CHAPTER THREE

Beams & Slabs

... The key to the whole was the gerberette [beam]. After all, a column is a column: a hollow round pole to carry the load. And a tie is easily found; it became a solid round bar. No, the gerberette was the thing. ... [W]hat shape should it take? The forces and loads in the piece – I like the word piece, it makes me feel like an artist when I use it – were the principal determinants of its shape: slender at the tension tie end where the load is applied, deep and strong over the column where the load and moment reach a maximum, and slender again at the point of pick up of the [trussed] beam. The development of form and the interactive nature of the design were complex. ...

Peter Rice *(in reference to Pompidou Center)*

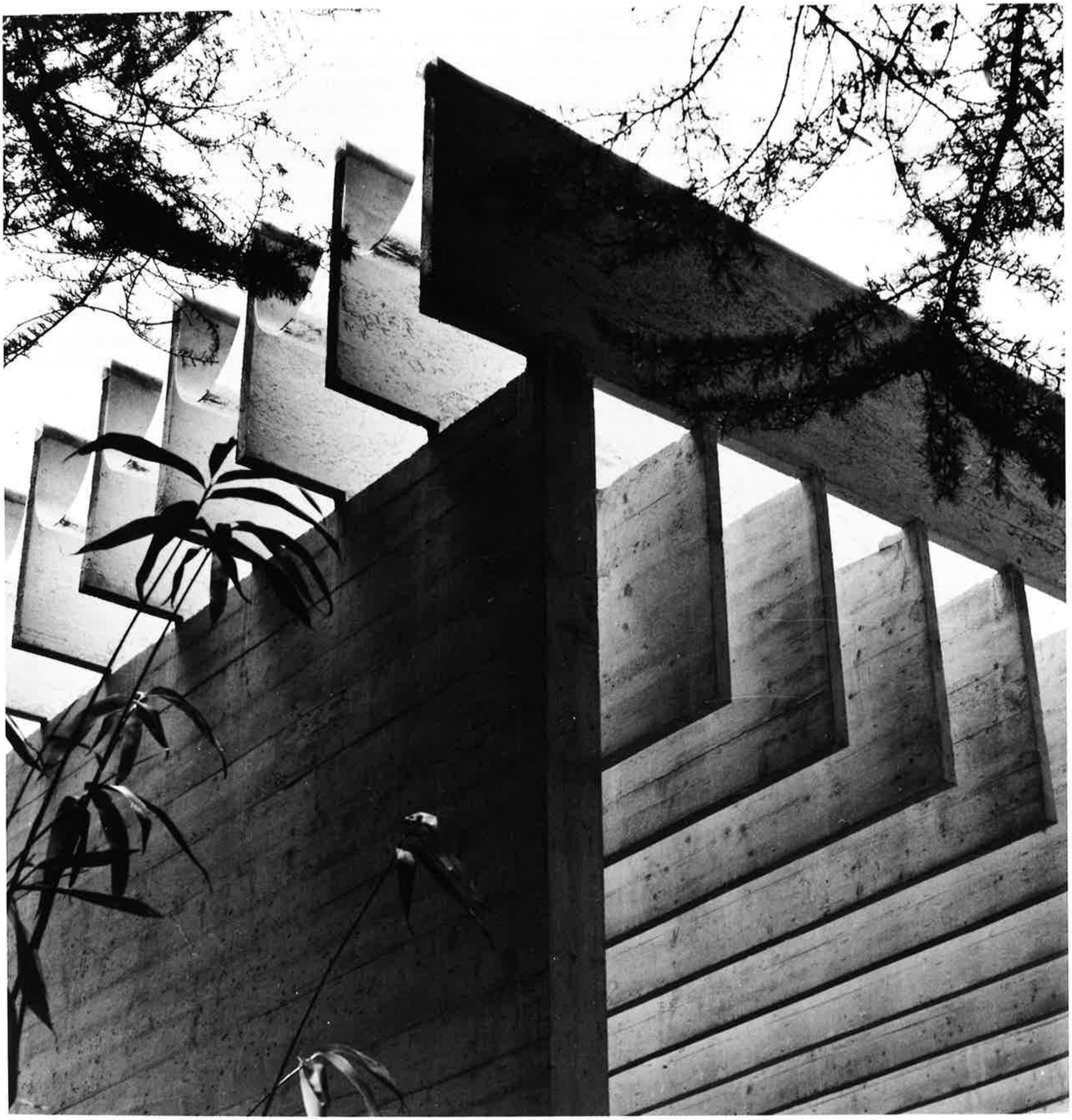


Photo: Teigens Fotoatelier / DEXTRA Photo

Beams largely define Sverre Fehn's Nordic Pavilion in Venice. The two-layered, two-way orthogonal grid of exceptionally tall, thin and closely spaced reinforced concrete beams is certainly distinctive. Common experience and basic knowledge of bending-stress-calculation formulas dictate such a vertical orientation of the beams; their seeming exaggeration here emphatically drives home the point (there are other reasons for these proportions, as is discussed below). Likewise the advantages of an orthogonal beam grid are generally understood in terms of being better able to span space in column-free fashion, while limiting the depth of beams necessary to accomplish the task. Even so, the manner in which the beam grid is here accomplished is sublime, notwithstanding that many beams are on full display; indeed, it is because of this. The Scandinavian art exhibition program and the very particular light-quality design objectives associated with this, combined with a commitment to preserving any trees that previously existed on the site are both determining factors in establishing the unique grid system for the roof. Further reinforcing Fehn's mastery of and reliance on the beam for this project, a level of subtle detailing and "play" with the beam elements of the grid confounds initial expectations; also, and in contrast to such refinements, the robust edge support beams allow the interior space to be completely opened up to the outside by means of two fully glazed walls. In an exclamation point to the whole beam ensemble, one of the edge beams is forked into Y-configuration so as to preserve – and highlight – the largest tree on the site. At the Nordic Pavilion, the beam enables all.

Nordic Pavilion – An Illuminating Beam Matrix

from *On Span and Space: Exploring Structures in Architecture*
Bjørn Normann Sandaker

... 'Building a museum for the visual arts', Fehn says, 'is the story of the struggle with light.' [1]

The Nordic Pavilion is essentially a room of about 470 m^2 for displaying different kinds of art works. The room is without any intermediate support. On two adjacent sides there are concrete walls closing off a more or less square plan, while the other two permit an almost invisible transition between the interior and the exterior. This is achieved by sliding floor-to-ceiling glazing. This openness visually brings the surrounding park inside the building, the only element pointing out the boundary being the floor covering of slate tiles.

... one of the basic ideas of the roof structure design is to protect ... paintings from direct sunlight. This is done by devising a structure of two orthogonal layers, consisting of narrowly spaced, thin concrete girders that create an atmosphere of diffused light that recalls the light of 'the shadowless world of the Nordic countries'.[2] The art works are thus exhibited in an environment of light supposed to resemble that of the countries in which they were made. To keep as much of the intensity of the light as possible, the concrete is cast in a mixture of white cement, white sand and crushed white marble. The girders follow a structural module of 523 mm (an ancient Egyptian module, according to Fehn), while their height and thickness are 1000 by 60 mm. These figures relate exactly to the trajectory of the sun at the Venetian summer solstice (64 degrees), and ensure the blocking out of direct light. The span of the bottom layer girders is about 18 m, not counting the 4+ m cantilevering part. In between the upper layer of girders are hung translucent gutters of glass-fibre-reinforced plastic sheets.

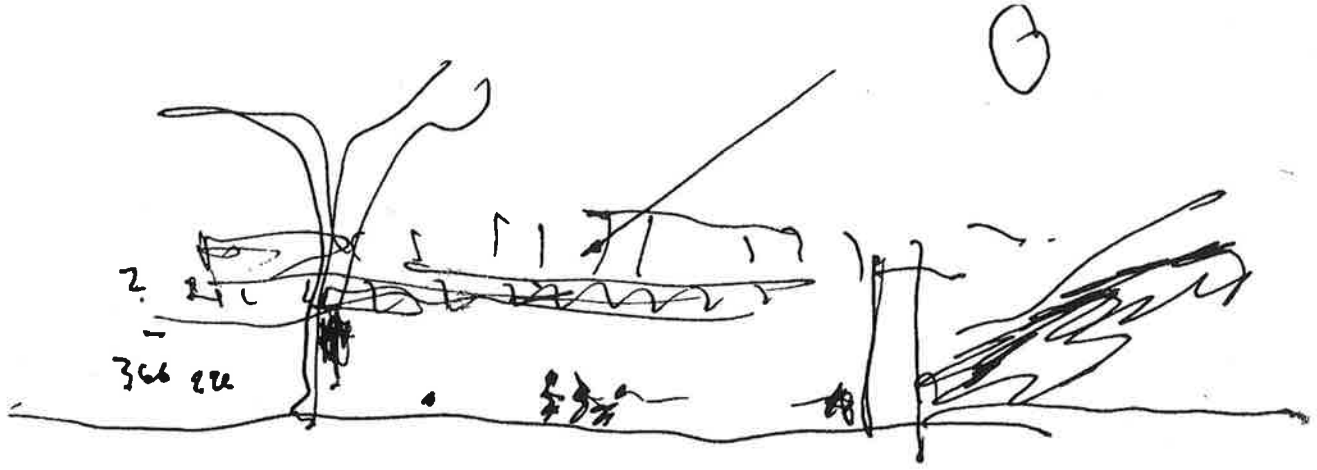
The quality of the light is thus the key to our aesthetic appreciation of the structure. The spacing, heights and remarkably small thicknesses of the girders derive from the manipulation of the light. If such a conception escapes us, we will experience the structure differently; if mechanical constraints alone were decisive, the proportions and the structural module will not seem appropriate in relation to the span and the choice of material. We will wonder why a primary tier of girders is as narrowly spaced as the secondary tier of purlins. If we conceive the roof structure as a two-way grid of beams, we will question why the grid is made by placing one layer of beams or girders on top of the other (making a total structural height of 2 m). This would be a quite unusual solution when seeking two-way structural action, especially when constructing in reinforced concrete.

There are, then, different possible interpretations as well as a number of different perceptions, but not all of them induce an experience of intellectual coherence or appropriateness. A grasp of the relevant concept when experiencing structures (as well as other objects of aesthetic interest) is very important. In this case, the idea of the control of light very nearly (but not entirely) dominates the concept and hence the experience. Another factor informing the choice of structure and determining how that choice is experienced was the

need to protect the trees on the site from being cut down, trees that are part of the only park in Venice. The highly appropriate two-way beam system controlling the interior light also seems right and fitting for making room for the trees. The trees actually penetrate the roof level by way of openings in the structure; this is made possible by the two-way structural action. From a mechanical, load-bearing point of view, then, the openings for the trees legitimate the structural system to a certain degree, although that particular two-layered form is not necessary for achieving this. Hence a richness of aesthetic experiences is possible because different ways of seeing sometimes harmonise and strengthen the feeling of appropriateness; sometimes they clash and make us wonder. Ambiguity – when a structure looks right from one point of view and strange from another – reveals the complexity of the work and thus contributes to our intellectual enjoyment.

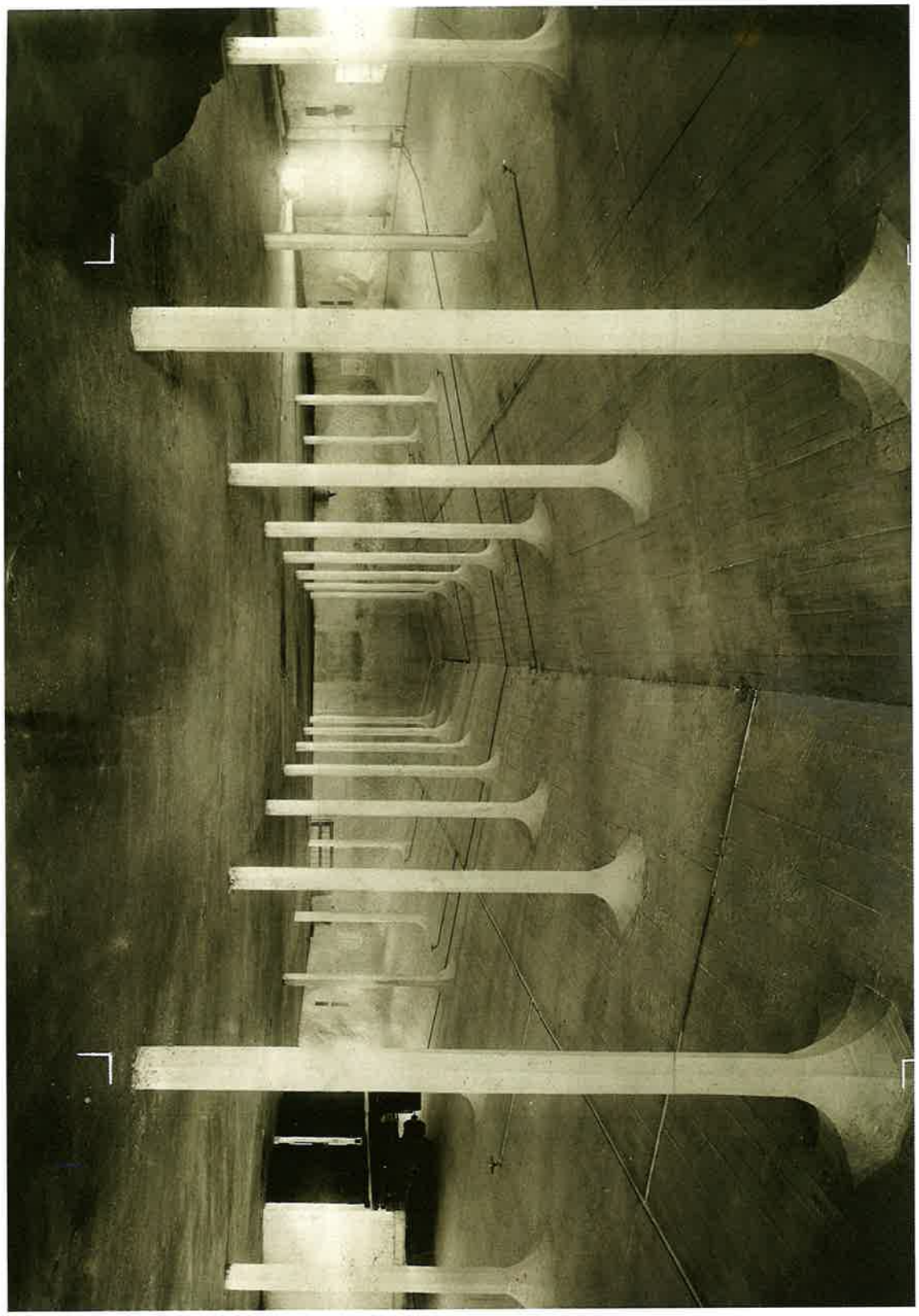
The real highlight of our aesthetic attention is the areas around the openings. Here the experience of the structure and the light reaches a particular intensity, where the diffused light reflected by the surfaces of the girders mingles with the direct light that reaches us through the openings for the trees. These areas are 'packed' with perceptual tension related to the different possible ways of seeing the load path of the structure: the lower tier of girders (generally experienced as supporting the tier above) is in some places abruptly cut off to give room for the trees. Seemingly without support, the girders read as hovering in the air. We can enjoy the fascination of choosing between ways of seeing: lower tier as supporting, or lower tier as suspended from above. The two ends of the girders in question introduce additional ambiguity because they are very differently designed, with the opposite end from the openings firmly underpinned. Even if we know that the orthogonally-directed upper girders relieve the cut-off lower ones in these areas by 'pulling' the load upwards, a support from underneath is definitely easier to grasp perceptually than a device for suspending them from above.

The Nordic Pavilion by Sverre Fehn shows with great clarity the value of considering structures not merely as mechanical assemblages but also, as in the present case, as architectural compositions that affect natural light and thus qualitatively influence our experience of the structure and the architectural work as a whole. In a wider perspective, the discussion concerns the relationship between architectural tectonics and the corresponding architectural spaces, and our experience of enjoyment when confronted by both. Kenneth Frampton understands this relationship when he says of the Pavilion that 'the architectonic form of the structure was once more to reinforce the spatial system'.[3]



Sverre Fehn sketch by permission of Prof. Per Olaf Fjeld

Photo: Ferruzzi, 1962 by courtesy of the National Museum of Art, Architecture and Design, Norway



Warehouse in St. Petersburg by Maillart & Co., 1912

Material innovations are frequently first incorporated into building structures in the familiar forms associated with the construction technologies that pre-date them; i.e., it takes some time for the implications of new developments to be realized, for conventional structural forms to evolve and for the often unfamiliar aesthetic results to be accepted by society. Reinforced concrete was no exception, including for the familiar slab-on-beam hierarchy of typical floor and roof construction. But at a certain point the structural possibilities and visual implications that result from the hidden steel reinforcing bars emerged, such that the beams themselves could effectively become hidden within a flat slab of uniform thickness – something that proved revolutionary not only in terms of built form but also of spatial reading and conceptual underpinning.

A century ago, the Swiss structural engineer Robert Maillart was at the forefront of such developments with his innovative designs for arched bridges and warehouse buildings alike. To this day images of his projects remain remarkably compelling; e.g., here of the St. Petersburg warehouse, left, as well as of the Schwandbach Bridge on the next page. The short text extract reprinted below is from the seminal book *Space, Time and Architecture: The Growth of a New Tradition*, written by the architectural historian and critic Sigfried Giedion; in it he focuses on the development of Maillart's work with concrete slabs through several projects. Furthermore, and in quintessential fashion, Giedion establishes a cultural context for these experiments in built form by drawing parallels between the slabs' articulated, geometric shapes and the simultaneous emergence of planar surface representations within Modern art.

Maillart Minimalism: The Flat Slab Emerges

from *Space, Time and Architecture: The Growth of a New Tradition*
Sigfried Giedion

... the methods of science and the methods of art came unconsciously to parallel each other about 1908. Among other more spectacular instances, ... construction and painting arrived at similar basic elements in their search for solutions to problems that had not previously been attempted. With the bridges of the Swiss engineer Robert Maillart we are brought ... to this topic. They offer us the chance to compare these basic elements and to investigate the way in which the aesthetic effect produced by a new type of construction arises.[1]

Those whose aesthetic sense has been formed or developed by the art of the present age can hardly fail to be stirred by Maillart's bridges, for their appearance may be trusted to arrest such observers before they can even ask themselves why. Maillart's surprising designs, which attract some as much as they repel others,[2] are the product of the uncompromising application of a new method of construction. They have almost as little in common with the solid arches, stout piers, and monumentally emphasized abutments of the usual "massive" type of bridge as an airplane has with a mail coach.

What, then, is the peculiarity of Maillart's methods of building?

In the early days of reinforced concrete the same methods of construction were used as were employed with timber and iron. Timber, being the trunks of trees, has length, just as iron has when rolled into long girders. One dimension always dominates, which is the one that transmits the load. As Maillart himself puts it: "The engineer was so accustomed to using those basic materials which provide only one-dimensional support that they became second nature to him, and restrained him from exploiting other possibilities. This was the state of affairs when reinforced concrete was introduced, and at first no change ensued."

Maillart was a pupil of Hennebique;[3] and Hennebique's reinforced concrete structures had beams and columns like timber-framed buildings. Following the model of timber construction, his beams reached from wall to wall and from column to column, the roof stretching across them in the form of a flat, inert slab.

In designing a bridge Maillart began by eliminating all that was nonfunctional; thus everything that remained was an immediate part of the structure. He hid this by improving the reinforced concrete slab until he had turned it into a new structural element. What Maillart achieved after that was based on one idea: that it is possible to reinforce a flat or curved concrete slab in such a manner as to dispense with the need for beams in flooring or solid arches in bridges. It is very difficult to determine the forces present in slabs of this nature by calculation alone. To obtain positive results entails a complicated process which cannot be entered into here, except to say that it is based partly on calculation and partly on experiment. The engineer's adoption of systems incapable of exact calculation is typical of the present day (as in shell concrete structures) and contrasts with the absolute, checked and proven calculations typical of Maillart's period.

Slabs had hitherto played a neutral or passive part in construction. Maillart transformed them into active bearing surfaces capable of absorbing all forms of stress, and he subsequently developed this principle into a comprehensive system of support able to be employed for tasks previously considered impossible for reinforced concrete. Whether engaged in perfecting a new form of flooring or in striking out new principles in bridge construction, he has always adhered to the same basic method of using reinforced concrete slabs as active structural elements.

Maillart's experiments with beamless flooring date from 1908. He treated a floor as a concrete slab, converting it into an actively coöperative structural member by distributing the reinforcement throughout its whole area. Since every part of the surface now became self-supporting, beams disappeared, their function being resolved into the floor itself. The heavier the load this homogeneous type of flooring is called upon to bear, the greater the practical inducement to adopt it. Consequently it is usually found in warehouses, factories, and other large, many-storied buildings.

The appearance of the branching columns which support this type of flooring somewhat recalls certain traditional styles, for in the basements of warehouses they resemble the heavy pillars of a Romanesque crypt and in the upper stories they suggest the slender palmlike columns of late Gothic. In point of fact, however, mushroom-headed columns have nothing beyond these superficial resemblances in common with either, since the peculiarity of the system resides neither in the formation of the shafts nor in the extruded corbeling of the capitals that crown them, but wholly in forces in the ceiling above, which do not meet the eye.

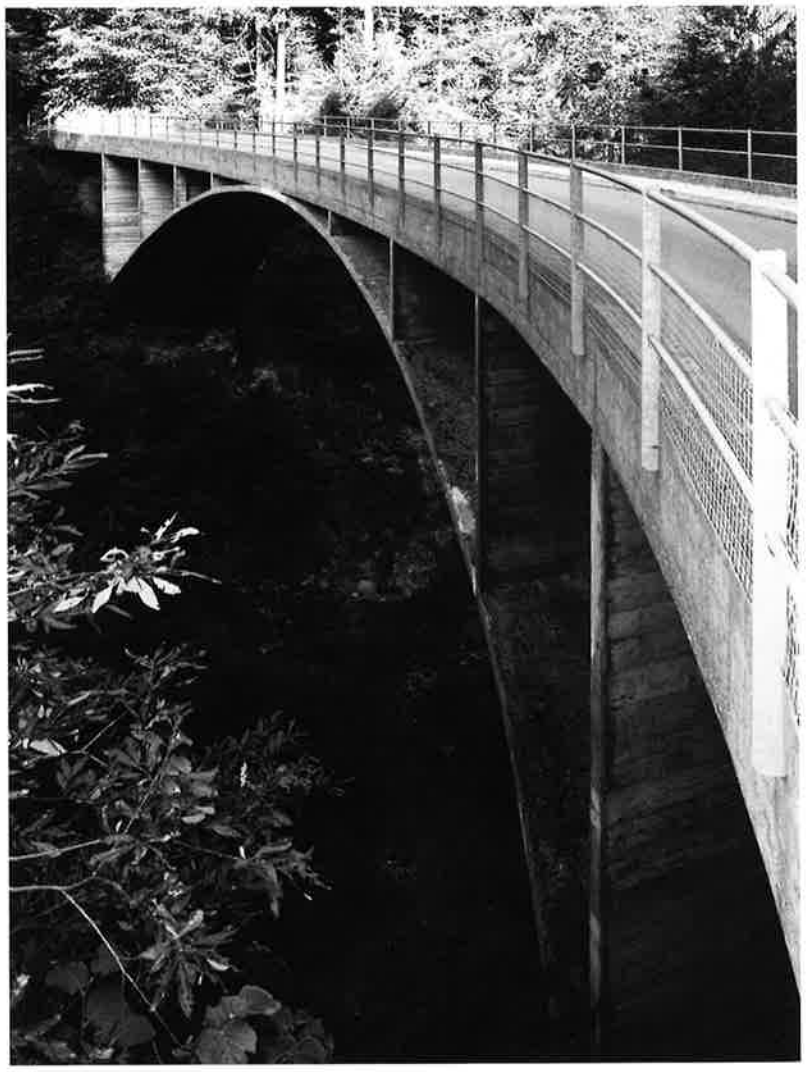
As floors of this type provide a uniform bearing surface throughout their length and breadth, their ends can be cantilevered out to carry supplementary loads. They are therefore ideal in combination with nonsupporting walls, such as continuous expanses of horizontal fenestration. It is hard to realize this in the obscurity of a warehouse, for the latent possibilities of mushroom slab construction can only find architectural vindication in buildings which are flooded with the light of day from all sides. [4] ...

Maillart had embodied this principle in a bridge as early as 1900; and in that over the Tavanasa (1905) he dared to strip his construction of all disguise. The Tavanasa bridge (span, 51 m.) represented a wholly unprecedented form, for in it Maillart discarded massive beams just as he was also shortly to eliminate the beams from floors. Instead, he employed a shallow, curved, reinforced concrete slab for the arch, which, with the horizontal slab of the platform and a series of stiffened vertical slabs used as ties to articulate them, constituted a monolith.

Thus Maillart resolved bridge-building into a system of flat and curved slabs so juxtaposed as to achieve a positively uncanny counterbalance of all stresses and strains arising between them. The first realization of a stiffened elliptical concrete bridge with an arch of eggshell thickness (his Valtschiel-Brücke) followed in 1925.

The elimination of all nonfunctional members has led Maillart during the last few years to dispense with the usual separate decking slab. In these later bridges trains and motor cars run directly upon their naked structural framework: that is to say, on the longitudinal slab of the platform itself.

In Maillart's hands the rigidity of the slab, hitherto an incalculable factor in construction, became an active bearing surface, which... opened up possibilities that had remained a closed book for reinforced concrete engineering. Thus the torsional strains that would have to be allowed for in a concrete bridge built on a curving alignment had previously been deemed to defy calculation.[5] Maillart's Schwandbach-Brücke in the Canton of Berne, opened in 1933, is the most beautiful example of a road bridge carried out in that material with a sickle-shaped platform. ...



Schwandbach Bridge by Robert Maillart. Photo: © Chriusha/Xpronna Media

... one or two striking features of Maillart's bridges may be touched on without entering into the technique of his structural methods:

One of the problems in art in which research has not yet made much headway is the relation between sculpture and nature—and, beyond this, the interrelations between sculpture, painting, and architecture. It is easier for the constructor to find a convincing solution than the artist, because physical factors (like the width of the interval to be spanned, the nature of the foundations, etc.) dictate its conditions. All the same, there is something altogether out of the ordinary in the way Maillart succeeds both in expressing and in sublimating the breadth of a chasm cleft between two walls of rock (i.e., in his Salginatobel-Brücke, 1929-30). His shapely bridges spring out of shapeless crags with the serene inevitability of Greek temples. The lithe, elastic resilience with which they leap their chasms, the attenuation of their dimensions, merges into the coördinated rhythms of arch, platform, and the upended slabs between them.

A bridge designed of slabs of various shapes no longer resembles the ordinary kind of bridge either in its form or in its proportions. To eyes that are blind to the vision of our own day, slanting columns with grotesquely splayed-out heads, like those of the approach viaducts of the Thur bridge—a form imposed by purely structural considerations that enabled Maillart to make two columns do the work of four—are bound to appear somewhat ugly; whereas eyes schooled by contemporary art recognize in these shapes an echo of those with which modern painting has already familiarized them.[6]

When Picasso paints half-geometric, half-organic plastic images on canvas—forms which in spite of their apparently capricious projection somehow achieve a singular degree of equipoise—and the constructor (proceeding from purely technical premises) arrives at similar absolute forms by substituting two vertical supports for four, there is a clear inference that mechanical shapes and the shapes evolved by art as the mirror of a higher reality rank *pari passu* in terms of development.

It is, of course, easy enough to retort that this is simply the result of chance, and that such resemblances are purely superficial. But we cannot afford to leave the matter there, for what concerns us is the question which must serve as our point of departure: Are the methods which underlie the artist's work related to those of the modern structural engineer? Is there in fact a direct affinity between the principles now current in painting and construction?

We know the great importance which *surface* has acquired in the composition of a picture, and the long road that had to be traversed—starting with Manet's light-fusion of paint, advancing by way of Cézanne's flat coloration and the work of Matisse, and ending with cubism—before this was finally recognized.

Surface, which was formerly held to possess no intrinsic capacity for expression, and so at best could only find decorative utilization, has now become the basis of composition, thereby supplanting perspective, which had triumphed over each successive change of style ever since the Renaissance.

With the cubist's conquest of space, and the abandonment of one predetermined angle of vision which went hand in hand with it, surface acquired a significance it had never known before. Our powers of perception became widened and sharpened in consequence. We discovered the interplay of imponderably floating elements irrationally penetrating or fusing with each other, as also the optical tensions which arise from the contrasts between various textural effects (the handling of color *qua* color, or the use of other media, such as sand, bits of dress fabrics, and scraps of paper, to supplement pigments). The human eye awoke to the spectacle of form, line, and color—that is, the whole grammar of composition—reacting to one another within an orbit of hovering planes, or, as J. J. Sweeney calls it, "the plastic organization of forms suggested by line and colour on a flat surface."

If Maillart, speaking as an engineer, could claim to have developed the slab into a basic element of construction, modern painters can answer with equal justice that they have made surface an essential factor in the composition of a picture. The slab long remained unheeded and unmastered: an inert inadaptable thing which defied calculation and so utilization. But just as a great constructor transformed it into a medium for solving structural problems that had always been considered insuperable, so the development of surface into a basic principle of composition in painting resulted in opening up untapped fields of optical expression.

This is no longer a fortuitous optical coincidence, as might be objected, but a definite parallelism of methods. By what mental processes the constructor and the painter arrived at it defies analysis. We can only authenticate a particular phenomenon in a particular case: a new method of construction found its simultaneous echo in a parallel method in art. But this proves that underlying the special power of visualization implicit in each of these fields similar elements have emerged which provide a creative impetus for both of them.

If the constructor, who necessarily proceeds from quite different considerations, finds he has to adopt substantially the same basic elements as the artist in order to solve his own technical problems, this signifies that in each case similar methods have informed optical imagination.

Contemporary artists continually reiterate the claim that their work forms part of Nature. This they explain as follows: "Modern art has reached the same results as modern science by entirely independent, intuitive steps. Like science it has resolved the shape of things into their basic elements with the object of reconstituting them in consonance with the universal laws of Nature." Now those forms in concrete which ignore former conventions in design are likewise the product of a process of "resolution into basic elements" (for a slab is an irreducible element) that uses reconstruction as a means of attaining a more rational synthesis.

In this connection mention should be made of the "eggshell" concrete vaulting which Freyssinet used for some locomotive sheds he built at Bagneux, outside Paris, in 1929, though since then that particular branch of reinforced concrete engineering has produced forms of almost fantastic daring. On the same principle of using the slab as an active structural member, the Finnish architect, Alvar Aalto, has struck out an entirely new line in furniture design. He uses thin sheets of plywood, which, like the concrete slab, was formerly regarded as useless for purposes of structural support.

In the community of method which now prevails in so many departments of human activity we may read a presage of far-reaching developments. The growth of this spontaneous identity of approach and its repercussions on society are being separately studied in every branch of knowledge. That there is a remarkable analogy between recent departures in philosophy, physics, literature, art, and music is a fact which has frequently been commented on. In the light of the particular case we have just examined, it is worth considering whether the field of structural engineering cannot be included as well. New methods are new tools for the creation of new types of reality. The greater the degree of identity in respect to what is fundamental to each of the creative spheres, and the closer the extent of their approximation to one another in terms of achievement, the sooner will the requisites for a new phase of culture be forthcoming.

Warehouse in Chiasso following Maillart slab design approach, by Bernasconi & Mascetti, 1924

Penguin Pool at London Zoo. Photo: © Crown copyright.EH

If Robert Maillart's warehouses and bridges were an early indication of the innovative possibilities of concrete slabs, the diminutive but no less spectacular spiraling ramps of the London Zoo's Penguin Pool built in 1934 have been widely regarded as having made the case for this type of structure's remarkable form-making potential, which was to be fully realized with the concrete shells in the decades that followed. Designed by the architect Berthold Lubetkin (as a member of the Tecton group) and the structural engineer Ove Arup (assisted by Felix Samuely), these remarkably thin, sharply curving, spectacularly cantilevering circulation ramps would have been quite unexpected to most of the general public attending the Zoo at the time, and in a sense they at once embodied as well as carried the promise of Modern architecture to largely transform the built/living environment. As is recounted here in an extract from an essay by the architectural historian Hadas A. Steiner, their structural and conceptually innovative qualities alike would have been made all the more noticeable given the adjacency of other quite traditional and sometimes heavy-handed approaches to representing an artificial "nature" elsewhere at the Zoo. Notwithstanding their demonstrably remarkable qualities, however, the notion of the Penguin Pool ramps' pointing the way forward with their seemingly effortless, weightless, free-form architecture is not without certain underlying ironies, in particular given the complicated formwork needed for construction as well as the exceptionally heavy reinforcing that ultimately remains hidden within the finished slabs; formal freedom coupled with apparent structural simplicity are evidently qualities not so easily achieved.

Concrete Takes Flight

from *For the Birds*
Hadas A. Steiner

Any illusion of a boundary-free environment was also one between inside and out.[1] Most massive but least architectonic of the pavilions, the exterior of the Mappin complex [open-air terraces housed various ruminants, pigs, bears, mountain goats, and waterfowl] tells the story of a remote natural environment. Internally, a dense forest of "elaborately latticed and trussed frames of crudely shuttered reinforced concrete posts, beam and braces" supports the rugged bareness of the irregularly finished slab and pebbledashed concrete.[2] ... Thus the surface naturalism of Mappin incrusted the archetypal machine of industrial production. ...

Some 600 feet to the southeast, by way of contrast, the diminutive Penguin Pool ... of the interwar period does not employ any such illusions of naturalism or boundary. The pool used the structural dynamics of concrete to demonstrate the opposite principle: nature, not as an environment, but as a system of geometric and physical order. Natural principle as truth to structure and the rejection of mimesis was at the root of theory at least since the widespread influence of the *Essai sur l'architecture*.[3] Structural inevitability was to modernism what the "State of Nature" had been to the Enlightenment philosopher: the equivalent of a vernacular essence for industrial times. In the modernist version of the primitive hut, however, structure had to support circulation as well as the roof.

Mitchell commissioned Tecton to design a penguin pool as a corollary to the success of its first commission, also for the London Zoo, the just completed Gorilla House (1932-3).[4] The most innovative structural engineering firm in London was also brought in on this project: Lubetkin hired Ove Arup; the contractors consulted with Arup's new assistant, Felix Samuely. Until penguins were designated their own home on a site that had been a paddock for geese, they had been squatting at the Mappin pond. Part of the brief was to accommodate the needs of this flightless seabird,[5] which primarily meant providing areas in which to swim and nest, as well as access for keepers to dispose of guano. At the same time, the pavilion had to enable the viewing of penguin activities.

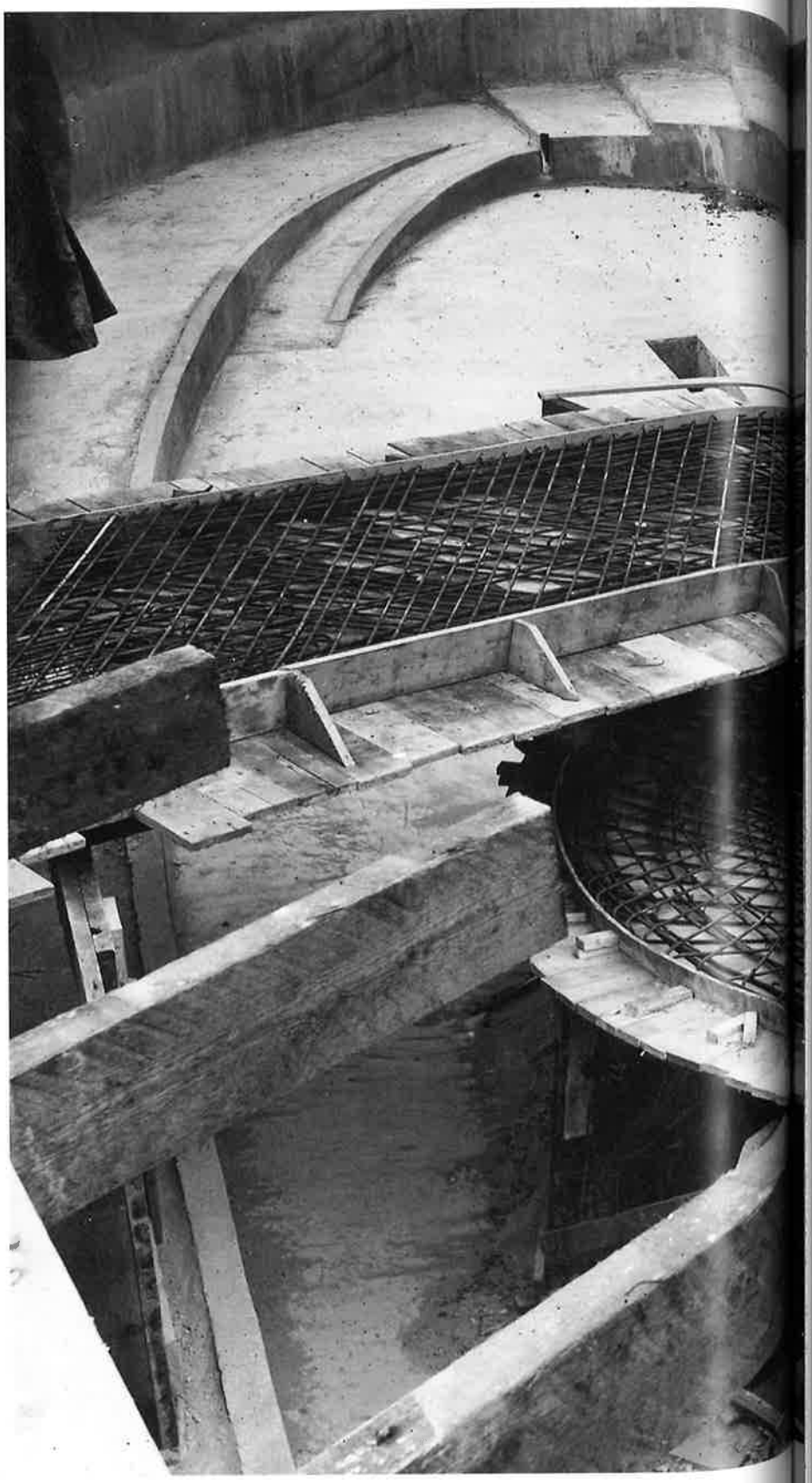
Tecton proposed an elongated ellipse (36 x 118 feet), the dynamism of which was reinforced by two ramps that bisected it in plan and elevation. The elliptical enclosure clearly differentiated the space of the pavilion from that of the viewer, as opposed to the experience at Mappin where, once the viewer entered the space, the totality of a panorama saturated the cone of sight. Further, the curved perimeter wall, cut to create a viewing aperture, was to retain penguins, sound and water. There is no pedestrian intersection of animal space in this model: the ramps are not a human zone as they were in Picturesque park or at the Mappin Terraces but are rather a topographical feature of the penguins' abstract Antarctica. Emphasis is placed on the representational geography by the contrast of the glacier-white concrete with the azure tile mosaic that lends the underwater floor its hint of ocean. The visual sense of a continuous white surface,

as if the curved upright perimeter folds into ramps, makes plain that circulatory infrastructure belongs to the natural order of things, not to the boundary condition between the feral and the cultivated.

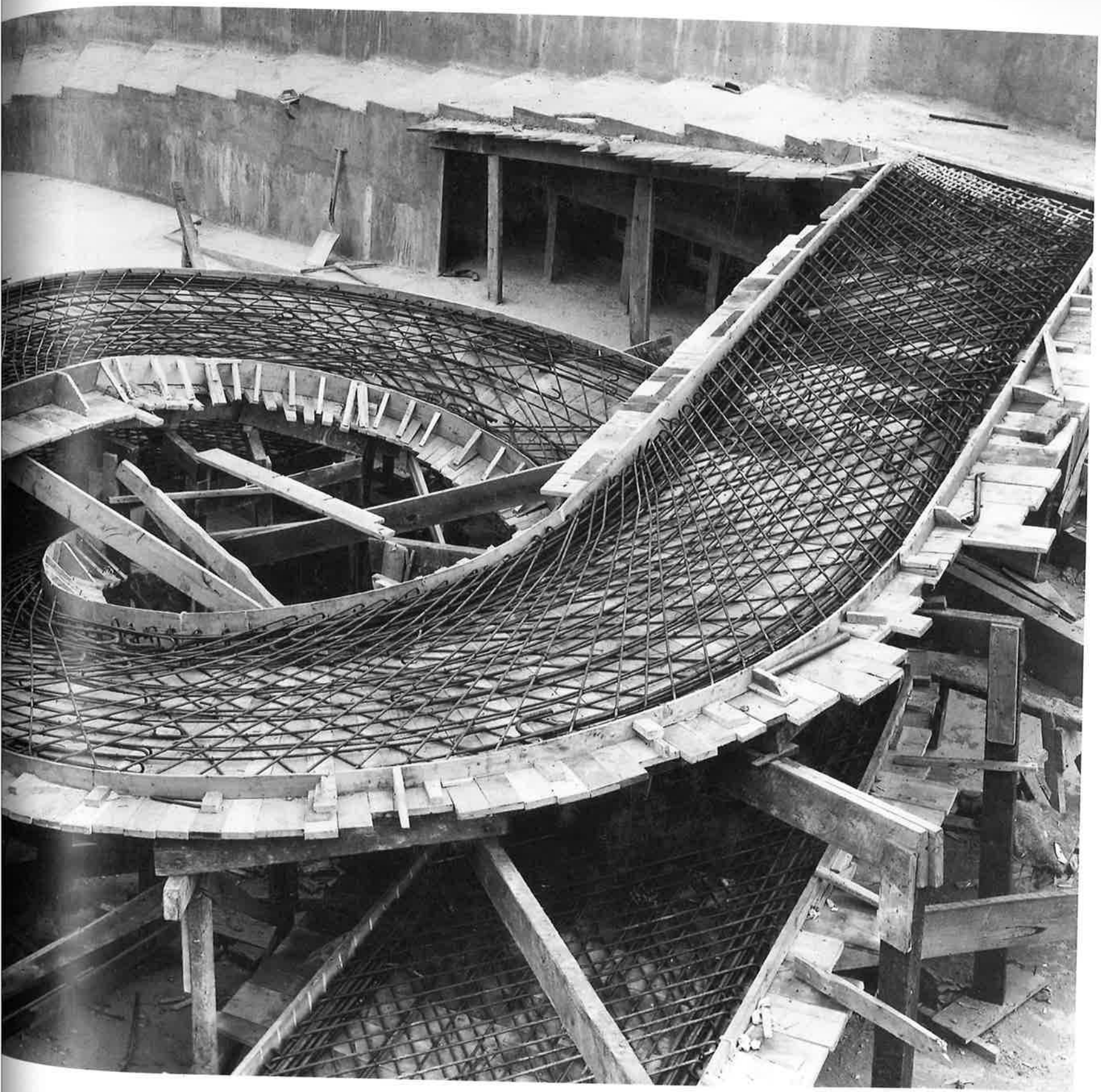
Rationalism did away with the epistemology of Picturesque construction: that the fine line between elusive categories, such as nature and its cultural embellishments, is discovered by the mind through the spatial experience of the body. Here the stationary observer looks inward through the strip windows at the animated show, not unlike a viewer watching a film. The same bodies that traversed the heavy ranges of Mappin, their movement adding spatiality to a scenic vista, watched longingly and immobilized as the penguins milled about on light arcs. The pool is a stage for the exotic animals that perform their lives on it but is also, especially from an architectural point of view, a stage for structure. The whole exercise is a platform for circulatory spectacle, and the ramps are such a spectacle themselves.

To cantilever the interlocking ramps of the pool without intermediary supports, Tecton had to petition for an exemption from the city building code. The ramps are about 46 feet long, 4 feet wide, 3 to 6 inches thick, and can tolerate 240 pounds per linear foot of applied load.[6] At this point of equilibrium, solid form reduced to a minimum; material pressed to its limits. Since the structure aimed to calibrate the ideal engagement of its inhabitants, the circumscribed form, whole in and of itself, left no room for addition or alteration. One ramp spirals up from the nesting boxes to the top of the slate stairs that curve around the northern perimeter, the other leads to the top of diving tank with a plate-glass front that faces the public. Reflections of the ramps in the water below redouble the spiral effect. In the Mappin Terraces the mechanics of circulation were concealed. In the Penguin Pool circulation was the empirical means of revelation.

The shell was a display of material technology, what the Royal Commission called "the liberating possibilities of modernist architecture." But to be a harbinger of a truly modern lifestyle, the circulation of the penguins was required. The structure dictated that penguins, birds that move gracefully through water, awkwardly plod up and down ramps.[7] The shape of the penguins, often referred to as dumpy, as well as the clumsy engagement with the ramps provides a formal foil for the elegance of the structure. A forced contraposition, of the penguins in their "natural" watery state versus the state of zoological exhibitionism, exposes the dichotomies of technological impressionism.[8]



Penguin Pool ramps under construction



1111 Lincoln Road by Herzog & de Meuron. Photo: Cora Visnick

Miami's 1111 Lincoln Road parking/multi-use structure is the quintessential slab building: not only are the beam-less floors of necessity doing all the work of carrying the loads of its occupants (cars and people alike, in ever-changing fashion) as well as of its own self-weight, but these slabs are on full display. At 1111 there is no enclosure; i.e., the slabs are all there is to be seen of the structure and of the architecture – well, almost. There are indeed also many columns holding the concrete slabs apart, but these are also "slab-like" in quality – i.e., they are planar, polygonal shapes that are strategically arrayed to carry gravity and lateral loads alike, their constantly changing forms and orientations from one floor level to the next serving to accentuate the horizontal layering of the building. The edges of the floor slabs themselves also do not line up vertically, suggesting the variation of things that happen on one level of the building vs. those on the floor above or below. In fact, as Michael Holt and Marissa Looby argue in this extract from their longer essay about the ever-evolving body of work of 1111 Lincoln Road's architects, Herzog and de Meuron, the edge of slab here effectively defines this building's façade and volume, even though such a façade is completely absent; here the slab does all. Although built nearly a century apart, the connections between the concrete slabs of Maillart's warehouses (or of the London Zoo Penguin Pool) and those of Miami's 1111 Lincoln Road are not so hard to fathom, whether structurally or conceptually...

Floor Plate–Defined Façades

from *Beyond the Wall, the Floor*
Michael Holt and Marissa Looby

Simple adjustments, slight alterations, subtle illusions. These are not tagline descriptions of the 1111 Lincoln Road, Miami Beach project, or a synopsis for a body of work. Instead they operate as retroactively projecting the course of professional development in the works of Swiss architects Herzog & de Meuron. The practice is known, from its earliest built projects, as a firm who produced artistically driven façade treatments where the vertical plane — the 'nominal façade' — would define form through the visually stimulating *surface* or *skin*. As the practice has evolved, it is argued here, they have crafted a new strategy: the horizontal plane as vertical façade generator.

In its progression the practice has deviated from façade ornamentation and fabrication towards the removal of the façade altogether; allowing for the floor plate — as a visual element — to operate as inadvertent façade and thus doubling its structural and visual importance. The placing of floor plates becomes the force creating the form — the 'inverted structural skin'. The stripped back architectural form does not remove the façade, but removes the *idea* of a façade, paradoxically creating a building mass almost by default.

The floor plates at 1111 Lincoln Road are design generators in both programmatic and visual terms. The building is a mixed-use development comprising of four different parcels that predominantly functions as a parking facility. Floor-to-ceiling heights vary between standard parking heights, double or even triple height in order to accommodate other programs in an inventive twist on the underutilized programmatic constraint of the typical parking station. The site accommodates an existing building, the former Suntrust bank; 300 car multi-level parking facility; 40,000 sqft retail; four luxury private residences as well as a number of internal courtyards; and, a public promenade with a glass pavilion designed by the artist Dan Graham.

Here, the ornamentally reductive, yet visually apparent, car parking mass is formed through a number of striated, interlocking concrete slab floor plates which are carried by irregularly-spaced, shard-like columns with pedestrian and vehicular ramps. The structure seems strangely flimsy, mainly as a result of its multilateral columns that seem to bow and compress with the force applied by the floor plate above. Of course, the visual impact is achievable by the fact that there is no apparent façade.

The Miami Beach project marks a significant step in the evolution of the practice. Where previously Herzog & de Meuron initiated the idea of a layered building envelope through the use of gabion wall construction (e.g. Dominus Winery, California, 1998); furthered by a flattening into a planar surface perceivably acting as three-dimensional skin (e.g. Ricola-Europe, Mulhouse-Brunstatt, 1993); to the present incarnation with a project that sublimates — the façade appears visible in its actual non-visible state. 1111 Lincoln Road visually collapses the façade into a *figural sublimation* where it appears through the very fact it is illusory. This is not achieved through representation, nor through a naïve formal abstraction, it sublimates: where one component is taken as given, worked against another,

producing something entirely different or subtly ambiguous, yet genealogically connected.

'Figural', in object terms, denotes the idea of comprehending an object through a process of association, where inflections give an idea of the object as opposed to its representable form. The act of 'sublimation,' in this analogy, would allow for the object to be identifiable as a more refined version of its original. Therefore, the figural sublimation of the façade is to define the vertical plane through a purified association of the basic components of construction. The same approach has been used in the marketing of the project with the design of the logo. The logo does not define the building's postal address solely; nor does it illustrate the building's aesthetics. Instead it collapses everything into a *figural sublimation* of what the building stands for in theoretical terms.

Herzog & de Meuron's use of artwork or their notable artistic collaborations with Michael Craig-Martin, Dan Graham, Karl Blossfeldt or Ai Weiwei are widely documented. Each collaboration has shifted the practice towards a new line of enquiry: whether it is the façade treatment of polycarbonate backlighting at the Laban Dance Centre, UK (Craig-Martin); the light filtration through replication of a photographic image at the Ricola-Europe factory, Switzerland (Blossfeldt); or, the instantly recognizable structural conglomeration of the Bird's Nest, China (Ai Weiwei). However, in projects designed since the turn of the century, Herzog & de Meuron has allowed the floor plate to become a defining element in the façade's visual appearance. ...

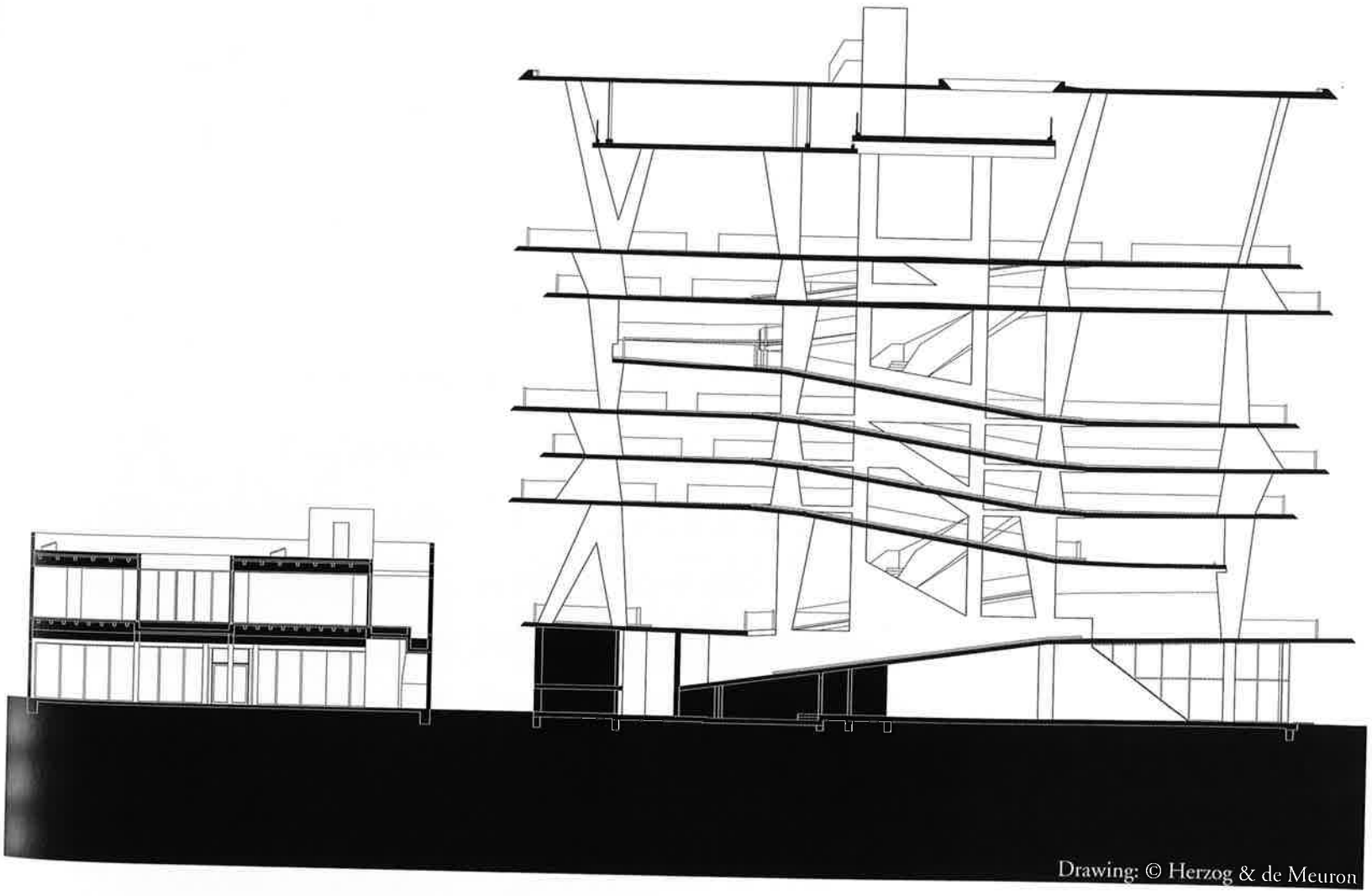
In their collaborations with notable artists, [Herzog & de Meuron] have previously cited figures from different fields believing that such a cross-contamination of discursive methods only adds to the richness of architectural production. Many of the terms at play in much of the earlier works are centered on terminology rooted in the late 1980's through to the mid-1990's, significantly impacting upon the architectural production of the practice. *Skin, surface, decoration, ornament, functionalism* and *cosmetics* are architecturally identifiable adjectives.

In the latter part of the 1990's, turning the corner into the twenty-first century, the practice speculated on the idea that the *skin* or *surface* could still operate as a decorative element, but significantly also begins to partially reveal the mechanics of the floor plates. Through varying façade treatments Herzog & de Meuron obscurely reveal the floor plates' simple form and strong visual impact. For instance, the Prada Aoyama (Tokyo, 2003) project with its rhomboid-shaped structural glazing façade creates a visual interactivity but also, ultimately, a transparency through the mixture of convex, concave or flat glass panels. Similarly, at the Laban Dance Centre (London, 2003) the use of colored, transparent polycarbonate panels mounted in front of the glazing system provides a visually engaging façade but virtually reveals the skeletal form of the building's frame.

Herzog & de Meuron hold a focus and importance on the façade, be it in aesthetic terms or solely functional. The façade would diffuse light through its gabion construction; or seductively shimmer in the moonlight; or its metal surface was figuratively perforated in its fabrication; or, its smooth, flatness collapsed images into a silk-screened two-dimensional image dually operating as a three-dimensional skin. One aspect remained constant: the façade was paramount; remaining as such for the fact that it concealed the mechanics of the building with the floor plate lying visually dormant. A non-visible, functional component in the construction process and a programmatic element.

As the body of work progressed, so does the concept of façade. In its various manifestations the façade has been a figurative description of a functionalist plane; with its overriding significance never in doubt, rather it has merely shifted from immediate view. Where once the façade — for Herzog & de Meuron — provided shelter, programmatic segregation or an aesthetic attraction to the viewer; the façade, skin or surface has now visually eroded into the *notion* of a façade. This is through the implementation of shifting, striated floor plates which passively project the notional façade and present the idea of a volumetric mass, minus façade treatment. It could be said that Herzog & de Meuron's work has encountered a complete reversal of aesthetics where solid becomes void, where ornamentation is paradoxically replaced by emptiness, and where three-dimensional form switched to the illusion of form — its figural sublimation.

Herzog & de Meuron's built resolution has, previously, proclaimed its arrival through a glamorous, aesthetically explicit façade; in a bid to present an inherent, figural expression the more recent projects rely not on a figurative representation but on the infinitely more gracious implicit notion of a façade resolutely sculpted by nothing yet announcing everything.



Drawing: © Herzog & de Meuron