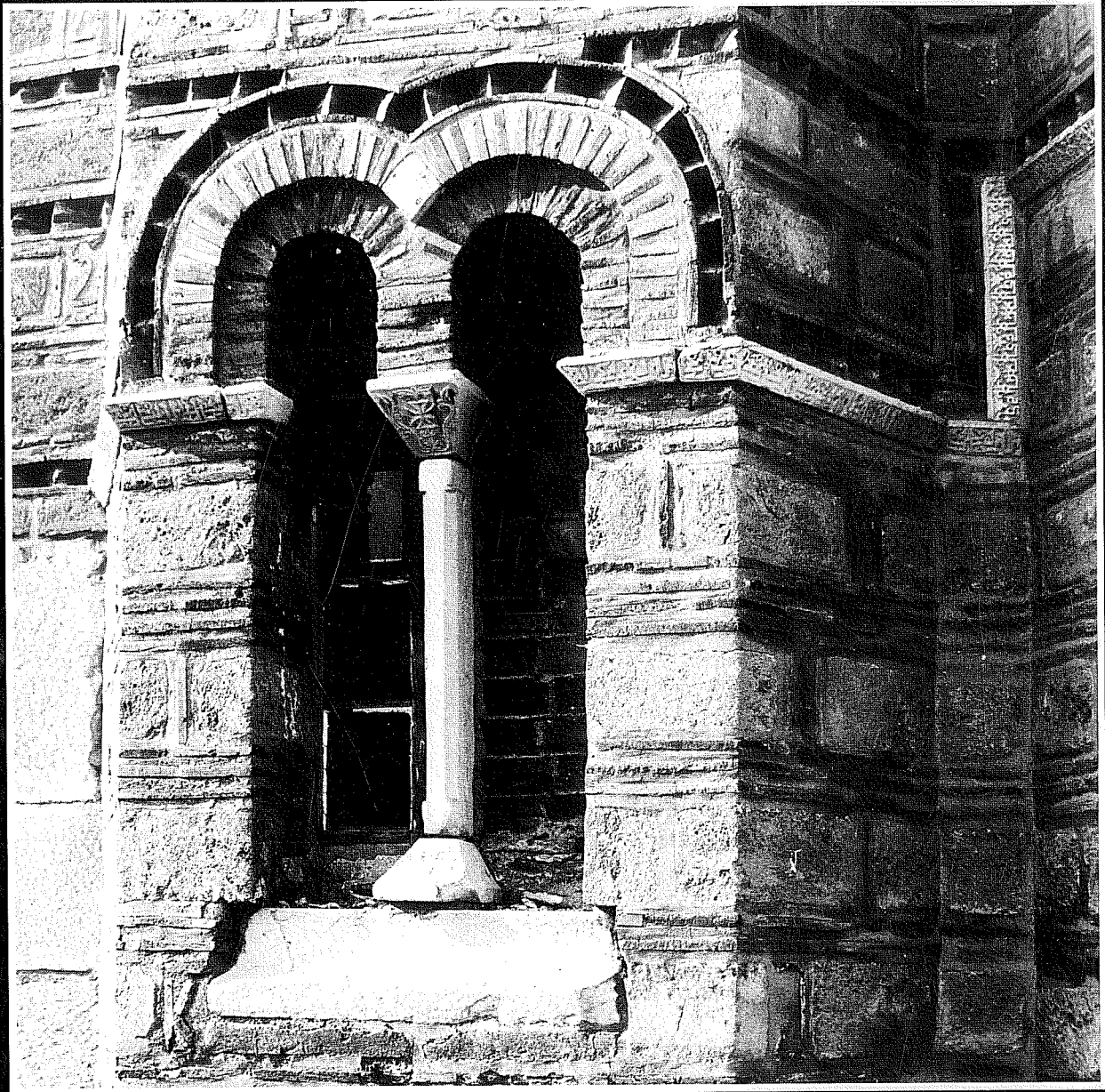


# 8

## FORM AND THE NATURE OF MATERIALS



*Overleaf*  
*Window and material.*  
*Hossios Loukas.*

## 8.1 Truth or untruth?

'To believe that one can attain beauty by untruth is heresy in the practice of art...' <sup>133</sup> As attractive as this aphorism of Viollet-le-Duc appears at first sight, its universality is put in doubt by the fact that art often uses illusion successfully. In architecture, the question of truth and untruth refers to the relationships between form and construction or between form and content. This chapter deals with the first pair: how does form express technique, or how does technique inspire form?

Architecture is an art of compromise: it can be untruth for some while in the same case others see truth in the skill and elegance of a solution appropriate to a problem. Discussions about '*honesty*' have always played an important part in architectural theory. They are articulated around the three terms: *form, expression and construction*.

Auguste Perret, who can be placed at the transition between academic rationalism and the engineer's rationality, said this: '*It is by the splendour of truth that the building attains beauty*' <sup>134</sup>. And by 'truth' he really meant definition of form based on materials and their appropriate use in construction.

That is only *one* of the attitudes amongst those current today. No earlier period witnessed such an ethical plurality on this subject, although the dilemma is as ancient as architecture itself. Today 'all' attitudes are practised simultaneously, giving the impression that it is only a question of the artist's taste. Technique is sometimes *glorified*, becoming the exclusive source of form; sometimes it is simply *used as an image*, as at the Centre Pompidou;

some people try to *falsify* it by giving an illusion of a technique other than that which has really been used; and others even *subject* it to formal ends inspired by the art of abstract painting and sculpture, and then there are those who *tame it* by exploiting the logic of construction, without giving it a privileged and independent status. What is worrying is that the architect who adheres to one of these approaches must all the same recognize from the evidence that each of the others may produce buildings which demand admiration. At best we have become more sceptical about dogmas; at worst we are in an ethical mess which leaves us without criteria for judgement.

The architect is faced with contradictory choices between right and wrong, or the good and the bad path to follow. Lack of certainty is one of the facets of the 'crisis' in contemporary architectural theory. Students are intellectually solicited, not only because there has been an increase in knowledge, but above all because, in the absence of a predominant doctrine, they must make ideological choices by *themselves*. Of course, a teacher will not agree with all the above-mentioned options; he will have a critical attitude and his own soundly argued preferences. But in the next-door garden other philosophies are cultivated and they are exposed to the light of day by our rapid means of communication: magazines, books and travel.

However, there are two fundamental principles which unite the five approaches we shall deal with and which distinguish them from painting, sculpture and to some extent arts and crafts: architecture always has to deal with gravity; its forms by necessity have to express this fact. '*Gravity and rigidity are the aesthe-*

*tic substance of beautiful architecture*'. <sup>135</sup>

Secondly, architecture always consists of hollow forms in order to accommodate the internal space which is its *raison d'être*.

These permanent truths do not as such determine an approach. The impulses in architectural form are numerous and complex: the discipline of architecture covers territory extending from the laws of vision to socio-psychological and cultural considerations; from the geometric and dimensional properties of the objects and spaces to be built, to the design for light and view to the design of place and path, etc., and now we superimpose on it the dilemma of constructional rationale.

A work of architecture attains its true greatness from the synthesis of these multiple constituents into a unique final design. The relative emphasis of these ingredients cannot be subjected to a rule of general validity. It must find its own balance according to the brief and the site in the wider sense of these terms. Their role and their relative importance will vary depending on whether it is a question of building a public institution, a factory or a dwelling, whether or not it is in the country or in the town, north of the Alps or on the Mediterranean ...

Construction - especially the load-bearing structure in its interaction with space, the spatial envelope, the openings and light - is the first means of putting into concrete form an idea which belongs to the domain of art. That does not mean that the construction will deny its own laws. On the contrary, these laws are themselves valuable sources for explaining the work, but the degree to which an expressive role may be given to the construction will depend even more on the brief and the site

than on the demands of statics and materials. The most mature and the richest architectural works have always subordinated, without betraying it, constructional rationality to that of a more universal architectural idea: structural design, the form and the texture of materials are superimposed and measure and order the design of space, light and place. That is how our best temples, and cathedrals and palaces are built, and likewise our humblest housing and urban fabric, when they stand out from the mediocre commercial development which scarcely merits the name of 'architecture'.

We can divide the attitudes concerning the relationship between form and technique into five categories: the glorification of technique, technique as an image, falsification of technique, technique subjected and technique tamed. This division is a useful simplification. It is certainly not able to cover the whole of reality which is undoubtedly more finely differentiated, but it does provide us with the elements for a better understanding of this fundamental choice in the architectural process.

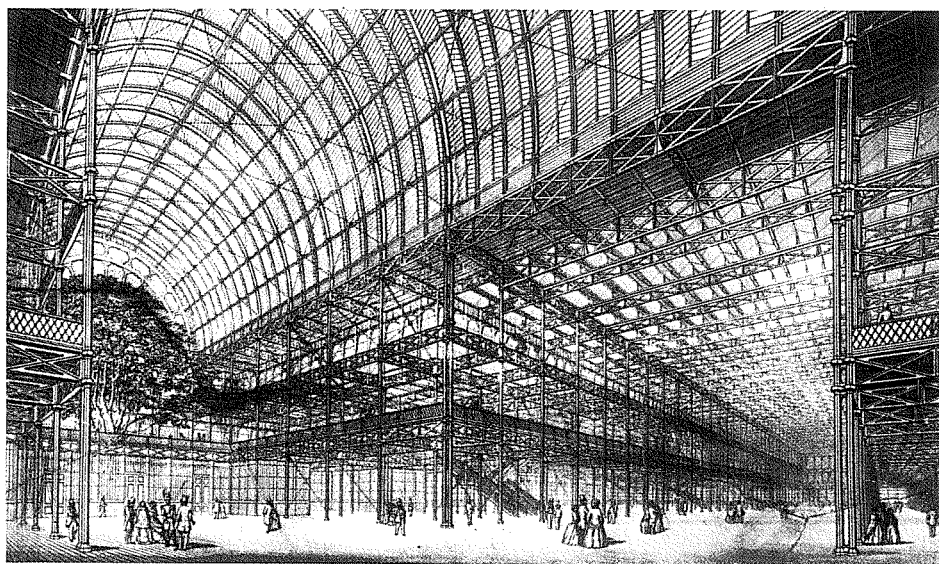
### *The glorification of technique*

Technique is sometimes itself the justification of an architectural code. In fact, who does not wonder at a fine timber frame, the metallic structure of Tony Garnier's slaughterhouse in Lyons, Paddington Station, the decorative effect of joints and rivets on the Eiffel Tower, the junctions of a suspension bridge cable and the carefully assembled laminated profiles of a building by Mies van der Rohe? Roland Barthes says in his essay on the Eiffel Tower that at the time of its construction it set a new value against the secular image of sculptural beauty, that of functional and technical beauty, which has since conquered the world<sup>136</sup>. In this the nakedness of a logical construction lies the condition for an aesthetic; it reflects an economical response to the laws of nature: gravity and the resistance of materials or, as Konrad Wachsmann puts it

... building is, in the end, a material struggle against the destructive forces of nature. That obliges us to draw on the consequences of the progress of science and from technical discoveries and inventions ... These revolutions in construction methods, which were limited until then by the rules of craftsmanship, have provided stimulation to which the sensitive and creative mind had to react.<sup>137</sup>

The poetic emotion aroused by a Robert Maillart bridge, a Pier Luigi Nervi exhibition hall, a covered market by Eduardo Torroja, a three-dimensional structure by Konrad Wachsmann, or that canopy by Santiago Calatrava (Figure 278), is created by expressive and elegant use of a technique in which the play of static forces and the method of assembly give a certain distinction to the work. The approach of these pioneers is experimental: intuition and artistic sensitivity are the driv-

Figure 275 Technical expressionism is established here as a principle of art: Joseph Paxton, Crystal Palace, 1851 Exhibition, London.





ing force. They are not content with the purely structural shape which depends too much on knowledge and not enough on feeling.<sup>138</sup>

In the twentieth century technical means attain the rank of a generating principle in art. The technical aesthetic gives the impression of a mathematical and therefore 'natural' logic of construction, but this remains equivocal; there are manifold possibilities. Calculation is only one means of control, after intuition and invention, of a constructional system. 'Form obeys the demands of expression, not calculation. One cannot separate structure from spatial reality.'<sup>139</sup>

The glorification of technique presupposes a task of construction dominated by questions of statics and technical means. It is most successful when there is an unequivocal brief, as in civil engineering: a bridge or a large covered market to span. In these briefs the fundamental problem is that of the stability and assembly, of the fixings and junctions between elements without interference by multiple or contradictory requirements. In the case of

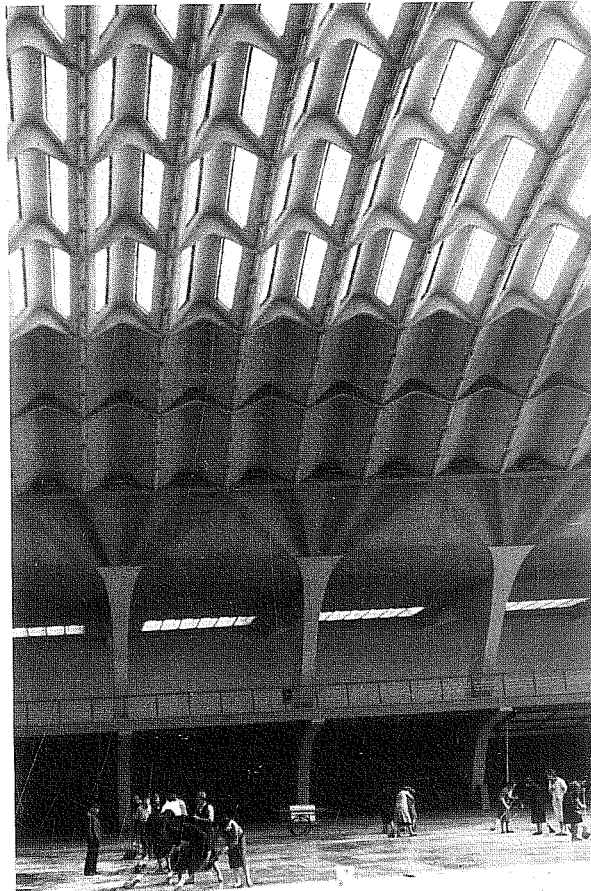


Figure 276 'Revolutions in construction methods have provided stimulation to which the sensitive and really creative mind had to react' (K. Wachsmann) Pier Luigi Nervi, exhibition hall Giovanni Agnelli, Turin, 1947/49.

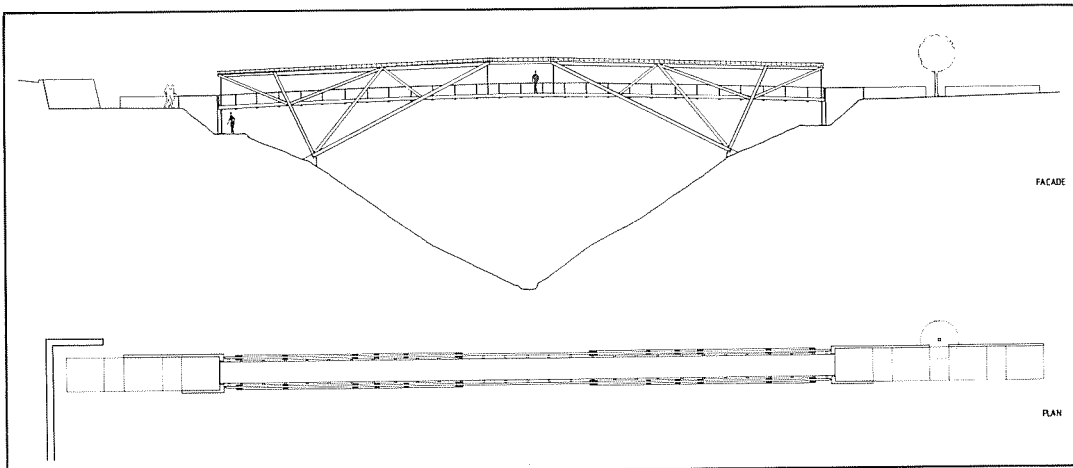


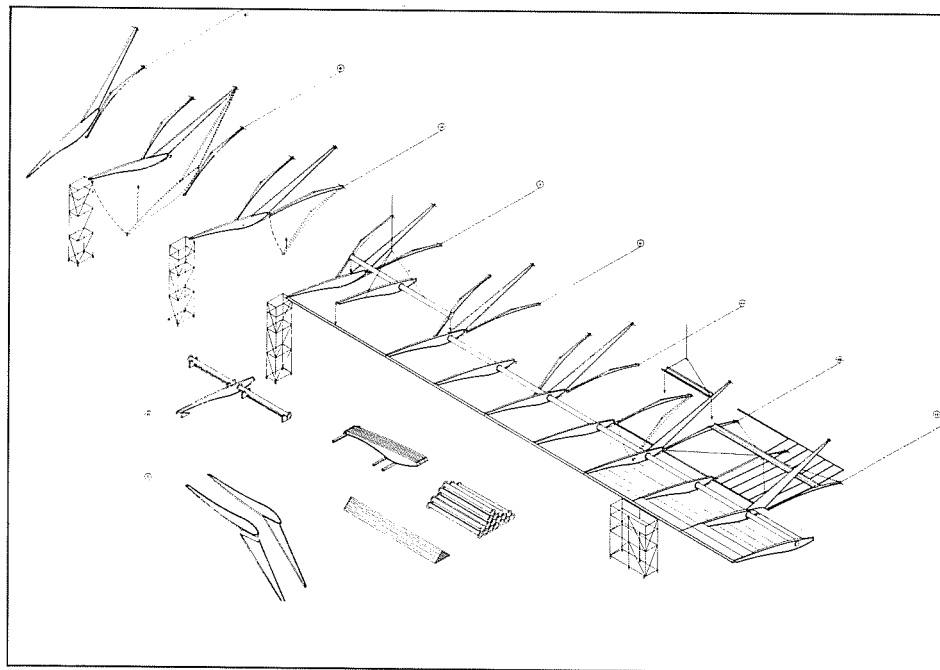
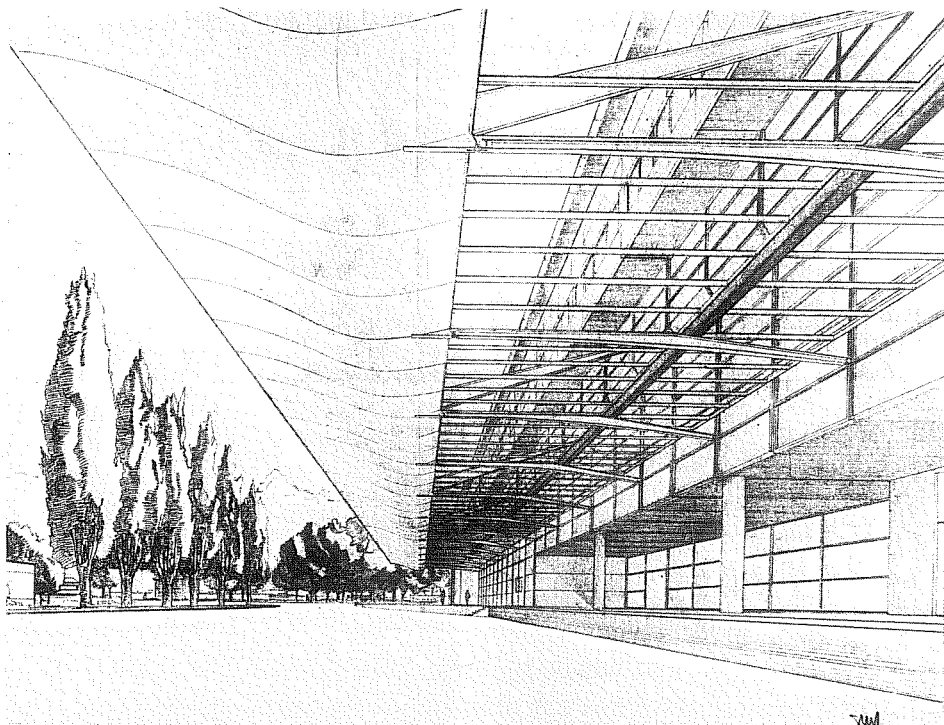
Figure 277 Glorified technique is helped by an unequivocal brief, such as this timber footbridge; student project, EPFL, 1984.

a dwelling, the expression of technique as an aesthetic aim does not follow very easily the complex spatial and cultural nuances required by this use.

These works in which technique is the very basis of architectural expression, present another characteristic worthy of attention and likely to arouse our critical thought: it is difficult for them to abandon their object-status in order to become a stitch in the urban fabric. That is precisely where their limitation lies: this building type cannot be generalized. When, on the other hand, their status as object is justified by the location and purpose of the building, the architecture of the town is enriched by it.

Another limitation to this approach is imposed by the risk of 'styling'. By this we mean the partial abandonment of structural truth for the sake of image. It is a delicate matter to define this limit, because even the works mentioned above are obviously not the expression of only material necessities. Considered from the restricted point of view of resistance of materials, articulation between the two segments of Calatrava's canopy could have been reduced. It is the need for the understanding of a structural phenomenon by the eye which required this accentuation. In this case, the choice is perfectly justified.

Some late works by Nervi and some civil engineering and 'industrial design' works undertaken with excessive aesthetic pretensions go beyond these limits. We are already touching on the approach to *technique as an image*.



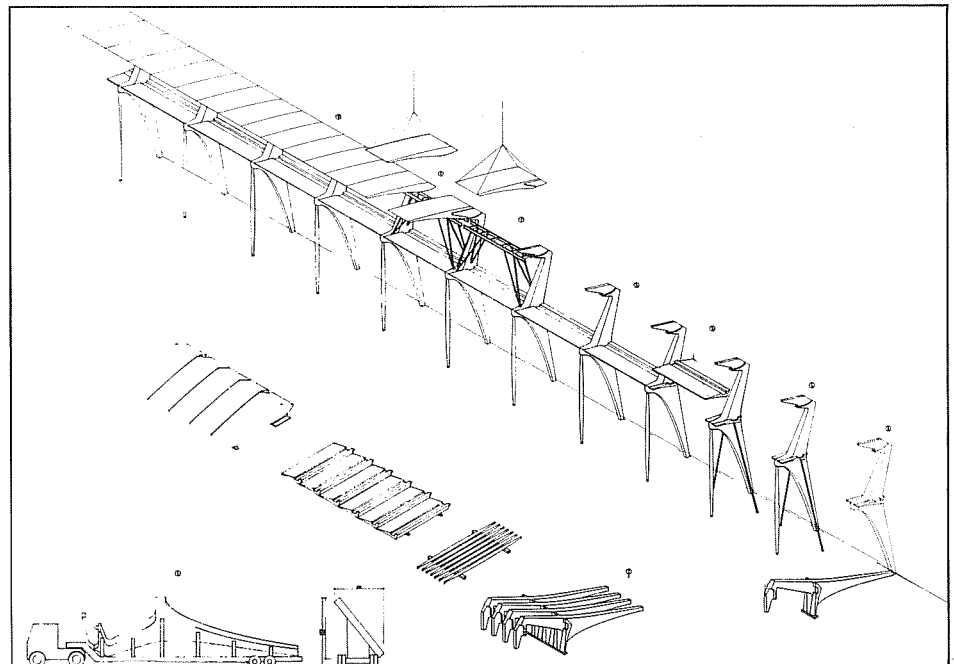
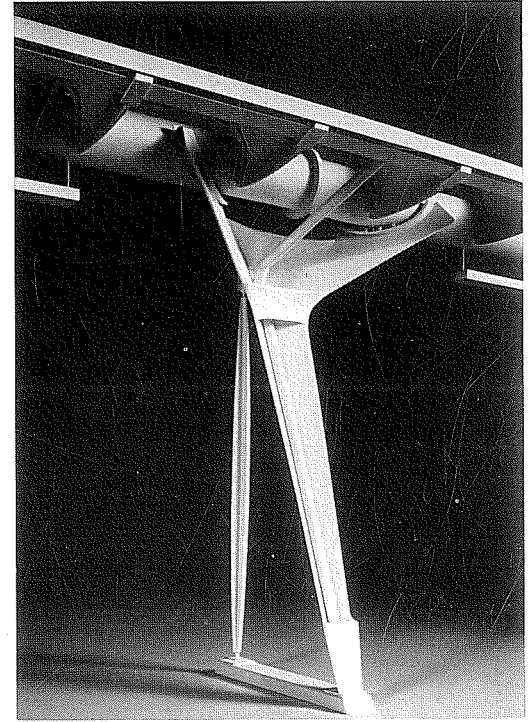
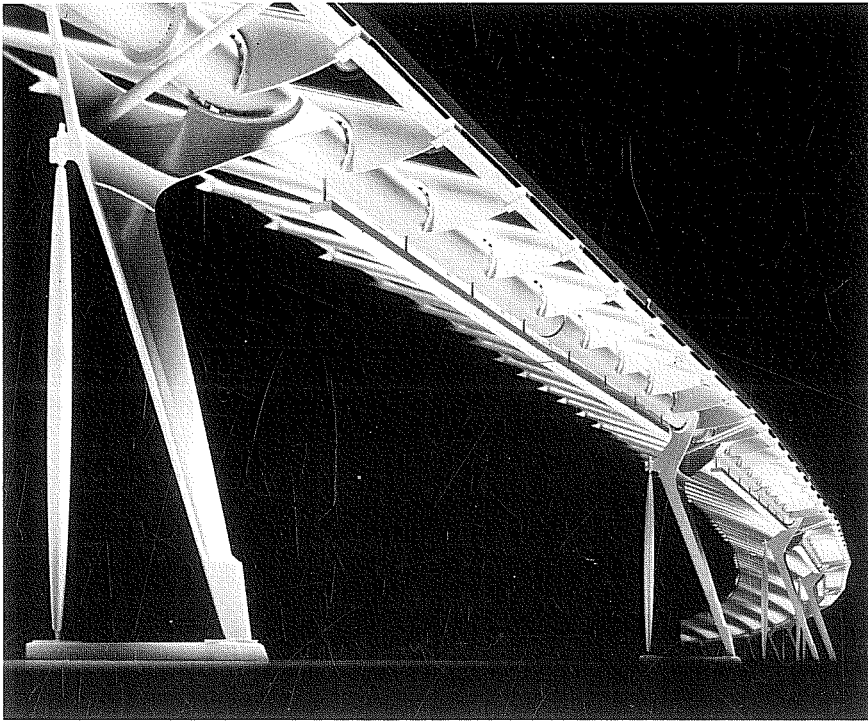


Figure 278 Bold canopies or railway station awnings: Santiago Calatrava counts among the few contemporary civil engineers who knows how to glorify technique to the benefit of enjoyment and beauty.

## Technique as an image

This principle is undoubtedly best illustrated by the utopian projects of the British group Archigram (1960s–1970s) and by its largest ‘child’: the Centre Pompidou by Piano and Rogers in Paris.

Contrary to the ‘glorification of technique’ in which form is guided by the expressive articulation of the potential inherent in a technology, here it is a question of an opposite process: one designs the technical image and *then* looks for a technology which enables it to be built, even by craft methods if need be. Frampton observes quite fairly that ‘... Archigram was more interested in the seductive appeal of space-age imagery and, after Fuller, by the overtones of survival technology, than in the process of production or the relevance of such a sophisticated technique to the tasks of the moment.’<sup>140</sup>

Sputnik and Apollo broke the imaginable limits of technology. One no longer needed to be Jules Verne or to be led by the engineers. Everything became possible once one had imagined it: creations such as ‘Plug-in City’, ‘Space Capsule’, ‘Instant City’, illustrating technology serving pleasure.

Technological imagery has been a catalyst in the debate on the inertia of conventional forms. It finds scope for experiment and a show-case in national and world exhibitions, world fairs, sets for various shows, and temporary buildings, but it hardly has a place in urban architecture or in that which has to transcend generations.

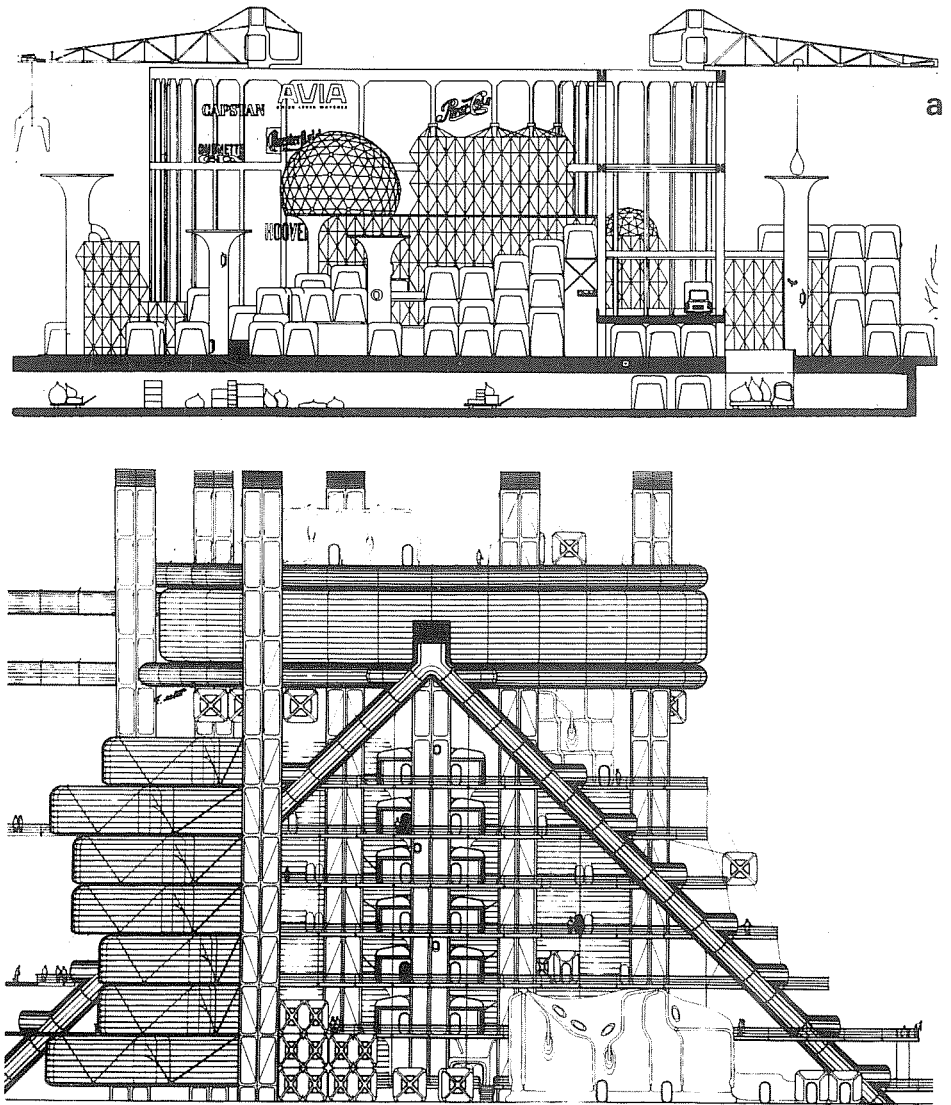
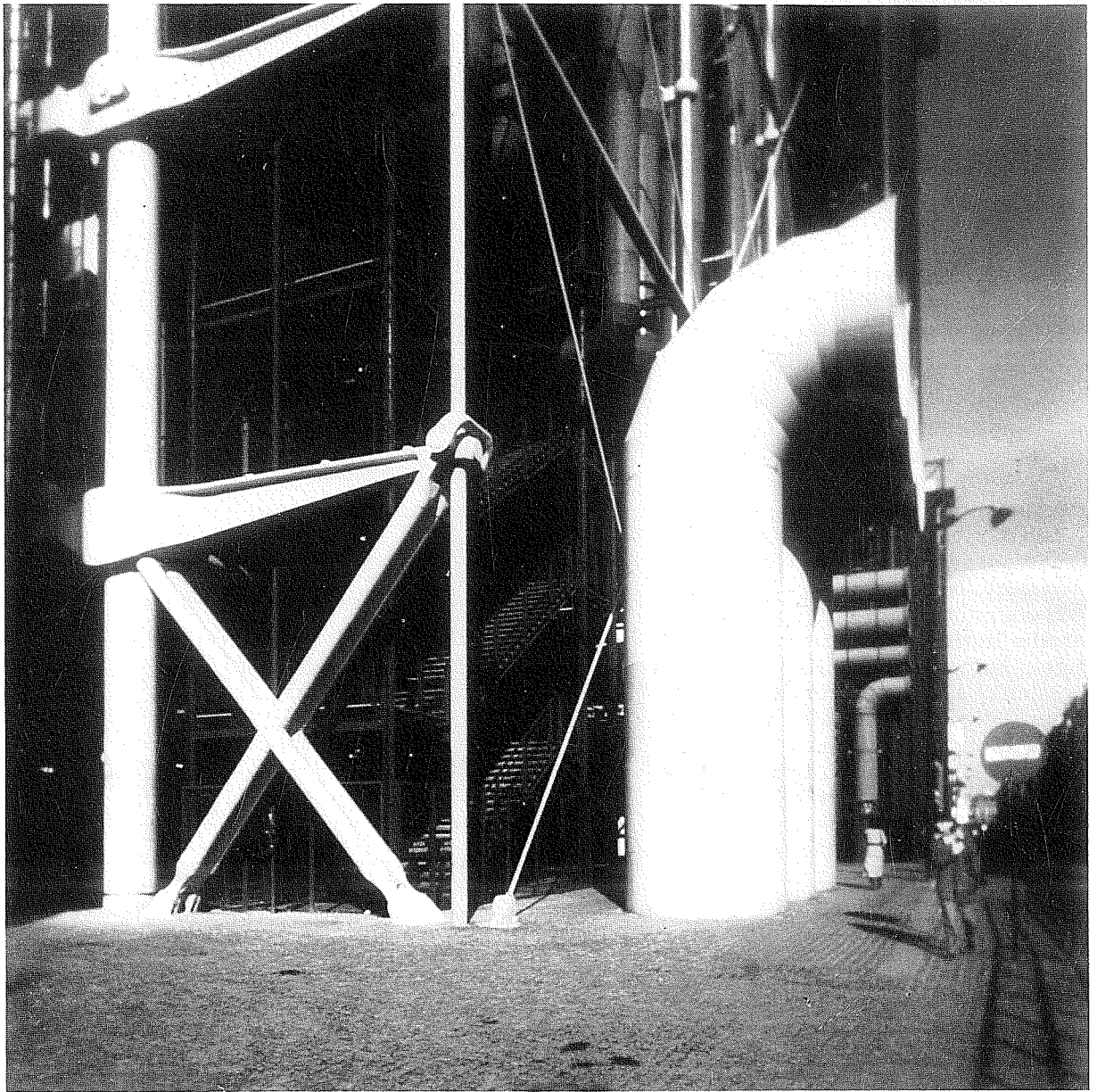


Figure 279 If the nineteenth and twentieth centuries not only introduced technology as an artistic message, they also assume the right to substitute the technical image for technical reality. ‘Archigram was more interested in the attraction of space-age imagery ... than by the production or perfection of a really sophisticated technology for present day purposes’ (K. Frampton)<sup>140</sup>.

Archigram, Peter Cook and David Green, Nottingham Shopping Viaduct, 1962, and Peter Cook, Plug-in City 1962/64.



*Figure 280 Technical illusion produced by the resemblance to mass-produced industrial products such as cars; symbols for clients eager to prove the virtue of progress. Piano and Rogers, Centre Pompidou, Paris, 1975.*



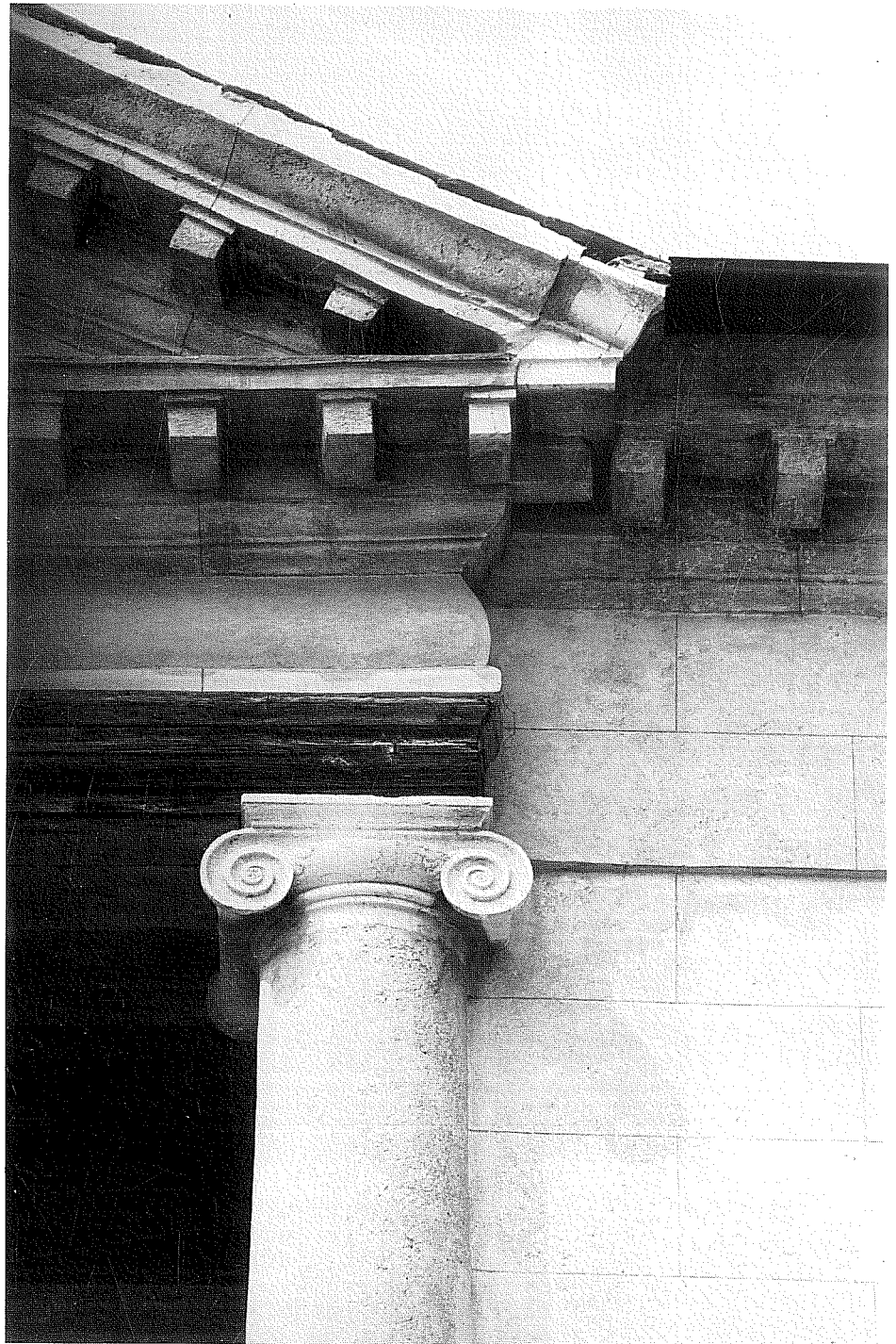
## Falsification

When the appearance of a technique is 'disturbing' one is inclined to make it disappear behind decoration which expresses what one would have wished to see. In the last years of Archigram (and the Beatles) a significant change came about. They saw themselves as precursors of a popular movement. Who wants to live in a 'capsule'? Archigram, back-pedalling, produced its last projects, amongst which were 'Hedgerow City' and 'Crater City'. All the sophisticated technology is buried, hidden behind the curtain of nature, in the same way as, today, some conceal it behind a neo-classical or pseudo-vernacular decor.

Other architects use economical techniques which they transform and reclothe in such a way as to *simulate* another technique from an earlier period and of greater 'prestige'. For Andrea Palladio brick columns, a timber architrave covered with stucco and false stones of stucco were legal currency.

In this respect it is important to make the distinction between the architecture of Greek antiquity and that of the Renaissance. It is true that the Greek temple in marble would not have its mutules or its modillions if its language were not derived from timber construction.

*Figure 281 With the aim of creating an image, Palladio had no fears about restoring to a decor which simulates technique other than that actually used. Detail of the Villa Badoer di Fratta Polesine, Andrea Palladio, 1557. Frank Lloyd Wright retorted; 'Instinctively all forms of pretension fear and hate reality. The hypocrite must always hate the radical' (Frank Lloyd Wright, The Natural House, p. 60.)*





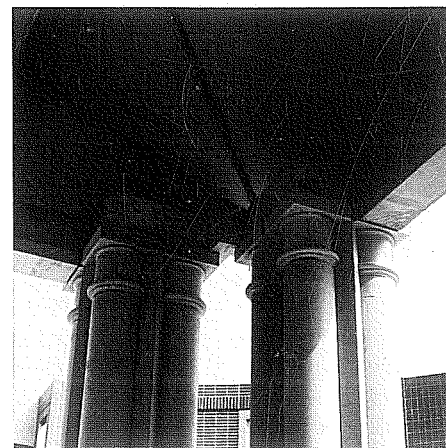


Figure 282 'The Romans, judicious people, provided with our large pieces of iron, would have left the forms borrowed from the Greeks on the side in order to adopt new ones' (Viollet-le-Duc) R. Bofill, aedicule at St Quentin-en-Yvelines, 1982.

However, *at no moment is it a question of imitation of wood*, whereas Palladio mixes the stone base, the brick column, the wooden architrave, the brick tympanum, etc., and covers it all with stucco which undisguisedly *imitates* stone in order to create an *illusion* (Figure 281).

At the other extreme Viollet-le-Duc asserts '... that to clad iron columns with brick cylinders or stucco rendering, or to cover iron supports with masonry, is neither the product of calculation nor of imagination ...'<sup>141</sup>. Thus, towards the end of the nineteenth century, Viollet-le-Duc recognized in constructional falsification a resistance to innovation. The forms that have emerged from new building methods have not yet acquired the status of aesthetic

value; we cover them up in order to satisfy tastes from the past. Lack of familiarity always acts as a brake to the diffusion of an invention. Viollet-le-Duc launched into a fight for renewal which would bear fruit in the twentieth century.

Towards the end of the twentieth century this phenomenon of substitution does not have the same significance. It is no longer a question of resistance to innovation in the case of the Krier brothers in the 1970s and 1980s. They do not refuse invention as far as it serves an image which 're-fossilizes' the town by recalling the principles of construction in stone and brick. Their propositions are merely a criticism of the material heterogeneity of the modern city.

Their strength lies more, however, in the proposition of a spatial order for the town by giving back to the public space a clear and recognizable form, than in the promotion of obsolete material methods. The substitution of an economic and constructional reality by recourse to the imagery of old techniques cannot be the basis of a contemporary aesthetic. The cry of alarm by the adherents of a fossilized town in the image of the past will never have the power of those who confidently use modern methods.

### *Technique subdued*

With the technical means of the twentieth century, architecture has been able to assume the great formal freedom which we know. From the 1920s onward, modern architecture has sought its renewal by moving closer to the conceptual world of abstract painting and sculpture, especially Cubist and Purist. Thus, contrary to widely held opinion today, its inspiration is not only derived from the expression of function or technique. The latter was often the servant of artistic expression for the great majority of avant-garde architects. Architecture has itself become plastic art manifest in such examples as Rietveld's Schroeder house, Lissitzky's Constructivist designs, Terragni's Frigerio house, Le Corbusier's church at Ronchamp and so many other outstanding works.

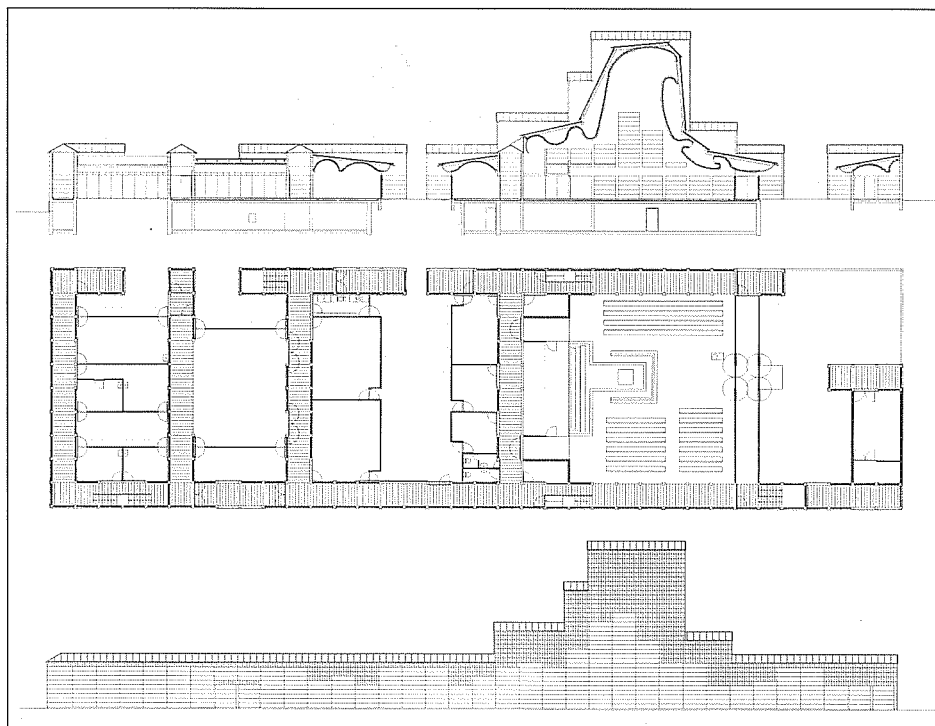
Peter Collins, a critic and historian of modern architecture has admirably grasped these contemporary phenomena in his book *Changing Ideals in Modern Architecture*. Let us quote a key passage from it:

The new theory of abstract art led to the complete interchangeability of artistic disciplines; it also inevitably suggested that the Vitruvian qualities of usefulness and stability were artistically of little importance as compared with the abstract aesthetic value which every building potentially possessed. ... The ideal of a complete fusion of abstract sculpture, abstract painting and building technology was expressed by J. J. P. Oud in his manifesto *On the Architecture of the Future*, published in 1921, in which he announced that 'a self-created architecture is possible at last, to which the other

arts are no longer subordinated. ... The Bauhaus students were initiated into the study of architecture by manipulating abstract shapes without any reference to building functions or the ultimate strength of materials, but solely with a view to achieving ornamental appeal in terms of 'significant form'

This relatively dematerialized approach to design, to criticism and teaching has opened undreamt-of routes to the flourishing of architecture as an authentic art of the twentieth century. Today it is architects like Richard Meier and Peter Eisenman<sup>143</sup>, critics like Colin Rowe and Robert Slutzky<sup>144</sup> and teachers like John Hejduk and Daniel Libeskind<sup>145</sup>, who have best grasped, manipulated and developed these

*Figure 283 Between frame and vault: as for the Baroque, Jörn Utzon's plastic and spatial intentions take precedence over constructional reality. Baqsvaerd church, Copenhagen, 1973-76.*



newly acquired constructional freedoms with the objective of applying contemporary plastic art to architecture.

They exploit the technical possibilities by subordinating them to a formal end. A column represents a vertical line, a balustrade becomes a strip, walls and floors are planes – the whole able to be covered with a white or coloured rendering in order to complete its dematerialization.

In practice, this approach sometimes leads us down dangerous paths because, by playing down constructional constraints, it can produce weaknesses in weather resistance or premature ageing of the building. It also deprives the building of a certain common sense which emanates from the logical indications of its being built. Let us emphasize, on the other hand, the enormous didactic advantages when such an approach is considered as *one of the steps* in the architect's training. Without functional or constructional alibis, the student must temporarily turn his attention to the inherent potential within the means of geometry and form in order to develop a concept.

Architectural form is certainly linked to use and technique, but it also enjoys a certain independence. On one hand, the same techniques and the same content do not in any way determine a precise form. On the other hand, built form proves to be a less ephemeral reality than use. There are very few examples of buildings whose life span does not extend beyond that of their initial use and meaning.

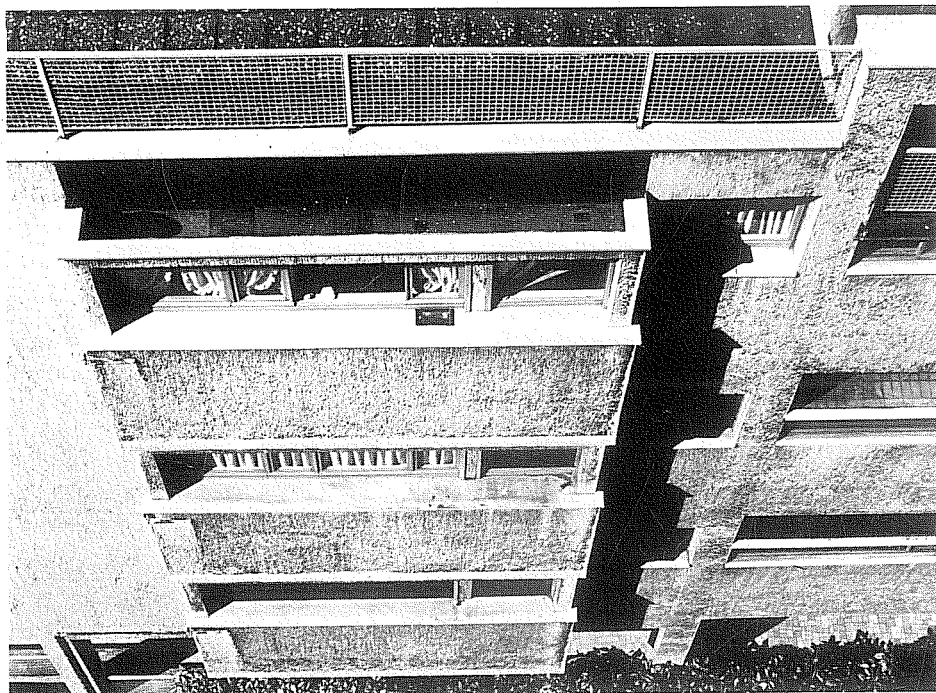


Figure 284 'The new architecture is elementary. It develops from elements of construction in the widest sense: function, mass, surface, time, space, light, colour, material, etc. . . , these elements generate form' (Theo van Doesburg, extract from the *De Stijl* Manifesto, 1924).

Plastic art in architecture by the de-composition of the plane of the façade in closely spaced layers: Giuseppe Terragni, Casa Frigerio, Como, 1939.

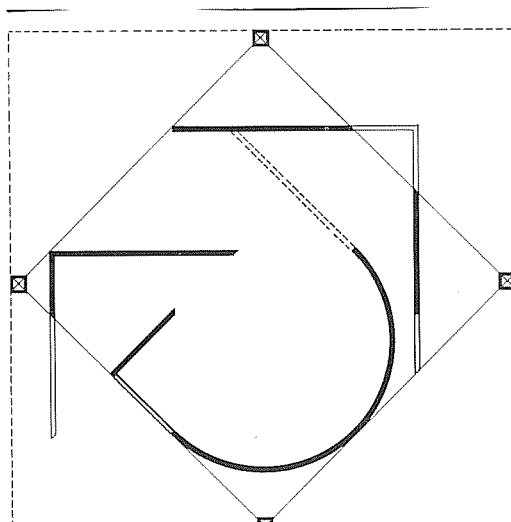
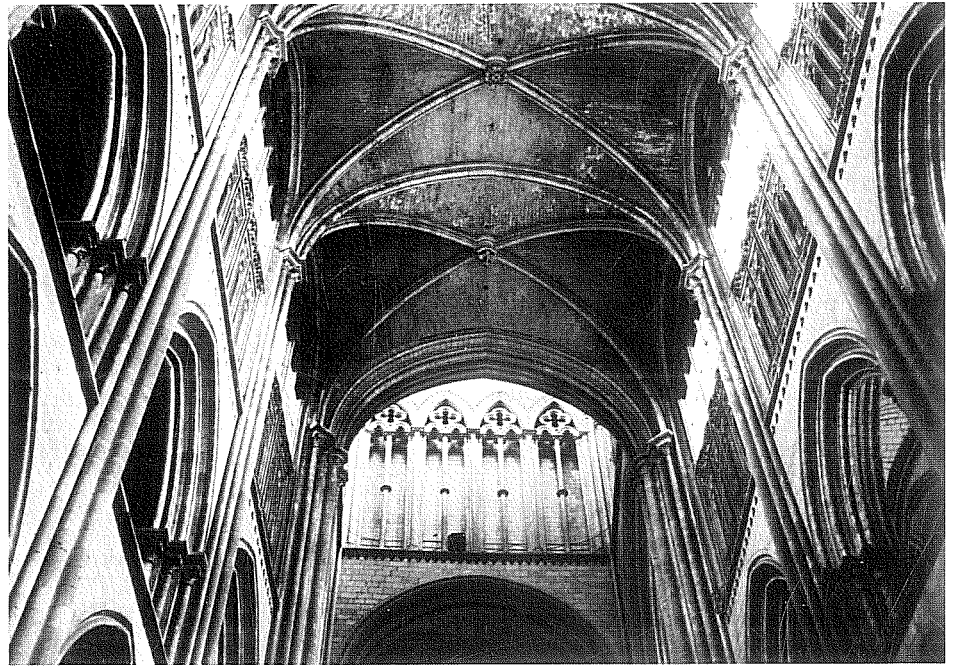


Figure 285 The student, working without functional and constructional alibis, temporarily centres his attention on the potential inherent in the methods of geometry and form: this is an irrefutable didactic advantage. Student exercise, EPFL, 1975-83.

### *Technique tamed*

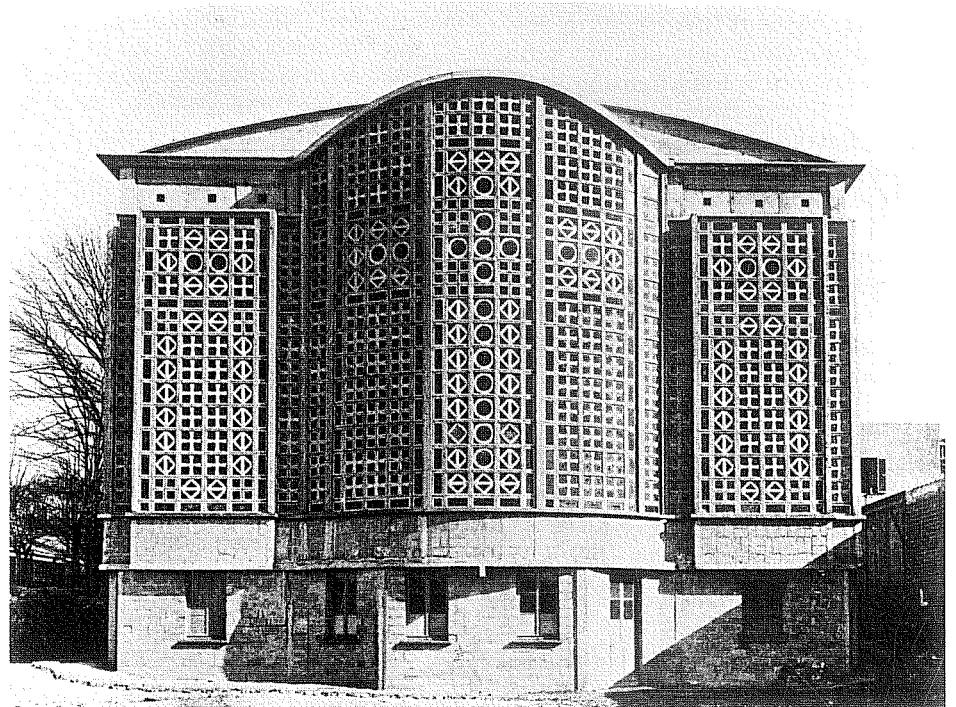
Technology has become part of the everyday order of things. It preserves us from famine, it offers us comfort and health, an extraordinary freedom of movement and also gives us the luxury of time for thought, study or play. Its failures provoke disruption according to the degree of our dependence on it. Technology can also be threatening by its harmful effects and the waste it creates. The earth already shows the scars of its inconsiderate exploitation inflicted by the frantic cycle of production and consumption.

The last quarter of the twentieth century is thus seeking rather to conceal technology without abandoning it as such. It simply refuses to elevate it to a monument. It is obviously not sufficient to hide it; it must be reinvented, and its impact on the planet on which we live must be regulated. In this intermediate phase in which we are living, technology will continue to influence form and appearance but it might no longer express itself loudly. That is what gives the works of Kahn, Scarpa, Botta and others a special



*Figure 286 'Was Gothic architecture because of stone or regardless of it?' (F. L. Wright). Rouen Cathedral.*

*Figure 287 'Decoration does not only mean a surface modified by man's imagination, but imagination giving a natural design to the structure ... articulating and making visible the material structure of the building, just as the structures of trees or lilies are articulated ... it is these qualities which distinguish the essence of architecture from the simple act of building' (F. L. Wright). Perret, Notre Dame du Raincy, 1923.*



relevance. Technique is tamed when it concerns itself with habitability and enjoyment with neither pride nor shame in its own rationality and laws.

Not being ashamed does not mean emphasizing all traces of construction. Let this anecdote recounted by Tessenow puts us on our guard against extremes:

An old, experienced and influential craftsman once said: if, for example, one nails two planks of wood together to make a door, one must show quite openly how it is made, and if possible one should show where the nails have gone through the plank and reappeared at the back, etc. If during this operation a splinter is pushed out, one should simply tear it off and do nothing more about it.

One can say that this story is nothing more than an image, but it shows where honesty can lead. A sort of 'bang-bang honesty' exists. It is these extremes of which we are afraid ... We want craftsmanship to be truthful as a general rule, but we do not want, indiscriminately, to see each nail and every glued joint<sup>146</sup>.

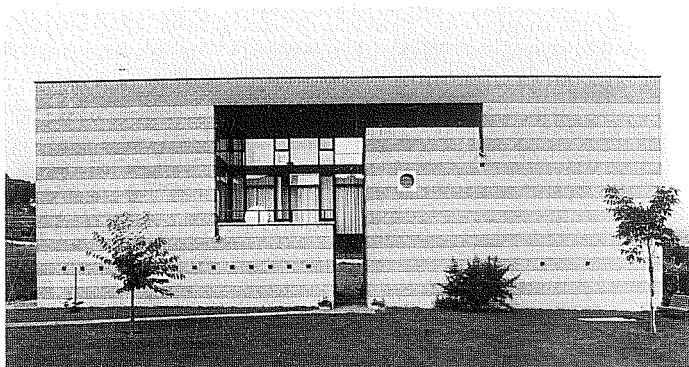
Once tamed, technique that is made visible is allowed and even called for, but the objective must remain an overall one. An elegant trace of the building process becomes an integrated ornament, as F. L. Wright would say, but this decoration must have a meaning in the architectural and artistic concept of the building. It cannot be the simple result of a building process. The project exploits technique as a resource for motifs for structuring the form without, however, allowing itself to be dominated. 'Beauty is the true and chosen expression of the material elements available and of the physi-

cal or moral needs that must be satisfied ...'<sup>147</sup>

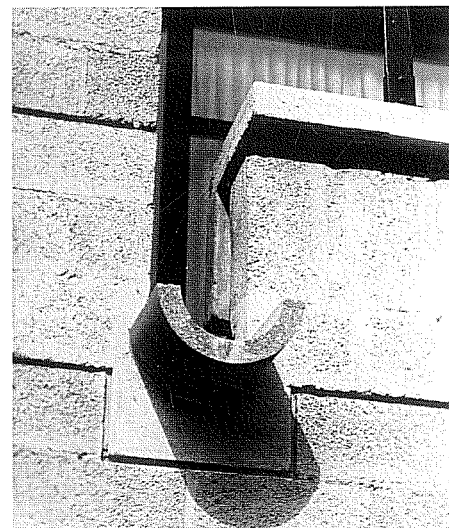
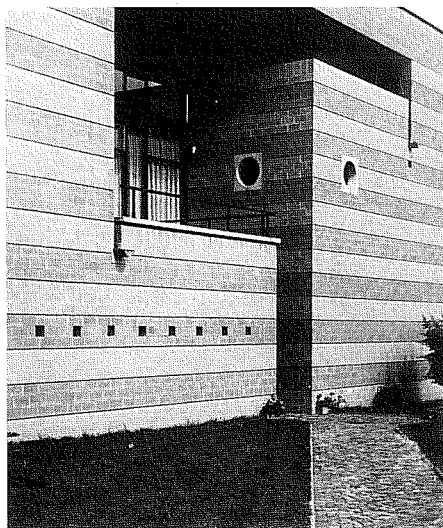
At their best, form and technique have a balanced relationship, each emphasizing its qualities and its claims. It is when neither technique nor form try to dazzle us on their own that we come closer to architecture. 'Technical honesty' must not take precedence over general honesty.

Gothic cathedrals remain perhaps the most sublime example of technique tamed. Frank Lloyd Wright suggests that it is not the stone

which inspired the cathedrals. It is a limiting factor; it makes one wonder whether Gothic architecture is of stone or whether it is what it is in spite of the stone.<sup>148</sup> Stone is no doubt used in it with a greater knowledge of its characteristics than was the case in Greek antiquity. The material is carried to extreme limits of performance owing to a structure whose logic is not intrinsic, but the product of an alliance between technique and the objective of religious glorification of the period.



*Figure 288 A symbiosis which seeks its perfection in the balance between man's artistic urge and the physical 'urge' inherent in the materials; Mario Botta, house at Ligornetto, 1978.*





## How to choose?

The critical review of the five attitudes towards materials and their utilization could lead us to espouse or oppose one rather than another according to our tastes. However, it would not be too difficult for most of us to agree with Viollet-le-Duc when he said: 'The Romans, judicious people, provided with our large pieces of iron, would have left the forms borrowed from the Greeks on one side in order to adopt new ones'.<sup>149</sup> Frank Lloyd Wright and many other moderns could just as well have said it. Truth must lie in the nature of materials. By adopting this position we would at least have reassuring directives for attaining 'an architecture of truth'.

It is no longer necessarily an adequate theory for our culture, as we near the end of the twentieth century, because our sophisticated technology allows us, on one hand, to make a 'perfect' and cheap imitation of a technique by substituting it with another, and on the other hand more than ever opens the way to cladding because of the requirements of thermal insulation.

Frank Lloyd Wright rejects these realities, saying that imitation is the natural tendency of man, not of mankind<sup>150</sup>. Perhaps we should make a clear distinction between *imitation* (or substitution) and apparent *de-materialization*. The latter is no longer 'a sin' these days. We have seen that, by de-materialization, we mean a design process whereby the sculptural play of the geometry of spaces, forms and surfaces dominates to the extent that the different materials with which they are created must be made homogeneous under a unified facing (Gerrit Rietveld, Theo van Doesburg, J. J. P. Oud, Jörn Utzon, Peter Eisenmann, Ric-

hard Meier, John Hejduk, etc.). With an architecture of facing to which our thermal demands are leading, such a tendency acquires a justification. Moreover, some buildings would gain by being covered with a unifying layer rather than 'honestly' displaying their heterogeneous range of materials. De-materialization has therefore become today one of the legitimate approaches and a potential for contemporary expression.

Little used, condemned by the majority of great contemporary architects, this approach conflicts with another which refuses to deprive architecture of the language of materials and their utilization. Without going as far as the nails which show through the assembled planks of the door, material as surface and texture as well as elements whose joints are a decorative feature originating in construction will always remain a valuable ingredient of architecture, as we can clearly see in the works of Louis Kahn and Carlo Scarpa.

The approaches of technique as an image, and the technique of substitution, are without any doubt the most debated and the most debatable. Architecture can never be merely an image. It would be deprived of its foundation, of its role in organizing territorial space into private places for accommodating human life. One can therefore hardly impose the same criteria of truth and untruth on architecture as on art in general. If illusion is the medium of picturesque expression, it cannot be the basis of architecture, whose role remains more concrete and thematic.

Stage sets are a kind of architecture, but architecture is not a stage set.

## 8.2 Materials have their own propensities

It is enough to know the physical and economic capacity of materials in order to build as a contractor. For an architect this type of performance is not very satisfactory. The form and space of architecture are *qualified* by the character of the materials and the way they are prepared and put in place. Light is a contributory factor. The result is '*an ambience*'; it is exactly this word '*ambience*' which is suitable here, a valuable word which does not really have an equivalent in the English language. We are obliged to use this foreign word to talk about the character of a place. In the definition of place, forms play their role by means of the material. When we run our hands or our eyes over it, it shows itself to be fragile or resistant, soft or hard, cold or temperate. According to its surface treatment the same material will be smooth or rough, matt, satiny or shiny. Polishing is what shows up its internal structure by laying it bare. Materials also have symbolic significance: they can evoke opulence or austerity, the ephemeral or the eternal, vegetable, mineral or artificial mixture, the private or the public, industrial or craft. Building materials thus potentially carry connotations.

Examination of the subjective impressions conveyed by stone, concrete, wood, metal or fabric indicates that connotations evolve with technology and culture. They sometimes go beyond their immediate constructional role, as the three following examples might show.

*Hewn stone*, extracted skilfully from its bed, then carefully worked and jointed, gives us an assurance of



its long life in exchange for man's sweat. When polished, it can become a cladding, showing off its veins and its colours. Each time that man has sought to secure its most important values by anchoring them in time, it is to stone that he has turned (Figure 289). Its meaning has hardly changed; its connotation of durability is the result of thousands of years of experience and resistance to fire. More resistant than the sandstone of Swiss cathedrals, less than the marble of Athens, *concrete* has become the 'rock' of twentieth century's builders. The mould is easy enough to construct; it is even reusable!

Reinforced, well gauged, vibrated and protected, concrete knows hardly any limits.

*Wood*, softer, easier to work as a structural and cladding material, even accepts tension; it has not always been as well regarded as today. Sensitive to weathering, it requires protection on the exterior (Figure 290). Deeming it to be too dark and less noble than stone, its true character has sometimes been stifled by a covering. The woodwork in rooms of eighteenth-century houses was filled and painted. At other periods wood was not only considered as a poor material, but it

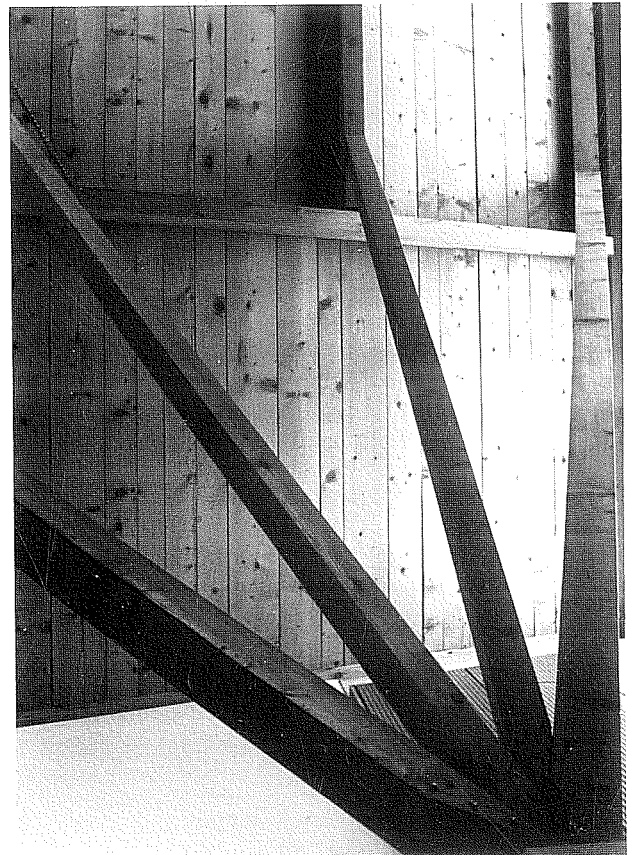
constituted a risk. Fires in the Middle Ages led to a hostility towards wood, whereas today interior walls and ceilings in wood are appreciated because they evoke shelter and warmth compared with the 'coldness' of industrial products.

*Pressed metal*, thin and supple metal sheets that are pressed on moulds in order to give them great rigidity has transformed the face of our environment. Transport vehicles, packaging, some pieces of furniture, etc., can release an extraordinary sensuality of form. And yet pressed or folded metal used in building has already fallen some-



Figure 289 Hewn stone – assurance of longevity; Segestum, Sicily.

Figure 290 Wood, easier to work, perhaps more ephemeral, but it remains a valuable component of man's shelter; v. Meiss, Collomb, Natterer, Le Châtelard school, Lausanne, 1979.



what into disgrace. Assimilated to our consumer products, it removes something from the idea of the longevity of the town and it symbolizes a progress which is no longer unanimously welcomed (Figure 291).

We could just as well have spoken about plastics. The distinction between 'natural' and 'synthetic' materials does not, however, make much sense, because paper, stainless steel and resins are not in conflict with nature, rather adding, by man's intelligence, to it, and he is already part of this nature.

The three examples - hewn stone, wood and pressed metal - present materials as bearers of messages from history and culture with a potential for poetics. That is only one aspect of their character.

It would be a mistake to consider materials as more or less neutral or inert bodies awaiting our imagination and our application. Materials also have their own urge, their 'soul'. In order to make judicious choices, the architect must consider them in a dialogue with his sensitivity.

*He must first of all question the materials about what they want to be.* That means not asking too much of them, nor too little. For this one must learn to know their inherent characteristics. Each material has its own 'structural potential' because it suggests certain volumetric and spatial forms. It also has its own 'application potential', of assembly, and formation of joints. Then it has its own 'cladding potential'. These resources are sufficiently rich for it not to be necessary to force one material to resemble another. The painted imitation of precious marbles in the Baroque churches of Bavaria, where there were none of these marbles, is certainly a demonstration of skilled craftsmanship,

but it hardly shows a way to the future. Imitation by industrial methods has become *too easy* to be credible and respectable. The apparent perfection of false rustic expanded polystyrene beams stuck onto a reinforced concrete ceiling, and the photographic wood finish under plastic laminate surfaces have devalued imitation. To find its right to art again, imitation must be diverted from its original function and be displayed as such. Trix and Robert

Haussmann work with talent and humour in this surprising and almost surrealist mode (Figure 292).

Questioning a material on what it can and wants to be in terms of formative structure of architectural spaces, is to give it authority and restrict our choices. Hewn stone will express other spaces and lights and textures than brick, wood, reinforced concrete or steel ... Frank Lloyd Wright is certainly correct when he says that 'a stone building will no

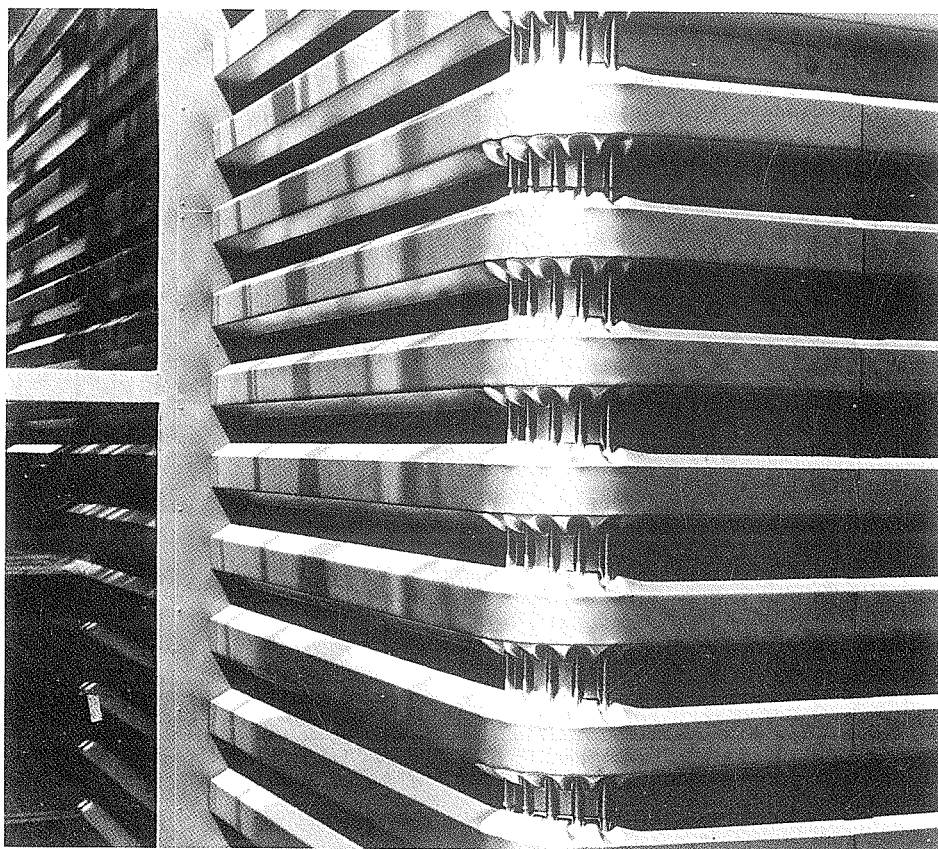


Figure 291 Pressed or folded metal - connotation of consumer products and industrial precision; corner detail of an industrial shed; Jean-Daniel Baechler, Fribourg, 1981.

more *be* nor will it *look* like a steel building. A pottery, or terracotta building, will not be nor should it look like a stone building. A wood building will look like none other, for it will glorify the stick. A steel and glass building could not possibly look like anything but itself. It will glorify steel and glass....'<sup>151</sup> Alas, this general principle does not serve as much of a guide; within each technique there exists a multitude of possible forms.

What then, together with the choice of material, are the variables manipulated by the architect, the craftsman and the labourer? The 'tactility' of a building always has a triple aesthetic aspect: *the form*, '*massiveness*' and *the texture/colour combination*, whether it is a question of an element of construction prepared before being put to use, such as brick, the panel of a façade, one step of a flight of steps, or whether it is an element of composite architecture such as a wall, façade or staircase.

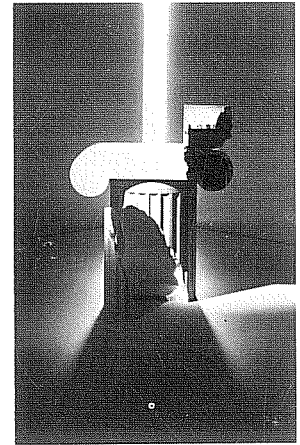
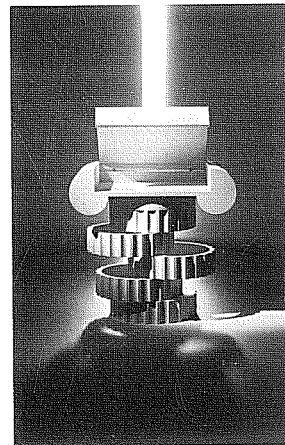
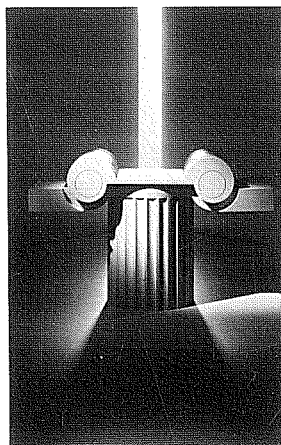
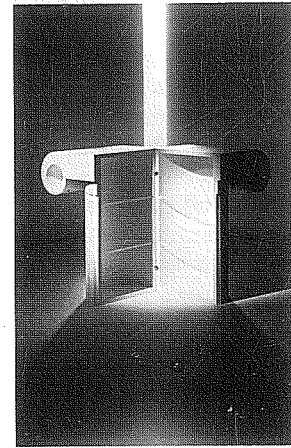
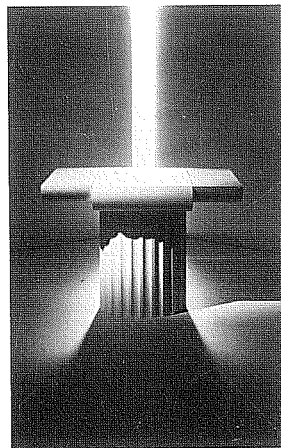
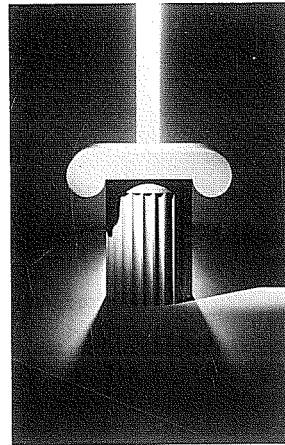


Figure 292 'Function follows form'; five functional metamorphoses of a conventional element by Trix and Robert Haussmann, 1977-78. A game with history or history as a game? Artistic quality permits ethical transgression. Furniture design may be more permissive than buildings.

## Form and material

By material 'form' we mean *the geometry of the volumetric envelope* of an element with a view to making it capable of production, resistant, manipulable and capable of assembly in order to serve and delight man.

To illustrate our point, we shall use the example of *brick*, this material used for thousands of years which has never lost its contemporary usefulness, in fact quite the opposite, since new sorts of brick are continually being invented. Terracotta or concrete block replace laboriously hewn stone. Working only in compression, it borrows structural and spatial forms from stone: wall, arch, vault and dome. But its manufacture makes it quite different: clay or malleable concrete at the outset, baked or hardened respectively, it can be given a form and relief which respond with less effort to our intentions in terms of surface texture. Its oblong geometry, size and weight have nothing arbitrary about them; they fit the mason's hand, the other hand remaining free for the trowel. The first use of brick is *the wall* - whether it be load-bearing or not. To be rigid it requires perfect verticality and bracing angles or curvatures; their frequency determines the ratios between thickness, height and length. To be as homogeneous as possible it requires the mortar beds to be perfectly horizontal and the vertical joints to be alternated. To be economical, the brick wall requires the dimensions of length, width and

height to be a multiple of its elements and joints. To remain sound, this material demands secure foundations and, when it is porous, to be protected from humidity in the ground, from rain and from frost on its surface. Such are the requirements of the wall and brick combined.

But brick can do more than the wall. Louis Kahn said: 'If you ask a brick what it wants to be, it would say, 'an arch'. Sometimes you ask concrete to help the brick and brick is very happy.'

Would certain materials therefore harmonize with certain forms and vice versa? Kahn's attractive aphorism conveys with great relevance

the form by which man attains the greatest virtuosity using brick intelligently. With the dome, brick is at its best (Figure 293). Kahn does not say that brick demands the vault, but he identifies the sublime use of brick in architecture when it outwits gravity.

In the economy of contemporary building, the vault and dome have given way to the reinforced concrete slab. The idea that brick may 'be helped' by concrete is considered by purist adherents of glorified technology as a perversion. But should we reject metal fixings in a timber frame in order to return to the onerous technique of pegging? Why should we prevent an ancient mate-

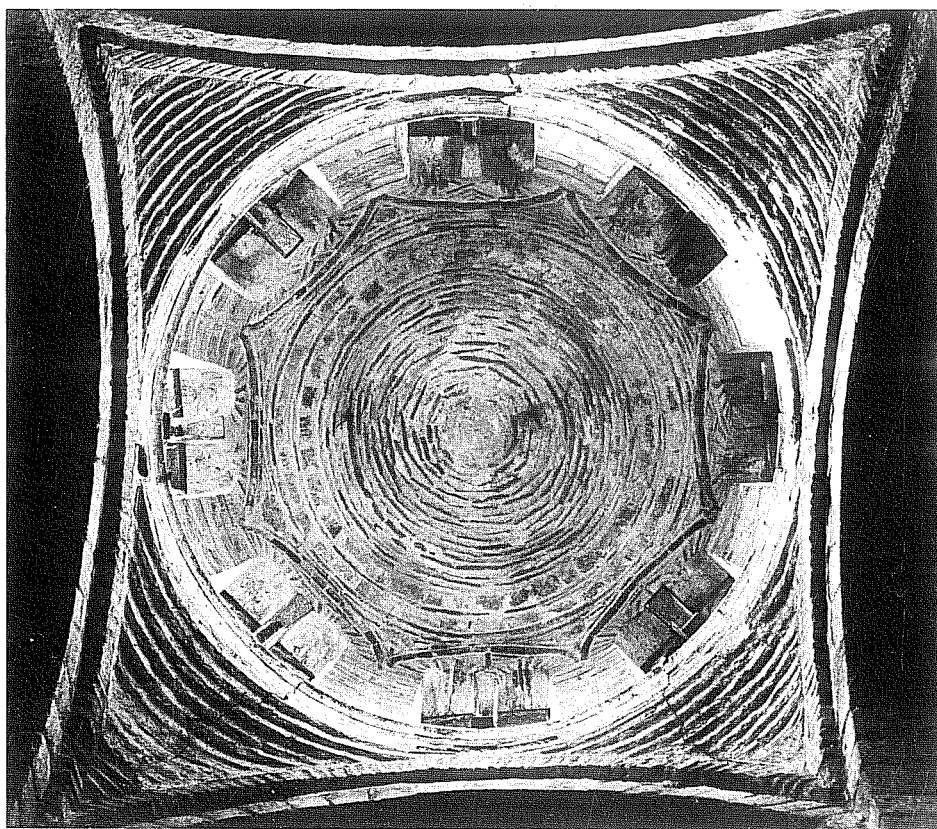


Figure 293 With the dome, brick is at its best: church of the Virgin Theotokos, Hosios Convent, Greece, about AD950.



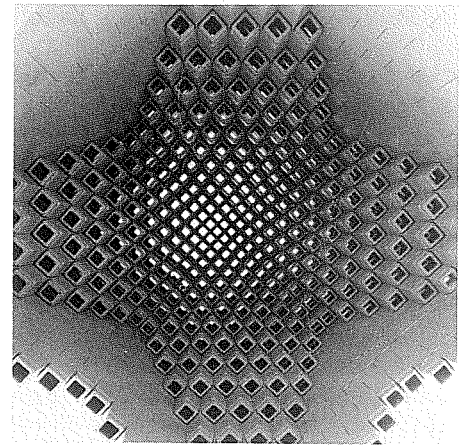
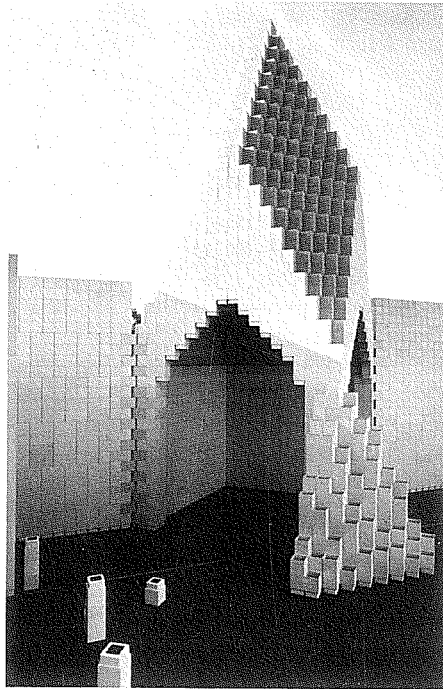
rial being helped by new techniques thanks to composite structures?

Let us take the example of the interlocking brick of synthetic material, measuring  $100 \times 100 \times 200$  mm, developed and used at the Laboratoire d'Expérimentation Architecturale (LEA) at the Ecole Polytechnique Fédérale in Lausanne. It is used as a teaching aid for design through full-scale simulation of architectural spaces. Consequently the constructions must be easily modifiable, demountable and remountable, hence the use of a light brick with accurate, dry joints, requiring precise interlocking to ensure the stability of the wall. This means it is not possible to alter the thickness and treatment of the joint, nor the facing. The walls are built on the ground without foundation. Not being loaded, their stability is precarious; corners and braces are necessary.

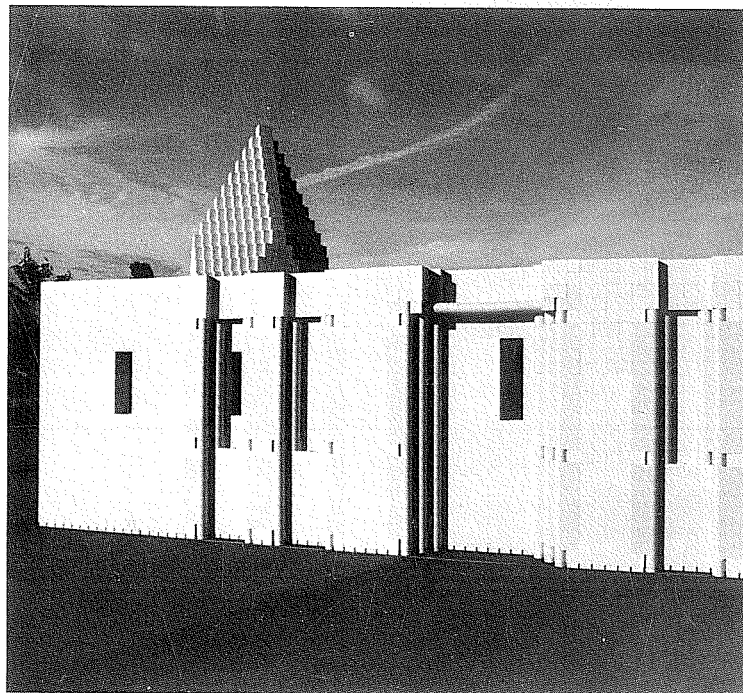
In an exercise on the bonding and modulation of walls carried out with students at the EPFL, we have done experiments in which the constraints of this particular material were to become design stimuli. The walls tended to transform themselves into arcades and, from one transgression to another, a pyramidal dome of about 3 m in diameter has appeared, an archetype which, until then, was reputed to be unfeasible with LEA's interlocking bricks (Figures 294-296).

This example shows how form and the system of construction sustain relationships stimulating composition to the point of fascination. Design and experiment can explore the farthest limits of stability with respect to one material, or explore its decorative capacities, in the correct meaning of the word.

Brick becomes clever in the hands of the Roman mason. It assists the



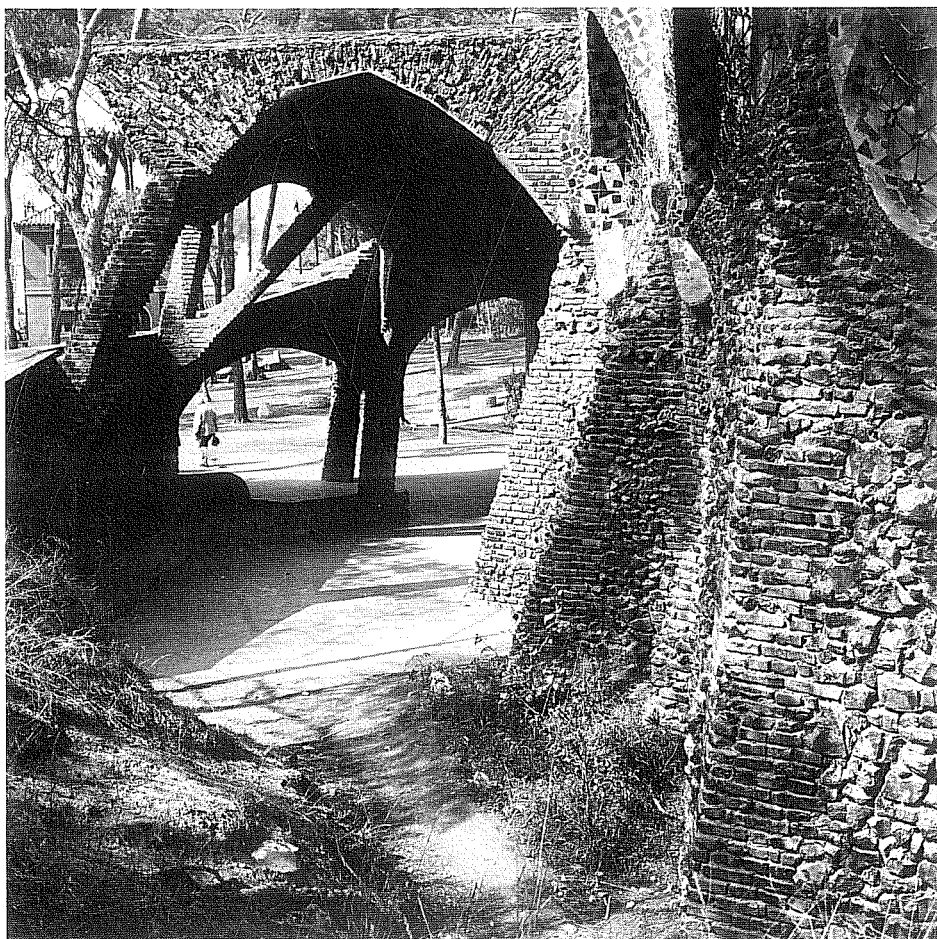
*Figures 294-296 The constraints of an interlocking brick become a stimulation for the design of walls, archways and domes. Laboratoire d'Expérimentation Architecturale, EPFL, 1980.*



pozzolana concrete, and not the opposite, in order to build the gigantic vaults of the thermal baths. It accepts the role of formwork.

It is fascinating to use a material by pushing its performance to the limits. The bricks forming the inclined columns at Antonio Gaudi's Colonia Güell in Barcelona excite the imagination by their audacity in having touched the bounds of credibility. He had to be an architect-builder of very great experience to manipulate materials with such ease. When brick is used with such virtuosity, without even being assisted by concrete, it is no longer a simple question of design, nor calculation, but much more the product of reason and practice, trial and error (Figure 297).

Materials do not tolerate excess; within the limits of their resistance, manufacture and installation, they grant a considerable margin to form. The great formal diversity of brick buildings is proof of this. The kind of thought that we have just given to the material aspects of brick and form, must be given, and in even greater depth, to the nature of all building materials.



*Figure 297 Brick pushed to the limits of credibility thanks to the great expertise of Antonio Gaudi. Colonia Güell, Santa Coloma de Cervello, 1898.*



## Thickness

If the volumetric envelope is a fundamental characteristic of form, its 'massiveness' is a particularly significant complementary attribute. The same form can appear thin or thick, solid or hollow. Mass influences our perception of things. The thin sheet metal of a car body and the massive mould on which it is pressed are judged in a totally different way. However, they have the same exterior form (Figure 298). The two images show very clearly the opposition in nature between the hollow and the solid form. The sheet metal is pressed so that its shell becomes sufficiently rigid to resist normal stress, whilst at the same time providing, with the greatest economy of material, space for other parts. Its mould is built to resist the extraordinary force of the

press; it does not have an interior.

We have said that architecture is an art of the hollow. The perception that one has of the spatial envelope of a building depends largely on the way in which we modulate and perforate the thickness of this envelope. A façade with deeply recessed windows will evoke 'fortress' and security whereas the urban Baroque Viennese window carefully placed on the exterior surface of a wall of the same thickness is agreeably deceptive, giving the whole building an appearance of lightness and elegance (Figures 299 and 300).

From the interior the thickness of a spatial envelope qualifies the space around the opening. A window placed in an 80 cm wall represents this envelope in a completely different manner from a window set in a 20 cm or less wall (Figure 301). Each opening creates a 'space of wall

thickness' and causes reflections of light on the reveals. In a thin wall or a curtain wall, space and reflected light are negligible. The space of wall thickness can become a place between the inside and the outside; accessible or not, it is one of the attractions of many traditional stone buildings.

Mass influences not only the manner in which we see architecture, but also its connotation of resistance and longevity. Rightly or wrongly, thin seems less permanent than thick, even if this thickness is sometimes only fake. In the Baroque a wall which appears very solid is often only the combination of two relatively thin shells concealing its hollow character. What interests us, in short, is the *apparent* rather than the actual massiveness.

Thinness also has a poetic potential. The circular stairs of Nervi's

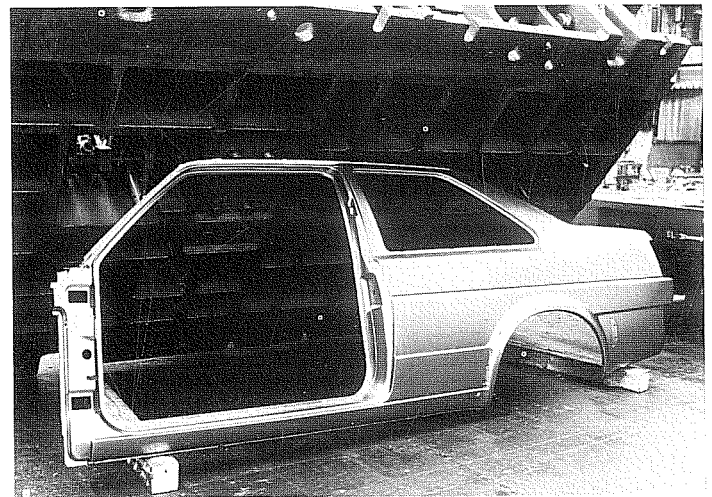
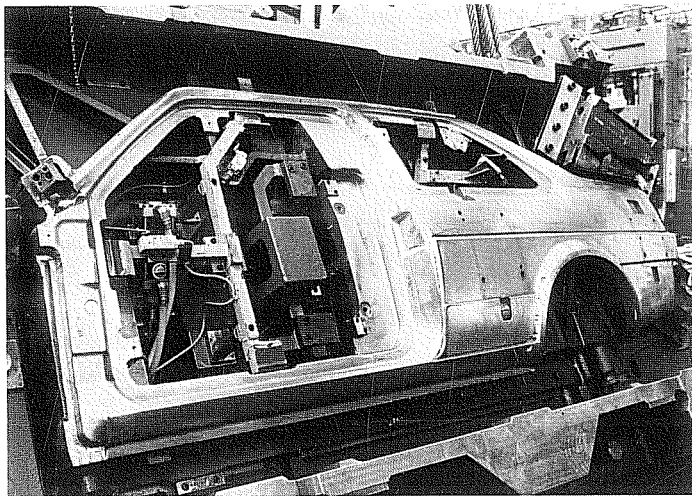
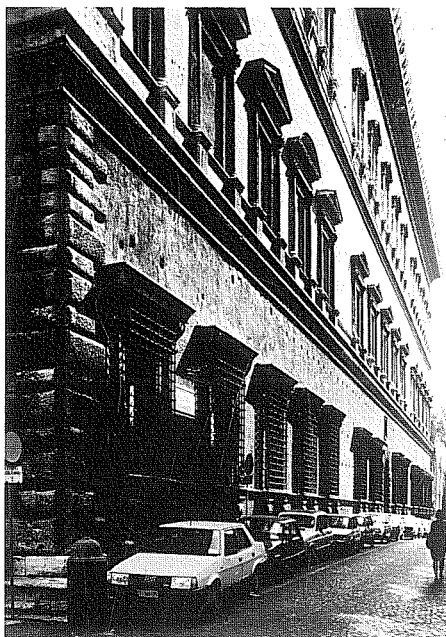


Figure 298 The thin sheet metal of a car body is experienced in a totally different way from the solid mould on which it has been pressed. However, they have the same exterior form. Volkswagen factories, 1985.



Figures 299 and 300 Massiveness or lightness as a result of the position of windows in the thickness of the façade. Baroque Rome, where each window aspires to be a deep aedicule, and Baroque Vienna, where the subdued profiles of the windows constitute an elegant surface texture.

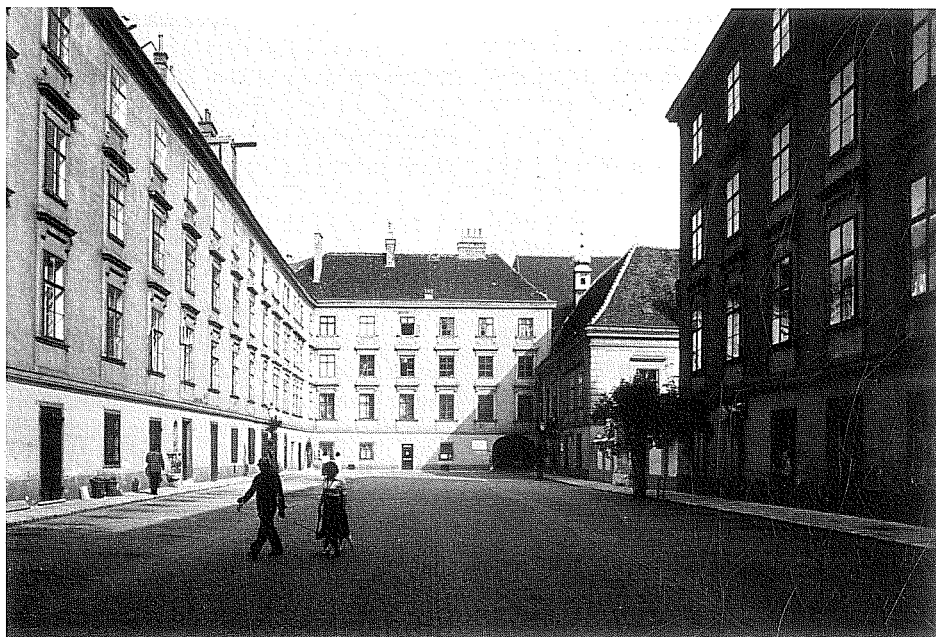
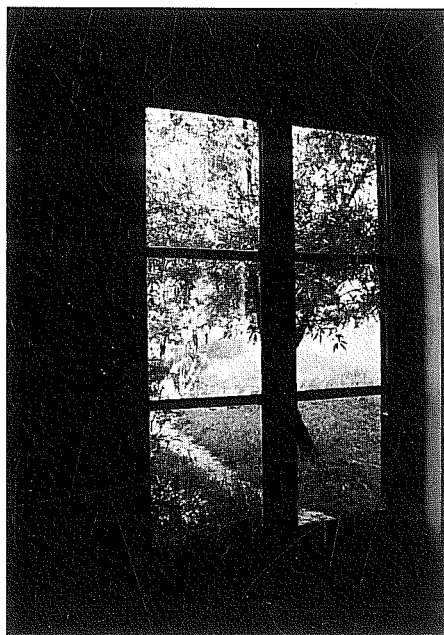


Figure 301 Openings in the wall reveal its thickness. There exists a 'space of the wall thickness'.

stadium in Florence, whose thickness is reduced to as little as 4 cm. Candella's large-span thin membranes, the elegant curtain wall of Mies van der Rohe's Seagram Building, or Frei Otto's daring tents, need not envy the massiveness of the pyramids.

The creation of architectural form, therefore, also requires a '*design for the thickness of spatial envelopes*' in harmony with other more general aspects of the plan such as the site, brief, theme, space, light, and building methods.



## Texture and surface modulation

The arrangement of coursing and bonding in masonry construction and mouldings and trimstone regulate the surfaces which surround us by the control of profiles, joints between elements and changes in materials (Figure 302).

Le Corbusier stresses this potential:

Surface modulation is the architect's touchstone. He reveals himself either as an artist or simply as an engineer.

Surface modulation is free from all constraint. It is no longer a question of habits, traditions, build-

ing processes, nor of adaptation to utilitarian requirements.

Surface modulation is a pure creation of the mind; it calls for the sculptor.<sup>152</sup>

These observations are of considerable relevance. They reflect a determination to defend the autonomy of architectural form with formal or

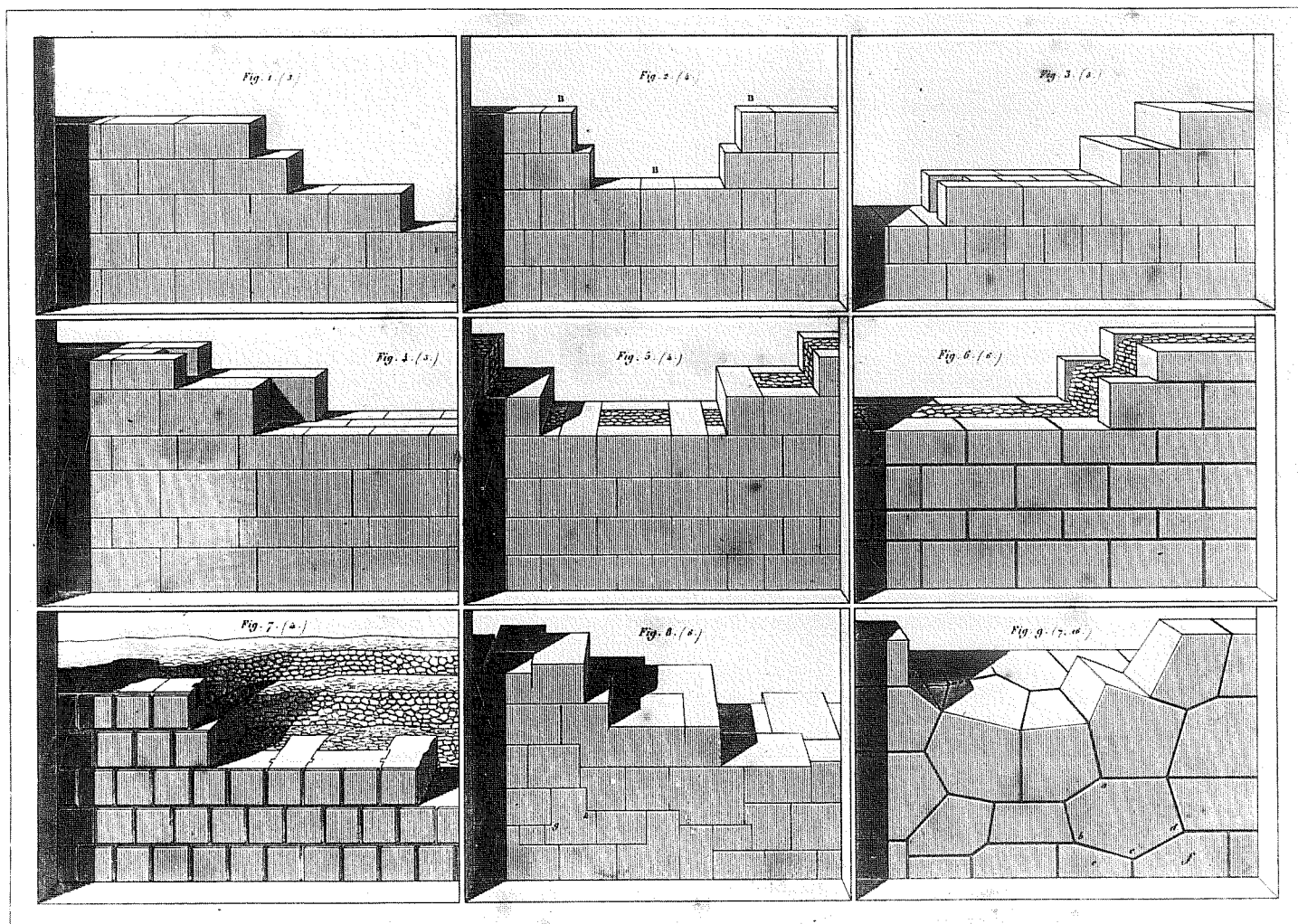


Figure 302 Wall bonding according to Jean Rondelet. *Theoretical and Practical Treatise on the Art of Building*, 1810-17.



Figure 303 Pure volumes and underlying texture without surface modulation, Cyclades.

symbolic objectives and not as the mere result of realities of production. Nevertheless, surface modulation is only exceptionally a pure creation of mind (stage set design for example); in fact it is *also* the reflection of a compromise by a designer who has to arrange the material and to join the elements together.

The surface texture and colour of the materials used, their combination and their jointing give the space its ultimate character, its 'status' and its 'temperature'. Traces of the chisel, bush-hammer or polishing machine model the surface of stone; joints between bricks, marks of formwork or the grain of wood on moulded concrete, the metal plate

taking the oblique forces of a timber frame, the lack of precision of a cut with an axe or the precision of the plane, the enamelling of a surface, the bend of sheet metal are all traces of fashioning which, together with colour, model the surfaces. They inform us about certain attributes of the building, for example its thickness, which we discussed earlier.

Frank Lloyd Wright enables us to rediscover the value of 'integral ornament' – the nature-pattern of actual construction' as a confrontation with material, as opposed to symbolic decoration. Integrated decoration is not, however, just the result of physical necessity.<sup>153</sup> Man's power of imagination modifies the surface by structuring it in harmony with his intentions and the material used. This also distinguishes architecture from ordinary building activity.

The precision of fashioning materials has always been an aim and a measure of human mastery of nature. *Polishing*, which reveals the internal structure of the material, is the ultimate stage of it. It erases the idea that the object has been made with tools; all that remains is the object itself. As architecture most often produces fairly coarse objects, it is nevertheless useful to know and to exploit the decorative effects of traces of fashioning and especially their capacity to differentiate reflections of light. The Greeks knew how to make the most of their tools to exploit the potential of reflected light which results from differences in texture of the same material.

Since an architectural element is composed of several parts, acknowledgement of the traces of assembly often becomes inevitable, unless a cladding is applied (Figure 303). A stone or brick wall is not, primarily, a geometric plane or panel. The

many standardized elements and their joints form a texture, a lasting trace of the act of construction (Figure 304). The recessed or projecting articulation between these elements shows the bonding at a detailed level. Instead of amounting to a uniform texture, these individual elements can constitute groups in such a way as to produce a design on a larger scale: *surface modulation*.

To discuss bonding and surface modulation we shall take the example of brick again, in a precise context. The art of Palaeo-Christian and Byzantine building is based on Roman inherited skills: the spatial enclosure of the vault and the dome and the composite wall construction of roughly cut stones alternating with beds of precise bricks. Byzantium developed the Roman techniques by increasing both the spatial possibilities (Saint Sophia in Constantinople) and the decorative effects of the bonding in order to save the expense of an exterior facing. In building a wall it is the corners and the openings which require the most care in construction. The corners are then carried out in precisely cut stone and the face of the wall in rubble, or roughly cut stone, sometimes surrounded with brick, thus creating surface modulation (Figure 305). Builders of Byzantine churches and palaces, incidentally, often economized on the cutting of stone by framing two or three arched windows in brick, thus emphasizing the form and importance of the openings. Sometimes the simple turning of the bricks by 45 degrees, without special bricks or the addition of more expensive materials, accentuates the outline of the windows in the roughness of the wall. The infill brick chips of the tympanum, in their matrix of mortar, form, in turn, a



surface decoration. Long experience of working with materials, and not the design itself, opened the way towards this method of economical treatment. The heavy elements in hewn stone can be restricted to capitals and centre columns of the windows whose slenderness prohibits the use of brick.

Each material is used within its own working logic, but with an overall objective. Brick has served the window well. The rational and refined combination of stone and brick guarantees the coherence of the whole. The exact places where there are changes in the form of assembly or in the material coincide with key locations in terms of the building as a whole: plinth, corners, openings, cornice, principal façade, lateral façade (Figure 305). The result is a design which makes it possible to accentuate edges and to introduce order on a larger scale than the simple additive texture of stones.

This example shows that the economy of cladding does not in any way exclude a decorative effect of the structure of the surfaces and architectural elements, when the materials are chosen, dimensioned and assembled with sensitivity, imagination and intelligence. Among contemporary examples one can cite the work of Mario Botta or, less well known, the repair of the breach in the Munich Pinakothek by Hans Döllgast after bomb damage (Figure 306).

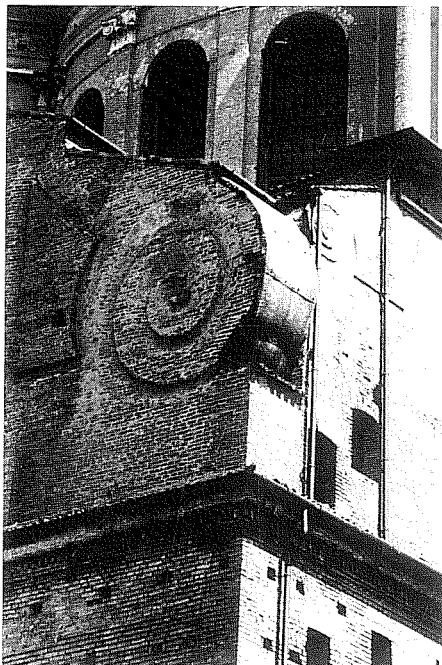


Figure 304 Bonding and surface modulation without facing: detail of the side façade of Leon Battista Alberti's Sant' Andrea in Mantua.

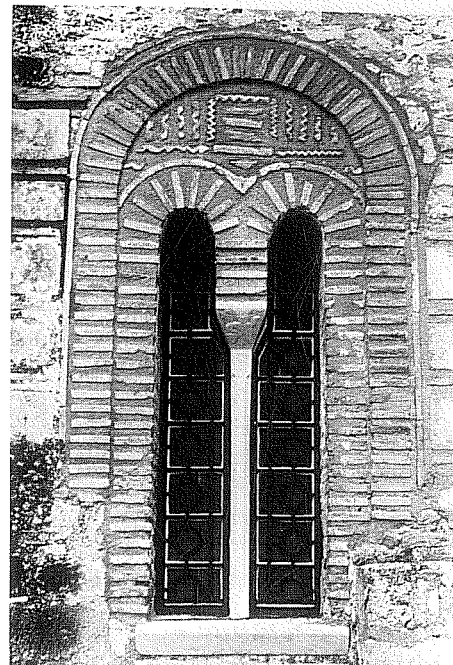


Figure 305 Bonding becoming surface modulation; Saint Sophia, Monemvassia, Greece.

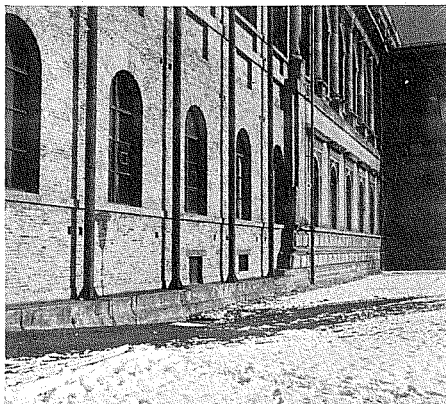
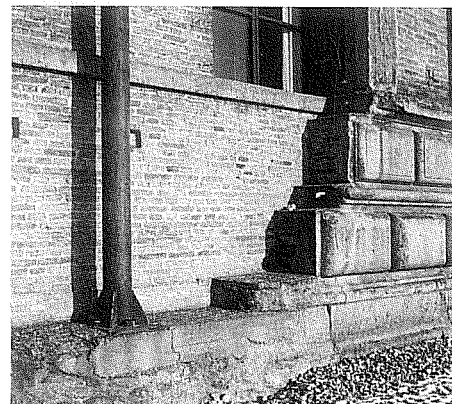


Figure 306 A great lesson in architecture: the Munich Pinakothek, damaged by bombs in the Second World War, emerges from its rubble with the greatest economy of means in the post-war period. The architect has known how to honour the sumptuous past by the modest means of salvaged brick and steel which were available immediately after the war.



### *Support structure and cladding*

The appearance of the surface of walls, floors and ceilings is important enough for a more resistant or higher quality cladding to be often applied to the mass of a structure which has been built with cheaper materials.

Italy, from the time of the Romans to the Renaissance and Baroque, hardly bestowed the stamp of respectability upon fair-faced brickwork, quite the opposite to Byzantium and, later, the Nordic countries. Brick is considered to be an economical means for building a *structure to be subsequently clad* by a superior

material: marble slabs, stucco frescoes, mosaics, etc. Rome's wealth had limits which would have made a massive construction in hewn stone without cladding too costly to cover the thermal baths, the Pantheon, or to build a prestigious villa. With the exception of columns Rome therefore used cheaper structural material with cladding to lend the desired glamour to its buildings. The Renaissance, upholding the idea and the image of the building more than its constructional reality, differentiated the scenic role of the main façades of a religious building and often treated the sides and the back as 'common sheds' (Figure 307). Conver-

sely, Greek antiquity, Byzantine and Gothic architecture considered buildings as precious objects of which neither the sides nor the rear deserve to be neglected. One can see a conceptual difference here between these civilizations.

There has been a period in modern architecture when the principle itself of cladding has been rejected in favour of the rough appearance of 'real' materials (the 1960s). The Greek temple with its columns and walls in solid marble was then recognized as a model of honesty. Viollet-le-Duc did not hide his preference for the Greek, who did not distinguish construction from deco-

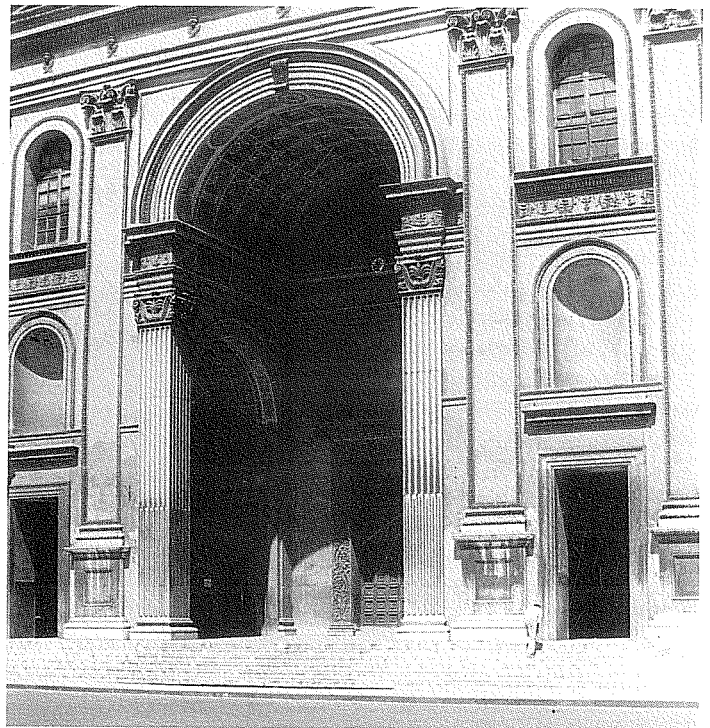
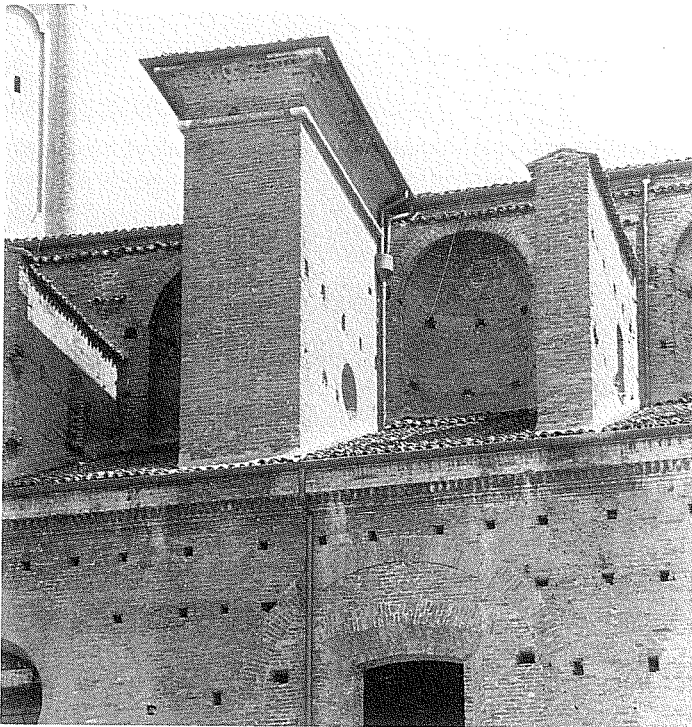


Figure 307 'Scenographic' cladding of the principal facade during the Renaissance period. The side and back are relegated to the rank of 'ordinary sheds'; Leon Battista Alberti's Sant' Andrea in Mantua.



ration, whereas he accused the Roman of being an 'upstart dresser' who only called on the artist once the material requirements (structure and space) were met.<sup>154</sup> More than Rome, one could have denounced Palladio (Figure 281) but this contempt for cladding would be excessive. Rome and Byzantium could not have financed their dreams in solid marble; it was brick and cladding which provided them with an economical method compatible with their ambitions. Gottfried Semper said: 'Form which is the expression of an idea must not contradict the material of which it is made, but it is nonetheless not indispensable for the material as such to be added to the work of art.'<sup>155</sup> - an opinion which is diametrically opposed to that of Viollet-le-Duc or Wright, which we discussed earlier.

Semper's proposition corresponds fairly well to certain demands of contemporary building. Thermal economy is directing us by necessity towards 'composite envelopes'. The development of an architected cladding is therefore a real task for our times. The fact that thermal insulation, which is by necessity light and fragile, would be more effectively placed on the exterior than on the interior of the structure will perhaps alter the appearance of our buildings. It is only resistance to change which means that, for the moment, this 'overcoat' continues most of the time to assume conventional forms.

Cladding allows the surface, and even space, great formal freedom. Its laws are not necessarily guided by structural requirements. Its thinness means it is possible to use high quality, more resistant and more expensive surface materials than those used for the structure. Their unit size and modulation can follow

a logic which more easily complies with the formal intentions of architecture.

Besides purely technical considerations, we can pick out roughly two uses of cladding: one which does not fundamentally alter the space produced by the structure, following it closely or even exaggerating it; the other contradicts structural reality by producing different spaces and objects, as we have shown in the abbey church of Einsiedeln (Figures 190 and 191). This path has become a precarious one to follow. There is no longer that unifying theme which governed the space of illusion as there was in the Baroque period. Consequently there is a risk of illusion causing alienation.

On an apparently more technical level, cladding which closely follows structure can, in turn, be divided into two categories.

Some very thin claddings *adhere* to the whole surface of the structure, for example paint, rendering, wallpaper, mosaics and tiles. If the texture of the structure is sufficiently pronounced and if the cladding consists of mosaics or a thin film which is flexible at the moment of application, the texture of the support shows through, but its irregularity is less apparent.

Other claddings come in the form of slabs or panels which are *fixed* individually to the structure, for example marble, glass, metal or wood. Their geometry and joints introduce a new modulation which does not necessarily correspond to that of the hidden structure. The fixing can be hidden or visible. In the latter case it introduces a new texture which accompanies the rhythm of the panels, as in Otto Wagner's Postsparkasse in Vienna.

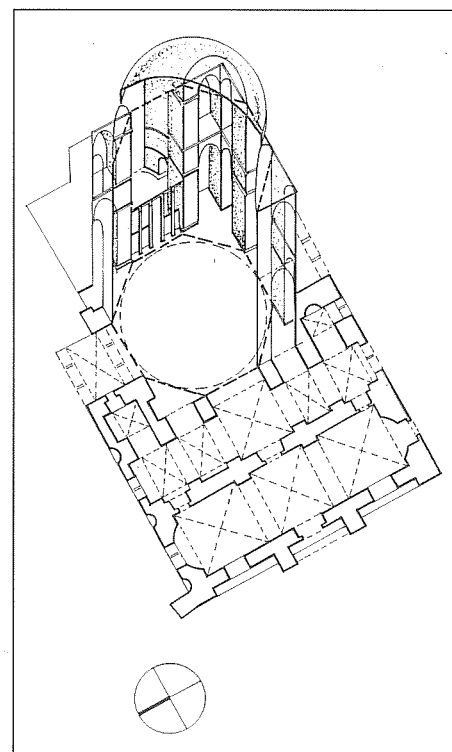
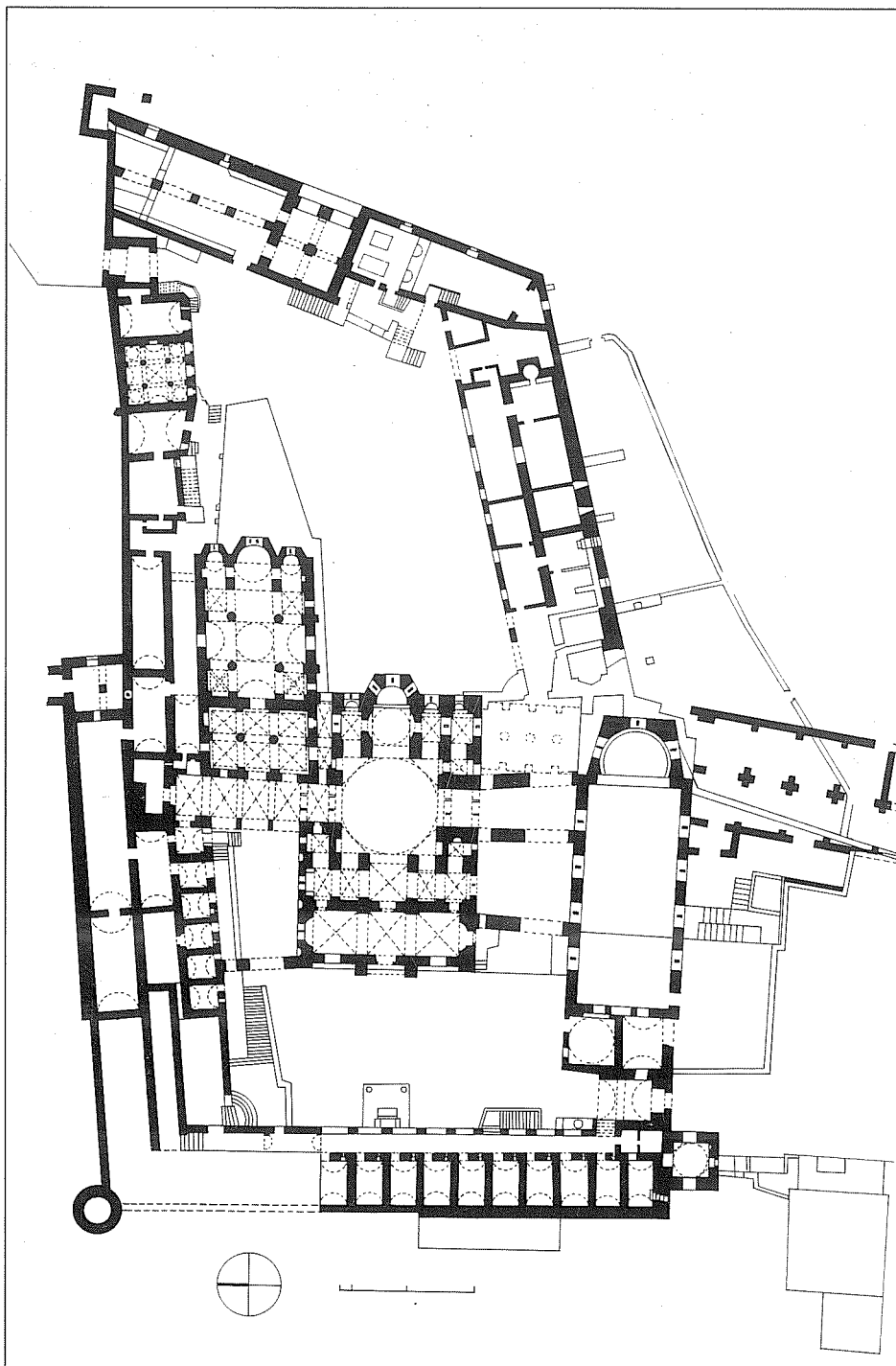
The wise and sensitive combination of these two methods of clad-

ding, by adhesion or fixing, has made it possible to create some extremely refined buildings, as we shall see by examining the Byzantine example of the church of the convent of Hosios Loukas built in the eleventh century not far from Delphi (Figure 308). I shall describe its interior:

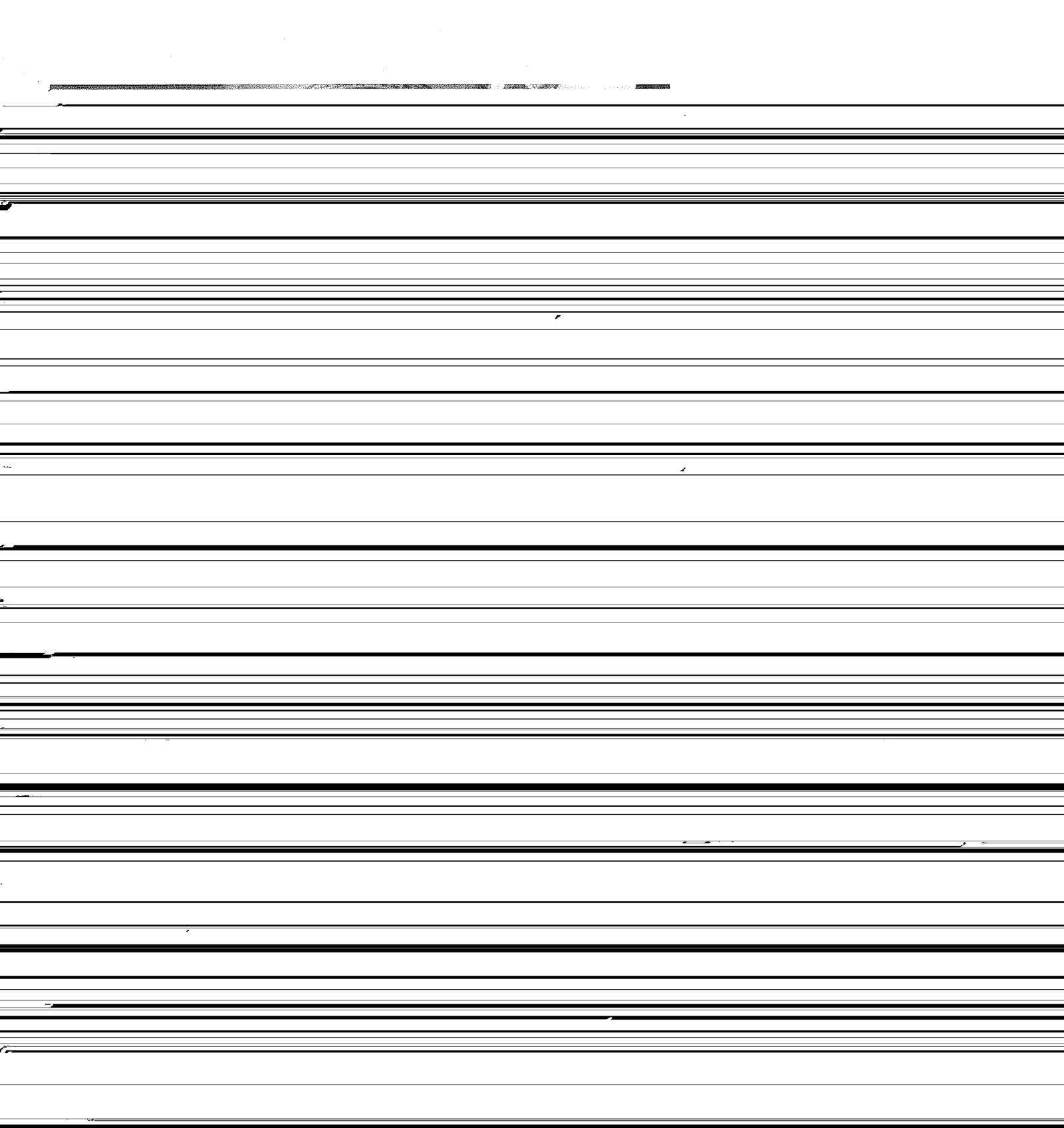
The walls up to the springing of the arches, vaults and dome are clad in solemn dress as for a celebration: an arrangement of slabs of polished marble, in grey, emerald, reddish brown, pink and ochre, large, simple rectangles which mutually encircle, juxtapose and superimpose themselves on each other in harmony with the spatial structure, making the transition between heaven and earth. A very thin ribbon of white marble, in slight relief, surrounds the slabs and gives them a relative autonomy. A geometric abstraction, the wall is thus clothed with classical simplicity which inspires respect for the place (Figure 309).

This dress is not a 'wall', it does not disappear in the ground in search of support. The marble cladding swells out slightly at its base and merely brushes the ground. The dress has its hem: the plinth with the slight relief of its white marble mouldings (Figure 310). Faithful companion to the wall, not straying at all from its master's path, the plinth traces, or rather retraces with its clear line, the ground plan of the church - and it does so superbly.

Above this plinth the rhythm of the rectangles does not start immediately. First of all there is horizontal band of monochrome marble, calm and smooth, contrasting with the verticality of the space or, rather, counterbalancing it. Two fine threads of white marble moulding accompany it, one at eye level and



*Figure 308 Hosios Loukas, Byzantine convent in Attica with two churches, and one of the tenth and one of the eleventh centuries; plan and axonometric.*



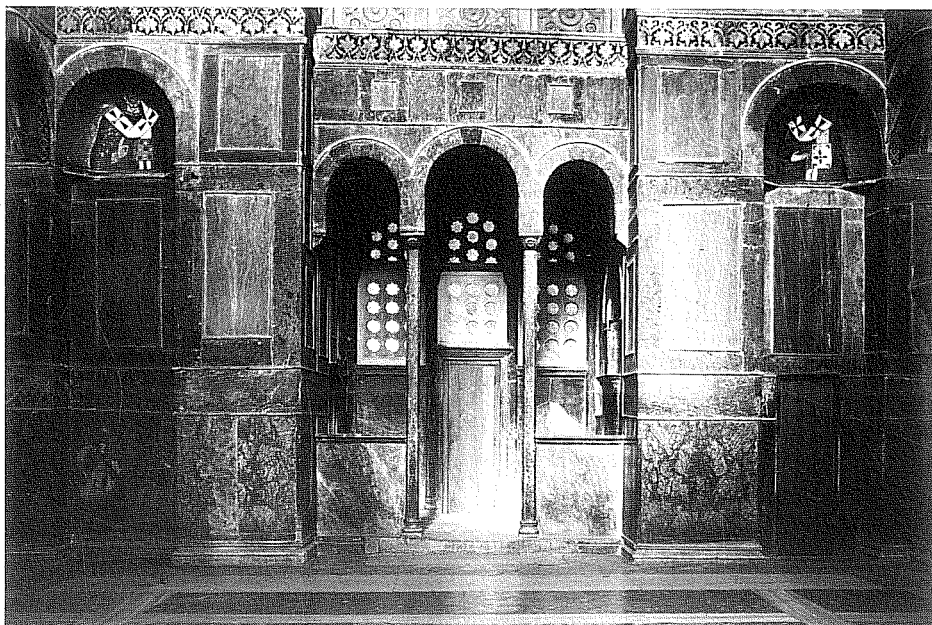
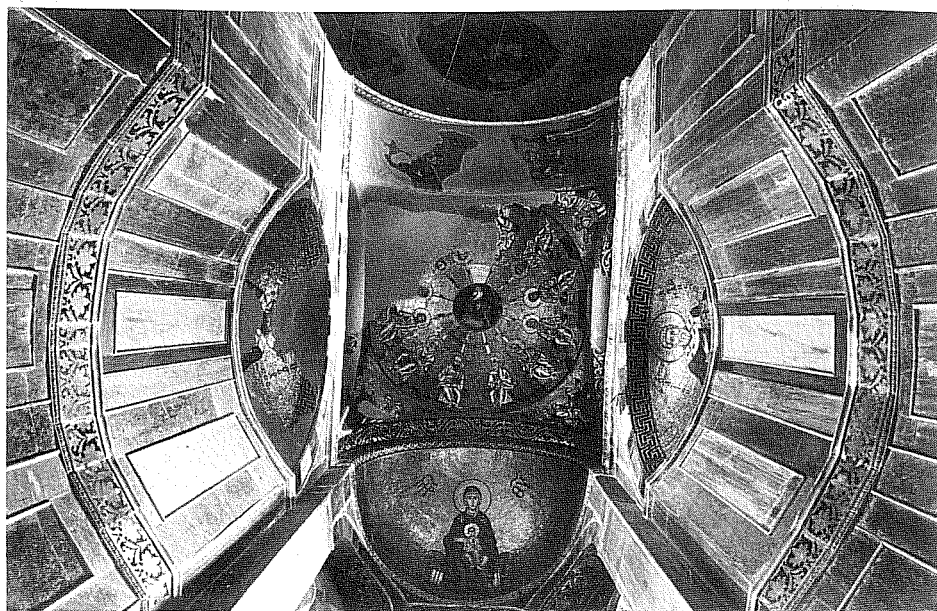


Figure 312 'From behind this sober and dignified clothing appears, for a moment and for the first time, the skin of the building, with the evangelists'.

Figure 313 'Above the rigorous and articulated geometry of the cladding rises in great splendour the naked body of the building with its skin of mosaics'.

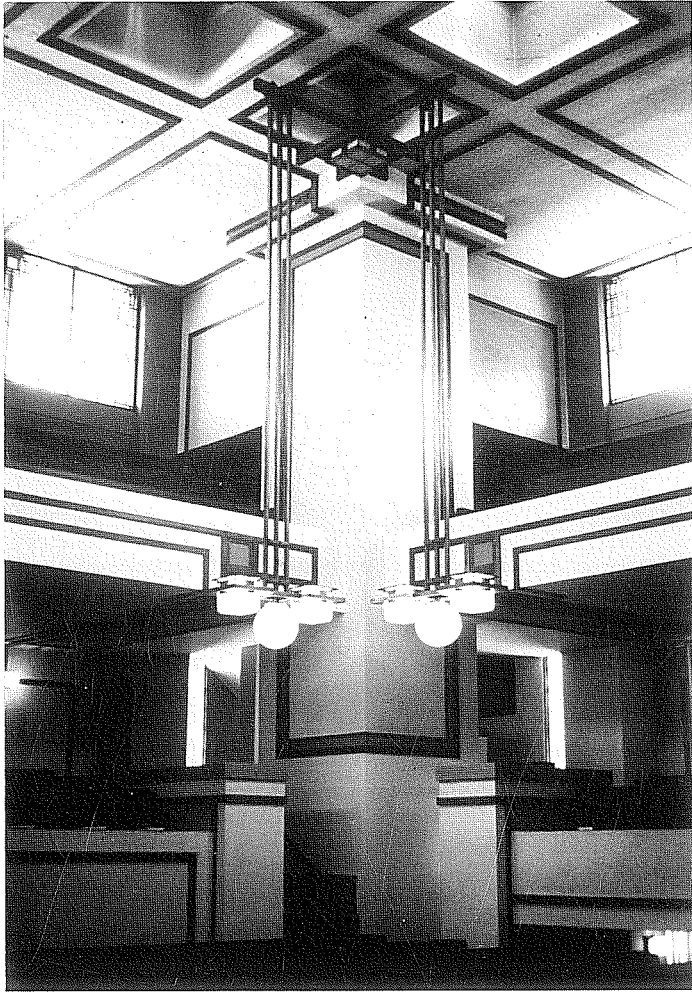


the other at raised arm level (Figure 311).

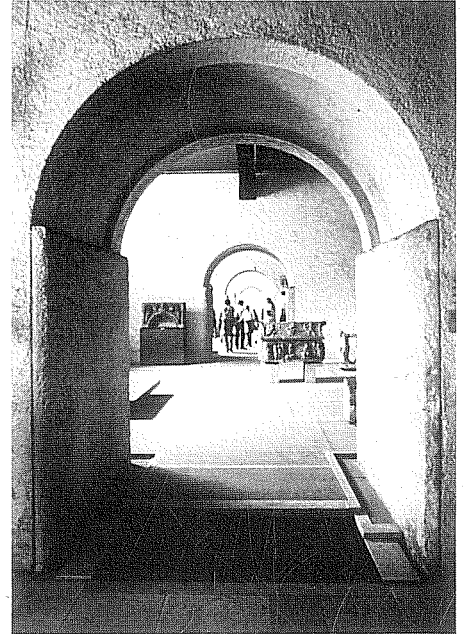
Between the lower level of recesses and vaults and those at the top, there is the *string course*, in white marble like the plinth, but with a delicate, repetitive, carved ornament. It gives scale to the height. In contrast to the plinth, which escapes discreetly towards the edge, the string course continues around the central square and the apse. But, before we get to the string course, something extra ordinary happens. We discover that underneath the dress there is a body! The dress has four openings which reveal the nakedness of the wall with its skin clad in gold and 'tattooed' with portraits of the four evangelists - openings which are forerunners of the vaults and the dome (Figure 312).

Above the string course, still in marble, are large, polychrome rectangles and white threads, which end with the 'collar', a simple white frieze like the string course. Here suddenly and magically emerges the 'real' body, the load-bearing structure which escapes from the rigour of its dress and transforms itself immediately into arches, vaults, pendentives and dome. A skin of mosaics covers the flesh. The contrast is controlled in a masterly fashion; from the rigorous and articulated geometry of the man-made dress emerges the continuity of the sensuous forms and textures of the body (Figure 313).

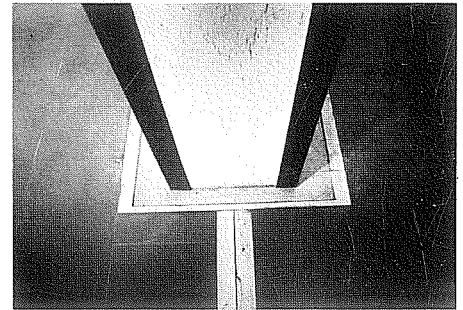
What a superb lesson in architecture and building, which manages to create, with confidence and economy of means, this contrast between the spirituality of the ceiling - because the dome seeks to be untouchable, a sky well beyond the measure of man - and the serene and rational beauty of the marble on the walls! The height of refinement is perhaps in



*Figure 314 The line conveys the spatial idea.*



*Figure 315 The decoration reveals the basic structure through contrast.*



the announcement by the four semi-domes of the evangelists - these lanterns on the walls, four tear-drops fallen from heaven, forming the ceiling of the recesses.

This subtle duality comes to us from Constantinople, but we come across it again elsewhere, especially in the Baroque period, whereas the Gothic, Renaissance and the Neo-classical tended more to extend rationality to relate it to the whole of the work. We are far from the 'integrated decoration' of Frank Lloyd Wright; without denying its aesthetic

potency, it should not be elevated to a dogma. Wright broke this rule himself: the decoration of the internal space of Unity Temple in Oak Park is articulated less from material than from a spatial idea (Figure 314).

Some contemporary architects have been able to exploit the potential of articulation between body and clothing without necessarily referring to the divine. At the Castelvecchio Museum in Verona, Carlo Scarpa uses the contrast between structure and cladding to articulate and make visible both history and the present.

His building reveals the precision of geometric control of our contemporary tools (especially the design on paper) whilst at the same time showing the geometric approximations from the past. History becomes explicit without being too voluble (Figure 315).

The final choice of surface treatment for the interior and exterior of the building is not easy to make. It requires knowledge of underlying associations. A cube covered in fur does not make one think of the same thing as the identical cube in pol-



ished steel. It was not by chance that Renaissance theorists insisted on *conformity* of surface treatment according to the type of building. Precious materials were, in the first place, intended for places of worship (Alberti and Palladio); rustication was particularly suited to fortified buildings (Serlio).<sup>156</sup>

Nowadays there are many different cladding materials available; the distinctions between 'precious' and 'poor' have become blurred. We find something of the place of worship in a villa, office, school... everywhere. The old labour-intensive methods are being replaced by new materials and processes. Glass and metal have, with their cheap, shiny surfaces, replaced polished marble. Mass-produced veneers and wood-photo laminates are making the former

luxury of solid wood into something commonplace. The ease with which we produce and reproduce these elements in large numbers has ended up by devaluing the rich associations of shininess. The precision of the craftsman's movements in shaping material, which since the beginning of time has been a sign of human skill, has been caught up with and overtaken by the machine. With the machine, unprecedented precision has been made possible, even compulsory, for industrially produced articles. Values have thus been reversed. Imperfect objects gain the symbolic value of personal investment; perfect objects no longer enjoy the same admiration. Many people scrutinize an object in search of imperfections, proof that it is 'hand-made'. Industrial produc-

tion has gone as far as the simulation of hand-crafted finishes. This art of 'faking' will perhaps lead to temporarily satisfactory solutions, but certainly not to a real architecture for our time.

In the contemporary scene of the profusion of 'easy cladding', it is necessary to remind ourselves of the principles which govern the architectural potential of the covering and its basic relationship with the structure as a body. Hosios Loukas, where nothing is left to chance, could teach us a lesson: to cover is not simply to hide a body in order to falsify appearances; on the contrary, the cladding attains perfection when it acknowledges what it is covering (Figure 316).

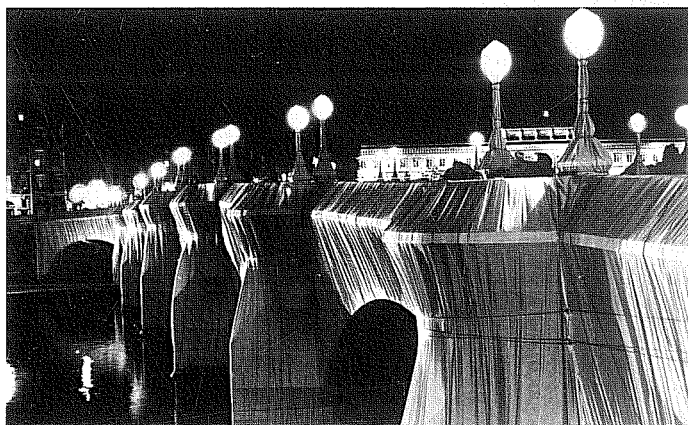


Figure 316 Acknowledging what is being covered and in what place: Christo wrapped the Kunsthalle in Berne fairly roughly in 1968. For the Pont Neuf in 1985 he respected the cultural demands of Parisian 'haute couture'.