PERSPECTA 6 THE YALE ARCHITECTURAL JOURNAL

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FOOD FOR CHANGING SENSIBILITY

Henry-Russell Hitchcock

Of all the forces acting upon architecture, the subtlest and least open to objective exploration is the changing sensibility of architects — especially of younger architects. Evidence of such changing sensibility is of various sorts; but some of the evidence seems almost to suggest that actual changes have occurred from time to time in the apparatus of the multiple senses by which architecture is experienced. It is as if some generations had been so myopic, for example, that they preferred to appreciate buildings and their detail from very near to; while other generations have liked to see buildings only from a great distance, and hence most esteemed those that were very big and bold. Not only the sense of sight is involved: some generations have certainly been happier under high ceilings and some under low; some have characteristically used materials that were slick and highly finished, others prefer them rough.

Changes of sensibility start with architects and reach the "consumers" only rather gradually. But even the most creative of architects have usually required training of some sort in the means that would ultimately be most efficacious for achieving the particular effects that their sensibilities seemed, almost subconsciously, to be demanding. At any given period of changing sensibility, such as that since the end of World War II, mature expressions of the new are at first few and often geographically far between. Positive response to the new is therefore rarer than negative response to the old — even though many of those who are, in principle, most ready to reject the old still continue from inertia to reproduce its effects.

This helps to explain why there always exists a real need to re-examine the work of the past. There is, presumably, almost always a generic interest in architectural history among architects; but the aspects, or periods, of history that seem at any given time to merit the closest attention certainly vary with changing sensibilities. New sensibilities demand something to feed on and, especially while the present still offers too little that appeals directly or — more often perhaps — only partial and transitional responses to the new demands, the past can often make good the deficiency. When, in the late forties, such buildings as Baker House at the Massachusetts Institute of Technology or the Unite d'habitation at Marseilles — in the latter case many years before it was finally

FOOD FOR CHANGING SENSIBILITY HENRY-RUSSELL HITCHCOCK

Professor Hitchcock's books include: In the Nature of Materials, The International Style (with Philip Johnson), and the Pelican Architecture Nineteenth and Twentieth Centuries.

A FAILURE OF ARCHITECTURAL PURISM FRANCOIS BUCHER

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HADRIAN'S VILLA CHARLES MOORE

Mr. Moore is an Associate Professor in the Department of Architecture, University of California at Berkeley. He received his Ph.D. in Architecture from Princeton University in 1958.

THE WORK OF CHARLES EDOUARD JEANNERET

The little known early work of Le Corbusier.

SOME ASPECTS OF JAPANESE ARCHITECTURE WALTER DODD RAMBERG

Mr. Ramberg collected the material for his PERSPECTA *article while on a Fullbright Fellowship which he received after his graduation from the Yale University School of Architecture.*

MACHU PICCHU GEORGE KUBLER

Professor Kubler has been, among other things, Editor in Chief of the Art Bulletin and Chairman of the Yale University Department of the History of Art. His most recent book is the Pelican monograph on Spanish Architecture.

NINETEENTH-CENTURY DESIGN EDGAR KAUFMANN, JR.

A regular contributor to the periodical and the editor of books on Wright and Sullivan, Mr. Kaufmann is well known as an expert on nineteenth-century design.

THE OBSERVATORIES OF THE MAHARAJAH SAWAI JAI SINGH II PHOTOGRAPHS BY ISAMU NOGUCHI

Although Mr. Noguchi is best known for his sculpture and landscape architecture, we present him as a photographer. Mr. Noguchi's more recent work includes the garden for UNESCO's Paris Headquarters.

MYKONOS AND PATMOS PAUL MITARACHI AND ROBERT ERNEST

Third Year Critic at the Yale Architectural School, Mr. Mitarachi was born in Paris, brought up in Greece, and educated in the United States. The photographs we present were taken while Mr. Mitarachi was on a Harvard School of Design Wheelwright Traveling Fellowship.

Mr. Ernest completed his Master of Architecture at the Yale University School of Architecture in 1959. Following his studies at Fountainbleau, he continued independent study and travel in Europe.

THE "FUNCTIONAL TRADITION" AND EXPRESSION JAMES STIRLING

Mr. Stirling received his formal architectural education at Liverpool School of Architecture. Now in private practice with James Gowan and a Visiting Critic at Yale University School of Architecture, Mr. Stirling is responsible for several articles in the Architectural Review.

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completed — illustrated a sharp change in sensibility away from the established "International Style" of the twenties, the work of Gaudii offered a richer repertory of forms which corresponded, at least roughly, to that new sensibility than Aalto or Le Corbusier were themselves then able to provide. PERSPECTA was among the first to make available new photographic material on Gaudii; the general revival of interest in Gaudii, evidenced by major exhibitions in Barcelona and New York and by an international flood of publications, followed several years later.

New interests of the present thus call most relevantly the tune for many of our re-investigations of the past, at least in the early stages. Such modest presentations as PERSPECTA gave of Gaudii's work — and has given and still gives of other facets of past architecture both nearer and very much farther afield — reflect the preoccupations of young architects today and provide vicariously a broader diet than current manifestations of the new sensibilities can do alone.

Once, of course, almost all investigation of the architecture of the past was in aid of its nominal reconstitution — an instrument of revivalism. That is no longer true, and there is little reason to fear that it will, in our time, become so again. Both the architects and the historian-critics of the early twentieth-century, when they were not merely seeking in the past fresh ammunition for current polemical warfare, taught us to see all architecture, as it were, abstractly, false though such a limited vision probably is to the complex sensibilities that produced most of the great architecture of the past. When we re-examine — or discover — this or that aspect of earlier building production today, it is with no idea of repeating its forms, but rather in the expectation of feeding more amply new sensibilities that are wholly the product of the present. To the pure historian this may seem regrettable, as introducing highly subjective elements into what he believes ought to be objective studies. Yet the pure historian, more often than not, will eventually find himself moving in directions that have been already determined by more sensitive weathervanes.

PERSPECTA has never offered the *last* word on any subject, but quite often it has uttered what (in the context, at least) was the *first* word. This is a service which the professional journals, burdened with other intellectual responsibilities, have in our country been reluctant to perform, and one which the scholarly journals, by their very nature, are vowed not to attempt.

It does not matter if, every now and then, the aim is inexact. By its very nature any scheme for providing food for new sensibilities must to a considerable extent be experimental. Perhaps the experiments that don't work may be as significant in the long run as those that do. A generation must define itself by its rejections as much as by its acceptances; and to reject only the immediate past is as dangerous as to accept it wholly, in the way many young architects were doing only a few years ago. The bundle of nascent responses that constitutes a new sensibility is rarely logically unified and until the new sensibility has found its full realization — if it ever does, before being in its turn superseded — the particular stimuli that it is seeking will never be precisely definable.

Several critics, nevertheless, have attempted in the past year to define for the professional audience of architects what are the major aspects of the new sensibility of the third quarter of the twentieth century. I may suggest here that these have so far paid insufficient attention to the evidence, necessarily unclear though that must always be, of what aspects of the past now attract the attention of young architects. I must also note that architectural sensibilities have often fed, not on the building art alone, but (not to go too far afield at this point) on other arts as well. As it is of real interest to read of the enthusiasms in painting and sculpture of established architects as reported in McCallum's *Architecture: U.S.A.*, conventional though many of them appear by this time to be, so it could be revealing to know how current production in these sister arts appears to younger architects. Perhaps, however, the very absence of such material — at least relatively — from the pages of PERSPECTA is itself significant. The day of "Painting toward Architecture," when the modern style of the twenties once owed so much to the previous and parallel experiments of painters and sculptors, is presumably well over now. Architecture has taken precedence, as in many ages of the past; it seems to need painting and sculpture only as subordinate accessories, not as sources of basic aesthetic inspiration.

A FAILURE OF ARCHITECTURAL PURISM

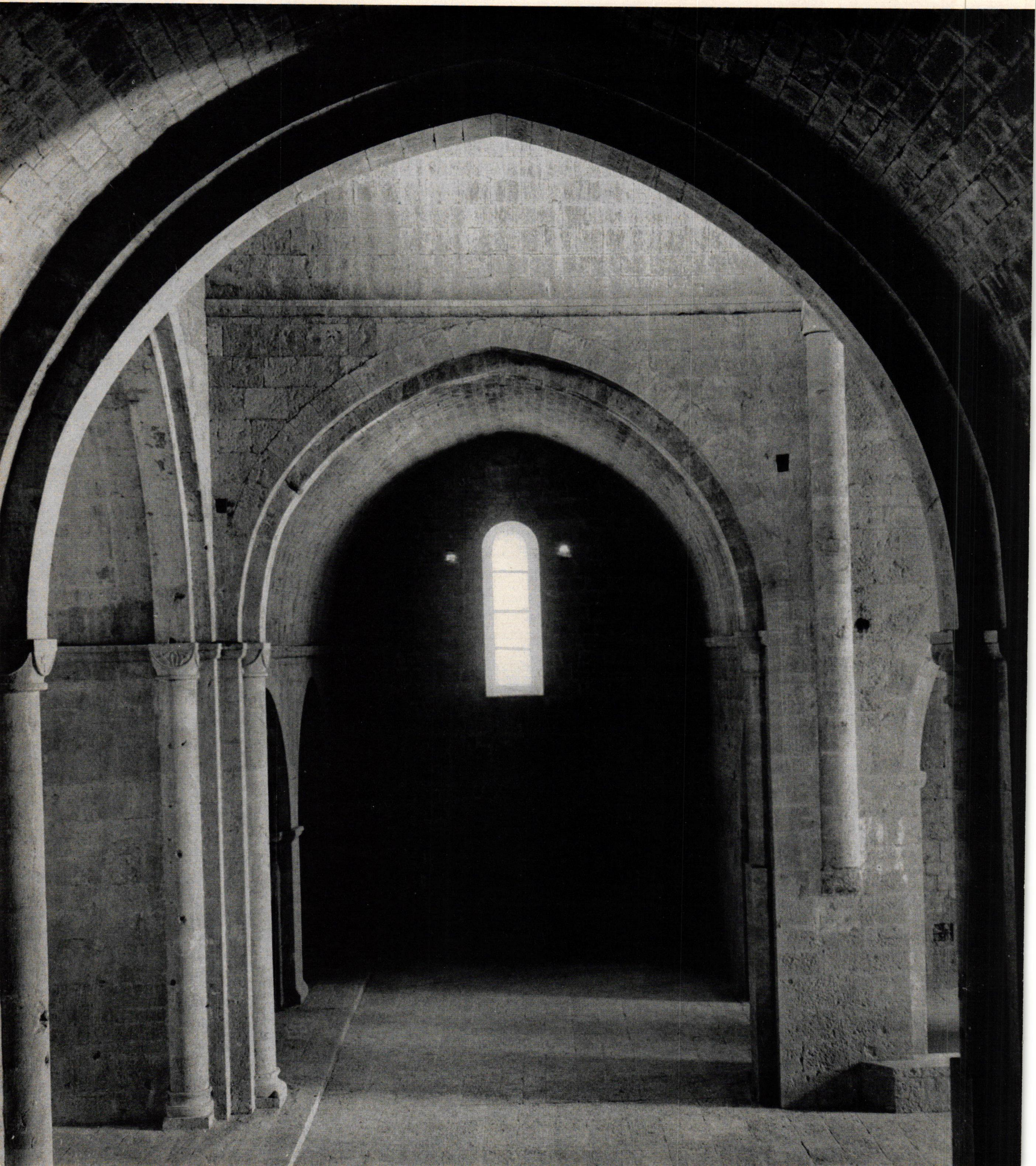
Francois Bucher

"You who enter disregard your bodies For flesh is superfluous here." *(Inscription at Clairvaux)*

Now that we have become aware of the waning of purely functionalistic theories and the Bauhaus postulate for "Materialgerechtigkeit" is slipping into the realm of history, some find it advisable to ridicule the purism of twentieth-century architecture. While the controversy of ornament versus curtain-wall, of the planar versus the sculptural formulation is as yet quietly shaping new dogmas in the sub-basement of architectural thinking, we find it rewarding to turn the telescope 180 degrees and to train it on the distant past where the once raging opponents of irreconcilable architectural theories appear tiny and the heads which roll are not our own. Analyzing the most important purist movement of the European past we will find parallels between the internationally austere profile of the townscapes of 1920-1960 and Cistercian construction of the twelfth century.

Since the feudal upper crust was feuding, the dictates of Romanesque taste were formulated mainly by church barons and abbots. It is the pilgrimage church serving often as a hostel — and the monastic oratory which show the new solutions. These were certainly based upon generally established theories which then as now gave the changing fashions their *ex post facto* justification. One can characterize the late eleventh century as an extremely complex age and it lies in the nature of history that muddled periods often serve as fertilizers for great new concepts. It seems a chance factor that the idea of an extremely austere spiritual movement whose basic laws would be so strict and so simple as to guarantee its survival should have originated in the restless brain of Robert de Molesmes. Under his leadership a handful of the "New Soldiers of Christ" established their headquarters in the "New Monastery" in the middle of the unhealthful swamps of Citeaux in Burgundy where they lived on roots for two years. At a time when fortresses would frequently capitulate for lack of salt alone this produced a scandal. A spokesman for the venerable order of Cluny, Fastred of Annievaux, described the straggling group with unmitigated disgust as a kind of suicide brigade. The age, however, was addicted to romantic heroism be it in war, the hunt, the tournament, or even the monumentally tragic game of the Crusades, the first of which took place while Citeaux was founded. An organization with a clearly stated purpose demanding at the same time an utmost dedication from the individual was immensely appealing. It is a natural sequel that a whole series of energetic personalities — all of them potential founders of similar movements — became leaders within the new community. Amongst them was Bernard de Chaatillon, a brilliant young knight. Accompanied by all his brothers save one who was still too young, and by several of his uncles, he knocked at the doors of Citeaux in 1112, demanding wholesale admittance into the new order. Bernard's dynamic personality gave the community new momentum and made him

Maulbronn, Germany. Twelfth-century fountain in the cloister.



Le Thoronet, Southern France. 12th century Cloister.

Facade of Fontenay, Burgundy, 1147 A.D.

Le Thoronet, Interior of crossing looking south.

the spiritual leader of the occident up to the middle of the twelfth century. The extent of his success can be gauged from the fact that by 1342 the Cistercians had founded or taken over about seven hundred and sixty monasteries and priories, not counting the nunneries. Some of the abbeys, which geographically ranged from Syria to Norway, sheltered up to seven hundred monks. Six hundred bishops and two popes were drafted from Cistercian ranks. Thus the yearly meeting of the abbots swarming to Citeaux from all the corners of the Christian world became a regularly convening international governing body.

The uncompromising austerity of Cistercian life certainly contributed to the quick spread of the movement. A dead monk in whose cap two cents was found was refused burial inside the monastery walls, for he had broken his vow of poverty. An abbot was punished not for eating but for offering meat to a visiting bishop; another had to abdicate because he did not dare to bar the monastic precinct to the Queen of France who impetuously demanded entrance. The working day of the monk started about 2 A.M., as it still does today. Stoves were a despised commodity. Reading was restricted to a few books. There were few people however who had not heard about the vision of the Cistercian monk Caesar of Heisterbach. Transported into heaven he searched in vain for his brethren. Deeply disturbed at the thought that they might be in hell he approached the Virgin seated near Christ who — lifting her mantle — showed him all the white monks in the very center of paradise. Later amidst waning enthusiasm it was the tight system of controls and recurring reforms which guaranteed the continuing existence of the order.

Today, due to a renewed search for the absolute or, according to one author, due to the growing pressure of population increase, hundreds of Americans have retired into the absolute silence of Cistercian abbeys and have made the United States one of the strongholds of the order. It may be reassuring to know that our mechanized civilization contains islands on which time is still measured according to the Roman changing of the watch.

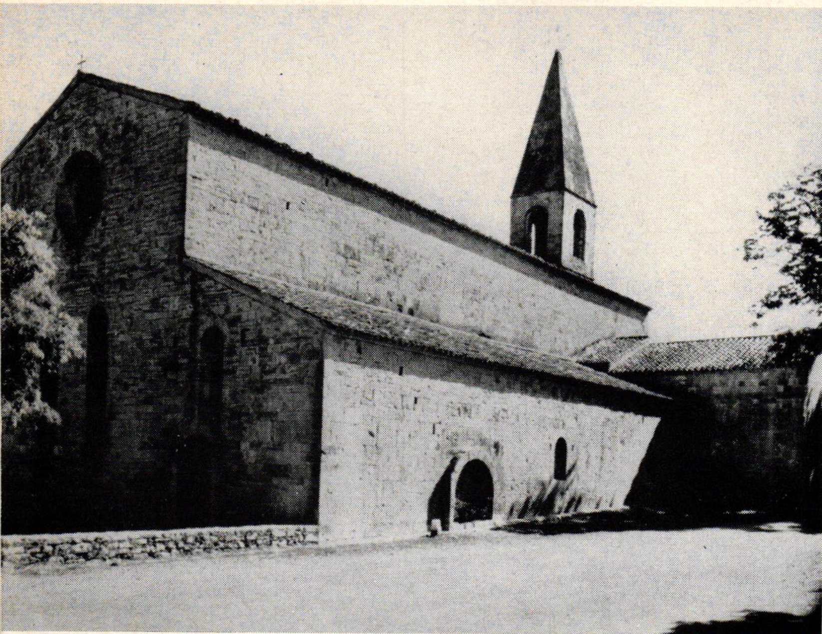
The following narration consists of quotations from pertinent twelfth and thirteenth century texts. Statements without quotation marks are longer documents which have been transposed into a lapidary form or statements based on the visual evidence of early Cistercian architecture.

The illustrations were chosen to show the typical expression of Cistercian austerity and could be replaced by hundreds of similar photographs. The standardization of the basic form also becomes obvious in F. Cali's The Architecture of Truth, *London, 1957, for which LeCorbusier wrote an introduction. The Benedictine rule which served as a basis for Cistercian and Dominican building activities was also the guiding law for Corbusier's monastic study centre of La Tourette at Eveux-sur-Arbresle, now nearing completion.*

The community

"Obeying one charity, one rule, we have adopted the same way of life."

"With separate bodies but a single mind we serve God."



Le Thoronet, Exterior from the south.

Fontenay, Interior 1139-1147 A.D.

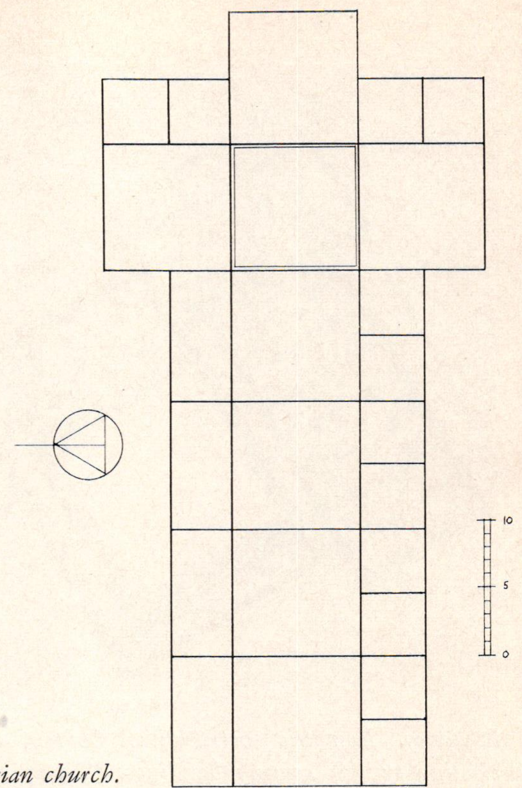
"The world mountain on which Lucifer lives must be transformed into the mountain of knowledge."
"Poverty is the guardian of virtue."
Augustine says: "Curiosity of the spirit, pure science, the desire to know all and to excel and a passionate love for art are forms of pride or passion and show a lack of humility."
1198: A monk shall be punished for learning Hebrew without his superior's consent.
1199: A monk shall be punished for writing a poem.

Opinions of the time

The monk's day is the work of God.
The Cistercian order is "like a lighthouse on a mountain." "The Cistercians are guardians on the walls of Jerusalem who, silent night and day, communicate with the Lord."
"The queen of heaven . . . will shower us with benevolence, for I am her son Bernard." (Dante — *Paradiso 31.*)
"Then suddenly they changed the old forms,
Transformed the deserts into fertile land,
And in the valleys built their churches."
"Be aware that having left the world once to enter a Clunaic monastery, you will leave it a second time if you join the Cistercian order." Saying attributed to St. Bernard.

Criticism of existing monastic architecture

This text written by St. Bernard about 1125 attacks the new abbey church at Cluny, the center of a powerful Benedictine community. The church was about 410 feet long, had three hundred windows, and reportedly



Standard plan of a Cistercian church.

60 columns and piers, some of them of African origin. Its richly ornamented interior formed the most important architectural ensemble of the beginning twelfth century. The quote is selective and contracted. "I am not even mentioning churches of immense height, immoderate length enclosing overempty spaces, for being a monk myself I ask you other monks: What is the sense of all this? O vanity of vanities, this is more vain than insane. The church is resplendent in its walls, clothes its stones in gold and leaves her sons naked. Lamps become blinding trees, we tread on images of Saints which swarm in the inlaid pavements. Men spit into Angel's faces, the countenance of some holy man is ground under the heel of a passer-by. Why create these comely forms in places where they are defiled by dirt? Let us suffer all this to be done in the parish churches, for though it be harmful to vain folk yet not so to the simple and devout. But in the cloister, what purpose is there in these ridiculous monstrosities in that wondrously deformed beauty, that lovely deformity? To what purpose are those unclean apes, those many bodies seen under one head or those multiheaded atrocities? For God's sake if men are not ashamed of such follies, why at least do they not shrink from the expense?"

Aesthetic theory

"Everything above an absolute minimum is superfluous and has to be discarded."

The church has to correspond to the straightforwardness of the rule. (rectitudo)

Being a "workshop for the art of holiness" it should be a structure without "affectus," that is without emotive expression. An architecture whose aim it is to create a vivid emotional response is unworthy of the independent spirit of the "genus monasteriale" that is the species of monks, who must transcend "a meaningless hull of stone."

"Bernard after having been a novice for one year did not know if his cell was vaulted or roofed over by wooden beams and thought that there were three windows in the chapter house while there was only one."

Laws against the superfluous

The general chapter convening every September at Citeaux left us a body of negative laws concerning Cistercian architecture. The following small selection shows extreme strictness and on the other hand the forceful desire for visual stimulation through exterior massing and interior decoration. The two last statements reflect the success of Cistercian architects and their yearning for more complex tasks.

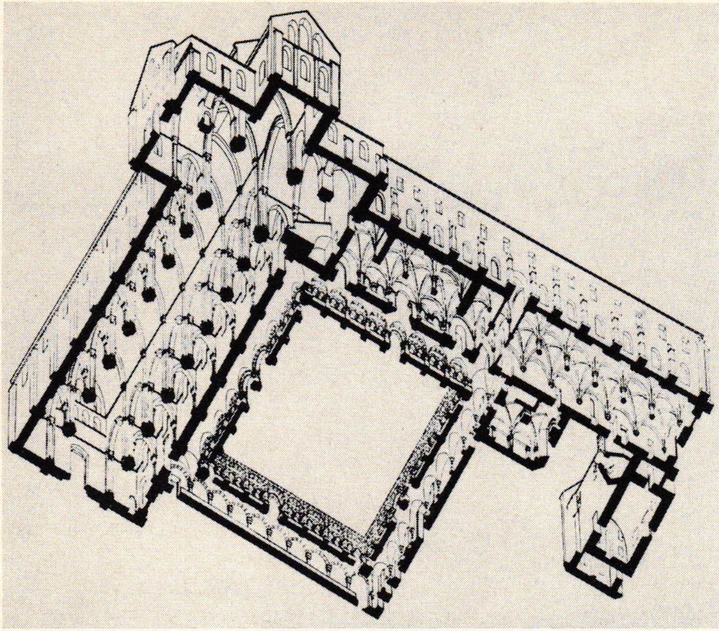
"We want none of the superfluities which would deform the honesty of an old religious order."

1134: No painting, sculpture or stained glass shall be allowed. The sole decoration will be a cross of wood on the altar and it shall not be painted. Two candles at the most will suffice for lighting.

1157: Stone or wooden towers of immoderate height shall not be built. There shall be two bells at the most, each not exceeding 500 pounds. One only shall be used at a time. There shall be no silver or gold altar crosses. These things do not befit the order's simplicity.

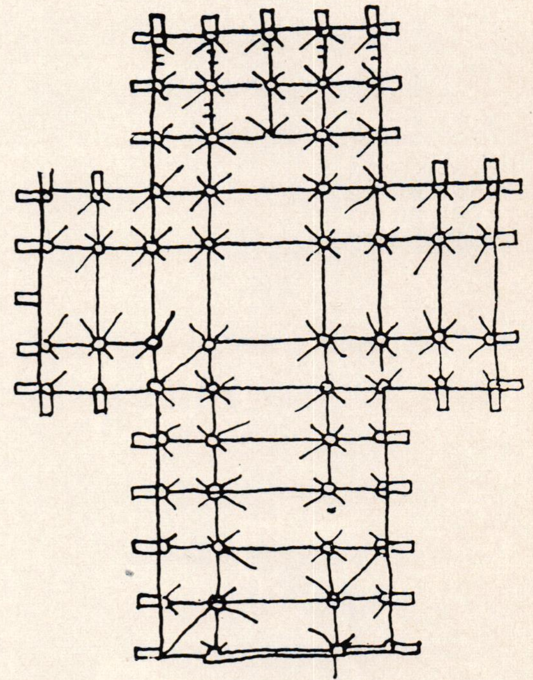
1182: Stained glass wherever used has to be removed immediately.

1199: No figural decoration shall be found on altar cloths or liturgical garments.



Fontenay. Isometric perspective. Church and existing twelfth century buildings. (Dijon, Museum)

Senanque Southern France. Ground plan twelfth century. Upper stories more recent.



Plan of a Cistercian church by Villard de Honnecourt drawn ca. 1120-30 A.D.

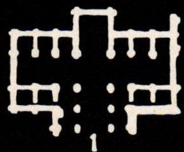
1207: The manuscript initials shall not be colored.
1217: The stone towers of Boheries shall be torn down.
End twelfth century: The doors must be white, the wall decoration geometric and monochrome. Pavements with figures or curiosities shall be torn out. Stoves must be dismantled. No golden chalices may be used. No conforming decorations will be whitewashed.
1157: The abbot shall be forbidden to rent out monks for secular construction work.
1210: An abbot shall be put on a diet of water and bread for letting several of his monks work on a complex outside job.

Choice of location

Hermitages separated from the discipline of a community are the "synagogues of satan."
"We believe that in pure air and under the open sky we shall be closest to God."
"No abbey shall be built near castles, villages or thoroughfares. They shall be in places removed from the conversation of man."
"No house shall be closer to the monastery than one burgundian mile, no other abbey closer than at least ten miles."
The location and later the buildings of a new foundation shall be inspected by an "inspector loci" who will report his findings to the General Chapter.
Existing monasteries admitted into the order will have to adopt the simplicity our order stands for. *(Forma ordinis)*

Construction

First "in the desert inhabited by wild beasts only a chapel and housing shall be built of rough logs."
Crosses marking the corners of the abbey shall be connected by walls of wood or stone.
A quarry shall be acquired with the original piece of land, in stoneless districts "an oven to fire brick shall be built."
Remains of any earlier religious structure shall be buried within the precinct.
The monks shall construct the buildings. Outside help must be avoided. The monks "shall not be bled during construction work."
"The monastery if at all possible has to contain all the commodities, most important water for the mill, the garden, the fishpond and to drive other machines. Thus it will not be necessary for the monks to leave the precinct, for this would be unhealthy to their souls."
The Sunday benediction will move through the rooms built around the cloister, namely from the church to the chapterhouse, then to the heated parlatorium where the monks can converse for half an hour a day and grease their shoes. From there it will proceed to the refectory, the kitchen, the upstairs dormitories and the hospital. It is customary that in cool climates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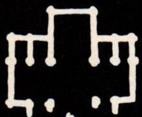
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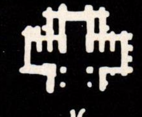
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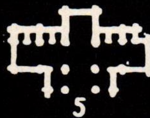
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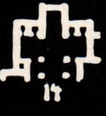
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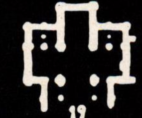
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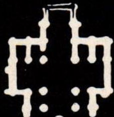
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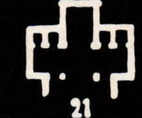
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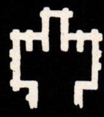
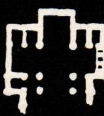
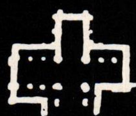
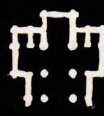
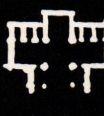
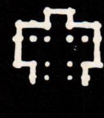
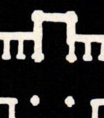
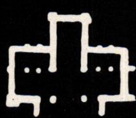
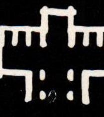
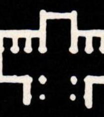
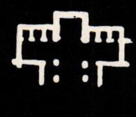
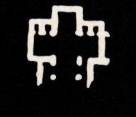
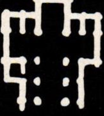
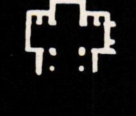
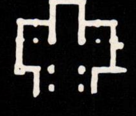


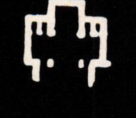
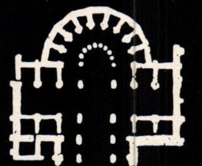





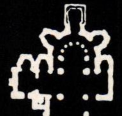
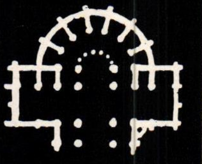







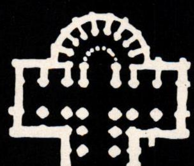
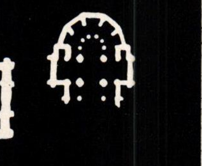



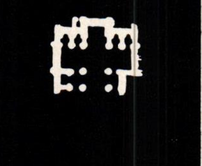
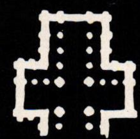


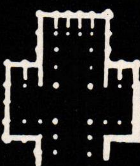
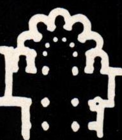
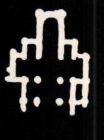


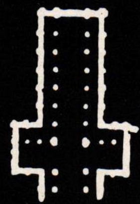



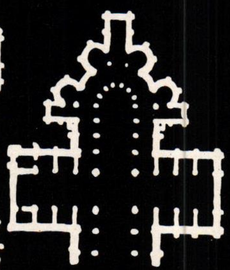
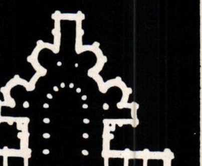



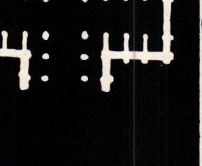



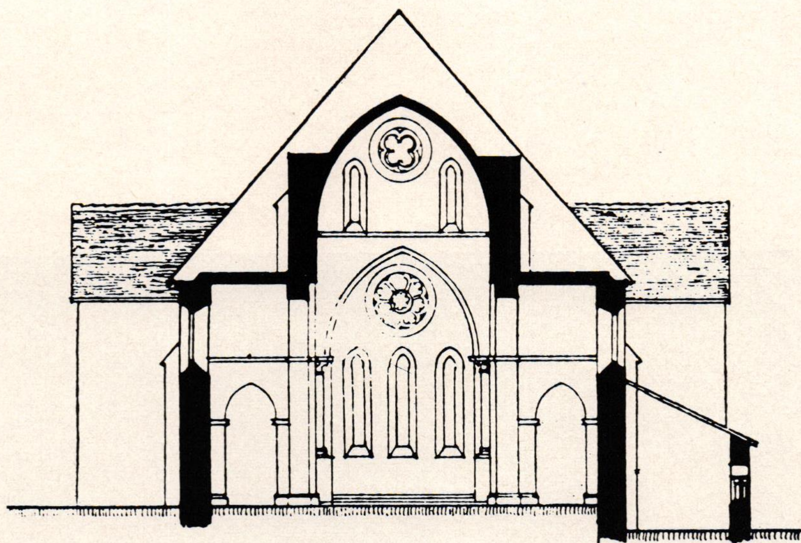



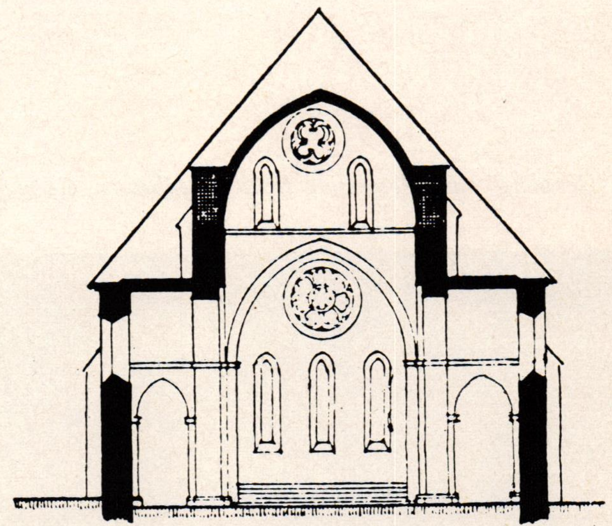




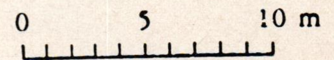










Cross-section through Hauterive (left) and Maigrauge (right) late twelfth century.

Plans of twelfth-century Cistercian churches. Left column: Churches directly influenced by St. Bernard. Right column: Churches planned after the death of St. Bernard. From Esser, Arch.f.mittelrheinische Kirchengesch. Speyer, 1953, p. 200.

the monastic buildings are located south of the church, in hot climates north of it.
1210: Ten crusaders after having decided not to join the expedition will be released from their vow after having given their travelling allowance to the abbey of Wettingen, now in construction.

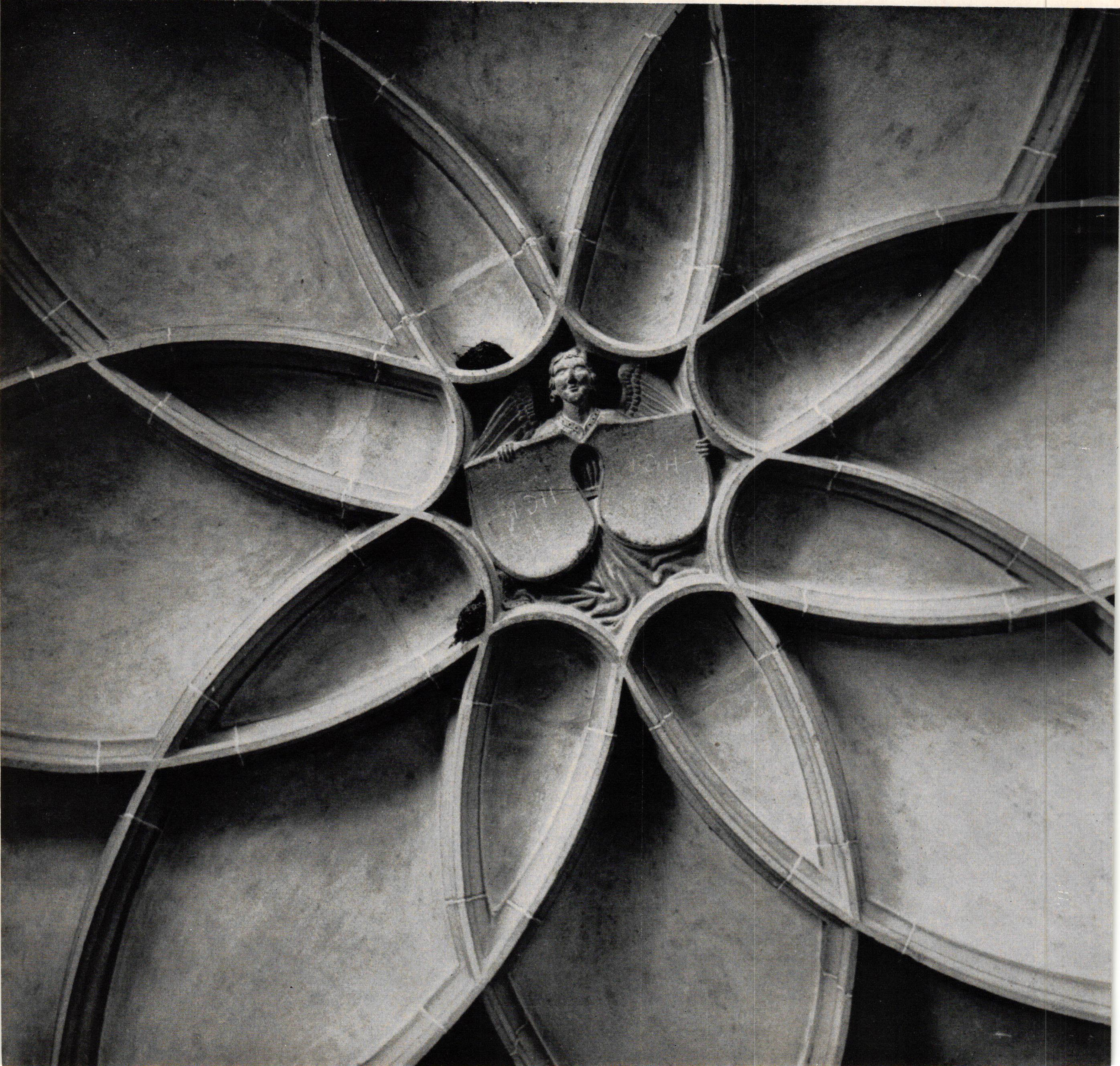
Construction of the church

"This is a church made up of squares which was to be erected for the order of Citeaux." (Ill. No. 9)
"All the churches of our order shall be constructed in form of a cross. Its length shall be divided into four parts by four steps, namely: The presbytery and choir of monks, the choir of the novices and the choir of the sick. The working monks shall be placed in the retrochorus and sideaisles."
I am sending a monk to measure your church at Clairvaux, for we want a copy of it in Friesland. (Wigbold of Aduard.)
We are sending out Magister Achard the architect to supervise the construction of Himmerod in Germany.
1134: Geoffray of Ainay from Clairvaux will supervise the construction of Fountain Abbey in England and of abbeys in Flanders.
The cathedral chapter of Magdeburg having declared bankruptcy due to the high cost of building the cathedral, a Cistercian architect from Walkeried is being requested to complete the chevet of said structure.

From about one hundred and fifty surviving Cistercian churches and from plans and descriptions of oratories which have been destroyed, we can derive the following basic set of rules which for the erection of a monumental building is amazingly simple. The phrasing of these rules follows the short and clear statement known from notes of several medieval architects.

Should you want to build a monumental abbey church, then (1) take a string, let us say ten yards long. This will be your basic measurement. (2) Then with four posts mark a square on the ground, its side being the length of your string. It will eventually be the crossing between your nave and transept. (3) Add to the north, south and east an equal square giving you the transept arms and the presbytery. (4) Add four squares to the west and you will arrive at the western wall of the church where you may put the entrance. (5) Take half of your original measure (five yards) and make a square comprising a quarter of the surface of your original square. Add two squares each

"Decadent" vault decoration from Bebenhausen, Germany.



at the eastern limits of your transept arms. These will be your side chapels. (6) Add eight small squares along each side of the nave.

Your plan is now laid out. You will arrive at the elevation proceeding the following way: (7) Your original measure (ten yards) will give you the height of the side aisles and eastern chapels. (8) Double the width of your nave and you will define its height (twenty yards). (9) Lower the presbytery one-third of the nave height. (10) Work on the details taking care that the windows be not too tall, for they would cool your building in a northern climate or brighten it too much in the south. (11) As for the vaults you divide your first measure into three equal parts. At the points thereby gained fix two strings of two-thirds the length of your basic measure. Take them up and see that the masonry of your vault follows their curve. The meeting of the strings will give you the crown of the vault and will define the level of the roof. Your building now is completed.

Looking at it you will realize that by using your basic measure four times in your elevation you can inscribe it into a square. According to the ancients the square is the most perfect form after the circle. Independent of the world it rests motionless within itself and thus incorporated into the church symbolizes your readiness for contemplation and introspection.

The triumph of fanciful art

1157: In special cases the founder of the abbey may be buried in the church. The slab may show his features in incised lines only.

1185: A shrine for relics may be used.

1213: Christ may be painted on the altar cross. Ornate pavements are to be removed.

1217: Donors may be buried in the cloister. Sculptural representation should be avoided.

1218: Curious pavements and complex wall decorations have to be removed.

1240: Abbeys taken over by the order may keep their stained glass. Pavements with figures have to be removed. Figural wall decoration has to be whitewashed. Offenders will be severely punished.

1242: Because of high winds the abbey of Valloires is allowed a stone tower.

1256: Wall decorations including figures and ornate pavements have to be removed.

1274: Stone towers in stormy climates are allowed. Shortly thereafter: Brother George from Salem has become a famous builder of towers.

Conclusions

The simple and standardized solution for the Cistercian oratory including the rectilinear chevet was dropped shortly after the end of the twelfth century. It was replaced by the more fashionable Gothic style with its wide semicircular ambulatory crowned by complex vaults. Illustration No. 13 shows in the first column churches built under the supervision of St. Bernard, while the two columns on the right show the increasing importance of Gothic solutions in a series of chevets planned after his death in 1153.

However, decoration was still banned. Laws issued by the General Chapter disclose the dramatic fight against what the first Cistercians would have called the bric-a-brac cluttering the parish churches and cathedrals. Towards the end of the twelfth century figural art began to appear in the cloisters of the order. The most interesting conclusion lies in the fact that, in a system which had the enthusiastic support of a great number of people from all the classes and which was not only making laws concerning construction but was also able to enforce them speedily, the purist trend did not survive the third generation. The human craving for new forms, for statues, paintings and for decoration overcame even the vow of obedience and the threat of punishment. The great achievement of Cistercian architecture was to purify the overladen forms of late Romanesque art, to prepare the world for the emergence of a new architectural vocabulary. The bareness of their blank churches then was swept away by the fashionable and powerful formulas. The weightlessly rising cage of stone would suit romantic mysticism much better. The true mystic, a man lonely and able to build his own resplendent Heavenly Jerusalem, had lost out to the petty mystic.

The lesson learned from this is older than the twelfth century. It tells of human weakness in general and more specifically the weakness for ever present Victorian trappings — symbols of coziness. It also tells of a mild form of cowardice and lack of spiritual courage. For — though it is big enough for two — nobody will contest that it takes courage to make love in a Mies van der Rohe chair placed in the middle of a room whose walls are of glareproof glass.

HADRIAN'S VILLA

Charles W. Moore

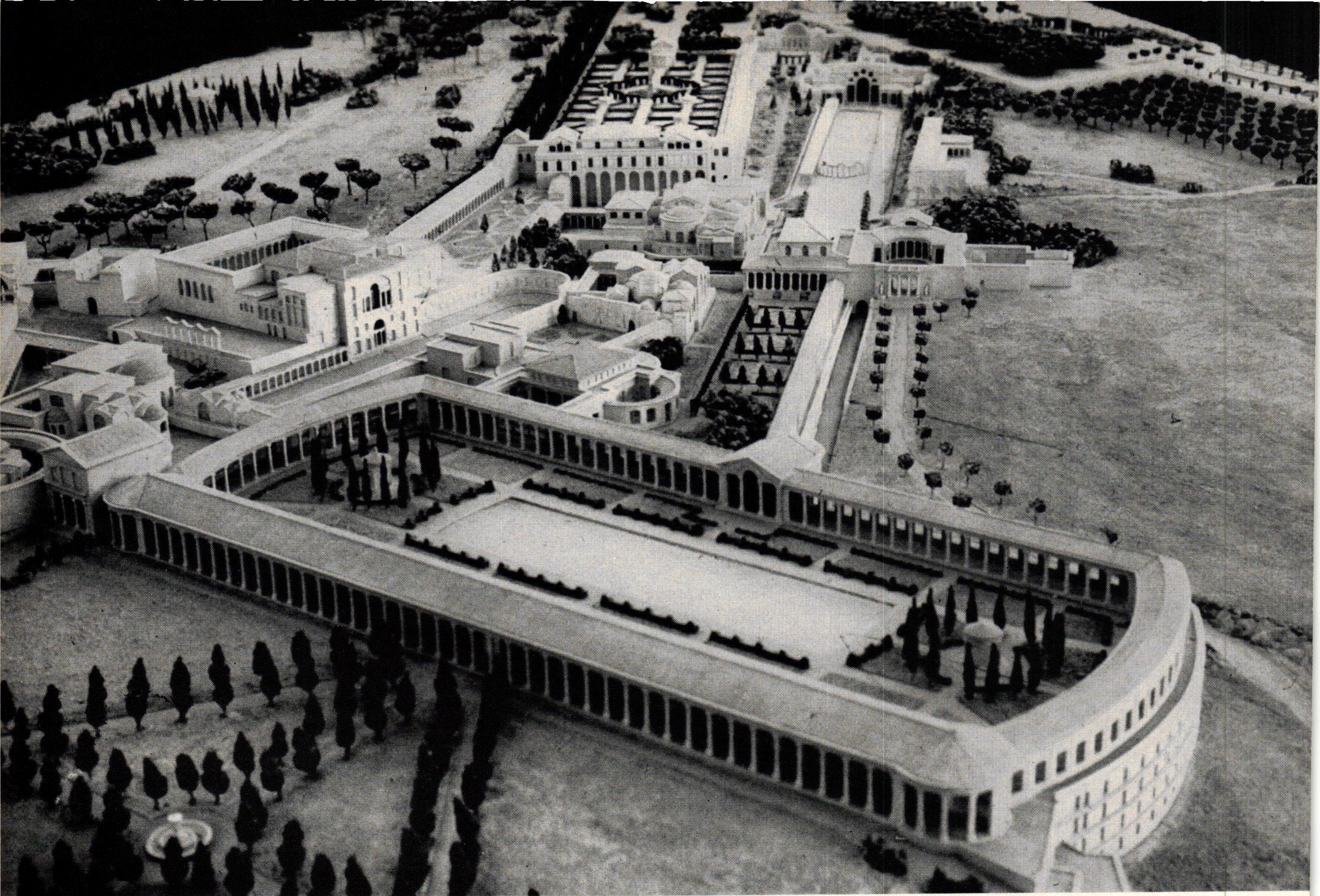
The Serapeion from the rear, showing the elevated water courses

Entrance to Hadrian's Villa at Tivoli is usually made against a stream of tourists pouring out looking very hot (if it's the season) and very tired (always) muttering, if they still have the strength, about how stupefyingly big it all was. It turns out, a few hundred yards later, that they were right; for sheer exhausting extent, rendered infinite by the blazing sun, the place has no peer. And yet architects flock to it, fascinated. This account is meant to examine what we see there, or perhaps what we think we see, in areas whose ruin is nearly complete, in order to try to find out why the villa has the meaning it has for us as twentieth-century architects. This is not meant to be an historical account; but one personality so dominates the place, and so affects our reaction to it, that any account must start with him. The Villa still is very much Hadrian's.

A classmate of mine whose experiences I found awesome once noted that he was revolted by perversions to which he was not addicted. Similarly, we are likely to be fascinated when someone else's vagaries coincide with our own, however repellent they seem. Ancient Romans are forever trotted out as worthy of our attention because they were, for ancients, so incredibly American. What's worse, the comparison seems to hold up in detail to a point which encourages us to extend it even farther. Hadrian met with the Parthian king in a successful attempt to avert a war in an atmosphere which has a remarkably twentieth-century air; and even a comparison between Hadrian and his villa and Thomas Jefferson and his may not prove too far-fetched, though Hadrian, to be sure, is something of an enigma. He has the reputation of having been a splendid sort for a Roman emperor, able and efficient, in possession of most of the qualities valued by nineteenth-century members of the British Liberal Party; but we also hear that he was especially interested in having himself worshiped as a deity (not very good form) and that his efforts to this end were remarkably successful in the eastern portions of his empire. His zeal, too, to deify his favorite Antinous after that young man had evaded the problems of aging by drowning in the Nile would strike us as even worse form in a Victorian. But the size of his undertakings, the avidity of his search for culture, and the gold-plated quality of his success at finding it are nothing short of Texan. And the sheer endlessness of his construction at Tivoli outdistances Versailles (which was, after all, based on a fairly simple idea) and competes with the scale of the twentieth century. The G. M. Technical Center will be equally exhausting to walk among the ruins of, though very probably not nearly so much fun.

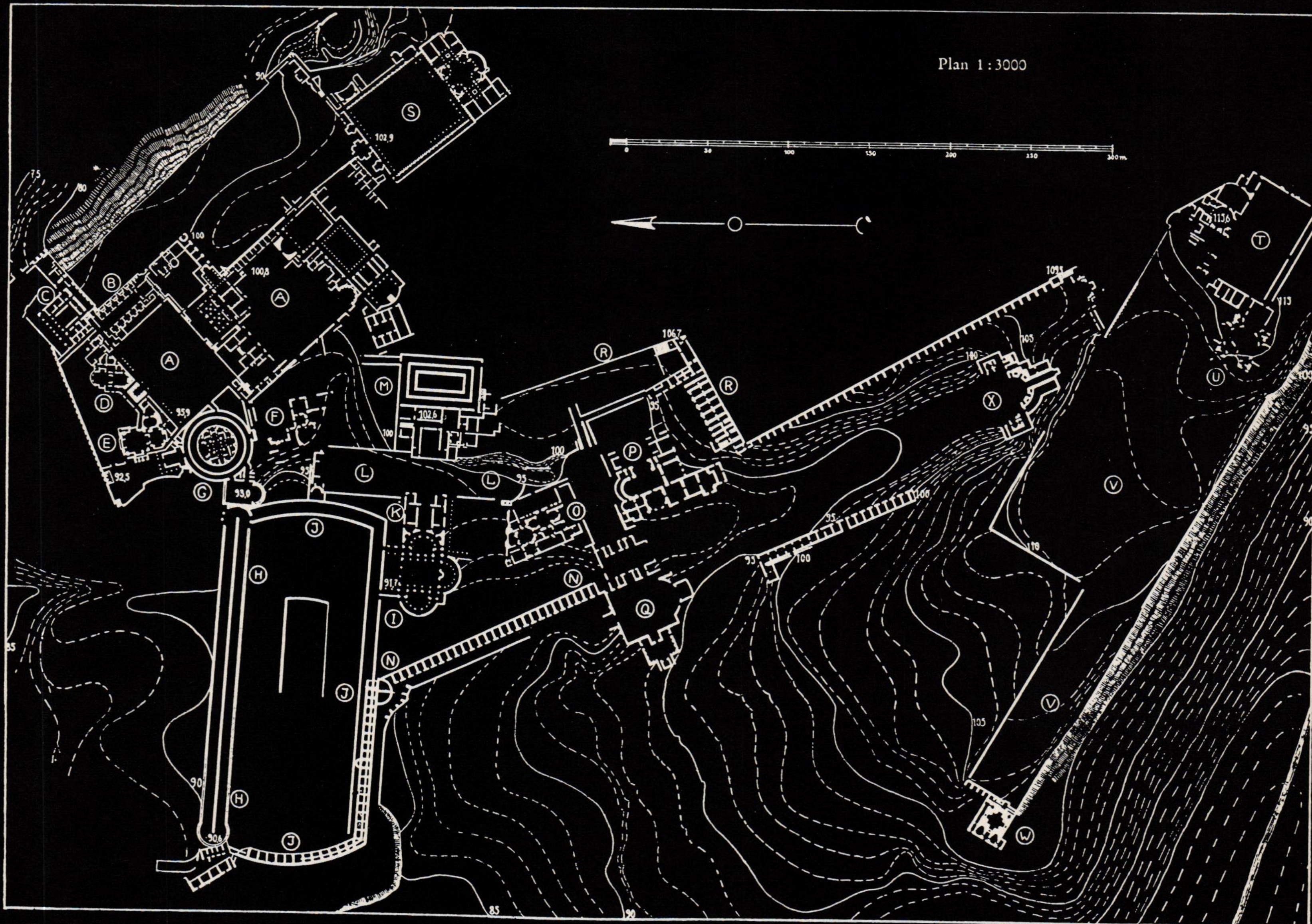
Hadrian's entry in the megalomania division, though, since it bears so heavily the stamp of one man, seems to come much closer to the edge of madness. It is the product, as Eleanor Clark pointed out, of a craze to build, very like those nineteenth-century follies in the United States whose owners, obeying only the dictates of some irresistible inner urge, added crazily, continually to them, and were generally stopped only by death. But this is not crazy in quite the same way, because this is often beautiful. It is perhaps much more parallel with Thomas Jefferson's efforts at Monticello, the work of a man moved to establish himself firmly on a piece of land, and to reaffirm the establishment constantly by building there, while his duties and his interests kept him far abroad. For Hadrian's conduct of his office, rather like John Foster Dulles', was based on travel. He strengthened the Roman Empire by traveling through it, and formed his own character along the way. He had been born in Spain, but Athens was said to be his favorite place, and the art of Greece, some of it already over five centuries old, his ideal, though he collected art from Egypt and the east, and many other places too, and seems to have found the vaguely oriental charms of a Bithynian more to his taste than whatever Greek talent was available.

Indeed, the most striking point of rapport between Hadrian and ourselves is this eclecticism. Eclectic has been a dirty word for most of the twentieth century and it is very recently, if yet, that most modern architects have been willing to drop the pretense that their work springs to life full blown from the problem and their uninfluenced imaginations, or that it is the product of a new tradition, a twentieth-century version of a medieval craft. A medieval craftsman could work within his tradition, developing it, unmindful of the work of other times and other places. A Renaissance man could form his images from Roman antiquity as well as from the local tradition; and nineteenth-century designers succumbed to the lure of a variety of rediscovered manners of building, which they sought to reproduce. But Hadrian was in another boat, very like our own. We are treated, every time we sit in a subway car and look at the ads above the windows, to maybe thirty different kinds of appeal — from abstractions in the manner of Mondrian on behalf of a bank through figures shaped



Photograph of Model: View towards Canopus

like Life Savers or cigarettes to a delicate line, vaguely Botticellian, which outlines a lady left clean and delicate by the right kind of shampoo — and what is more, we respond to all of them. Books and magazines, movies, television, and easy travel flood our mind's eyes with an incredible array of things. We could not shut them out, even if we wanted to, nor can we pick among them. Instead we have to transform them in our visions, absorb them into our whole selves, and then create, not from a fragment of our experience, but from the whole thing. It is Hadrian's triumph that he did just this. He created at Tivoli, his biographer Spartian says, representations of celebrated buildings and localities which had impressed him on his extensive travels; but he did not reproduce them into a Disneyland of exotic forms. He transformed them. Not only are they all Roman; they are a whole new kind of Roman style, less Greek, if anything, than what had gone on in Rome before. The orders and the marble revetments, to be sure, which were once applied to portions of the masonry forms are gone now, but they could never have been the whole show: there is too much excitement in the masonry forms themselves, in walls and vaults and especially in domes, and in spaces that must once have been domed. Behind it all — and once again we are looking at ourselves — is the search for order in geometry. Circles and squares and a riot of combinations of the two are the ordering devices which bring unity and continuity to the vast establishment. They are additive, though, as we would expect from a complex that was, for the few years of its building, constantly and obsessively added onto. It is not the sort of place which insists, for its beauty, that nothing could be added or nothing taken away. That sort would have been done in by several centuries of use as a quarry. But it is not, on the other hand, as far as we can tell, the sort of place subtly keyed to the varied dictates of function. Countless hours have been whiled away by archaeologists assigning uses to the spaces, and guessing what specific exotic locale they were meant to recreate, but the archaeologists cannot agree, because the spaces are not thus specific. To take the terms from Louis Kahn, the villa is a realm of spaces, designed as spaces, domed and colonnaded, and made to evoke their use. The use, to take it from E. Baldwin Smith, would have been for the solemn palace ceremonies based on those of the Hellenistic



east which deified Hadrian, in the setting of the royal symbolism of the colonnade, the divine and celestial symbolism of the dome, and (I suspect) the fertility symbolism of flowing water. Professor Smith, who must often have been at Tivoli under the sun of noon opined that "without the solemn formalities of a court ritual, which presented him as a manifest god, his architectural creations at Tivoli would have been as empty, meaningless, and tiresome to him as they are to the casual visitor who wanders aimlessly from one unused structure to another."

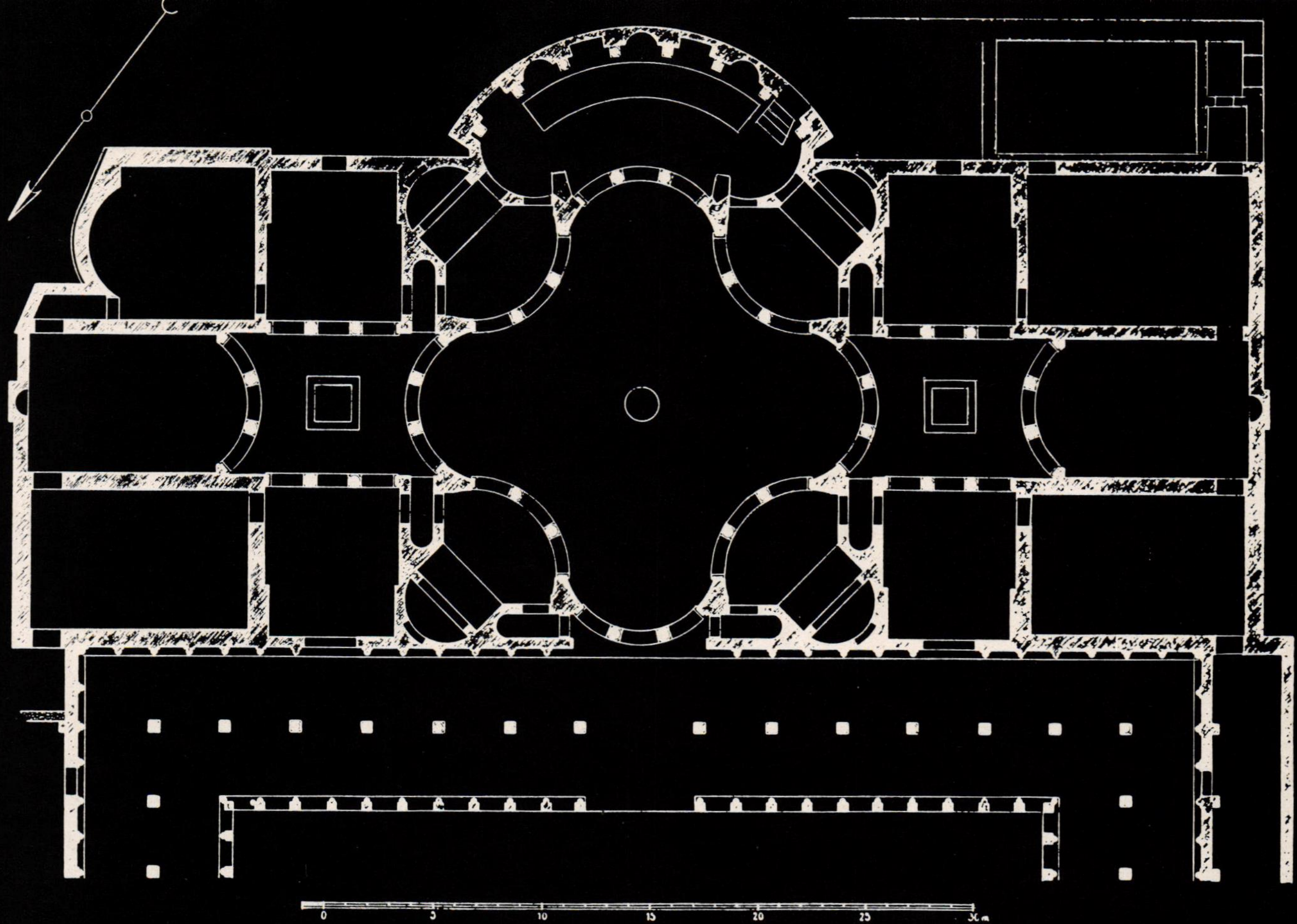
To animate the spaces beyond what we can see today, or perhaps beyond what we can even imagine, would have been the rush and the splash of flowing water, which was everywhere. It is possible to trace its presence, but almost impossible even to surmise what special delights each fountain offered. Did some of them bubble, or jet up to support balls and dancing objects in the air, or splash in pretty rivulets, and did some quietly moisten mosaics, or lie still and mysterious, in deep pools? Scholars have noted that a recurrent feature of the villa would have been long vistas down straight axes, along which there would have been alternate pools of light and shade, so that moving from one area to another would begin to be an ordered experience in time. The sight and sound of the water, and its flow, must have contributed even more to this processional quality, toward bringing some coherence into the passage from space to space. This coherence now, in the passage among the ruins is, of all qualities, the most elusive.

The site for Hadrian's Villa in the foothills at the edge of the Roman campagna raised an immediate question: why would a man with an empire to choose a site from have picked this one? Jefferson chose for Monticello a hilltop which commanded the widest and most beautiful prospect he knew. The views from the town of Tivoli, not far up behind Hadrian's villa are magnificent, the weather is better, and surely the site was available to the emperor. Hadrian's view of the campagna does not extend quite so far as Rome, and is, whatever the enthusiasts write, totally unremarkable, while the "Vale of Tempe" which lies between the villa and the mountains behind it has been accurately described as a gulch. The gulch owes even its present size, it turns out, to excavation made there for material during the construction of the villa. The Touring Club Italiano's guide suggests, without con-

View towards Canopus and Serapeion

viction, that the unimpressive site was selected because the property belonged to Sabina, the wife who played such a negligible (or negative) part in Hadrian's life. That seems little enough reason, but then there was little enough reason for all the fuss over the Bithynian shepherd boy Antinous, who was bland and pudgy, sulky, and very probably quite brainless. It was the Emperor's energies that turned him into a deity. Perhaps it does not force the issue too hard to suggest that the site below Tivoli was as tractable as Antinous, capable of being molded to the Emperor's design, something fairly positive to start from but capable of being, in the end, swallowed up into the grand scheme. For here nature is dominated by geometry, more even than at Versailles. At Versailles a system of axes imposes a formal order on the grounds, but at Hadrian's villa there are no grounds, only the architecture which contains it all and includes spaces roofed and unroofed, open to the outside and enclosed.

The mound which this architecture occupies, and must once have come close to superseding, runs roughly north and south for almost a mile, though it seems longer, and is about a third that wide. To the east, beyond the so-called "Vale of Tempe" lie the Sabine mountains; to the west stretches the flat Roman campagna, visible almost, but not quite, to Rome, which is fifteen miles away. The villa wrapped around the north, west, and south sides of the mound, cut well below its surface in places, especially at the Canopus and the Inferi, and extended well out past it at other places, notably the Poikele. There, especially, the hill has been superseded by a multi-storied wall filled with cubicles for guards or slaves, which retains a vast earth terrace at a dizzy height above the slope, a lovers' leap, as someone has called it, shored up on slave quarters. It all seems frightfully undemocratic, a horror, mitigated for us, perhaps, because Jefferson did exactly the same thing on a much smaller scale at Monticello, where a semi-underground level of service rooms builds up the top of his hill, and makes a base for the geometry of the pavilions he places above. At Tivoli, it occurs, as it does perhaps even more powerfully on the arcades which form the face of the Palatine hill above the Roman Forum, that the scale of natural formations and of man-made structures coincides, so that the hills become in a sense man-made, and the structures take



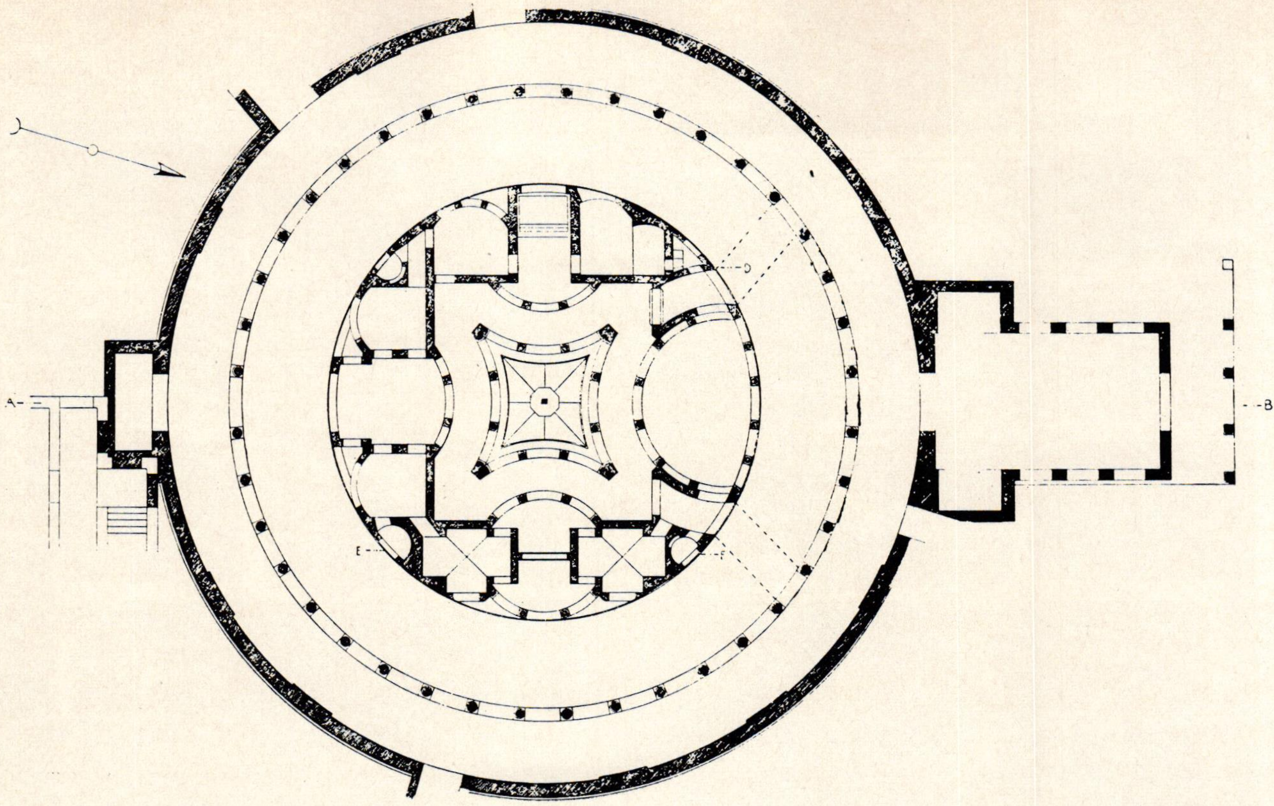
Die ‚Piazza d'oro. Plan 1:300

Plan of Piazza d'Oro (H. Kahler)

on the quality of a natural formation. Farther on top of Hadrian's hill, more such merging of scales takes place. A valley was dug for the Canopus, and a ravine hewn in the rock, supposedly for the River Styx, was connected with a set of subterranean passages. Natural formations become almost indistinguishable from man-made ones, but the control is in a man's hands (though proper Roman usage, and certainly his own wish, might require us to call God's hands the controls of the deified Hadrian).

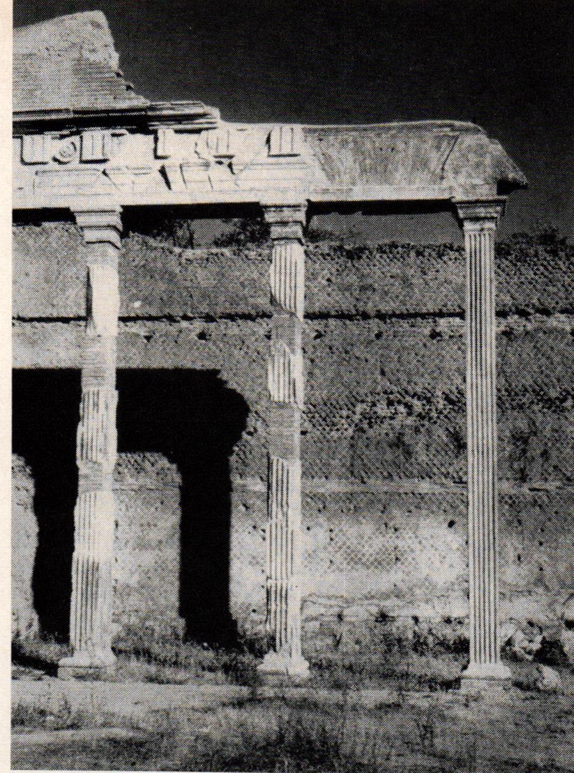
The foregoing might be regarded as remarks made enroute to the site (although the ride is scarcely that long) so that the next step is to examine the site itself, fragment (as is inevitable) by fragment. A plan of the whole is not so helpful as we could hope, since it can suggest neither the original scheme, which would have been much less random than what happens to have survived, nor the quality of the ruins, which are much more picturesquely vertical than their incredible horizontal extent would lead us to suppose. Much of the excitement of the spaces, in fact, comes from slight changes of level between them. The plan is but remotely suggestive, too, of the play of light and shade, of covered area and open, of hall, portico, and peristyle, which would once have been an important part of the experience of being in the palace, nor can it any more follow the water courses which might have brought another kind of order to movement through the complex. The plan does suggest how big it all is (though there are many more buildings off the plan), how strong the geometry of the individual pieces is, and how axial organizations form. Notice especially the one from the Poikele through the Canopus, reinforced by later excavations there, and the one into and through the Piazza d'Oro, on the eastern side of the villa.

Some areas are named on the plan, but this is in most cases for convenience only, and to commemorate the endless effort of archaeologists to find places in the ruins to accord with the description of Hadrian's biographer Spartian, who related how the emperor "created in his villa at Tivoli a marvel of architecture and landscape-gardening; to its different parts he assigned the names of celebrated buildings and localities, such as the Lyceum, the Academy, the Prytaneum, the Canopus, the Stoa Poikele, and Tempe, while in order that nothing should be wanting he even constructed a representation of Tartarus." A few places, especially



"Maritime Theater"

Large Baths



Hall of the Doric Pillars

Canopus and the Stoa Poikele, are clear enough. The rest of the names at least facilitate discussion, and recall how well these spaces defy labeling.

The modern entrance to the area is from the north, toward the Poikele. The ancient approach, supposed to have been between the Poikele and the Canopus is the most satisfying place to imagine entering the villa itself, since the approach would have to pass under the huge retaining walls stuffed with rooms (the Hundred Chambers) which support the Poikele high above the slope of the hill, and entrance is into a vestibule big enough to celebrate the Advent of the deified emperor, with a portico and a semicircular apse forcing the juxtaposition of a square and a circle, to set a theme around whose recurrence the geometry of the whole villa is organized.

Right from the vestibule, along the one long axis of the complex, lies Canopus. The axis followed to the left would lead to the Poikele. And just across the axis, to the left and right lie two baths, variously labelled "men's" and "women's," or "summer" and "winter," or "large" and "small." One of Piranesi's *Vedute di Roma,* of the larger baths, comes as close as any one drawing can to showing the excitement that attended the translation of Hadrian's two-dimensional circles and squares into a three-dimensional piling up of vaults and domes. Piranesi's splendid foliage creeping over the bared masonry doubtless pleases us more than the sumptuous materials that would once have covered the surfaces, although this is the area where some stucco decoration does survive, and it is very fine. During the century and a half which preceded Hadrian the Romans had fallen into the habit of hanging their structures with fancy-dress systems of columnar decorations, generally banal enough, and very nineteenth-century; poor Hadrian seems to have had even the same crosses to bear that we do, furnished by the taste of his predecessors. Pretty clearly, though, in such a place as these large baths, no cosmetic application could veil the clarity and strength of the arched and vaulted forms. The *frigidarium* was covered, over its square center section, with a cross vault, and was elongated north and south with barrel-vaulted sections. North of this extends a semicircular apse the full width of the room. Niches in the walls of the apse held fountains. To the east, the *frigidarium* was extended by a rectangular swimming pool, with fountains, and to the west is a circular *caldarium,* whose diameter equals the diameter of the semicircular apse, or the side of the square high vaulted area of the *frigidarium.* Opening from both the *frigidarium* and the *caldarium* is a square *tepidarium,* of the same dimensions, its roof essentially a barrel vault. South of the *frigidarium* opens another square of the same dimensions, this one cross-vaulted. All this is very simple geometry — the circle, the square, another square differently vaulted, then a big room roofed as a square and half a circle, but with its space further extended in three directions — but it is a geometry that is immensely effective, capable of containing without dissolution huge quantities of bejewelled and polychromed jazz. To judge from the quantities of *objets d'art* found here and mercifully spirited away, it must have had its hands full, even so.

The small baths don't have so much ruined grandeur, but their plan is intriguing to trace. The shapes are not quite so simple, and run to rectangles with con-

Poikele wall and Apse of the "Hall of Philosophers"

Vestibule of the Piazza d'Oro

vex ends. The tepidarium was such a shape; from it opens a circular caldarium, entered from an octagonal hall whose alternate faces curve into the space. From it a small room of the characteristic rectangular shape with concave ends leads to a much larger room of the same shape, extended at its sides into wings which in plan are deepended semicircles.

The small baths, built along an axis established by the part of the retaining wall which holds the Hundred Chambers and which includes the larger baths, the vestibule, and Canopus, are distorted at their north end to pick up a new direction, on which the stadium, the cryptoporticus, the Poikele, and the buildings between them are laid out. All this, of course, is to make the villa fit around the brow of its hill, as Frank Lloyd Wright disclosed that a villa should; but on a scale as vast as this, the clanging together of geometries, at least on the plan, is a strange thing to see.

The space referred to as a cryptoporticus on older maps has a raised pool restored in its center, with a double portico around. The pool is the size and shape of a good sized American swimming pool, and as appealing in the heat, but it is not sunken restfully into the ground. It is raised, so that the water seems to hang there in the middle of the court. Low around the outside, giving the weight it all needs, is the cryptoporticus, with openings looking out toward the pool, and on top of this are set up some columns from the high upper portico, which manage to create a really outsized Texan look. After this the Hall of the Doric Pillars nearby, with (probably) no water ever, and with a few rectangular Doric Pillars, freestanding, seems chaste, and refreshingly clean-cut, although it is self-consciously archaic. It is neither really Greek nor modern (second century) Roman, and has whatever mixture of virtues we might be able to attribute to a white clapboarded "colonial" church in one of the flashier reaches of Dallas or Beverly Hills.

All this is several hundred yards from the Poikele, for which the change in geometry at the little baths had prepared us, and to which we should return, past a long narrow space below the *cryptoporticus,* whose shape suggests that it was once a stadium, and past a structure where we can trace in plan a system of half-circles around a square.

The Poikele is a huge colonnade, 330 feet by 750, suggested, we are told, by the Stoa Poikele, or painted porch, at Athens. In spite of the general agreement about its name, it is hard to understand on archi-

tectural grounds. The orientation, as we've seen, of this part of the villa has been shifted from that of Canopus and the baths, in response to the curve of the hill. Now this great field, perfectly level, leaves the hill, and soars to the west out over the valley, retained high above the slope by the Hundred Chambers. The magnitude of all this undertaking is hard to realize from on top, and of course the need for a vast flat field right at this point is lost on us, though the power that comes from the simple geometric form is not. The shape, the same kind of rectangle with concave ends that we saw in the smaller baths is echoed by a large pool in the center. Around that, some say, would have been a hippodrome, or, as it has been hypothetically restored, a garden. Around that is supposed to have been a kind of cloister, which would be less moving than the fragment left standing along the north side of the field: a great wall, 250 yards long and almost 10 yards high, which runs almost due east and west, so that the south side is in sun, and along the north is shade. The simple strength of this statement — a long slab surrounded by space, which divides sun from shade — amasses a grandeur which, in its ruined state, is more than just Roman.

At the east end of this great wall, past the Hall of the Philosophers, a rectangle with a semicircular apse and seven niches for statues, is the circular area that makes a pivot point on the plan and is, more than any other single place, the focus and the heart of the villa. It is called the Maritime Theater, or the Natatorium, but neither of these names makes any sense. It is a round island, surrounded by a moat which is surrounded with a colonnade, which in turn is backed by a circular wall. In Hadrian's time, the Island was reached only by two retractable bridges. As we've seen, in the villa water was used everywhere, creating with its flow an image of distance, creating, especially in some of the sections cut into the hill, an image of immersion, but here in this round place the water is made to create the image of an island, with all the sense of withdrawal and independence that an island implies. Here in this vast jungle of ruins is an inviolate place, a perfect circle surrounded by water, with a stronger sense of place than anywhere else in the world. Gertrude Stein said of Oakland, California, that "there's no there there." This island has, above all things, there.

On the island are incredibly small rooms, and in the center of it all is a tiny atrium, square with concave sides, which must have held a fountain, a source of active moving water which would have lost itself in the still waters of the moat around. What went on in the rooms is anybody's guess, but it was surely something very special.

The concentric circles of island, moat, and colonnade make what seems like a pivot point in the plan, but two affairs called libraries invite a set of spatial problems by continuing the direction of some structures south of the island into an area where everything is oriented in a new direction, along the northeast slope of the hill, facing the "Vale of Tempe." This is the area of the Imperial Palace, so called, with large numbers of buildings and courts, which were once, it appears, particularly lushly appointed, and where the arrangement seems especially formal. The presence there of a couple of major buildings heading in another direction is particularly surprising, but they are at the edge of the hill, and have fallen into ruin in a highly picturesque way. The importance they gain because of their odd direction and the skill with which they have been fitted into the rest are both remarkable. The whole villa defies understanding as a place where people might live, and these Libraries, Latin and Greek, seem best to be suited for that, since they have at least some privacy. The Ospidale, which occupy the adjacent side of the rectangular courtyard against which the Libraries are wedged, are shown as guest rooms, but it would take a peculiarly eccentric Texan to stuff his guests into cubby-holes like this, even though water channels there suggest heaven knows what sort of hidden delights.

(This is perhaps the time to point out that the hidden delights in all this mass of masonry have been poked among not only with the archaeological skill that we would expect by now, but with skill and verve and high excitement by Eleanor Clark, in *Rome and a Villa* and Marguerite Yourcenar, in *Hadrian's Memoirs.* Their own monuments are not to be sliced into, but must be taken on all at once, like Hadrian's. Their fantasies, however, as well as their insights, have become, as Piranesi's did earlier, a part of the place, in the way that more recent residences gain fame for the guests they have sheltered. So their speculations appear here.)

On past endless rooms of the Imperial Palace, past the Hall of the Doric Pillars, lies the Piazza d'Oro, so grandly named because the objects taken from here have been even more sumptuous than the ones from anywhere else. The Piazza itself is a rectangle, whose 68 columns were alternately of Oriental granite and cippolino. It is entered through the center of one

short side via a vestibule which is octagonal, with alternate sides concave, so that it looks in plan like a square with rounded corners, which would have had a domical vault, for the celestial implications of the ceremonies when the deified emperor arrived here. Flanking the vestibule, opening into the Piazza, are square vaulted spaces, small, with half-circular niches. On one of the long sides of the Piazza, facing northeast, a half-round area faces the Vale of Tempe, but opposite the vestibule lies what must have been a space reserved for the most elevating ceremonies. In plan it is a large octagon, with sides alternately concave and convex, not walled, but suggested by arcades, as San Vitale in Ravenna was to have its form suggested four centuries later. On the concave sides, splayed rectangles helped fill a square. On the side opposite the entrance, which was convex, the form was echoed by an apsidal wall concentric with the convex arcade bordering the octagon. The two remaining sides, at right angles to the entrance and the apse gave onto rectangles whose ends were concave. These rectangles had no walls, but only arcades into still other spaces. It is the Baroque-like summation of the simpler geometries of the square and circle which the whole villa has developed. And it was alive with water, flowing from everywhere. The water used in the rest of the villa and the geometry of the rest of the villa must here have reached a ceremonial crescendo, though at the center of everything, hundreds of yards away, lies the island.

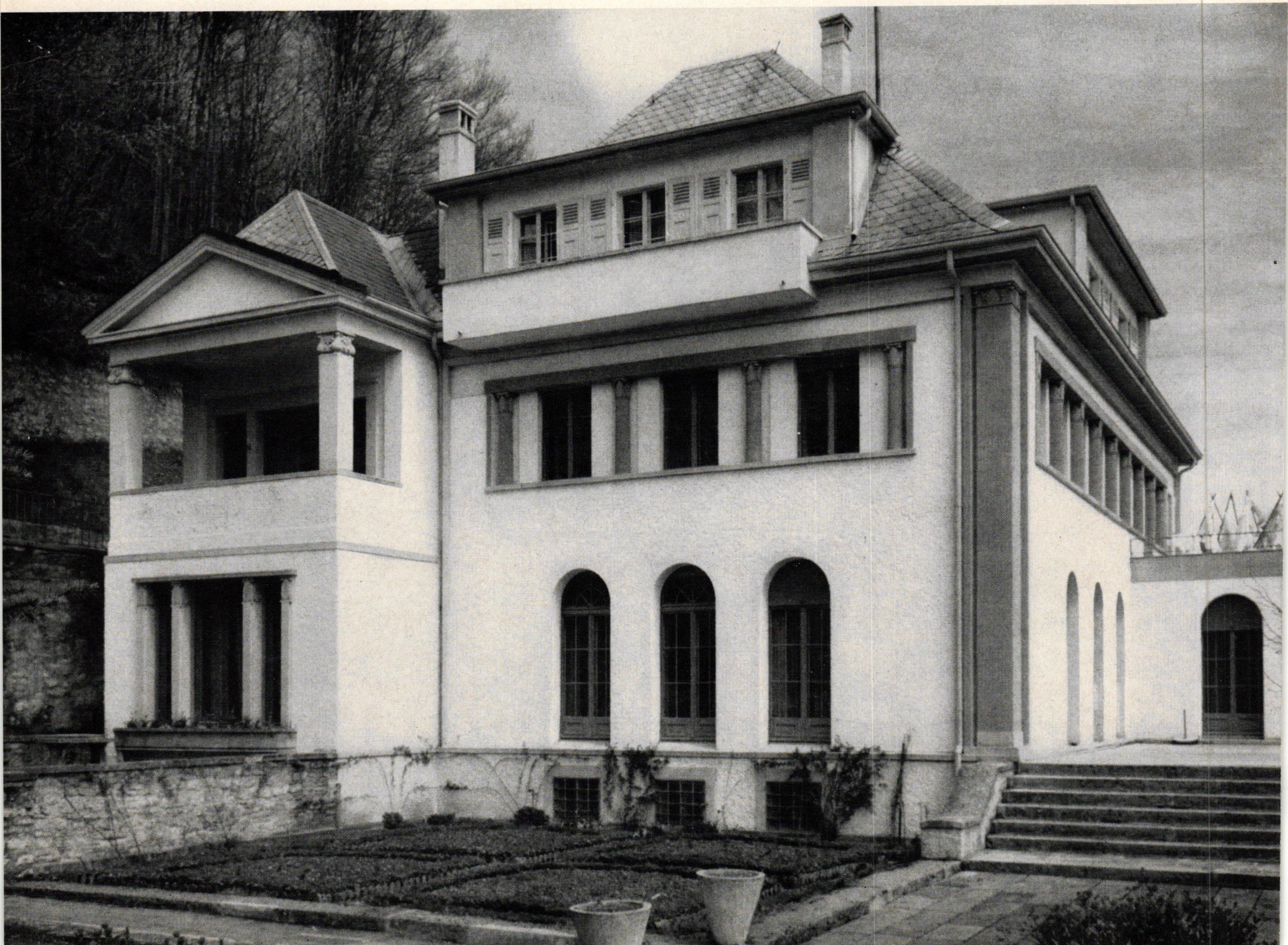
The Piazza d'Oro lies at the end of the Imperial Palace portion of the villa, so that past it to the south and east lies the brow of the hill itself. Our steps retraced toward the vestibule and the baths, where we started our tour, might well take us past a nymphaeum, and exedra with a fountain, a set of cubicles called a barracks, and a grander set, behind the great baths, called a praetorium. From the vestibule and baths to the south, along the great axis we previously followed north, lies the Valley of Canopus, artificially cut into the tufa rock of the hill. This is one part of the villa whose special affinities are in little doubt. "Canopus," according to Strabo, "is a town 120 stadia from Alexandria . . . containing a highly revered temple of Serapis . . . Troops of pilgrims descend the canal from Alexandria to celebrate the festivals of this goddess. The neighborhood of the temple swarms day and night with men and women, who spend the time in their boats dancing and singing with the most unbridled merriment, or find accommodation in the town of Canopus and there prosecute their orgies." Hadrian's Canopus, too, has cubicles along the sides of the valley and a temple of Serapis at the end of a panel of water. The area furnished quantities of Egyptian works of art, now mostly in the Vatican, which made more positive its identification; but perhaps the most surprising thing about the valley now is how Roman it all is. The "canal," recently restored and filled with water, is not really a canal at all (and Hadrian could certainly have afforded a canal if he had wanted it, if need be with water running uphill). It is a pool, in one of the characteristic shapes of the villa, a rectangle with convex end. At its north end a colonnade with architrave alternately flat and arched has now been restored — a form new even to Rome, and unheard of in Egypt. Opposite it the temple took on an even more remarkable form, a melon-domed circle sliced off at the front with a plane which would have produced an arched opening divided with columns. From behind the circular space came a tunnel, alternately roofed and unroofed (therefore light and dark), through which a major source of water flowed and splashed in fountains, in the tunnel, in the niches of the domed temple, and in front of it, toward the pool. Only the rear half of the dome exists now as it did in Piranesi's time, made of concave segments as some domes were to be in Byzantium much later. The look here is forward, not back. The festivals in this Canopus were said to copy Egyptian ones, and they may have, but neither the building forms nor the plans were copies of anything.

The rest of the Villa, to the south, looks fascinating in the books, with a ravine cut into the rock in order to recall, it is said, the River Styx, and mysterious underground passages connecting it with other underground phenomena, including one named after Tartarus. Then there are other ruins, the Academy, the Odeon, the Lyceum. The Academy, or Small Palace, especially, has a fascinating plan, squares and circle and a portico, with a main space made of circles intersecting the sides of a square, with round-ended rooms to fill out the corners. But they are private property and not part of a visit, and anyway there has already been, on even the coolest days, enough. The row of eighteenth-century cypresses that leads away from the hill is beautiful, its shade is deliciously cool, and we will want refreshment. We will probably not remember to look back. It will be later, when we need refreshment of another sort, that we will want to look again at the whole hill made over, devoted to the primacy of forms and a serious game of space, a game based on the subtlest permutations of the possibilities inherent in a circle and a square, and transforming with a circle and a square the objects and impressions of a whole world.

Serapeion

THE WORK OF CHARLES-EDOUARD JEANNERET

1



The Oeuvre Complete de 1910-1929 *of Le Corbusier and Pierre Jeanneret makes no mention of the work of Charles-Edouard Jeanneret. When one considers that the advent of the periodical* L'Esprit Nouveau [1] *in 1920 metamorphosized the young architect Charles-Edouard Jeanneret into the personage of Le Corbusier, the omission becomes understandable. This omission, not to say suppression, of Le Corbusier's pre-Le Corbusier work has by now become so nearly complete that the buildings themselves have almost ceased to exist, the one exception being the Villa in La Chaux-de-Fonds (the birthplace and early home of Le Corbusier) of 1916 which is illustrated in* Towards a New Architecture. [2]

As the following photographs show, several buildings by the young Charles-Edouard Jeanneret survive in excellent condition.

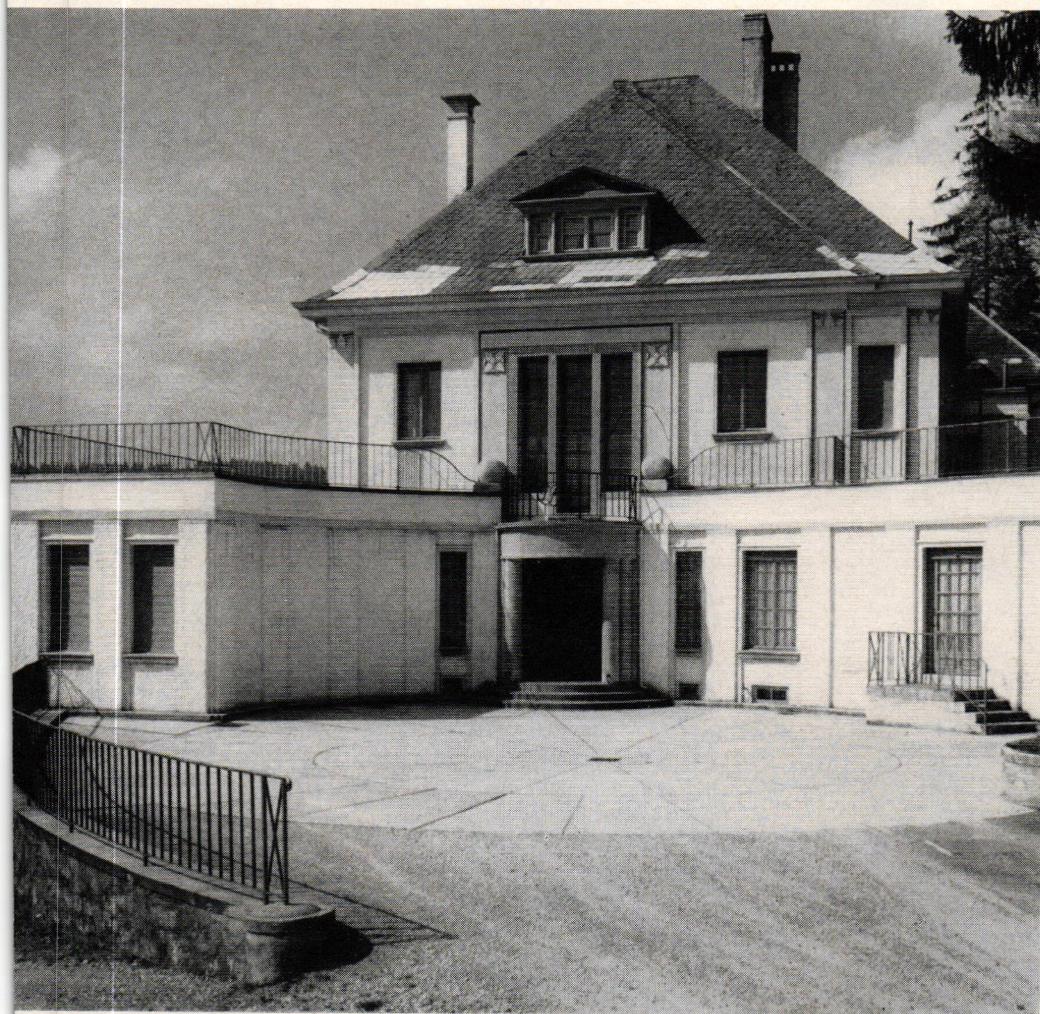
W. J. C.

1. *L'Esprit Nouveau,* Editors G. Crés et Cie., Paris 1920-1925
2. Le Corbusier: *Towards a New Architecture* Published as *Vers Une Architecture* Editions G. Crés et Cie., Paris 1923

Plates 1, 2, and 3

The "Villa Fauvre," Le Locle (near La Chaux-de-Fonds) Le Corbusier has said [1] that the house which he designed at the head of a group of students at the L'Ecole D'Art de La Chaux-de-Fonds for his master L'Epplatenier had "gables, balconies, and carved crows." Mr. Henry-Russell Hitchcock dates this building at 1905. [2]

1. Geoffrey T. Hellman: *Profiles: From Within to Without* *The New Yorker,* April 26 and May 3, 1947
2. Henry-Russell Hitchcock: *The Evolution of Wright, Mies and Le Corbusier* *Perspecta One,* Summer; 1952



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3

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Plates 4 and 5

The "Villa Cornu", La Chaux-de-Fonds

To quote Mr. Henry-Russell Hitchcock in *Modern Architects:* [1] "Yet when he (Le Corbusier) built a house for his father in 1911 it was still rather in the Swiss tradition. The white stucco walls and the horizontal grouping of the windows suggested the direction in which he was moving, as did the simple metal pipe railing."

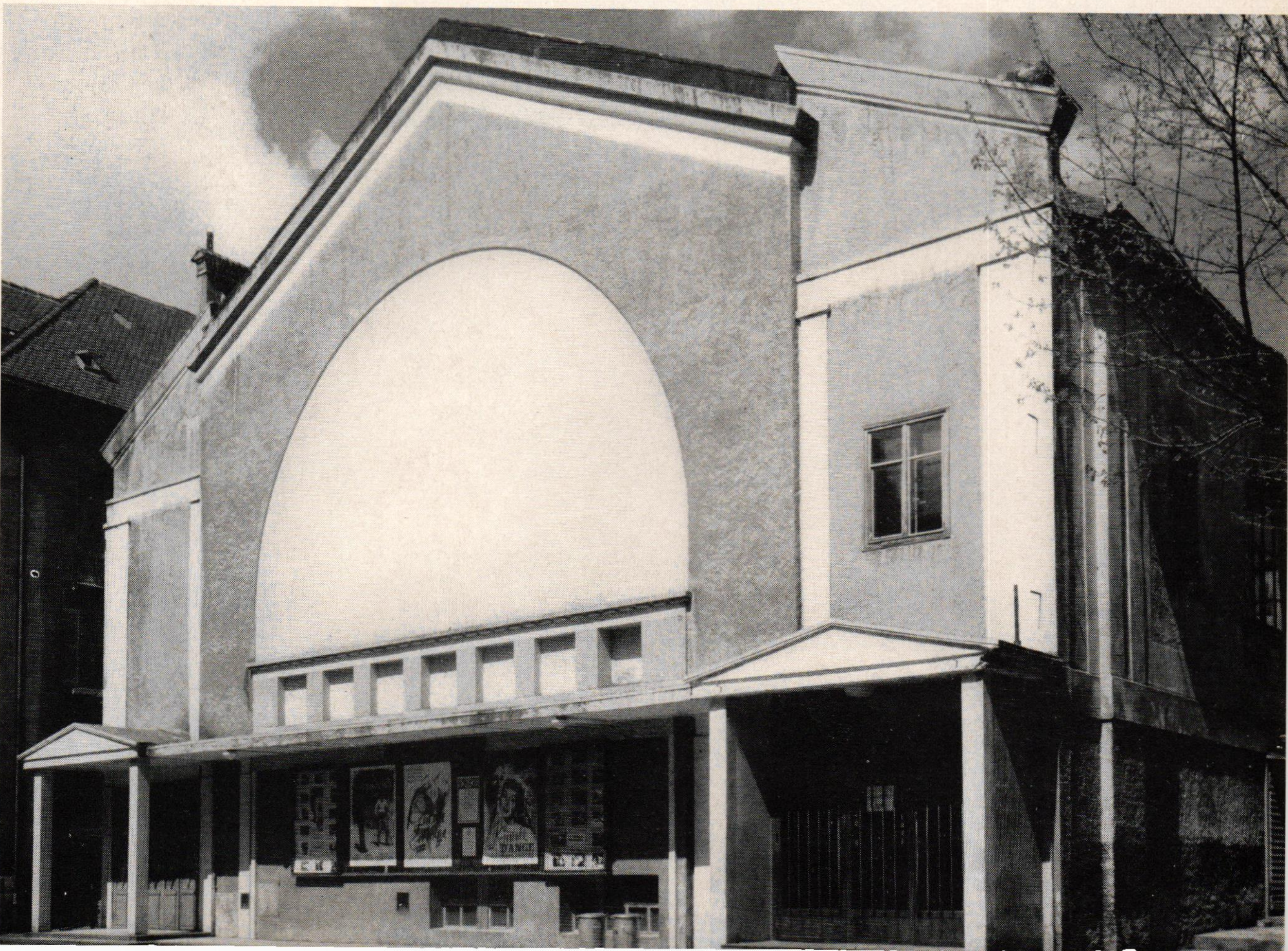
1. Messers Barr, Hitchcock, Johnson and Mumford: *Modern Architects* The Museum of Modern Art, New York, 1932

Plate 6

The "Scala" Movie Theater, La Chaux de-Fonds

The attribution of this building to Le Corbusier is largely by the citizens of La Chaux-de-Fonds. The date probably falls in the period from 1912-1916.

6



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Plates 7, 8, and 9

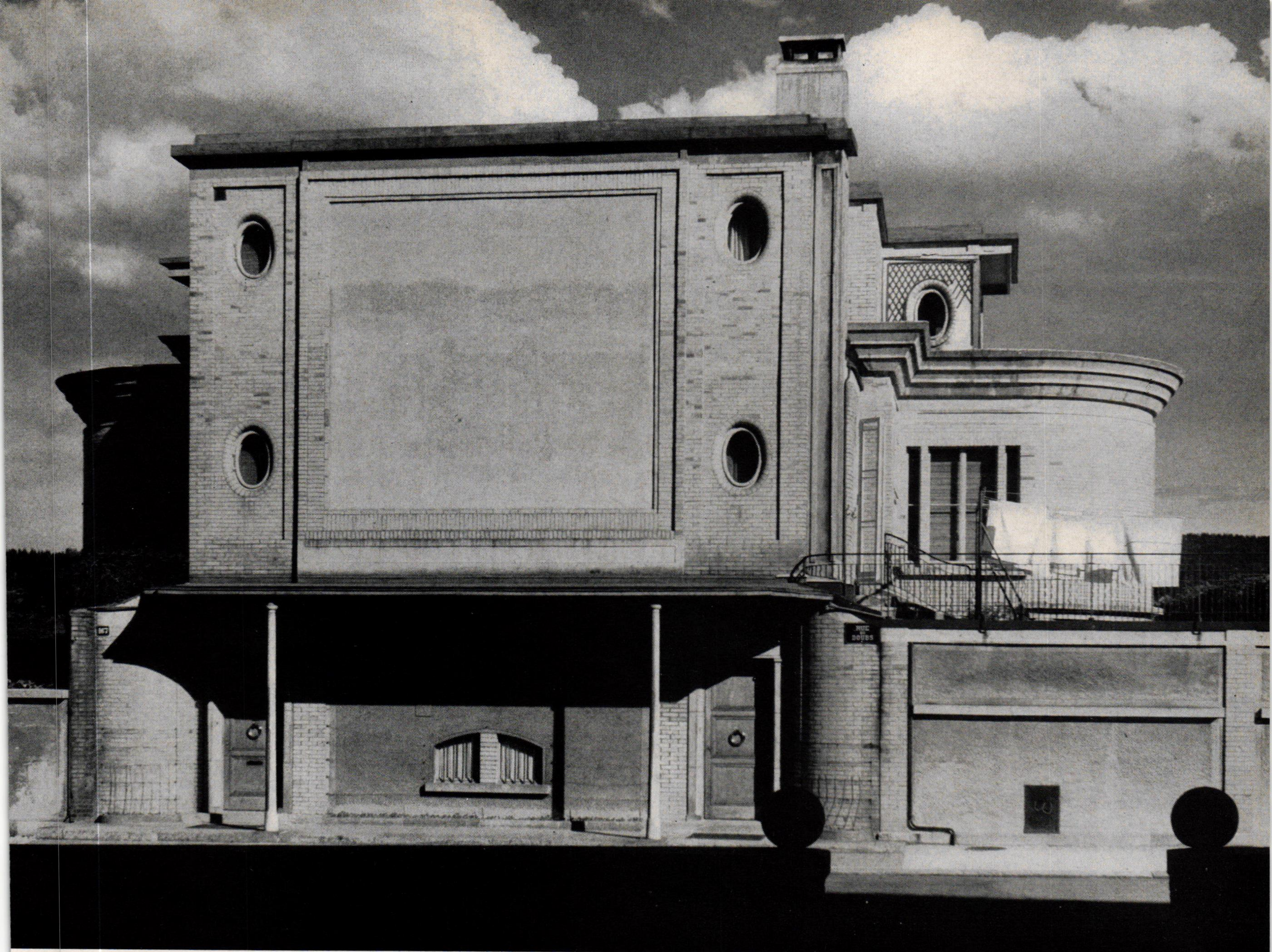
The "Villa Schwob" at La Chaux-de-Fonds

This is the building illustrated in *Towards a New Architecture* [1] and dated there at 1916. A plan and elevation of this building appears in Mr. Hitchcock's article in *Perspecta One.* [2]

See also C. Rowe: *Mannerism and Modern Architecture*

The Architectural Review, May 1950

1. Le Corbusier
2. Hitchcock



9

八海

SOME ASPECTS OF JAPANESE ARCHITECTURE

Walter Dodd Ramberg

Sand garden, Tofukuji, Kyoto

Japanese architecture is in many respects a partial and limited endeavor. It is almost entirely one of post and beam wood construction, making little use structurally of metal or stone. Wood is used almost exclusively, despite the fact that stone suitable for building is plentiful in Japan, and is lavishly and knowingly used in the construction of freestanding walls, paths, roadways, platforms, and stairs. Even those materials used non-structurally to finish roofs, interiors, exterior walls, floors, and ceilings are few in kind. Clay tile, HINOKI bark, and straw are used on Japanese roofs. Walls and sliding doors are made of wood, plaster on bamboo lath, and paper. Ceilings are of wood, and floors, when not of wood, are of straw mat, TATAMI, or bamboo. The limitation to wood construction can, of course, be attributed to the Japanese architect's concern for building in a country much visited by earthquakes. One might well feel, however, that stone is eschewed for aesthetic reasons as well. Traditional adherence to inherited technique and the material poverty of the islands might explain the use of so few secondary building materials. Those that are used, however, appear to be carefully selected for certain natural qualities of harmonious color and texture. One can but feel that such economy of means is also in large measure highly intentional.

However the material vocabulary of the Japanese architect comes to be so limited, its paucity profoundly affects the architectural possibilities of his work. There is in it, for instance, very little occasion for the creation and manipulation of mass, and in the absence of mass little possibility of sculptural plasticity.

Wood post and beam construction, further, limits very considerably the size of the individual building. There are, in Japan, temples with columns of enormous size and clear spans of up to 30 feet or more. It is the rule, however, that the single span is limited to 12 feet and column size to less than 1 foot diameter — 4 inches square is standard in the common dwelling. The limited span that wood construction affords tends to deprive Japanese architecture of large-scale volumetric possibilities. Spaces within the Japanese building are, of necessity, small and rather uniform in size and shape.

The building types which make up the whole of Japanese architecture are by any relative standard few in number. Shrines, temples, palaces, farmhouses, city dwellings, and teahouses make up the lot. While they all have clearly distinguishable stylistic characteristics, their program is for the most part remarkably similar. The city dwelling is, in fact, in many respects composite of its sacred and rural secular antecedents and may quite reasonably be considered to reflect the essential character of Japanese building. Given such limited vocabulary of structure, material, and type it is not at all surprising that Japanese architecture is one of very little basic variety of form. There are, of course, a half dozen sorts of roof shapes. There are raised floors of varying heights. There are two- and three-, as well as single-story buildings. But, in general, variety of form is confined to the manipulation of a few basic over-all configurations and to the execution of detail.

One would, however, be mistaken to assume from such evidence of both physical and self-imposed limitations a narrow range of architectural ambition

作事往来

四方阿利

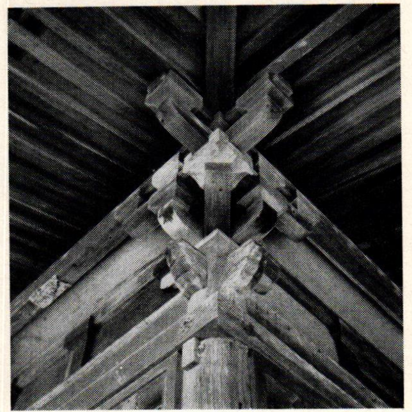
二面

上六

下六

右二
二面男木

二面女木



and accomplishment among the Japanese. The accomplishment of the Japanese architect is most readily recognizable in the quality of his craft and in his deft manipulation of the traditional vocabulary of architectural forms. The measure of his ambition is to be clearly read in the large conception and subtle elaboration of the visual order superimposed on the structural fabric of the architectural environment.

It is the unusual accomplishment of the Japanese to have directed a rich capacity for invention almost exclusively to the refinement of their architecture in terms of detail and execution. Nothing reflects more clearly the measure of this capacity than the tools and methods of the Japanese carpenter. Planes, chisels, and saws are numerous in kind and extraordinary in configuration. They are cleverly designed to allow and facilitate the execution of the smallest and most irregular work. Joinery is similarly of an unexpectedly complex character. The standard of craftsmanship which the Japanese set themselves in building is unparalleled in the work of any other people save possibly in that of the Hellenic Greeks.

Such command of their material as the Japanese possess is directed to an artifice which endows the whole of their work with a highly willful character. The structural fabric of the building is for the most part concealed. Exposed beams are spliced and given concealed support with such artistry that they appear to accomplish improbable spans. Ceilings are hung at varying heights so as to give interior spaces pleasing proportions, little dependent on the whole of the building or on its exterior configuration. The intersection between interior wall and hung ceiling is detailed in such a fashion as to give the ceiling a weightless floating appearance. Columns are occasionally eliminated from and often added to the regular symmetrical grid in such a way as to relieve the whole of a compulsive constructivism, of a logic born only of technique. Joints are cunningly made to appear effortless and inconsequential. Appreciating the severe limitations which the Japanese architect accepts, one can but be astonished at the degree to which he has been successful in freeing his work of any attendant sense of uncomfortable constraint.

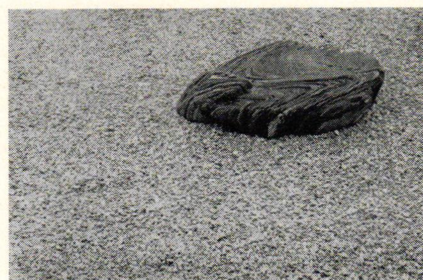
The artifice which enables in Japanese architecture this unexpected freedom of expression has not been used for the most part, as it well might have been, for the accomplishment of capricious and arbitrary effect. Relieving the building of a logic born only of technique, artifice serves the creation within it of a visual or formal order born rather of deference to an order intuitively recognized in nature.

The Japanese have been fortunate in their geographical isolation. It has made them heir to a cultural development exceptional for its continuous, uninterrupted character. The rich and continued presence of the past has made possible in Japan a cultural cohesiveness which informs all aspects of life and art. This presence of the past does much, of course, to explain the high order of refinement to which the Japanese have attained in their art and architecture. In addition, and more significantly, this cultural continuity has preserved and nourished in the Japanese a vigorous primitive intuition, which is in them the source of a sure instinctive recognition of the essential as opposed to the trivial in nature and art. The special quality of Japanese life and art; its unusual juxtaposition of restraint in economy of means and

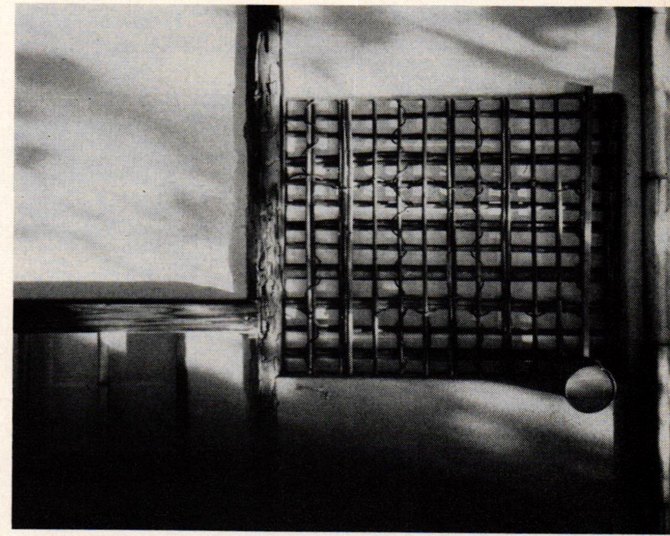
The free standing walls that one sees in Japan seem to betray in their form and use something of an attitude to stone construction, peculiar to the Japanese. The face of a wall of any height seldom strikes the ground at an angle of 90°. Some walls are battered; others curve into the ground at their base. The top of the wall is rarely allowed to describe a line against the sky. It is sometimes roofed with tile or wood shingle, and sometimes planted with trees, bushes, or grass. Japanese walls, thus, contrive in some measure to preserve the character of a natural phenomenon, a cliff or outcropping. One might surmise that stone buildings sit too heavily on the ground and make too arrogant an intrusion into the natural scene to satisfy traditional Japanese sensibilities. The choice of wood construction in Japan may on such evidence reasonably be assumed to have been endorsed not only by natural conditions, but also by native sensibilities.

sophistication in carefully contrived effect; its mythical character and preciosity is largely a function of the persistence of the archaic in a fully and richly elaborated culture.

The Japanese have conceived an architecture which, if more abstract, is no less than painting an image of nature. The qualities which they seek to realize in architecture are those which seem essential in nature. The significant form to which they aspire in building is analogous to that observable in nature. Persistence of the archaic complicates and enriches the Japanese apprehension of the essential in nature, adding to the measure of beauty a supernatural measure of the significant. It is a fundamental part of that primitive intuition which they maintain to sense very strongly the divine presence in nature. The supernatural is not in Japan, as it is commonly felt elsewhere, simply an aura, an added dimension to the whole of nature. It is seen rather to obtrude insistently in innumerable individually unique phenomena. KAMI or spirits are recognized and revered in trees, stones, mountains, and the sea. While they are felt present in all things, they are seen to reveal themselves especially and most significantly in extraordinary phenomena: ancient or unlikely trees, stones of exceptional size or configuration.



That intuition which is the origin of the native cult, directing attention to the particular and peculiar, leads the Japanese to recognize a natural order which is of necessity fragmentary and unsystematic, and little susceptible to conceptualization. Albeit unsystematic, and in its workings even mysterious, this order is nonetheless convincing to the Japanese. The significant in nature so apprehended is, in fact, sufficient to dictate, in terms of deference to the divine



presence in natural phenomena, a strong and surprisingly precise sense of seemliness and propriety, largely affecting Japanese life and art.

Beauty is, of course, the artist's usual measure of merit. The Japanese recognize in nature as well as the supernatural, the origin and lineaments of beauty. Beauty is in nature, as is the supernatural, both all-pervading and specially expressed. KAGAMI, mirrors, are treasured in shrines as symbols of beauty, reflecting as they do in their face the image of nature. Nature is in a sense inevitably beautiful, the natural by definition beautiful. It is, nevertheless, not equally so in all its parts.

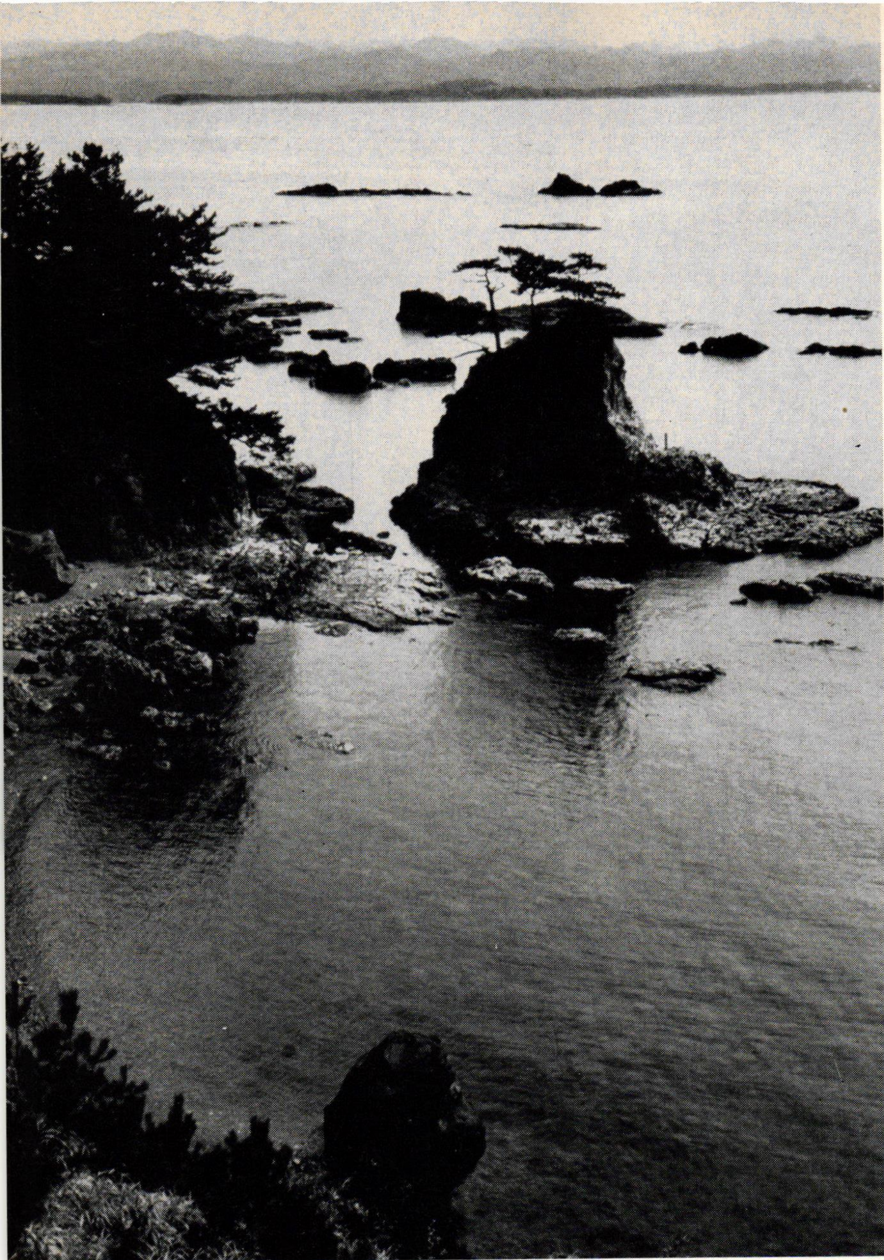
The Japanese are quick to discern in particular phenomena a special beauty. Such particular phenomena and the special beauty that is recognized in them are of two sorts. In some, beauty is seen as perfection of type and, in others, as a property of accident. Certain trees and blossoms possess more than the common measure of beauty and significance. Cherry, plum, maple, pine, and bamboo, chrysanthemum, peony, and iris are among such favorites. They are appreciated individually for their special beauty, being to the Japanese eye the finest of species, and further as types, being in sum descriptive of the range of natural growth and form.

Trees branch and flowers exfoliate in many but not innumerable ways. Among those natural phenomena which the Japanese especially appreciate are many which seem to portray in their form the essential alternatives in natural configuration. Taken together they make a sort of Aristotelian categorization. Familiarity with them endows the observer and the artist with a kind of predictive power, a knowledge born of a quick comprehension of the limits of nature.

Recognition of this sort of special beauty seems a part of their concern to know nature's usual way. The Japanese are quick as well to appreciate and count especially significant exceptional phenomena. They are in fact much preoccupied with aesthetic qualities which are in nature, for the most part, properties of accident. Among such qualities are those collectively described as SABI or WABI. In architecture that which is SABI or WABI often possesses beauty born of age and natural decay. In man the appreciation of such beauty stimulates a sense of gentle melancholy, loneliness, and acute consciousness of the ephemeral quality of life and beauty. Through erosion, natural discoloration, the scars of age and weather, trees and stones acquire a grace, demonstrate a mutability born of vulnerability to natural forces. They are precious, guarding in their configuration and color the fossil imprint of life.

The Japanese use the word IKI to describe other aesthetically desirable qualities. Its meaning includes recognition of the delights of the hidden, the partially revealed, the unsatisfied and the unresolved. Mist, shadow, forest, and thicket please in possessing such elusive qualities. It is perhaps corollary to appreciation of that which is IKI in nature to prize secret and hidden richness, the persistence of nature's careful and painstaking design in the root buried in the ground, the grain at the heart of the tree, the veining of stone. The Japanese, thus, find beauty especially expressed in nature by the perfection of type, by fragility and mutability, and by concomitant seeming accident and ubiquitous concern.

It has been the large intent of the Japanese architect to realize in his work such qualities as he has especially appreciated in nature. The use of natural ma-



View from Hinomisaki Promontory to Mainland

Rice paddy, Muroji, Nara

terial — wood, straw, and stone — exposed to the weather unprotected, and the incorporation within the architectural whole, even in the interior, of weathered boards, twisted tree and branch, eroded and moss-covered stone lend the building qualities of fragility and mutability. The Japanese gardener prunes and tortures trees to cultivate in them configuration analogous to that born of age and the severity of the elements. Paper doors and split-bamboo curtains contribute to the Japanese interior a sense of the half-hidden and partially revealed. Deep eaves and surrounding verandas keep the interior in darkness and shadow analogous to that of the forest. The hidden richness and ubiquitous concern, which the Japanese appreciate in nature, they emulate in architecture with the elaboration of carefully concealed joinery. It is, however, in an insistent asymmetry and cultivated microcosm that the Japanese most clearly demonstrate the large character of their architectural ambition and accomplishment.

Such symmetry as exists in nature is largely interior and discontinuous. Plants show in their growth and form a certain measure of symmetrical bias. But they are in their whole configuration and disposition, like the inanimate in nature, irregular and asymmetric. The Japanese have been concerned to make the architectural intrusion into the natural scene an easy and gracious one and this concern has done much to preclude the symmetrical organization of buildings. Symmetrical arrangement bears very much the stamp of a human and an intellectual order. It involves an interruption of the natural pattern and implies man's intent to improve on nature in terms other than its own. It insists on man's divine dispensation, his special place between nature and the gods. Its endorsement seems testimony to the propriety of man's rude refashioning of the world in the image of that passion for regularity he calls reason. The Japanese have been much more disposed to defer to nature than to project its improvement in a systematic intellectual manner. They have been more interested in discovering the order in the face of nature than in accomplishing an ideal in an imperfect world.

The disposition of Japanese buildings and cities is a function of such concern for a deferential intrusion into the natural scene. The asymmetry which characterizes the Japanese site has in fact rather obvious origin in the character of the Japanese land.

Japan is an island country of many mountains, narrow valleys and broken coastline. There is much insistent asymmetry inherent in the land itself and in the pat-

tern of its use. Rice culture has been the dominant factor determining land use in Japan. It has dictated the division of the valleys and plains into innumerable paddies. These paddies recognize in their size and shape the least irregularity in the surface of the ground, and, in so doing, leave an assymetric calligraphy inscribed on the land. They follow the valleys like steps, as they rise into the mountains. As they must be flooded, they turn the flat land into a sea at the foot of the mountains. Land suitable for economic rice cultivation is scarce, a bare three-tenths of the total land area. It cannot in general be spared for other use. Between the rice and the mountains the Japanese find a narrow place to build that rural dwelling which is a native architectural prototype.

The site which they choose under the mountains makes for many architectural limitations. It is closed behind and of limited extension. It is on broken, if not rough, terrain. Even buildings which affect large roofs can count for little against the mountains. Such buildings are not lost in insignificance, however, for the mountains are small. The *shape* which Japanese mountains give the land is almost human in scale. The land, therefore, does not, perhaps, require such architectural order as might be born of symmetry to make it comprehensible in scale. Raised floor construction allows the rural dwelling to be built with deference to the surface of the ground, eliminating any necessity for large-scale cutting and filling. It makes the use of an uneven site less awkward, and simplifies drainage problems. Most significant of all, however, the raised floor contributes to the development of the individual building as an island. Drainage ditches set buildings, roads, and walks apart in an analogous but obverse way to that in which dykes separate the rice paddies. As islands, buildings, and other elements of the architectural environment are irregularly disposed and asymmetrically approached, their disposition as well as their size is such as to prevent their being the basis of an architectural order which might become a measure laid on the land.

Urban architecture would, of necessity, imply the imposition of such an order, and the Japanese have actually done very little to develop a distinctive urban architecture. The city dwelling differs in few fundamentals from its rural antecedent and contemporary. The vast majority of small towns conform in plan to the asymmetric and somewhat accidental disposition of the rural village. A number dating from feudal times are consciously organized only in that they are clustered about great castles. Edo or Tokyo, though much larger than the rest, is typical of these. Only the capitals at Nara and Kyoto are in fact laid out as cities, and symmetrically. They were built on relatively flat ground and, to conform to Chinese precedent, on a rectangular grid. The earliest capitals built in the vicinity of Nara escaped the finality of such symmetrical order by being removed and rebuilt for each successive imperial reign. Those that became relatively permanent at Nara and later at Kyoto grew less insistently symmetrical with time. If the symmetrical character of the city plan was by-and-large preserved, the qualities that one might expect of such order in terms of comprehensiveness, insistence on the man-made, and overruling imposition on nature were in various ways mitigated if not obviated. Kyoto refused the center of the valley; to move under the eastern mountains astride the KAMOGAWA, seeming to prefer the twisted and lively river to an Imperial avenue as axis. Both at Nara and Kyoto the fact that the grid was not enclosed by moat or wall made it a less arrogant intrusion on the natural scene than it might have been. This peripheral openness or vulnerability to nature is complemented within the city by a large order of natural infiltration. Urban concentration is avoided rather than cultivated. The Imperial enclosure is so vast that from the Kyoto palace nothing may be seen of the city; one looks from the park directly to the surrounding mountains. Such lesser palaces and private dwellings as are able to do so aspire to similar isolation within the city. At any crossing within the city one looks directly to the mountains to the north, to the east and to the west. The principal streets, open-ended and unpunctuated by square or circus, seem curiously unaffected by their urban periphery. Dwelling house and shop alike turn blank faces to the street in reciprocal indifference. One is reminded, even in the Imperial capital, of the unnamed and aimless streets which are the Japanese vernacular. Kyoto's symmetrical grid, albeit admired as an appropriately exotic, continental, and arrogant traditional embellishment of the Imperial seat is not elsewhere imitated. Its fate in this respect is in some sense, at least, typical of that of Chinese example in Japan.

Chinese architectural example is often considered to be rendered Japanese by the dissolution of symmetrical order. The occasion for and impetus to such dissolution is seen in the *topographical* dissimilarity of the two countries. Chinese cities and temples are laid out on wide plains; Japan is a country of narrow valleys and innumerable mountains. The Chinese

Konjikido, Chudonjo, Hiraizumi, Iwate Ken

scheme may well have seemed inappropriate to Japan and it certainly proved awkward and even impossible to realize in many instances. HORYUJI, the oldest temple complex built in Japan, is built in the midst of a plain and, with only minor exceptions, conforms to Chinese symmetrical precedent. Already, in the HEIAN (800-1200) period, however, the temple complex in Japan became radically asymmetrical. The mountains HIEIZAN and KOYA-SAN were used as sites for the temples of new sects. It was quite impossible to lay out the 3000 buildings of ENRYAKUJI on Mt. HIEI in any symmetrical fashion. Out of deference to such topographical circumstances was born an asymmetrical organization of the site which is the Japanese rule, even in the building of temple and palace of Chinese and symmetrical origin. Shrines, teahouses, and dwellings of indigenous origin are almost invariably disposed and approached in asymmetrical manner.

The asymmetry of the Japanese site is complemented in the Japanese interior by an independently cultivated asymmetrical order. The Japanese interior is defined and articulated by exposed columns, beams, purlins, window frames, sills, and mullions in part structural and in part applied or decorative. These members are so sized and arranged as to create patterns of considerable sophistication in terms of continuity and discontinuity, direction, thickness, and density of line. Japanese art has perhaps most impressed the western world by its cultivated use of line, and the Japanese undoubtedly owe much of their extraordinary sophistication in this regard to the discipline of their calligraphy. A highly developed calligraphical sensibility governs the linear abstraction which is so evident an aspect of Japanese architecture, and in fact may be thought, as well, to dictate its characteristic asymmetric bias. The oblique view and the quest for unsystematic balance are everywhere characteristic of the "painterly" sensibility. In representational art and in calligraphy, symmetrical order that can be satisfying in architecture proves wanting. This may be the result of one's looking into the painter's image of the sensually perceived world, and into the calligrapher's world of pure form. One actually enters a world of architectural order. Where the eye alone is to enter, a devious path must establish the sense of movement; where the foot accompanies the eye, a more reasonable path must be described. There is much that is highly two-dimensional about Japanese architecture. Many of its characteristic elements are to be looked at. The typical gardens outside

of teahouses, or of dwelling houses, are examples of such elements. Interior walls and even exteriors are finicky. Their careful proportions and fine detail only seem reasonable when they are looked at as a painting might be. The Japanese taste for asymmetry may be seen, then, as a part of a painterly approach to architecture.

Such an approach applied to architecture has done much to relieve and even deny the inert constructive character one might expect of simple exposed post and beam. The continuity of line and asymmetry born of calligraphic concern give the exposed structure a grown rather than assembled aspect. Curiously enough in this guise the elaborated and attenuated structural order is rendered more, rather than less, convincing. NAGESHI, false beams applied at the head rail of sliding doors, are wedded to the whole structural fabric by being carried throughout the building at a consistent height, with only rare and calculated interruption or omission. Columns are consistently introduced to articulate the wall plane at all corners and intersections. In such a manner the apparent structure is completely integrated with the division of interior spaces, to the end that such division, however asymmetric, seems anything but capricious or arbitrary.

The illusion of spaciousness in Japanese architecture is a function of its emptiness in the absence of furnishings and, as well, a function of its microcosmic orientation. It also depends very much on asymmetric organization. The asymmetrical placement of buildings, of elements within gardens, and those within the building implies a spacial extension beyond what one sees, denying a sense of completion or definition. One is presented with what seems only a part of a pattern when what one sees is asymmetrical. The part argues its completion out of sight, beyond what is immediately spacially comprehensible. If asymmetry leads the eye out of a defined space, it not only contributes to the illusion of spaciousness, but also to that of movement; and in suggesting movement, asymmetrical organization endows Japanese architecture with qualities of liveliness. Western architecture gains much of its lively aspect from the relatively free arrangement of furnishings and from plasticity. The Japanese room is largely devoid of furnishings and it must, in compensation, provide for its own lively aspect. The wall and the elements which articulate it offer the eye little repose and much cause for movement. The surface of both wall and floor are given an unsettled and, in a sense, unresolved aspect by the asymmetrical organization of their component parts.

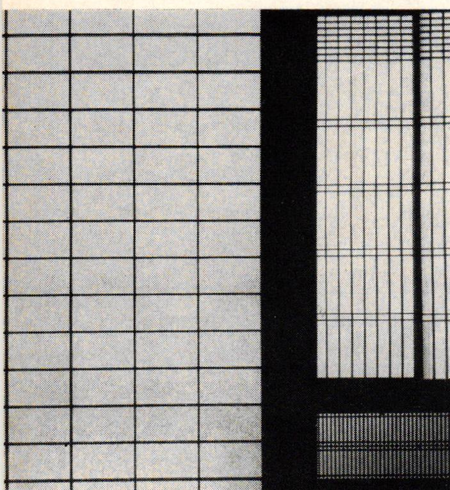
They might have this aspect through plasticity if their material and its reasonable configuration allowed such a possibility. Lack of mass, lightness of structure, and thinness of surface do much to preclude plasticity in Japanese domestic architecture. Furthermore, fundamental aspects of Japanese taste tend to combine in such fashion as to preclude any large measure of plasticity. The Japanese, as one might expect from their special intuition of nature, prefer a distinct and individual presentation of component parts, and have a definite dislike for vague and inert backgrounds. These preferences, in combination, lead inevitably to a certain standardization of the shape and size of component parts, and to a rectangularity that leaves little room but for the most reticent plasticity.

Asymmetry is thus, in large measure, the only remaining antidote for insistent rectangularity and repetition. It is in a sense an antidote for simplicity itself; for an uncultivated or unchallenged simplicity can easily fail to delight. Asymmetry may be thought to imperil simplicity of form. In its parlous state simplicity is made precious. It seems something tranquil, wrested from a lively pattern, rather than the static statement it might be.

The asymmetrical organization of architectural elements in depth makes for the changing patterns that movement within the Japanese house reveals. The kaleidoscopic image emphasizes and exaggerates physical movement. Its memory and its promise endow the prospect, even from a position of repose, with liveliness.

Liveliness is not, however, in Japanese architecture, as it so often is, purchased at the expense of a convincing order. Such architectural order as we are most familiar with is anthropocentric and symmetrical. Having had many reasons to eschew symmetrical organization, the Japanese rely on other means to establish the seeming inevitability that architectural order demands. The use of elements of standardized shape and size, TATAMI, FUSUMA, SHOJI, hung ceiling, columns, give their buildings an order they would otherwise lack in their asymmetry, and this order is analogous to that observable in nature. While plants possess some measure of internal symmetry, in their whole configuration and disposition they are related only by the repetition of identical parts. If the architectural environment is thought of as an image of the natural world, such an order is a seemly one. The search for seeming inevitability in natural an-

Toko Bashira



Akari Shoji

alogy sponsors, as well, in Japanese architecture a choice of building material and a pattern for its use. The general use of exposed columns and beams of standard size and shape makes possible, without fragmentation, the accommodation of the unique TOKOBASHIRA and other details of the TOKO in an architectural order. Such members as are selected for column, TOKOBASHIRA, and beam of the TOKO are rough-hewn, unfinished, and irregular elements introduced among identical and repeated structural components. They reinforce, in their unfinished state, the natural analogy of the architectural order; and, as a figure of the irregular aspect of living nature, incorporated within an abstract created order, support its asymmetrical organization. They do much to make what might seem arbitrary seem convincing or inevitable.

Asymmetry is, thus, in Japanese architecture, instrumental to the realization of both enduring and lively qualities. It is rooted in an intuition of nature, and in calligraphical concern. Asymmetry allows deference to the natural site. It assists the establishment of order and seeming inevitability in natural analogy; and it endows with liveliness in implied movement and linear abstraction. Cultivated asymmetry is a product of a painterly approach to architecture which insists on the two-dimensional aspect of the created environment. Such insistence on the two-dimensional entails an insistence on visual rather than tactile apprehension of architectural form, a kind of measure by eye. The articulated surface so treated, as a painting, becomes more symbol than substance.

If the large intent and accomplishment of the Japanese architect are well reflected in those qualities sought and gained in deference to nature and in cultivated asymmetry, they are, perhaps, even more clearly displayed in an insistence on a kind of microcosmic cultivation. The architectural environment is in a certain sense inevitably a world in small, a universe within the universe. Describing by containment and by implication a bit of the whole, architecture not only establishes an order secondary to that of nature but, in fact, one which is in some sense entire unto itself. The architect, recognizing this, is sometimes consciously moved to realize in the created environment a cosmic image. One is familiar with temples and palaces so conceived, the Roman Pantheon being a case in point. The Gothic cathedral is represented as an image of paradise. The Moorish Alhambra is, perhaps, one as well. Hagia Sophia and the Islamic mosque are cast in the image of paradise. Even such palaces as Versailles can be thought conscious endeavors at the creation of a cosmic image. It is the distinction of the Japanese architect to have attempted such a microcosm in the common dwelling, in the room, in fact, which is its basic unit.

The small scale and the very limited size of the Japanese building would seem to preclude the possibility of such an endeavor, let alone its accomplishment. The spacial ambitions of the Japanese architect are in any physical terms limited, such limitation being not only of scale and size but, even more, of manipulation. Much that has been said in praise of Japanese architecture has been couched in terms of admiration for its spacial qualities. It is often suggested that sliding partitions and large openings allow an exceptional continuity or flow of space within the Japanese dwelling. These openings are appreciated as the means by which an unfettered and easy relationship is established between interior and exterior spaces. Such relationship as does exist is not, however, spacial in the usual sense of the word but rather narrowly visual. What might appear to be continuity or flow of space is largely illusory, certainly incidental. A preoccupation with the shaping and manipulation of space does not seem to inform Japanese architectural design. Interior spaces are not, if exteriors occasionally are, compressed or expanded in such a way that one's delight in them is a function of their containment and directed movement.

A relationship between architectural spaces generally comes to be appreciated by virtue of the cultivation of a pattern of movement through them and between them. In the Japanese house there is, however, no path described. Into any room there are many possible entrances and from it a variety of exits might be made. The paths so much in evidence in Japanese gardens are rather to be seen than used. They are, in fact, often awkward to use, describing a disjointed and difficult pattern of movement. Movement between the house and garden is all but prohibited, necessitating as it does a change of levels and a change of footwear.

In Japanese architecture it would appear that movement is cultivated in appearance rather than in fact. That which is organized spacially is intended to be measured and negotiated by the eye but not by the foot. One finds in the Japanese dwelling carefully organized perspectives to be appreciated from stationary viewpoints. When the viewpoint is moved, variety is encountered in shifting patterns but not in the manipulation of space or the plastic develop-

stones, gravel, and sand as well as of living things. The materials of which the surfaces within the room are made up partake of similar duality. Plaster, paper, metal hardware, and cloth are inert; wood and straw retain in their grain and texture the evidence of growth and, in that, a suggestion of life.

Both the inert and the animate are presented in such minutiae as to be quite uncountable, though individually distinguishable. So displayed, the elements of the created environment are analogous to the myriad natural phenomena of the larger world. The grain of sand on a plaster wall or in a garden is, perhaps, too small to be individually distinguishable by the eye, though certainly the eye recognizes the granular quality of sand. Garden pebbles are not so small, however. Within the room the smallest bit of natural form is distinguishable in the woven straw of the TATAMI. If the uncountable were only displayed in such textile it might easily escape notice; it might in fact be dismissed as accidental. The rectangular articulation of the rooms insures that it cannot be so dismissed. The small rectangles into which AKARI SHOJI are divided are so numerous as to discourage their being counted. In a visual, if not in an intellectual sense, they can be said to be uncountable, though clearly recognizable individually.

The incommensurable character which the created environment gains in directing one's attention to such ubiquitous minutiae is reinforced by an insistence on the hidden and partially revealed. The transparency of paper screens and split bamboo blinds, darkness and shade, recreate in the room the mystery of the partially revealed in forest and thicket. Adjacent spaces, anteroom, veranda and garden, are only partially revealed in that they continue out of sight, behind open FUSUMA or SHOJI. These sliding doors, albeit allowing a large opening, provide something less than an unobstructed view. Like the wings of a theater stage they obscure the limits of the enclosed space, hiding corners behind them. The hung wall contrives as well to hide the upper reaches of adjacent spaces. The TOKO, niche, within the room insists on the hidden, close at hand, for its upper reaches retreat beyond its own hung wall. The ceiling of the TOKO is, in fact, entirely out of sight. KAKEMONO displayed in the TOKO hang from a cultivated obscurity, their upper edge and point of suspension being hidden in the recess.

These same devices that establish a sense of mystery contribute to the implication of infinity within the Japanese room. It is, perhaps, in implying the infinite that the ZASHIKI most effectively renders the image of a larger world. In the disappearance of space both horizontally and vertically, behind sliding doors and into the TOKO, there is an implicit denial of its limits. The lines of adjacent flooring, ceiling battens, or TATAMI binding which the eye follows out of sight cannot be sensed as finite. It is, however, in leading the eye into a recognition of infinite minutiae that the room is most cultivated to the implication of infinity. The rectangular panels and internal divisions of panels making up the walls of the room are so graduated in size and even arranged as to lead the eye into the smallest end of their whole spectrum. The TATAMI is first a very large shape, then bindings, then vertical ribbing, and finally a textile to the eye. The eye cannot rest on the larger order of the columns, interstices, or doors in the wall any more than it can on the whole shape of the TATAMI. It is insistently drawn to the smallest distinguishable entity and this is found to be so small as to beg its own disappearance, and so numerous as to proclaim its infinity. The view from the raised floor of the room into the garden, inhibited as it is by a hung wall, is necessarily directed to the ground. On the ground one distinguishes a minutiae of sand, pebbles, or moss that complements the minutiae within.

While the physical limitations of Japanese architecture are evident and do in fact make it in many respects a special phenomena, and while it is in many respects governed in its formal development by an intuition of nature peculiar to the Japanese, while it is in fact largely a Japanese myth of doubtful universal validity, it carries within it a knowledgeability of line and surface and an order of metaphysical ambition that can only be considered to give architectural endeavor in Japan a significance quite beyond parochial bounds.

View into a garden, Daitokuji, Kyoto

MACHU PICCHU

George Kubler

"... *trapezoidal profiles are the characteristic geometric form of the entire system.*"

American time

It is a common experience among students of the American past whose attention fixes upon precolumbian art to have the illusion of an antiquity far greater, far denser, and far deeper than commonly encountered in the European past. The illusion perhaps arises from the doubled nature of older American time: on the one hand, European intervention in America connects us to the end of the Middle Ages; on the other, we enter an altogether different native history reaching from paleolithic origins to the military states of the Inca and Aztec peoples during some ten thousand years. This double past produces an effect of abysmal remoteness: it requires from the student a knowledge of two kinds of time, both native and European, for the comprehension of the American present.

The chronological effect resembles the compacted planes of long distance photography on infra-red film with telescopic lenses. We know that the planes are far apart, but they are shown to us very close together. To put it another way, the abrupt passage in the sixteenth century from precolumbian to colonial time amounts to shortening what we are accustomed to know as vast durations: it is as if the passage from Old Kingdom Egypt to the sixteenth century A. D. had been reduced by forty centuries to forty years. At Machu Picchu this passage of forty evolutionary centuries during only forty actual years is apparent in the passage from a civilization of bronze age attainments to the Age of Discovery and Conquest: the town was built after 1440 A. D., and it was finally abandoned c. 1540 after a brief colonial occupation by Indian groups in flight from the civil wars in the early colony.

Down, up, and around

The same sort of vertiginous transformation occurs in our perceptions of space at Machu Picchu. The town lies on a grassy saddle between two peaks, 2000 feet above a horseshoe bend in the Urubamba River. Its long axis points to the north, but flanking this axis are terraced contours falling away abruptly on the east and west into blue-green abysses. The terracing is so steep that all the cross axes are staircases. The dimensions and directions of the town are "around" and "up" and "down"; the units of urban space are contoured terraces, rising by pyramidal stages and spreading across the saddle like a blanket of ribbed and stony weave.

"Rectangular block mansory . . . arose from the tradition of square-cut blocks of sod."

"The span of each opening diminished as the wall rose higher . . ."

The site is a sugar-loaf peninsula circled by the Urubamba; the rush of the river waters rises to the ear on all sides to give the illusion of a mountain island afloat upon a sea studded with other islands and bathed at dawn and dusk by Chinese washes of fog and mist. The river bottom is garlanded with large tropical fruits and flowers: up above in the town the terraces are covered during July and August with small wild strawberries and tiny flowers. Within the eye lie both tropical valleys and peaks with eternal snow: the extremes of reality are simultaneously present in space and in time.

The double Quechua economy

Categorical contrasts appear again in the social dimension. The purpose of the settlement is not clear. Its strategic and demographic conditions are unknown; its economic relationship to other communities is unclear; and the town has been variously regarded as a fortress, as a temple, as a nunnery-town and as a resort. A large part of this obscurity is owing to the absence of any permanent written record in preconquest Peru; consequently we know less about the history of the Andean peoples than we do about predynastic Egypt four millennia earlier. Nonexistent defenses make it unlikely that Machu Picchu was built for military reasons; in addition practically all tombs contained the bodies of women only. The discovery in 1940-42 of six more towns south of Machu Picchu among the western tributaries of the Urubamba suggests that the region upstream was among the most densely inhabited provinces of the Inca empire. Two of these towns cover more land than Machu Picchu, but their construction is less dense. One may conjecture that the Urubamba region was a frontier opening upon the Amazonian rainforests of eastern South America, serving to survey and control the movements of lowland tribes towards the Andean plateaus under Inca government, in addition to being a land of beauty and ease for austere highlanders.

Inca penetration into this frontier was surely late, as we can verify by the styles of building and pottery at the different "hanging cities" perched high above the valleys. The language of the Inca dynasty was Quechua. The language still is spoken today by many millions. The term *Quechua* also signifies the characteristic habitat of the central Andean highland peoples. It means a mountain shoulder, with access both to the warm river valley bottoms and to the highland plateaus with their abundant pastures.

"Both methods of wall assembly — polygonal and rectangular — show extreme precision in the fitting of the stones."

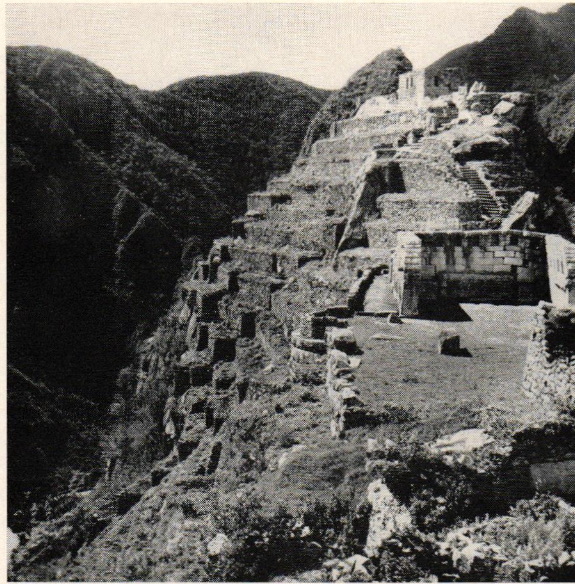
Flocks of llama and alpaca were the peculiar specialty of the Quechua peoples, who have the distinction of being the only pastoral group ever to emerge in ancient America. Machu Picchu is a typical Quechua settlement, drawing its substance both from the tropical Urubamba valley and from the high grazing lands above timber line.

Stone upon stone

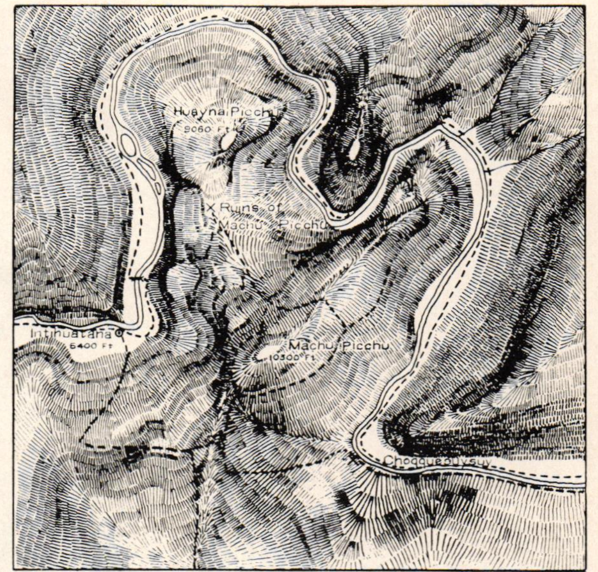
As at other great ruins of the late Inca period after 1440, three principal masonry types are evident: 1) "polygonal" walls with large irregular stone blocks carefully fitted; 2) rectangular stone blocks in approximately regular courses; 3) *pirca,* or rough field stones laid in clay mortar. The foundation courses of the large house walls belong to the first class, the upper walls are usually regular, and many terrace facings, simple boundaries, and plain housing walls are of *pirca.* Polygonal masonry probably arose from the *pirca* tradition: it appears only in retaining walls and major enclosures of massive proportions. Rectangular block masonry used mainly for freestanding, two-faced walls, on the other hand, arose from the tradition of square-cut blocks of sod. Both methods of wall assembly — polygonal and rectangular — show extreme precision in the fitting of the stones.

The large and irregular polygonal stones have peculiarities which suggest the manner of attaining this precise fit. Some stones, especially the larger ones, retain the stubs of tenons left on the outer faces. All stones fit upon concavely curved beds ground into the bearing stones immediately underneath. In poly-

Terraced contours fall away abruptly into blue-green abysses.



"The dimensions and directions of the town are 'around' and 'up' 'down' . . ."



"The site is a sugar-loaf peninsula circled by the Urubamba; . . ."

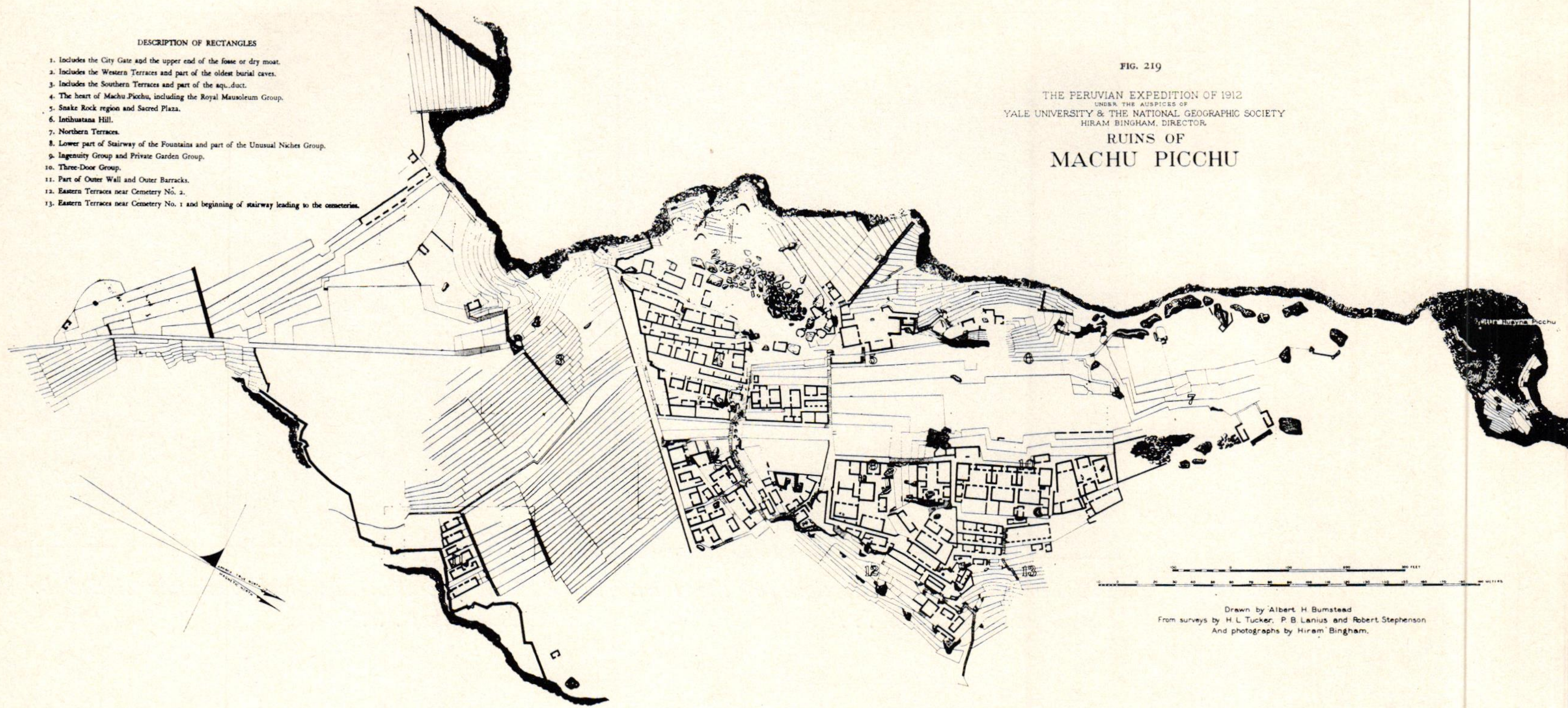
gonal masonry no stone is seated upon a level surface. Every stone is cupped by its support although the curve of the cup may be almost imperceptible. The combination of tenons with these curved seating planes immediately suggests the manner of bringing the stones to their close fit. After rough shaping with stone or bronze tools, each stone was ground against its bed in a swinging motion, suspended from a wooden gantry by rope slings catching the tenons. A few men then could abrade the swinging stone to a close fit with its neighbors by simple friction in a pendulum motion. The time needed for such procedures was not excessive by pre-industrial European standards. There is no internal evidence that the construction of Machu Picchu endured more than a generation or two.

In coursed masonry composed of regular rectangular blocks the technique was less complicated but more laborious. The concave seating planes are not evident. The fit of stone was secured by push-and-pull abrasion in the flat plane, as seen in the bed between courses atop the curved wall of the temple on the cave-rock. The size of the stones in both polygonal and coursed masonry diminished with increasing height. The wall thickness and span of each opening, whether door or window, also diminished as the wall rose higher, so that trapezoidal profiles are the characteristic geometric forms of the entire system.

Siting

The urban design of Machu Picchu is like a patterned blanket thrown over a great rock. The pattern falls in many folds, but with a little study one recognizes certain coordinates of Inca city planning which are more readily visible in other Inca cities such as the capital at Cuzco and upstream at Ollantaytambo. The Inca cities were usually clusters of large walled courtyards housing the extended families or clans of Inca society. Normally these courtyards were distributed upon a regular system of intersecting thoroughfares which at Ollantaytambo, in the lower riverbank town, approached the regularity of the Mediterranean gridiron plan.

At Machu Picchu the saddle-shaped topography was clearly divided into flat and steep halves. 1) The northern half has terraced plazas descending by graded levels to the south. On the west rises a high ridge bearing small temple buildings. On the east are six or more distinct house groups separated by terraces and walled thoroughfares. 2) The southern half is far steeper with terraced *andenes* bearing rows of houses. Thus the main cluster of terraced open plazas is surrounded on three sides by building groups: high temples and shrines on the west, walled compounds on the east and steep terraces with rows of houses on the south. Beyond these houses the entire city is cut off from the agricultural terracing farther south by a straight high wall spanning the saddle. South of this wall are narrow terraces on steeper slopes angled northwards to the sub-equatorial sun and offering fields like ribbons for the cultivation of food. These southern fields enjoyed longer exposure to the sun than the more level portions of the saddle where the city stands. Thus the southern approach crosses the steepest portion of the saddle where the best fields lay under the longest hours of sunshine. Inside the city wall the terraced row houses are less steep and more shaded but they are more precipitously ranked in rising stages than in the northern portion where early shadows each day made



"The urban design of Machu Picchu is like a patterned blanket thrown over a great rock."

the gentler slopes less desirable for farming and more suitable for civic life. The sun and the slope are the governing considerations in this kind of town planning. The sunny hillsides were reserved for agriculture; the shady level places became public places and clusters of dwellings. The wall between the town and the fields has often been interpreted as a defensive measure. Perhaps it was but its position also accurately marks a change in slope and insolation, striking off the boundary between steep agricultural terraces favorably exposed to the northeast, and the gentler more shaded eastern slopes of the southern part of the town.

Architecture as escape

The contemporaries of Karl Marx such as Heinrich Cunow fastened with delight upon Inca society as an early example of the totally rational and completely utilitarian state. Indeed the manufactures of the Andean peoples under Inca domination show an astonishing regression from the variety and intricacy of earlier styles. Texts by early witnesses give the net impression of an economy arbitrarily held to minimum subsistence requirements by rigid policing of the public demand.

Only the architectural forms escape from the grim sameness of Inca manufactures. The escape took the form of extreme rhythmic and plastic variety within narrow technological limits directed towards a poetic vision of the natural setting. At Machu Picchu the rectangular plazas overlap one another like interlocking boxes spread out across the gentle southerly slope surrounded by a great variety of architectural rhythms in spacing, terracing and in gabling. The profusion transcends any idea of mere utility; the choice of the site, moreover, betrays a conception of the natural setting that most unexpectedly coincides with latter-day romantic European conceptions of alluring prospect, mysterious distance, and variegated rhythm.

". . . towards a poetic vision of the natural setting."

NINETEENTH-CENTURY DESIGN

Edgar Kaufmann, Jr.

E. Schinkel, easychair c. 1830

In the West, nineteenth-century design was conditioned by three ideas that had grown strong at the end of the preceding century: human equality, popular education, and scientific progress. Nineteenth-century products thus were conceived, made, and used in a spirit and with means different from those of medieval or Renaissance crafts or academically controlled eighteenth-century design. Yet, imitation of those very eras characterized nineteenth-century design in the eyes of later generations. This view obscures the positive accomplishments of the period. Careful investigations have shown nineteenth-century design to be the matrix of new concepts suited to the modern world, preliminary in fact to twentieth-century design.

Historicism and science

A return to past forms is regular in civilizations; unique, however, were the range, enthusiasm, and thoroughness of the nineteenth-century designers' exploitation of history. The scientific method was being widely applied to the evidence of explorers, archivists, and archaeologists; knowledge of every kind flooded in faster almost than understanding could deal with it. Much derogatorily called eclecticism was an earnest attempt to make use of this pate of information. Designers were convinced that in the mass of documentation lay a key to the principles of their art. Like scientists they compared, experimented, deduced. Systematic analysis of natural forms and colors, it was believed, might provide another approach to fundamentals. This recurrent search for design principles in nature or in history demonstrates that nineteenth-century designers were keenly aware of the need for a firm basis from which to deal with vast problems presented by the Industrial Revolution. For designers, the Industrial Revolution meant unprecedented floods of goods, unprecedented popular markets, and division of the once close-knit activities of designers, workers, manufacturers, and distributors. The traditional significance of handwork and the individual craftsman vanished. Steam power, in Europe alone, increased a hundred fold between 1800 and 1900; after 1870 gasoline engines and electricity began to augment energy at a rate previously inconceivable. Transportation improved so that, in effect, distances were reduced to one-eighth their former spans. The relationship of raw materials, fuels, and labor supply was upset; production centers moved; transmittal of stylistic and technological information was greatly speeded. Lithography and, later, color

lithography profoundly influenced visual information; softer, fuller, more sensuous images became the rule. Mass production made its first strides in textiles, revolutionized again when synthetic dyes were perfected after 1850. Later wall papers became common, further changing the character of interiors. Synthetic materials began about 1840 with the vulcanization of rubber; gutta-percha, celluloid, papier-mâché, artificial stone were quickly and widely accepted. Plywood (used by ancient Egyptians) was produced around mid-century; bent, solid wood furniture, first mass-produced around 1850 by Michael Thonet, 1796-1871, soon became a commonplace. In metals, mechanized stamping and spinning, improvements in casting, and above all electroplating made great changes; improved alloys appeared, and new metals like chromium and aluminum. No previous period had such a record of continuous change and invention.

Neo-Classicism

As the century opened the style dominant in the arts was neo-classicism, in which elaborate Roman grandeur was revived, chastened by Greek precedent and authority. Neo-classicism had arisen fifty years earlier as a reform directed against the caprice of the rococo. The rediscovery and publication of Greek (as contrasted to well-known Roman and Renaissance) architecture and art relics had stimulated a pristine, earnest style theoretically favoring structural logic, expression of the natural qualities of a few chosen materials, and chaste, symbolic ornamentation. Ancient and modern conquests of Egypt occasioned some use of Pharaonic motifs. From 1750 to 1850 one or more variations of neo-classicism flourished.

Around 1800 neo-classicism had lost its first impetus, though as the official style for Napoléon's empire (1804-1815) it enjoyed great prestige. *Empire* design was generally dry, monotonous, and cramped, though elegant and correct. In areas relatively free of Parisian influence neo-classicism was often agreeably unforced, as in some provincial *Empire* products and in some of the Austrian and Russian empires, the North American republic before 1850, and English Regency, which also exuberantly developed pseudo-oriental mannerisms.

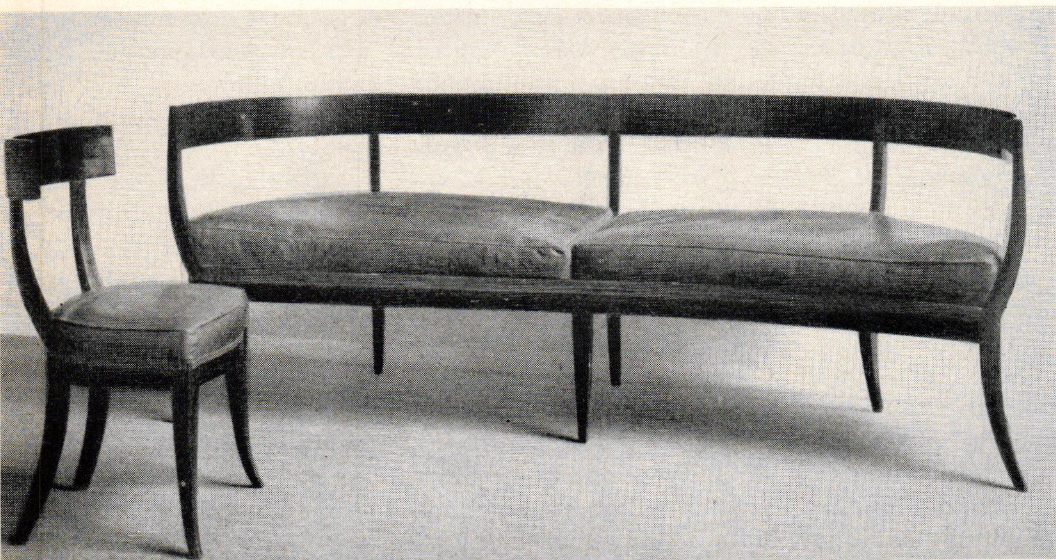
Neo-classicism inherited many intellectual appetites of the Enlightenment but not that movement's fearless logic. Thus *Empire* ornament lowered symbolism toward association, prefiguring the sentimental, anecdotal 'language' of later design. Laurels for glory, wheat for plenty, sphinxes to guard the mysteries of royalty and of eternal life, such symbols communicated to a humanistically educated "happy few"; but under the pressures of industry and democracy symbols often became mere malapropisms.

Sir John Soane, 1753-1837, was the most original master of structure, lighting, and space in neo-classic architecture. Two other prominent architects, the amateur Thomas Jefferson, 1743-1826, in the United States, and the highly professional K. F. Schinkel, 1781-1841, in Prussia, applied mechanical ingenuity and rational forms to everyday comfort and convenience. From these men to the creative engineers of the period such as Sir Samuel Bentham, 1751-1831, and the American Oliver Evans, 1755-1819, is a short step, yet is one which leads outside design.

Early in the century two interesting variations of neo-classicism appeared. Architects of the French Revolutionary era sought cosmic effects to make clear the divine right of insurgent democracy. This pursuit of the Sublime, so called, led to forms severely plain, gigantic, visibly indeterminate though logically defined, and strongly contrasted one with another. Cylinders, spheres and circles, pyramids and triangles were preferred. Fluent transitions between parts, graduations mounting to a climax were abandoned for abrupt juxtapositions. Though many structures were planned too ambitiously, a few arose, scattered over Europe; some vast, stirring public spectacles were staged in Paris itself; and a curious echo of these efforts reverberated in the Biedermeier, a name given to certain furnishings produced in German-speaking lands from 1810 to 1840. The same severe surfaces and geometric, centralized forms, blockily independent even as parts of a single object, were as evident there as in the architectural designs. Yet, in man-made as in natural forms, outward resemblance guarantees no inherent connection. Biedermeier design opposed sublimity, in fact the very name was derived from a literary character of the period, a typically solid, humdrum, nineteenth-century bourgeois.

Romanticism

Like the neo-classic, medieval design was an inherited interest of the nineteenth century; many playful evocations of Gothic detail had slipped easily into irregular rococo design. A related eighteenth-century heritage was the concept of the Picturesque, influenced by the paintings of Claude, Salvator Rosa, and their school: wild landscapes composed with Gothic and other ruins. In gardens, and then decorating an in-



South German furniture c. 1830

Family Group by Peter Schwingen, 1844

finitude of products, Picturesque taste nostalgically evoked the decay of classicism in artificial ruins and contrived wildernesses. As nature seemingly resumed its sway over the works of man, the Picturesque could approach the Sublime, itself most effective in nature untouched and savage. Nature, raw material for scientific research, was also considered the very stuff of poetic insight. Coleridge, 1772-1834, writing about Shakespeare in 1808 said, "Such as the life is, such is the form," recognizing organic form and process as prototypes for the creations of men. Before the century's end Louis Sullivan, 1856-1924, the American architect, phrased the idea more familiarly, "form follows function."

Napoléon's ventures in Syria and Spain (1798-1814) turned the world's attention toward Islam. For a while early in the nineteenth century, Gothic, Romanesque, and Islamic design were confused one with the others, since none fitted the classicist codification that Europe accepted as its great tradition. The heritage of Greece and Rome apparently had been polluted by travel-stained crusaders, or by Moors and Goths probing deep into the continent during the Dark Ages. All this barbarism seemed alike, even if, as some said, Egyptian pyramids or Druidic tree worship were responsible. What was not classic, in short, could be devilishly entertaining.

Another romantic feature can be credited to Napoléon: his omnivorous ambitions aroused modern nationalism that naturally turned to history for its atmosphere and insignia. In Protestant lands the transition from late Gothic to Renaissance most often provided requisite glamor; in Catholic countries, the baroque. Thus romantic design revived that of the Elizabethans, the Bourbons, Frederick the Great, and Barbarossa — the entire historic pageant, filtered to reinforce each separate national indentity and pride.

Mid-Century design

The waning of neo-classic design was associated with decreasing confidence in Enlightenment and its results. Until around 1825 the dislocation and brutalization of traditional ways of life seemed catastrophic; the French Revolution had produced misery and repression. But from 1825 to 1850 the working classes mustered strength; unions began to be legally recognized; Marx, 1818-1883, and Engels, 1820-1895, rewrote history from the viewpoint of productivity, discarding humanist values. A great gush of mechanical inventions issued from 1800 to 1830; by 1850 processes were developed to utilize them. Confidence

revived despite repeated economic crises and uprisings across Europe, culminating in the revolutions of 1848. In this situation romanticism flourished, nurtured by escapism that accompanied social chaos and, more significantly for the future, by the revival of ethical and religious standards in which design played an important role. Feeding romanticism, historicism was in its turn reinforced by abundant, increasingly informative, printed words and pictures, largely addressed to the masses.

In 1851 attention was focused on design by the first Great Exhibition of the Industry of All Nations, for which the Crystal Palace was built in London. The sensational palace, designed by Joseph Paxton, 1801-1865, a self-educated gardener, was essentially a huge conservatory; demountable iron and glass members, interchangeable and massproduced, were organized in a building that ever since has been regarded as progressive, practical, and inspiring. The fully illustrated catalogs of the 1851 exhibition became the principal records of Victorian design. Their value was challenged on the claim that mostly atypical show pieces were reproduced. However, like the great international exhibitions that followed, the Crystal Palace indicated dominant design trends of its time. The "historic masquerade," all styles mixed together, was in full swing; heavy, bulging forms prevailed, covered with flat patterns and molded ornaments, often anecdotal and naturalistic. Craftsmanship had flown from the arts to engineering; world trade encouraged generally low standards of material quality; but a growing public discovered many amenities and mechanical ingenuity prospered.

Reform and realism

The Crystal Palace revealed confusion, but the struggle for order had begun. Early in the century academic art instruction throughout the West formalized the applications of neo-classic art to industry, successfully initiated by Sir Josiah Wedgwood, 1730-1795. In a dynamic period these efforts were insufficient. An English Parliamentary Committee of 1835 began to hear expert witnesses on design as it affected national economy. The dependence on importing and copying, especially of excellent, handmade French wares, was to be countered by improving design and design education. The experts favored neither Greece nor any other historic precedent, but held that knowledge of nature was the best basis for design. As this idea was tested, a clear divergence developed; some wanted to copy natural forms as the most perfect ones, a variant academic ideal; others wanted to analyse natural forms to extract their principles of structure and relationship, an approach modeled on scientific inquiry. As early as 1835 the esthetic impact of engineering was acknowledged: "There is probably no example of a perfect machine which is not at the same time beautiful." Design, moreover, should be characteristic of its age and of its nation. Design piracy was decried, as had become usual. These ideas were introduced in instruction and practice with "complete and utter failure" reported in another Parliamentary review of 1849.

While these attempts were tested another approach was made by an eccentric, successful, young English architect, A. N. Welby Pugin, 1812-1852, whose greatest task was creating all the ornamental details of the new Houses of Parliament. Trained by his *émigré* father, an ardent Gothicist, Pugin late in the 1830s established workshops for authentically designed furnishings to complete his churches and houses. Thrice married, he designed his homes, their furniture, and even his wives' jewelry. Pugin became an ardent Roman Catholic in 1835; most of his private work was for pious, wealthy patrons stimulated by the Catholic Emancipation Act of 1829.

Pugin was the first in the nineteenth century to formulate a consistent design code influential for over a century. He believed design was primarily a moral act; the attitudes of designers were transmitted to others through their works. Therefore the higher the ideals, the greater the art. Pugin opposed the Picturesque, which valued effects regardless of means, saying "designs should be adapted to the material in which they are executed." He thought the designer's "skill consisted in embodying and expressing the structure," that is, the purpose of the structure even more than its constructive system. Deriving decorative arts from architecture, he saw the architect as chief implementer of a good and noble life. Bygone ages offered examples of how good work could be done but not of how it should appear; even in the Gothic Pugin sought "not a *style,* but a principle." Thus every age and nation should evolve spontaneously a style that expressed its life — a thought close to Coleridge's. To achieve fitness, repose, and unity, the tests of successful design, Pugin recommended "seeking *the most convenient form* and then *decorating it*" so that "the smallest detail should *have a meaning and serve a purpose.*" He wrote that naturalistic ornament should be conventionalized and disposed geometrically to enhance the underlying form.

He hated all sham materials; fought against three-dimensional effects on plane surfaces; and criticized the cherished overabundance of draperies. These reformatory ideas, launched throughout the 1840s in books which Pugin wrote and illustrated, were widely accepted. The year before his death, when his products were featured at the Great Exhibition, Welby Pugin correctly claimed "my writings, much more than what I have been able to do, have revolutionized taste in England." Pugin anticipated later nineteenth-century design reformers; however he differed from many of them in important ideas and practises. "Any modern invention which conduces to comfort, cleanliness or durability should be adopted," he wrote, "we do not want to arrest the course of inventions, but to confine [them] to their legitimate uses." Thus he found steam engines, modern plumbing, and gas lights "most valuable", railroads he thought offered great architectural opportunities. Tiles, metalwares, furniture, stained glass, vestments, and jewelry by Pugin were manufactured and sold in regular trade. Not a fanatic about hand work, he believed it should be supplemented by labor-saving devices and itself used chiefly for significant embellishments.

England at this time developed an internationally influential school of Gothicizing church architects, associated with the Oxford Movement, founded in 1833. This English Protestant religious revival naturally was more accepted than the similar Catholic activity Pugin served. The Oxford Movement's most original architect, William Butterfield, 1814-1900, introduced the concept of "realism", meaning a clear expression of materials through colorful contrast of textures and patterns, and large, abrupt forms indicating structure and workmanship. Such "masculine" expression has remained important in design.

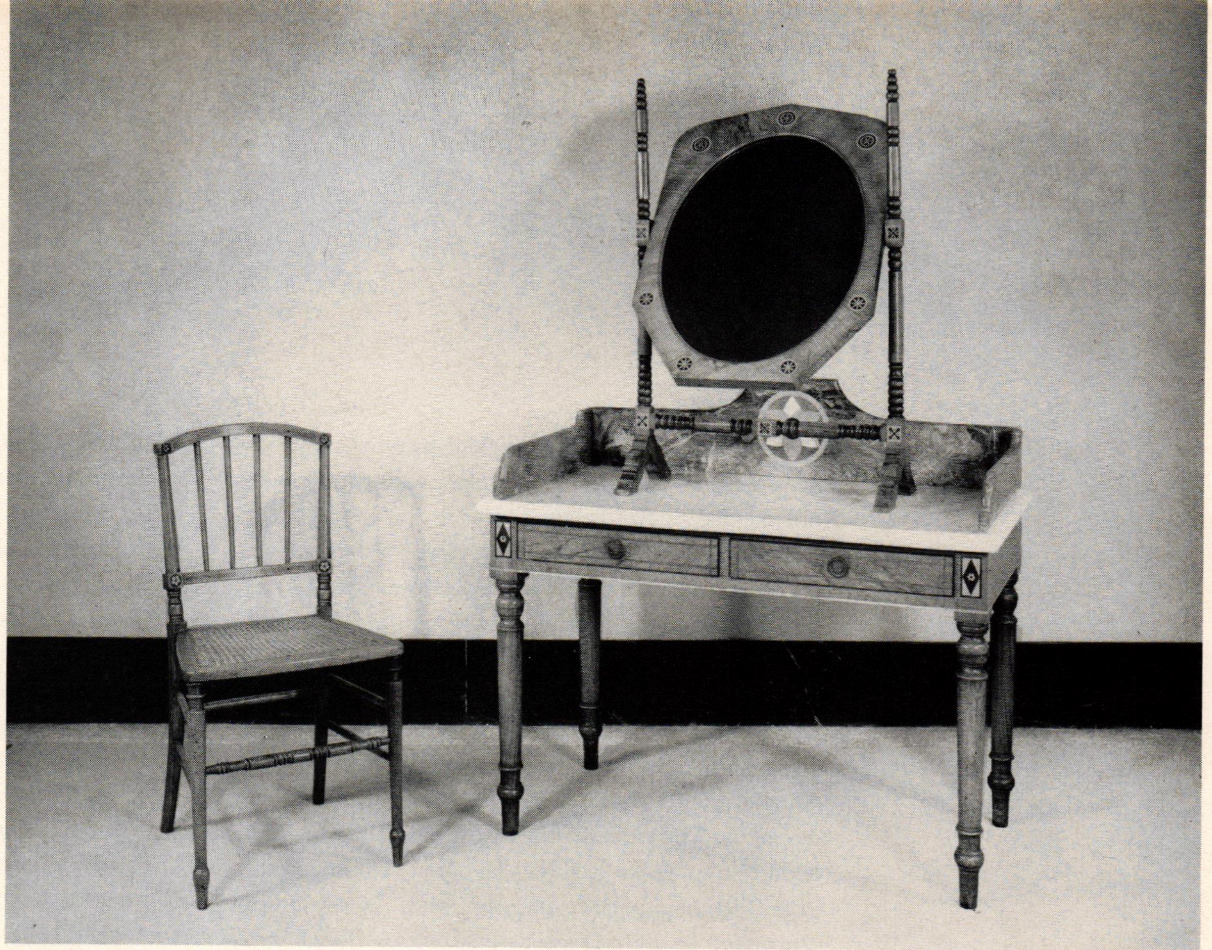
Another personality in mid-century England was Owen Jones, 1809-1847, prominent color expert, author, and designer of prefabricated metal buildings. In 1856 Jones published *The Grammar of Ornament* with large, unprecedented color plates, that ranged from "Ornament of Savage Tribes" through all history to "Leaves and Flowers from Nature," preceded by "General Principles in the Arrangement of Form and Colour, in Architecture and the Decorative Arts." Jones's *Grammar* was frequently reprinted, last in 1928.

Morris Chair, produced c. 1867 by Morris, Marshall, Faulkner and Co.

An occasional associate of Jones and Pugin was Sir Henry Cole, 1808-1882, civil servant, author, editor, entrepreneur in design and other arts. He was a key figure in the financially very successful Great Exhibition, working closely with its patron, Prince Albert. Subsequently he headed the national School of Design and its collections that grew into the first great national museum of applied arts, the Victoria and Albert. The school and museum were modeled on a plan suggested by Gottfried Semper, 1803-1879. Semper came to England, a revolutionist exiled from Dresden, just as the Great Exhibition was taking form. With the gifted English sculptor, Alfred Stevens, 1817-1875, and a French refugee from the troubles of 1848, Lèon Arnoux, 1816-1902, technical and artistic leader of Minton's ceramic works, Semper helped introduce a neo-Renaissance mode into English design. In the mid-century welter of styles this seemed livable and reasonable compared to the then current, debased Gothic and rococo. The Renaissance, moreover, had played an important role in English architecture from the 1830s, and a subordinate one in neo-classicism from the beginning.

Neo-Renaissance design opposed neo-Gothic in Europe too, from the 1860s on. Leading the trends were Semper, active in Germany, Switzerland, and Austria, and Eugène-Emmanuel Viollet-le-Duc, 1814-1879, in France. Both gifted, rebellious architects wrote extensive analytic design histories, announcing principles from which a new design could arise, befitting modern man. Viollet the Gothicist and Semper the humanist each exerted great influence to spread his favorite style. However divergent their tastes, both preached that the best examples of past eras revealed utilitarian structure, logical expression of materials, and distribution of color and decoration to emphasize structure and materials. Thus Viollet and Semper upheld a rational design evaluation, linking neo-classic reform of the eighteenth century to "functionalism" in the twentieth.

In the 1850s and 1860s the English art critic John Ruskin, 1819-1900, won a phenomenally wide audience, American as well as British. His central themes were two: the *study of nature,* particularly botany and geology (an enthusiasm of Viollet's), to discover therein principles of form and organization; and the importance of *the human touch* that involuntarily but effectively gives character to the surface of an artifact. Ruskin felt that only happy, moral men could make truly beautiful products; skill was not a prime requisite, still less the mathematical perfection of the machine. The touch of the artist or workman was the true source of artistic value, not rationality of structure or rational use of materials. The preference for expressive character over inherent



Bedroom furniture designed in 1860 by William Butterfield for his home

logic brought Ruskin close to architectural "realism." The importance of the human being behind the product paralleled Pugin's ideas, but emphasis had shifted from the *intent of the designer* to the involuntary *character of the hand-made surface.* Mid-nineteenth-century sensitivity to surface quality has been associated with improvements in printing illustrations; tactile values were readily rendered and became widely appreciated. Ruskin in fact was much concerned with the illustrations in his books. Architecturally, Ruskin and his followers favored Venetian Gothic.

William Morris, 1834-1896, adapted a Ruskinian version of Pugin's principles to the applied arts. A constant experimenter, he revived many vanished or dying crafts; and he was an unusually gifted designer of flat patterns. Morris followed Pugin in building and furnishing controversial homes for himself. In Morris's early furnishing, heavy neo-Gothic forms were richly decorated with Pre-Raphaelite painting by himself and his friends. Thanks to Morris's example, the gospel of design reform through handicraft, with Gothic forms and moral ideas dominant, spread throughout the West.

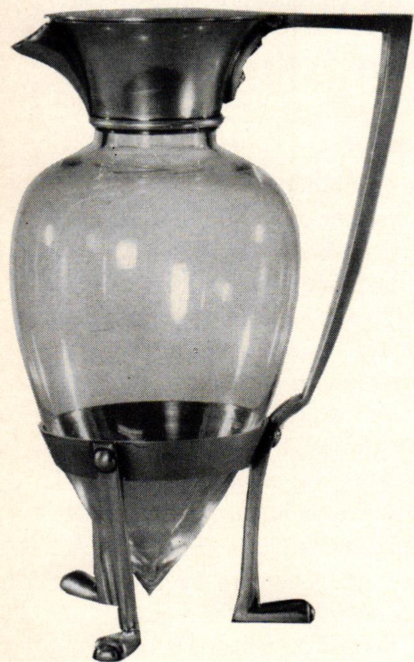
This increased an already lively interest in oriental handicrafts. In 1862 a second International Exhibition was held in London; Japan, newly restored to contact with the world, exhibited deft, fascinating crafts; Turkey, Arabia and India were challenged. The newly revealed crafts were helped by the vogue for Japanese popular woodcuts, and, in the next decades, by the further sensational discovery of Japanese architecture.

Idealism and innovation

Following the Great Exhibition, Pugin's successors in England divided into two camps: reforming, eloquent handicrafters, remembered by posterity; and pioneering designers for industry who welcomed the machine and believed medieval methods could not satisfy the wants nor express the character of their civilization. These practical men generally were overlooked in the twentieth century, but attention has veered toward them increasingly. Three stand out. E. W. Godwin, 1833-1886, was trained as an architect. He became a Japanese enthusiast in 1862, and soon a friend and collaborator of the painter J. A. McN. Whistler, 1834-1903. Godwin's long association with the famous actress, Ellen Terry, led to costume and scenery design, at which he excelled. His first table was produced in 1868 by William Watt, for whom over many years he designed strik-

ingly simple, sensible, and original furniture, light in construction, often dark in color, and occasionally ornamented by flat, bright hardware and inset panels. Godwin and Whistler together evolved a daring style of interior in pale tints, sparsely, asymmetrically furnished. This and Godwin's "Art Furniture" launched the Aesthetic Movement in design that, growing, became the butt of cartoonists. Gilbert and Sullivan immortalized it in *Patience,* 1881, a year before Oscar Wilde lectured on it in the United States. Christopher Dresser, 1834-1904, was a precocious design student who switched to botany, on which he became a popular lecturer. He drew an important page analyzing plant forms for Jones' *Grammar of Ornament.* In 1862 Dresser's first text on design was published and widely used, as were its sequels. In the next five years he built an extensive practice as a free lance commercial designer, like Godwin, of furniture, textiles, and wall papers. Dresser also did much in metalwares, pottery, and glass; surviving examples are notably above the general level of his times. In 1868 Dresser founded a design office that expanded with the years. In the 1870s he traveled as official representative to international exhibitions: 1873 Vienna, 1876 Tokyo and Philadelphia, and in 1878 he was juror at the Paris fair. Dresser's designs in the Aesthetic taste were forerunners of twentieth century work — functionally conceived, favoring geometric shapes, often severely plain. He was an ornamentalist, especially in textiles and wallpapers, where he used a surprisingly abstract symbolic expressionism, derived empathetically. Bruce J. Talbert, 1838-1881, after schooling as an architect, began to design furniture for manufacture in 1862. In three years he became the leading Gothicist in his field; then within a decade he turned toward the Jacobean style, freely interpreted in furniture, carpets, wallpapers, textiles and metalwork, paralleling the "Queen Anne" revival in English architecture.

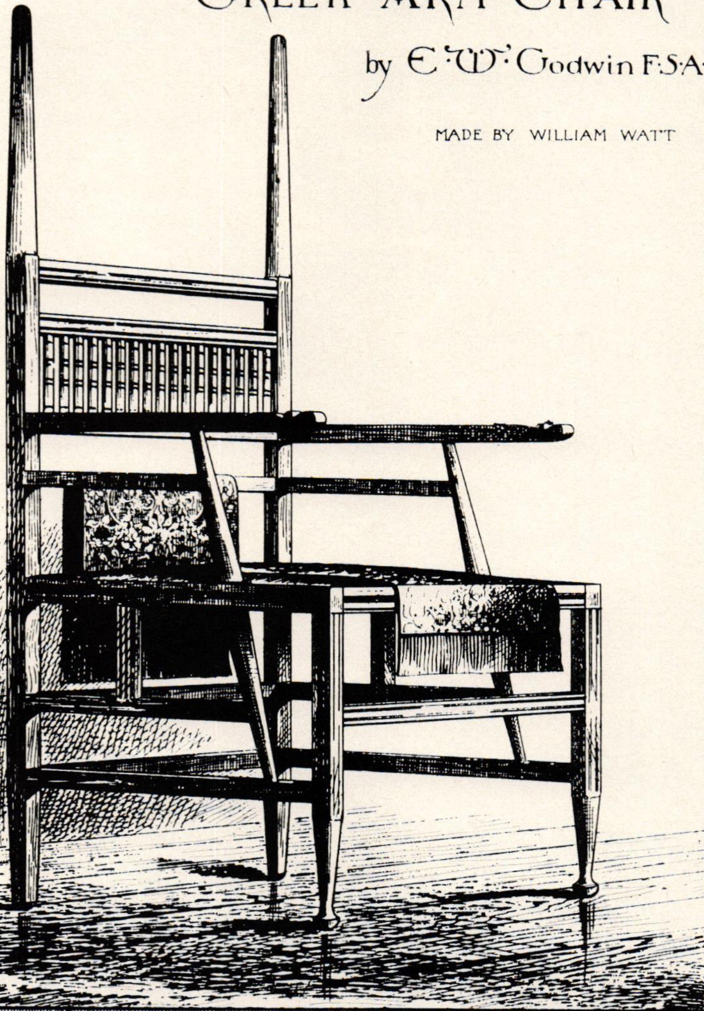
Charles Locke Eastlake, 1836-1906, wrote *Hints on Household Taste,* published in 1868 from earlier magazine articles. It went through four English and six Americans editions. It resumed Pugin's theories in homely form, showing neo-Gothic furniture rationally constructed and ornamented. These illustrations were copied and varied commercially, but Eastlake himself did little designing.

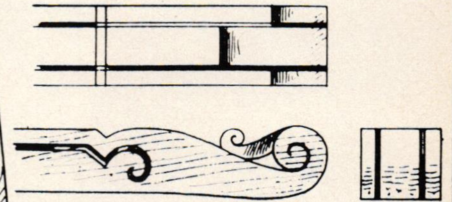


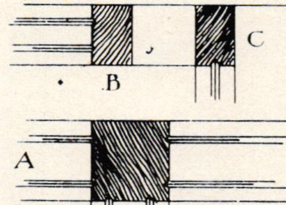
Glass and silver Claret jug

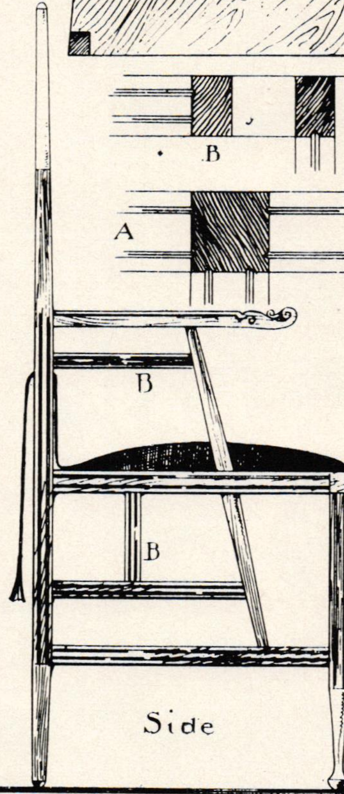
In 1866 William Morris's firm received its first commission: rooms in St James's Palace and the Victoria and Albert Museum. The 1870s and 1880s were busy years for this group, which included the Pre-Raphaelite painter Edward Burne-Jones, 1833-1898 (tapestries, stained glass, tiles, and embroideries); the "realist" residential architect Philip Webb, 1831-1915 (metalwork and glass of particular excellence, furniture, embroideries and jewelry); and the American, George Jack, 1855-1932, (chief furniture designer). Many textiles, wallpapers, and rugs were designed by Morris himself, but the famous Morris chair with adjustable back, beloved in many variations in America, was produced by the firm without specific authorship. The Morris chair was an elementary example of "patent" furniture that grew popular in the 1870s and 1880s. Twentieth-century historians reappreciated the inventive engineering and common-sense functionalism of these designs, generally overlooking their derivation from ancient sources: campaign and invalid furniture.

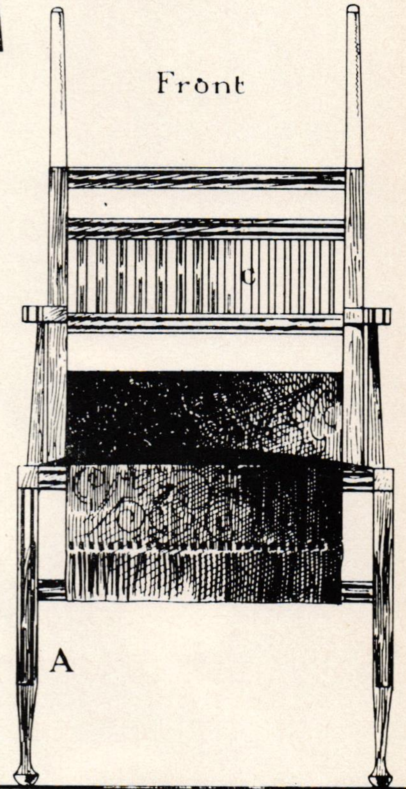
The Art and Crafts Movement flourished from 1882 to about 1910, spreading Ruskin's ideals and Morris's practices. Craftsmen's guilds — associations to spread the word, maintain standards, exhibit, and teach — were formed in England and later, elsewhere. Less medievalizing than Morris's, their work emphasized materials and workmanship; ornament was reduced, floral elements were more naturalistic than conventionalized, and symbols referred to medieval, not humanist lore. English guilds organized an Arts and Crafts Exhibition Society, 1888, to demonstrate the unity of all the arts, fine and applied, as Ruskin and Morris taught. This idea, almost an axiom of design in later years, directly opposed the academic hierarchy of the arts. Walter Crane, 1845-1915, an admired illustrator, was leader of the Movement, as was C. R. Ashbee, 1863-1942, a distinguished teacher. Arthur H. Mackmurdo, 1851-1942, was an early, spirited contributor; later, like Ruskin and Morris, he became concerned with social reform rather than artistic reform. C. F. A. Voysey, 1857-1941, was the leading architect of the Arts and Crafts; his original, delightful "cottage style" houses were widely copied in all suburbia. Voysey rose to prominence in the 1890s; even earlier he was known as the best flat-pattern designer after Morris. Perhaps influenced by











Greek Revival plans for chair

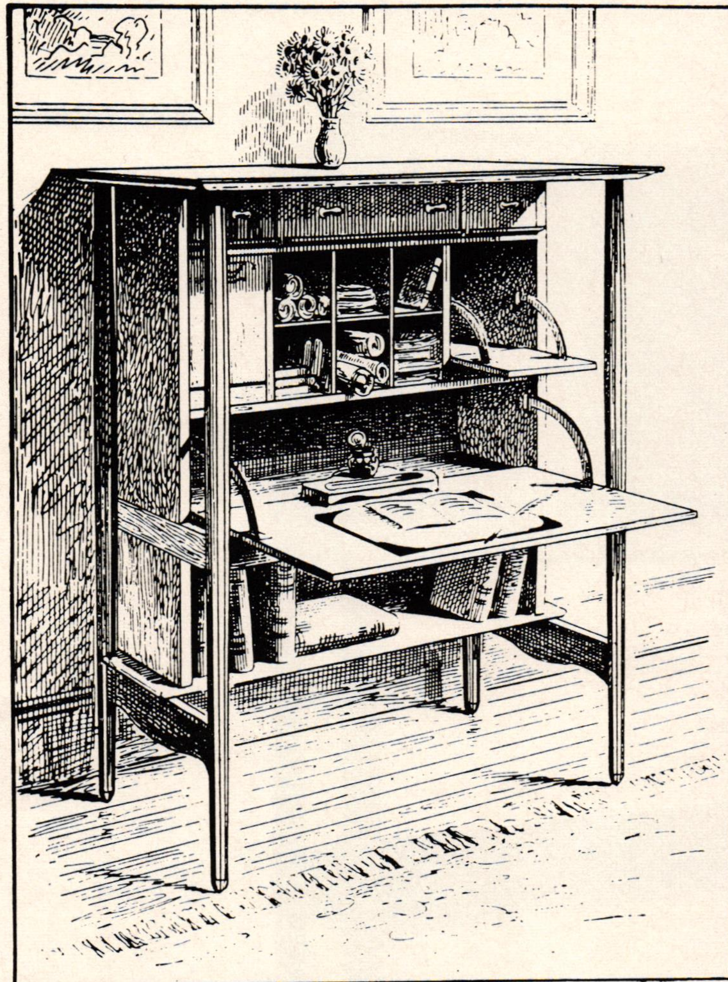
Mural Decoration, crypt, Chapel at Santa olona de Cervello, 1898

Whistler and Godwin, Voysey's designs were light-toned; here too his example was very widely followed. The Arts and Crafts Movement began a successful reform of lettering, printing, binding, illustrating and related arts; William Morris's epochal Kelmscott Press was founded in 1890; two distinguished book designers, T. J. Cobden Sanderson, 1840-1922, and Sir Emery Walker, 1851-1933, worked here. The Arts and Crafts Movement recruited leading young architects and designers in Holland, Belgium, and Germany, and in the United States, where the Mission style of furnishings and the *Craftsman* magazine lasted through 1916; Frank Lloyd Wright's, 1869-1959, "Prairie House" furnishings (1895-1910) were related.

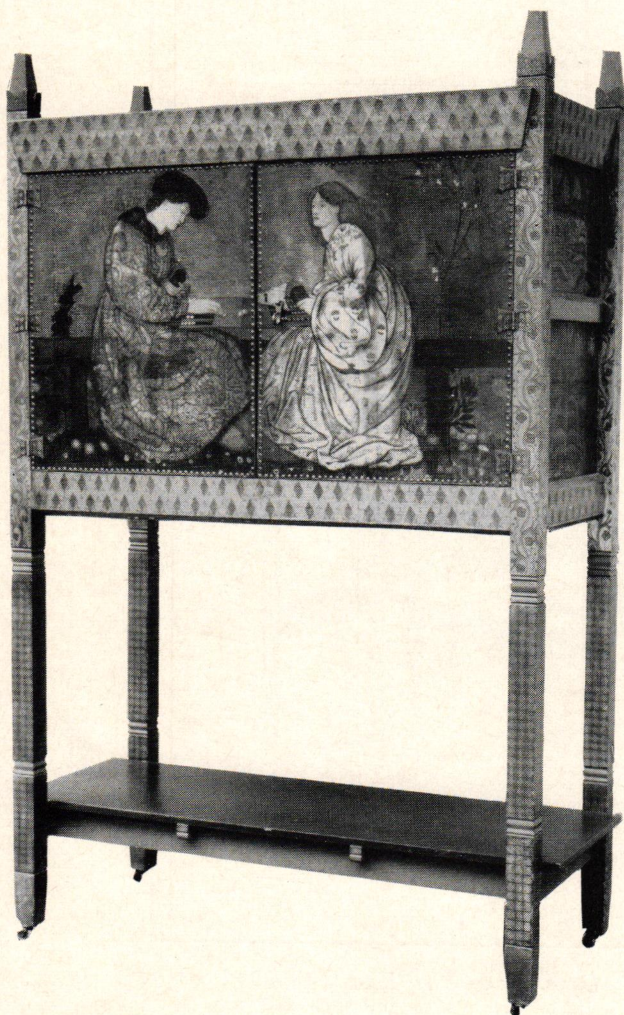
The Arts and Crafts Movement focussed attention on humble, handmade things, leading to a revival of cottage crafts, the diversified skills originally developed to keep a peasant household self-sufficient. This activity and Voysey's cottage architecture followed a century-old interest in peasant huts and hamlets, inaugurated by Queen Caroline of England and Queen Marie Antoinette of France in their garden retreats. The passage of time ensured a change from the Picturesque approach to "realism," but the attitude of escape from actuality remained.

Glasgow in the latter 1890s produced a vigorous design group centered on C. R. Mackintosh, 1868-1928, one of the genial architects of his time. For a few years their highly romantic symbolic version of the Arts and Crafts led insurgent design. Liege, Vienna, Turin, Budapest, Dresden, Munich, Berlin, Venice, and Moscow admiringly exhibited works of the group. To the process-bound forms of the Arts and Crafts Glasgow designers added a feminizing, lyrical complexity and curvilinearity that was the very opposite of "realism" and led straight to Art Nouveau, the last flower of nineteenth-century design.

Art Nouveau had three reciprocal but distinct characteristics, all evident before 1900. Reformatory, like British work, but centered in Brussels, Nancy, and Paris, it fed directly on the rational, progressive ideas of Viollet-le-Duc. It looked to train sheds and viaducts rather than to cottages for inspiration, becoming a style of metal and glass. Secondly, continental designers were close to the Symbolist writers, musicians, and painters of the 1880s and 1890s, and took into design their love of linearity, undulating rhythms, glowing colors, and richly encrusted accentuation,



Desk, Dekorative Kunst, 1898



Cabinet designed by William Morris, 1861

their penchant for mysticism, allusion, and psychological tension. Thirdly, the need was strong for a new style, not assembled in bits from historic revivals (by then as stifling as academic classicism had been) but totally modern.

Many Art Nouveau designers, however, took their points of departure from previous non-imitative styles, rococo, baroque, even Biedermeier, hoping to re-establish the broken chain of Western creativity. Despite this tribute to history a fresh spirit was supported by insurgent art periodicals. In London *The Studio* began in 1893. Similar magazines followed in New York, Chicago, Vienna, Brussels, Paris, Berlin, Munich, Dresden, Darmstadt, Stuttgart, Amsterdam, Rome, and Milan. Art Nouveau typography and ornament spread far into commercial graphic arts. When not abstractly expressive Art Nouveau ornament was often floral. The first and best master of this vein was Emile Gallé of Nancy, 1846-1904, who designed widely influential glass and furniture. An American, Louis C. Tiffany, 1848-1933, was the one glass designer and decorator of the 1890s comparably original. Parisian modern designers were the most elegant; three exhibition centers served them. The earliest, founded in 1895, was S. Bing's shop, l'Art Nouveau, that gave the style its name. Bing's first designer was Henry van de Velde, 1863-1957, a Belgian who soon thereafter pioneered modern design in Germany. Van de Velde's impetus was derived from the Brussels architect who initiated Art Nouveau, developing it with sudden, peerless genius, Baron Victor Horta, 1861-1947. In 1892 Horta designed a residence for Professor Tassel, first of a series of large and small town houses that in fittings, furnishings, and structures were rational, unprecedented, unified by sinuous linear networks and warm, rich colors. Nothing in France or Germany, where the style took root almost at once (nor, before 1900, in Spain), surpassed the Brussels originals. The speed and vitality with which Art Nouveau spread demonstrated that the twentieth century would be ushered in with what had not been seen for a century — modern design intrinsically free of retrospection. Its principles were those formulated in the 1840s by Pugin; now they found shapes unmistakably independent and apposite.

Dining room ceiling, Hotel Solvay, Brussels, 1895

THE OBSERVATORIES OF THE MAHARAJAH SAWAI JAI SINGH II

Photographs by Isamu Noguchi

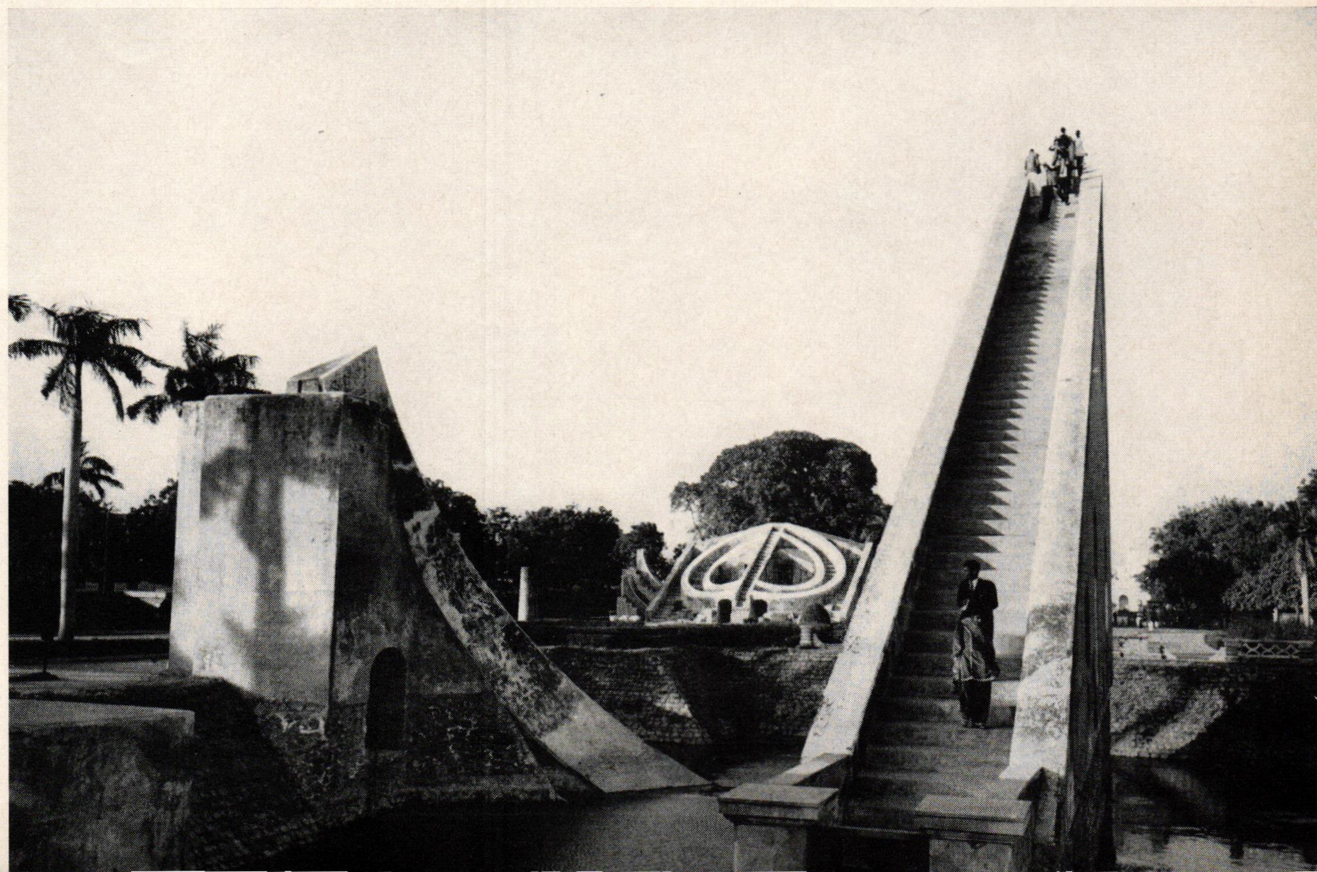
The following group of photographs by Mr. Isamu Noguchi show a large part of two of the world's most unusual cities, the astronomical observatories of Delhi and Jaipur, India.

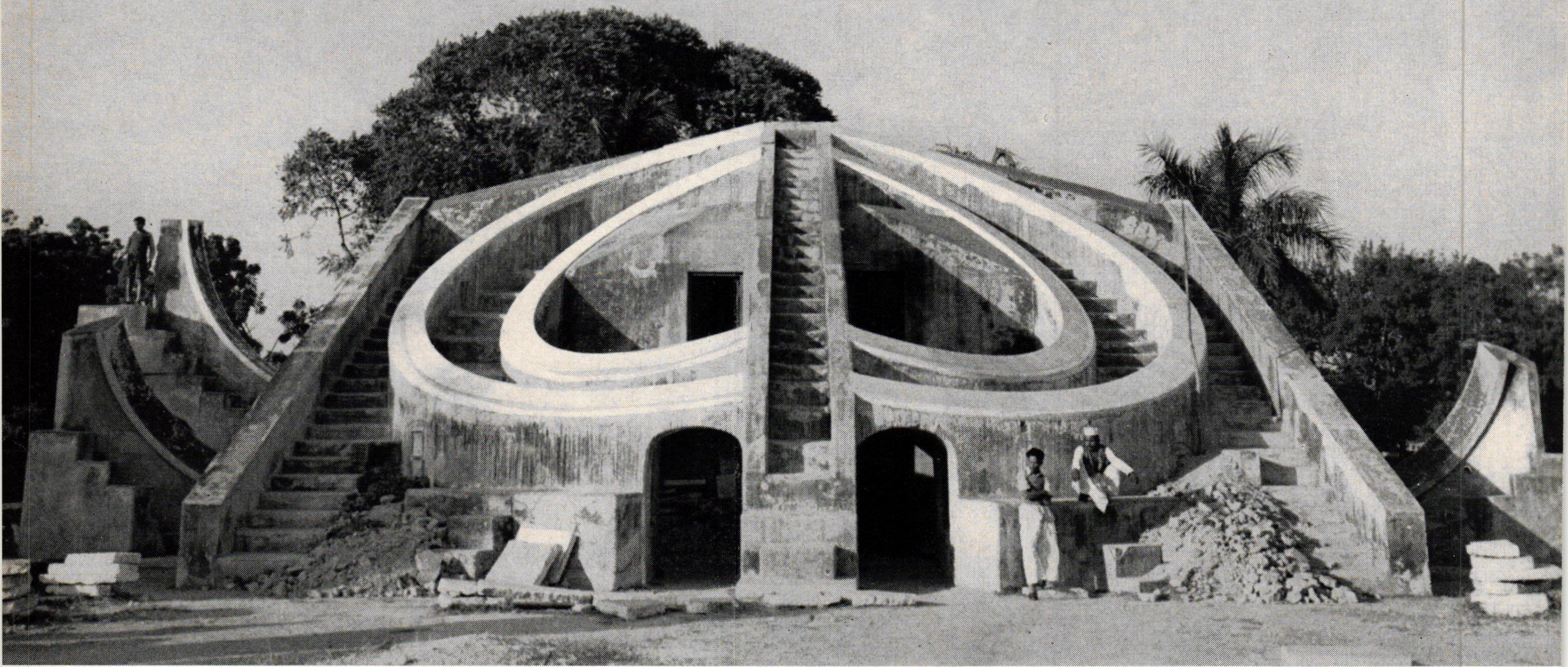
The man responsible for the creation of these structures was the Maharajah Sawai Jai Singh II of Jaipur State (1683-1743). Astronomy appears to have been the Maharajah's great passion in life, but he is also noted as the planner of the city which bears his name, Jaipur, and was statesman enough to earn a reputation as the Indian Machiavelli of his time. While the library of Jai Singh no longer exists — rumour has it that it was given to a courtesan after his death — there is evidence that he was acquainted with the writings of Flamsteed, La Hire, Ulugh Beb, Euclid, and Ptolemy. The idea of the observatories germinated when his chief astronomer, Samrat Jagganath, translated Ptolemy's Syntaxis into Sanskrit.

These books are largely tables of astronomical data and descriptions of the instruments used to obtain it. But Jai Singh was suspicious of the accuracy of these tables and, believing the instruments to be to blame, he set out to rectify the situation. The following is taken from a translation of his own account of the matter in his book *Zij Muhammed Shati:*

"But finding that brass instruments did not come up to the ideas which he (the Maharajah) had formed of accuracy, because of the smallness of their size, the want of division into minutes, the shaking and wearing of their axes, the displacement of the centres of the circles, and the shifting of the planes of the instruments, he concluded that the reason why the determinations of the ancients, such as Hipparchus and Ptolemy, proved inaccurate, must have been of this kind.

"Therefore he constructed . . . instruments of his own invention . . . of stone and lime of perfect stability, with attention to the rules of geometry and adjustment to the meridian and to the latitude of the place, and with care in the measuring and fixing of them, so that the inaccuracies from the shaking of the circles and the wearing of their axes and displacement of their centres and the inequality of the minutes might be corrected. Thus an accurate method of constructing an observatory was established and the difference which had existed between the computed and observed places of the fixed stars and planets by means of observing their mean motions and observations was removed."





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The first observatory was built in about 1724 at Delhi; the more elaborate one at Jaipur followed some ten years later. Subsequent observatories were located at Ujjain, Benaras, and Muttra, the last being the only one so far destroyed.

"When he compared these observatories, after allowing for the difference of longitude between the places where they stood, the observatories agreed.

"Hence he determined to erect similar observatories in other large cities so that every person who is devoted to these studies, whenever he wished to ascertain the place of a star or the relative situation of one star to another might by these instruments observe the phenomena."

Unfortunately, the Maharajah was incorrect in his basic assumption and his tables have been proven to be even more inaccurate than those tables he had sought to correct. In fact, the leading expert on Jai and his observatories, G. R. Kaye, says that "Even a modern theodolite is worth more than all Jai Singh's large buildings."

The Maharajah's problem was one of communication. Although he had gone so far as to send emissaries to Europe to learn the most recent advances in astronomical thought, he remained several decades behind Europe. His observatories were hardly new; the Greeks had done the same thing; size was his only advantage. They work, but the work is not very difficult. At a time when Newton was putting forth his theories, Jai Singh was building gigantic toys.

There are five basic instrument types in the astronomical cities:

1. Samrat Yantra
2. Ram Yantra
3. Jai Prakas
4. Misra Yantra
5. Nari Valaya Yantra

Of these, the Maharajah is reported to have designed the first three himself.

W. J. C.

The Samrat Yantras or Supreme Instruments are essentially the world's largest equinoctial sundials. Built into excavations, they each consist of a right triangle and a pair of quadrants. As the hypotenuse of the right triangle is parallel to the earth's north-south axis, the angle between the base and the hypotenuse is equal to the latitude of the sundials location: 26° 56′ in the case of Jaipur and 28° 37′ at Delhi. The plane of the circle whose quadrants lie to each side of the triangle is parallel to the plane of the equator. As the shadow of the edge of the triangle runs along the face of the quadrant — on the western quadrant in the morning and on the eastern in the afternoon — local time can be read from the markings on the edges of the quadrants. The declination is then read off of the sides of the ramp, which is marked accordingly. If a piece of string is stretched between the ramp and a quadrant and any heavenly body aligned with it, its declination and hour angle can then be found.

(Plates 1 and 2) The Samrat Yantra at Jaipur and Delhi, respectively. That at Jaipur is larger, later and somewhat more elaborate. The instrument visible to the rear of the Delhi sundial is a Misra Yantra.

(Plate 3) The Misra Yantra is in reality four instruments in one structure, but only one of the instruments is not functionally a duplication of one of the other structures. This instrument is known as the Niyat Chakra Yantra and is composed of the four semicircles and the central triangular ramp. Again, the hypotenuse of the triangle is parallel to the earth's pole. The semicircles are each in the plane of a great circle which runs through one of the world's four time-center observatories: Notke in Japan, Greenwich, Saritchen on Pic Island, and Zurich. The position on the semicircles of the shadow of a rod placed in the center of the ramp allows local time to be calibrated with that of the world's four time-centers.

The Samrat Yantra at Jaipur is surrounded by twelve smaller instruments known as Rasi Valaya Yantra which operate on the same principle. But instead of the hypotenuse of the triangle pointing in the constant direction of the earth's axis, the hypotenuse of these instruments follows the pole of the ecliptic — the plane of the earth's orbit, inclined 23½° to that of the equator — in its journey around the earth's pole. Thus, each instrument is only good for the two hours per day when the hypotenuse of its triangle is roughly parallel to the pole of the ecliptic. The sun's latitude or declination being close to zero at that time with reference to the instrument, one may read the sun's longitude or right ascension from the quadrant.

(Plate 4) The mother Samrat Yantra with her brood;
(Plate 5) The Rasi Valaya Yantra in detail.

(Plate 6) The return view from the summit of the Samrat Yantra at Delhi looks down upon a pair of Jai Prakas and, further back, a pair of Ram Yantra.

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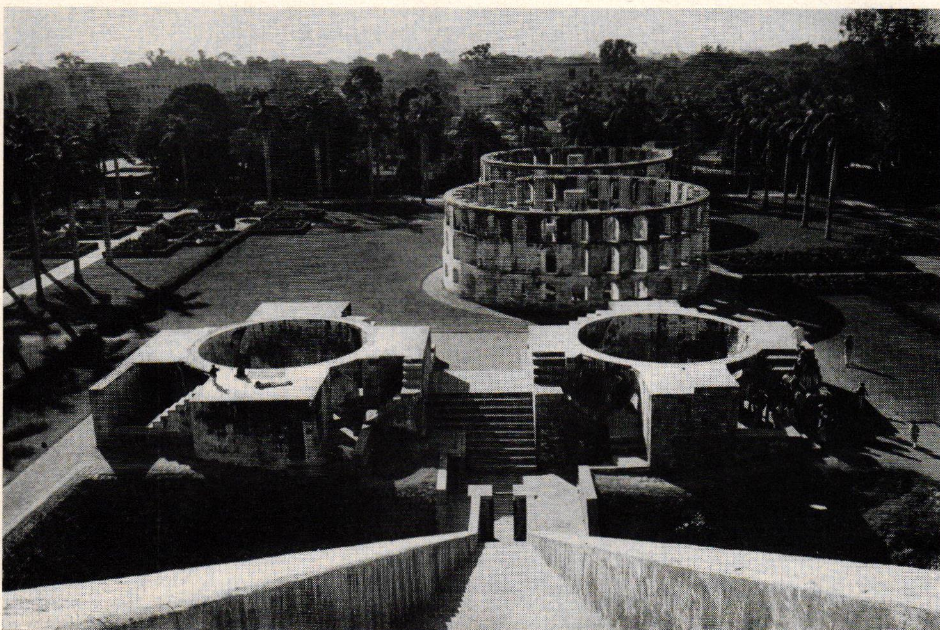

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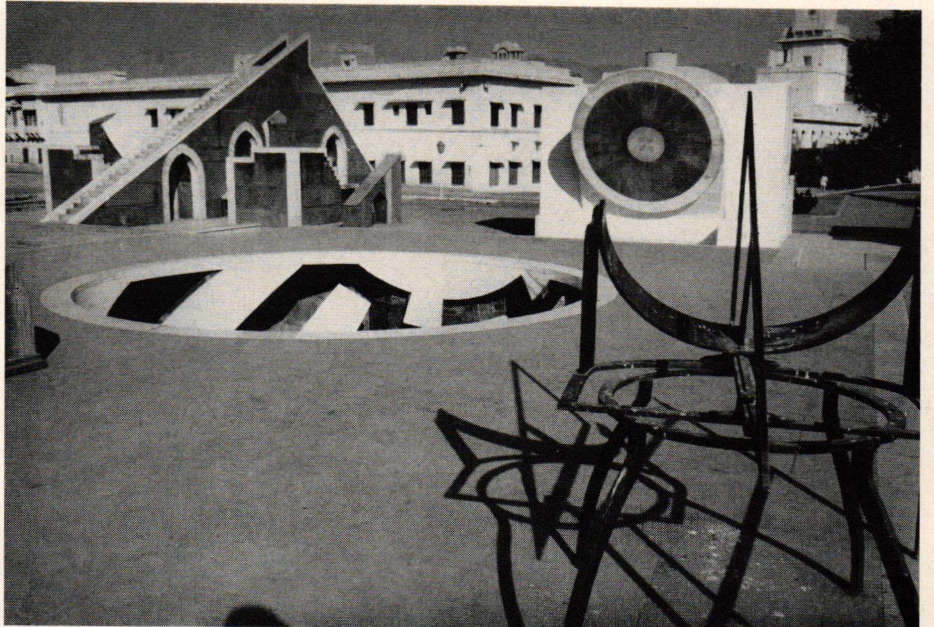

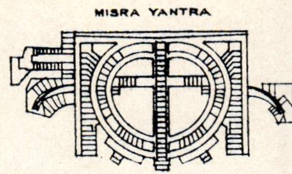

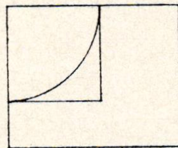

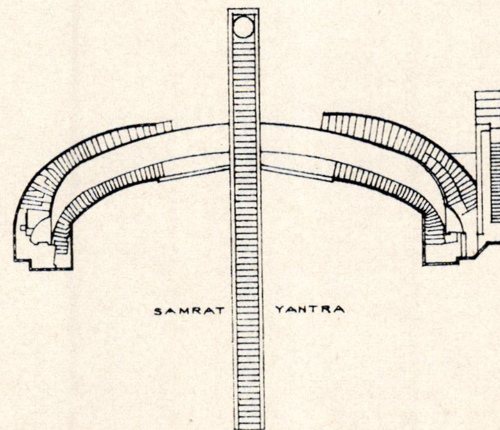

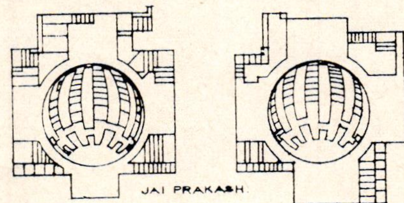

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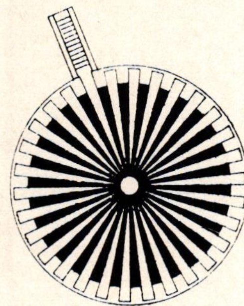
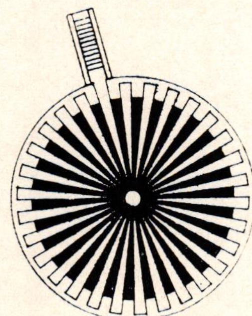
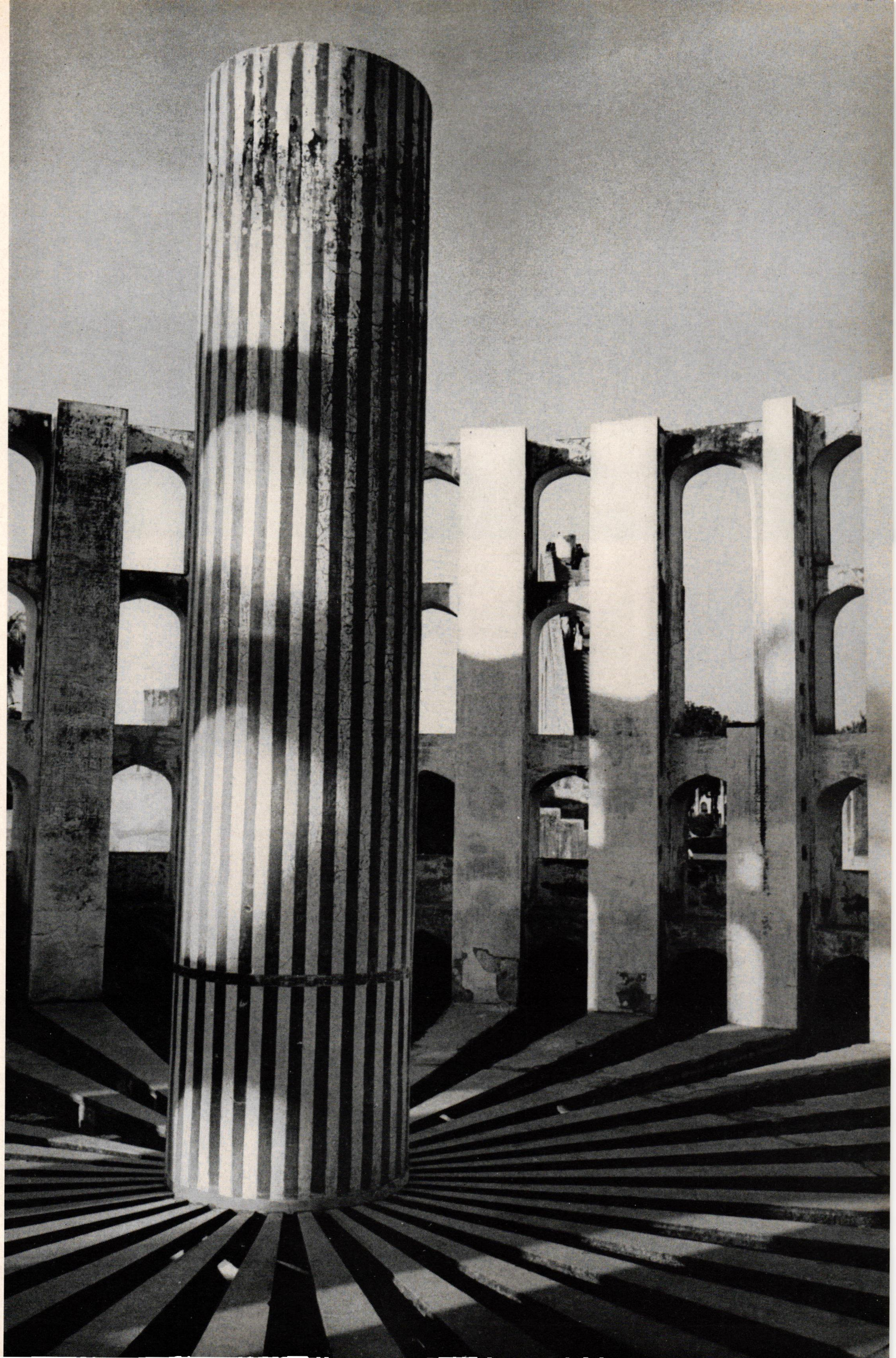
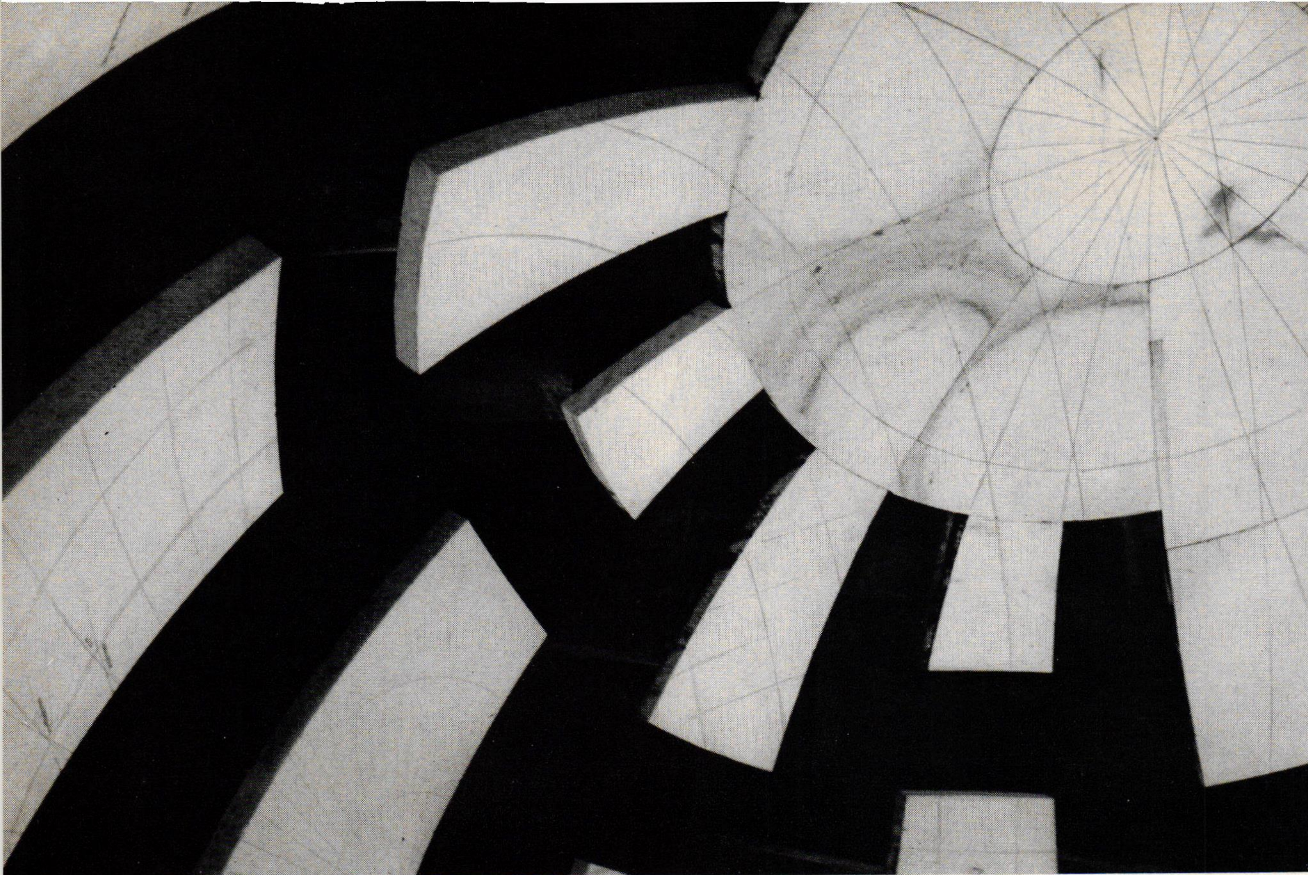




RAM YANTRA

Delhi Observatory





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The Jai Prakas, called "the crest jewel of all instruments" by Jai's assistant, is a concave hemispherical bowl placed in a stand (or sunk in the ground as at Jaipur). The rim of the instrument represents the horizon, while the makings of the bowl are those of the celestial sphere: zenith, South Pole, meridian, great circles, equator, etc. Two wires are stretched across the rim, one N-S, the other E-W. By aligning the intersection of the wires, an object and a marking on the bowl, zenith distance, altitude, etc., can be read.

Although such an instrument was built in Babylonia in the third century B.C., Jai Singh was not aware of the fact.

Jai Prakas and Ram Yantra come paired for the same reason. This is simply to allow access for the taking of readings, one being the negative space of the other. Where one is solid, the other is void.

(Plate 7) Inside one of the Jai Prakas.

(Plate 8) Four of the instruments at Jaipur. A brass sundial of the type which Jai Singh sought to replace in the foreground; in the middle ground, one of Jaipur's two marble Jai Prakas. The instrument to the left rear is another Samrat Yantra of medium size. The remaining instrument is a vertical sundial with opposed parallel faces (the obverse is naturally out of sight) known as the Nari Valaya Yantra.

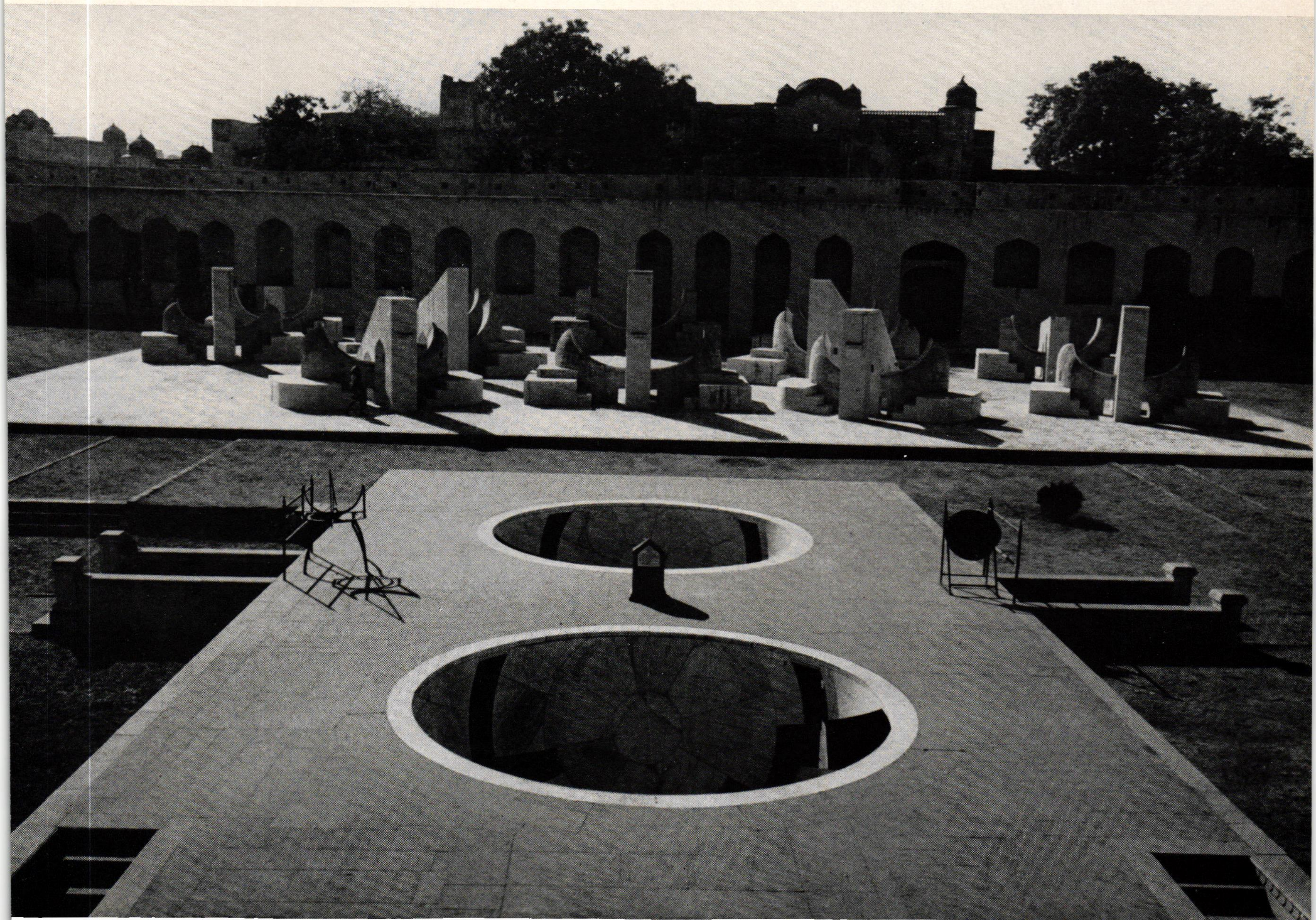
The faces are in turn parallel to the plane of the equator, the line joining the centers of the sundials being parallel to the axis of the earth. The sun falls on the northern face when its declination is north of the equator from 24 March to 21 September; the other six months it is to the south and the south face is used. At the equinoxes, sunlight just grazes both faces.

(Plates 9 and 10) The Ram Yantra is a circular building with a pillar at the center. The height of the walls and the height of the pillar from the floor are each equal to the inside radius of the building measured from the circumference of the pillar to the wall. Both walls and floor are calibrated in degrees, each representing exactly 45°.

As the shadow of the sun runs down the western wall, across the floor and then up the eastern wall, the location of the end of the shadow will at any time give the altitude of the sun. Likewise the radial line on the floor which bisects the shadow lengthwise will give the sun's azimuth or horizontal position with reference to the north-south axis. A piece of string run from the top of the pillar to a point on the structure and aligned with any heavenly body will allow its altitude and azimuth to be read as well.

(Plate 11) The celestial hemisphere in marble: looking into the bowels of one of the Jai Prakas at Jaipur's astronomical city.

A return view from the Nari Valaya Yantra. The two Jai Prakas and the twelve Rasi Valaya Yantra.



Looking at the overall site one is aware of a relationship between city and land.

The continuous movement of the street is modulated by the projecting stairs.

MYKONOS AND PATMOS

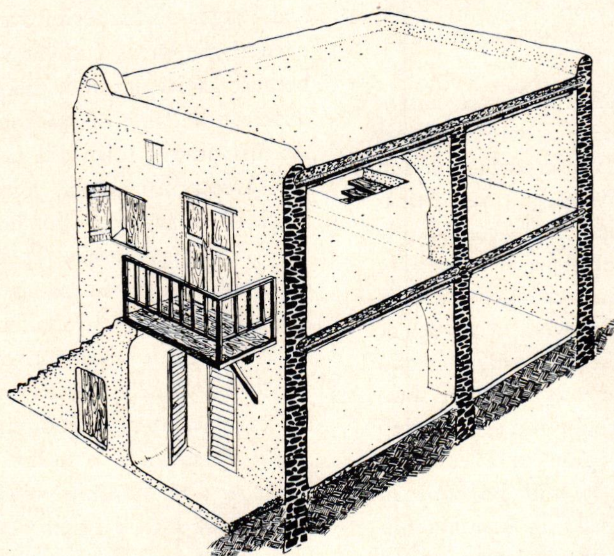
Paul Mitarachi and Robert Ernest

It is only lately that the architects of our generation have become conscious of their position in an historically evolving world rather than standing merely in a revolutionary chapter from it. With the critical eye of our day we evaluate the monuments left by previous generations. More recently, we have become aware of the achievements of the popular builders. In these we look for clues in our search for the proper balance between the individual parts and the harmonious whole.

In the Aegean islands it is possible to isolate certain native building characteristics, such as whitewashing, assymetrical massing, similarities in construction and the use of native materials, an integral yet articulated relationship to the landscape, and a consistently human scale. The less apparent diversity of expression on the individual islands is also interesting and seldom discussed. Within the above framework, a particular site, history, a set of social and religious customs and aesthetic preferences will evoke very different solutions to similar problems. Although one tends to identify Greek islands as belonging to a common tradition, closer investigation, as will be seen in Mykonos and Patmos, shows varying solutions in terms of siting, and the elements of which these towns are built.

Mykonos is a comparatively flat island. This may account for it not having been developed by the classical Greeks, who well knew of its existence, but chose to build their temples and legends under the symbolic mountain of its closest neighbor, Delos. During the fourteenth to sixteenth century period of piracy, many other island cities, Kastro on Siphnos and Pyrgos on Santorini, for example, took on their present shapes as fortress sites, but again probably because of its flat and, therefore, difficult to protect terrain, the site of Mykonos was not developed. At this time, a town did exist, but until the end of the seventeenth century it consisted only of a small block of houses and churches built on the tip of an unprotected peninsula. These early structures were connected either in series or by buttressing and bridging over the streets, so that the houses themselves served as continuous ramparts, a characteristic which is partially carried over in the later, less restricted development along the northern gulf. Looking at the overall site as it has developed today, one is aware of a relationship between city and land which is typically Greek in its reverence. Like the island itself, the city has no violent contrasts or eruptive changes in scale.

Mykonos



Typical structure, Mykonos.

The present plan of Mykonos indicates the overriding importance of the post seventeenth century orientation away from the small peninsula and toward the gulf. (The early city, although many of its structures are still in dramatic evidence, is almost deserted.) The plan was never formalized, but, while it is not immediately comprehensible, there is natural order in its movement. The broad-quay is the commercial, social, and civic nucleus; it is harbor, street, market, and square. From here two major streets flow in long continuous lines to the extremities of the city, receiving irregularly the smaller domestic streets, passageways, and squares. The great length of these streets is constantly interrupted by projecting stairs and porches. In this way the stairs and, as will be seen later, the chapels, become major sculptural elements in the street, modulating it, changing its direction, but never terminating it. In the same way, the irregular squares are never static focal points, or climaxes of the street. But the continuity of the street does not prevent one from sensing a hierarchy of plan movement. This comes from the physical dimensions of the streets and, more subtly, from the light which these streets admit, varying from the naked sunlight of the quay to the often cave-like quality of the domestic passages. The uniform whiteness of the structures and of the street itself provides a constant scale for measuring the intensity of the light.

The house, which is the main definer of the street, quite naturally takes the form of the row house, ancient and typical of insular Greece. Like every element of the Mykonos townscape, this reflects a reverence for the total scheme, yet there are a few more examples of the endless variety possible in row housing. There are one-story row houses one room deep, three-story row houses three rooms deep, and many variations in between, including split-level plans. Even within a block of similar houses, each gains its own identity by the manipulation of the elements of the facade: stairs, doors, two kinds of windows, chimneys, and often roof drains. The cut-away perspective illustrates one of the most repeated types. As is always the case, the room opening directly off the street is the living room; behind this is the kitchen, here containing a stair of ladder proportions leading to the upstairs sleeping rooms. A courtyard or another street might occur at the rear of the house, or another structure might be backed up to form a third party wall. The space under the exterior stair is the toilet, chicken hatch, or storage area. A small high window is usually open for ventilation, while the longer, shut-

tered windows are handled according to the weather and the privacy desired. An opening in the parapet wall allows the water to drain from the roof down the facade. As all surfaces are white, there is little discoloration, but there are integral gutters on some of the facades, which lessen the weathering of the whitewash.

The materials used in the houses and the method of their construction vary little. The island itself is granite and this is the basic building material. There is a very limited amount of wood, plenty of seaweed and earth. Thus, load-bearing stone walls support the inevitable flat roofs which span the short room dimensions with rough-hewn cypress logs. (The span is sometime halved by the introduction of an intermediate arch.) Small twigs tied together and covered with seaweed form a continuous, woven ceiling which rests on the beams. A very thick layer of mud completes the roof section.

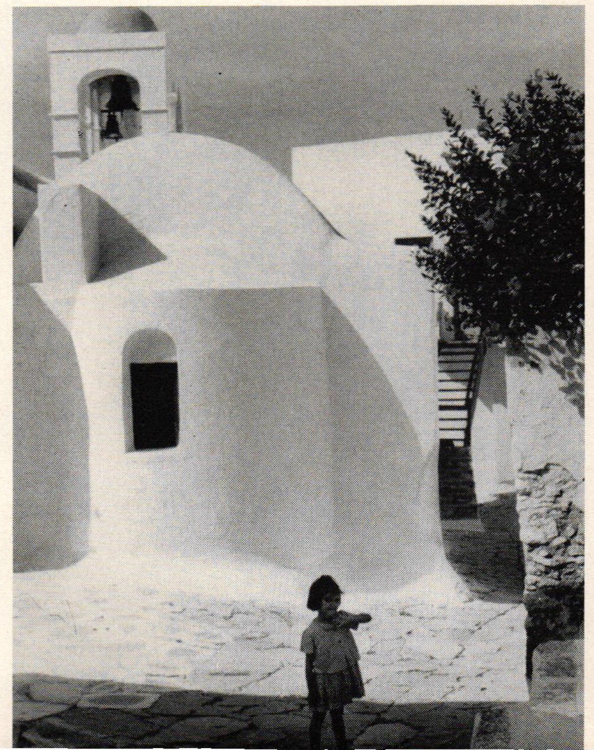
Impervious layers of white paint are then applied to the entire surface of the structure. This process, repeated semiannually, accounts for the soft sculptured appearance of the forms. The visual impact of this whiteness on the total cityscape, carried to its uncompromising ultimate on Mykonos, differentiates most directly and effectively the man-made city from its granite origin.

Color is used sparingly; on the delicate wood railings of the houses, it contributes its own delight and makes the massive white surfaces seem even more pure. The chapels are the only buildings on which color is directly applied; their red and blue roofs present the only large painted areas. Thus color is reserved for the most important buildings, in a way which recalls the hierarchal order of a classic Greek city.

An even more important definition of the chapels derives from their structure; their characteristic vaults and domes are never used secularly on Mykonos. Immediately recognizable in the sea of flat-roofed houses, the chapels punctuate the cityscape. Plasticity is also seen in the chapel walls, which may be rounded to describe niches or contain altars. In further contrast to the long rows of houses, the chapels are freestanding and are, therefore, able to take an active part in the street, where they appear as uncalculated and constant surprises.

The Mykonos street is not terminated architecturally.

The chapels punctuate the cityscape with their more sculpturesque forms. They take an active part in the street, changing its direction or as below forming small squares.



The existence of 360 chapels for a population of 3500 indicates the significance of religion in the Mykonite life, but it is also evidence of a private rather than an institutionalized monastic religious tradition. Chapels are constructed and maintained by individual families, usually in fulfillment of vows made in prayers for the saving of life at sea. Size, forms, and furnishings of the chapels vary according to the owner's means — one is no larger than a dog house. Most are simple vaulted basilicas, and some are variations of Greek and Latin cross plans combining vaulted basilicas and domed sanctuaries. The construction of the chapel is similar to that of the house, except for the vaults and domes, which are formed of mud and stone, using wood centering and scaffolding matted with a layer of seaweed.

In every case, it is the artisan who is the creator. He works without plans, yet he is completely familiar with the restrictions imposed by his materials and the physical requirements. Limited materials and the same social and climatic needs determine the framework within which he creates, but there is another motivating force — his own creative imagination, and in many instances he uses it freely. Any attempt to

The chapels occur as constant surprises in the street. Mykonos

Detail. Homogeneity with great variety is achieved on Mykonos by the consistently plastic treatment of forms.

evaluate his work on a purely functional basis leaves irreconcilable gaps.

The origins of the architectural style of Mykonos are diverse and obscure. One may say that the church is principally of Byzantine origin, while the house may have evolved from the early Greek town house, or, more likely, it may represent a type which has reappeared because of similar conditions. As is often the case in popular styles, there is no real way of measuring the nature or extent of outside influences, and indeed it is less interesting to speculate on these antecedents than to evaluate Mykonite architecture itself as a mature style.

Patmos

Patmos, one of the Dodecanese Islands, lies only eighty miles east of the larger Mykonos. On Patmos, two factors have been of primary importance in influencing the shape of the town and its architecture. One is the site, more hilly and abrupt than the gentle slope on which the town of Mykonos grew up; the other is Patmos' particular historical and cultural tradition.

The island, in the form of a misshapen hourglass, runs north and south for about eight miles. Of the two bays formed by the narrow neck at the middle, the western one has developed into the port of Scala. The town spreads a little way up the two hills on either side of the harbor, but does not extend far inland except along the road, which winds its way to the top of the eight-hundred and fifty foot hill crowned by the old town of Chora.

Chora, "the city," first built in 1088 as a fortified monastery, grew in a series of concentric circles around the castle. The two old taxis which connect Chora to Scala make the hairpin-turn climb in three minutes and never penetrate into either town, the streets being too narrow and, in the case of Chora, often interrupted by flights of steps. The small hills surrounding Scala have provided ideal sites for little chapels which overlook the harbor, and the relative steepness of the site makes both upper and lower towns look like cascades of white cubes.

The traditions of Patmos grew up around St. John the Evangelist's exile to the island in the first century. A thousand years after the revelation, the by-then deserted island became, by a decree of the emperor of Byzantium, the property of the new and powerful

Like the comparatively flat island, the city is without violent contrasts or eruptive changes.

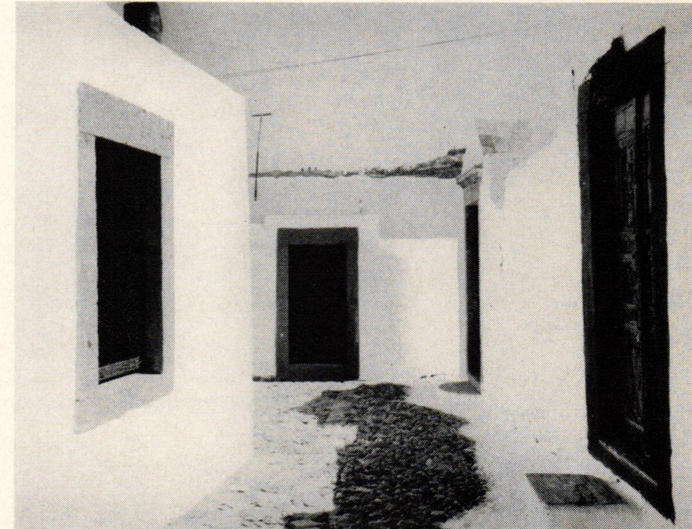
fortified monastery of St. John the Theologian. Thus, the island took on the character of a sacred site: myths relating to St. John developed; religious monuments such as monasteries and churches were built; and economic and trade privileges were granted to the islanders, who became rich, traveled, and literate. Venice influenced the way of life and the design of the elaborate houses of the merchant shipowners, while the monastery overlooking the thriving town retained its spiritual leadership.

During the Turkish occupation of the Byzantine empire, Patmos kept a measure of independence, continued to thrive, and developed into a major center of culture and higher education where many of the leaders of the nineteenth-century Greek uprising against the Turks were trained. The physical development of Patmos was strongly influenced not only by the monuments which for centuries has been part of the scenery, but also by the inhabitants' consciousness of a heritage which directed them culturally and historically rather than technologically. That Patmos is quite different from Mykonos should not come as a surprise.

At present, Chora is being deserted in favor of the more active Scala. At the foot of the fortified monastery, the old mansions built by the seventeenth-century merchant seamen and the later nineteenth-century houses stand half abandoned. Their corners are sharply defined and quoined; their windows and doors well framed by stone jambs, sills, and heads which, like the quoins, are left unpainted and stand out from the whitewashed walls. In the most recent houses of Scala, this expression of sharply meeting planes and framed openings continues as part of the tradition which differentiates the architecture of Patmos from that of Mykonos, where every building seems to melt into the ground, corners are rounded, and only carpentry and the domes of some churches are painted. The contrast between the sharp self-contained cubes of Patmos and the fluidity of Mykonos is striking. To obtain this quality of sharpness, quarried stone, as of old, is used rather than fieldstone, of which, however, there is no shortage. The walls are therefore better built, with tighter joints and do not have to be protected with a layer of stucco before being whitewashed. The resulting effect is of

Chora: The eleventh century monastery towers over the old town. Its powerful influence is visible in the architecture here as well as in the harbor below.

Scala: Short streets bound by the simple elevations of the houses. The town is a series of interconnected courtyards similar to this one.



Scala: Doors and windows became the climactic events at the end of each street.

painted stone rather than the white adobe-like texture found on Mykonos. Although the use of quoining has been abandoned, the windows continue to be framed, whether with cut stone as before, or, more often, simply by a careful painting of a frame on the surface of the wall around the opening. Colors are limited to light and dark grey, blue, yellow ochre, and red ochre, with no more than one color used on each house.

The roof and wall construction of these houses is essentially the same as that of Mykonos and need not be described again.

The winding streets of Chora are of great interest, but are fairly representative of similar streets of other nine-hundred-year-old towns in the Eastern Mediterranean. It is in Scala that we discover a most striking street pattern, clearly the opposite of the Mykonos pattern of long linear pedestrian ways.

In the northwestern part of Scala, streets take the form of courtyards, their boundaries uninterrupted by projections from the houses, their length limited to about fifteen times their width. I am convinced that this limitation of the length of the street is directly and consciously related to the simplified form of the house, as the more sculptural house and the endless street are equally consciously related on Mykonos. On Patmos, the facades on the street are modulated only by the painted openings. Each street is related to two others as the bar of an H relates to the two vertical sides. Thus the end of each street is a T crossroad punctuated by windows and doors, which are placed with extreme care on the house which faces the crossroad. On Mykonos, a walk through the town is a series of climaxes dispersed along the length of the street. On Patmos, the walker invariably faces the climax at the end of the space, before he turns the corner to encounter the next surprise. With extremely few variations this pattern is repeated throughout the area and appears to be a conscious plan to which all builders have adhered.

The needs of defense have often shaped the towns of the Eastern Mediterranean. If this is the case here, the result is strikingly different from that of other towns designed with defense in mind.

Squares are closely related to the religious history of the island. The upper town has three major open spaces. One, the public square, at one time presumably the busy center of the town, is now partly deserted, with a single coffee house and the few shops needed by the dwindling community. The other two have administrative and ceremonial functions. Flanked by austere buildings of the local government, they are also the scenes of yearly religious processions and festivities, and are dedicated, not to the commercial

Chora: Like most other squares on the island this formal space is used during major religious festivals organized by the monastery.

A double vaulted chapel in the hills above Scala.

activities or leisure of the community, but to the mysteries of the Greek Orthodox faith, carried on through the ages by the monks of the monastery. In the port below, younger, more active commercially, and closely related to the water and its activities, the proportion is reversed: there are two commercial squares and one religious one. Here, unlike Mykonos, it is not the port which comes to life at sundown, but the major square whose west side opens on the quay. The other three sides are occupied by arcades with stores, coffeeshops, the post office, and a small covered market. This irregularly shaped trapezoid is about one hundred by two hundred feet and is truly the core of the island. Linked to it is a smaller irregular triangular square with a few shops and trees. Further up is the church square, deserted except on religious feast days.

Like the squares, the churches exist as self-contained units and not as events in the streets. In every case they are detached architectural statements, whether located on a major square or in the open country. The country churches in most cases are single or double vaulted with battered walls. They do not have the peaked fronts and the painted roofs we have seen on Mykonos. Again, while house roofs are mostly flat, the roofs of churches are invariably domed or vaulted. As on Mykonos, there are a number of twin churches. There are also two churches with double barrel vaults, each with a cylindrical dome, such as I have seen nowhere else.

In evaluating Patmos not only in relation to Mykonos, but also to eight other islands visited last year, its surprising sophistication, the result of its rich secular and religious traditions, stands out. The monks of St. John the Theologian, born in the towns of Patmos and cloistered in its monastery, display with pride the wealth of its treasury and its library. In the evenings they gather on the roof overlooking the two towns and gaze at their white cubes, well aware that both Chora and Scala were created by their monastery. While the cityscape of Mykonos is purely popular in origin and remains humble in its scale and anonymous in its expression, Patmos shows itself to be the result of a cultural continuity. The island is conscious of an historical style of Byzantine and "bourgeois" origin, the latter the work of skilled and careful craftsmen, intent on expressing the will of the individual owner, as is typical in a wealthy and therefore competitive society. As in Mykonos, individualism is expressed within the measure of an almost intangible harmony which, however, never becomes uniformity.

Scala: Doors and windows with painted masonry frames. This tradition as well as that of good craftsmanship continues since the 11th Century.

"THE FUNCTIONAL TRADITION" AND EXPRESSION

James Stirling

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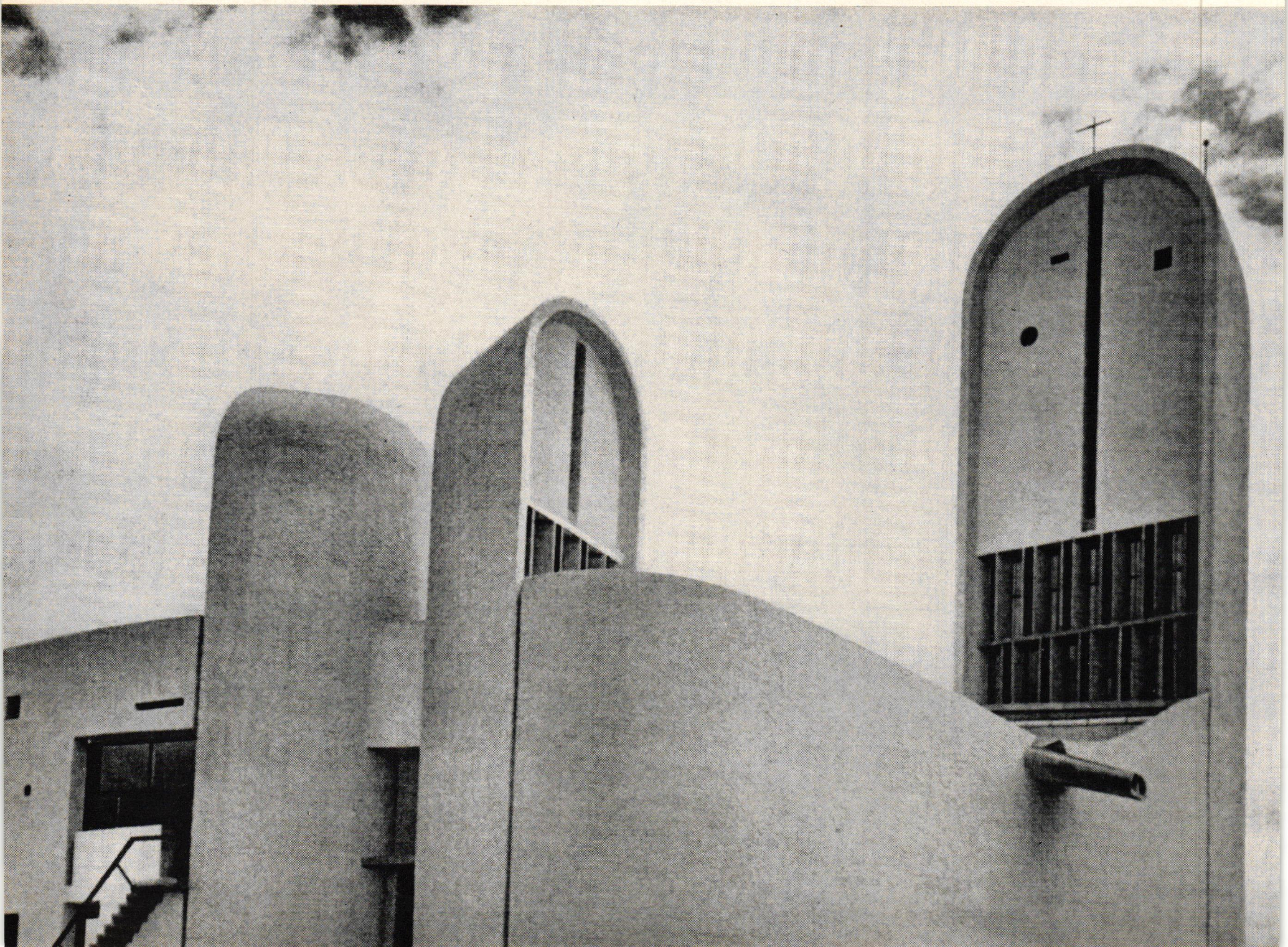

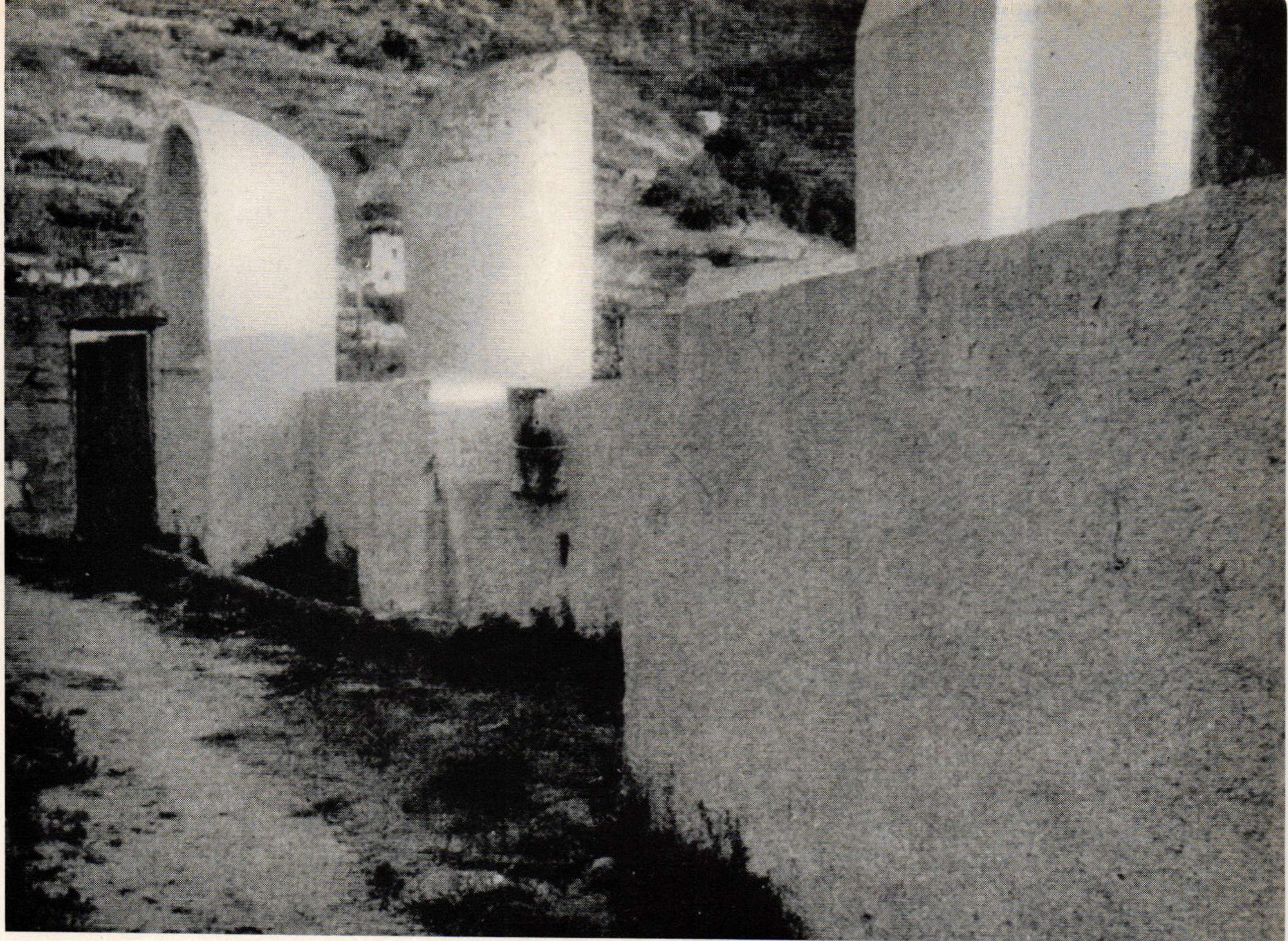

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The *Architectural Review* published in July 1957 a special number called "The Functional Tradition"; this illustrated many anonymously designed buildings in England of a regional type, such as farmhouses, barns, warehouses, mills, etc. This selection was perhaps a little narrow, faintly Georgian, and too nearly confined to early industrialism. It could have included fortifications, village housing, and early office building. Sibyl Moholy-Nagy has also published a book illustrating similar buildings in America.

The merit of this type of building as seen by an architect today is that they are usually composed of direct and undecorated volumes evolved from building usage and particularly from the functions of their major elements. They adapt to a wide variety of materials and locality and their structural support is sensibly derived from the organization of the building. Though dating back to medieval times, they are peculiarly modern, suggestive of the early ideas of Functionalism, but probably less of the machine aesthetic, which was primarily a style concern. Le Corbusier has always been aware of the uncompromising appearance of this type of building, and as the theoretical impetus of the modern movement has diminished, their influence upon him has become apparent, particularly in his later work. (1, 2)

The flats of Ham Common (4) were probably influenced by de Stijl and the Jaoul houses, but at the same time we were fascinated by the quality of vernacular brick buildings such as the Liverpool warehouses, (3) and in general by the great virtuosity of English nineteenth-century brick technology. (7) The design of a small house in the country (6) was probably affected by the roof complexes of traditional farm buildings, (5) and the pyramidal massing results from giving the living-room a double height space with a sloping ceiling, and by placing a studio/bedroom on the upper level. The roofs are simple lean-to's spanning between walls.

On both sides of the Atlantic the current dilemma of modern architecture seems to be that top architects are absorbed in becoming either stylists or structural exhibitionists and as the "Functional Tradition" indicates, there is an alternative architectural expression to that of style or structure. This is by the direct expression of the actual accommodation volumes in relation to each element determining the plastic composition of the building. ("The section is the elevation" — Le Corbusier) The architectural quality of a solution will of course depend upon the particular organization of the accommodation, circulation, services, etc., and vernacular buildings usually have

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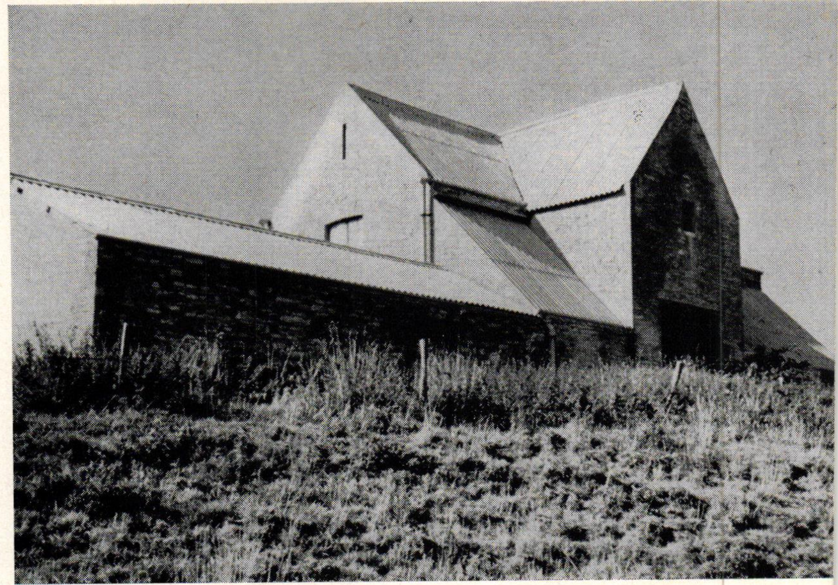

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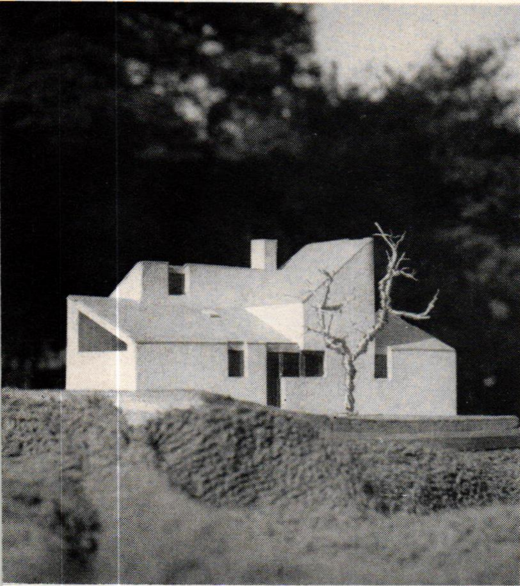
an unsophisticated but successful integration of large and small elements achieved with a degree of inevitability. In modern architecture, an over-formal solution may avoid the realities of the accommodation, and this is the case with Louis Kahn's project for the Trenton Community Centre where the silhouette of the gymnasium, which is the biggest single volume, is determined by a roof-bay system which is mainly appropriate to the corridors and small rooms.

In America, "styling" appears as the application of frills and grilles, the introduction of historical fragments, and the indiscriminate use of glass curtain walls. Structural exhibitionism appears as the over-articulation of columns and floors. Both are obsessed with the outer building skin and both are equally effective in masking the volumetric dimensions of the spaces behind the facade. Recent "after-Mies" architecture can be seen in fact as a more decorative elaboration of the Miesian peripheral structure solution. Arising from axial plan arrangements of classical origin, the structure is often unrelated to the shape of the internal space, and it tends to stand evermore in its own right accounting for the principal appearance of the building. The ideology of the 'free plan' included the independence of spaces and walls, where necessary pushing through the constrictions of the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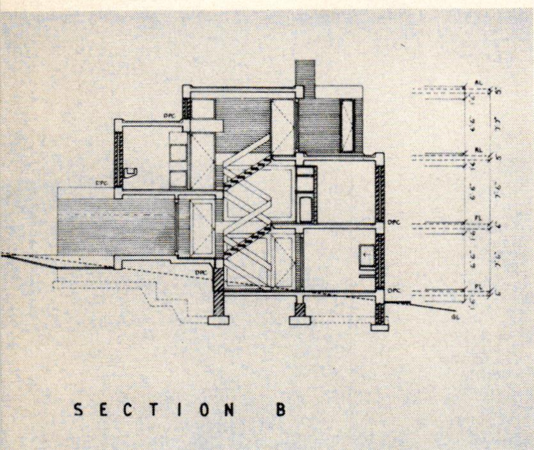
structural cage; and on the exterior of Le Corbusier's early Paris houses, the shape and purpose of the internal spaces is suggested, bringing the scale of the human being and the room back into the city.

Modern architecture has recently gained its real foothold in England through the necessity for low-cost building, whereas more fortunately its acceptance in America appears to be synonymous with prestige. We have therefore only recently taken up with the application of curtain walling, but as our buildings have neither the scale or the expense of their American equivalents they appear cheap and undistinguished. ("Money equals quality" seems to be a factor in this style of architecture.) We also have a complete alphabet of "contemporary style," fashion-promoted by the public press as avant-garde, and this will soon create more harassing problems for modern architects than the dying protests of the academic conservatives.

In the Georgian squares, each house has an elaborated entrance and the location of the principal room, usually on the first floor, was indicated by wrought-iron work, canopies, etc.; thus the extent of the dwelling and the location of its main accommodation was indicated on the terraces of the eighteenth-century city. This identification of the house in its environment is repeated by Le Corbusier in the Unité, with the expression of the dwelling cell, several of which comprise the total building, whereas in the Lake Shore Apartments the location of the dwelling is of little consequence. "Styling" encourages ambiguity and in most of our Victorian terraces the identity of the individual house has also disappeared. The styled uniformity of these street facades was achieved with rendered walls, repeating windows, and horizontal cornice, but the true organization remains visible on the backs (8) where it can be seen that building is made of bricks; it has a pitched roof, rooms are at different levels and of unequal size, and outhouses define the property walls.

With the design for a house in the Chilterns, (9) the organization of stacked room volumes resulted from using each half-landing of a central staircase as access to, in principle, one room at each level. This formation adapted well to the site which was sloping in two directions.

A few years ago, Luigi Moretti illustrated in "Spazio" the plaster castings taken from inside accurate models of certain historical buildings. By treating the external surface and the inner constructions of a building as a three-dimensional negative or mould, he was able to obtain solidified space. If space



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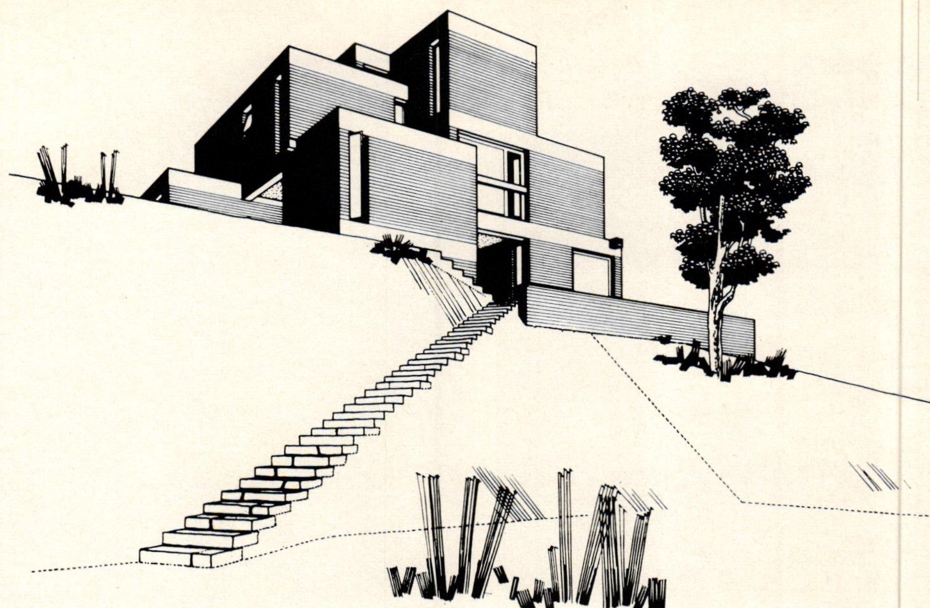

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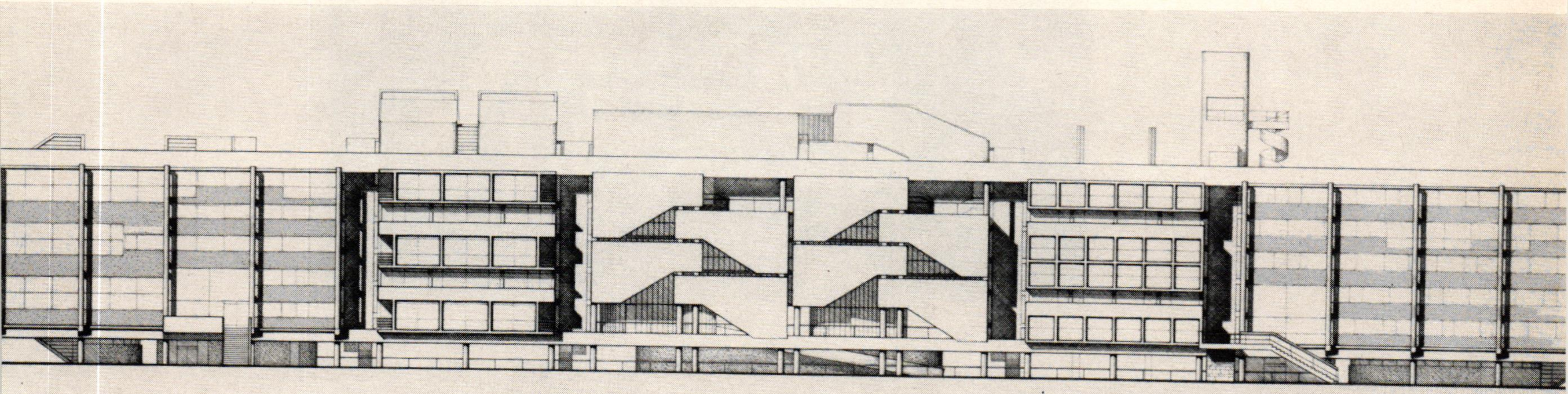
can be imagined as a solid mass determined in shape and size by the proportion of a room or the function of a corridor, then an architectural solution could be perceived by the consideration of alternative ways in which the various elements of the programme could be plastically assembled. It is not assumed that every element should be expressive, but it is important that a hierarchy of the most significant volumes is recognizable in the ultimate composition. Within practical limits, room shapes are variable and the different ways of assembling accommodation, circulation, etc., may be almost infinite; nevertheless a design will start to emerge in the imagination when the relationship of spaces appears to have coherent organizational pattern. At this moment of coagulation, however, the cerebral exercise loses its abstract value as it is necessary for it to materialize as substance; and a successful transition from organizational pattern into structure and materials is dependent upon the author's structural vocabulary. Through its selection the method of support should assist the ideogram of the space organization.

Le Corbusier's monastery at La Tourette grammatically explains a pattern of cellular repetitive spaces (the monks' cells) related above the varied proportions of the halls and refectories and set alongside the dense single mass of the chapel. The structural grille of the Unité defines the space and describes the dwelling, and where the shape of the accommodation radically changes so does the structural system, setting free the drama of the roof.

With a complex building of different shapes and sizes of accommodation, it appears essential that several appropriate methods of support should be used, each specific to a particular organization; and this was the case with our design for the new main building at Sheffield University. (10) The Architecture, Arts and Administration Building was in principle a long terrace of varied accommodation planned either side of a centre axle of horizontal circulation. From left to right are located the Architecture studios, the Arts classrooms, the Arts lecture theaters, tutorial rooms, and finally the University Administration offices. Each of these groupings is joined by a shaft of vertical circulation. The classrooms and tutorial groups are of mass concrete walling, and the remainder is supported by columns and beams. At roof level there is a terrace, and underneath there is a covered access walk, and



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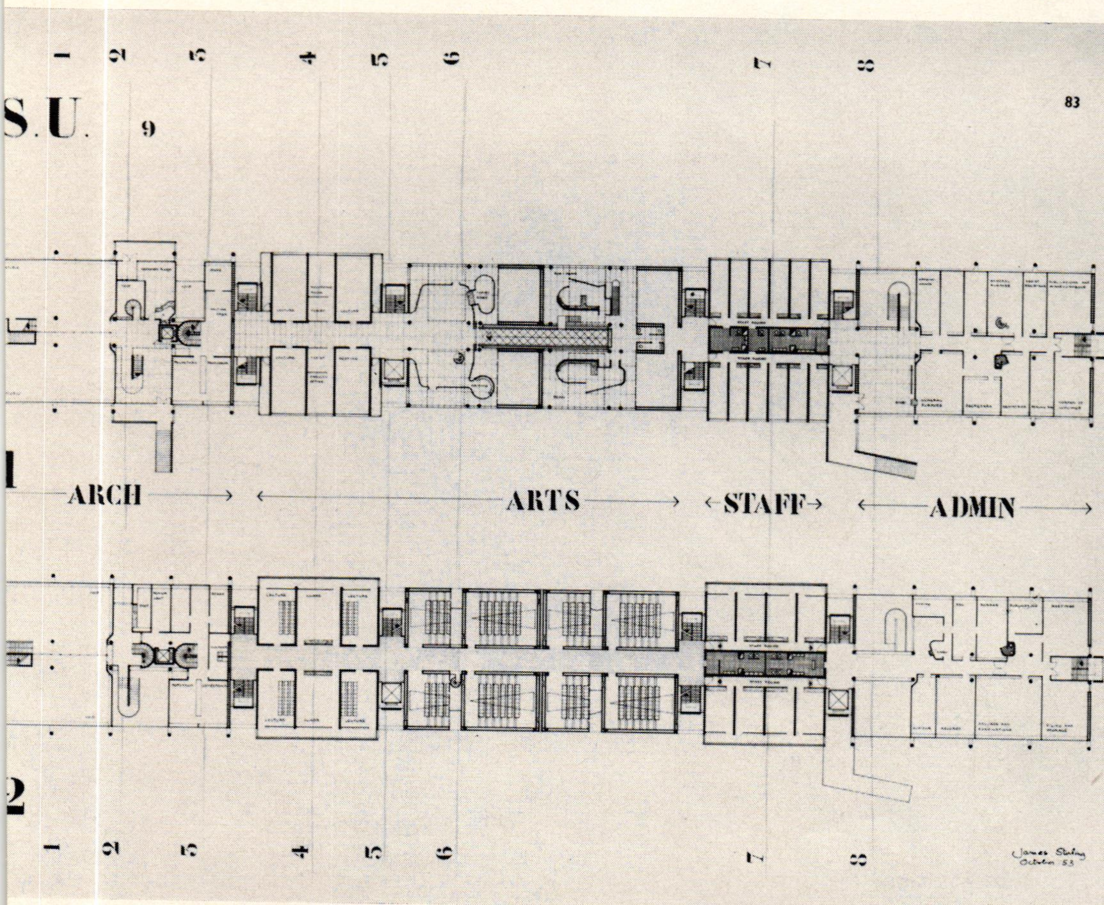

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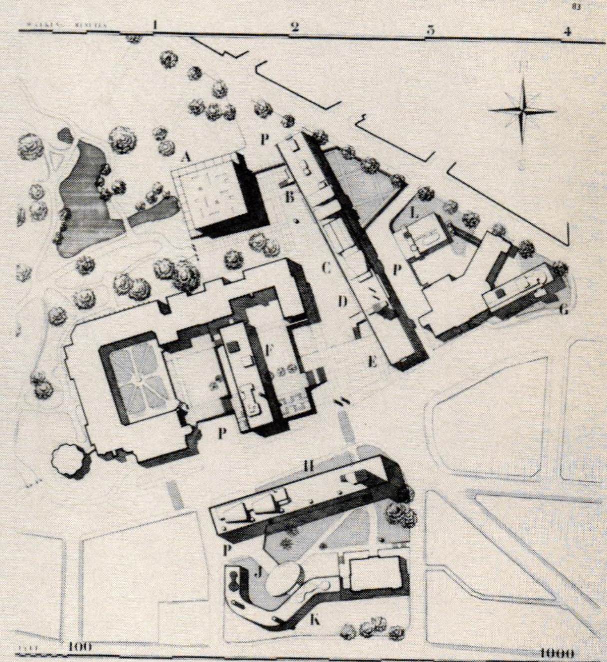

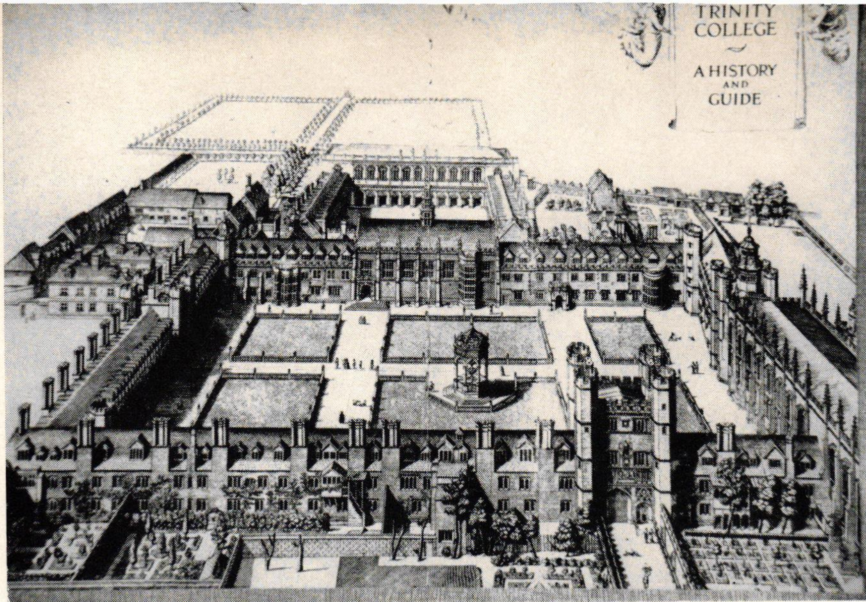

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