichsbank proposal in the first place. Whether he was throwing a brick at the image of solidity so sacred to this powerful German institution, or simply demonstrating a radical redefinition of materials inherent in the new architectural order - it seems clear that Mies' use of brick was intended to provoke. In a similar way the motives for floating bricks in the air today must be rooted in provocation, subversion, or cynicism. Apart from ignorance there can be no other reason for undermining the fundamental nature of brick.

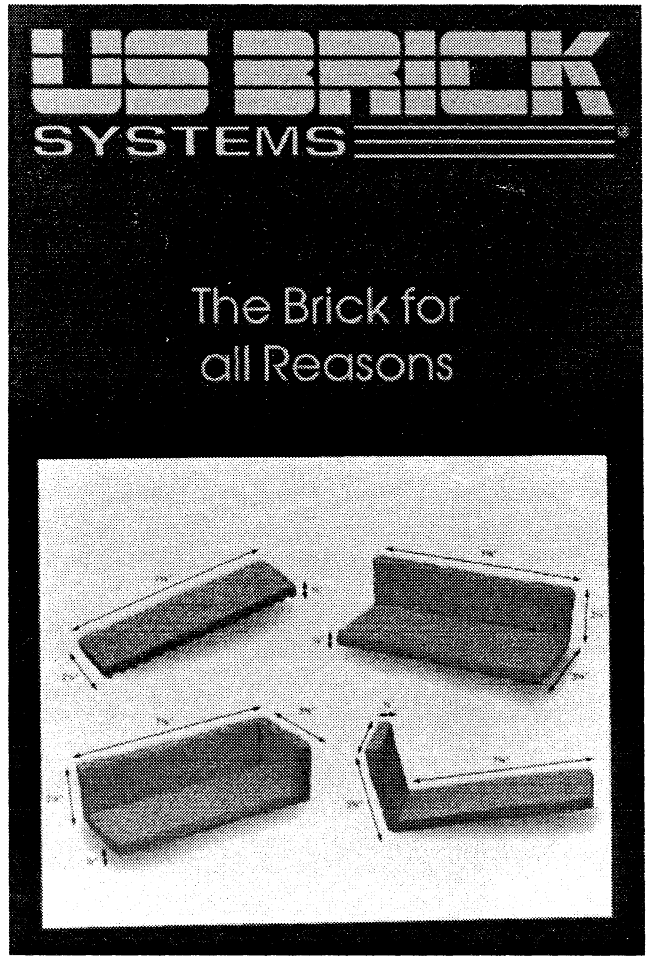

Fig. 5. The Brick for all Reasons

Like a Brick

Once we are willing to accept the use of brick as cladding, no matter how it is treated, is there any reason to use real bricks at all? There are numerous fired-clay cladding products on the market that are designed to look like brick. Some are simply clay tiles that have the same proportions as the face of a brick.

Others are panelized systems which save a tremendous amount of labor in installation. One particular manufacturer of brick-like tile boasts of the relatively light weight of their product by using an illustration of a "brick"-clad motorboat with the company name emblazoned across the stern in "bricks" of contrasting color. Why are we so repelled by this ersatz representation of brick when we are so ready to accept the non-structural use of real brick itself?

V. SAILOR

"If we feel compelled to make the intellectual distinction between the tectonic and formal ingredients of our compositional ways, we ought to see the role of tectonics as being part of those other formal ingredients. That its peculiarities be used in a highly expressionistic way or quietly subdued to other impulses is a matter to be defined by the overall compositional strategy. But it is within that greater plan that tectonics has its highest task."

-Carles Valhonrat[7]

There is genuine danger in the pursuit of an architecture that is based entirely upon its material manifestations. Integrity in the use of materials and the derivation of architectural form from systems of assembly is surely more than a side show in the architectural circus, but neither is it the main event. We continue to build with brick because we like it. It has become a part of our cultural genetic code. We know its color, its texture, its size, its mass, its strength, its warmth in the sun, its coolness in the shade. We feel secure in its embrace. How are we to reconcile those familiar and comforting associations with the economic, structural and environmental dictates which would preclude its use in the way it was originally intended?

One possibility lies in the use of materials that possess some of the physical, visual and tactile qualities of brick with which we are so attuned, without imitating brick itself. Cladding systems that use clay or stone tiles are one way to evoke the non-structural qualities of masonry that we seek. Tiles provide all of the physical and performance advantages of their structural counterparts without the added weight; and they can be sized, proportioned, and placed in ways that prevent them from being mistaken as a structural material. Examples of the use of non-structural tile as cladding are numerous. Alvar Aalto used glazed clay tiles as the exterior skin of many of his civic buildings to create the level of protection, texture, color, and scale he felt appropriate, without resorting to the use of a bearing material.

Josep Luis Mateo's use of thin stone tiles mounted on a steel frame substructure and clearly hung from the sides of the courthouse in Badalona, Spain, is another example of using a material chosen for contextual and symbolic reasons in a non-traditional way.

Stone is used because it fits in with the surrounding buildings and because it conveys the sense of permanence,

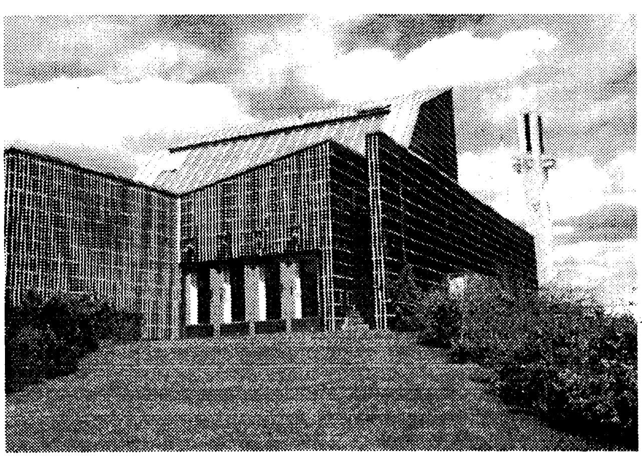

Fig. 6. Seinajoki Town Hall, 1958, Alvar Aalto.

Fig. 7. Courthouse in Badalona, Spain, 1986, Josep Luis Mateo.

durability, and stability that is necessary for this important civic building. The form of the material however, and the way it is treated leaves little doubt about its use as cladding. The Renzo Piano Building Workshop has long been experimenting with cladding systems consisting of extruded clay tiles set in an exposed steel frame. In a series of residential structures built in Paris in 1988, Piano uses such a system to provide a weather screen for the buildings while maintaining a strong contextual relationship to their brick-clad neighbors. He has continued to develop this cladding system in a mixed-use project built in Lyons in 1995.

VI. SHINER

There is extraordinary power that resides in simple building materials. Learning to use that power, and not abuse it, is one task of the architect. In designing buildings we constantly

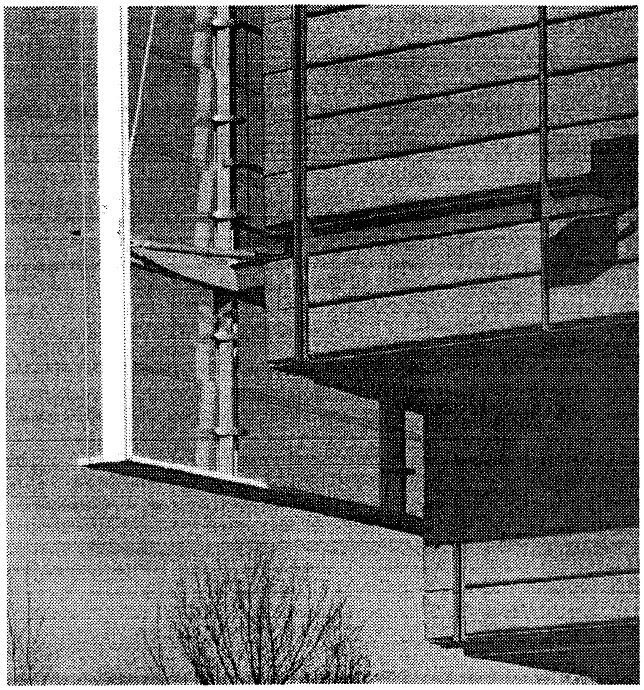

Fig. 8. Mixed-use Building, Lyons, France, 1995, The Renzo Piano Building Workshop.

struggle to reconcile reason with desire. As we seek logical justification for our instinctive impulses we must be prepared to accept disturbing results. In determining proper uses for brick in current practice, we may be forced to conclude that there are few—if any. There are serious difficulties with its use as a structural material, and the appropriateness of using traditional bricks as cladding is questionable. Brick can still be considered an suitable paving material, and it remains the projectile of choice for those who wish to exploit its destructive potential. If we are forced to conclude that brick is no longer an appropriate material for use as either actual or symbolic structure, there will always be two uses that remain - you can walk on it - or you can throw it.

NOTES

[1] from Mies van der Rohe's 1938 inaugural address as director of architecture at Armour Institute of Technology. Philip Johnson, Mies van der Rohe, Third Edition (New York: The Museum of Modern Art 1978), 198.

[2] This interpretation of the essential characteristics of stereotomy and tectonics as defined by Gottfried Semper can be found in numerous contemporary sources. One of the clearer explanations of these concepts is made by Kenneth Frampton in "Rappel à l'ordre: the Case for the Tectonic." *New Architecture: The New Moderns & Super Moderns* (London: Architectural Design 1993).

[3] Jonathan Ochshorn, "On the Disappearance of Monolithic Walls: Meditations on a Brick," *Making Environments: Technology and Design*, Proceedings of the 10th Annual ACSA Technology Conference, (Association of Collegiate Schools of Architecture, 1992).

[4] The fact that we commonly identify any structure clad in brick as a "brick building" seems to support Semper's assertions of the primacy of cladding over structure. Wolfgang Herrmann, Gottfried Semper: *In Search of Architecture* (Cambridge, MA: The MIT Press 1984).

[5] For a further discussion of the scenographic in architecture see Frampton, *Rappel à l'ordre: the Case for the Tectonic*".

[6] Gyorgy Kepes, *Structure in Art in Science* (New York: G. Braziller, 1965).

[7] "Tectonics Considered: Between the Presence and Absence of Artifice", *Perspecta* 24, The Yale Architectural Journal, 1989.