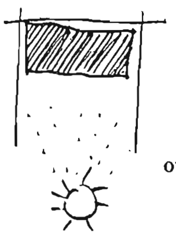
Note that this pattern was developed in the San Francisco Bay Area. Of course, its significance varies as latitude and climate change. In Eugene, Oregon, for example, with a rather rainy climate, at about 50° latitude, the pattern is even more essential: the south faces of the buildings are the most valuable outdoor spaces on sunny days. In desert climates, the pattern is less important; people will want to stay in outdoor spaces that have a balance of sun and shade. But remember that in one way or another, this pattern is absolutely fundamental.

Therefore:

Always place buildings to the north of the outdoor spaces that go with them, and keep the outdoor spaces to the south. Never leave a deep band of shade between the building and the sunny part of the outdoors.



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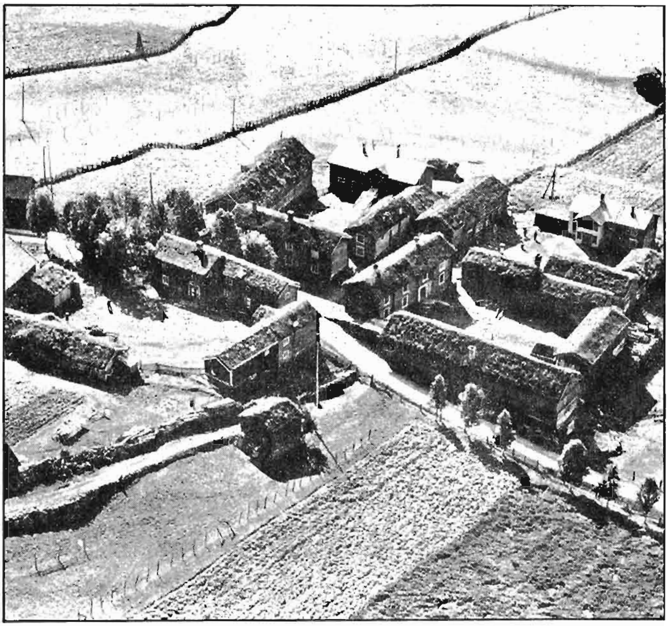
Let HALF-HIDDEN GARDEN (111) influence the position of the outdoors too. Make the outdoor spaces positive—POSITIVE OUTDOOR SPACE (106)—and break the building into narrow wings —WINGS OF LIGHT (107). Keep the most important rooms to the south of these wings—INDOOR SUNLIGHT (128); and keep storage, parking, etc, to the north—NORTH FACE (162). When the building is more developed, you can concentrate on the special sunny areas where the outdoors and building meet, and make definite places there, where people can sit in the sun—SUNNY PLACE (161). . . .

106 POSITIVE OUTDOOR SPACE**



. . . in making SOUTH FACING OUTDOORS (105) you must both choose the place to build, and also choose the place for the outdoors. You cannot shape the one without the other. This pattern gives you the geometric character of the outdoors; the next one—WINGS OF LIGHT (107)—gives you the complementary shape of the indoors.

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Outdoor spaces which are merely "left over" between buildings will, in general, not be used.

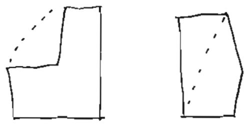
There are two fundamentally different kinds of outdoor space: negative space and positive space. Outdoor space is negative when it is shapeless, the residue left behind when buildings—which are generally viewed as positive—are placed on the land. An outdoor space is positive when it has a distinct and definite shape, as definite as the shape of a room, and when its shape is as important as the shapes of the buildings which surround it. These two kinds of space have entirely different plan geometries, which may be most easily distinguished by their figure-ground reversal.

Buildings that create negative, leftover space . . . buildings that create positive outdoor space.

If you look at the plan of an environment where outdoor spaces are negative, you see the buildings as figure, and the outdoor space as ground. There is no reversal. It is impossible to see the outdoor space as figure, and the buildings as ground. If you look at the plan of an environment where outdoor spaces are positive, you may see the buildings as figure, and outdoor spaces as ground—*and*, you may *also* see the outdoor spaces as figure against the ground of the buildings. The plans have figure-ground reversal.

Another way of defining the difference between "positive" and "negative" outdoor spaces is by their degree of enclosure and their degree of convexity.

In mathematics, a space is convex when a line joining any two points inside the space itself lies totally inside the space. It is nonconvex, when some lines joining two points lie at least partly outside the space. According to this definition, the following irregular squarish space is convex and therefore positive; but the L-shaped space is not convex or positive, because the line joining its two end points cuts across the corner and therefore goes outside the space.



Convex and nonconvex.

Positive spaces are partly enclosed, at least to the extent that their areas seem bounded (even though they are not, in fact, because there are always paths leading out, even whole sides open), and the "virtual" area which seems to exist is *convex*. Negative spaces are so poorly defined that you cannot really tell where their boundaries are, and to the extent that you can tell, the shapes are *nonconvex*.

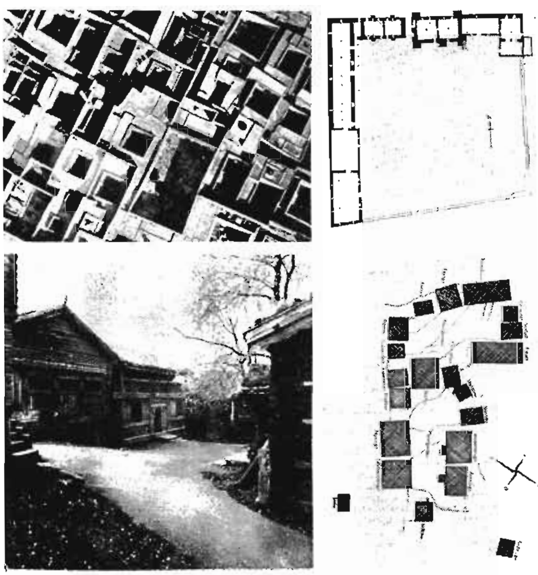
This space can be felt: it is distinct:—a place . . . and it is convex. This space is vague, amorphous, "nothing."

Now, what is the functional relevance of the distinction between "positive" and "negative" outdoor spaces. We put forward the following hypothesis. *People feel comfortable in spaces which are "positive" and use these spaces; people feel relatively uncomfortable in spaces which are "negative" and such spaces tend to remain unused.*

The case for this hypothesis has been most fully argued by Camillo Sitte, in *City Planning According to Artistic Principles* (republished by Random House in 1965). Sitte has analyzed a very large number of European city squares, distinguishing those which seem used and lively from those which don't, trying to account for the success of the lively squares. He shows, with example after example, that the successful ones—those which are greatly used and enjoyed—have two properties. On the one hand, they are partly enclosed; on the other hand, they are also open to one another, so that each one leads into the next.

The fact that people feel more comfortable in a space which is at least partly enclosed is hard to explain. To begin with, it is obviously not *always* true. For example, people feel very comfortable indeed on an open beach, or on a rolling plain, where there may be no enclosure at all. But in the smaller outdoor spaces —gardens, parks, walks, plazas—enclosure does, for some reason, seem to create a feeling of security.

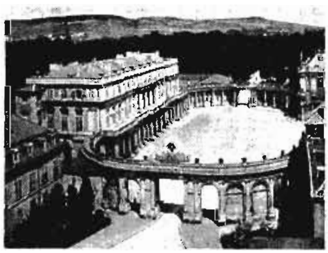
It seems likely that the need for enclosure goes back to our most



Four examples of positive outdoor space.

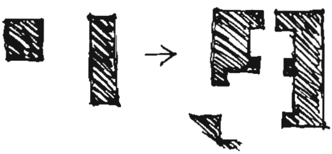
primitive instincts. For example, when a person looks for a place to sit down outdoors, he rarely chooses to sit exposed in the middle of an open space—he usually looks for a tree to put his back against; a hollow in the ground, a natural cleft which will partly enclose and shelter him. Our studies of people's space needs in workplaces show a similar phenomenon. To be comfortable, a person wants a certain amount of enclosure around him and his work—but not too much—see WORKSPACE ENCLOSURE (183). Clare Cooper has found the same thing in her study of parks: people seek areas which are partially enclosed and partly open—not too open, not too enclosed (Clare Cooper, Open Space Study, *San Francisco Urban Design Study*, San Francisco City Planning Dept., 1969).

Most often, positive outdoor space is created at the same time that other patterns are created. The following photograph shows one of the few places in the world where a considerable amount of building had no other purpose whatsoever except to create a positive outdoor space. It somehow underlines the pattern's urgency.



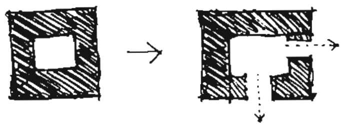
The square at Nancy.

When open space is negative, for example, L-shaped—it is always possible to place small buildings, or building projections, or walls in such a way as to break the space into positive pieces.



Transform this. . . . . .to this.

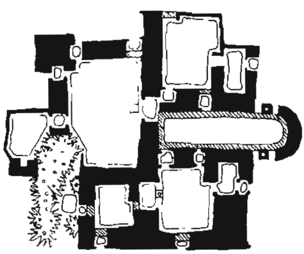
And when an existing open space is too enclosed, it may be possible to break a hole through the building to open the space up.



Transform this. . . . . .to this.

Therefore:

Make all the outdoor spaces which surround and lie between your buildings positive. Give each one some degree of enclosure; surround each space with wings of buildings, trees, hedges, fences, arcades, and trellised walks, until it becomes an entity with a positive quality and does not spill out indefinitely around corners.



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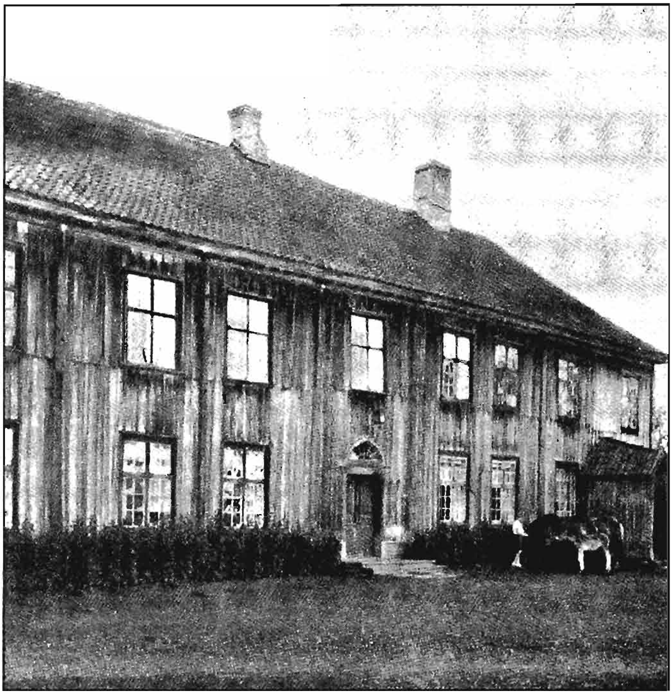
Place WINGS OF LIGHT (107) to form the spaces. Use open trellised walks, walls, and trees to close off spaces which are too exposed—TREE PLACES (171), GARDEN WALL (173), TRELLISED WALK (174); but make sure that every space is always open to some larger space, so that it is not too enclosed—HIERARCHY OF OPEN SPACE (114). Use BUILDING FRONTS (122) to help create the shape of space. Complete the positive character of the outdoors by making places all around the edge of buildings, and so make the outdoors as much a focus of attention as the buildings—BUILDING EDGE (160). Apply this pattern to COURTYARDS WHICH LIVE (115), ROOF GARDENS (118), PATH SHAPE (121), OUTDOOR ROOM (163), GARDEN GROWING WILD (172).

107 WINGS OF LIGHT**



. . . at this stage, you have a rough position for the building or buildings on the site from SOUTH FACING OUTDOORS (105) and POSITIVE OUTDOOR SPACE (106). Before you lay out the interior of the building in detail, it is necessary to define the shapes of roofs and buildings in rather more detail. To do this, go back to the decisions you have already made about the basic social components of the building. In some cases, you will have made these decisions according to the individual case; in other cases you may have used the fundamental social patterns to define the basic entities—THE FAMILY (75), HOUSE FOR A SMALL FAMILY (76), HOUSE FOR A COUPLE (77), HOUSE FOR ONE PERSON (78), SELF-GOVERNING WORKSHOPS AND OFFICES (80), SMALL SERVICES WITHOUT RED TAPE (81), OFFICE CONNECTIONS (82), MASTER AND APPRENTICES (83), INDIVIDUALLY OWNED SHOPS (87). Now it is time to start giving the building a more definite shape based on these social groupings. Start by realizing that the building needn't be a massive hulk, but may be broken into wings.

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Modern buildings are often shaped with no concern for natural light—they depend almost entirely on artificial light. But buildings which displace natural light as the major source of illumination are not fit places to spend the day.

A monster building—no concern for daylight inside.

This simple statement, if taken seriously, will make a revolution in the shape of buildings. At present, people take for granted that it is possible to use indoor space which is lit by artificial light; and buildings therefore take on all kinds of shapes and depths.

If we treat the presence of natural light as an *essential*—not optional—feature of indoor space, then no building could ever be more than 20–25 feet deep, since no point in a building which is more than about 12 or 15 feet from a window, can get good natural light.

Later on, in LIGHT ON TWO SIDES (159), we shall argue, even more sharply, that every room where people can feel comfortable must have not merely one window, but two, on different sides. This adds even further structure to the building shape: it requires not only that the building be no more than 25 feet deep, but also that its outer walls are continually broken up by corners and re-entrant corners to give every room two outside walls.

The present pattern, which requires that buildings be made up of long and narrow wings, lays the groundwork for the later pattern. Unless the building is first conceived as being made of long, thin wings, there is no possible way of introducing LIGHT ON TWO SIDES (159), in its complete form, later in the process. Therefore, we first build up the argument for this pattern, based on the human requirements for natural light, and later, in LIGHT ON TWO SIDES (159), we shall be concerned with the organization of windows within a particular room.

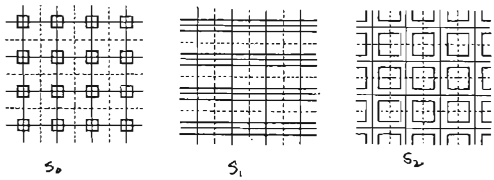
There are two reasons for believing that people must have buildings lit essentially by sun.

First, all over the world, people are rebelling against windowless buildings; people complain when they have to work in places without daylight. By analyzing words they use, Rapoport has shown that people are in a more positive frame of mind in rooms with windows than in rooms without windows. (Amos Rapoport, "Some Consumer Comments on a Designed Environment," *Arena*, January, 1967, pp. 176–78.) Edward Hall tells the story of a man who worked in a windowless office for some time, all the time saying that it was "just fine, just fine," and then abruptly quit. Hall says, "The issue was so deep, and so serious, that this man could not even bear to discuss it, since just discussing it would have opened the floodgates."

Second, there is a growing body of evidence which suggests that man actually *needs* daylight, since the cycle of daylight somehow plays a vital role in the maintenance of the body's circadian rhythms, and that the change of light during the day, though apparently variable, is in this sense a fundamental constant by which the human body maintains its relationship to the environment. (See, for instance, R. G. Hopkinson, *Architectural Physics: Lighting*, Department of Scientific & Industrial Research, Building Research Station, HMSO, London, 1963, pp. 116–17.) If this is true, then too much artificial light actually creates a rift between a person and his surroundings and upsets the human physiology.

Many people will agree with these arguments. Indeed, the arguments merely express precisely what all of us know already: that it is much more pleasant to be in a building lit by daylight than in one which is not. But the trouble is that many of the buildings which are built without daylight are built that way because of density. They are built compact, in the belief that it is necessary to sacrifice daylight in order to reach high densities.

Lionel March and Leslie Martin have made a major contribution to this discussion. (Leslie Martin and Lionel March, *Land Use and Built Form*, Cambridge Research, Cambridge University, April 1966.) Using the ratio of built floor area to total site area as a measure of density and the semi-depth of the building as a measure of daylight conditions, they have compared three different arrangements of building and open space, which they call S_0, S_1, and S_2.



Three building types.

Of the three arrangements, S_2, in which buildings surround the outdoors with thin wings, gives the best daylight conditions for a fixed density. It also gives the highest density for a fixed level of daylight.

There is another criticism that is often leveled against this pattern. Since it tends to create buildings which are narrow and rambling, it increases the perimeter of buildings and therefore raises building cost substantially. How big is the difference? The following figures are taken from a cost analysis of standard office buildings used by Skidmore Owings and Merrill, in the program BOP (Building Optimization). These figures illustrate costs for a typical floor of an office building and are based on costs of 21 dollars per square foot for the structure, floors, finishes, mechanical, and so on, not including exterior wall, and a cost of 110 dollars per running foot for the perimeter wall. (Costs are for 1969.)

Area (Sq. Ft.)	Shape	Perimeter Cost (S)	Perimeter Cost Per Sq. Ft. (S)	Total Cost Per Sq. Ft. (S)
15,000	120 x 125	$54,000	3.6	24.6
15,000	100 x 150	55,000	3.7	24.7
15,000	75 x 200	60,500	4.0	25.0
15,000	60 x 250	68,000	4.5	25.5
15,000	50 x 300	77,000	5.1	26.1

The extra perimeter adds little to building costs.

We see then, that at least in this one case, the cost of the extra perimeter adds very little to the cost of the building. The narrowest building costs only 6 per cent more than the squarest. We believe this case is fairly typical and that the cost savings to be achieved by square and compact building forms have been greatly exaggerated.

Now, assuming that this pattern is compatible with the problems of density and perimeter cost, we must decide how wide a building can be, and still be essentially lit by the sun.

We assume, first of all, that no point in the building should have less than 20 lumens per square foot of illumination. This is the level found in a typical corridor and is just below the level required for reading. We assume, second, that a place will only seem "naturally" lit, if more than 50 per cent of its light comes from the sky: that is, even the points furthest from the windows must be getting at least 10 lumens per square foot of their illumination from the sky.

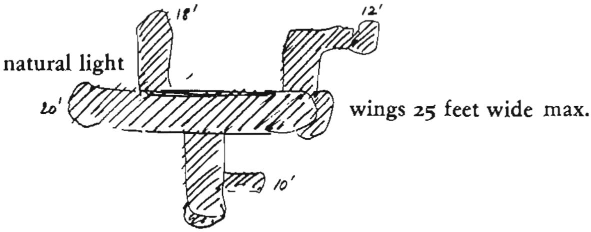
Let us now look at a room analyzed in detail by Hopkinson and Kay. The room, a classroom, is 18 feet deep, 24 feet wide, with a window all along one side starting three feet above the floor. Walls have a reflectance of 40 per cent—a fairly typical value. With a standard sky, the desks 15 feet from the window are just getting 10 lumens per square foot from the sky—our minimum. Yet this is a rather well lit room. R. G. Hopkinson and J. G. Kay, *The Lighting of Buildings,* New York: Praeger, 1969, p. 108).

It is hard to imagine then, that many rooms more than 15 feet deep will meet our standards. Indeed, many patterns in this book will tend to reduce the window area—WINDOWS OVERLOOKING LIFE (192), NATURAL DOORS AND WINDOWS (221), DEEP REVEALS (223), SMALL PANES (239), so that in many cases rooms should be no more than 12 feet deep—more only if the walls are very light or the ceilings very high. We conclude, therefore, that a building wing that is truly a "wing of light" must be about 25 feet wide—never wider than 30 feet—with the interior rooms "one deep" along the wing. When buildings are wider than this, artificial light, of necessity, takes over.

A building which simply has to be wide—a large hall for example—can have the proper level of natural light if there are extra clerestory windows in the roof.

Therefore:

Arrange each building so that it breaks down into wings which correspond, approximately, to the most important natural social groups within the building. Make each wing long and as narrow as you can—never more than 25 feet wide.



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Use the wings to form outdoor areas which have a definite shape, like courts and rooms—POSITIVE OUTDOOR SPACE (106); connect the wings, whenever possible, to the existing buildings round about so that the building takes its place within a long and rambling continuous fabric—CONNECTED BUILDINGS (108). When you get further down and start defining individual rooms, make use of the daylight which the wings provide by giving each room LIGHT ON TWO SIDES (159).

Give each wing its own roof in such a way that all the wings together form a great cascade of roofs—CASCADE OF ROOFS (116); if the wing contains various houses, or workgroups, or a sequence of major rooms, build access to these rooms and groups of rooms from one side, from an arcade, or gallery, not from a central corridor—ARCADES (119), SHORT PASSAGES (132). For the load bearing structure of the wings, begin with STRUCTURE FOLLOWS SOCIAL SPACES (205). . . .

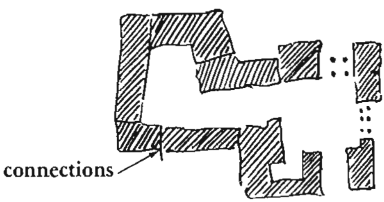
favorable for building, since its effect is not concentrated anywhere but is scattered all about it. Such an exposed building will always appear like a cake on a serving-platter. To start with, any life-like organic integration with the site is ruled out. . . .

It is really a foolish fad, this craze for isolating buildings. . . . (Camillo Sitte, *City Planning According to Artistic Principles*, New York: Random House, 1965, pp. 25–31.)

A fabric of connected buildings.

Therefore:

Connect your building up, wherever possible, to the existing buildings round about. Do not keep set backs between buildings; instead, try to form new buildings as continuations of the older buildings.



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Connect buildings with arcades, and outdoor rooms, and courtyards where they cannot be connected physically, wall to wall—COURTYARDS WHICH LIVE (115), ARCADES (119), OUTDOOR ROOMS (163). . . .

When buildings are isolated and free standing, it is of course not necessary for the people who own them, use them, and repair them to interact with one another at all. By contrast, in a town where buildings lean against each other physically, the sheer fact of their adjacency forces people to confront their neighbors, forces them to solve the myriad of little problems which occur between them, forces them to learn how to adapt to other people's foibles, forces them to learn how to adapt to the realities outside them, which are greater, and more impenetrable than they are.

Not only is it true that connected buildings have these healthy consequences and that isolated buildings have unhealthy ones. It seems very likely—though we have no evidence to prove it—that, in fact, isolated buildings have become so popular, so automatic, so taken for granted in our time, because people seek refuge from the need to confront their neighbors, refuge from the need to work out common problems. In this sense, the isolated buildings are not only symptoms of withdrawal, but they also perpetuate and nurture the sickness.

If this is so, it is literally not too much to say that *in those parts of town where densities are relatively high*, isolated buildings, and the laws which create and enforce them, are undermining the fabric of society as forcibly and as persistently as any other social evil of our time.

By contrast, Sitte gives a beautiful discussion, with many examples, of the normal way that buildings were connected in ancient times:

> The result is indeed astonishing, since from amongst 255 churches:
> 41 have one side attached to other buildings
> 96 have two sides attached to other buildings
> 110 have three sides attached to other buildings
> 2 have four sides obstructed by other buildings
> 6 are free standing
>
> 255 churches in all; only 6 free-standing.
>
> Regarding Rome then, it can be taken as a rule that churches were never erected as free-standing structures. Almost the same is true, in fact, for the whole of Italy. As is becoming clear, our modern attitude runs precisely contrary to this well-integrated and obviously thought-out procedure. We do not seem to think it possible that a new church can be located anywhere except in the middle of its building lot, so that there is space all around it. But this placement offers only disadvantages and not a single advantage. It is the least

. . . this pattern helps to complete BUILDING COMPLEX (95), WINGS OF LIGHT (107), and POSITIVE OUTDOOR SPACE (106). It helps to create positive outdoor space, especially, by eliminating all the wasted areas between buildings. As you connect each building to the next you will find that you make the outdoor space positive, almost instinctively.

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Isolated buildings are symptoms of a disconnected sick society.

Even in medium and high density areas where buildings are very close to each other and where there are strong reasons to connect them in a single fabric, people still insist on building isolated structures, with little bits of useless space around them.

These buildings pretend to be independent of one another— and this pretense leads to useless space around them.

Indeed, in our time, isolated, free-standing buildings are so common, that we have learned to take them for granted, without realizing that all the psycho-social disintegration of society is embodied in the fact of their existence.

It is easiest to understand this at the emotional level. The house, in dreams, most often means the self or person of the dreamer. A town of disconnected buildings, in a dream, would be a picture of society, made up of disconnected, isolated, selves. And the real towns which have this form, like dreams, embody just this meaning: they perpetuate the arrogant assumption that people stand alone and exist independently of one another.

108 CONNECTED BUILDINGS*

109 LONG THIN HOUSE*

. . . for a very small house or office the pattern of WINGS OF LIGHT (106) is almost automatically solved—no one would imagine that the house should be more than 25 feet wide. But in such a house or office there are strong reasons to make the building even longer and thinner still. This pattern was originally formulated by Christie Coffin.

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The shape of a building has a great effect on the relative degrees of privacy and overcrowding in it, and this in turn has a critical effect on people's comfort and well being.

There is widespread evidence to show that overcrowding in small dwellings causes psychological and social damage. (For example, Wiliam C. Loring, "Housing Characteristics and Social Disorganization," *Social Problems*, January 1956; Chombart de Lauwe, *Famille et Habitation,* Editions du Centre National de la Recherche Scientifique, Paris, 1959; Bernard Lander, *Towards an Understanding of Juvenile Delinquency*, New York: Columbia University Press, 1954.) Everyone seems to be on top of everyone else. Everything seems to be too near everything else. Privacy for individuals or couples is almost impossible.

It would be simple to solve these problems by providing more space—but space is expensive, and it is usually impossible to buy more than a certain very limited amount of it. So the question is: *For a given fixed area, which shape will create the greatest feeling of spaciousness?*

There is a mathematical answer to this question.

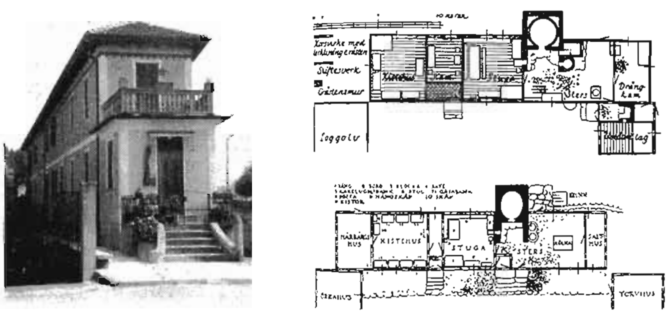
The feeling of overcrowding is largely created by the mean point-to-point distances inside a building. In a small house these distances are small—as a result it is not possible to walk far inside the house nor to get away from annoying disturbances; and it is hard to get away from noise sources, even when they are in other rooms.

To reduce this effect the building should have a shape for which the mean point-to-point distance is high. (For any given shape, we may compute the mean or average distance between two randomly chosen points within the shape). The mean point-to-point distance is low in compact shapes like circles and squares, and high in those distended shapes like long thin rectangles, and branched shapes, and tall narrow towers. These shapes increase the separation between places inside the building and therefore increase the relative privacy which people are able to get within a given area.

Buildings which increase the distance between points. . .

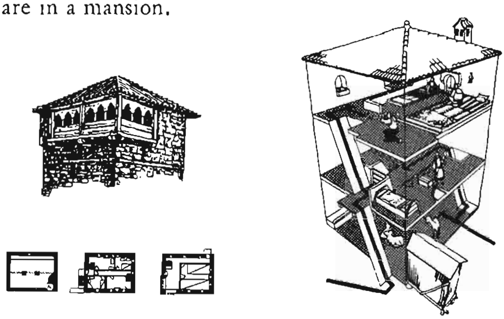
Of course, in practice there are limits on the long-thinness of a building. If it is too long and thin, the cost of walls becomes prohibitive, the cost of heating is too high, and the plan is not useful. But this is still no reason to settle only for box-like forms.

A small building can actually be much narrower than people imagine. It can certainly be much narrower than the 25 foot width proposed in WINGS OF LIGHT (107). We have seen successful buildings as narrow as 12 feet wide—indeed, Richard Neutra's own house in Los Angeles is even less.



Long thin houses.

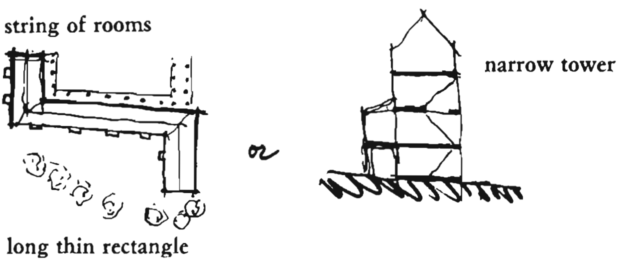
And a long thin house can also be a tower, or a pair of towers, connected at ground level. Towers, like floors can be much narrower than people realize. A building which is 12 feet square, and three stories high, with an exterior stair, makes a wonderful house. The rooms are so far apart, psychologically, that you feel as if you are in a mansion.



A Russian tower.

Therefore:

In small buildings, don't cluster all the rooms together around each other; instead string out the rooms one after another, so that distance between each room is as great as it can be. You can do this horizontally—so that the plan becomes a thin, long rectangle; or you can do it vertically —so that the building becomes a tall narrow tower. In either case, the building can be surprisingly narrow and still work—8, 10, and 12 feet are all quite possible.



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Use the long thin plan to help shape outdoor space on the site—POSITIVE OUTDOOR SPACE (106); the long perimeter of the building sets the stage for INTIMACY GRADIENT (127) and for the CASCADE OF ROOFS (116). Make certain that the privacy which is achieved with the thinness of the building is balanced with the communality at the crossroads of the house—COMMON AREAS AT THE HEART (129). . . .

within the buildings' wings, lay out the entrances, the gardens, courtyards, roofs and terraces: shape both the volume of the buildings and the volume of the space between the buildings at the same time—remembering that indoor space and outdoor space, like yin and yang, must always get their shape together.

110. MAIN ENTRANCE

111. HALF-HIDDEN GARDEN

112. ENTRANCE TRANSITION

113. CAR CONNECTION

114. HIERARCHY OF OPEN SPACE

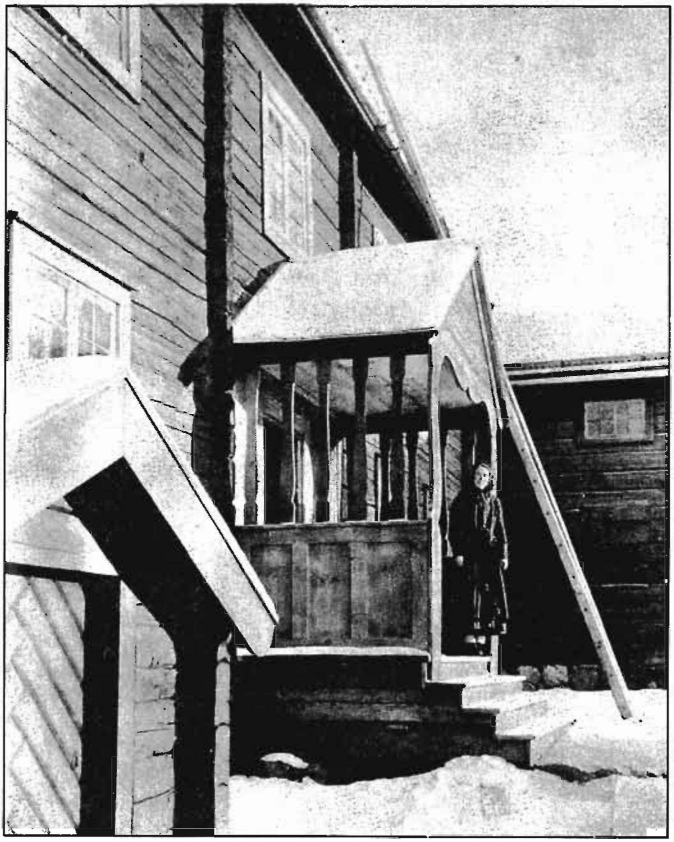
115. COURTYARDS WHICH LIVE

116. CASCADE OF ROOFS

117. SHELTERING ROOF

118. ROOF GARDEN

110 MAIN ENTRANCE**



. . . you have a rough position for your building on the site—SITE REPAIR (104), SOUTH FACING OUTDOORS (105), WINGS OF LIGHT (107). You also have an idea of the major circulation in the building complex and the lines of approach which lead toward the building—CIRCULATION REALMS (98), FAMILY OF ENTRANCES (102). Now it is time to fix the entrance of the building.

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Placing the main entrance (or main entrances) is perhaps the single most important step you take during the evolution of a building plan.

The position of main entrances controls the layout of the building. It controls movement to and from the building, and all the other decisions about layout flow from this decision. When the entrances are placed correctly, the layout of the building unfolds naturally and simply; when the entrances are badly placed, the rest of the building never seems quite right. It is therefore vital that the position of the main entrance (or entrances) be made early and correctly.

The functional problem which guides the placing of main entrances is simple. *The entrance must be placed in such a way that people who approach the bulding see the entrance or some hint of where the entrance is, as soon as they see the building itself.* This makes it possible for them to orient their movements toward the entrance as soon as they start moving toward the building, without having to change direction or change their plan of how they will approach the building.

The functional problem is rather obvious, but it is hard to overestimate the contribution it makes to a good building. We have had the experience over and again, that until this question is settled and an appropriate position chosen, a project is at a stalemate. And conversely, once the main entrances have been located and they can be felt to be in the right position, then other decisions begin to come naturally. This is true for single houses, house clusters, small public buildings, large complexes of public buildings. Apparently, the pattern is basic, no matter the scale of the building.

Let us look into the functional question in more detail. Everyone finds it annoying to search around a building, or a precinct of buildings, looking for the proper entrance. When you know just where the entrance is, you don't have to bother thinking about it. It's automatic—you walk in, thinking about whatever's on your mind, looking at whatever catches your eye—you are not forced to pay attention to the environment simply to get around. Yet the entrances to many buildings are hard to find; they are not "automatic" in this sense.

There are two steps to solving the problem. First, the main entrances must be placed correctly. Second, they must be shaped so they are clearly visible.

1. Position

Consciously or unconsciously, a person walking works out his path some distance ahead, so as to take the shortest path. (See Tyrus Porter, *A Study of Path Choosing Behavior*, thesis, University of California, Berkeley, 1964). If the entrance is not visible when the building itself becomes visible, he cannot work out his path. To be able to work out his path, he must be able to see the entrance early, as soon as he sees the building.

And for other reasons too, the entrance needs to be the first thing that you come to. If you have to walk a long distance along the building before you can enter, the chances are high that you will have to turn back after entering, and walk back in the direction you came from. This is not only annoying, but you may even begin to wonder whether you are going the right way and whether you haven't perhaps even missed the proper entrance. It is hard to pin this down numerically, but we suggest a threshold of some 50 feet. No one is bothered by a detour of 50 feet; if it gets much longer, it begins to be annoying.

Therefore, the first step in placing the entrances is to consider the main lines of approach to the site. Locate entrances so that, once the building(s) come into view, the entrance, too, comes into view; and the path toward the entrance is not more than 50 feet along the building.

Entrance position.

2. *Shape*

A person approaching a building needs to see the entrance clearly. Yet many of the people approaching the building are walking along the front of the building and parallel to it. Their angle of approach is acute. From this angle, many entrances are hardly visible. An entrance will be visible from an acute angled approach if:

a. The entrance sticks out beyond the building line.

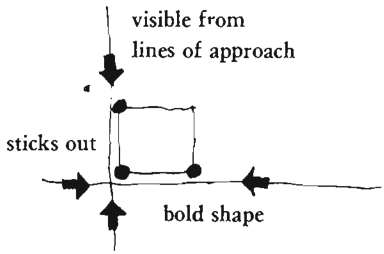
b. The building is higher around the entrance, and this height is visible along the approach.

Entrance shape.

And of course, the relative color of the entrance, the light and shade immediately around it, the presence of mouldings and ornaments, may all play a part too. But above all, it is important that the entrance be strongly differentiated from its immediate surroundings.

Therefore:

Place the main entrance of the building at a point where it can be seen immediately from the main avenues of approach and give it a bold, visible shape which stands out in front of the building.



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If possible, make the entrance one of a family of similar entrances, so that they all stand out as visibly as possible within the street or building complex—FAMILY OF ENTRANCES (102); build that part of the entrance which sticks out, as a room, large enough to be a pleasant, light, and beautiful place—ENTRANCE ROOM (130) and bring the path between the street and this entrance room through a series of transitions of light and level and view—ENTRANCE TRANSITION (112). Make sure that the entrance has the proper relationship to parking—SHIELDED PARKING (97), CAR CONNECTION (113) . . .

111 HALF-HIDDEN GARDEN*

. . . this pattern helps to form the fundamental layout of HOUSE CLUSTERS (37), ROW HOUSES (38), WORK COMMUNITY (41), YOUR OWN HOME (79), and BUILDING COMPLEX (95), because it influences the relative position of the buildings and their gardens. Since it affects the position of the buildings, and the shape and position of the gardens, it can also be used to help create SOUTH FACING OUTDOORS (105) and to help the general process of SITE REPAIR (104).

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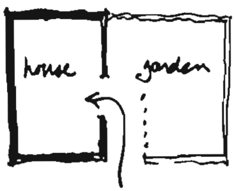
If a garden is too close to the street, people won't use it because it isn't private enough. But if it is too far from the street, then it won't be used either, because it is too isolated.

Start by thinking about the front gardens which you know. They are often decorative, lawns, flowers. But how often are people sitting there? Except at those special moments, when people want specifically to be watching the street, the front garden is nothing but a decoration. The half-private family groups, drinks with friends, playing ball with the children, lying in the grass—these need more protection than the typical front garden can create.

And the back gardens do not really solve the problem either. Those back gardens which are entirely isolated, entirely "in back" —are so remote from the street, that people often don't feel comfortable there either. Often the back garden is so remote from the street, that you can't hear people coming to the house; you have no sense of any larger, more open space, no sense of other people—only the enclosed, isolated, fenced-in world of one family. Children, so much more spontaneous and intuitive, give us a view in microcosm. How rarely they play in the full back garden; how much more often they prefer these side yards and gardens which have some privacy, yet also some exposure to the street.

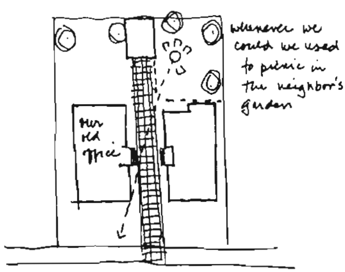
It seems then, that the proper place for a garden is neither in front, nor fully behind. The garden needs a certain degree of privacy, yet also wants some kind of tenuous connection to the street and entrance. This balance can only be created in a situation where the garden is half in front, half in back—in a word, at the side, protected by a wall from too great an exposure to the street; and yet open enough, through paths, gates, arcades, trellises, so that people in the garden still have a glimpse of the street, a view of the front door or the path to the front door.

All this requires a revolution in the normal conception of a "lot." Lots are usually narrow along the street and deep. But to create half-hidden gardens, the lots must be long along the street, and shallow, so that each house can have a garden at its side. This gives the following archetype for house and half-hidden.



Archetype of a half-hidden garden.

There are many ways of developing this idea. One version we experienced in an old house where we once had our offices was particularly interesting.

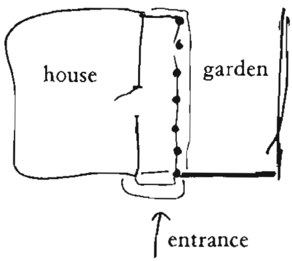


Another example.

The garden that *we* used was to the back, but behind the *next-door* house. It worked perfectly as a half-hidden garden for our house. We were able to sit there privately and have our lunch, and work on warm days, and still be in touch with the main entrance and even a glimpse of the street. But our own back garden was entirely hidden—and we never used it.

Therefore:

Do not place the garden fully in front of the house, nor fully to the back. Instead, place it in some kind of half-way position, side-by-side with the house, in a position which is half-hidden from the street, and half-exposed.



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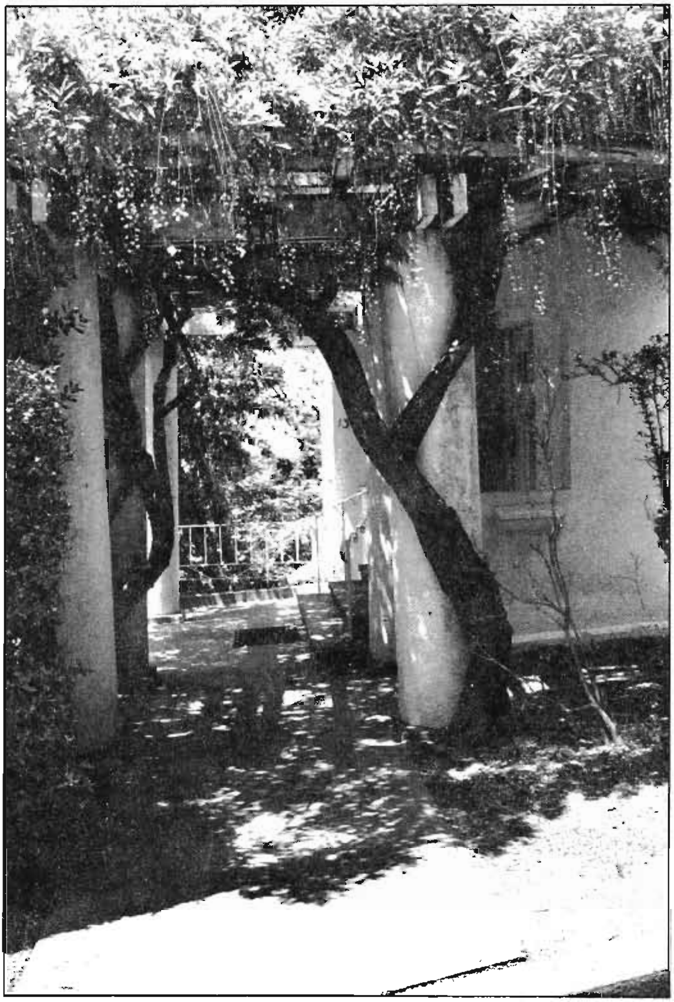
If possible, use this pattern to influence the shape of house lots too, and make them as near double squares along the street as possible; build a partial wall around the garden, and locate the entrance to the house between the house and the garden, so that people in the garden can be private, yet still aware of the street, and aware of anybody coming up to the house—MAIN ENTRANCE (110), GARDEN WALL (173); allow the garden to grow wild—GARDEN GROWING WILD (172), and make the passage through, or alongside it, a major part of the transition between street and house—ENTRANCE TRANSITION (112). Half-hidden gardens may be COURTYARDS WHICH LIVE (115), ROOF GARDENS (118), or a PRIVATE TERRACE ON THE STREET (140). . . .

112 ENTRANCE TRANSITION**



. . . whatever kind of building or building complex you are making, you have a rough position for its major entrances—the gateways to the site from MAIN GATEWAYS (53); the entrances to individual buildings from FAMILY OF ENTRANCES (102), MAIN ENTRANCE (110). In every case, the entrances create a transition between the "outside"—the public world—and some less public inner world. If you have HALF-HIDDEN GARDENS (111) the gardens help to intensify the beauty of the transition. This pattern now elaborates and reinforces the transition which entrances and gardens generate.

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Buildings, and especially houses, with a graceful transition between the street and the inside, are more tranquil than those which open directly off the street.

The experience of entering a building influences the way you feel inside the building. If the transition is too abrupt there is no feeling of arrival, and the inside of the building fails to be an inner sanctum.

An abrupt entrance—no transition.

The following argument may help to explain it. While people are on the street, they adopt a style of "street behavior." When they come into a house they naturally want to get rid of this street behavior and settle down completely into the more intimate spirit appropriate to a house. But it seems likely that they cannot do this unless there is a transition from one to the other which helps them to lose the street behavior. The transition must, in effect, destroy the momentum of the closedness, tension and "distance" which are appropriate to street behavior, before people can relax completely.

Evidence comes from the report by Robert Weiss and Serge Bouterline, *Fairs, Exhibits, Pavilions, and their Audiences*, Cambridge, Mass., 1962. The authors noticed that many exhibits failed to "hold" people; people drifted in and then drifted out again within a very short time. However, in one exhibit people had to cross a huge, deep-pile, bright orange carpet on the way in. In this case, though the exhibit was no better than other exhibits, people stayed. The authors concluded that people were, in general, under the influence of their own "street and crowd behavior," and that while under this influence could not relax enough to make contact with the exhibits. But the bright carpet presented them with such a strong contrast as they walked in, that it broke the effect of their outside behavior, in effect "wiped them clean," with the result that they could then get absorbed in the exhibit.

Michael Christiano, while a student at the University of California, made the following experiment. He showed people photographs and drawings of house entrances with varying degrees of transition and then asked them which of these had the most "houseness." He found that the more changes and transitions a house entrance has, the more it seems to be "houselike." And the entrance which was judged most houselike of all is one which is approached by a long open sheltered gallery from which there is a view into the distance.

There is another argument which helps to explain the importance of the transition: people want their house, and especially the entrance, to be a private domain. If the front door is set back, and there is a transition space between it and the street, this domain is well established. This would explain why people are often unwilling to go without a front lawn, even though they do not "use it." Cyril Bird found that 90 per cent of the inhabitants of a housing project said their front gardens, which were some 20 feet deep, were just right or even too small—yet only 15 per cent of them ever used the gardens as a place to sit. ("Reactions to Radburn: A Study of Radburn Type Housing, in Hemel Hempstead," RIBA final thesis, 1960.)

So far we have spoken mainly about houses. But we believe this pattern applies to a wide variety of entrances. It certainly applies to all dwellings including apartments—even though it is usually missing from apartments today. It also applies to those public buildings which thrive on a sense of seclusion from the world: a clinic, a jewelry store, a church, a public library. It does not apply to public buildings or any buildings which thrive on the fact of being continuous with the public world.

Here are four examples of successful entrance transitions.

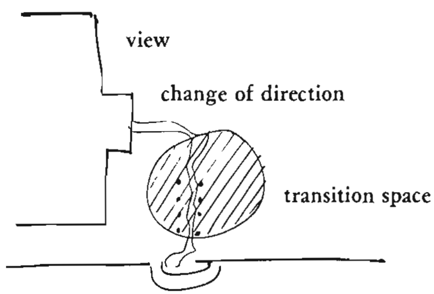
Each creates the transition with a different combination of elements.

As you see from these examples, it is possible to make the transition itself in many different physical ways. In some cases, for example, it may be just inside the front door—a kind of entry court, leading to another door or opening that is more definitely inside. In another case, the transition may be formed by a bend in the path that takes you through a gate and brushes past the fuchsia on the way to the door. Or again, you might create a transition by changing the texture of the path, so that you step off the sidewalk onto a gravel path and then up a step or two and under a trellis.

In all these cases, what matters most is that the transition exists, as an actual physical place, between the outside and the inside, and that the view, and sounds, and light, and surface which you walk on change as you pass through this place. It is the physical changes—and above all the change of view—which creates the psychological transition in your mind.

Therefore:

Make a transition space between the street and the front door. Bring the path which connects street and entrance through this transition space, and mark it with a change of light, a change of sound, a change of direction, a change of surface, a change of level, perhaps by gateways which make a change of enclosure, and above all with a change of view.



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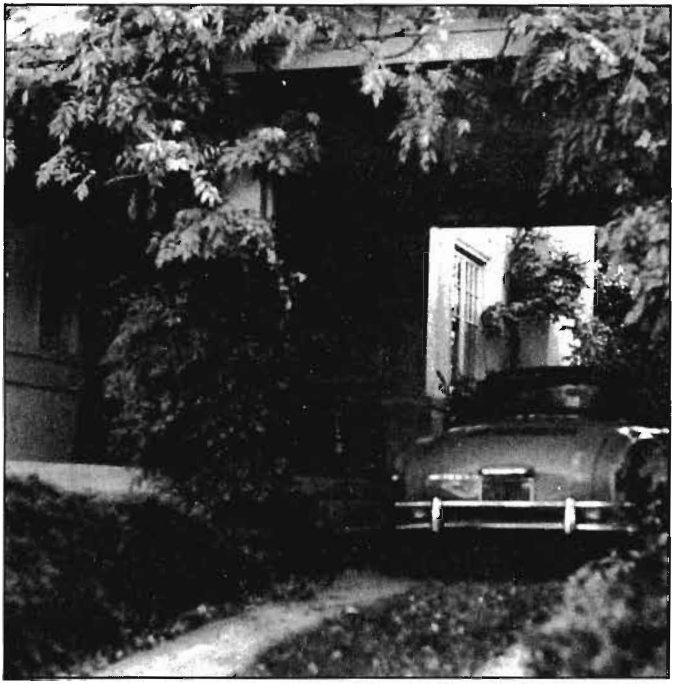
Emphasize the momentary view which marks the transition by a glimpse of a distant place—ZEN VIEW (134); perhaps make a gateway or a simple garden gate to mark the entrance—GARDEN WALL (173); and emphasize the change of light—TAPESTRY OF LIGHT AND DARK (135), TRELLISED WALK (174). The transition runs right up to the front door, up to the ENTRANCE ROOM (130), and marks the beginning of the INTIMACY GRADIENT (127). . . .

113 CAR CONNECTION



. . . once you have the entrance of the building fixed and its transition clear—MAIN ENTRANCE (110), ENTRANCE TRANSITION (112)—it is necessary to work out how a person can approach the building by car. Of course, in a pedestrian precinct this will not apply; but generally the car itself must have a housing somewhere near the building; and when this is so, its place and character are critical.

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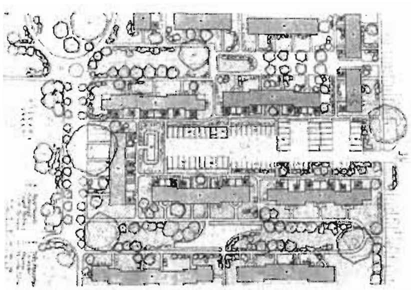
The process of arriving in a house, and leaving it, is fundamental to our daily lives; and very often it involves a car. But the place where cars connect to houses, far from being important and beautiful, is often off to one side and neglected.

This neglect can wreck havoc with the circulation in the house, especially in those houses with the traditional "front door and back door" relationship. Both family and visitors tend, more and more, to come and go by car. Since people always try to use the door nearest the car (see Vere Hole, et al., "Studies of 800 Houses in Conventional and Radburn Layouts," Building Research Station, Garston, Herts, England, 1966), the entrance nearest the parking spot always becomes the "main" entrance, even if it was not planned that way.



The car entrance becomes the main entrance —regardless of the plan.

If this entrance is a "back" door, then the back of the house becomes less a sanctuary for the family and perhaps the housewife feels uncomfortable about guests traipsing through. On the other hand, if this entrance is a formal "front" door, it is not really appropriate for family and good friends. In Radburn, the back doors face the parking lot, and the front doors face a pedestrian green. For families with cars, the back door, being on the car side, dominates exit and entry, yet visitors are "supposed" to come to the front door.

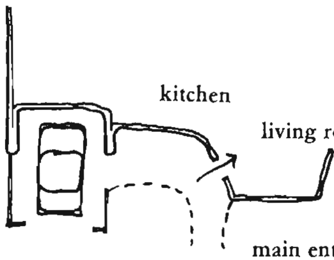
In order to ensure that both the kitchen and formal living room are conveniently located with respect to cars and that each space maintains its integrity in terms of use and privacy, there must be one and only one primary entrance into the house, and the kitchen and living room must be both directly accessible from this entrance. We do not mean that a house needs to have only one entrance. There is no reason why a house cannot have several entrances—indeed there are good reasons why it probably should have more than one. Secondary entrances, like patio and garden doors and teenager's private entrances, are very important. But they should never be placed so that they are in between the main entrance and the natural place to arrive by car—otherwise, they will compete with the main entrance and, again, confuse the way the house plan works.

Finally, it is essential to make something of the space which connects the house and the car, to make it a positive space—a space which supports the experience of coming and going. Essentially this means making a room out of the place for the car, the path from the car door to the house, and the front door. It may be achieved with columns, low walls, the edge of the house, plants, a trellised walk, a place to sit. This is the place we call the CAR CONNECTION (113). A proper car connection is a place where people can walk together, lean, say goodbye; perhaps it is integrated with the structure and form of the house.

An ancient inn, built in the days of coach and horses, has a layout which treats the coach as a fundamental part of the environment and makes the connection between the two a significant part of the inn—so much so that it gives the inn its character. Airports, boathouses, stables, railway stations, all do the same. But for some reason, even though the car is so important to the way of life in a modern house, the place where car and house meet is almost never treated seriously as a beautiful and significant place in its own right.

Therefore:

Place the parking place for the car and the main entrance, in such a relation to each other, that the shortest route from the parked car into the house, both to the kitchen and to the living rooms, is always through the main entrance. Make the parking place for the car into an actual room which makes a positive and graceful place where the car stands, not just a gap in the terrain.



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Place both kitchen and main common living room just inside the main entrance—INTIMACY GRADIENT (127), COMMON AREAS AT THE HEART (129); treat the place for the car as if it were an actual outdoor room—OUTDOOR ROOM (163). If it is enclosed, build the enclosure according to STRUCTURE FOLLOWS SOCIAL SPACES (205); and make the path between this room and the front door a beautiful path, preferably the same as the one used by people who come on foot—ENTRANCE TRANSITION (112), ARCADES (119), PATHS AND GOALS (120), RAISED FLOWERS (245). If you can, put the car connection on the north face of the building—NORTH FACE (162). . . .

114 HIERARCHY OF OPEN SPACE*

. . . the main outdoor spaces are given their character by SITE REPAIR (104), SOUTH FACING OUTDOORS (105) and POSITIVE OUTDOOR SPACE (106). But you can refine them, and complete their character by making certain that every space always has a view out into some other larger one, and that all the spaces work together to form hierarchies.

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Outdoors, people always try to find a spot where they can have their backs protected, looking out toward some larger opening, beyond the space immediately in front of them.

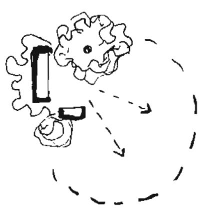
In short, people do not sit facing brick walls—they place themselves toward the view or toward whatever there is in the distance that comes nearest to a view.

Simple as this observation is, there is almost no more basic statement to make about the way people place themselves in space. And this observation has enormous implications for the spaces in which people can feel comfortable. Essentially, it means that any place where people can feel comfortable has

1. A back.
2. A view into a larger space.

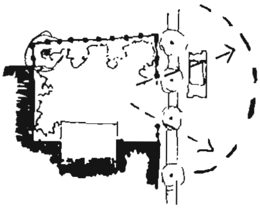
In order to understand the implications of this pattern, let us look at the three major cases where it applies.

In the very smallest of outdoor spaces, in private gardens, this pattern tells you to make a corner of the space as a "back" with a seat, looking out on the garden. If it is rightly made, this corner will be snug, but not at all claustrophobic.



Seat and garden.

Slightly larger in scale, there is the connection between a terrace or an outdoor room of some kind and a larger open space, the street or a square. The most common form of the pattern at this scale is the front stoop, which forms a definite enclosure and a back, off the public street.



Terrace and street or square.

At the largest scale, this pattern tells you to open up public squares and greens, at one end, to great vistas. At this scale, the square itself acts as a kind of back which a person can occupy, and from which he can look out upon an even larger expanse.

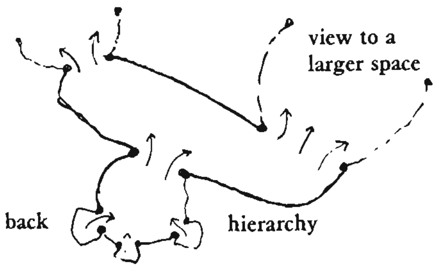
Square and vista.

Therefore:

Whatever space you are shaping—whether it is a garden, terrace, street, park, public outdoor room, or courtyard, make sure of two things. First, make at least one smaller space, which looks into it and forms a natural back for it. Second, place it, and its openings, so that it looks into at least one larger space.

When you have done this, every outdoor space will have

a natural "back"; and every person who takes up the natural position, with his back to this "back," will be looking out toward some larger distant view.



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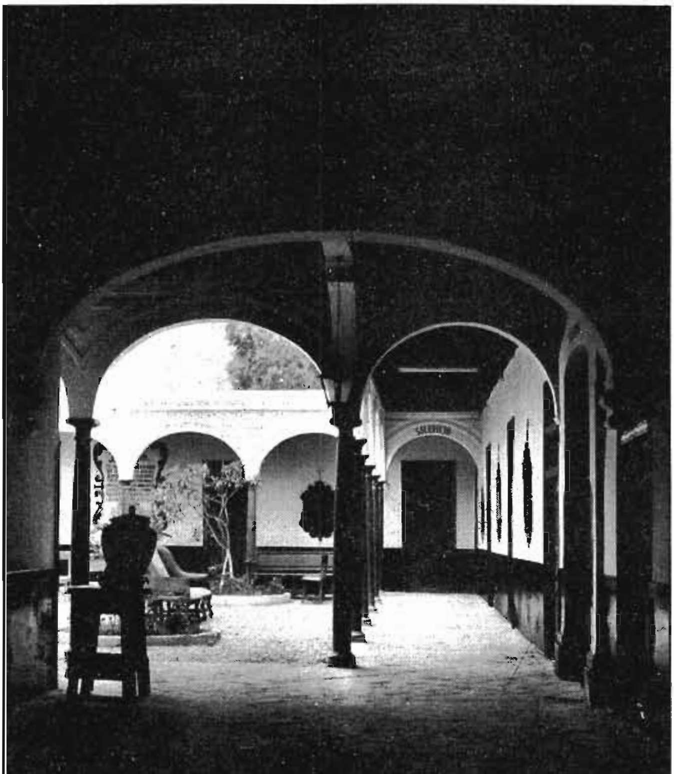
For example: garden seats open to gardens—GARDEN SEAT (176), HALF-HIDDEN GARDEN (106); activity pockets open to public squares—ACTIVITY POCKETS (124), SMALL PUBLIC SQUARE (61); gardens open to local roads—PRIVATE TERRACE ON THE STREET (140), LOOPED LOCAL ROAD (49), roads open to fields—GREEN STREETS (51), ACCESSIBLE GREENS (60); fields open to the countryside, on a great vista—COMMON LAND (67), THE COUNTRYSIDE (7). Make certain that each piece of the hierarchy is arranged so that people can be comfortably settled within it, oriented out toward the next larger space. . . .

115 COURTYARDS WHICH LIVE**



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. . . within the general scheme of outdoor spaces, made positive according to the patterns POSITIVE OUTDOOR SPACE (106) and HIERARCHY OF OPEN SPACE (114), it is necessary to pay special attention to those smallest ones, less than 30 or 40 feet across—the courtyards—because it is especially easy to make them in such a way that they do not live.

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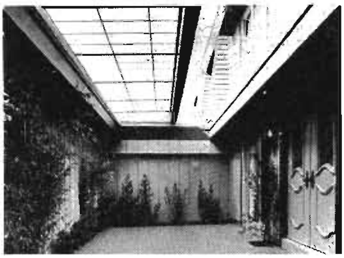
The courtyards built in modern buildings are very often dead. They are intended to be private open spaces for people to use—but they end up unused, full of gravel and abstract sculptures.



Dead courtyard.

There seem to be three distinct ways in which these courtyards fail.

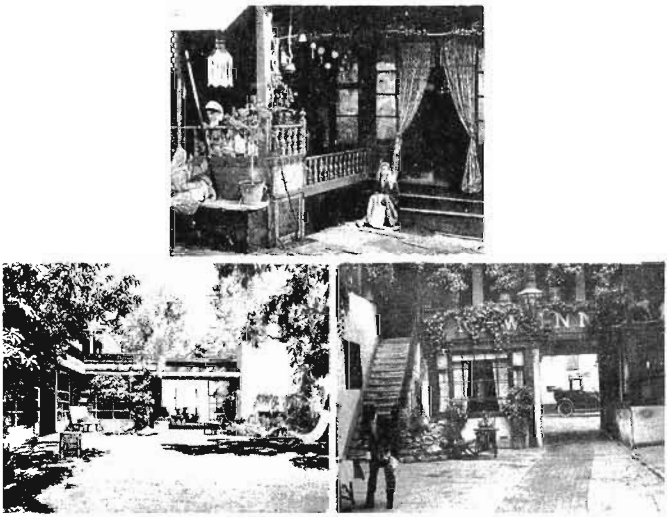
1. *There is too little ambiguity between indoors and outdoors.* If the walls, sliding doors, doors which lead from the indoors to the outdoors, are too abrupt, then there is no opportunity for a person to find himself half way between the two—and then, on the impulse of a second, to drift toward the outside. People need an ambiguous in-between realm—a porch, or a veranda, which they naturally pass onto often, as part of their ordinary life within the house, so that they can drift naturally to the outside.

2. *There are not enough doors into the courtyard.* If there is just one door, then the courtyard never lies between two activities inside the house; and so people are never passing through it, and enlivening it, while they go about their daily business. To overcome this, the courtyard should have doors on at least two op-

posite sides, so that it becomes a meeting point for different activities, provides access to them, provides overflow from them, and provides the cross-circulation between them.

3. They are too enclosed. Courtyards which are pleasant to be in always seem to have "loopholes" which allow you to see beyond them into some larger, further space. The courtyard should never be perfectly enclosed by the rooms which surround it, but should give at least a glimpse of some other space beyond.

Here are several examples of courtyards, large and small, from various parts of the world, which are alive.

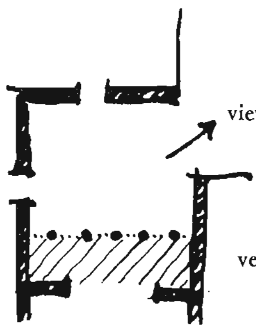


Courtyards which live.

Each one is partly open to the activity of the building that surrounds it and yet still private. A person passing through the courtyard and children running by can all be glimpsed and felt, but they are not disruptive. Again, notice that all these courtyards have strong connections to other spaces. The photographs do not tell the whole story; but still, you can see that the courtyards look out, along paths, through the buildings, to larger spaces. And most spectacular, notice the many different positions that one can take up in each courtyard, depending on mood and climate. There are covered places, places in the sun, places spotted with filtered light, places to lie on the ground, places where a person can sleep. The edge and the corners of the courtyards are ambiguous and richly textured; in some places the walls of the buildings open, and connect the courtyard with the inside of the building, directly.

Therefore:

Place every courtyard in such a way that there is a view out of it to some larger open space; place it so that at least two or three doors open from the building into it and so that the natural paths which connect these doors pass across the courtyard. And, at one edge, beside a door, make a roofed veranda or a porch, which is continuous with both the inside and the courtyard.



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Build the porch according to the patterns for ARCADE (119), GALLERY SURROUND (166), and SIX-FOOT BALCONY (167); make sure that it is in the sun—SUNNY PLACE (161); build the view out according to the HIERARCHY OF OPEN SPACE (114) and ZEN VIEW (134); make the courtyard like an OUTDOOR ROOM (163) and a GARDEN WALL (173) for more enclosure; make the height of the eaves around any courtyard of even height; if there are gable ends, hip them to make the roof edge level—ROOF LAYOUT (209); put SOMETHING ROUGHLY IN THE MIDDLE (126). . . .

116 CASCADE OF ROOFS*

. . . this pattern helps complete the BUILDING COMPLEX (95), NUMBER OF STORIES (96), MAIN BUILDING (99), and WINGS OF LIGHT (107), and it can also be used to help create these patterns. If you are designing a building from scratch, these larger patterns have already helped you to decide how high your buildings are; and they have given you a rough layout, in wings, with an idea of what spaces there are going to be in each floor of the wings. Now we come to the stage where it is necessary to visualize the building as a volume and, therefore, above all else, as a system of roofs.

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Few buildings will be structurally and socially intact, unless the floors step down toward the ends of wings, and unless the roof, accordingly, forms a cascade.

This is a strange pattern. Several problems, from entirely different spheres, point in the same direction; but there is no obvious common bond which binds these different problems to one another—we have not succeeded in seizing the single kernel which forms the pivot of the pattern.

Let us observe, first, that many beautiful buildings have the form of a cascade: a tumbling arrangement of wings and lower wings and smaller rooms and sheds, often with a single highest center. Hagia Sophia, the Norwegian stave churches, and Palladio's villas are imposing and magnificent examples. Simple houses, small

Hagia Sophia

informal building complexes, and even clusters of mud huts are more modest ones.

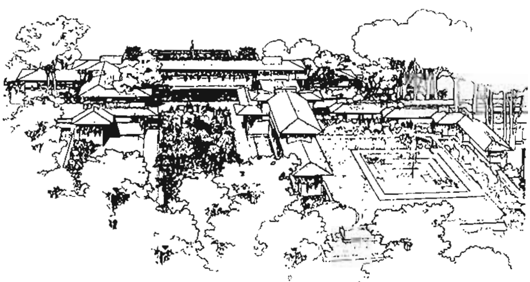
What is it that makes the cascading character of these buildings so sound and so appropriate?

First of all, there is a social meaning in this form. The largest gathering places with the highest ceilings are in the middle because they are the social centers of activities; smaller groups of people, individual rooms, and alcoves fall naturally around the edges.

Second, there is a structural meaning in the form. Buildings tend to be of materials that are strong in compression; compressive strength is cheaper then tensile strength or strength in bending. Any building which stands in pure compression will tend toward the overall outline of an inverted catenary—ROOF LAYOUT (209). When a building does take this form, each outlying space acts to buttress the higher spaces. The building is stable in just the same way that a pile of earth, which has assumed the line of least resistance, is also stable.

And third, there is a practical consideration. We shall explain that ROOF GARDENS (118), wherever they occur, should not be over the top floor, but always on the same level as the rooms they serve. This means, naturally, that the building tends to get lower toward the edges since the roof gardens step down from the top toward the outer edge of the ground floor.

Why do these three apparently different problems lead to the same pattern? We don't know. But we suspect that there is some deeper essence behind the apparent coincidence. We leave the pattern intact in the hope that someone else will understand its meaning.



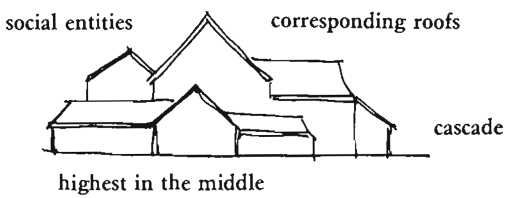
A sketch of Frank Lloyd Wright's.

Finally, a note on the application of the pattern. One must take care, in laying out large buildings, to make the cascade compatible with WINGS OF LIGHT (107). If you conceive of the cascade as pyramidal and the building is large, the middle section of the building will be cut off from daylight. Instead, the proper synthesis of cascades and wings of light will generate a building that tumbles down along relatively narrow wings, the wings turning corners and becoming lower where they will.

Therefore:

Visualize the whole building, or building complex, as a system of roofs.

Place the largest, highest, and widest roofs over those parts of the building which are most significant: when you come to lay the roofs out in detail, you will be able to make all lesser roofs cascade off these large roofs and form a stable self-buttressing system, which is congruent with the hierarchy of social spaces underneath the roofs.



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Make the roofs a combination of steeply pitched or domed, and flat shapes—SHELTERING ROOF (117), ROOF GARDEN (118). Prepare to place small rooms at the outside and ends of wings, and large rooms in the middle—CEILING HEIGHT VARIETY (190). Later, once the plan of the building is more exactly defined, you can lay out the roofs exactly to fit the cascade to individual rooms; and at that stage the cascade will begin to have a structural effect of great importance—STRUCTURE FOLLOWS SOCIAL SPACES (205), ROOF LAYOUT (209). . . .

117 SHELTERING ROOF**

. . . over the WINGS OF LIGHT (107), within the overall CASCADE OF ROOFS (116), some parts of the cascade are flat and some are steeply pitched or vaulted. This pattern gives the character of those parts which are steeply pitched or vaulted; the next one gives the character of those which must be flat.

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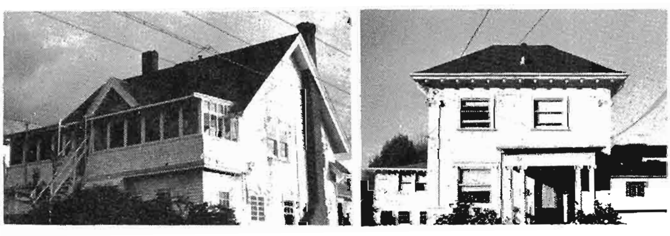
The roof plays a primal role in our lives. The most primitive buildings are nothing but a roof. If the roof is hidden, if its presence cannot be felt around the building, or if it cannot be used, then people will lack a fundamental sense of shelter.

This sheltering function cannot be created by a pitched roof, or large roof, which is merely added to the top of an existing structure. The roof itself only shelters if it contains, embraces, covers, surrounds the process of living. This means very simply, that the roof must not only be large and visible, but it must also include living quarters *within* its volume, not only underneath it.

Compare the following examples. They show clearly how different roofs are, when they have living quarters within them and when they don't.



One roof lived in, the other stuck on.

The difference between these two houses comes largely from the fact that in one the roof is an integral part of the volume of the building, while in the other it is no more than a cap that has been set down on top of the building. In the first case, where the building conveys an enormous sense of shelter, it is impossible to draw a horizontal line across the facade of the building and separate the roof from the inhabited parts of the building. But in the second case, the roof is so separate and distinct a thing, that such a line almost draws itself.

We believe that this connection between the geometry of roofs, and their capacity to provide psychological shelter, can be put on empirical grounds: first, there is a kind of evidence which shows that both children and adults naturally incline toward the sheltering roofs, almost as if they had archetypal properties. For example, here is Amos Rapoport on the subject:

> . . . "roof" is a symbol of home, as in the phrase "a roof over one's head," and its importance has been stressed in a number of studies. In one study, the importance of images—i.e., symbols—for house form is stressed, and the pitched roof is said to be symbolic of shelter while the flat roof is not, and is therefore unacceptable on symbolic grounds. Another study of this subject shows the importance of these aspects in the choice of house form in England, and also shows that the pitched, tile roof is a symbol of security. It is considered, and even shown in a building-society advertisement, as an umbrella, and the houses directly reflect this view. (Amos Rapoport, *House Form and Culture*, Englewood Cliffs, N.J.: Prentice-Hall, 1969, p. 134.)

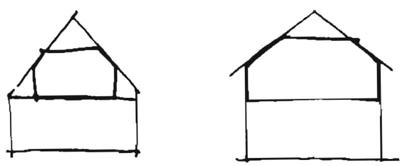
George Rand has drawn a similar point from his research. Rand finds that people are extremely conservative about their images of home and shelter. Despite 50 years of the flat roofs of the "modern movement," people still find the simple pitched roof the most powerful symbol of shelter. (George Rand, "Children's Images of Houses: A Prolegomena to the Study of Why People Still Want Pitched Roofs," *Environmental Design: Research and Practice*, Proceedings of the EDRA 3/AR 8 Conference, University of California at Los Angeles, William J. Mitchell, ed., January 1972, pp. 6–9–2 to 6–9–10.)

And the French psychiatrist, Menie Gregoire, makes the following observation about children:

> At Nancy the children from the apartments were asked to draw a house. These children had been born in these apartment slabs which stand up like a house of cards upon an isolated hill. Without exception they each drew a small cottage with two windows and smoke curling up from a chimney on the roof. (M. Gregoire, "The Child in the High-Rise," *Ekistics*, May 1971, pp. 331–33.)

Such evidence as this can perhaps be dismissed on the grounds that it is culturally induced. But there is a second kind of evidence, more obvious, which lies in the simple fact of making the connection between the features of a roof and the feeling of shelter completely clear. In the passage which follows, we explain the geometric features which a roof must have in order to create an atmosphere of shelter.

1. The space under or on the roof must be useful space, space that people come into contact with daily. The whole feeling of shelter comes from the fact that the roof *surrounds* people at the same time that it covers them. You can imagine this taking either of the following forms. In both cases, the rooms under the roof are actually surrounded by the roof.



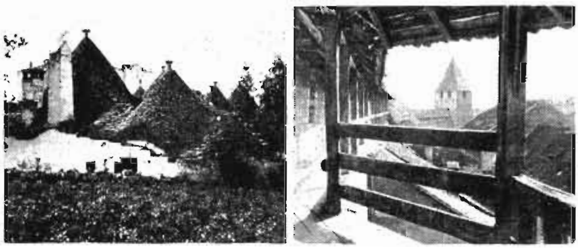
Two roof sections.

2. Seen from afar, the roof of the building must be made to form a massive part of the building. When you see the building, you see the roof. This is perhaps the most dramatic feature of a strong, sheltering roof.

What constitutes the charm to the eye of the old-fashioned country barn but its immense roof—a slope of gray shingle exposed to the weather like the side of a hill, and by its amplitude suggesting a bounty that warms the heart. Many of the old farmhouses, too, were modelled on the same generous scale, and at a distance little was visible but their great sloping roofs. They covered their inmates as a hen covereth her brood, and are touching pictures of the domestic spirit in its simpler forms. (John Burroughs, *Signs and Seasons*, New York: Houghton Mifflin, 1914, p. 252.)

3. And a sheltering roof must be placed so that one can touch it—touch it from outside. If it is pitched or vaulted, some

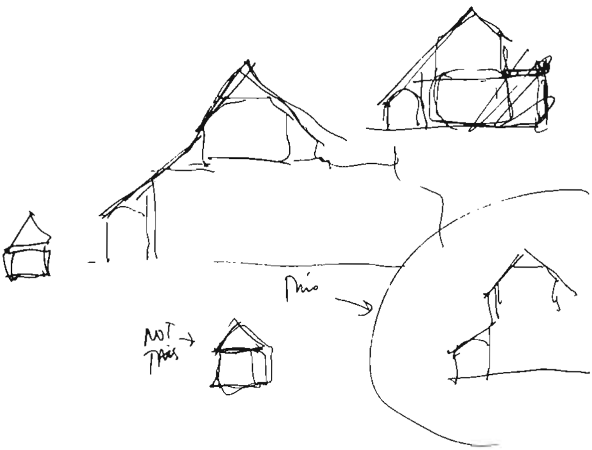
part of the roof must come down low to the ground, just in a place where there is a path, so that it becomes a natural thing to touch the roof edge as you pass it.



Roof edges you can touch.

Therefore:

Slope the roof or make a vault of it, make its entire surface visible, and bring the eaves of the roof down low, as low as 6′0″ or 6′6″ at places like the entrance, where people pause. Build the top story of each wing right into the roof, so that the roof does not only cover it, but actually surrounds it.



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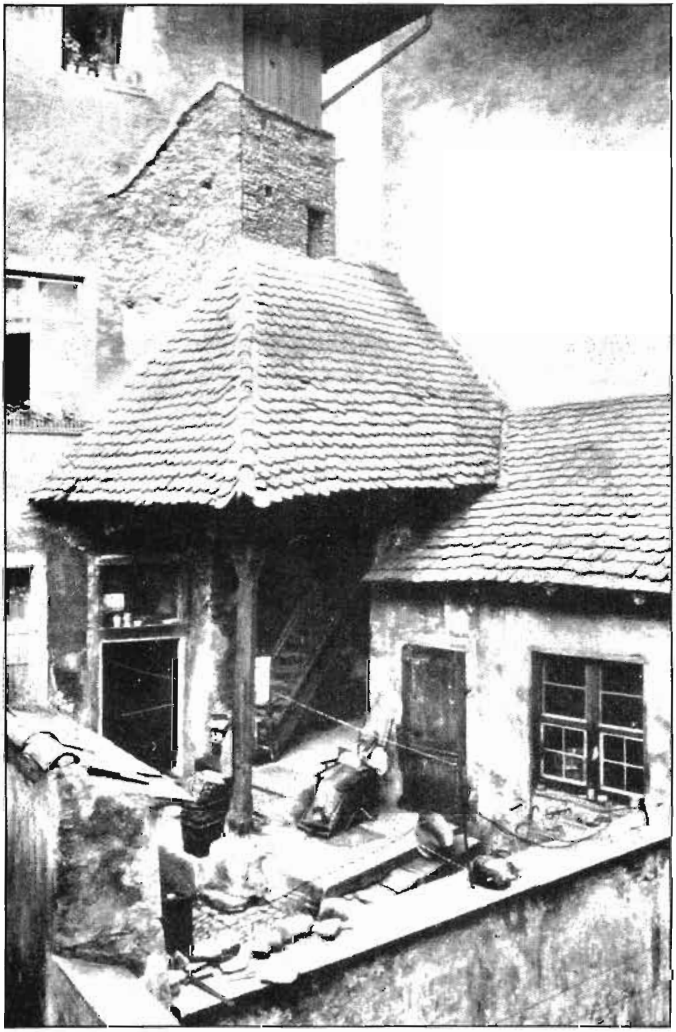
Get the exact shape of the cross section from ROOF VAULTS (220); use the space inside the top of the sloped roof for BULK STORAGE (145); where the roof comes down low, perhaps make it continuous with an ARCADE (119) or GALLERY SURROUND (166). Build the roof flat, not sloped, only where people can get out to it to use it as a garden—ROOF GARDENS (118); where rooms are built into the roof, make windows in the roof—DORMER WINDOWS (231). If the building plan is complex, get the exact way that different sloped roofs meet from ROOF LAYOUT (209). . . .

118 ROOF GARDEN*



. . . in between the sloping roofs created by SHELTERING ROOF (117), the roofs are flat where people can walk out on them. This pattern describes the best position for these roof gardens and specifies their character. If they are correctly placed, they will most often form the ends of WINGS OF LIGHT (107) at different stories and will, therefore, automatically help to complete the overall CASCADE OF ROOFS (116).

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A vast part of the earth's surface, in a town, consists of roofs. Couple this with the fact that the total area of a town which can be exposed to the sun is finite, and you will realize that is is natural, and indeed essential, to make roofs which take advantage of the sun and air.

However, as we know from SHELTERING ROOF (117) and ROOF VAULTS (220), the flat shape is quite unnatural for roofs from psychological, structural, and climatic points of view. It is therefore sensible to use a flat roof only where the roof will actually become a garden or an outdoor room; to make as many of these "useful" roofs as possible; but to make all other roofs, which cannot be used, the sloping, vaulted, shell-like structures specified by SHELTERING ROOF (117) and ROOF VAULT (220).

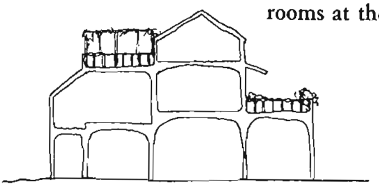
Here is a rule of thumb: if possible, make at least one small roof garden in every building, more if you are sure people will actually use them. Make the remaining roofs steep roofs. Since, as we shall see, the roof gardens which work are almost always at the same level as some indoor rooms, this means that at least some part of the building's roofs will always be steep. We shall expect, then, that this pattern will generate a roof landscape in which roof gardens and steep roofs are mixed in almost every building.

We now consider the flat roof, briefly, on its own terms. Flat roof gardens have always been prevalent in dry, warm climates, where they can be made into livable environments. In the dense parts of towns in Mediterranean climates, nearly every roof is habitable: they are full of green, private screens, with lovely views, places to cook out and eat and sleep. And even in temperate climates they are beautiful. They can be designed as rooms without ceilings, places that are protected from the wind, but open to the sky.

However, the flat roofs that have become architectural fads during the last 40 years are quite another matter. Gray gravel covered asphalt structures, these flat roofs are very rarely useful places; they are not gardens; and taken as a whole, they do not meet the psychological requirements that we have outlined in SHELTERING ROOF (117). To make the flat parts of roofs truly useful, and compatible with the need for sloping roofs, it seems necessary to build flat roof gardens off the indoor parts of the buildings. In other words, do not make them the highest part of the roof; let the highest parts of the roof slope; and make it possible to walk out to the roof garden from an interior room, without climbing special stairs. We have found that roof gardens that have this relationship are used far more intensely than those rooftops which must be reached by climbing stairs. The explanation is obvious: it is far more comfortable to walk straight out onto a roof and feel the comfort of part of the building behind and to one side of you, then it is to climb up to a place you cannot see.

Therefore:

Make parts of almost every roof system usable as roof gardens. Make these parts flat, perhaps terraced for planting, with places to sit and sleep, private places. Place the roof gardens at various stories, and always make it possible to walk directly out onto the roof garden from some lived-in part of the building.



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Remember to try and put the roof gardens at the open ends of WINGS OF LIGHT (107) so as not to take the daylight away from lower stories. Some roof gardens may be like balconys or galleries or terraces—PRIVATE TERRACE ON THE STREET (140), GALLERY SURROUND (166), SIX-FOOT BALCONY (167). In any case, place the roof garden so that it is sheltered from the wind—SUNNY PLACE (161), and give part of the roof some extra kind of shelter —perhaps a canvas awning—so that people can stay on the roof but keep out of the hot sun—CANVAS ROOFS (244). Treat each individual garden much the way as any other garden, with flowers, vegetables, outdoor rooms, canvas awnings, climbing plants—OUTDOOR ROOMS (163), VEGETABLE GARDEN (177), RAISED FLOWERS (245), CLIMBING PLANTS (246). . . .

when the major parts of buildings and the outdoor areas have been given their rough shape, it is the right time to give more detailed attention to the paths and squares between the buildings.

119. ARCADES

120. PATHS AND GOALS

121. PATH SHAPE

122. BUILDING FRONTS

123. PEDESTRIAN DENSITY

124. ACTIVITY POCKETS

125. STAIR SEATS

126. SOMETHING ROUGHLY IN THE MIDDLE

119 ARCADES**

. . . the CASCADE OF ROOFS (116) may be completed by arcades. Paths along the building, short paths between buildings, PEDESTRIAN STREET (100), paths between CONNECTED BUILDINGS (108), and parts of CIRCULATION REALMS (98) are all best as arcades. This is one of the most beautiful patterns in the language; it affects the total character of buildings as few other patterns do.

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Arcades—covered walkways at the edge of buildings, which are partly inside, partly outside—play a vital role in the way that people interact with buildings.

Buildings are often much more unfriendly than they need to be. They do not create the possibility of a connection with the public world outside. They do not genuinely invite the public in; they operate essentially as private territory for the people who are inside.

The problem lies in the fact that there are no strong connections between the territorial world within the building and the purely public world outside. There are no realms between the two kinds of spaces which are ambiguously a part of each—places that are both characteristic of the territory inside and, simultaneously, part of the public world.

The classic solution to this problem is the arcade: arcades create an ambiguous territory between the public world and the private world, and so make buildings friendly. But they need the following properties to be successful.

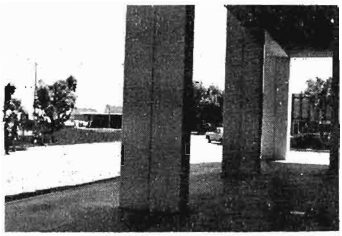
1. To make them public, the public path to the building must itself become a *place* that is partly inside the building; and this place must contain the character of the inside.

If the major paths through and beside the buildings are genuinely public, covered by an extension of the building, a low arcade, with openings into the building—many doors and windows and half-open walls—then people are drawn into the building; the action is on display, they feel tangentially a part of it. Perhaps they will watch, step inside, and ask a question.

2. To establish this place as a territory which is also *apart* from the public world, it must be felt as an extension of the building interior and therefore covered.

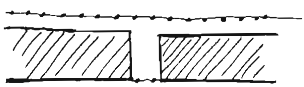
The arcade is the most simple and beautiful way of making such a territory. Arcades run along the building, where it meets the public world; they are open to the public, yet set partly into the building and at least seven feet deep.

3. Arcades don't work if the edges of the ceiling are too high. Keep the edges of the arcade ceilings low.



The edges of the ceiling are too high.

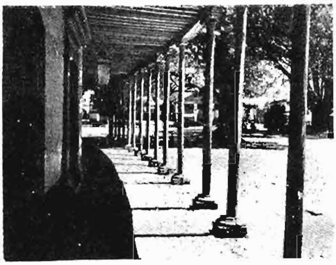
4. In certain cases, the effect of the arcade can be increased if the paths open to the public pass right through the building. This is especially effective in those places where the building wings are narrow—then the passage through the building need be no more than 25 feet long. It is very beautiful if these "tunnels" connect arcades on both sides of the wing. The importance of these arcades which pass right through a building; depends on the same functional effects as those described in BUILDING THOROUGHFARE (101).



Arcades which pass through buildings.

In those parts of the world where this pattern has taken hold, there are miles of linked and half-linked arcades and covered walks passing by and through the public parts of the town. This covered space then becomes the setting for much of the informal business of the city. Indeed, Rudofsky claims that such space "takes the place of the ancient forum." A good deal of his book, *Streets for People,* is concerned with the arcade and the marvelous ambiguities of its space:

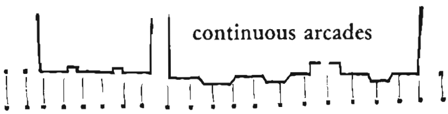
> It simply never occurs to us to make streets into oases rather than deserts. In countries where their function has not yet deteriorated into highways and parking lots, a number of arrangements make streets fit for humans; pergole and awnings (that is, awnings spread across a street), tentlike structures, or permanent roofs. All are characteristic of the Orient, or countries with an oriental heritage, like Spain. The most refined street coverings, a tangible expression of civic solidarity—or, should one say, of philanthropy—are arcades. Unknown and unappreciated in our latitudes, the function of this singularly ingratiating feature goes far beyond providing shelter against the elements or protecting pedestrians from traffic hazards. Apart from lending unity to the streetscape, they often take the place of the ancient forums. Throughout Europe, North Africa, and Asia, arcades are a common sight because they also have been incorporated into "formal" architecture. Bologna's streets, to cite but one example, are accompanied by nearly twenty miles of portici. (Bernard Rudofsky, *Streets for People,* New York: Doubleday, 1969, p. 13.)



Simple and beautiful.

Therefore:

Wherever paths run along the edge of buildings, build arcades, and use the arcades, above all, to connect up the buildings to one another, so that a person can walk from place to place under the cover of the arcades.



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Keep the arcade low—CEILING HEIGHT VARIETY (190); bring the roof of the arcade as low as possible—SHELTERING ROOF (117); make the columns thick enough to lean against—COLUMN PLACE (226); and make the openings between columns narrow and low—LOW DOORWAY (224), COLUMN CONNECTION (227)—either by arching them or by making deep beams or with lattice work—so that the inside feels enclosed—BUILDING EDGE (160), HALF-OPEN WALL (193). For construction see STRUCTURE FOLLOWS SOCIAL SPACES (205) and THICKENING THE OUTER WALLS (211). . . .

120 PATHS AND GOALS*

. . . once buildings and arcades and open spaces have been roughly fixed by BUILDING COMPLEX (95), WINGS OF LIGHT (107), POSITIVE OUTDOOR SPACE (106), ARCADES (119)—it is time to pay attention to the paths which run between the buildings. This pattern shapes these paths and also helps to give more detailed form to DEGREES OF PUBLICNESS (36), NETWORK OF PATHS AND CARS (52), and CIRCULATION REALMS (98).

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The layout of paths will seem right and comfortable only when it is compatible with the process of walking. And the process of walking is far more subtle than one might imagine.

Essentially there are three complementary processes:

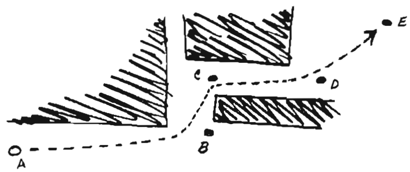
1. As you walk along you scan the landscape for intermediate destinations—the furthest points along the path which you can see. You try, more or less, to walk in a straight line toward these points. This naturally has the effect that you will cut corners and take "diagonal" paths, since these are the ones which often form straight lines between your present position and the point which you are making for.

Path to a goal.

2. These intermediate destinations keep changing. The further you walk, the more you can see around the corner. If you always walk straight toward this furthest point and the furthest point keeps changing, you will actually move in a slow curve, like a missile tracking a moving target.

Series of goals.

3. Since you do not want to keep changing direction while you walk and do not want to spend your whole time re-calculating your best direction of travel, you arrange your walking process in such a way that you pick a temporary "goal"—some clearly visible landmark—which is more or less in the direction you want to take and then walk in a straight line toward it for a hundred yards, then, as you get close, pick another new goal, once more a hundred yards further on, and walk toward it. . . . You do this so that in between, you can talk, think, daydream, smell the spring, without having to think about your walking direction every minute.



The actual path.

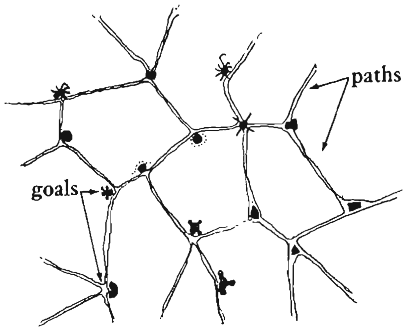
In the diagram above a person begins at A and heads for point E. Along the way, his intermediate goals are points B, C, and D. Since he is trying to walk in a roughly straight line toward E, his intermediate goal changes from B to C, as soon as C is visible; and from C to D, as soon as D is visible.

The proper arrangements of paths is one with enough intermediate goals, to make this process workable. If there aren't enough intermediate goals, the process of walking becomes more difficult, and consumes unnecessary emotional energy.

Therefore:

To lay out paths, first place goals at natural points of interest. Then connect the goals to one another to form the

paths. The paths may be straight, or gently curving between goals; their paving should swell around the goal. The goals should never be more than a few hundred feet apart.



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All the ordinary things in the outdoors—trees, fountains, entrances, gateways, seats, statues, a swing, an outdoor room—can be the goals. See FAMILY OF ENTRANCES (102), MAIN ENTRANCE (110), TREE PLACES (171), SEAT SPOTS (241), RAISED FLOWERS (245); build the "goals" according to the rules of SOMETHING ROUGHLY IN THE MIDDLE (126); and shape the paths according to PATH SHAPE (121). To pave the paths use PAVING WITH CRACKS BETWEEN THE STONES (247). . . .

121 PATH SHAPE*

. . . paths of various kinds have been defined by larger patterns—PROMENADE (31), SHOPPING STREET (32), NETWORK OF PATHS AND CARS (52), RAISED WALK (55), PEDESTRIAN STREET (100), and PATHS AND GOALS (120). This pattern defines their shape: and it can also help to generate these larger patterns piecemeal, through the very process of shaping parts of the path.

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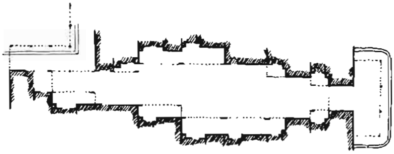
Streets should be for staying in, and not just for moving through, the way they are today.

For centuries, the street provided city dwellers with usable public space right outside their houses. Now, in a number of subtle ways, the modern city has made streets which are for "going through," not for "staying in." This is reinforced by regulations which make it a crime to loiter, by the greater attractions inside the side itself, and by streets which are so unattractive to stay in, that they almost force people into their houses.

From an environmental standpoint, the essence of the problem is this: streets are "centrifugal" not "centripetal": they drive people out instead of attracting them in. In order to combat this effect, the pedestrian world outside houses must be made into the kind of place where you stay, rather than the kind of place you move through. It must, in short, be made like a kind of outside public room, with a greater sense of enclosure than a street.

This can be accomplished if we make residential pedestrian streets subtly convex in plan with seats and galleries around the edges, and even sometimes roof the streets with beams or trellis-work.

Here are two examples of this pattern, at two different scales. First, we show a plan of ours for fourteen houses in Peru. The street shape is created by gradually stepping back the houses, in plan. The result is a street with a positive, somewhat elliptical shape. We hope it is a place that will encourage people to slow down and spend time there.



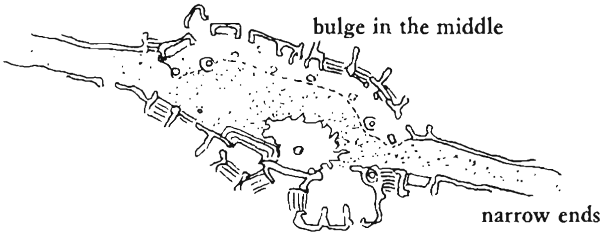
The path shape formed by fourteen houses.

The second example is a very small path, cutting through a neighborhood in the hills of Berkeley. Again, the shape swells out subtly, just in those places where it is good to pause and sit.

A spot along a path in the hills of Berkeley.

Therefore:

Make a bulge in the middle of a public path, and make the ends narrower, so that the path forms an enclosure which is a place to stay, not just a place to pass through.



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Above all, to create the shape of the path, move the building fronts into the right positions, and on no acount allow a set-back between the building and the path—BUILDING FRONTS (122); decide on the appropriate area for the "bulge" by using the arithmetic of PEDESTRIAN DENSITY (123); then form the details of the bulge with ARCADES (119), ACTIVITY POCKETS (124) and STAIR SEATS (125); perhaps even with a PUBLIC OUTDOOR ROOM (69); and give as much life as you can to the path all along its length with windows—STREET WINDOWS (164). . . .

122 BUILDING FRONTS*

. . . this pattern helps to shape the paths and buildings simultaneously; and so completes BUILDING COMPLEX (95), WINGS OF LIGHT (107), POSITIVE OUTDOOR SPACE (106), ARCADES (119), PATH SHAPE (121), and also ACTIVITY POCKETS (124).

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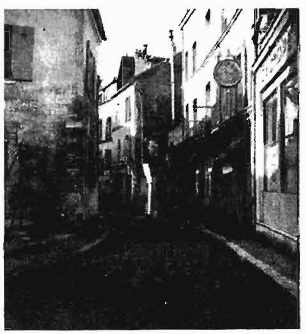
Building set-backs from the street, originally invented to protect the public welfare by giving every building light and air, have actually helped greatly to destroy the street as a social space.

In POSITIVE OUTDOOR SPACE (106) we have described the fact that buildings are not merely placed into the outdoors, but that they actually shape the outdoors. Since streets and squares have such enormous social importance, it is natural to pay close attention to the way that they are shaped by building fronts.

The early twentieth-century urge for "cleanliness" at all costs, and the social efforts to clean up slums, led social reformers to pass laws which make it necessary to place buildings several feet back from the street edge, to make sure that buildings cannot crowd the street and cut off sunshine, light, and air.

But, the set backs have destroyed the streets. Since it is possible to guarantee plenty of air and sun in buildings and streets in other ways—see, for example, FOUR-STORY LIMIT (21) and WINGS OF LIGHT (107)—it is essential to build the front of buildings on the street, so that the streets which they create are usable.

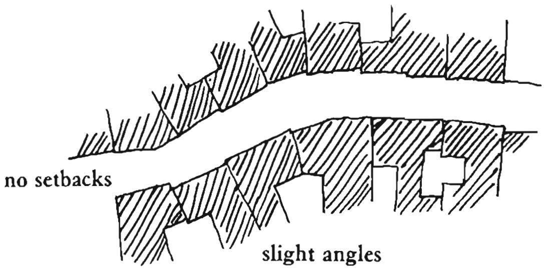
Finally, note that the positive shape of the street cannot be achieved by merely staggering building fronts. If the building fronts are adjusted to the shape of the outdoors, they will almost always take on a variety of slightly uneven angles.



Slight angles in the building fronts.

Therefore:

On no account allow set-backs between streets or paths or public open land and the buildings which front on them. The set-backs do nothing valuable and almost always destroy the value of the open areas between the buildings. Build right up to the paths; change the laws in all communities where obsolete by-laws make this impossible. And let the building fronts take on slightly uneven angles as they accommodate to the shape of the street.



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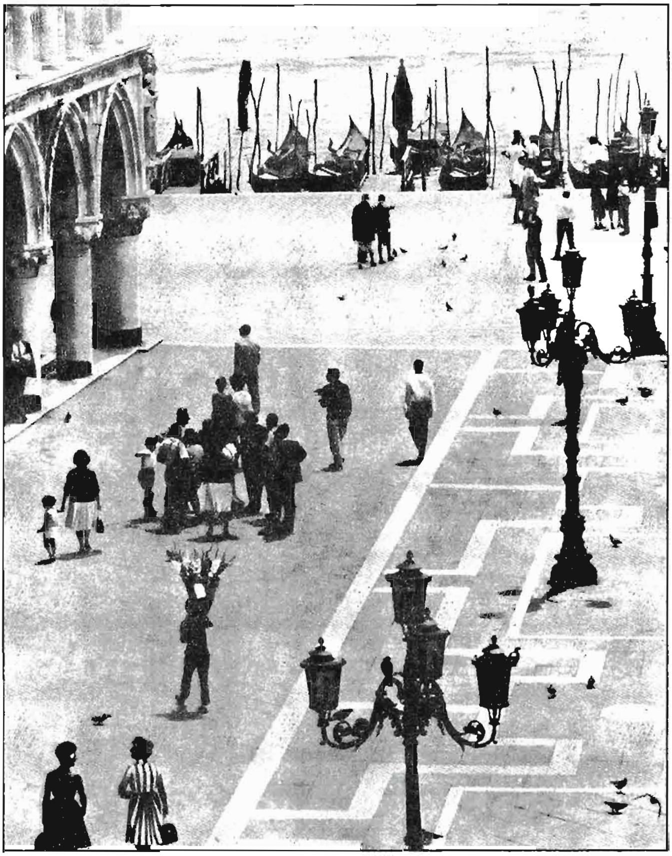
Detail the fronts of buildings, indeed the whole building perimeter, according to the pattern BUILDING EDGE (160). If some outdoor space is needed at the front of the building, make it part of the street life by making it a PRIVATE TERRACE ON THE STREET (140) or GALLERY SURROUND (166); and give the building many openings onto the street—STAIR SEATS (125), OPEN STAIRS (158), STREET WINDOWS (164), OPENING TO THE STREET (165), FRONT DOOR BENCH (242). . . .

123 PEDESTRIAN DENSITY*



. . . in various places there are pedestrian areas, paved so that people will congregate there or walk up and down—PROMENADE (31), SMALL PUBLIC SQUARES (61), PEDESTRIAN STREET (100), BUILDING THOROUGHFARE (101), PATH SHAPE (121). It is essential to limit the sizes of these places very strictly, especially the size of areas which are paved, so that they stay alive.

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Many of our modern public squares, though intended as lively plazas, are in fact deserted and dead.

In this pattern, we call attention to the relationship between the number of people in a pedestrian area, the size of the area, and a subjective estimate of the extent to which the area is alive.

We do not say categorically that the number of people per square foot *controls* the apparent liveliness of a pedestrian area. Other factors—the nature of the land around the edge, the grouping of people, what the people are doing—obviously contribute greatly. People who are running, especially if they are making noise, add to the liveliness. A small group attracted to a couple of folk singers in a plaza give much more life to the place than the same number sunning on the grass.

However, the number of square feet per person does give a reasonably crude estimate of the liveliness of a space. Christie Coffin's observations show the following figures for various public places in and around San Francisco. Her estimate of the liveliness of the places is given in the right-hand column.

	Sq. ft. per person	
Golden Gate Plaza, noon:	1000	Dead
Fresno Mall:	100	Alive
Sproul Plaza, daytime:	150	Alive
Sproul Plaza, evening:	2000	Dead
Union Square, central part:	600	Half-dead

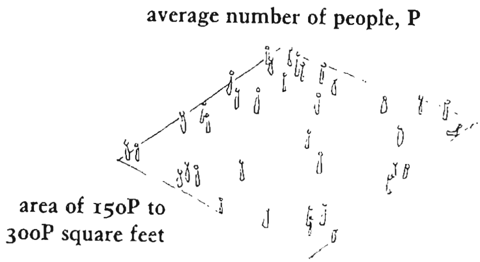
Although these subjective estimates are clearly open to question, they suggest the following rule of thumb: At 150 square feet per person, an area is lively. If there are more than 500 square feet per person, the area begins to be dead.

Even if these figures are only correct to within an order of magnitude, we can use them to shape public pedestrian areas—squares, indoor streets, shopping streets, promenades.

To use the pattern it is essential to make a rough estimate of the number of people that are *typically* found in a given space at any moment of its use. In the front area of a market, for example, we might find that typically there are three people lingering and walking. Then we shall want the front of this market to form a little square, no larger than 450 square feet. If we estimate a pedestrian street will typically contain 35 people window shopping and walking, we shall want the street to form an enclosure of roughly 5000 square feet. (For an example of this calculation in a more complicated case—the case of a square in a public building that has yet to be built—see *A Pattern Language Which Generates Multi-Service Centers*, Alexander, Ishikawa, Silverstein, Center for Environmental Structure, 1968, p. 148.)

Therefore:

For public squares, courts, pedestrian streets, any place where crowds are drawn together, estimate the mean number of people in the place at any given moment (P), and make the area of the place between 150P and 300P square feet.



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Embellish the density and feeling of life with areas at the edge which are especially crowded—STREET CAFE (88), ACTIVITY POCKETS (124), STAIR SEATS (125), PRIVATE TERRACE ON THE STREET (140), BUILDING EDGE (160), STREET WINDOWS (164), OPENING TO THE STREET (165), GALLERY SURROUND (166). . . .

124 ACTIVITY POCKETS**

. . . in many large scale patterns which define public space, the edge is critical: PROMENADE (31), SMALL PUBLIC SQUARES (61), PUBLIC OUTDOOR ROOM (69), PEDESTRIAN STREET (100), BUILDING THOROUGHFARE (101), PATH SHAPE (121). This pattern helps complete the edge of all these larger patterns.

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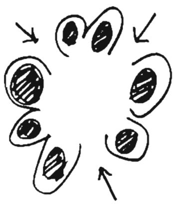
The life of a public square forms naturally around its edge. If the edge fails, then the space never becomes lively.

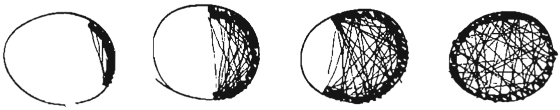
In more detail: people gravitate naturally toward the edge of public spaces. They do not linger out in the open. If the edge does not provide them with places where it is natural to linger, the space becomes a place to walk through, not a place to stop. It is therefore clear that a public square should be surrounded by pockets of activity: shops, stands, benches, displays, rails, courts, gardens, news racks. In effect, the edge must be scalloped.

Further, the process of lingering is a gradual one; it happens; people do not make up their minds to stay; they stay or go, according to a process of gradual involvement. This means that the various pockets of activity around the edge should all be next to paths and entrances so that people pass right by them as they pass through. The goal-oriented activity of coming and going then has a chance to turn gradually into something more relaxed. And once many small groups form around the edge, it is likely that they will begin to overlap and spill in toward the center of the square. We therefore specify that pockets of activity must alternate with access points.



A conceptual diagram.

The scalloped edge must surround the space entirely. We may see this clearly as follows: draw a circle to represent the space, and darken some part of its perimeter to stand for the scalloped edge. Now draw chords which join different points along this darkened perimeter. As the length of the darkened edge gets smaller, the area of the space covered by these chords wanes drastically. This shows how quickly the life in the space will drop when the length of the scalloped edge gets shorter. To make the space lively, the scalloped edge must surround the space completely.



As the activities grow around the space, it becomes more lively.

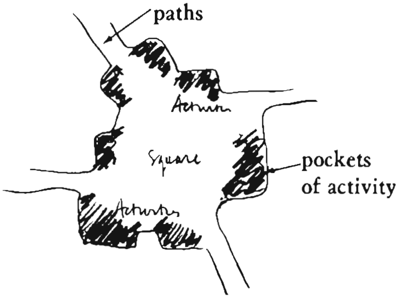
When we say that the edge must be scalloped with activity, we mean this conceptually—not literally. In fact, to build this pattern, you must build the activity pockets *forward* into the square: first rough out the major paths that cross the space and the spaces left over between these paths; then build the activity pockets into these "in-between" spaces, bringing them forward, into the square.

A pocket of activity which bulges into the square.

Therefore:

Surround public gathering places with pockets of activity —small, partly enclosed areas at the edges, which jut for-

ward into the open space between the paths, and contain activities which make it natural for people to pause and get involved.



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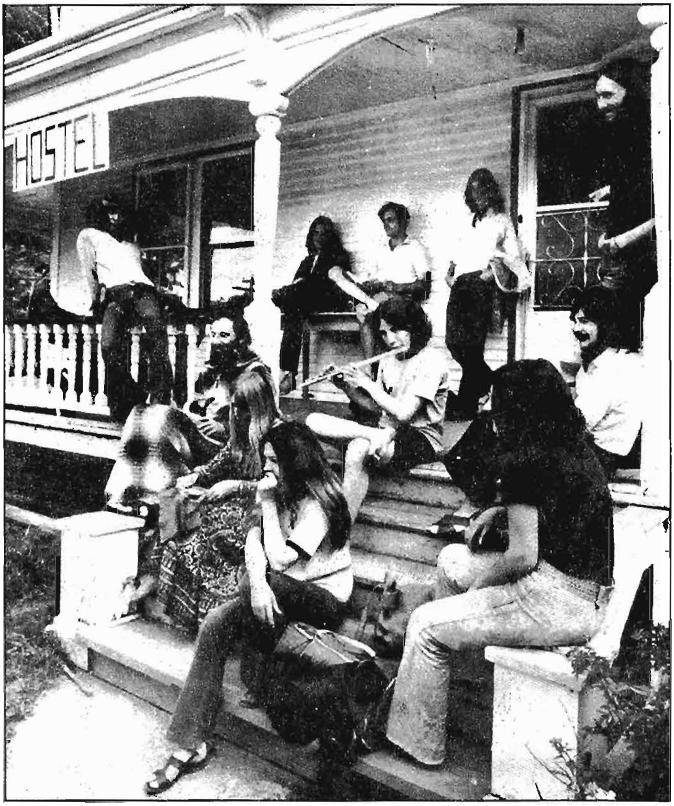
Lead paths between the pockets of activity—PATHS AND GOALS (120)—and shape the pockets themselves with arcades and seats, and sitting walls, and columns and trellises—ARCADES (119), OUTDOOR ROOM (163), TRELLISED WALK (174), SEAT SPOTS (241), SITTING WALL (243); above all shape them with the fronts of buildings—BUILDING FRONTS (122); and include, within the pockets, newsstands—BUS STOPS (92), FOOD STANDS (93), gardens, games, small shops, STREET CAFES (88), and A PLACE TO WAIT (150). . . .

125 STAIR SEATS*



. . . we know that paths and larger public gathering places need a definite shape and a degree of enclosure, with people looking into them, not out of them—SMALL PUBLIC SQUARES (61), POSITIVE OUTDOOR SPACE (106), PATH SHAPE (121). Stairs around the edge do it just perfectly; and they also help embellish FAMILY OF ENTRANCES (102), MAIN ENTRANCES (110), and OPEN STAIRS (158).

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Wherever there is action in a place, the spots which are the most inviting, are those high enough to give people a vantage point, and low enough to put them in action.

On the one hand, people seek a vantage point from which they can take in the action as a whole. On the other hand, they still want to be part of the action; they do not want to be mere onlookers. Unless a public space provides for both these tendencies, a lot of people simply will not stay there.

For a person looking at the horizon, the visual field is far larger below the horizon than above it. It is therefore clear that anybody who is "people-watching" will naturally try to take up a position a few feet above the action.

The trouble is that this position will usually have the effect of removing a person from the action. Yet most people want to be able to take the action in and to be part of it at the same time. This means that any places which are slightly elevated must also be within easy reach of passers-by, hence on circulation paths, and directly accessible from below.

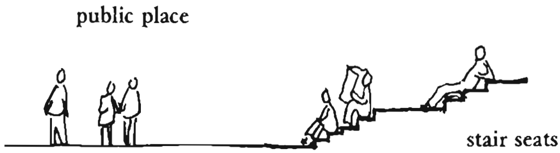
The bottom few steps of stairs, and the balusters and rails along stairs, are precisely the kinds of places which resolve these tendencies. People sit on the edges of the lower steps, if they are wide enough and inviting, and they lean against the rails.

There is a simple kind of evidence, both for the reality of the forces described here and for the value of the pattern. When there are areas in public places which are both slightly raised and very accessible, people naturally gravitate toward them.

Stepped cafe terraces, steps surrounding public plazas, stepped porches, stepped statues and seats, are all examples.

Therefore:

In any public place where people loiter, add a few steps at the edge where stairs come down or where there is a change of level. Make these raised areas immediately accessible from below, so that people may congregate and sit to watch the goings-on.



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Give the stair seats the same orientation as SEAT SPOTS (241). Make the steps out of wood or tile or brick so that they wear with time, and show the marks of feet, and are soft to the touch for people sitting on them—SOFT TILE AND BRICK (248); and make the steps connect directly to surrounding buildings—CONNECTION TO THE EARTH (168). . . .

126 SOMETHING ROUGHLY IN THE MIDDLE

. . . SMALL PUBLIC SQUARES (61), COMMON LAND (67), COURTYARDS WHICH LIVE (115), PATH SHAPE (121) all draw their life from the activities around their edges—ACTIVITY POCKETS (124) and STAIR SEATS (125). But even then, the middle is still empty, and it needs embellishment.

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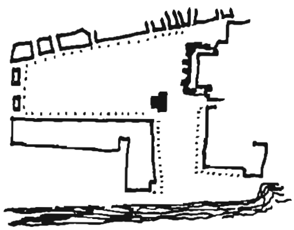
A public space without a middle is quite likely to stay empty.

We have discussed the fact that people tend to take up positions from which they are protected, partly, at their backs—HIERARCHY OF OPEN SPACE (114), and the way this fact tends to make the action grow around the edge of public squares—ACTIVITY POCKETS (124), STAIR SEATS (125). If the space is a tiny one, there is no need for anything beyond an edge. But if there is a reasonable area in the middle, intended for public use, it will be wasted unless there are trees, monuments, seats, fountains—a place where people can protect their backs, as easily as they can around the edge. This reason for setting something roughly in the middle of a square is obvious and practical. But perhaps there is an even more primitive instinct at work.

Imagine a bare table in your house. Think of the power of the instinct which tells you to put a candle or a bowl of flowers in the middle. And think of the power of the effect once you have done it. Obviously, it is an act of great significance; yet clearly it has nothing to do with activities at the edge or in the center.

Apparently the effect is purely geometrical. Perhaps it is the sheer fact that the space of the table is given a center, and the point at the center then organizes the space around it, and makes it clear, and puts it roughly at rest. The same thing happens in a courtyard or a public square. It is perhaps related to the mandala instinct, which finds in any centrally symmetric figure a powerful receptacle for dreams and images and for conjugations of the self.

We believe that this instinct is at work in every courtyard and every square. Even in the Piazza San Marco, one of the few squares without an obvious center piece, the campanile juts out and creates an off beat center to the two plazas together.



The campanile forms a rough center to the two piazzas.

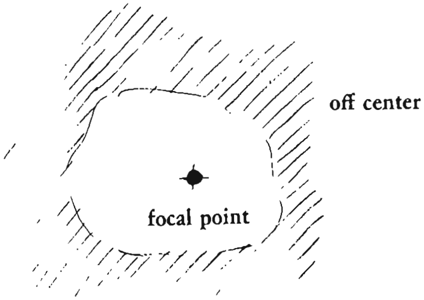
Camillo Sitte, the great Italian planner, describes the evolution of such focal points and their functional significance in his book *City Planning According to Artistic Principles* (New York: Random House, 1965, pp. 20–31). But interestingly, he claims that the impulse to center something *perfectly* in a square is an "affliction" of modern times.

> Imagine the open square of a small market town in the country, covered with deep snow and criss-crossed by several roads and paths that, shaped by the traffic, form the natural lines of communication. Between them are left irregularly distributed patches untouched by traffic. . . .
>
> On exactly such spots, undisturbed by the flow of vehicles, rose the fountains and monuments of old communities. . . .

Therefore:

Between the natural paths which cross a public square or courtyard or a piece of common land choose something to stand roughly in the middle: a fountain, a tree, a statue, a clock-tower with seats, a windmill, a bandstand. Make

it something which gives a strong and steady pulse to the square, drawing people in toward the center. Leave it exactly where it falls between the paths; resist the impulse to put it exactly in the middle.



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Connect the different "somethings" to one another with the path system—PATHS AND GOALS (120). They may include HIGH PLACES (62), DANCING IN THE STREETS (63), POOLS AND STREAMS (64), PUBLIC OUTDOOR ROOM (69), STILL WATER (71), TREE PLACES (171); make sure that each one has a SITTING WALL (243) around it. . . .

Now, with the paths fixed, we come back to the building: Within the various wings of any one building, work out the fundamental gradients of space, and decide how the movement will connect the spaces in the gradients;

127. INTIMACY GRADIENT
128. INDOOR SUNLIGHT
129. COMMON AREAS AT THE HEART
130. ENTRANCE ROOM
131. THE FLOW THROUGH ROOMS
132. SHORT PASSAGES
133. STAIRCASE AS A STAGE
134. ZEN VIEW
135. TAPESTRY OF LIGHT AND DARK

127 INTIMACY GRADIENT**

. . . if you know roughly where you intend to place the building wings—WINGS OF LIGHT (107), and how many stories they will have—NUMBER OF STORIES (96), and where the MAIN ENTRANCE (110) is, it is time to work out the rough disposition of the major areas on every floor. In every building the relationship between the public areas and private areas is most important.

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Unless the spaces in a building are arranged in a sequence which corresponds to their degrees of privateness, the visits made by strangers, friends, guests, clients, family, will always be a little awkward.

In any building—house, office, public building, summer cottage—people need a gradient of settings, which have different degrees of intimacy. A bedroom or boudoir is most intimate; a back sitting room or study less so; a common area or kitchen more public still; a front porch or entrance room most public of all. When there is a gradient of this kind, people can give each encounter different shades of meaning, by choosing its position on the gradient very carefully. In a building which has its rooms so interlaced that there is no clearly defined gradient of intimacy, it is not possible to choose the spot for any particular encounter so carefully; and it is therefore impossible to give the encounter this dimension of added meaning by the choice of space. This homogeneity of space, where every room has a similar degree of intimacy, rubs out all possible subtlety of social interaction in the building.

We illustrate this general fact by giving an example from Peru—a case which we have studied in detail. In Peru, friendship is taken very seriously and exists at a number of levels. Casual neighborhood friends will probably never enter the house at all.

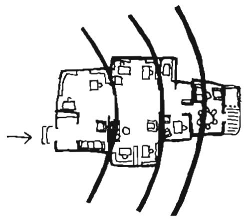
Formal friends, such as the priest, the daughter's boyfriend, and friends from work may be invited in, but tend to be limited to a well-furnished and maintained part of the house, the *sala*. This room is sheltered from the clutter and more obvious informality of the rest of the house. Relatives and intimate friends may be made to feel at home in the family room (*comedor-estar*), where the family is likely to spend much of its time. A few relatives and friends, particularly women, will be allowed into the kitchen, other workspaces, and, perhaps, the bedrooms of the house. In this way, the family maintains both privacy and pride.

The phenomenon of the intimacy gradient is particularly evident at the time of a *fiesta*. Even though the house is full of people, some people never get beyond the *sala;* some do not even get beyond the threshold of the front door. Others go all the way into the kitchen, where the cooking is going on, and stay there throughout the evening. Each person has a very accurate sense of his degree of intimacy with the family and knows exactly how far into the house he may penetrate, according to this established level of intimacy.

Even extremely poor people try to have a *sala* if they can: we saw many in the *barriadas*. Yet modern houses and apartments in Peru combine *sala* and family room in order to save space. Almost everyone we talked to complained about this situation. As far as we can tell, a Peruvian house must not, under any circumstances, violate the principle of the intimacy gradient.

The intimacy gradient is unusually crucial in a Peruvian house. But in some form the pattern seems to exist in almost all cultures. We see it in widely different cultures—compare the plan of an African compound, a traditional Japanese house, and early American colonial homes—and it also applies to almost every building type—compare a house, a small shop, a large office building, and even a church. It is almost an archetypal ordering principle for all man's buildings. All buildings, and all parts of buildings which house well-defined human groups, need a definite gradient from "front" to "back," from the most formal spaces at the front to the most intimate spaces at the back.

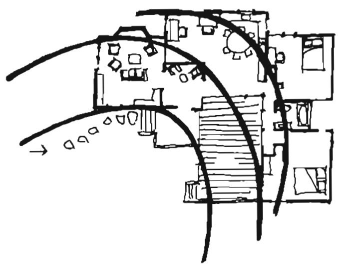
In an office the sequence might be: entry lobby, coffee and reception areas, offices and workspaces, private lounge.



Office intimacy gradient.

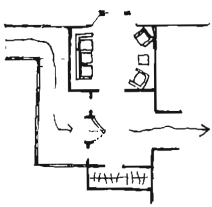
In a small shop the sequence might be: shop entrance, customer milling space, browsing area, sales counter, behind the counter, private place for workers.

In a house: gate, outdoor porch, entrance, sitting wall, common space and kitchen, private garden, bed alcoves.



Intimacy gradient in a house.

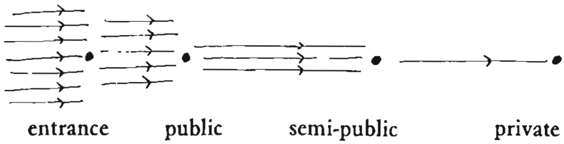
And in a more formal house, the sequence might begin with something like the Peruvian *sala*—a parlor or sitting room for guests.



Formal version of the front of the gradient.

Therefore:

Lay out the spaces of a building so that they create a sequence which begins with the entrance and the most public parts of the building, then leads into the slightly more private areas, and finally to the most private domains.



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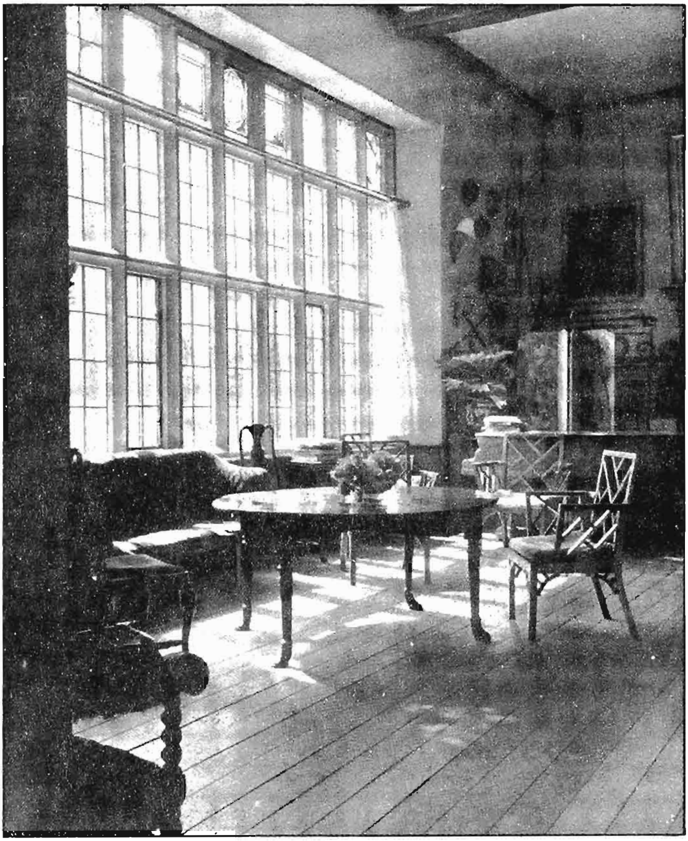
At the same time that common areas are to the front, make sure that they are also at the heart and soul of the activity, and that all paths between more private rooms pass tangent to the common ones—COMMON AREAS AT THE HEART (129). In private houses make the ENTRANCE ROOM (130) the most formal and public place and arrange the most private areas so that each person has a room of his own, where he can retire to be alone—A ROOM OF ONE'S OWN (141). Place bathing rooms and toilets half-way between the common areas and the private ones, so that people can reach them comfortably from both—BATHING ROOM (144); and place sitting areas at all the different degrees of intimacy, and shape them according to their position in the gradient—SEQUENCE OF SITTING SPACES (142). In offices put RECEPTION WELCOMES YOU (149) at the front of the gradient and HALF-PRIVATE OFFICE (152) at the back. . . .

128 INDOOR SUNLIGHT*



. . . according to SOUTH FACING OUTDOORS (105), the building is placed in such a way as to allow the sun to shine directly into it, across its gardens. From INTIMACY GRADIENT (127), you have some idea of the overall distribution of public and private rooms within the building. This pattern marks those rooms and areas along the intimacy gradient which need the sunlight most, and helps to place them so that the indoor sunlight can be made to coincide with the rooms in the INTIMACY GRADIENT which are most used.

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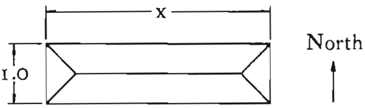
If the right rooms are facing south, a house is bright and sunny and cheerful; if the wrong rooms are facing south, the house is dark and gloomy.

Everyone knows this. But people may forget about it, and get confused by other considerations. The fact is that very few things have so much effect on the feeling inside a room as the sun shining into it. If you want to be sure that your house, or building, and the rooms in it are wonderful, comfortable places, give this pattern its due. Treat it seriously; cling to it tenaciously; insist upon it. Think of the rooms you know which do have sunshine in them, and compare them with the many rooms you know that don't.

From the pattern SOUTH FACING OUTDOORS (105), the building gets an orientation toward the south. Now the issue is the particular arrangement of rooms along this south edge. Here are some examples: (1) a porch that gets the evening sun late in the day; (2) a breakfast nook that looks directly into a garden which is sunny in the morning; (3) a bathing room arranged to get full morning sun; (4) a workshop that gets full southern exposure during the middle of the day; (5) an edge of a living room where the sun falls on an outside wall and warms a flowering plant.

The key diagram for this pattern summarizes the relations between parts of the house and the morning, the afternoon and the late afternoon sun. To get the sun right in your design, first decide upon your requirements for sun: make a diagram for yourself, like the key diagram, but with your own special needs. Then arrange spaces along the south, southeast, and southwest of the building to capture the sun. Take special care to detail the south edge properly, so that the sun is working indoors throughout the day. This will most often need a building which is long along the east-west axis.

If we approach the problem of indoor sunlight from the point of view of thermal considerations, we come to a similar conclusion. A long east-west axis sets up a building to keep the heat in during winter, and to keep the heat out during the summer. This makes buildings more pleasant, and cheaper to run. The "optimum shape" of an east-west building is given by the following table, adapted from Victor Olgyay, *Design with Climate* (New Jersey: Princeton University Press, 1963, p. 89). Note that it is always best to orient the long axis east-west.



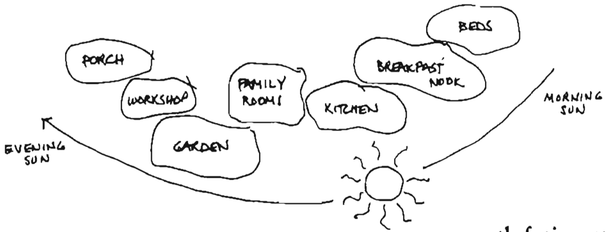
climate	summer optimum	winter optimum	composite optimum	reasonable efficiency
cool (Minneapolis) 	1.4	1.1	1.1	1.3
temperate (New York) 	1.63	1.56	1.6	2.4
hot-arid (Phoenix) 	1.26	none	1.3	1.6
hot-humid (Miami) 	1.7	2.69	1.7	3.0

Rough shape for different climates.

Therefore:

Place the most important rooms along the south edge of the building, and spread the building out along the east-west axis.

Fine tune the arrangement so that the proper rooms are exposed to the south-east and the south-west sun. For example: give the common area a full southern exposure, bedrooms south-east, porch south-west. For most climates, this means the shape of the building is elongated east-west.



south-facing rooms

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When you can, open up these indoor sunny rooms to the outdoors, and build a sunny place and outdoor rooms directly outside—SUNNY PLACE (161), OUTDOOR ROOM (163), WINDOWS WHICH OPEN WIDE (236). Give the bedrooms eastern exposure—SLEEPING TO THE EAST (138), and put storage and garages to the north—NORTH FACE (162). Where there is a kitchen, try to put its work counter toward the sun—SUNNY COUNTER (199); perhaps do the same for any work bench or desk in a HOME WORKSHOP (157), WORKSPACE ENCLOSURE (183). . . .

129 COMMON AREAS AT THE HEART**

. . . along the INTIMACY GRADIENT (127), in every building and in every social group within the building, it is necessary to place the common areas. Place them on the sunlit side to reinforce the pattern of INDOOR SUNLIGHT (128); and, when they are large, give them the higher roofs of the CASCADE OF ROOFS (116).

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No social group—whether a family, a work group, or a school group—can survive without constant informal contact among its members.

Any building which houses a social group supports this kind of contact by providing common areas. The form and location of the common areas is critical. Here is a perfect example—a description of the family room in a Peruvian worker's house:

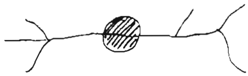
For a low-income Peruvian family, the family room is the heart of family life. The family eat here, they watch TV here, and everyone who comes into the house comes into this room to say hello to the others, kiss them, shake hands with them, exchange news. The same happens when people leave the house.

The family room functions as the heart of the family life by helping to support these processes. The room is so placed in the house, that people naturally pass through it on their way into and out of the house. The end where they pass through it allows them to linger for a few moments, without having to pull out a chair to sit down. The TV set is at the opposite end of the room from this throughway, and a glance at the screen is often the excuse for a moment's further lingering. The part of the room for the TV set is often darkened; the family room and the TV function just as much during midday as they do at night.

Let us now generalize from this example. If a common area is located at the end of a corridor and people have to make a special, deliberate effort to go there, they are not likely to use it informally and spontaneously.

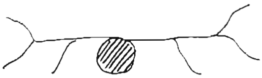
. . . *At one end.*

Alternatively, if the circulation path cuts too deeply through the common area, the space will be too exposed, it will not be comfortable to linger there and settle down.



. . . *Through the middle.*

The only balanced situation is the one where a common path, which people use every day, runs *tangent* to the common areas and is open to them in passing. Then people will be constantly passing the space; but because the path is to one side, they are not forced to stop. If they want to, they can keep going. If they want to, they can stop for a moment, and see what's happening; if they want to, they can come right in and settle down.



. . . *Tangent.*

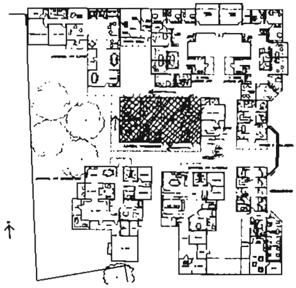
It is worth mentioning, that this pattern has occurred, in some form, in every single project we have worked on. In the multi-service center, we had a pattern called *Staff lounge* based on the same geometry (*A pattern language which generates multi-service centers*, C.E.S., 1968, p. 241); in our work on mental health centers, we had *Patient's choice of being involved*, the same pattern again, as an essential element in therapy; in our work on Peruvian housing, we had *Family room circulation*—this is the example we have given for a family (*Houses generated by patterns*, C.E.S., 1969, p. 140); and in our work on universities, *The*

Oregon Experiment, we had a pattern called *Department hearth*, again the same, for each department. It is perhaps the most basic pattern there is in forming group cohesion.

In detail, we have isolated three characteristics for a successful common area:

1. It must be at the center of gravity of the building complex, building, or building wing which the group occupies. In other words, it must be at the physical heart of the organization, so that it is equally accessible to everyone and can be felt as the center of the group.

2. Most important of all, it must be "on the way" from the entrance to private rooms, so people always go by it on the way in and out of the building. It is crucial that it not be a dead-end room which one would have to go out of one's way to get to. For this reason, the paths which pass it must lie tangent to it.

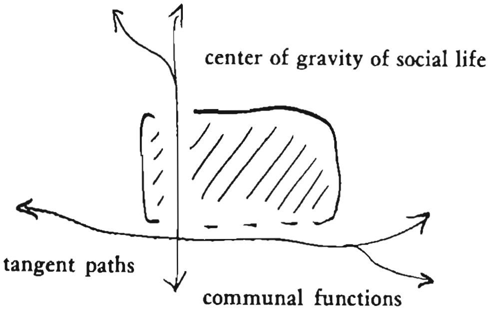


The common area of a clinic we have built in Modesto, California, where we managed to put tangent paths on all four sides.

3. It must have the right components in it—usually a kitchen and eating space, since eating is one of the most communal of activities, and a sitting space—at least some comfortable chairs, so people will feel like staying. It should also include an outdoor area—on nice days there is always the longing to be outside—to step out for a smoke, to sit down on the grass, to carry on a discussion.

Therefore:

Create a single common area for every social group. Locate it at the center of gravity of all the spaces the group occupies, and in such a way that the paths which go in and out of the building lie tangent to it.



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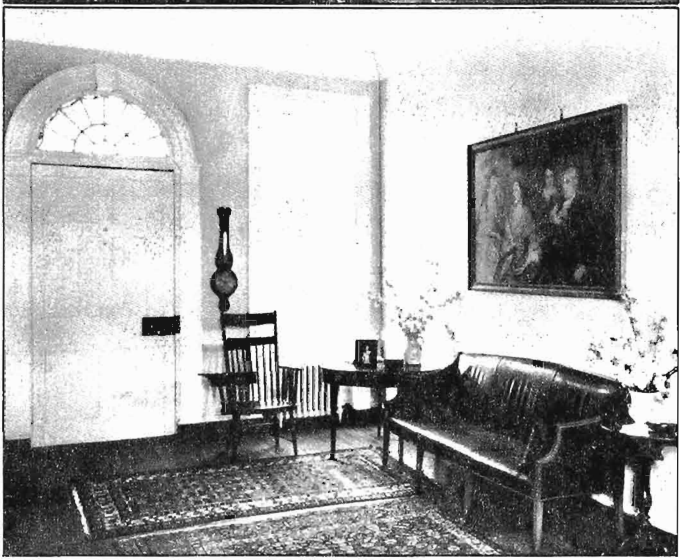
Most basic of all to common areas are food and fire. Include FARMHOUSE KITCHEN (139), COMMUNAL EATING (147), and THE FIRE (181). For the shape of the common area in fine detail, see LIGHT ON TWO SIDES OF EVERY ROOM (159) and THE SHAPE OF INDOOR SPACE (191). Make sure that there are plenty of different sitting places, different in character for different kinds of moments—SEQUENCE OF SITTING SPACES (142). Include an OUTDOOR ROOM (163). And make the paths properly tangent to the common areas—ARCADES (119), THE FLOW THROUGH ROOMS (131), SHORT PASSAGES (132). . . .

130 ENTRANCE ROOM**



. . . the position and overall shape of entrances is given by FAMILY OF ENTRANCES (102), MAIN ENTRANCE (110) and ENTRANCE TRANSITION (112). This pattern gives the entrances their detailed shape, their shape and body and three dimensions, and helps complete the form begun by CAR CONNECTION (113), and the PRIVATE TERRACE ON THE STREET (140).

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Arriving in a building, or leaving it, you need a room to pass through, both inside the building and outside it. This is the entrance room.

The most impressionistic and intuitive way to describe the need for the entrance room is to say that the time of arriving, or leaving, seems to swell with respect to the minutes which precede and follow it, and that in order to be congruent with the importance of the moment, the space too must follow suit and swell with respect to the immediate inside and the immediate outside of the building.

We shall see now that there are a tremendous number of miniscule forces which all come together to support this general intuition. All these forces, tendencies, and solutions were originally describe by Alexander and Poyner, in the Atoms of Environmental Structure, Ministry of Public Works, Research and Development, SFB Ba4, London, 1966. At that time it seemed important to emphasize the separate and individual patterns defined by these forces. However, at the present writing it seems clear that these original patterns are, in fact, all faces of the one larger and more comprehensive entity, which we call the ENTRANCE ROOM (130).

1. The relationship of windows to the entrance

(a) A person answering the door often tries to see who is at the door before they open it.

(b) People do not want to go out of their way to peer at people on the doorstep.

(c) If the people meeting are old friends, they seek a chance to shout out and wave in anticipation.

The entrance room therefore needs a window—or windows—on the path from the family room or kitchen to the door, facing the area outside the door from the side.

2. *The need for shelter outside the door*

(a) People try to get shelter from the rain, wind, and cold while they are waiting.

(b) People stand near the door while they are waiting for it to open.

On the outside, therefore, give the entrance room walls enclosing three sides of a covered space.

3. *The subtleties of saying goodbye*

When hosts and guests are saying goodbye, the lack of a clearly marked "goodbye" point can easily lead to endless "Well, we really must be going now," and then further conversations lingering on, over and over again.

(a) Once they have finally decided to go, people try to leave without hesitation.

(b) People try to make their goodbye as nonabrupt as possible and seek a comfortable break.

Give the entrance room, therefore, a clearly defined area, at least 20 square feet, outside the front door, raised with a natural threshold—perhaps a railing, or a low wall, or a step—between it and the visitors' cars.

4. *Shelf near the entrance*

When a person is going into the house with a package:

(a) He tries to hold onto the package; he tries to keep it upright, and off the ground.

(b) At the same time he tries to get both hands free to hunt through pockets or handbag for a key.

And leaving the house with a package:

(c) At the moment of leaving people tend to be preoccupied with other things, and this makes them forget the package which they meant to take.

You can avoid these conflicts if there are shelves both inside and outside the door, at about waist height; a place to leave packages in readiness; a place to put them down while opening the door.

5. Interior of the entrance room

(a) Politeness demands that when someone comes to the door, the door is opened wide.

(b) People seek privacy for the inside of their houses.

(c) The family, sitting, talking, or at table, do not want to feel disturbed or intruded upon when someone comes to the door.

Make the inside of the entrance room zigzag, or obstructed, so that a person standing on the doorstep of the open door can see no rooms inside, except the entrance room itself, nor through the doors of any rooms.

6. Coats, shoes, children's bikes . . .

(a) Muddy boots have got to come off.

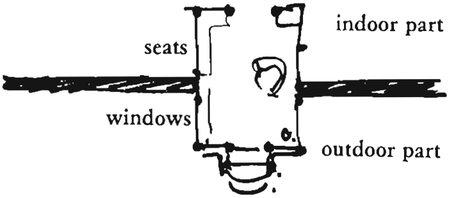
(b) People need a five foot diameter of clear space to take off their coats.

(c) People take prams, bicycles, and so on indoors to protect them from theft and weather; and children will tend to leave all kinds of clutter—bikes, wagons, roller skates, trikes, shovels, balls—around the door they use most often.

Therefore, give the entrance room a dead corner for storage, put coat pegs in a position which can be seen from the front door, and make an area five feet in diameter next to the pegs.

Therefore:

At the main entrance to a building, make a light-filled room which marks the entrance and straddles the boundary between indoors and outdoors, covering some space outdoors and some space indoors. The outside part may be like an old-fashioned porch; the inside like a hall or sitting room.



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Give that part of the entrance which sticks out into the street or garden a physical character which, as far as possible, make it one of the family of entrances along the street—FAMILY OF ENTRANCES (102); where it is appropriate, make it a porch—GALLERY SURROUND (166); and include a bench or seat, where people can watch the world go by or wait for someone—FRONT DOOR BENCH (242). As for the indoor part of the entrance room, above all, make sure that it is filled with light from two or even three sides, so that the first impression of the building is of light—TAPESTRY OF LIGHT AND DARK (135), LIGHT ON TWO SIDES OF EVERY ROOM (159). Put windows in the door itself—SOLID DOORS WITH GLASS (237). Put in BUILT-IN SEATS (202) and make the room part of the SEQUENCE OF SITTING SPACES (142); provide a WAIST-HIGH SHELF (201) for packages. And finally, for the overall shape of the entrance room and its construction, begin with THE SHAPE OF INDOOR SPACE (191). . . .

131 THE FLOW THROUGH ROOMS

. . . next to the gradient of spaces created by INTIMACY GRADIENT (127) and COMMON AREAS AT THE HEART (129), the way that rooms connect to one another will play the largest role in governing the character of indoor space. This pattern describes the most fundamental way of linking rooms to one another.

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The movement between rooms is as important as the rooms themselves; and its arrangement has as much effect on social interaction in the rooms, as the interiors of the rooms.

The movement between rooms, the circulation space, may be generous or mean. In a building where the movement is mean, the passages are dark and narrow—rooms open off them as dead ends; you spend your time entering the building, or moving between rooms, like a crab scuttling in the dark.

Compare this with a building where the movement is generous. The passages are broad, sunlit, with seats in them, views into gardens, and they are more or less continuous with the rooms themselves, so that the smell of woodsmoke and cigars, the sound of glasses, whispers, laughter, all that which enlivens a room, also enlivens the places where you move.

These two approaches to movement have entirely different psychological effects.

In a complex social fabric, human relations are inevitably subtle. It is essential that each person feels free to make connections or not, to move or not, to talk or not, to change the situation or not, according to his judgment. If the physical environment inhibits him and reduces his freedom of action, it will prevent him from doing the best he can to keep healing and improving the social situations he is in as he sees fit.

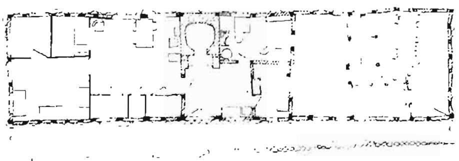
The building with generous circulation allows each person's instincts and intuitions full play. The building with ungenerous circulation inhibits them. It not only separates rooms from one another to such an extent that it is an ordeal to move from room to room, but kills the joy of time spent between rooms and may discourage movement altogether.

The following incident shows how important freedom of movement is to the life of a building. An industrial company in Lausanne had the following experience. They installed TV-phone intercoms between all offices to improve communication. A few months later, the firm was going down the drain—and they called in a management consultant. He finally traced their problems back to the TV-phones. People were calling each other on the TV-phone to ask specific questions—but as a result, people never talked in the halls and passages any more—no more "Hey, how are you, say, by the way, what do you think of this idea. . ." The organization was falling apart, because the informal talk—the glue which held the organization together—had been destroyed. The consultant advised them to junk the TV-phones—and they lived happily ever after.

This incident happened in a large organization. But the principle is just the same in a small work group or a family. The possibility of small momentary conversations, gestures, kindnesses, explanations which clear up misunderstandings, jokes and stories is the lifeblood of a human group. If it gets prevented, the group will fall apart as people's individual relationships go gradually downhill.

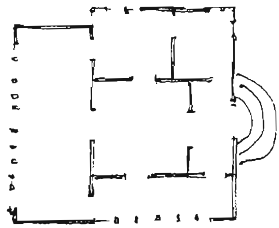
It is almost certain that the building with ungenerous circulation makes it harder for people to maintain their social fabric. In the long run, there is a good chance that social order in the building with ungenerous circulation will break down altogether.

The generosity of movement depends on the overall arrangement of the movement in the building, not on the detailed design of individual passages. In fact, it is at its most generous, when there are no passages at all and movement is created by a string of interconnecting rooms with doors between them.



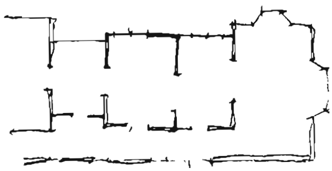
A sequence of rooms without a passage.

Even better, is the case where there is a loop. A loop, which passes through all the major rooms, public and common, establishes an enormous feeling of generosity. With a loop it is always possible to come and go in two different directions. It is possible to walk around and around, and it ties the rooms together. And, when such a loop passes through rooms (at one end so as not to disturb them), it connects rooms far more than a simple passage does.



A generous circulation loop.

A building where there is a chain of rooms in sequence also works like this, if there is a passage in parallel with the chain of rooms.

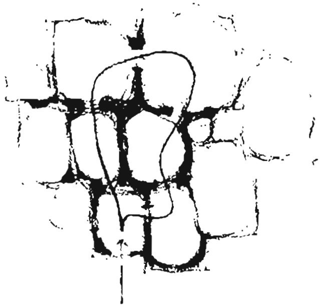


Passage in parallel forms the loop.

Therefore:

As far as possible, avoid the use of corridors and passages. Instead, use public rooms and common rooms as rooms for movement and for gathering. To do this, place the common rooms to form a chain, or loop, so that it becomes possible to walk from room to room—and so that private rooms open directly off these public rooms. In every

case, give this indoor circulation from room to room a feeling of great generosity, passing in a wide and ample loop around the house, with views of fires and great windows.



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Whenever passages or corridors are unavoidable, make them wide and generous too; and try to place them on one side of the building, so that they can be filled with light—SHORT PASSAGES (132). Furnish them like rooms, with carpets, bookshelves, easy chairs and tables, filtered light, and do the same for ENTRANCE ROOM (130) and STAIRCASE AS A STAGE (133). Always make sure that these rooms for movement have plenty of light in them and perhaps a view—ZEN VIEW (134), TAPESTRY OF LIGHT AND DARK (135), and LIGHT ON TWO SIDES OF EVERY ROOM (159). Keep doors which open into rooms, or doors between rooms which create the flow through rooms, in the corners of the rooms—CORNER DOORS (196). . . .

132 SHORT PASSAGES*

. . . THE FLOW THROUGH ROOMS (131) describes the generosity of light and movement in the way that rooms connect to one another and recommends against the use of passages. But when there has to be a passage in an office or a house and when it is too small to be a BUILDING THOROUGHFARE (101), it must be treated very specially, as if it were itself a room. This pattern gives the character of these smallest passages, and so completes the circulation system laid down by CIRCULATION REALMS (98) and BUILDING THOROUGHFARE (101) and THE FLOW THROUGH ROOMS (131).

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". . . long, sterile corridors set the scene for everything bad about modern architecture."

In fact, the ugly long repetitive corridors of the machine age have so far infected the word "corridor" that it is hard to imagine that a corridor could ever be a place of beauty, a moment in your passage from room to room, which means as much as all the moments you spend in the rooms themselves.

Long corridors.

We shall now try to pinpoint the difference between the corridors which live, which give pleasure, and make people feel alive, and those which do not. There are four main issues.

The most profound issue, to our minds, is natural light. A hall or passage that is generously lit by the sun is almost always pleasant. The archetype is the one-sided hall, lined with windows and doors on its open side. (Notice that this is one of the few places where it is a good idea to light a space from one side).

The second issue is the relation of the passage to the rooms which open off it. Interior windows, opening from these rooms into the hall, help animate the hall. They establish a flow between the rooms and the passage; they support a more informal style of communication; they give the person moving through the hall a taste of life inside the rooms. Even in an office, this contact is fine so long as it is not extreme; so long as the workplaces are protected individually by distance or by a partial wall—see HALF-PRIVATE OFFICE (152), WORKSPACE ENCLOSURE (183).

The third issue which makes the difference between a lively passage and a dead one is the presence of furnishings. If the passage is made in a way which invites people to furnish it with book cases, small tables, places to lean, even seats, then it becomes very much a part of the living space of the building, not something entirely separate.

And finally, there is the critical issue of length. We know intuitively that corridors in office buildings, hospitals, hotels, apartment buildings—even sometimes in houses—are far too long. People dislike them: they represent bureaucracy and monotony. And there is even evidence to show that they do actual damage.

Consider a study by Mayer Spivack on the unconscious effects of long hospital corridors on perception, communication, and behavior:

> Four examples of long mental hospital corridors are examined . . . it is concluded that such spaces interfere with normal verbal communication due to their characteristic acoustical properties. Optical phenomena common to these passageways obscure the perception of the human figure and face, and distort distance perception. Paradoxical visual cues produced by one tunnel created interrelated, cross-sensory illusions involving room size, distance, walking speed and time. Observations of patient behavior suggest the effect of narrow corridors upon anxiety is via the penetration of the personal

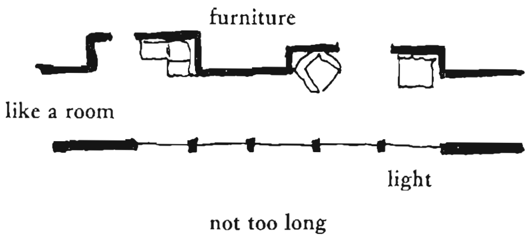
space envelope. (M. Spivack, "Sensory Distortion in Tunnels and Corridors," *Hospital and Community Psychiatry*, 18, No. 1, January 1967.)

When does a corridor become too long? In an earlier version of this pattern (*Short corridors* in *A Pattern Language Which Generates Multi-Service Centers*, CES, 1967, pp. 179–82), we have presented evidence which suggests that there is a definite cognitive breakpoint between long corridors and short halls: the evidence points to a figure of some 50 feet as a critical threshold. Beyond that, passages begin to feel dead and monotonous.

Of course it is possible to make even very long corridors in a human way; but if they have to be longer than 50 feet, it is essential to break down their scale in some fashion. For example, a long hall that is lit in patches from one side at short intervals can be very pleasant indeed: the sequence of light and dark and the chance to pause and glance out, breaks down the feeling of the endless dead corridor; or a hall which opens out into wider rooms, every now and then, has the same effect. However, do everything you can to keep the passages really short.

Therefore:

Keep passages short. Make them as much like rooms as possible, with carpets or wood on the floor, furniture, bookshelves, beautiful windows. Make them generous in shape, and always give them plenty of light; the best corridors and passages of all are those which have windows along an entire wall.



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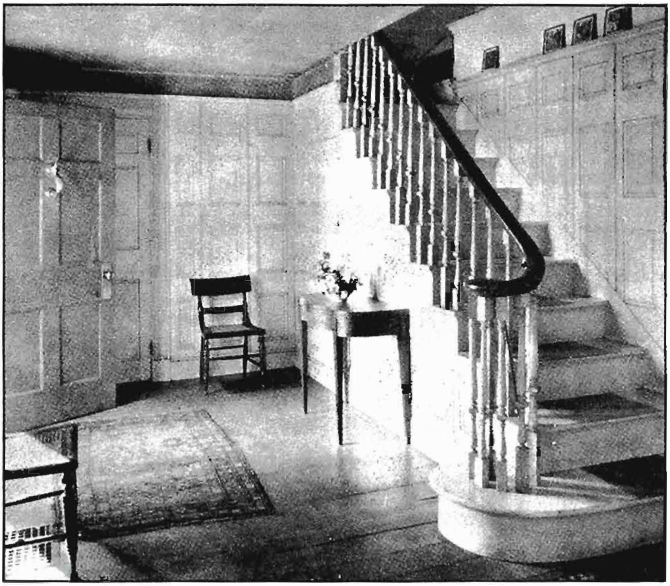
Put in windows, bookshelves, and furnishings to make them as much like actual rooms as possible, with alcoves, seats along the edge—LIGHT ON TWO SIDES OF EVERY ROOM (159), ALCOVES (179), WINDOW PLACE (180), THICK WALLS (197), CLOSETS BETWEEN ROOMS (198); open up the long side into the garden or out onto balconies—OUTDOOR ROOM (163), GALLERY SURROUND (166), LOW SILL (222). Make interior windows between the passage and the rooms which open off it—INTERIOR WINDOWS (194), SOLID DOORS WITH GLASS (237). And finally, for the shape of the passages, in detail, start with THE SHAPE OF INDOOR SPACE (191). . . .

133 STAIRCASE AS A STAGE



. . . if the entrances are in position—MAIN ENTRANCE (110); and the pattern of movement through the building is established —THE FLOW THROUGH ROOMS (131), SHORT PASSAGES (132), the main stairs must be put in and given an appropriate social character.

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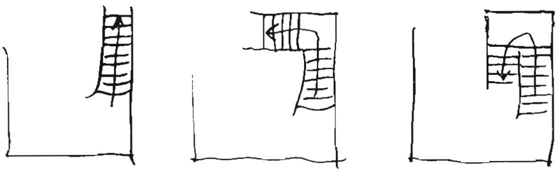
A staircase is not just a way of getting from one floor to another. The stair is itself a space, a volume, a part of the building; and unless this space is made to live, it will be a dead spot, and work to disconnect the building and to tear its processes apart.

Our feelings for the general shape of the stair are based on this conjecture: changes of level play a crucial role at many moments during social gatherings; they provide special places to sit, a place where someone can make a graceful or dramatic entrance, a place from which to speak, a place from which to look at other people while also being seen, a place which increases face to face contact when many people are together.

If this is so, then the stair is one of the few places in a building which is capable of providing for this requirement, since it is almost the only place in a building where a transition between levels occurs naturally.

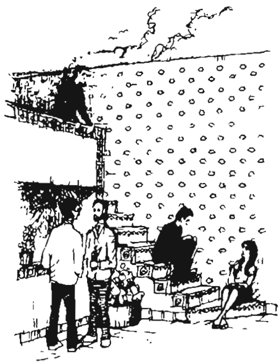
This suggests that the stair always be made rather open to the room below it, embracing the room, coming down around the outer perimeter of the room, so that the stairs together with the room form a socially connected space. Stairs that are enclosed in stairwells or stairs that are free standing and chop up the space



Examples of stair rooms.

below, do not have this character at all. But straight stairs, stairs that follow the contour of the walls below, or stairs that double back can all be made to work this way.

Furthermore, the first four or five steps are the places where people are most likely to sit if the stair is working well. To support this fact, make the bottom of the staircase flare out, widen the steps, and make them comfortable to sit on.



Stair seats.

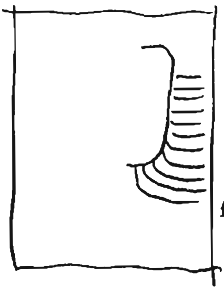
Finally, we must decide where to place the stair. On the one hand, of course, the stair is the key to movement in a building. It must therefore be visible from the front door; and, in a building with many different rooms upstairs, it must be in a position which commands as many of these rooms as possible, so that it forms a kind of axis people can keep clearly in their minds.

However, if the stair is too near the door, it will be so public that its position will undermine the vital social character we have described. Instead, we suggest that the stair be clear, and central, yes—but in the common area of the building, a little further back from the front door than usual. Not usually in the ENTRANCE ROOM (130), but in the COMMON AREA AT THE HEART (129). Then it will be clear and visible, and also keep its necessary social character.

Therefore:

Place the main stair in a key position, central and vis-

ible. Treat the whole staircase as a room (or if it is outside, as a courtyard). Arrange it so that the stair and the room are one, with the stair coming down around one or two walls of the room. Flare out the bottom of the stair with open windows or balustrades and with wide steps so that the people coming down the stair become part of the action in the room while they are on the stair, and so that people below will naturally use the stair for seats.



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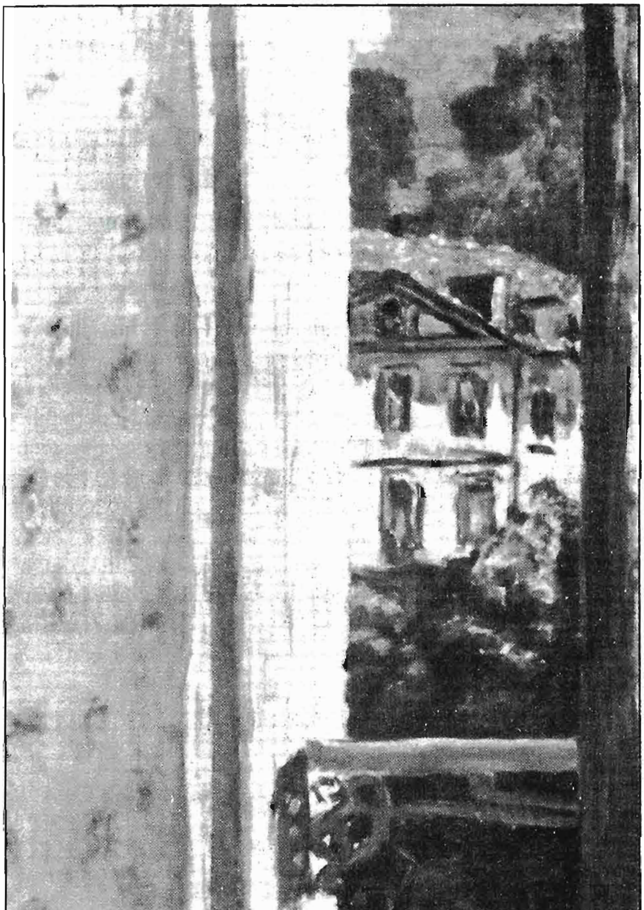
Treat the bottom steps as STAIR SEATS (125); provide a window or a view half-way up the stair, both to light the stair and to create a natural focus of attention—ZEN VIEW (134), TAPESTRY OF LIGHT AND DARK (135); remember to calculate the length and shape of the stair while you are working out its position—STAIRCASE VOLUME (195). Get the final shape of the staircase room and the beginnings of its construction from THE SHAPE OF INDOOR SPACE (191). . . .

134 ZEN VIEW*



. . . how should we make the most of a view? It turns out that the pattern which answers this question helps to govern not the rooms and windows in a building, but the places of transition. It helps to place and detail ENTRANCE TRANSITION (112), ENTRANCE ROOM (130), SHORT PASSAGES (132), THE STAIRCASE AS A STAGE (133)—and outside, PATHS AND GOALS (120).

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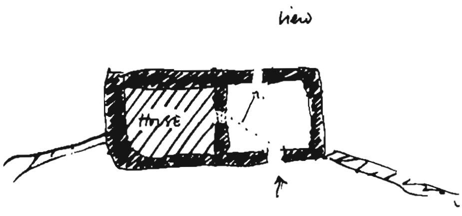
The archetypal zen view occurs in a famous Japanese house, which gives this pattern its name.

A Buddhist monk lived high in the mountains, in a small stone house. Far, far in the distance was the ocean, visible and beautiful from the mountains. But it was not visible from the monk's house itself, nor from the approach road to the house. However, in front of the house there stood a courtyard surrounded by a thick stone wall. As one came to the house, one passed through a gate into this court, and then diagonally across the court to the front door of the house. On the far side of the courtyard there was a slit in the wall, narrow and diagonal, cut through the thickness of the wall. As a person walked across the court, at one spot, where his position lined up with the slit in the wall, for an instant, he could see the ocean. And then he was past it once again, and went into the house.



The monk's house.

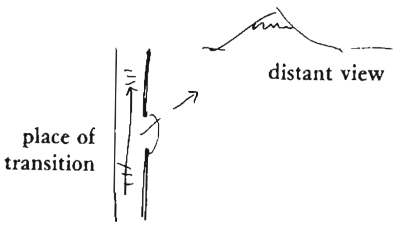
What is it that happens in this courtyard? The view of the distant sea is so restrained that it stays alive forever. Who, that has ever seen that view, can ever forget it? Its power will never fade. Even for the man who lives there, coming past that view day after day for fifty years, it will still be alive.

This is the essence of the problem with any view. It is a beautiful thing. One wants to enjoy it and drink it in every day. But the more open it is, the more obvious, the more it shouts, the sooner it will fade. Gradually it will become part of the building, like the wallpaper; and the intensity of its beauty will no longer be accessible to the people who live there.

Therefore:

If there is a beautiful view, don't spoil it by building huge windows that gape incessantly at it. Instead, put the windows which look onto the view at places of transition—along paths, in hallways, in entry ways, on stairs, between rooms.

If the view window is correctly placed, people will see a glimpse of the distant view as they come up to the window or pass it: but the view is never visible from the places where people stay.



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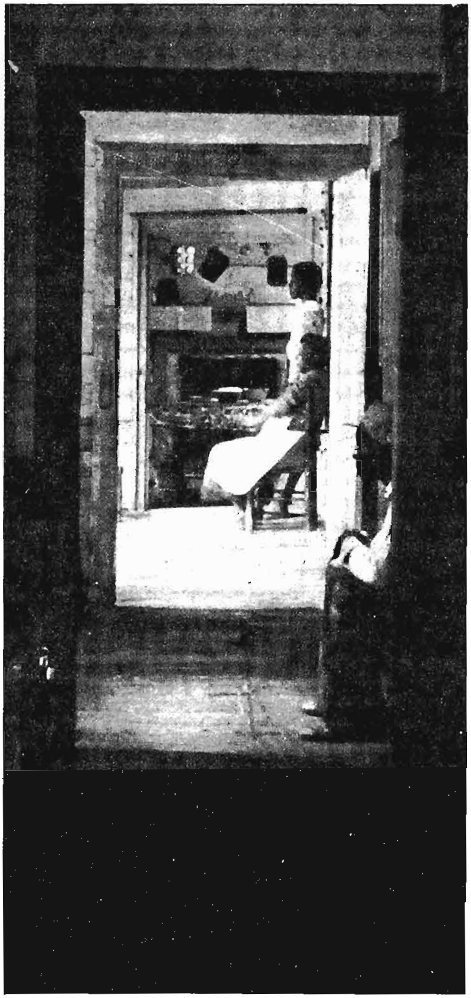
Put in the windows to complete the indirectness of the view —NATURAL DOORS AND WINDOWS (221); place them to help the TAPESTRY OF LIGHT AND DARK (135); and build a seat from which a person can enjoy the view—WINDOW PLACE (180). If the view must be visible from inside a room, make a special corner of the room which looks onto the view, so that the enjoyment of the view becomes a definite act in its own right. . . .

135 TAPESTRY OF LIGHT AND DARK*



. . . passages, entrances, stairs are given their rough position by THE FLOW THROUGH ROOMS (131), SHORT PASSAGES (132), STAIRCASE AS A STAGE (133), ZEN VIEW (134). This pattern helps you fine tune their positions by placing light correctly.

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In a building with uniform light level, there are few "places" which function as effective settings for human events. This happens because, to a large extent, the places which make effective settings are defined by light.

People are by nature phototropic—they move toward light, and, when stationary, they orient themselves toward the light. As a result the much loved and much used places in buildings, where the most things happen, are places like window seats, verandas, fireside corners, trellised arbors; all of them defined by non-uniformities in light, and all of them allowing the people who are in them to orient themselves toward the light.

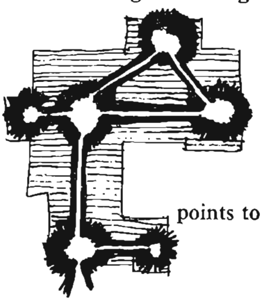
We may say that these places become the settings for the human events that occur in the building. Since there is good reason to believe that people need a rich variety of settings in their lives (see for instance, Roger Barker, *The Stream of Behavior: Explorations of its Structure and Content*, New York: Appleton-Century-Crofts, 1963), and since settings are defined by "places," which in turn seem often to be defined by light, and since light places can only be defined by contrast with darker ones, this suggests that the interior parts of buildings where people spend much time should contain a great deal of alternating light and dark. The building needs to be a tapestry of light and dark.

This tapestry of light and dark must then fit together with the flow of movement, too. As we have said, people naturally tend to walk toward the light. It is therefore obvious that any entrance, or any key point in a circulation system, must be systematically lighter than its surroundings—with light (daylight and artificial light) flooded there, so that its intensity becomes a natural target. The reason is simple. If there are places which have more light than the entrances and circulation nodes, people will tend to walk toward *them* (because of their phototropic tendency) and will therefore end up in the wrong place—with frustration and confusion as the only possible result.

If the places where the light falls are not the places you are meant to go toward, or if the light is uniform, the environment is giving information which contradicts its own meaning. The environment is only functioning in a single-hearted manner, as information, when the lightest spots coincide with the points of maximum importance.

Therefore:

Create alternating areas of light and dark throughout the building, in such a way that people naturally walk toward the light, whenever they are going to important places: seats, entrances, stairs, passages, places of special beauty, and make other areas darker, to increase the contrast.



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Where the light to walk toward is natural light, build seats and alcoves in those windows which attract the movement—WINDOW PLACE (180). If you use skylights, then make the surfaces around the skylight warm in color—WARM COLORS (250); otherwise the direct light from the sky is almost always cold. At night make pools of incandescent light which guide the movement—POOLS OF LIGHT (252). . . .

within the framework of the wings and their internal gradients of space and movement, define the most important areas and rooms. First, for a house;

136. COUPLE'S REALM
137. CHILDREN'S REALM
138. SLEEPING TO THE EAST
139. FARMHOUSE KITCHEN
140. PRIVATE TERRACE ON THE STREET
141. A ROOM OF ONE'S OWN
142. SEQUENCE OF SITTING SPACES
143. BED CLUSTER
144. BATHING ROOM
145. BULK STORAGE

136 COUPLE'S REALM*

. . . this pattern helps to complete THE FAMILY (75), HOUSE FOR A SMALL FAMILY (76) and HOUSE FOR A COUPLE (77). It also ties in to a particular position on the INTIMACY GRADIENT (127), and can be used to help generate that gradient, if it doesn't exist already.

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The presence of children in a family often destroys the closeness and the special privacy which a man and wife need together.

Every couple start out sharing each other's adult lives. When children come, concern for parenthood often overwhelms the private sharing, and everything becomes exclusively oriented toward the children.

In most houses this is aggravated by the physical design of the environment. Specifically:

1. Children are able to run everywhere in the house, and therefore tend to dominate all of it. No rooms are private.

2. The bathroom is often placed so that adults must walk past children's bedrooms to reach it.

3. The walls of the master bedroom are usually too thin to afford much acoustical privacy.

The result is that the private life of the couple is continually interrupted by the awareness that the children are nearby. Their role as parents rather than as a couple permeates all aspects of their private relations.

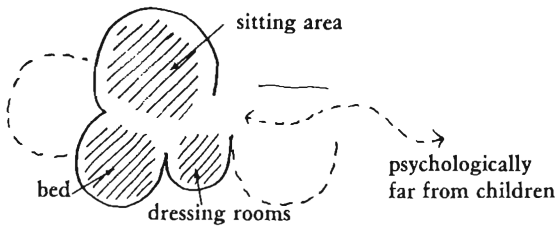
On the other hand, of course, they do not want to be completely separated from the children's rooms. They also want to be close to them, especially while the children are young. A mother wants to run quickly to the bed of an infant in an emergency.

These problems can only be solved if there is a part of the house, which we call the couple's realm; that is, a world in which the intimacy of the man and woman, their joys and sorrows, can be shared and lived through. It is a place not only insulated from the children's world, but also complete in itself, a world, a domain. In many respects it is a version of the pattern HOUSE FOR A COUPLE (77), embedded in the larger house with children.

The couple's realm needs to be the kind of place that one might sit in and talk privately, perhaps with its own entrance to the outdoors, to a balcony. It is a sitting room, a place for privacy, a place for projects; the bed is part of it, but tucked away into an alcove with its own window; a fireplace is wonderful; and it needs some kind of a double door, an ante-room, to protect its privacy.

Therefore:

Make a special part of the house distinct from the common areas and all the children's rooms, where the man and woman of the house can be together in private. Give this place a quick path to the children's rooms, but, at all costs, make it a distinctly separate realm.



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Even if it's very tiny, give it a sitting area, a place to relax, read, make love, play music—SITTING CIRCLE (185). Give it LIGHT ON TWO SIDES (159). At the heart of the couple's realm, place the bed—MARRIAGE BED (187) so it has morning light—SLEEPING TO THE EAST (138), and, beside it, the DRESSING ROOM (189); if possible, try to place the bathing room to open off the couple's realm—BATHING ROOM (144). For the shape of this room in fine detail and its construction, see THE SHAPE OF INDOOR SPACE (191). And keep the area private with a LOW DOORWAY (224) or two doors—CLOSETS BETWEEN ROOMS (198). . . .

137 CHILDREN'S REALM*

. . . in a HOUSE FOR A SMALL FAMILY (76), there are three main areas: a COMMON AREA AT THE HEART (129), a COUPLE'S REALM (136), and a CHILDREN'S REALM which overlaps the common area. If the common area and couple's realm are in position, it is now possible to weave in this partly separate, partly overlapping place for children, which we call a realm, although we recognize that it is not a separate realm but more an aspect of the house, reserved for children, a mode of functioning which is physically separate only in certain parts. It is that component of CONNECTED PLAY (68) which acts within the individual houses.

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If children do not have space to release a tremendous amount of energy when they need to, they will drive themselves and everybody else in the family up the wall.

A frenzy in the dining room.

For a graphic example, visualize what happens when children bring in friends after school and have a whole number of ideas in their heads of what to do or play. They are loud and boisterous after being pent up in school all day and they need a lot of indoor and outdoor space to expend all this energy. Obviously, the mood calls for space which contains long distances because they suggest the possibility of physical freedom much more.

And, in general, the child's world is not some single space or room—it is a continuum of spaces. The sidewalk where he sells lemonade and talks with friends, the outdoor play area of his house into which he can invite his friends, the indoor playspace, his private space in the house where he can be alone with a friend, the bathroom, the kitchen where his mother is, the family room where the rest of the family is—for the child, all of these together form his world. If any other kind of space interrupts this continuum, it will be swallowed up into the child's world as part of his circulation path.

If the private rooms, the couple's realm, the quiet sitting areas are scattered randomly among the places that form the children's world, then they will certainly be violated. But if the children's world is one continuous swath, then these quiet, private, adult places will be protected by the mere fact that they are not part of the continuum. We therefore conclude that all the places which children need and use should form one continuous geometrical swath, which does not include the couple's realm, the adult private rooms, or any formal, quiet sitting spaces. This continuous playspace needs certain additional properties.

1. Children are apt to be very demanding of everyone's attention when they are in this specially energetic state. The mother is particularly susceptible to being totally swallowed up by them. They will want to show her things, ask her questions, ask her to do things . . . "Look what I found. Look what I made. Where shall I put this? Where's the clay? Make some paint." The mother must be available for all this, but not forced to be in the thick of it. Her workroom and the kitchen need to be protected, yet tangential to the playspace.

2. The family room is also part of the continuum since it is where children and the rest of the family have contact with each other. The playspace, therefore, should enter the common area—preferably to one side—see COMMON AREA AT THE HEART (129).

3. The children's private spaces (whether they are alcoves or bedrooms) can be off the playspace, but it must be possible to close them off. Children naturally want to be exclusive at times—they often invite their closest friends into such a space for a private chat or to show off some prized possession.

4. It is usually too expensive to create a special playspace; but it is always possible to make a hallway function as the indoor part of the playspace. It needs to be a bit wider than a normal hall (perhaps seven feet) with nooks and stages along the edge. Children take up the suggestive qualities of spaces—on sight of a little cave-like space, they will decide to play house; on sight of a raised platform, they will decide to put on a play. Thus, both indoor and outdoor parts of the playspace need different levels, little nooks, counters, or tables, and so on. A lot of open storage for toys, costumes, and so forth should also be provided in these spaces. When toys are visible, they are more likely to be used.

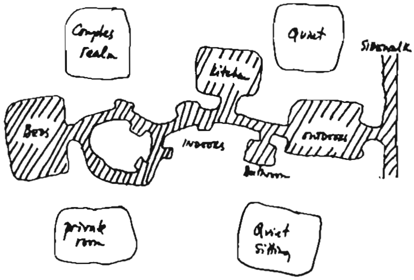
5. The outdoor space just adjacent to the indoor space should be partially roofed, to provide transition between the two and to reinforce the continuity.

Remember that this kind of playspace is as much in the interest of the adults in the family, as in the interest of the children. If the house is organized so that the children's world gradually spreads throughout the home, it will disrupt and dominate the world of tranquility, preciousness, and freedom that adults need, to live their own lives. If there is an adequate children's world, in the manner described in this pattern, then both the adults and children can co-exist, each without dominating the other.

Therefore:

Start by placing the small area which will belong entirely to the children—the cluster of their beds. Place it in a separate position toward the back of the house, and in such a way that a continuous playspace can be made from this cluster to the street, almost like a wide swath inside the house, muddy, toys strewn along the way, touching those family rooms which children need—the bathroom and the kitchen most of all—passing the common area along one side (but leaving quiet sitting areas and the couple's realm entirely separate and inviolate), reaching out to the street, either through its own door or through the entrance room, and ending in an outdoor room, connected

to the street, and sheltered, and large enough so that the children can play in it when it rains, yet still be outdoors.



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As you place this swath between the children's beds and the street, place the FARMHOUSE KITCHEN (139) and the HOME WORKSHOP (157) to one side of the path, touching it, yet not violated by it. Do the same for BATHING ROOM (144), and give it some connection to the children's beds. Develop the cluster of children's beds according to BED CLUSTERS (143); make the long passages which form the realm as light and warm as possible —SHORT PASSAGES (132); make the OUTDOOR ROOM (163) large enough for boisterous activity. . . .

138 SLEEPING TO THE EAST*

. . . at the back of the INTIMACY GRADIENT (127), the position of the COUPLE'S REALM (136) and CHILDREN'S REALM (137), give some idea of where bedrooms will be. This pattern settles the position of the bedrooms by placing them to face the east, and thereby complements the effect of INDOOR SUNLIGHT (128), which places the more public rooms toward the south.

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This is one of the patterns people most often disagree with. However, we believe they are mistaken.

People's attitude to this pattern often runs along the following lines: "The pattern suggests that I should sleep somewhere where the sun can wake me up; but I don't want the sun to wake me up; I want to be able to sleep late, whenever I can. I guess I have a different style of life; so the pattern doesn't apply to me."

We believe there may be fundamental biological matters at stake here and that no one who once understands them will want to ignore them, even if his present style of life does seem to contradict them.

The facts, as far as we can tell, are these. Our human organism contains a number of very sensitive biological clocks. We are creatures of rhythms and cycles. Whenever we behave in a way which is not in tune with our natural rhythms and cycles, we run a very good chance of disturbing our natural physiological and emotional functioning.

Specifically, these cycles have a great deal to do with sleep. And the cycle of the sun governs our physiology to such an extent, that we cannot afford to sleep out of touch with this cycle. Consider the fact that the body reaches its lowest metabolic activity in the middle of the sun's night, at about 2 A.M. It seems very likely, then, that the most nourishing kind of sleep is a sleep whose curve more or less coincides with the curve of metabolic activity—which is in turn dependent on the sun.

It has recently been shown by Dr. London at the San Francisco Medical School, that our whole day depends critically on the conditions under which we waken. If we wake up immediately after a period of dreaming (REM sleep), we will feel ebullient, energetic, and refreshed for the whole day, because certain critical hormones are injected into the bloodstream immediately after REM sleep. If, however, we wake up during delta sleep (another type of sleep, which happens in between periods of dreaming), we will feel irritable, drowsy, flat, and lethargic all day long: the relevant hormones are not in the bloodstream at the critical moment of awakening.

Now, obviously, anyone who is woken by an alarm clock, will sometimes be woken in the middle of delta sleep and will, on those days, have a lethargic day; and will sometimes wake up just after REM sleep and will, on those days, have an energetic day. Of course this is tremendously oversimplified—many other matters intervene. But if these facts about sleep are correct, they cannot help but have *some* impact on your waking hours.

Now, the only way to make sure that you wake up at the right time, with the closure of REM sleep, is to wake up naturally. But you can only wake up naturally, and in accordance with the other, larger cycle of metabolic activity, if you wake up with the sun. The sun warms you, increases the light, gently nudges you to wake up—but in a way that is so gentle, that you will still actually wake up at the moment which serves you best—that is, just *after* a dream.

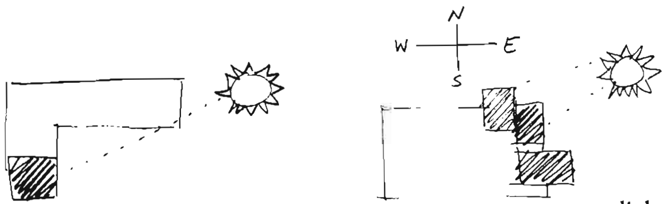
We believe, in short, that this pattern is fundamental to the process of having a healthy, active, energetic day—and that anyone who rejects this pattern on the grounds that he does not want to be woken by the sun, is making a serious mistake about the functioning of his or her own body.

What about details? You want to see the sunlight, but you don't want the sun to shine on the bed itself or you'll wake up hot and uncomfortable. The right kind of place is one which provides morning light—consequently a window in the room that lets in the eastern light—and a bed that provides a view of the light without being directly in the light shaft.

And finally, the matter of the view from the bed is worth mentioning. People look out in the morning to see what kind of day its going to be. Some views give this information very well; others not at all. A good morning window looks out on some kind of constant object or growing thing, which reflects the changes of season and the weather, and allows a person to establish the mood of the day as soon as he wakes up.

Therefore,

Give those parts of the house where people sleep, an eastern orientation, so that they wake up with the sun and light. This means, typically, that the sleeping area needs to be on the eastern side of the house; but it can also be on the western side provided there is a courtyard or a terrace to the east of it.



eastern light

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Place all the beds with care, so that they get the morning light, not only as a group—COUPLE'S REALM (136), BED CLUSTER (143), but individually, so that each gets eastern light from some specific window—MARRIAGE BED (187), BED ALCOVE (188). Use FILTERED LIGHT (238) to prevent the sun from shining too directly on the bed. If there is room, make this window function as a WINDOW PLACE (180). Place the window nearest the bed carefully so that it frames a view which tells a person waking what the weather is like—NATURAL DOORS AND WINDOWS (221). . . .

139 FARMHOUSE KITCHEN**

. . . you have laid out, or already have, some kind of common area at the center of the building. In many cases, especially in houses, the heart of this common area is a kitchen or an eating area since shared food has more capacity than almost anything to be the basis for communal feelings—COMMON AREA AT THE HEART (129), COMMUNAL EATING (147). This pattern defines an ancient kind of kitchen where the cooking and the eating and the living are all in a single place.

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The isolated kitchen, separate from the family and considered as an efficient but unpleasant factory for food is a hangover from the days of servants; and from the more recent days when women willingly took over the servants' role.

In traditional societies, where there were no servants and the members of a family took care of their own food, the isolated kitchen was virtually unknown. Even when cooking was entirely in the hands of women, as it very often was, the work of cooking was still thought of as a primal, communal function; and the "hearth," the place where food was made and eaten, was the heart of family life.

As soon as servants took over the function of cooking, in the palaces and manor houses of the rich, the kitchens naturally got separated from the dining halls. Then, in the middle class housing of the nineteenth century, where the use of servants became rather widespread, the pattern of the isolated kitchen also spread, and became an accepted part of any house. But when the servants disappeared, the kitchen was still left separate, because it was thought "genteel" and "nice" to eat in dining rooms away from any sight or smell of food. The isolated kitchen was still associated with those houses of the rich, where dining rooms like this were taken for granted.

But this separation, in a family, has put the woman in a very difficult position. Indeed, it may not be too much to say that it has helped to generate those circumstances which have made the woman's position in mid-twentieth century society unworkable and unacceptable. Very simply, the woman who accepted responsibility for making food agreed to isolate herself in the "kitchen"—and subtly then agreed to become a servant.

Modern American houses, with the so-called open plan, have gone some way toward resolving this conflict. They very often have a kitchen that is half-separated from the family room: not isolated, and not entirely in the family room. This does create a circumstance where the people who are cooking are in touch with the rest of the family, while they are working. And it does not have the obvious stigma and unpleasantness of separated sculleries and kitchens.

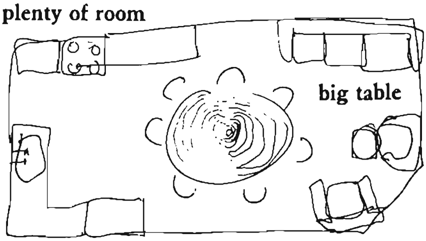
But it does not go far enough. If we look beneath the surface, there is in this kind of plan still the hidden supposition that cooking is a chore and that eating is a pleasure. So long as this mentality rules over the arrangement of the house, the conflict which existed in the isolated kitchen is still present. The difficulties which surround the situation will only disappear, finally, when all the members of the family are able to accept, fully, the fact that taking care of themselves by *cooking* is as much a part of life as taking care of themselves by *eating*. This will only happen when the communal hearth is once more gathered round the big kitchen table, as it is in primitive communities, where the taking care of necessary functions is an everyday part of life, and has not been lost to people's consciousness through the misleading function of the servant.

We are convinced that the solution lies in the pattern of the old farmhouse kitchen. In the farmhouse kitchen, kitchen work and family activity were completely integrated in one big room. The family activity centered around a big table in the middle: here they ate, talked, played cards, and did work of all kinds including some of the food preparation. The kitchen work was done communally both on the table, and on counters round the walls. And there might have been a comfortable old chair in the corner where someone could sleep through the activities.

Therefore:

Make the kitchen bigger than usual, big enough to in-

clude the "family room" space, and place it near the center of the commons, not so far back in the house as an ordinary kitchen. Make it large enough to hold a good big table and chairs, some soft and some hard, with counters and stove and sink around the edge of the room; and make it a bright and comfortable room.



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Give the kitchen LIGHT ON TWO SIDES (159). When you place the kitchen counters later, make them really long and generous and toward the south to get the light—COOKING LAYOUT (184), SUNNY COUNTER (199); leave room for an alcove or two around the kitchen—ALCOVES (179); make the table in the middle big, and hang a nice big warm single light right in the middle to draw the family around it—EATING ATMOSPHERE (182); surround the walls, when you detail them, with plenty of open shelves for pots, and mugs, and bottles, and jars of jam—OPEN SHELVES (200), WAIST-HIGH SHELF (201). Put in a comfortable chair somewhere—SEQUENCE OF SITTING SPACES (142). And for the room shape and construction, start with THE SHAPE OF INDOOR SPACE (191). . . .

140 PRIVATE TERRACE ON THE STREET**

. . . among the common areas and sitting spaces—COMMON AREAS AT THE HEART (129), SEQUENCE OF SITTING SPACES (142) —there is a need for one, at least, which puts the people in the house in touch with the world of the street outside the house. This pattern helps to create the HALF-HIDDEN GARDEN (111) and gives life to the street—GREEN STREET (51) or PEDESTRIAN STREET (100).

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The relationship of a house to a street is often confused: either the house opens entirely to the street and there is no privacy; or the house turns its back on the street, and communion with street life is lost.

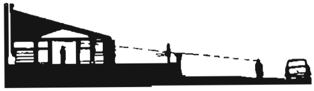
We have within our natures tendencies toward both communality and individuality. A good house supports *both* kinds of experience: the intimacy of a private haven *and* our participation with a public world.

But most homes fail to support these complementary needs. Most often they emphasize one, to the exclusion of the other: we have, for instance, the fishbowl scheme, where living areas face the street with picture windows and the "retreat," where living areas turn away from the street into private gardens.

The old front porch, in traditional American society, solved this problem perfectly. Where the street is quiet enough, and the house near enough to the street, we cannot imagine a much better solution. But if the street is different, a slightly different solution will be necessary.

Early in his career, Frank Wright experimented with one possible solution. When he built beside lively streets he built a wide terrace between the living room and the street.

To our knowledge, Grant Hildebrand first pointed out this pattern in Wright's work, in his paper, "Privacy and Participation: Frank Lloyd Wright and the City Street," School of



Section of private terrace and street.

Architecture, University of Washington, Seattle, Washington: 1970. Hildebrand gives an interesting account of the way this pattern works in the Cheney house:

> As the pedestrian looks toward the house from the sidewalk, the masonry terrace wall is located so that his line of sight over its top falls at the lower edge of the elaborately leaded upper glass zone of the terrace doors. Vision into the living room from the sidewalk thus is carefully controlled. If the occupant within the house is standing near the doors only his head and shoulders are dimly visible through a diffusing surface. If the occupant is sitting he is, of course, completely hidden from the pedestrian's view.
>
> But whereas the pedestrian cannot effectively intrude on the privacy of the house, the inhabitant on the other hand has a number of options available at will. As he stands or sits on the terrace itself, well above the sidewalk, the effect is of easy participation in the full panorama of the street. From the elevated platform vision is unobstructed. Neighbors and friends can be waved at, greeted, invited in for a chat. Thus the terrace, projecting toward the street, linked—and still links—the Cheney house and its inhabitants to the community life of Oak Park. The configuration is so successful that, as in the Robie house, there has never been much need for curtains. The parapets and the leaded glass, carefully placed, do it all. Thus out of the decision to face the living room toward the street has come not a sacrifice of privacy, but a much richer range of alternative experiences for the occupant.

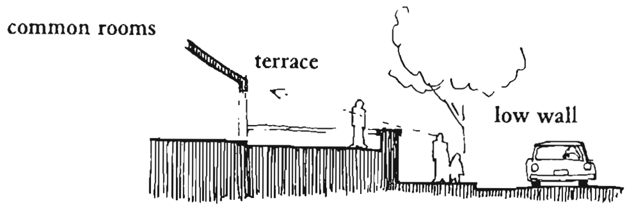
We believe that Wright's use of this pattern was based on accurate intuitions about a fundamental human need. Indeed, there are empirical grounds for believing that the need for a house to be in touch with the street outside is a fundamental psychological necessity: and that its opposite—the tendency some people have to keep their houses away from the street, locked up, barred, and disconnected from the street—is a symptom of a serious emotional disorder—the autonomy-withdrawal syndrome. See Alexander, "The City as a Mechanism for Sustaining Human Contact," W. Ewald, ed., *Environment for Man*, Indiana University Press, 1967, pp. 60–102.

Here is an example of this pattern from Greece. It is clear that the pattern can be expressed in many ways, so long as the relationship, the balance of privacy and street contact, is maintained.

Private terrace on the street.

Therefore:

Let the common rooms open onto a wide terrace or a porch which looks into the street. Raise the terrace slightly above street level and protect it with a low wall, which you can see over if you sit near it, but which prevents people on the street from looking into the common rooms.



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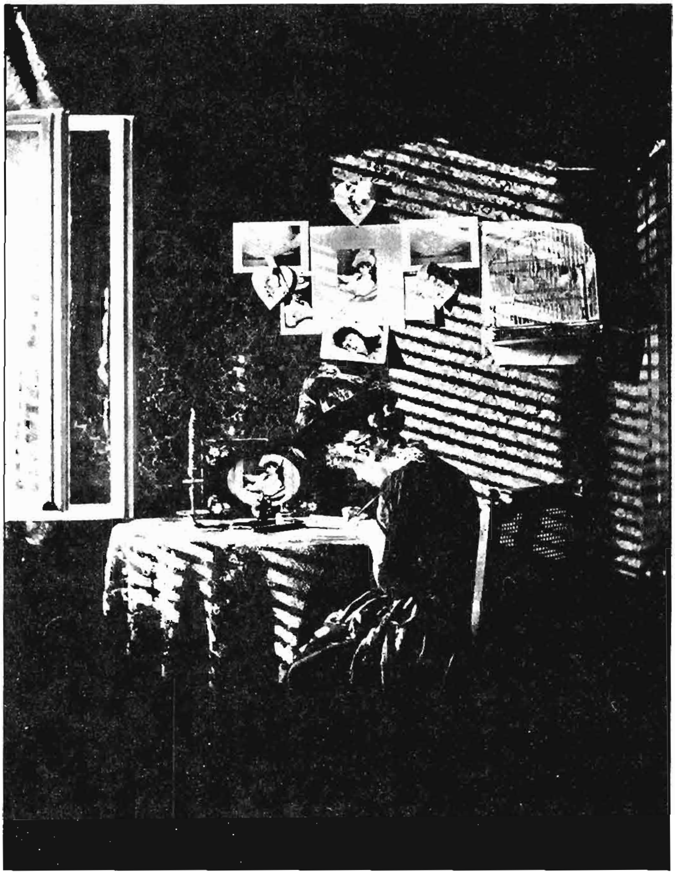
If possible, place the terrace in a position which is also congruent with natural contours—TERRACED SLOPE (169). The wall, if low enough, can be a SITTING WALL (243); in other cases, where you want more privacy, you can build a full garden wall, with openings in it, almost like windows, which make the connection with the street—GARDEN WALL (173), HALF-OPEN WALL (193). In any case, surround the terrace with enough things to give it at least the partial feeling of a room—OUTDOOR ROOM (163). . . .

141 A ROOM OF ONE'S OWN**



. . . the INTIMACY GRADIENT (127) makes it clear that every house needs rooms where individuals can be alone. In any household which has more than one person, this need is fundamental and essential—THE FAMILY (75), HOUSE FOR A SMALL FAMILY (76), HOUSE FOR A COUPLE (77). This pattern, which defines the rooms that people can have to themselves, is the natural counterpart and complement to the social activity provided for in COMMON AREAS AT THE HEART (129).

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No one can be close to others, without also having frequent opportunities to be alone.

A person in a household without a room of his own will always be confronted with a problem: he wants to participate in family life and to be recognized as an important member of that group; but he cannot individualize himself because no part of the house is totally in his control. It is rather like expecting one drowning man to save another. Only a person who has a well-developed strong personal self, can venture out to participate in communal life.

This notion has been explored by two American sociologists, Foote and Cottrell:

> There is a critical point beyond which closer contact with another person will no longer lead to an increase in empathy. (A) Up to a certain point, intimate interaction with others increases the capacity to empathize with them. But when others are too constantly present, the organism appears to develop a protective resistance to responding to them. . . . This limit to the capacity to empathize should be taken into account in planning the optimal size and concentration of urban populations, as well as in planning the schools and the housing of individual families. (B) Families who provide time and space for privacy, and who teach children the utility and satisfaction of withdrawing for private reveries, will show higher average empathic capacity than those who do not. (Foote, N. and L. Cottrell, *Identity and Interpersonal Competence*, Chicago, 1955, pp. 72–73, 79.)

Alexander Leighton has made a similar point, emphasizing the mental damage that results from a *systematic lack of privacy*

["Psychiatric Disorder and Social Environment," *Psychiatry*, 18 (3), p. 374, 1955].

In terms of space, what is required to solve the problem? Simply, a room of one's own. A place to go and close the door; a retreat. Visual and acoustic privacy. And to make certain that the rooms are truly private, they must be located at the extremities of the house: at the ends of building wings; at the ends of the INTIMACY GRADIENT (127); far from the common areas.

We shall now look at the individual members of the family one at a time, in slightly more detail.

Wife. We put the wife first, because, classically, it is she who has the greatest difficulty with this problem. She belongs everywhere, and every place inside the house is in a vague sense hers—yet it is only very rarely that the woman of the house has a small room which is specifically and exclusively her own. Virginia Woolf's famous essay "A room of one's own" is the strongest and most important statement on this issue—and has given this pattern its name.

Husband. In older houses, the man of the house usually had a study or a workshop of his own. However, in modern houses and apartments, this has become as rare as the woman's own room. And it is certainly just as essential. Many a man associates his house with the mad scene of young children and the enormous demands put on him there. If he has no room of his own, he has to stay at his office, away from home, to get peace and quiet.

Teenagers. For teenage children, we have devoted an entire pattern to this problem: TEENAGER'S COTTAGE (154). We have argued there that it is the teenagers who are faced with the problem of building a firm and strong identity; yet among the adults, it is the young who are most often prevented from having a place in the home that is clearly marked as their own.

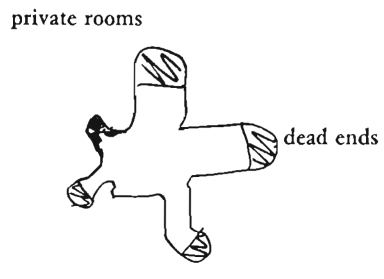
Children. Very young children experience the need for privacy less—but they still experience it. They need some place to keep their possessions, to be alone at times, to have a private visit with a playmate. See BED CLUSTER (143) and BED ALCOVE (188). John Madge has written a good survey of a family's need for private space ("Privacy and Social Interaction," Transactions of the Bartlett Society, Vol. 3, 1964–65), and concerning the children he says:

The bedroom is often the repository of most of these items of personal property around which the individual builds his own satisfactions and which help to differentiate him from the other members of the inner circle of his life—indeed he will often reveal them more freely to a peer in age and sex than to a member of his own family.

In summary then, we propose that a room of one's own—an alcove or bed nook for younger children—is essential for each member of the family. It helps develop one's own sense of identity; it strengthens one's relationship to the rest of the family; and it creates personal territory, thereby building ties with the house itself.

Therefore:

Give each member of the family a room of his own, especially adults. A minimum room of one's own is an alcove with desk, shelves, and curtain. The maximum is a cottage—like a TEENAGER'S COTTAGE (154), or an OLD AGE COTTAGE (155). In all cases, especially the adult ones, place these rooms at the far ends of the intimacy gradient—far from the common rooms.



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Use this pattern as an antidote to the extremes of "togetherness" created by COMMON AREAS AT THE HEART (129). Even for small children, give them at least an alcove in the communal sleeping area—BED ALCOVE (188); and for the man and woman, give each of them a separate room, beyond the couples realm they share; it may be an expanded dressing room—DRESSING ROOM (189), a home workshop—HOME WORKSHOP (157), or once again, an alcove off some other room—ALCOVES (179), WORKSPACE ENCLOSURE (183). If there is money for it, it may even be possible to give a person a cottage, attached to the main structure—TEENAGER'S COTTAGE (154), OLD AGE COTTAGE (155). In every case there must at least be room for a desk, a chair, and THINGS FROM YOUR LIFE (253). And for the detailed shape of the room, see LIGHT ON TWO SIDES OF EVERY ROOM (159) and THE SHAPE OF INDOOR SPACE (191). . . .

142 SEQUENCE OF SITTING SPACES*

. . . at various points along the INTIMACY GRADIENT (127) of a house, or office, or a public building, there is a need for sitting space. Some of this space may take the form of rooms devoted entirely to sitting, like the formal sitting rooms of old; others may be simply areas or corners of other rooms. This pattern states the range and distribution of these sitting spaces, and helps create the intimacy gradient by doing so.

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Every corner of a building is a potential sitting space. But each sitting space has different needs for comfort and enclosure according to its position in the intimacy gradient.

We know from INTIMACY GRADIENT (127) that a building has a natural sequence of spaces in it, ranging from the most public areas, outside the entrance, to the most private, in individual rooms and couples realms. Here is a sequence of sitting spaces that would correspond roughly to the INTIMACY GRADIENT (127):

1. Outside the entrance—ENTRANCE ROOM (130), FRONT DOOR BENCH (242)
2. Inside the entrance—ENTRANCE ROOM (130), RECEPTION WELCOMES YOU (149)
3. Common rooms—COMMON AREAS AT THE HEART (129), SHORT PASSAGES (132), FARMHOUSE KITCHEN (139), SMALL MEETING ROOMS (151)
4. Half-private rooms—CHILDREN'S REALM (137), PRIVATE TERRACE ON THE STREET (140), HALF-PRIVATE OFFICE (152), ALCOVES (179)
5. Private rooms—COUPLE'S REALM (136), A ROOM OF ONE'S OWN (141), GARDEN SEAT (176).

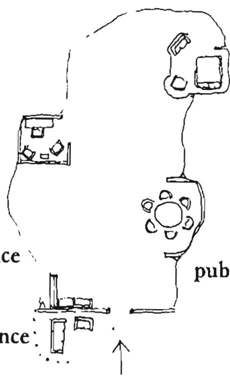
Now, what is the problem? Simply, it is the following. People have a tendency to think about *the* sitting room, as though a building, and especially a house, has just one room made for sitting. Within this frame of reference, this one sitting room gets a great deal of care and attention. But the fact that human activity naturally occurs all through the house, at a variety of degrees of intensity and intimacy, is forgotten—and the sitting spaces throughout the building fail to support the real rhythms of sitting and hanging around.

To solve the problem, recognize that your building should contain a sequence of sitting spaces of varying degrees of intimacy, and that each space in this sequence needs the degree of enclosure and comfort appropriate to its position. Pay attention to the full sequence, not just to one room. Ask yourself if the building you are making or repairing has the full sequence of sitting spaces, and what needs to be done to create this sequence, in its full richness and variety.

Of course, you may want to build a special sitting room—a *sala* or a parlor or a library or a living room—as one of the sitting spaces in your house. But remember that each office and workroom needs a sitting space too; so does a kitchen, so does a couple's realm, so does a garden, so does an entrance room, so does a corridor even, so does a roof, so does a window place. Pick the sequence of sitting spaces quite deliberately, mark it, and pay equal attention to the various spaces in the sequence as you go further into the details of the design.

Therefore:

Put in a sequence of graded sitting spaces throughout the building, varying according to their degree of enclosure. Enclose the most formal ones entirely, in rooms by themselves; put the least formal ones in corners of other rooms, without any kind of screen around them; and place the intermediate one with a partial enclosure round them to keep them connected to some larger space, but also partly separate.



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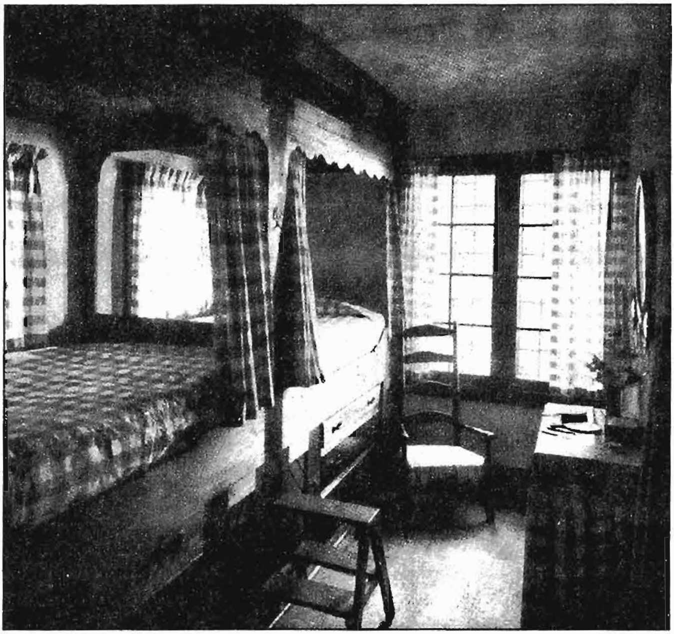
Put the most formal sitting spaces in the COMMON AREAS AT THE HEART (129) and in the ENTRANCE ROOM (130); put the intermediate spaces also in the COMMON AREAS AT THE HEART (129), in FLEXIBLE OFFICE SPACE (146), in a PLACE TO WAIT (150), and on the PRIVATE TERRACE ON THE STREET (140); and put the most intimate and most informal sitting spaces in the COUPLE'S REALM (136), the FARMHOUSE KITCHEN (139), the ROOMS OF ONE'S OWN (141), and the HALF-PRIVATE OFFICES (152). Build the enclosure round each space, according to its position in the scale of sitting spaces—THE SHAPE OF INDOOR SPACE (191); and make each one, wherever it is, comfortable and lazy by placing chairs correctly with respect to fires and windows —ZEN VIEW (134), WINDOW PLACE (180), THE FIRE (181), SITTING CIRCLE (185), SEAT SPOTS (241). . . .

143 BED CLUSTER*



. . . the sleeping areas have been defined to be inside the COUPLE'S REALM (136) and CHILDREN'S REALM (137). Beyond that, they are in places facing east to get the morning light—SLEEPING TO THE EAST (138). This pattern defines the grouping of the beds within the sleeping areas, and also helps to generate the general sleeping areas themselves.

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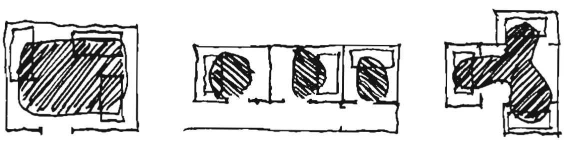
Every child in the family needs a private place, generally centered around the bed. But in many cultures, perhaps all cultures, young children feel isolated if they sleep alone, if their sleeping area is too private.

Let us consider the various possible configurations of the children's beds. At one extreme, they can all be in one room—one shared bedroom. At the other extreme, we can imagine an arrangement in which each child has a private room. And then, in between these two extremes, there is a kind of configuration in which children have their own, small, private spaces, not as large as rooms, clustered around a common playspace. We shall try to show that both extremes are bad; and that some version of the cluster of alcoves is needed to solve the conflict between forces in a young child's life.



Three configurations: the shared bedroom, isolated rooms, a cluster of alcoves.

We first discuss the one room version. The problems in this case are obvious. Children are jealous of one another's toys; they fight over the light, the radio, the game being played, the door open or closed. In short, for young children, especially in that age when feelings of possession and control are developing, the one room with many beds is just too difficult.

In the effort to avoid these difficulties, it is not surprising that many parents go to the other extreme—if they can afford it —an arrangement in which each child has his own room. But this creates new difficulties, of an entirely different sort: Young children feel isolated when they are forced to be alone.

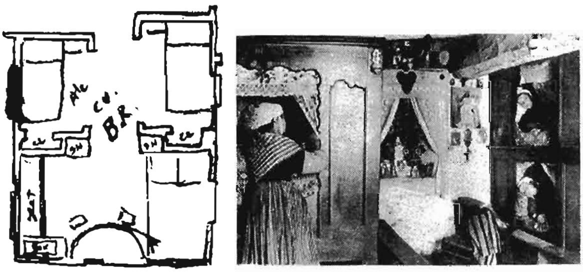
The need for contact in the sleeping area is particularly true in strongly traditional cultures like Peru and India, where even adults sleep in groups. In these countries, people simply do not like to feel isolated and draw a great deal of comfort and security from the fact that they are constantly surrounded by people. But even in "privacy-oriented" cultures like the United States, where isolation is common and taken for granted, children, at least, feel the same way. They prefer to sleep in the company of others. For instance, we know that little children like to leave their door ajar at night, and to sleep with some light on; they like to go off to sleep hearing the voices of the adults around the house.

This instinct is so strongly developed in children of all cultures, that we believe it may be unhealthy for little children to have whole rooms of their own, regardless of cultural habit. It is very easy for a cultural relativist to argue that it depends on the cultural setting, and that a culture which puts high value on privacy, self-sufficiency, and aloneness, might very well choose to put each child in his own room in order to foster these attitudes. However, in spite of this potentially reasonable cultural relativism, it seems to us that although adults do need their own rooms, the isolation of a private room for a small child may perhaps be fundamentally incompatible with healthy psycho-social development; and might even do organic damage. It is significant that there is no culture in the world except the United States, and the offshoots of the United States, where this one-child-one-room pattern is widely practiced. And our observations do certainly suggest that this pattern is correlated with emotional withdrawal, and exaggerated conceptions of the individual's self-sufficiency, which, in the end, bring a person into inner conflicts between the need for contact and the need for withdrawal.

We thus face two conflicting forces. Children need some privacy, some way of retreating from endless squabbles about territory, some way of having a miniature version of the adult's "room of his own." Yet at the same time, they also need extensive, almost animal, contact with others—their talk, their care, their touch, their sound, their smell.

We believe that this conflict can only be resolved in an arrangement which gives them the opportunity for both; an arrangement of individual spaces which they "own," clustered around a common playspace so that they are all in sight and sound of one another, never too alone. In a culture with relatively little need for privacy, the clustered beds can get enough privacy by being set into simple, curtained bed-alcoves, see BED ALCOVE (188). In a culture where people have a strong need for privacy, the clustered beds may be in tiny rooms, surrounding a communal space.

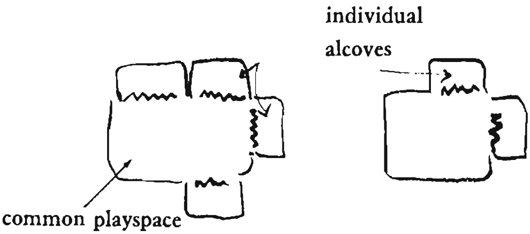
Finally, two examples: One shows the way one lay-designer, working with this pattern language, interpreted this pattern. The other shows a cluster of beds in a Breton farmhouse.



Two homemade bed clusters.

Therefore:

Place the children's beds in alcoves or small alcove-like rooms, around a common playspace. Make each alcove large enough to contain a table, or chair, or shelves—at least some floor area, where each child has his own things. Give the alcoves curtains looking into the common space, but not walls or doors, which will tend once more to isolate the beds too greatly.



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Another version of this pattern, more suitable for adults, is given by COMMUNAL SLEEPING (186). In both cases, build the individual alcoves according to BED ALCOVE (188); if the cluster is for children, shape the playspace in the middle according to the specifications of CHILDREN'S REALM (137), and make the path which leads from the beds, past the kitchen, to the outdoors, according to that pattern too. Use the location of dressing areas and closets to help shape the bed cluster and the individual alcoves—DRESSING ROOM (189), CLOSETS BETWEEN ROOMS (198); include some tiny nooks and crannies—CHILD CAVES (203). Give the entire space LIGHT ON TWO SIDES (159). And for the shape of this space in more detail and its construction, start with THE SHAPE OF INDOOR SPACE (191). . . .

144 BATHING ROOM*

. . . this pattern defines and places the main bathroom of a building. It does it by changing the present character of bathing rooms completely: And its position is so clear, and so essential, that it will probably help to form the sleeping areas and public areas given by larger patterns: INTIMACY GRADIENT (127), COMMON AREAS AT THE HEART (129), COUPLE'S REALM (136), CHILDREN'S REALM (137), SLEEPING TO THE EAST (138), BED CLUSTER (143).

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"The motions we call bathing are mere ablutions which formerly preceded the bath. The place where they are performed, though adequate for the routine, does not deserve to be called a bathroom."

Bernard Rudofsky

Rudofsky points out that cleaning up is only a small part of bathing; that bathing as a whole is a far more basic activity, with therapeutic and pleasurable aspects. In bathing we tend to ourselves, our bodies. It is one of the precious times when we are awake and absolutely naked. The relaxation of the bath puts us into sensual contact with water. It is one of the most direct and simple ways of unwinding. And, most astonishing, there is even evidence that we become less warlike when we tend to ourselves and our children in this way.

Cross culturally there is a correlation between the degree to which a society places restrictions on bodily pleasure—particularly in childhood—and the degree to which the society engages in the glorification of warfare and sadistic practices. (Philip Slater, *Pursuit of Loneliness*, Boston: Beacon Press, 1970, pp. 89–90.)

We ought to remember . . . that the thermae of old, with their routine of daily regeneration, were as much a matter of course to their users as our restaurants are to us. Only more so; they were considered indispensable. In the fourth century, the city of Rome alone counted 856 bathing establishments; six hundred years later, Cordoba boasted an even larger number of public baths—and who ever hears as much as its name? (Rudofsky, *Behind the Picture Window*, New York: Oxford University Press, 1955, p. 118.)

A Finnish sauna.

But bathing for pleasure has had a hard history. It went underground with the Reformation of the Church, the Elizabethan Era, and Puritanism. It became a "scapegoat" for the evils of society—immorality, ungodliness, and disease. It is strange that we have not yet recovered from such nonsense. Contrast our approach to the bath, tub, and shower with these words, written in 1935 by Nikos Kazantzakis, the Greek novelist and poet, after his first Japanese bath:

> I feel unsurpassed happiness. I put on the kimono, wear the wooden sandals, return to my room, drink more tea, and, from the open wall, watch the pilgrims as they go up the road beating drums. . . . I have overcome impatience, nervousness, haste. I enjoy every single second of these simple moments I spend. Happiness, I think, is a simple everyday miracle, like water, and we are not aware of it.

We start, then, with the assumption that there are strong and profound reasons for making something pleasant out of bathing, and that there is something quite wrong with our present way of building several small and separate bathrooms, one for the master bedroom, one for children, perhaps one near the living room—each one of them a compact efficient box. These separate, efficiency bathrooms never give a family the chance to share the intimacies and pleasures of bathing, of being naked and half-naked together. And yet, of course, this sharing has its limits. House guests and casual visitors must be able to use the bathroom too; and one bathroom will not work for a whole family, if any one person can lock the door and keep it to himself. Yet if we imagine a large bathing room, large enough to make bathing a pleasure, we see that we can certainly not afford more than one of them per family.

How can all these problems be resolved? In order to resolve them, we shall list the various forces which seem to be acting. Then we can untangle them.

1. First, the newly re-emerging force, which we have named already—the growing desire that people have to make their bathing into a positive re-generating pleasure.

2. Second, an increasing relaxation about nakedness, which makes it possible to imagine members of a family, and their friends, and even strangers, sharing a bath.

3. Third, the fact that this increasing relaxation has its limits; and that the limits are different for every person. Some people still want to be able to keep their nakedness private: they must be able to have a shower, or use the toilet, unseen, when they want to.

4. The fact that the habit of putting toilets in bathrooms (not next to them as they used to be), springs from the convenience of passing to and fro between the toilet and the bath—or shower—without dressing and undressing to go out into a passage. People want to be comfortably naked while they are in the bathroom—going into the bathroom, going from the toilet to the bath, shaving, and so on. It is a nuisance to have to dress simply to negotiate any one of these connections.

5. And yet, the members of the family must be able to pass between bedrooms and bathroom, in various stages of undress, without passing through public areas. This is especially true of the adults.

6. And visitors must be able to use the bathing room, and must therefore be able to reach it without passing through the private rooms or bedrooms.

The fundamental conflict in these forces seems to be between openness and privacy. There are reasons to draw the functions of the bathroom together, and reasons to keep them separate. This suggests that all the functions of the bathroom be drawn together to form a suite, that this suite or bathing room be conceived of as the only bathroom in the house, but that private realms be created within this suite, where people can shut a door or pull a curtain and be private.

We imagine the entire bathing room tiled and protected from other parts of the house, and the public outdoors. Within this space it is possible to achieve the right connections between the bath itself and the other parts of the bathing room, and yet keep the bathing room proper open to people who want to use only the sink, the shower, or the toilet. We suggest that the room be placed next to the couple's realm—they will use it most—but also *between* the public part of the house and the private part of the house, so that the path from the family commons to the bathing room does not pass through the bedrooms or private workspace. And make sure paths from bedrooms to bathroom do not pass through any area which is visible from the common rooms.

A simple way to cope with the subtleties of nakedness and gowns is to give the bathing room prominent towel racks in several places, each with a few giant towels, towels that people can wrap up in. Under these circumstances a person can simply throw a towel around himself and twist it together when he is uneasy about his nakedness, and otherwise let it drop. This is far better than the formal robes, which are always in the wrong place, and are too much like dressing.

The bath itself should be large enough so that two or three people can get themselves comfortably in the water—so that you feel like staying, not rushing in and out. Light helps a lot. If privacy is an issue, natural light can filter through translucent glass; or a window with clear glass can overlook a private garden.

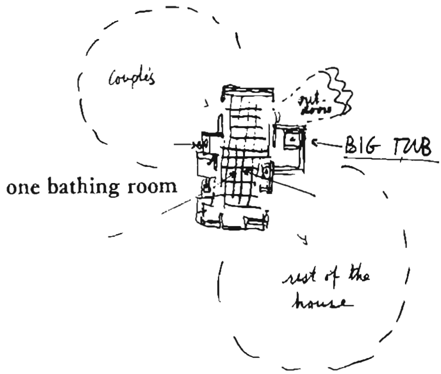
Finally, a word about the doors: It is important to place them correctly, as they do the most to establish the subtle balance between openness and privacy. We imagine solid unlockable doors to the bathing room as a whole; perhaps swinging doors to establish the fluidity of the area; and then opaque glass doors or curtains on the shower stall; a simple door for the toilet stalls—this is the most private spot; and an open doorway to the alcove which contains the bath. The sinks and the towels, the shelves, and all the other odds and ends are in the tiled outer zone.

Therefore:

Concentrate the bathing room, toilets, showers, and basins of the house in a single tiled area. Locate this bathing

room beside the couple's realm—with private access—in a position half-way between the private secluded parts of the house and the common areas; if possible, give it access to the outdoors; perhaps a tiny balcony or walled garden.

Put in a large bath—large enough for at least two people to get completely immersed in water; an efficiency shower and basins for the actual business of cleaning; and two or three racks for huge towels—one by the door, one by the shower, one by the sink.



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Above all, make sure that there is light, plenty of light—LIGHT ON TWO SIDES OF EVERY ROOM (159) and FILTERED LIGHT (238); try to place the bathing room so that it opens out into a private part of the garden—GARDEN WALL (173), and perhaps even gives direct access to some local swimming pool—STILL WATER (71). Line up the toilet with the compost chamber—COMPOST (178); and for the detailed shape of the room and its construction, start with THE SHAPE OF INDOOR SPACE (191). . . .

145 BULK STORAGE

. . . this pattern helps to complete any HOUSE FOR A SMALL FAMILY (76), SELF-GOVERNING WORKSHOPS AND OFFICES (80), and INDIVIDUALLY OWNED SHOPS (87). More generally, it is needed to fill out every BUILDING COMPLEX (95).

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In houses and workplaces there is always some need for bulk storage space; a place for things like suitcases, old furniture, old files, boxes—all those things which you are not ready to throw away, and yet not using everyday.

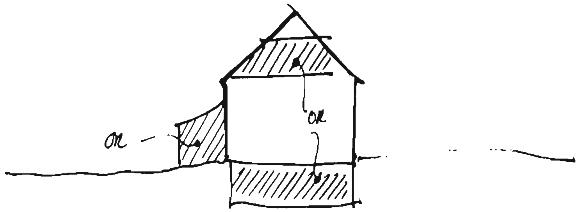
Some old buildings provide for this kind of storage automatically, with their attics, cellars, and sheds. But very often this kind of storage space is overlooked. We find it neglected, for example, in carefully designed buildings, where the designer is watching the square foot costs closely and cannot justify an extra room that is not "living space."

In our experience, however, bulk storage space is terribly important; and when it is not provided, it usually means that some other space becomes the receptacle for all the bulky, marginal things that people need to store.

How much bulk storage should be provided? Certainly there should not be too much of it. That only invites us to keep old things that we have long since finished with. But some bulk storage is essential. Any household or workshop or cluster will have old furniture to store until it can be fixed, old tires, books, chests, tools that are only occasionally used; and the more self-sufficient the household is, the more space it needs. In the extreme case, it is even necessary to have space for storing building materials! The amount needed is never less than 10 per cent of the built area—sometimes as high as 50 per cent—and normally 15 to 20 per cent.

Therefore:

Do not leave bulk storage till last or forget it. Include a volume for bulk storage in the building—its floor area at least 15 to 20 per cent of the whole building area—not less. Place this storage somewhere in the building where it costs less than other rooms—because, of course, it doesn't need a finish.



20 per cent of building area

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Put the storage in the apex of the roof if the roof has a steep pitch—SHELTERING ROOF (117); if there is a sloping site, put it in a basement—TERRACED SLOPE (169), GROUND FLOOR SLAB (215); otherwise, put it in a shed which can perhaps be made into a cottage later—ROOMS TO RENT (153). No matter whether it is an attic, cellar, or shed, it is usually good advice to follow NORTH FACE (162) and situate bulk storage to the north of the building, leaving the sunny spaces for rooms and gardens. . . .

then the same for offices, workshops, and public buildings.

146. FLEXIBLE OFFICE SPACE

147. COMMUNAL EATING

148. SMALL WORK GROUPS

149. RECEPTION WELCOMES YOU

150. A PLACE TO WAIT

151. SMALL MEETING ROOMS

152. HALF-PRIVATE OFFICE

146 FLEXIBLE OFFICE SPACE

. . . imagine that you have laid out the basic areas of a workshop or office—SELF GOVERNING WORKSHOPS AND OFFICES (80), OFFICE CONNECTIONS (82). Once again, as in a house, the most basic layout of all is given by INTIMACY GRADIENT (127) and COMMON AREAS AT THE HEART (129). Within their general framework, this pattern helps to define the working space in more detail, and so completes these larger patterns.

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Is it possible to create a kind of space which is specifically tuned to the needs of people working, and yet capable of an infinite number of various arrangements and combinations within it?

Every human organization goes through a series of changes. In offices, the clusters of work groups, their size and functions, are all subject to change—often unpredictably. How must office space be designed to cope with this situation?

The standard approaches to the problem of flexibility in office spaces are: (1) uninterrupted modular space with modular partitions (full height or half-height) and (2) entire floors of uninterrupted space with low ceilings and no partitions (known as "office landscape").

But neither of these solutions really work. They are not genuinely flexible. Let us analyze them in turn.

We discuss the partition solution first. In a naïve sense, it seems obvious that the problem can be solved by movable partitions. However, in practice there are a number of serious difficulties.

1. If partitions are made easy to move, they become lightweight and provide inadequate acoustic insulation.

2. If the partitions are both easy to move and acoustically insulated, they are usually very expensive.

3. The actual cost of moving a partition is usually so high that even in highly "flexible" and "modular" systems, the partitions are in fact very rarely moved.

4. Most serious of all: it is usually not possible to make minor changes in a partition system. At the moment when one working group expands and needs more space, it is only by rare accident that the working group next door happens at this same moment to be contracting. In order to make room for the expanding group, a large part of the office must be reshuffled, but this causes so much disruption that many office managements adopt the simpler solutions—they leave the partitions as they are and move the people.

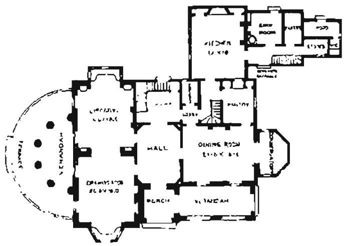
5. Finally, it is in the nature of office space that certain informal, semi-permanent arrangements *grow more permanent over time* (for example, furnishing, filing systems, "ownership" of special spaces or windows). This makes the occupants resistant to change. Though they may be willing to move when the growth of their own working group is at stake, they will resist moving strongly, as part of any general office reshuffle, caused by the expansion or contraction of some other working group.

The modular partition system fails because the partitions become, in effect, ordinary walls; yet they are less useful than real walls for defining territory and for sound insulation; and what is more, the partitions do not necessarily satisfy the need for a semi-enclosed workspace, discussed in WORKSPACE ENCLOSURE (183). It is clear, then, that systems of movable partitions do not really solve the problem.

The office landscape solution, since it has no partitions, is more genuinely flexible. However, this system is only suitable for types of work which require neither a high degree of privacy nor much internal cohesion within individual working groups. Moreover, studies by Brian Wells have made it clear that office workers strongly prefer small work spaces to larger ones—see SMALL WORK GROUPS (148). Wells shows that, when given a choice among different sized offices, people choose desks in small offices rather than large ones. And he shows that working groups in small offices are much more cohesive (defined by a larger percentage of internal sociometric choices), than the working groups in large offices. (Pilkington Research Unit, *Office Design: A*

Study of Environment, Department of Building Science, University of Liverpool, 1965, pp. 113–21.)

It seems then, that neither flexible partitions nor office landscape, really works. Neither creates space that is both well-adapted to specific work arrangements *and* truly flexible. A clue to an altogether different approach to flexibility comes from the fact that organizations which use converted houses as office space have no difficulty with this problem at all. Indeed, it appears that these old buildings actually provide more real flexibility than the apparent flexibility of modular partitioned offices. The reason is simple. In these old houses, there are many small rooms, a few large rooms, and many partially defined spaces, usually interconnected in a variety of ways.



Mixture of room sizes.

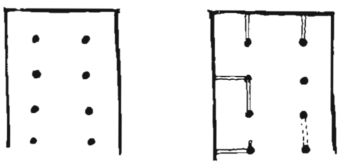
Though these spaces were designed to support family life, they turn out also to support the natural structure of work groups: there are small spaces for private and half-private offices, slightly larger spaces for work groups of two to six, usually one space where up to 12 people can gather, and a commons centered around the kitchen and dining room. Furthermore, within each space there are usually a variety of walls, half-walls, window seats, which allow for changes within the rooms.

Although the walls cannot be moved at a moment's notice—the house is genuinely adaptable. Changes in work groups can be made in a few minutes, at no cost, just by opening and closing doors. And the acoustic characteristics are excellent—since most of the walls are solid, often load-bearing walls.

It is occasionally possible to build an office or a workspace like a house—when you know enough about the working group ahead of time to base the mix of rooms and larger spaces on their specific nature. But, *far more often*, the work groups which will occupy the space are unknown at the time the space is built. In this case, no specific "house-like" design is possible. Instead, it is necessary to design and build a type of space which can gradually, and systematically, be turned into this needed house-like kind of space once it is occupied.

The kind of space which will create this possibility is not "warehouse" space or "office landscape" space but instead, a kind of space which contains the possibility that people need, in the form of columns and ceiling height variety, to encourage them to modify it as they use it. If there are columns, so placed, that a few partitions nailed to the columns will begin to form differentiations and rooms within rooms, then we can be sure that people will actually transform it to meet their needs once they begin to work there.

As far as the geometrical layout of the columns is concerned, we have found that it works best when there is essentially a central space—with aisles down the sides—and the possibility of forming the bays of the aisles into workspaces. The illustration below shows the general idea, together with the ways this pattern may be transformed after a few years.



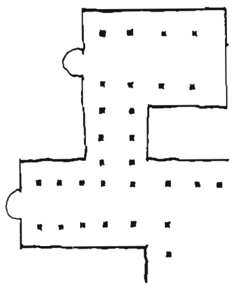
Adding partitions.

Of course, you can add rooms of different sizes and combine spaces to follow this general outline in an almost endless variety of ways. In one case they may be rather simple, with bays laid out in rows. In another case, the bays may twist and turn, with odd sized rooms and spaces in between. The details are irrelevant. What matters is the general position of the columns and, *of course*, the guarantee that they are placed in such a way that there is plenty of natural light inside—LIGHT ON TWO SIDES OF EVERY ROOM (159).

Therefore:

Lay out the office space as wings of open space, with free standing columns around their edges, so they define half-private and common spaces opening into one another. Set down enough columns so that people can fill them in over the years, in many different ways—but always in a semi-permanent fashion.

If you happen to know the working group before you build the space, then make it more like a house, more closely tailored to their needs. In either case, create a variety of space throughout the office—comparable in variety to the different sizes and kinds of space in a large old house.



possibility of many different sized rooms

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Light is critical. The bays of this kind of workspace must either be free-standing (so that there is light behind the alcoves), or the entire bay must be short enough to bring enough light in from the two ends—LIGHT ON TWO SIDES OF EVERY ROOM (159). Use CEILING HEIGHT VARIETY (190) and COLUMN PLACES (226) to define the proper mix of possible spaces. Above all, lay the workspace out in such a way to make it possible for people to work in twos and threes, always with partial contact and partial privacy—SMALL WORK GROUPS (148) and HALF-PRIVATE OFFICE (152). Place a welcoming reception area at the front—RECEPTION WELCOMES YOU (149); and in the common areas at the heart arrange a place where people can eat together, everyday—COMMUNAL EATING (147). . . .

147 COMMUNAL EATING*

. . . this pattern helps complete all those human groups and institutions which have COMMON AREAS AT THE HEART (129) in them, and most of all it helps to complete workshops and offices and extended families—THE FAMILY (75), SELF-GOVERNING WORKSHOPS AND OFFICES (80). In all of them, the common area will draw its strength from the sharing of food and drink. This pattern defines it in detail, and shows also how it helps to generate a larger social order.

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Without communal eating, no human group can hold together.

The importance of communal eating is clear in all human societies. Holy communion, wedding feasts, birthday parties, Christmas dinner, an Irish wake, the family evening meal are Western and Christian examples, but every society has its equivalents. There are almost no important human events or institutions which are not given their power to bind, their sacral character, by food and drink. The anthropological literature is full of references. For example: "Food and Its Vicissitudes: A Cross-Cultural Study of Sharing and Nonsharing," in Yehudi A. Cohen, *Social Structure and Personality: A Casebook*, New York: Holt, 1961. Audrey I. Richards, *Hunger and Work in a Savage Tribe: A Functional Study of Nutrition Among the Southern Bantu.* Glencoe, Ill.: Free Press, 1932.

Thomas Merton summarizes the meaning of communal eating beautifully:

> A feast is of such a nature that it draws people to itself, and makes them leave everything else in order to participate in its joys. To feast together is to bear witness to the joy one has at being with his friends. The mere act of eating together, quite apart from a banquet or some other festival occasion, is by its very nature a sign of friendship and of "communion."
>
> In modern times we have lost sight of the fact that even the most ordinary actions of our everyday life are invested, by their very nature, with a deep spiritual meaning. The table is in a

certain sense the center of family life, the expression of family life. Here the children gather with their parents to eat the food which the love of their parents has provided. . . .

So, too, with a banquet. The Latin word *convivium* contains more of this mystery than our words "banquet" or "feast." To call a feast a "convivium" is to call it a "mystery of the sharing of life"—a mystery in which guests partake of the good things prepared and given to them by the love of their host, and in which the atmosphere of friendship and gratitude expands into a sharing of thoughts and sentiments, and ends in common rejoicing. (Thomas Merton, *The Living Bread*, New York, 1956, pp. 126–27.)

It is clear, then, that communal eating plays a vital role in almost all human societies as a way of binding people together and increasing the extent to which they feel like "members" of a group.

But beyond this intrinsic importance of communal eating, as a way of binding the members of a group together, there is another important reason for maintaining the pattern, which applies especially to modern metropolitan society.

Metropolitan society creates the possibility of meeting a wonderful variety of people, a possibility almost entirely new in human history. In a traditional society, one learns to live with the people he knows, but the people he knows form a relatively closed group; there is little possibility of expanding it greatly. In a modern metropolitan society, each person has the possibility of finding those few other people in the city he really wants to be with. In theory, a man in a city of five million people has the possibility of meeting just those half dozen people who are the people he most wants to be with, in all of these five million.

But this is only theory. In practice it is very hard. Few people can feel confident that they have met their closest possible companions or found the informal groups they want to belong to in the cities they inhabit. In fact, on the contrary, people complain constantly that they cannot meet enough people, that there are too few opportunities for meeting people. Far from being free to explore the natures of all the people in society, and free to be together with those others who have the greatest natural and mutual affinities, instead people feel constrained to be with the few people they happen to have run into.

How can the great potential of metropolitan society be realized? How can a person find the other people for whom he has the greatest possible affinity?

To answer this question, we must define the workings of the process by which people meet new people in society. The answer to this question hinges on the following three critical hypotheses:

1. The process hinges entirely on the *overlap* of the human groups in society, and the way a person can pass through these human groups, expanding his associations.

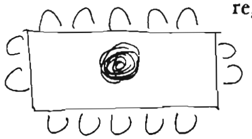
2. The process can only take place if the various human groups in society possess "group territories" where meeting can take place.

3. The process of meeting seems to depend especially on communal eating and drinking and therefore takes place especially well in those groups which have at least partly institutionalized common food and drink.

If these three hypotheses are correct, as we believe, then it is plain that the process by which people meet one another depends very largely on the extent to which people are able to pass from group to group, as visitors and guests, at communal meals. And this of course can happen only if each institution and each social group has its own common meals, regularly, and if its members are free to invite guests to their meals and in turn are free to be invited by the guests they meeet to other meals at other gatherings.

Therefore:

Give every institution and social group a place where people can eat together. Make the common meal a regular event. In particular, start a common lunch in every work place, so that a genuine meal around a common table (not out of boxes, machines, or bags) becomes an important, comfortable, and daily event with room for invited guests. In our own work group at the Center, we found this worked most beautifully when we took it in turns to cook the lunch. The lunch became an event: a gathering: something that each of us put our love and energy into, on our day to cook.



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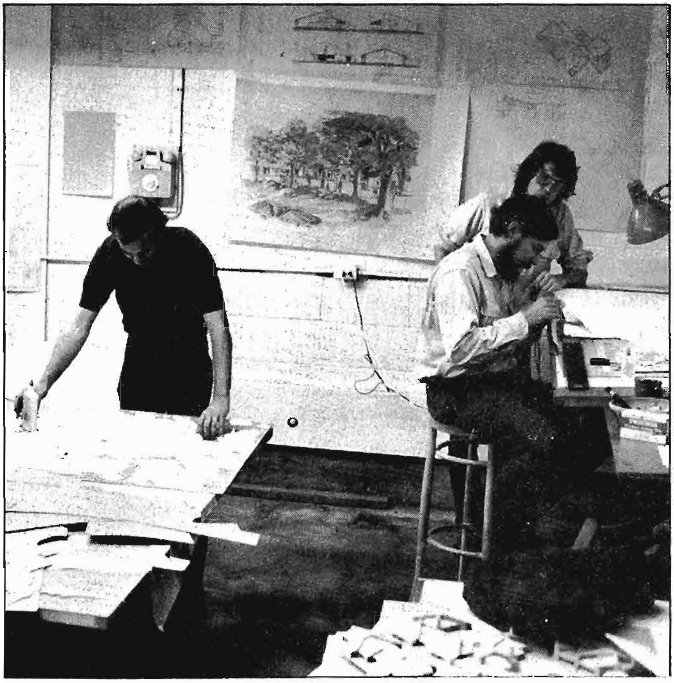
If the institution is large, find some way of breaking it down into smaller groups which eat together, so that no one group which eats together has more than about a dozen people in it—SMALL WORK GROUPS (148), SMALL MEETING ROOMS (151). Build the kitchen all around the eating place like a FARMHOUSE KITCHEN (139); make the table itself a focus of great importance —EATING ATMOSPHERE (182). . . .

148 SMALL WORK GROUPS**



. . . within the workspace of an institution—SELF-GOVERNING WORKSHOPS AND OFFICES (80), FLEXIBLE OFFICE SPACE (146), there need to be still further subdivisions. Above all, as this pattern shows, it is essential that the smallest human working groups each have their own physical space.

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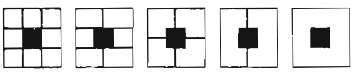
When more than half a dozen people work in the same place, it is essential that they not be forced to work in one huge undifferentiated space, but that instead, they can divide their workspace up, and so form smaller groups.

In fact, people will feel oppressed, both when they are either working in an undifferentiated mass of workers and when they are forced to work in isolation. The small group achieves a nice balance between the one extreme in which there are so many people, that there is no opportunity for an intimate social structure to develop, and the other extreme in which there are so few, that the possibility of social groups does not occur at all.

This attitude toward the size of work groups is supported by the findings of the Pilkington Research Unit, in their investigations of office life (*Office Design: A Study of Environment*, ed. Peter Manning, Department of Building Science, University of Liverpool, 1965, pp. 104–28). In a very large study indeed, office workers were asked their opinions of large offices and small offices. The statements they chose most often to describe their opinions were: "The larger offices make one feel relatively unimportant" and "There is an uncomfortable feeling of being watched all the time in a large office." And when asked to compare five different possible layouts for offices, workers consistently chose those layouts in which workgroups were smallest.



The five layouts in order of preference.

Analysis of the results also showed that "the people who work in small office areas are more opposed to large office areas than those who actually work in them." Apparently, once people have had the experience of working in small groups, they find it very uncomfortable to imagine going back to the larger office settings.

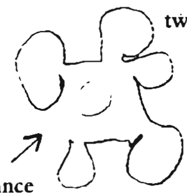
In our own survey of attitudes toward workspace—taken among workers at the Berkeley City Hall—we found that people prefer to be part of a group that ranges from two to eight. When there are more than eight, people lose touch with the group as a human gathering; and almost no one likes working alone.

A similar finding is reported by the Japanese architect, T. Takano, in his study of work groups in Japan. In the offices he studied, he found that five persons formed the most useful functional group. (Building Section, Building and Repairs Bureau, Ministry of Construction: The Design of Akita prefectural government office, Public Buildings, 1961.)

How should these small groups be related to each other? Brian Wells points out that while small offices support an intimate atmosphere, they do not support communications between groups. "The Psycho-Social Influence of Building Environment" (*Building Science*, Vol. 1, Pergamon Press, 1965, p. 153). It would seem that this problem can be solved by arranging the small work groups so that several of them share common facilities: drinking fountains, toilets, office equipment, perhaps a common anteroom and garden.

Therefore:

Break institutions into small, spatially identifiable work groups, with less than half a dozen people in each. Arrange these work groups so that each person is in at least partial view of the other members of his own group; and arrange several groups in such a way that they share a common entrance, food, office equipment, drinking fountains, bathrooms.



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Lay the workgroups out with respect to each other so that the distances between groups is within the constraints of OFFICE CONNECTIONS (82), and give each group office space which leaves room to expand and to contract—FLEXIBLE OFFICE SPACE (146); provide a common area, either for the group itself or for several groups together or both—COMMON AREA AT THE HEART (129). Treat each small work group, in every kind of industry and office, as a place of learning—MASTER AND APPRENTICES (83). Give it its own stair, directly to the street—OPEN STAIRS (158). Arrange the individual workspaces within the small work group according to HALF-PRIVATE OFFICE (152) and WORKSPACE ENCLOSURE (183). . . .

149 RECEPTION WELCOMES YOU

. . . in a public building, or an office where there are many people coming in, SELF-GOVERNING WORKSHOPS AND OFFICES (80), SMALL SERVICES WITHOUT RED TAPE (81), TRAVELER'S INN (91), FLEXIBLE OFFICE SPACE (146)—the place inside the ENTRANCE ROOM (130) plays an essential role; it must be built from the very start with the right atmosphere. This pattern was originally proposed by Clyde Dorsett of the National Institute of Mental Health, in a program for community mental health clinics.

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Have you ever walked into a public building and been processed by the receptionist as if you were a package?

To make a person feel at ease, you must do the same for him as you would do to welcome him to your home; go toward him, greet him, offer him a chair, offer him some food and drink, and take his coat.

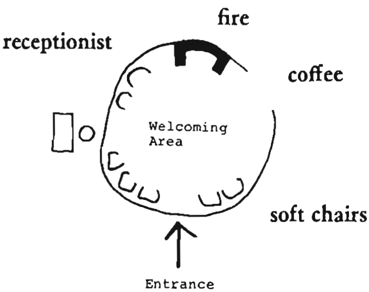
In most institutions the person arriving has to go toward the receptionist; the receptionist remains passive and offers nothing. To be welcoming the receptionist must initiate the action—come forward and greet the person, offer a chair, food, a seat by the fire, coffee. Since it is first impressions which count, this whole atmosphere should be the first thing a person encounters.

A beautiful example we know is the reception desk at Browns Hotel in London. You pass into the hotel through a small, unassuming entrance, not unlike the entrance to a house. You pass through two or three rooms; then come to the central room in which there are two old writing desks. The receptionist comes forward from an inner office, invites you to sit down in a comfortable chair at one of these writing desks, and sits down with you while you fill out the hotel register.

The reasons most reception areas fail completely to have this quality, is that the receptionist's desk forms a barrier, so that the desk and equipment together help to create an institutional atmosphere, quite at odds with the feeling of welcome.

Therefore:

Arrange a series of welcoming things immediately inside the entrance—soft chairs, a fireplace, food, coffee. Place the reception desk so that it is not between the receptionist and the welcoming area, but to one side at an angle—so that she, or he, can get up and walk toward the people who come in, greet them, and then invite them to sit down.



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Place the fireplace most carefully, to be a focus—THE FIRE (181) give the receptionist a workspace where she can be comfortable in her own work, and still make visitors feel welcome—WORKSPACE ENCLOSURE (183); give the space LIGHT ON TWO SIDES (159); perhaps put in an alcove or a window seat for people who are waiting—A PLACE TO WAIT (150), ALCOVES (179), WINDOW PLACE (180). Make sure that the reception point itself is lighter than surrounding areas—TAPESTRY OF LIGHT AND DARK (135). And for the shape of the reception space start with THE SHAPE OF INDOOR SPACE (191). . . .

150 A PLACE TO WAIT*

. . . in any office, or workshop, or public service, or station, or clinic, where people have to wait—INTERCHANGE (34), HEALTH CENTER (47), SMALL SERVICES WITHOUT RED TAPE (81), OFFICE CONNECTIONS (82), it is essential to provide a special place for waiting, and doubly essential that this place not have the sordid, enclosed, time-slowed character of ordinary waiting rooms.

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The process of waiting has inherent conflicts in it.

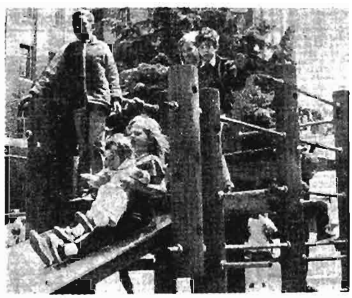
On the one hand, whatever people are waiting for—the doctor, an airplane, a business appointment—has built in uncertainties, which make it inevitable that they must spend a long time hanging around, waiting, doing nothing.

On the other hand, they cannot usually afford to enjoy this time. Because it is unpredictable, they must hang at the very door. Since they never know exactly when their turn will come, they cannot even take a stroll or sit outside. They must stay in the narrow confine of the waiting room, waiting their turn. But this, of course, is an extremely demoralizing situation: nobody wants to wait at somebody else's beck and call. Kafka's greatest works, *The Castle* and *The Trial*, both deal almost entirely with the way this kind of atmosphere destroys a man.

The classic "waiting room" does nothing to resolve this problem. A tight dreary little room, with people staring at each other, fidgeting, a magazine or two to flip—this is the very situation which creates the conflict. Evidence for the deadening effect of this situation comes from Scott Briar ("Welfare From Below: Recipients' Views of the Public Welfare System," in Jacobus Tenbroek, ed., *The Law and the Poor*, San Francisco: Chandler Publishing Company, 1966, p. 52). We all know that time seems to pass more slowly when we are bored or anxious or restless. Briar found that people waiting in welfare agencies consistently thought they had been waiting for longer than they really had. Some thought they had been wating four times as long.

The fundamental problem then, is this. How can the people who are waiting, spend their time wholeheartedly—live the hours or minutes while they wait, as fully as the other hours of their day—and yet still be on hand, whenever the event or the person they are waiting for is ready?

It can be done best when the waiting is fused with some other activity: an activity that draws in other people who are not there essentially to wait—a cafe, pool tables, tables, a reading room, where the activities and the seats around them are within earshot of the signal that the interviewer (or the plane, or whatever) is ready. For example, the Pediatrics Clinic at San Francisco General Hospital built a small playground beside the entrance, to serve as a waiting area for children and a play area for the neighborhood.



Waiting room at the pediatrics clinic.

In another example we know, a horseshoe pit was built alongside a terrace where people came to wait for appointments. The people waiting inevitably started pitching horseshoes, others joined in, people left as their appointments came up—there was an easy flow between the horseshoe pit, the terrace, and the offices.

Waiting can also be a situation where the person waiting finds himself with free time, and, with the support of the surroundings, is able to draw into himself, become still, meditative—quite the opposite of the activity described above.

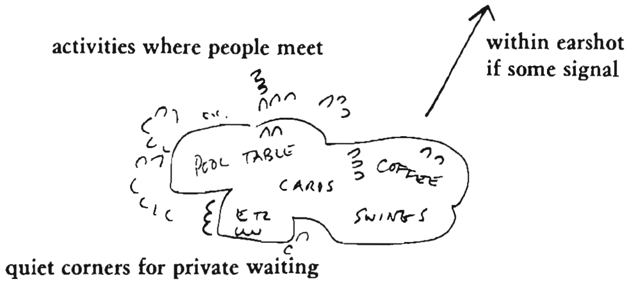
The right atmosphere will come naturally if the waiting area provides some places that are quiet, protected, and do not draw out the anxiety of the wait. Some examples: a seat near a bus stop, under a tree, protected from the street; a window seat that looks down upon a street scene below; a protected seat in a garden, a swing or a hammock; a dark place and a glass of beer, far enough away from passages so that a person is not always looking up when someone comes or goes; a private seat by a fish tank.

In summary, then, people who are waiting must be free to do what they want. If they want to sit outside the interviewer's door, they can. If they want to get up and take a stroll, or play a game of pool, or have a cup of coffee, or watch other people, they can. If they want to sit privately and fall into a daydream, they can. And all this without having to fear that they are losing their place in line.

Quiet waiting.

Therefore:

In places where people end up waiting (for a bus, for an appointment, for a plane), create a situation which makes the waiting positive. Fuse the waiting with some other activity—newspaper, coffee, pool tables, horseshoes; something which draws people in who are not simply waiting. And also the opposite: make a place which can draw a person waiting into a reverie; quiet; a positive silence.



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The active part might have a window on the street—STREET WINDOWS (164), WINDOW PLACE (180), a cafe—STREET CAFE (88), games, positive engagements with the people passing by—OPENING TO THE STREET (165). The quiet part might have a quiet garden seat—GARDEN SEAT (176), a place for people to doze—SLEEPING IN PUBLIC (94), perhaps a pond with fish in it—STILL WATER (71). To the extent that this waiting space is a room, or a group of rooms, it gets its detailed shape from LIGHT ON TWO SIDES OF EVERY ROOM (159) and THE SHAPE OF INDOOR SPACE (191). . . .

151 SMALL MEETING ROOMS*

. . . within organizations and workplaces—UNIVERSITY AS A MARKETPLACE (43), LOCAL TOWN HALL (44), MASTER AND APPRENTICES (83), FLEXIBLE OFFICE SPACE (146), SMALL WORK GROUPS (148), there will, inevitably, be meeting rooms, group rooms, classrooms, of one kind or another. Investigation of meeting rooms shows that the best distribution—both by size and by position—is rather unexpected.

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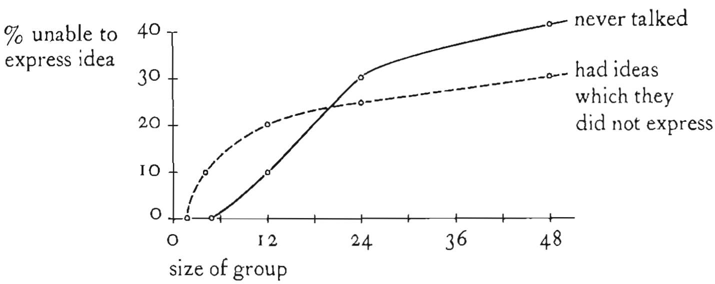
The larger meetings are, the less people get out of them. But institutions often put their money and attention into large meeting rooms and lecture halls.

We first discuss the sheer size of meetings. It has been shown that the number of people in a group influences both the number who never talk, and the number who feel they have ideas which they have not been able to express. For example, Bernard Bass (*Organizational Psychology*, Boston: Allyn, 1965, p. 200) has conducted an experiment relating group size to participation. The results of this experiment are shown in the following graph.



As size of group grows, more and more people hold back.

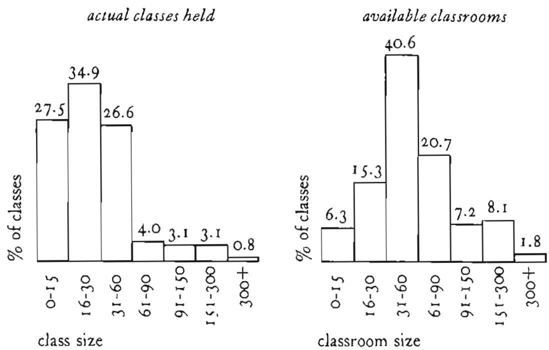
There is no particularly natural threshold for group size; but it is clear that the number who never talk climbs very rapidly. In a group of 12, one person never talks. In a group of 24, there are six people who never talk.

We get similar thresholds when we consider comfortable distances for talking. Edward Hall has established the upper range for full casual voice at about 8 feet; a person with 20/20 vision can see details of facial expression up to 12 feet; two people whose heads are 8 to 9 feet apart, can pass an object if they both stretch; clear vision (that is, macular vision) includes 12 degrees horizontally and 3 degrees vertically—which includes one face but not two, at distances up to about 10 feet. (See Edward Hall, *The Silent Language*, New York: Doubleday, 1966, pp. 118–19.)

Thus a small group discussion will function best if the members of the group are arranged in a rough circle, with a maximum diameter of about 8 feet. At this diameter, the circumference of the circle will be 25 feet. Since people require about 27 inches each for their seats, there can be no more than about 12 people round the circle.

Next we shall present evidence to show that in institutions and workgroups, the natural history of meetings tends also to converge on this size.

The following histograms show the relative numbers of different sized classes held at the University of Oregon in the Fall of 1970 and the relative numbers of available classrooms in the different size ranges. We believe these figures are typical for many universities. But it is obvious at a glance that there are too many large classrooms and too few small classrooms. Most of the classes actually held are relatively small seminars and "section" meetings, while most of the classrooms are in the 30 to 150 size range. These large classrooms may have reflected the teaching methods of

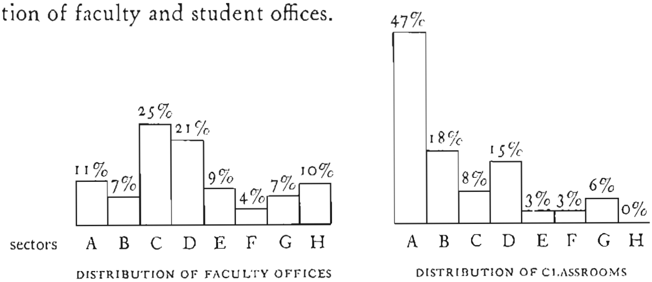


Histogram: Classes don't fit the classrooms.

an earlier period, but apparently they do not conform to the actual practice of teaching in the 1970's.

We found that the meetings of official committees, boards, and commissions in the City of Berkeley have a similar distribution. Among the various city boards, commissions, and committees, 73 per cent have an average attendance of 15 or less. Yet of course, most of these meetings are held in rooms designed for far more than 15 people. Here again, most of the meetings are held in rooms that are too large; the rooms are half-empty; people tend to sit at the back; speakers face rows of empty seats. The intimate and intense atmosphere typical of a good small meeting cannot be achieved under these circumstances.

Finally, the *spatial* distribution of meeting rooms is often as poorly adapted to the actual meetings as the size distribution. The following histograms compare the distribution of classrooms in different sectors of the University of Oregon with the distribution of faculty and student offices.

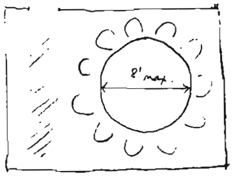


The meeting rooms are not located where people work.

Once again, this discrepancy has a bad effect on the social life of small meetings. The meetings work best when the meeting rooms are fairly near the participants' offices. Then discussions which begin in the meeting rooms are able to continue in the office or the laboratory. When the meeting rooms are a long walk from offices, the chances of this kind of informal business are drastically reduced.

Therefore:

Make at least 70 per cent of all meeting rooms really small—for 12 people or less. Locate them in the most public parts of the building, evenly scattered among the workplaces.



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Shape meeting rooms like any other rooms, perhaps with special emphasis on the fact that there must be no glare—LIGHT ON TWO SIDES OF EVERY ROOM (159)—and on the fact that the rooms should be roughly round or square, and not too long or narrow—SITTING CIRCLE (185). People will feel best if many of the chairs are different, to suit different temperaments and moods and shapes and sizes—DIFFERENT CHAIRS (251). A light over the table or over the center of the group will help tie people together—POOLS OF LIGHT (252). For the shape of the room in detail, start with THE SHAPE OF INDOOR SPACE (191). . . .

152 HALF-PRIVATE OFFICE

. . . within the overall arrangement of group space and individual working space provided by INTIMACY GRADIENT (127), FLEXIBLE OFFICE SPACE (146), and SMALL WORK GROUPS (148), this pattern shapes the individual rooms and offices. The pattern also helps to generate the organization of these larger patterns.

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What is the right balance between privacy and connection in office work?

The totally private office has a devastating effect on the flow of human relationships within a work group, and entrenches the ugly quality of office hierarchies. At the same time, there are moments when privacy is essential; and to some extent nearly every job of work needs to be free from random interruption.

Everyone who has experienced office work reports some version of this problem. In our own experience—as members of a working team of architects—we have faced the problem in hundreds of ways. The best evidence we have to report is our own experience as a work group.

Over the last seven years we moved our offices on several occasions. At one point we moved to a large old house: large enough for some of us to have private rooms and others to share rooms. In a matter of months our social coherence as a group was on the point of breakdown. The workings of the group became formalized; easy-going communication vanished; the entire atmosphere changed from a setting which sustained our growth as a group to an office bureaucracy, where people made appointments with each other, left notes in special boxes, and nervously knocked on each other's doors.

For a while we were virtually unable to produce any interesting work.

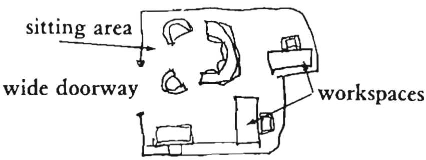
It gradually dawned on us that the environment of the house was playing a powerful role in the breakdown. As we started to pay attention to it, we noticed that those rooms which were still functioning—the places where we would all gather to talk over the work—had a special characteristic: they were only *half*-private, even though the workspaces within them were strongly marked.

As we thought it out, it seemed that almost every place where we had found ourselves working well together had these characteristics: no office was entirely private; most offices were for more than one person; but even when an office was only for one, it had a kind of simple common area at its front and everyone felt free to drop in and stay for a moment. And the desks themselves were always built up as private domains within and toward the edges of these offices, so that doors could always be left wide open. Eventually we rearranged ourselves until each person had some version of this pattern.

The pattern works so well, that we recommend it to everyone in similar circumstances.

Therefore:

Avoid closed off, separate, or private offices. Make every workroom, whether it is for a group of two or three people or for one person, half-open to the other workgroups and the world immediately beyond it. At the front, just inside the door, make comfortable sitting space, with the actual workspace(s) away from the door, and further back.



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Shape each office in detail, according to THE SHAPE OF INDOOR SPACE (191); give it windows on at least two sides—LIGHT ON TWO SIDES OF EVERY ROOM (159); make individual workspaces in the corners—WORKSPACE ENCLOSURE (183), looking out of windows—WINDOWS OVERLOOKING LIFE (192); make the sitting area toward the door as comfortable as possible—SITTING CIRCLE (185). . . .

add those small outbuildings which must be slightly independent from the main structure, and put in the access from the upper stories to the street and gardens;

153. ROOMS TO RENT
154. TEENAGER'S COTTAGE
155. OLD AGE COTTAGE
156. SETTLED WORK
157. HOME WORKSHOP
158. OPEN STAIRS

153 ROOMS TO RENT

. . . this pattern is the first which sets the framework for the outbuildings. Used properly, it can help to create NECKLACE OF COMMUNITY PROJECTS (45), THE FAMILY (75), SELF-GOVERNING WORKSHOPS AND OFFICES (80), SMALL SERVICES WITHOUT RED TAPE (81), FLEXIBLE OFFICE SPACE (146), TEENAGER'S COTTAGE (154), OLD AGE COTTAGE (155), HOME WORKSHOP (157): in general it makes any building flexible, useful in a greater variety of circumstances.

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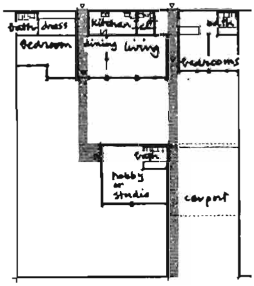
As the life in a building changes, the need for space shrinks and swells cyclically. The building must be able to adapt to this irregular increase and decrease in the need for space.

Very simply, when a family or a workgroup shrinks because one or two people leave, the space which becomes empty should be able to find a use. Otherwise, the people who stay behind will rattle around in a hollow shell which is too big for them. They may even be forced to sell their property and move because they cannot afford the upkeep of so big a place.

And by the same token, since swelling and shrinking is almost always unpredictable, this splitting off of space should be reversible. The rooms which are given to outside use or let out when they are not used, may one day be needed again when circumstances change and the workgroup or family swells in size again.

To give buildings this flexibility, it is essential that parts of them be relatively independent. In effect, some rooms should be conceived in advance as potential rooms to let if the size of the group should change. These rooms need a kind of connection to the rest of the house, which allows them to be closed off and separated, and then, just as easily, joined up again. Generally, this means a private entrance from the outside, either a private bath or direct access to a bathroom, and perhaps access to the kitchen.

In Denmark, Ole Dybbroe has developed a scheme for housing that takes this pattern as a crucial generator of the form of the house. The houses he shows in *Enfamiliehuset 1970* (Landsbankernes Reallanefond, stiftedes den 9. maj 1959) grow slowly, and each part of them can either be united with the larger household or inhabited as an independent unit. Here is his plan for a "four part" house.

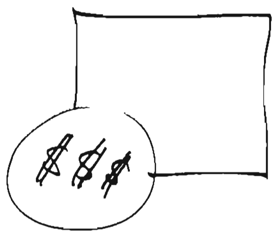


Dybbroe's four-part house.

Though renting in general has a devastating impact on the environment—see YOUR OWN HOME (79) our experience has been that face-to-face rental, with the owners occupying the main structure, is the one kind of rental relationship that is reasonably healthy. The landlord is actually there, so he is directly concerned with the well-being of the life around him and with the environment, unlike the absentee landlords, who own property only for the money which it makes. And the tenants are usually short-term tenants, who prefer to rent a room rather than take on burdens of ownership. Even here a more ideal situation would be for the owner to share out ownership over some part of the building, with certain options for taking back the space. However, in the absence of such subtle forms of legal ownership, face to face renting is, we believe, the only form of renting that is not socially and physically destructive.

Therefore:

Make at least some part of the building rentable: give it a private entrance over and above its regular connection to the rest of the house. Make sure that the regular entrance can be easily closed off without destroying the circulation in the house, and make sure that a bathroom can be directly reached from this room without having to go through the main house.



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Place the rooms to rent in such a way that they can double as a TEENAGER'S COTTAGE (154), or an OLD AGE COTTAGE (155), or a HOME WORKSHOP (157); give the private entrance an ENTRANCE TRANSITION (112), and if the space is on an upper floor, give it direct access to the street by means of OPEN STAIRS (158). And give the rooms themselves LIGHT ON TWO SIDES (159) and THE SHAPE OF INDOOR SPACE (191). . . .

154 TEENAGER'S COTTAGE*

. . . in any house which has teenagers in it—THE FAMILY (75), HOUSE FOR A SMALL FAMILY (76)—it is necessary to give special consideration to their rooms—A ROOM OF ONE'S OWN (141). If possible, these rooms should be attached but separate, and made to help create the possibility of later being ROOMS TO RENT (153).

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If a teenager's place in the home does not reflect his need for a measure of independence, he will be locked in conflict with his family.

In most family homes the rooms for children and adolescents are essentially the same. But when children become adolescents, their relationship to the family changes considerably. They become less and less dependent on the family; they take on greater responsibilities; their life outside the home becomes richer, more absorbing. Most of the time they want more independence; occasionally they really need the family to fall back on; sometimes they are terrified by the confusion within and around them. All of this places new demands on the organization of the family and, accordingly, on the organization of the house.

To really help a young person go through this time, home life must strike a subtle balance. It must offer tremendous opportunities for initiative and independence, as well as a constant sense of support, no matter what happens. But American family life never seems to strike this balance. The studies of adolescent family life depict a time of endless petty conflict, tyranny, delinquency, and acquiescence. As a social process, adolescence, it seems, is geared more to breaking the spirit of young boys and girls, than to helping them find themselves in the world. (See, for example, Jules Henry, *Culture Against Man,* New York: Random House, 1963.)

In physical terms these problems boil down to this. A teenager needs a place in the house that has more autonomy and character and is more a base for independent action than a child's bedroom or bed alcove. He needs a place from which he can come and go as he pleases, a place within which his privacy is respected. At the same time he needs the chance to establish a closeness with his family that is more mutual and less strictly dependent than ever before. What seems to be required is a cottage which, in its organization and location, strikes the balance between a new independence and new ties to the family.

The teenager's cottage might be made from the child's old bedroom, the boy and his father knocking a door through the wall and enlarging the room. It might be built from scratch, with the intention that it later serve as a workshop, or a place for grandfather to live out his life, or a room to rent. The cottage might even be an entirely detached structure in the garden, but in this case, a very strong connection to the main house is essential: perhaps a short covered path from the cottage into the main kitchen. Even in row housing, or apartments, it is possible to give teenagers rooms with private entry.

Is the idea of the teenage cottage acceptable to parents? Silverstein interviewed 12 mothers living in Foster City, a suburb of San Francisco, and asked them whether they would like a teenage cottage in their family. Their resistance to the idea revolved around three objections:

1. The cottage would be useful for only a few years, and would then stand empty.

2. The cottage would break up the family; it isolates the teenager.

3. It gives the teenager too much freedom in his comings and goings.

Silverstein then suggested three modifications, to meet these objections:

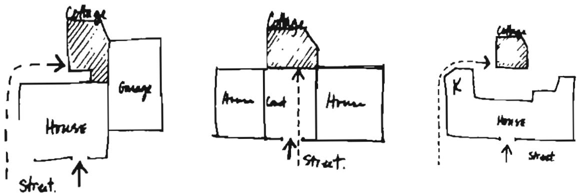
To meet the first objection, make the space double as a workshop, guest room, studio, place for grandmother; and build it with wood, so it can be modified easily with hand tools.

To meet the second objection, attach the cottage to the house, but with its own entrance; attach the cottage to the house via a short hall or vestibule or keep the cottage to the back of the lot, behind the house.

To meet the third objection, place the cottage so that the path from the room to the street passes through an important communal part of the house—the kitchen, a courtyard.

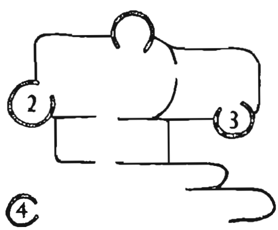
He discussed these modifications with the same twelve mothers. Eleven of the twelve now felt that the modified version had some merit, and was worth trying. This material is reported by Murray Silverstein, in "The Boy's Room: Twelve Mothers Respond to an Architectural Pattern," University of California, Department of Architecture, December 1967.

Here are some possible variants containing these modifications.



Variations of teenager's cottage.

Among the Comanches, ". . . the boy after puberty was given a separate tepee in which he slept, entertained his friends, and spent most of his time." (Abram Kardiner, *Psychological Frontiers of Society*, New York: Columbia University Press, 1945, p. 75.)



Plan of a Yungur Compound, Africa; 2 is the master bedroom; 3 is the daughter's hut; 4 is the son's hut.

And finally, from Simone De Beauvoir:

When I was twelve I had suffered through not having a private retreat of my own at home. Leafing through *Mon Journal* I had found a story about an English schoolgirl, and gazed enviously at the colored illustration portraying her room. There was a desk, and a divan, and shelves filled with books. Here, within these gaily painted walls, she read and worked and drank tea, with no one watching her—how envious I felt! For the first time ever I had glimpsed a more fortunate way of life than my own. And now, at long last, I too had a room to myself. My grandmother had stripped her drawing room of all its armchairs, occasional tables, and knick-knacks. I had bought some unpainted furniture, and my sister had helped me to give it a coat of brown varnish. I had a table, two chairs, a large chest which served both as a seat and as a hold-all, shelves for my books. I papered the walls orange, and got a divan to match. From my fifth-floor balcony I looked out over the Lion of Belfort and the plane trees on the Rue Denfert-Rochereau. I kept myself warm with an evil-smelling kerosene stove. Somehow its stink seemed to protect my solitude, and I loved it. It was wonderful to be able to shut my door and keep my daily life free of other people's inquisitiveness. For a long time I remained indifferent to the decor of my surroundings. Possibly because of that picture in *Mon Journal* I preferred rooms that offered me a divan and bookshelves, but I was prepared to put up with any sort of retreat in a pinch. To have a door that I could shut was still the height of bliss for me . . . I was free to come and go as I pleased. I could get home with the milk, read in bed all night, sleep till midday, shut myself up for forty-eight hours at a stretch, or go out on the spur of the moment . . . my chief delight was in doing as I pleased. (Simone De Beauvoir, *The Prime of Life*, New York: Lancer Books, 1966, pp. 9–10.)

Therefore:

To mark a child's coming of age, transform his place in the home into a kind of cottage that expresses in a physical way the beginnings of independence. Keep the cottage attached to the home, but make it a distinctly visible bulge, far away from the master bedroom, with its own private entrance, perhaps its own roof.

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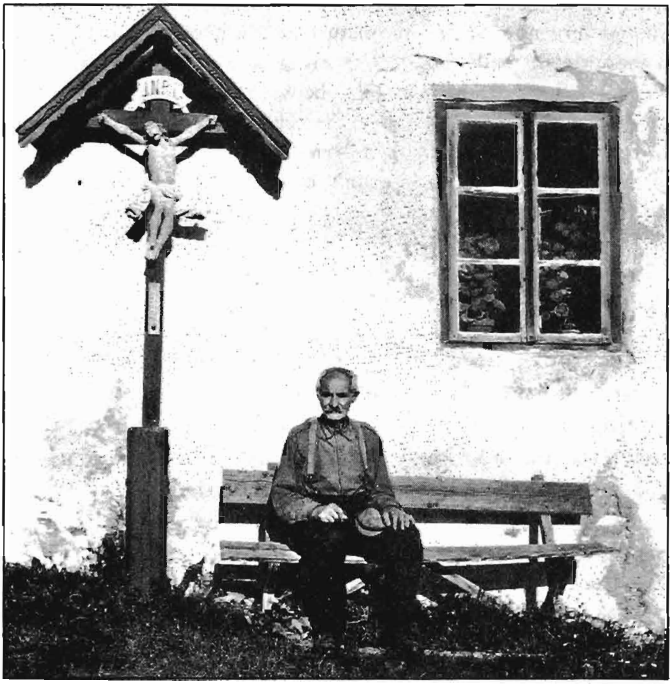
Arrange the cottage to contain a SITTING CIRCLE (185) and a BED ALCOVE (188) but not a private bath and kitchen—sharing these is essential: it allows the boy or girl to keep enough connection with the family. Make it a place that can eventually become a guest room, room to rent, workshop, and so on—ROOMS TO RENT (153), HOME WORKSHOP (157). If it is on an upper story, give it a separate private OPEN STAIR (158). And for the shape of the cottage and its construction, start with THE SHAPE OF INDOOR SPACE (191) and STRUCTURE FOLLOWS SOCIAL SPACES (205). . . .

155 OLD AGE COTTAGE**



. . . we have explained, in OLD PEOPLE EVERYWHERE (40), that it is essential to have a balanced number of old people in every neighborhood, partly centered around a communal place, but largely strung out among the other houses of the neighborhood. This pattern now defines the nature of the houses for old people in more detail: both those which are a part of clusters and those which are tucked, autonomously, between the larger houses. As we shall see, it seems desirable that every family should have a cottage like this, attached to it—THE FAMILY (75). Like ROOMS TO RENT (153) and TEENAGER'S COTTAGE (154), this cottage can be rented out or used for other purposes in time of trouble.

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Old people, especially when they are alone, face a terrible dilemma. On the one hand, there are inescapable forces pushing them toward independence: their children move away; the neighborhood changes; their friends and wives and husbands die. On the other hand, by the very nature of aging, old people become dependent on simple conveniences, simple connections to the society about them.

This conflict is reflected often in their children's conflict. On the one hand, children feel responsible for their parents, because, of course, they sense their growing need for care and comfort. On the other hand, as families are whittled down, parent-child conflicts become more acute, and few people can imagine actually being able or willing to take care of their parents in their dotage.

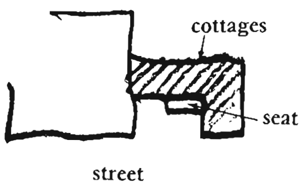
The conflict can be partly resolved, if each house which houses a nuclear family has, somewhere near it, a small cottage where a grandparent can live, far enough away to be independent, and yet close enough to feel some tie and to be cared for in a time of trouble or approaching death.

But the conflict is more general. Even if we ignore, altogether, the complexities of parent-child relationships, the fact is that most old people face enormous difficulties as they grow older. The welfare state tries to replace the comfort of the extended family with payments—social security or pensions. This income is always tiny; and inflation makes it worse. In the United States, one-quarter of the population over 65 lives on less than $4000 a year. Many of the old people in our society are forced to live in miserable tiny rooms, way in the back of some run-down old folks hotel. They cannnot have a decent house, because there are no decent tiny houses compatible with a small income and reduced activity.

This second conflict, between the need for someplace really small and modest and the need for social contact, a view of passing people, someone to nod to, a place in the sun, can also be resolved, like the first conflict, by cottages. It can be resolved, if there are many tiny cottages, dotted among the houses of communities and always strung along pedestrian paths—tiny enough to be really cheap.

Therefore:

Build small cottages specifically for old people. Build some of them on the land of larger houses, for a grandparent; build others on individual lots, much smaller than ordinary lots. In all cases, place these cottages at ground level, right on the street, where people are walking by, and close to neighborhood services and common land.



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Perhaps the most important part of an old age cottage is the front porch and front door bench outside the door, right on the street—PRIVATE TERRACE ON THE STREET (140), FRONT DOOR BENCH (242); for the rest, arrange the cottage pretty much according to the layout of any HOUSE FOR ONE PERSON (78); make provisions for SETTLED WORK (156); and give the cottage a STREET WINDOW (164). And for the shape of the cottage start with THE SHAPE OF INDOOR SPACE (191) and STRUCTURE FOLLOWS SOCIAL SPACES (205). . . .

156 SETTLED WORK*

. . . as people grow older, simple satisfying work which nourishes, becomes more and more important. This pattern specifies the need for this development to be a part of every family. It helps to form THE FAMILY (75), it helps form OLD AGE COTTAGE (155), and it is a natural embellishment of A ROOM OF ONE'S OWN (141).

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The experience of settled work is a prerequisite for peace of mind in old age. Yet our society undermines this experience by making a rift between working life and retirement, and between workplace and home.

First of all, what do we mean by "settled work"? It is the work which unites all the threads of a person's life into one activity: the activity becomes a complete and wholehearted extension of the person behind it. It is a kind of work that one cannot come to overnight; but only by gradual development. And it is a kind of work that is so thoroughly a part of one's way of life that it most naturally occurs within or very near the home: when it is free to develop, the workplace and the home gradually fuse and become one thing.

It may be the same kind of work that a man has been doing all his life—but as settled work it becomes more profound, more concrete, and more unique. For example, there is the bureaucrat who finally breaks through all the paper work and finds the underlying organic function in his work. Then he begins to let this function into the world. This is the theme of Kurosawa's most beautiful film, *Ikiru: To Live*. Or it may be work that a person begins in his spare time, away from his occupation, and it gradually expands and becomes more involving, until it replaces his old occupation altogether.

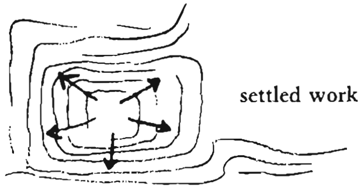
The problem is that very many people never achieve the experience of settled work. This is essentially because a person, during his working life, has neither the time nor the space to develop it. In today's marketplace most people are forced to adapt their work to the rules of the office, the factory, or the institution. And generally this work is all-consuming—when the weekends come people do not have the energy to start a new, demanding kind of work. Even in the self-governing workshops and offices, where working procedures are created ad hoc by the workers as they go, the work itself is generally geared to the demands of the marketplace. It does not allow time for the slow growth of "settled work"—which comes from within and may not always carry its weight in the marketplace.

To solve the problem, we must first of all create a working environment, where a person, from say middle age, has the opportunity of slowly developing a kind of settled work that is right for him. For instance, if people were able to take off one day a week, with half-time pay, beginning at the age of 40, they could gradually set up for themselves a workshop in their home or in their neighborhood. If the time is increased gradually over the years, a person can explore various kinds of work; and, then, gradually let the settled work replace his working life.

We make special mention of settled work as the work of old age, because, even though it must begin early on in a person's life, it is in old age that having such work becomes a necessity. The crisis of old age, life integrity versus despair and cynicism, can only be solved by a person engaged in some form of settled work —see LIFE CYCLE (26). People who have the opportunity to develop such work and to relate it in some appropriate way to the world about them, will find their way to a successful resolution of this crisis as they grow old; others will sink into despair.

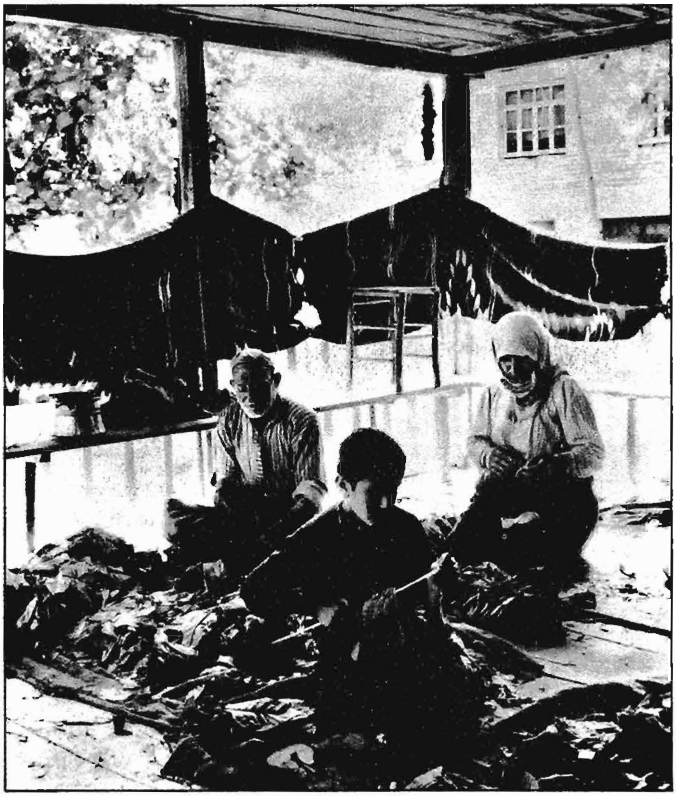
Therefore:

Give each person, especially as he grows old, the chance to set up a workplace of his own, within or very near his home. Make it a place that can grow slowly, perhaps in the beginning sustaining a weekend hobby and gradually becoming a complete, productive, and comfortable workshop.



Arrange the workshop, physically, along the lines defined by HOME WORKSHOP (157), and make the workshop open to the street, a part of local street life—PRIVATE TERRACE ON THE STREET (140), OPENING TO THE STREET (165). . . .

157 HOME WORKSHOP



. . . at the center of each HOUSE CLUSER (37) and in YOUR OWN HOME (79) there needs to be one room or outbuilding, which is freely attached and accessible from the outside. This is the workshop. The following pattern tells us how important workshops are, how widely they ought to be scattered, how omnipresent, and when they are built, how easy to reach, and how public they should always be. It helps to reinforce the patterns of SCATTERED WORK (9), NETWORK OF LEARNING (18), and MEN AND WOMEN (27).

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As the decentralization of work becomes more and more effective, the workshop in the home grows and grows in importance.

We have explained in SCATTERED WORK (9), NETWORK OF LEARNING (18), MEN AND WOMEN (27), SELF-GOVERNING WORKSHOPS AND OFFICES (80), and other patterns that we imagine a society in which work and family are far more intermingled than today; a society in which people—businessmen, artists, craftsmen, shopkeepers, professionals—work for themselves, alone and in small groups, with much more relation to their immediate surroundings than they have today.

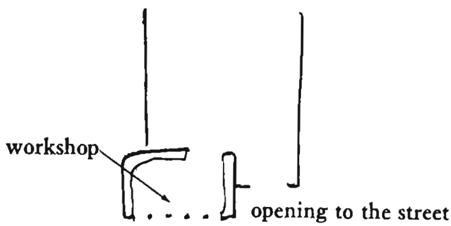
In such a society, the home workshop becomes far more than a basement or a garage hobby shop. It becomes an integral part of every house; as central to the house's function as the kitchen or the bedrooms. And we believe its most important characteristic is its relationship to the public street. For most of us, work life is relatively public. Certainly, compared to the privacy of the hearth, it is a public affair. Even where the public relationship is slight, there is something to be gained, both for the worker and the community, by enlarging the connection between the two.

In the case of the home workshop, the public nature of the work is especially valuable. It brings the workshop out of the realm of backyard hobbies and into the public domain. The people working there have a view of the street; they are exposed to the people passing by. And the people passing learn something about the nature of the community. The children especially are enlivened by this contact. And according to the nature of the work, the public connection takes the form of a shopfront, a driveway for loading and unloading materials, a work bench in the open, a small meeting room . . .

We therefore advocate provision for a substantial workshop with all the character of a real workplace and some degree of connection to the public street: at least a glancing connection so that people can see in and out; and perhaps a full connection, like an open shop front.

Therefore:

Make a place in the home, where substantial work can be done; not just a hobby, but a job. Change the zoning laws to encourage modest, quiet work operations to locate in neighborhoods. Give the workshop perhaps a few hundred square feet; and locate it so it can be seen from the street and the owner can hang out a shingle.



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Give the workshop a corner where it is especially nice to work —LIGHT ON TWO SIDES (159), WORKSPACE ENCLOSURE (183); a strong connection to the street—OPENING TO THE STREET (165), WINDOWS OVERLOOKING LIFE (192); perhaps a place to work in the sun on warm days—SUNNY PLACE (161). For the shape of the workshop and its construction, start with THE SHAPE OF INDOOR SPACE (191). . . .

158 OPEN STAIRS*

. . . most of the last patterns—ROOMS TO RENT (153), TEENAGER'S COTTAGE (154), SETTLED WORK (156), HOME WORKSHOP (157)—can be upstairs, provided that they have direct connections to the street. Far more generally, it is true that many of the households, public services, and workgroups given by earlier patterns can be successful when they lie upstairs, only if they are given direct connections to the street. For instance, in a work community SELF-GOVERNING WORKSHOPS AND OFFICES (80), SMALL SERVICES WITHOUT RED TAPE (81), SMALL WORK GROUPS (148) all require direct access to the public street when they are on the upper storys of a building. And in the individual households—HOUSE FOR A SMALL FAMILY (76), HOUSE FOR A COUPLE (77), HOUSE FOR ONE PERSON (78) also need direct connections to the street, so people do not need to go through lower floors to get to them. This pattern describes the open stairs which may be used to form these many individual connections to the street. They play a major role in helping to create PEDESTRIAN STREETS (100).

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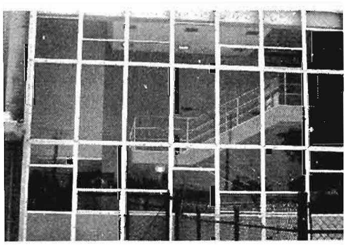
Internal staircases reduce the connection between upper stories and the life of the street to such an extent that they can do enormous social damage.

The simple fact of the matter is that an apartment on the second floor of a building is wonderful when it has a direct stair to the street, and much less wonderful when it is merely one of several apartments served by an internal stair. The following, perhaps rather laborious discussion, is our effort to explain this vital and commonplace intuition.

In a traditional culture where buildings are built incrementally, outdoor stairs leading to upper stories are common. And half "outdoor" stairs—protected by walls and roofs, but nonetheless open to the street—are also common.

The beauty of open stairs.

By contrast, in industrialized, authoritarian societies most stairs are indoor stairs. The access to these stairs is from internal lobbies and corridors; the upper stories are cut off from direct access to the life of the street.



This is not an open stair—don't be fooled.

This difference is not an incidental by-product of fire laws or construction techniques. It is fundamental to the difference between a free anarchical society, in which there is a voluntary exchange of ideas between equals, and a highly centralized authoritarian society, in which most individuals are subservient to large government and business organizations.

In effect we are saying that a centralized entrance, which funnels everyone in a building through it, has in its nature the trappings of control; while the pattern of many open stairs, leading off the public streets, direct to private doors, has in its nature the fact of independence, free comings and goings.

We can see this most easily in the cases where the centralized door is, without question, a source of social control. In workplaces with a central entrance and a time-clock, workers punch in and out, and they have to make excuses when they are leaving at a time that is not normal. In some kinds of student housing, people are asked to sign in and out; and if they are not back by "lock-out" time, they are in trouble.

Then there are cases where the control is more subtle. In an apartment house or a workplace where everyone is free to come or go as he pleases it is not uncommon for the main door to be kept locked. Of course the residents have a key to the building; but their friends do not. When the front door is locked—after normal hours, say—they are effectively cut off from the spontaneous "dropping in" that can occur freely only where all paths are public right up to the thresholds of private territory.

Then there is the still more subtle fact that, even where the centralized entrance carries with it no explicit policy of social control—let us say that it is a door that is always open—it still has an uneasy feeling about it for people who cherish basic liberties. The single, centralized entrance is the precise pattern that a tyrant *would* propose who wanted to control people's comings and goings. It makes one uneasy to live with such a form, even where the social policy is relatively free.

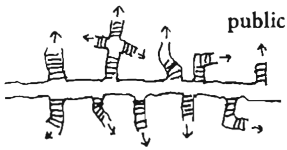
This may very easily sound paranoid. But the point is this: socially, a libertarian society tries to build for itself structures which cannot easily be controlled by one person or one group "at the helm." It tries to decentralize social structures so that there are *many* centers, and no one group can come to have excessive control.

A physical environment which supports the same libertarian ideal will certainly put a premium on structures that allow people freedom to come and go as they please. And it will try to protect this right by building it into the very ground plan of buildings and cities. When we feel uneasy in a building that is spatially over-centralized and authoritarian, it is because we feel unprotected in this way; we feel that one of our basic rights is potentially vulnerable and is not being fully affirmed by the physical structure of the environment.

Open stairs which act as extensions of the public world and which reach up to the very threshold of each household's and each workgroup's own space solve this problem. These spaces are then connected directly to the world at large. People on the street recognize each entry as the domain of real people—not the domain of corporations and institutions, which have the actual or potential power to tyrannize.

Therefore:

Do away, as far as possible, with internal staircases in institutions. Connect all autonomous households, public services, and workgroups on the upper floors of buildings directly to the ground. Do this by creating open stairs which are approached directly from the street. Keep the stair roofed or unroofed, according to climate, but at all events leave the stair open at ground level, without a door, so that the stair is functionally a continuation of the street. And build no upstairs corridors. Instead, make open landings or an open arcade where upstairs units share a single stair.



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Where the stair comes down to the ground, make an entrance which helps to repair the family of entrances that exist already on the street—FAMILY OF ENTRANCES (102); make the landings and the top of the stair, where it reaches the roof, into gardens where things can grow and where people can sit in the sun—ROOF GARDEN (118), SUNNY PLACE (161). Remember STAIR SEATS (125), and build the stair according to STAIRCASE VOLUME (195). . . .

prepare to knit the inside of the building to the outside, by treating the edge between the two as a place in its own right, and making human details there;

159. LIGHT ON TWO SIDES OF EVERY ROOM

160. BUILDING EDGE

161. SUNNY PLACE

162. NORTH FACE

163. OUTDOOR ROOM

164. STREET WINDOWS

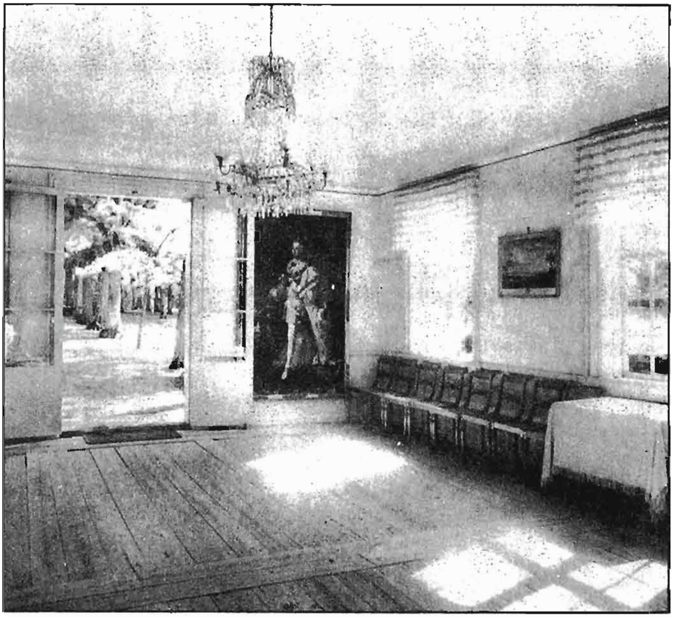
165. OPENING TO THE STREET

166. GALLERY SURROUND

167. SIX-FOOT BALCONY

168. CONNECTION TO THE EARTH

159 LIGHT ON TWO SIDES OF EVERY ROOM**



. . . once the building's major rooms are in position, we have to fix its actual shape: and this we do essentially with the position of the edge. The edge has got its rough position already from the overall form of the building—WINGS OF LIGHT (107), POSITIVE OUTDOOR SPACE (106), LONG THIN HOUSE (109), CASCADE OF ROOFS (116). This pattern now completes the work of WINGS OF LIGHT (107), by placing each individual room exactly where it needs to be to get the light. It forms the exact line of the building edge, according to the position of these individual rooms. The next pattern starts to shape the edge.

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When they have a choice, people will always gravitate to those rooms which have light on two sides, and leave the rooms which are lit only from one side unused and empty.

This pattern, perhaps more than any other single pattern, determines the success or failure of a room. The arrangement of daylight in a room, and the presence of windows on two sides, is fundamental. If you build a room with light on one side only, you can be almost certain that you are wasting your money. People will stay out of that room if they can possibly avoid it. Of course, if all the rooms are lit from one side only, people will have to use them. But we can be fairly sure that they are subtly uncomfortable there, always wishing they weren't there, wanting to leave—just because we are so sure of what people do when they do have the choice.

Our experiments on this matter have been rather informal and drawn out over several years. We have been aware of the idea for some time—as have many builders. (We have even heard that "light on two sides" was a tenet of the old Beaux Arts design tradition.) In any case, our experiments were simple: over and over again, in one building after another, wherever we happened to find ourselves, we would check to see if the pattern held. Were people in fact avoiding rooms lit only on one side, preferring the two-sided rooms—what did they think about it?

We have gone through this with our friends, in offices, in many homes—and overwhelmingly the two-sided pattern seems significant. People are aware, or half-aware of the pattern—they understand exactly what we mean.

With light on two sides . . . . and without

If this evidence seems too haphazard, please try these observations yourself. Bear the pattern in mind, and examine all the buildings you come across in your daily life. We believe that you will find, as we have done, that those rooms you intuitively recognize as pleasant, friendly rooms have the pattern; and those you intuitively reject as unfriendly, unpleasant, are the ones which do not have the pattern. In short, this one pattern alone, is able to distinguish good rooms from unpleasant ones.

The importance of this pattern lies partly in the social atmosphere it creates in the room. Rooms lit on two sides, with natural light, create less glare around people and objects; this lets us see things more intricately; and most important, it allows us to read in detail the minute expressions that flash across people's faces, the motion of their hands . . . and thereby understand, more clearly, the meaning they are after. *The light on two sides allows people to understand each other.*

In a room lit on only one side, the light gradient on the walls and floors inside the room is very steep, so that the part furthest from the window is uncomfortably dark, compared with the part near the window. Even worse, since there is little reflected light on the room's inner surfaces, the interior wall immediately next to the window is usually dark, creating discomfort and glare against this light. *In rooms lit on one side, the glare which sur-*

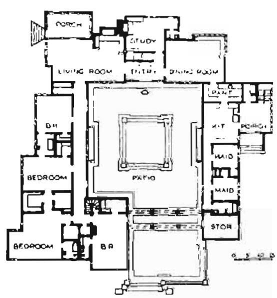
rounds people's faces prevents people from understanding one another.

Although this glare may be somewhat reduced by supplementary artificial lighting, and by well-designed window reveals, the most simple and most basic way of overcoming glare, is to give every room two windows. The light from each window illuminates the wall surfaces just inside the other window, thus reducing the contrast between those walls and the sky outside. For details and illustrations, see R. G. Hopkinson, *Architectural Physics: Lighting*, London: Building Research Station, 1963, pp. 29, 103.

A supreme example of the complete neglect of this pattern is Le Corbusier's Marseilles Block apartments. Each apartment unit is very long and relatively narrow, and gets all its light from one end, the narrow end. The rooms are very bright just at the windows and dark everywhere else. And, as a result, the glare created by the light-dark contrast around the windows is very disturbing.

In a small building, it is easy to give every room light on two sides: one room in each of the four corners of a house does it automatically.

In a slightly larger building, it is necessary to wrinkle the edge, turn corners, to get the same effect. Juxtaposition of large rooms and small, helps also.



Wrinkle the edge.

In an even larger building, it may be necessary to build in some sort of systematic widening in the plan or to convolute the edge still further, to get light on two sides for every room.

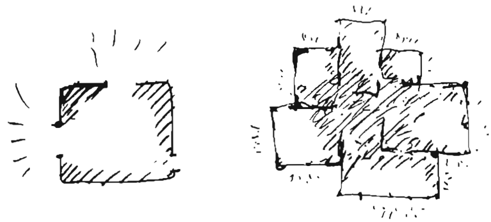
But of course, no matter how clever we are with the plan, no matter how carefully we convolute the building edge, sometimes it is just impossible. In these cases, the rooms can get the effect of light on two sides under two conditions. They can get it, if the room is very shallow—not more than about eight feet deep—with at least two windows side by side. The light bounces off the back wall, and bounces sideways between the two windows, so that the light still has the glare-free character of light on two sides.

And finally, if a room simply has to be more than eight feet deep, but cannot have light from two sides—then the problem can be solved by making the ceiling very high, by painting the walls very white, and by putting great high windows in the wall, set into very deep reveals, deep enough to offset the glare. Elizabethan dining halls and living rooms in Georgian mansions were often built like this. Remember, though, that it is very hard to make it work.

Therefore:

Locate each room so that it has outdoor space outside it on at least two sides, and then place windows in these outdoor walls so that natural light falls into every room from more than one direction.

each room has light on two sides



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Don't let this pattern make your plans too wild—otherwise you will destroy the simplicity of POSITIVE OUTDOOR SPACE (106), and you will have a terrible time roofing the building—ROOF

LAYOUT (209). Remember that it is possible to keep the essence of the pattern with windows on one side, if the room is unusually high, if it is shallow compared with the length of the window wall, the windows large, the walls of the room white, and massive deep reveals on the windows to make quite certain that the big windows, bright against the sky, do not create glare.

Place the individual windows to look onto something beautiful—WINDOWS OVERLOOKING LIFE (192), NATURAL DOORS AND WINDOWS (221); and make one of the windows in the room a special one, so that a place gathers itself around it—WINDOW PLACE (180). Use DEEP REVEALS (223) and FILTERED LIGHT (238). . . .

160 BUILDING EDGE**

. . . assume that the position of the building edge is fixed—most recently by LIGHT ON TWO SIDES OF EVERY ROOM (159)—and before that by the position of the building wings and their interior spaces and by the courts and gardens and streets between the buildings—WINGS OF LIGHT (107), POSITIVE OUTDOOR SPACE (106). This pattern now sets the stage for the development of the zone between the indoors and the outdoors. Often this "zone" is thought of as an edge, a line on paper without thickness, a wall. But this is altogether wrong . . .

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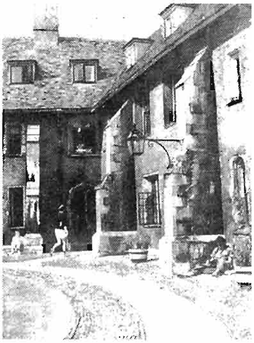
A building is most often thought of as something which turns inward—toward its rooms. People do not often think of a building as something which must also be oriented toward the outside.

But unless the building is oriented toward the outside, which surrounds it, as carefully and positively as toward its inside, the space around the building will be useless and blank—with the direct effect, in the long run, that the building will be socially isolated, because you have to cross a no-man's land to get to it.

Look, for example, at this machine age slab of steel and glass. You cannot approach it anywhere except at its entrance—because the space around it is not made for people.

The edge cannot support any life.

And compare it with this older, warmer building, which has a continuous surrounding of benches, galleries, balconies, flowers, corners to sit, places to stop. This building edge is alive. It is connected to the world around it by the simple fact that it is made into a positive place where people can enjoy themselves.



An edge that can be used . . .

Think of the effect of this small difference. The machine-like building is cut off from its surroundings, isolated, an island. The building with a lively building edge, is connected, part of the social fabric, part of the town, part of the lives of all the people who live and move around it.

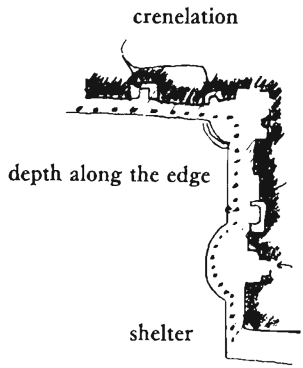
We get empirical support for this contrast from the following: apparently people prefer being at the edges of open spaces—and when these edges are made human, people cling to them tenaciously. In observing people's behavior in outdoor spaces, for example, Jan Gehl discovered that "there is a marked tendency for both standing and sitting persons to place themselves near something—a facade, pillar, furniture, etc." ["Mennesker til Fods (Pedestrians)," *Arkitekten*, No. 20, 1968.] This tendency for people to stay at the edges of spaces, is also discussed in the pattern ACTIVITY POCKETS (124).

If this propensity were taken as seriously outdoors as it is indoors, then the exterior walls of buildings would look very different indeed from the way they look today. They would be more like places—walls would weave in and out, and the roof would extend over them to create little places for benches, posters, and notices for people to look at. For the niches to have the right depth, they would have to be occasionally as much as 6 feet deep—see the arguments for SIX-FOOT BALCONY (167).

When it is properly made, such an edge is a realm between realms: it increases the connection between inside and outside, encourages the formation of groups which cross the boundary, encourages movement which starts on one side and ends on the other, and allows activity to be either on, or in the boundary itself. A very fundamental notion.

Therefore:

Make sure that you treat the edge of the building as a "thing," a "place," a zone with volume to it, not a line or interface which has no thickness. Crenelate the edge of buildings with places that invite people to stop. Make places that have depth and a covering, places to sit, lean, and walk, especially at those points along the perimeter which look onto interesting outdoor life.



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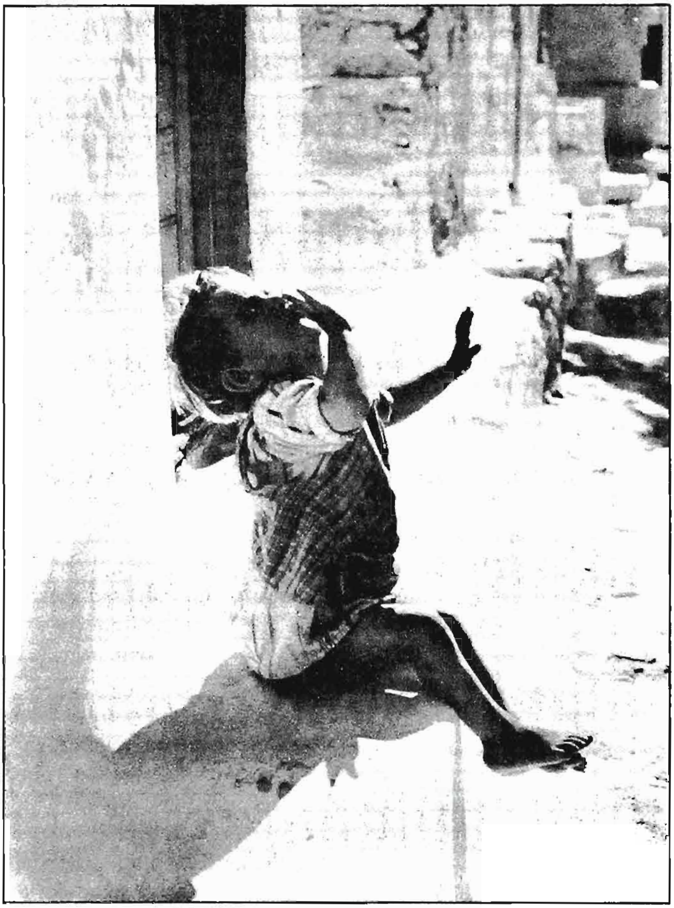
Do it with arcades, galleries, porches, and terraces—ARCADES (119), OUTDOOR ROOM (163), GALLERY SURROUND (166), SIX-FOOT BALCONY (167), CONNECTION TO THE EARTH (168); take special account of the sun—SUNNY PLACE (161), NORTH FACE (162); and put in seats and windows which complete the feeling of connection—STAIR SEATS (125), STREET WINDOWS (164), SEAT SPOTS (241), FRONT DOOR BENCH (242). . . .

161 SUNNY PLACE**



. . . this pattern helps to embellish and give life to any SOUTH FACING OUTDOORS (105); and, in a situation where the outdoors is not to the south, but east or west, it can help to modify the building so that the effective part of the outdoors moves towards the south. It also helps to complete BUILDING EDGE (160), and to place OUTDOOR ROOM (163).

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The area immediately outside the building, to the south—that angle between its walls and the earth where the sun falls—must be developed and made into a place which lets people bask in it.

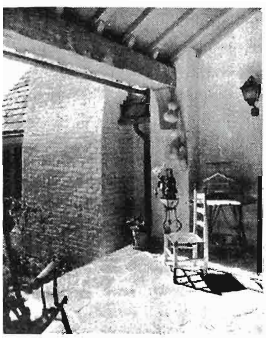
We have already made the point that important outdoor areas should be to the south of buildings which they serve, and we presented the empirical evidence for this idea in SOUTH FACING OUTDOORS (105). But even if the outdoor areas around a building are toward the south, this still won't guarantee that people actually will use them.

In this pattern, we shall now discuss the subtler fact that a south-facing court or garden will still not work, unless there is a functionally important sunny place within it, intently and specifically placed for sun, at a central juncture between indoors and outdoors and immediately next to the indoor rooms which it serves.

We have some evidence—presented in SOUTH-FACING OUTDOORS (105)—that a deep band of shade between a building and a sunny area can act as a barrier and keep the area from being well used. It is this evidence which makes us believe that the most important sunny places occur up against the exterior walls of buildings, where people can see into them from inside and step directly out into the light, leaning in the doorway of the building. Furthermore, we have observed that these places are more inviting if they are placed in the crook of a building or wall, where there is just enough enclosure from a hedge, a low wall, a column, to provide a backdrop, a place to sit up against and take in the sun.

And finally, of course, if the place is really to work, there must be a good reason for going there: something special which draws a person there—a swing, a potting table for plants, a special view, a brick step to sit upon and look into a pool—whatever, so long as it has the power to bring a person there almost without thinking about it.

Here is an example—a sunny place at the edge of a building, directly related to the inside, and set in a nook of the building. Someone comes there every day to sit for a moment, water the hanging plants, see how they are doing, and take in some sun.



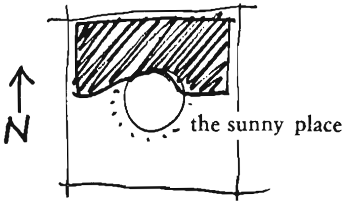
Sunny place . . .

A particularly beautiful version of this pattern can be made when several sunny places are placed together—perhaps for a HOUSE CLUSTER (37) or a WORK COMMUNITY (41). If the places can be set down so that they form a south-facing half-necklace of sunny spots, each within hailing distance of all the others, it makes the act of coming out into the sun a communal affair.

Therefore:

Inside a south-facing court, or garden, or yard, find the spot between the building and the outdoors which gets the best sun. Develop this spot as a special sunny place—make it the important outdoor room, a place to work in the sun, or a place for a swing and some special plants, a place to sunbathe. Be very careful indeed to place the

sunny place in a position where it is sheltered from the wind. A steady wind will prevent you from using the most beautiful place.



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Make the place itself as much as possible like a room—PRIVATE TERRACE ON THE STREET (140), OUTDOOR ROOM (163); always at least six feet deep, no less—SIX-FOOT BALCONY (167); perhaps with foliage or a canvas to filter the light on hot days—FILTERED LIGHT (238), TRELLISED WALK (174), CANVAS ROOF (244). Put in seats according to SEAT SPOTS (241). . . .

162 NORTH FACE

. . . even if the building has been placed correctly according to SOUTH-FACING OUTDOORS (105) and there is little outdoor space toward the north, there is usually still some kind of area or volume on the north face of the building. It is necessary to take care of this north-facing place to supplement the work of INDOOR SUNLIGHT (128) and SUNNY PLACE (161).

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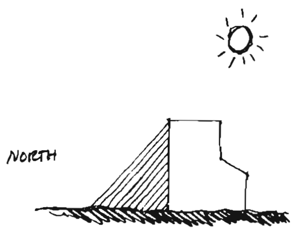
Look at the north sides of the buildings which you know. Almost everywhere you will find that these are the spots which are dead and dank, gloomy and useless. Yet there are hundreds of acres in a town on the north sides of buildings; and it is inevitable that there must always be land in this position, wherever there are buildings.

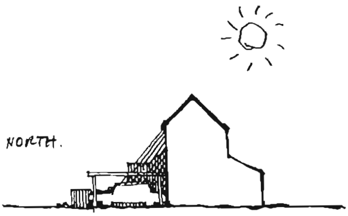
If a building has a sheer north face, during many months of the year it will cast a long shadow out behind it.



North shadows.

These dead and gloomy north sides not only waste enormous areas of land; they also help to kill the larger environment, by cutting it up with shadow areas which no one wants to cross, and which therefore break up the various areas of the environment from one another. It is essential to find a way of making these north-facing areas alive, at least in their own terms, so that they help the land around them instead of breaking it apart.

The shadow cast by the north face is essentially triangular. To keep this triangle of shade from becoming a forlorn place, it is necessary to fill it up with things and places which do not need the sun. For example, the area to the north may form a gentle cascade which contains the car shelter, perhaps a bath suite, storage, garbage cans, a studio. If this cascade is properly made, then for most of the year the outdoors beyond it to the north will have enough sun for a garden, a greenhouse, a private garden seat, a workshop, paths.

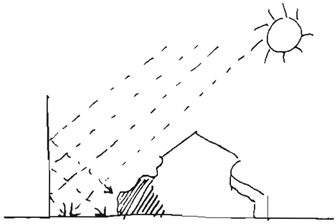


North cascade.

Furthermore, if there are north rooms that are inevitably gloomy, it helps enormously to make a reflecting wall: a wall standing some ways to the north of the building, painted white or yellow, and set in a position which gets the sun and reflects it back into the building. This wall might be the wall of a nearby building, a garden wall, etc.

Therefore:

Make the north face of the building a cascade which slopes down to the ground, so that the sun which normally casts a long shadow to the north strikes the ground immediately beside the building.



north face

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Use the triangle inside this north cascade for car, garbage, storage, shed, a studio which requires north light, closets—those parts of the building which can do very well without interior sunlight—CAR CONNECTION (113), BULK STORAGE (145), COMPOST (178), CLOSETS BETWEEN ROOMS (198). If it is at all practical, use a white or yellow wall to the north of the building to reflect sunlight into the north-facing rooms—INDOOR SUNLIGHT (128), LIGHT ON TWO SIDES OF EVERY ROOM (159), GARDEN WALL (173). . . .

163 OUTDOOR ROOM**

. . . every building has rooms where people stay and live and talk together—COMMON AREAS AT THE HEART (129), FARMHOUSE KITCHEN (139), SEQUENCE OF SITTING SPACES (142). Whenever possible, these rooms need to be embellished by a further "room" outdoors. This kind of outdoor room also helps to form a part of any PUBLIC OUTDOOR ROOM (69), HALF-HIDDEN GARDEN (111), PRIVATE TERRACE ON THE STEET (140), or SUNNY PLACE (161).

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A garden is the place for lying in the grass, swinging, croquet, growing flowers, throwing a ball for the dog. But there is another way of being outdoors: and its needs are not met by the garden at all.

For some moods, some times of day, some kinds of friendship, people need a place to eat, to sit in formal clothes, to drink, to talk together, to be still, and yet outdoors.

They need an outdoor room, a literal outdoor room—a partly enclosed space, outdoors, but enough like a room so that people behave there as they do in rooms, but with the added beauties of the sun, and wind, and smells, and rustling leaves, and crickets.

This need occurs everywhere. It is hardly too much to say that every building needs an outdoor room attached to it, between it and the garden; and more, that many of the special places in a garden—sunny places, terraces, gazebos—need to be made as outdoor rooms, as well.

The inspiration for this pattern comes from Bernard Rudofsky's chapter, "The Conditioned Outdoor Room," in *Behind the Picture Window* (New York: Oxford Press, 1955).

In a superbly layed out house-garden, one ought to be able to work and sleep, cook and eat, play and loaf. No doubt, this sounds specious to the confirmed indoor dweller and needs elaboration.

As a rule, the inhabitant of our climate makes no sallies into his immediate surroundings. His farthest outpost is the screened porch. The garden—if there is one—remains unoccupied between garden parties. Indeed, when he talks about the outdoors, he seldom means his garden. He does not think of gardens as potential living space. . . . Like the parlor of our grandmothers, the garden is an object of excessive care. Like the parlor, it is not meant to be lived in. In an age that puts a premium on usefulness this is most irregular. Paradoxical though it may sound, the use of glass walls in recent years alienated the garden. Even the "picture window," as the domestic version of the show-window is called, has contributed to the estrangement between indoors and outdoors; the garden has become a spectator garden.

The historical concept of the house-garden is entirely different. Domestic gardens as we have known them through the centuries were valued mostly for their habitableness and privacy, two qualities that are conspicuously absent in contemporary gardens. Privacy, so little in demand these days, was indispensable to people with a taste for dignified living. The house-gardens of antiquity furnish us, even in their fragmentary and dilapidated state, perfect examples of how a diminutive and apparently negligible quantity of land can, with some ingenuity, be transformed into an oasis of delight. Miniature gardens though they were, they had all the ingredients of a happy environment.

These gardens were an essential part of the house; they were, mind you, contained *within* the house. One can best describe them as rooms without ceilings. They were true outdoor living rooms, and invariably regarded as such by their inhabitants. The wall- and floor-materials of Roman gardens, for example, were no less lavish than those used in the interior part of the house. The combined use of stone mosaic, marble slabs, stucco reliefs, mural decorations from the simplest geometric patterns to the most elaborate murals established a mood particularly favorable to spiritual composure. As for the ceiling, there was always the sky in its hundred moods. (pp. 157–59)

An outdoor space becomes a special outdoor room when it is well enclosed with walls of the building, walls of foliage, columns, trellis, and sky; and when the outdoor room, together with an indoor space, forms a virtually continuous living area.

Here are several examples of outdoor rooms. Each one uses a different combination of elements to establish its enclosure; each one is related to its building in a slightly different way. Rudofsky gives many other examples in the book we have cited. For instance, he describes how a front lawn can be rebuilt to become an outdoor room.

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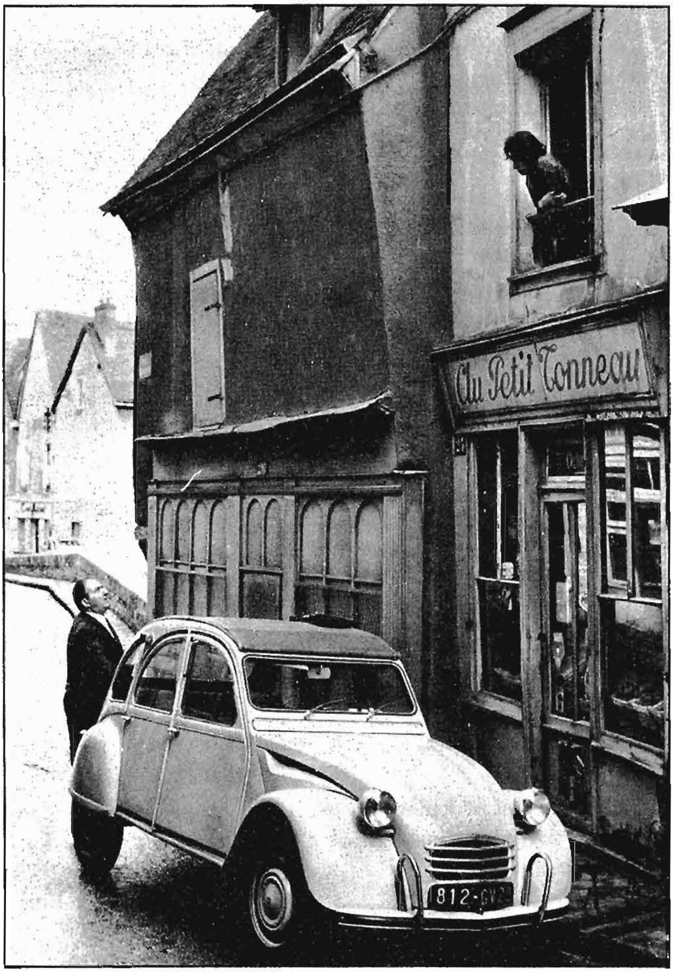
This outdoor room is formed, most often, by free standing columns—COLUMN PLACE (226), walls—GARDEN WALL (173), low SITTING WALLS (243), perhaps a trellis overhead—TRELLISED WALK (174), or a translucent canvas awning—CANVAS ROOFS (244), and a ground surface which helps to provide CONNECTION TO THE EARTH (168). Like any other room, for its construction start with THE SHAPE OF INDOOR SPACE (191) and STRUCTURE FOLLOW SOCIAL SPACES (205). . . .

164 STREET WINDOWS*



. . . wherever there are GREEN STREETS (51), SMALL PUBLIC SQUARES (61), PEDESTRIAN STREETS (100), BUILDING THOROUGHFARES (101)—in short, any streets with people in them, these streets will only come to life if they are helped to do so by the people looking out on them, hanging out of windows, laughing, shouting, whistling.

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A street without windows is blind and frightening. And it is equally uncomfortable to be in a house which bounds a public street with no window at all on the street.

The street window provides a unique kind of connection between the life inside buildings and the street. Franz Kafka wrote a short commentary entitled "The Street Window," which expresses beautifully the power of this relationship.

> Whoever leads a solitary life and yet now and then wants to attach himself somewhere, whoever, according to changes in the time of day, the weather, the state of his business, and the like, suddenly wishes to see any arm at all to which he might cling—he will not be able to manage for long without a window looking onto the street. And if he is in the mood of not desiring anything and only goes to his window sill a tired man, with eyes turning from his public to heaven and back again, not wanting to look out and having thrown his head up a little, even then the horses below will draw him down into their train of wagons and tumult, and so at last into the human harmony. (Franz Kafka, *The Complete Stories*, ed. Nahum N. Glatzer, New York: Schocken Books, 1972, p. 384).

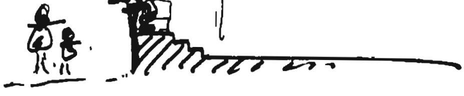
The process of watching the street from upper story windows is strongly embedded in traditional Peruvian culture in the form of the *mirador*, the beautiful ornamented gallery which sticks out over the street from many of the colonial buildings in Lima. Peruvian girls especially love to watch the street, but only if they are not too visible. They can watch the street from the mirador without any impropriety, something they cannot do so easily from the front door. If anyone looks at them too hard, they can pull back into the window.

The mirador—the lookout.

Street windows are most successful on the second and third floors. Anything higher, and the street becomes a "view"—the vitality of the connection is destroyed. From the second and third floors people can shout down to the street, throw down a jacket or a ball; people in the street can whistle for a person to come to the window, and even glimpse the expressions on a person's face inside.

At ground level, street windows are less likely to work. If they are too far back from the street, they don't really give a view onto the street—though of course they still give light. If they are too close to the street, they don't work at all, because they get boarded up or curtained to protect the privacy of the rooms inside—see the empirical findings presented in *Houses Generated by Patterns*, Center for Environmental Structure, 1969, pp. 179–80.

One possible way of making a street window at ground level might be to build an alcove, two or three steps up, with a window on the street, its window-sill five feet above the street. People in the alcove, can lean on the window sill, and watch the street; people in the street can see them, without being able to see into the room behind them. It is even easier, of course, if the



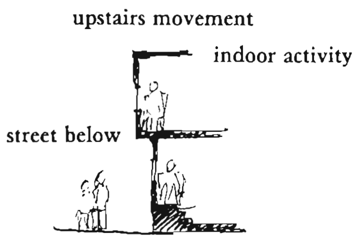
An alcove street window at ground level.

ground floor of the house is two or three feet above the street, as many ground floors are.

Finally, on whatever floor it is, a street window must be placed in a position which the people inside pass often, a place where they are likely to pause and stand beside the window: the head of a stair, the bay window of a favorite room, a kitchen, bedroom, or window in a passage.

Therefore:

Where buildings run alongside busy streets, build windows with window seats, looking out onto the street. Place them in bedrooms or at some point on a passage or stair, where people keep passing by. On the first floor, keep these windows high enough to be private.



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On the inside, give each of these windows a substantial place, so that a person feels encouraged to sit there or stand and watch the street—WINDOW PLACE (180); make the windows open outward—WINDOWS WHICH OPEN WIDE (236); enrich the outside of the window with flower boxes and climbing plants—then people, in the course of caring for the flowers, will have the opportunity for hanging out—FILTERED LIGHT (238), CLIMBING PLANTS (246). . . .

165 OPENING TO THE STREET*

. . . many places in a town depend for their success on complete exposure to the people passing by—far more exposure than a STREET WINDOW (164) can provide. UNIVERSITY AS A MARKETPLACE (43), LOCAL TOWN HALL (44), NECKLACE OF COMMUNITY PROJECTS (45), MARKET OF MANY SHOPS (46), HEALTH CENTER (47), STREET CAFE (88), BUILDING THOROUGHFARE (101) are all examples. This pattern defines the form of the exposure.

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The sight of action is an incentive for action. When people can see into spaces from the street their world is enlarged and made richer, there is more understanding; and there is the possibility for communication, learning.

The service center is a storefront, with the windows all along the front. A man walks past the door. As he does so, he looks into the center, but only turns his head for a second—apparently unwilling to show too great a curiosity. He then sees a notice on the window, stops to read the notice. As he stands reading it, he looks past the notice to see what is going on inside. After a few seconds he retraces his steps, and comes into the center. (*A Pattern Language Which Generates Multi-Service Centers*, C.E.S., 1968, p. 251.)

There are many ways of establishing connection with the street.

1. First, the obvious case: the wall along the street is made essentially of glass, and the view in is of some inviting activity. A community center in Berkeley moved from a rennovated house which was away from the street, to a rennovated furniture showroom which was completely transparent to the street. The number of people dropping in soared after the move. It was partly because the new location was on a much busier pedestrian street. But transparency also played a role in bringing people in: of the people walking past the center about 66 per cent turned and looked in, and about 7 per cent stopped—either to read a notice or to look into the interior more carefully.

2. However, a glass connection creates relatively passive involvement. By comparison, a wall which is actually open—with a sliding wall or shutter—creates a far more valuable and involving

connection. When the wall is open it is possible to hear what is going on inside, to smell the inside, to exchange words, and even to step in all along the opening. Street cafes, open food stalls, workshops with garage door openings are examples.

We passed the workshop every day on our way home from school. It was a furniture shop, and we would stand at the opening and watch men building chairs and tables, sawdust flying, forming legs on the lathe. There was a low wall, and the foreman told us to stay outside it; but he let us sit there, and we did, sometimes for hours.

3. The most involving case of all: activity is not only open to sight and sound on one side of the path, but some part of the activity actually crosses the path, so that people who walk down the sidewalk find themselves walking *through* the activity. The extreme version is the one where a shop is set up to straddle the path, with goods displayed on either side. A more modest version is the one where the roof of the space covers the path, the wall is entirely open, and the paving of the path is continuous with the "interior" of the space.

No matter how the opening is formed, it is essential that it expose the ordinary activity inside in a way that invites people passing to take it in and have some relationship, however modest, to it. The doctors of the Pioneer Health Center in Peckham believed this principle to be so essential that they deliberately built the center's gymnasium, swimming pool, dance floor, cafeteria, and theater in such a way that people passing could not help but see others, often people they knew, inside:

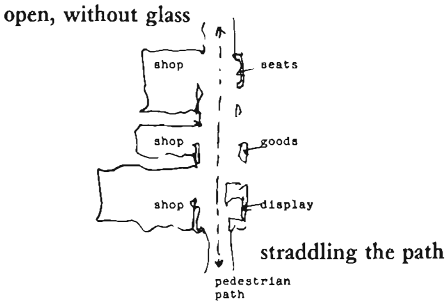
. . . dancing goes on there and moving figures can be seen on the floor of the main building at night when the whole building is lit up attracting the attention of the passers by. . . .

. . . it must be remembered that it is not the action of the skilled alone that is to be seen in the Centre, but *every degree* of proficiency in all that is going on. This point is crucial to an understanding of how vision can work as a stimulus engendering action in the company gathering there. In ordinary life the spectator of any activity is apt to be presented *only* with the exhibition of the specialist; and this trend has been gathering impetus year by year with alarming progression. Audiences swell in their thousands to watch the expert game, but as the "stars" grow in brilliance, the conviction of an ineptitude that makes trying not worth while, increasingly confirms the inactivity of the crowd. It is not then all forms of action that invite the attempt to action: it is the sight of action that is within the possible scope of the spectator that affords a temptation eventually irresistible to him. Short though the time of our experiment has been, this fact has been amply substantiated, as the growth of activities in the Centre demonstrates. (*The Peckham Experiment*, I. Pearse and L. Crocker, New Haven: Yale University Press, 1947, pp. 67–72.)

Therefore:

In any public space which depends for its success on its exposure to the street, open it up, with a fully opening wall which can be thrown wide open, and if it is possible, include some part of the activity on the far side of the pedestrian path, so that it actually straddles the path, and people walk through it as they walk along the path.

There are dozens of ways to build such an opening. For example, a wall can be made very cheaply with a simple plywood hanging shutter sliding on an overhead rail, which can be removed to open up completely, and locked in place at night.



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Give the opening a boundary, when it is entirely open, with a low solid wall which people can sit on—SITTING WALL (243); and make an outdoor room out of the part of the path which runs past it—PATH SHAPE (121), OUTDOOR ROOM (163). . . .

166 GALLERY SURROUND*

. . . we continue to fill out the BUILDING EDGE (160). Assume that arcades have been built wherever they make sense—ARCADES (119); there are still large areas within the building edge where BUILDING EDGE tells you to make something positive—but so far no patterns have explained how this can be done physically. This pattern shows you how you can complete the edge. It complements ROOF GARDEN (118) and ARCADES (119) and helps to enliven the PEDESTRIAN STREET (100).

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If people cannot walk out from the building onto balconies and terraces which look toward the outdoor space around the building, then neither they themselves nor the people outside have any medium which helps them feel the building and the larger public world are intertwined.

We have discussed the importance of the building edge in two other patterns: BUILDING EDGE (160) itself, and ARCADES (119). In both cases, we explained how the arcades and the edge help to create space which people who are *outside* the building can use to help them feel more intimately connected with the building. These patterns, in short, look at the problem of connection from the point of view of the people *outside* the building.

In this pattern we discuss the same problem—but from the point of view of the people *inside* the building. We believe, simply, that every building needs at least one place, and preferably a whole range of places, where people can be still within the building, but in touch with the people and the scene outside. This problem has also been discussed in PRIVATE TERRACE ON THE STREET (140). But that pattern deals only with one very important and highly specific occurrence of this need. The present pattern suggests that the need is completely general: very plainly, it is fundamental, an all-embracing necessity which applies to all buildings over and again.

The need has been documented extensively. (See, for example, Anthony Wallace, *Housing and Social Structure,* Philadelphia Housing Authority, 1952; Federal Housing Authority, *The Livability Problem of 1,000 Families,* Washington, D. C., 1945.)

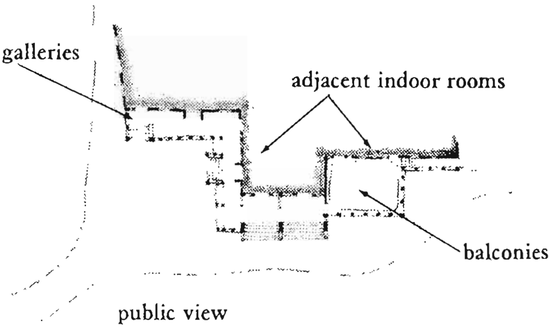
Windows on the street, while they have their own virtues, are simply not enough to satisfy this need. They usually occupy a very small part of the wall, and can only be used if a person stands at the edge of the room. The kinds of situations that are needed are far more rich and engrossing. We need places along the upper stories of the building's edge where we can live comfortably, for hours, in touch with the street—playing cards, bringing work out on the terrace on a hot day, eating, scrambling with children or setting up an electric train, drying and folding the wash, sculpting with clay, paying the bills.

In short, almost all the basic human situations can be enriched by the qualities of the gallery surround. This is why we specify that each building should have as many versions of it as possible along its edge—porches, arcades, balconies, awnings, terraces, and galleries.

Four examples of this pattern.

Therefore:

Whenever possible, and at every story, build porches, galleries, arcades, balconies, niches, outdoor seats, awnings, trellised rooms, and the like at the edges of buildings—especially where they open off public spaces and streets, and connect them by doors, directly to the rooms inside.



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A warning: take care that such places are not stuck artificially onto the building. Keep them real; find the places along the building edge that offer a direct and useful connection with the life indoors—the space outside the stair landing, the space to one side of the bedroom alcove, and so on.

These places should be an integral part of the building territory, and contain seats, tables, furniture, places to stand and talk, places to work outside—all in the public view—PRIVATE TERRACE ON THE STREET (140), OUTDOOR ROOM (163); make the spaces deep enough to be really useful—SIX-FOOT BALCONY (167)—with columns heavy enough to provide at least partial enclosure—HALF-OPEN WALL (193), COLUMN PLACES (226). . . .

167 SIX-FOOT BALCONY**

. . . in various places ARCADES (119) and GALLERY SURROUND (166) have helped you to imagine some kind of a balcony, veranda, terrace, porch, arcade along the building edge or halfway into it. This pattern simply specifies the depth of this arcade or porch or balcony, to make sure that it really works.

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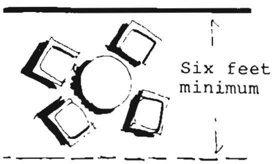
Balconies and porches which are less than six feet deep are hardly ever used.

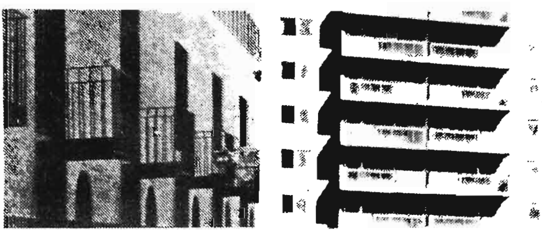
Balconies and porches are often made very small to save money; but when they are too small, they might just as well not be there.

A balcony is first used properly when there is enough room for two or three people to sit in a small group with room to stretch their legs, and room for a small table where they can set down glasses, cups, and the newspaper. No balcony works if it is so narrow that people have to sit in a row facing outward. The critical size is hard to determine, but it is at least six feet. The following drawing and photograph show roughly why:



Six feet deep.

Our observations make it clear that the difference between deep balconies and those which are not deep enough is simply astonishing. In our experience, almost no balconies at all which are 3 or 4 feet deep manage to gather life to them or to get used. And almost no balconies which are more than six feet deep are *not* used.

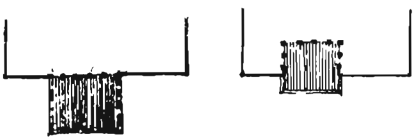


Narrow balconies are useless.

Two other features of the balcony make a difference in the degree to which people will use it: its enclosure and its recession into the building.

As far as enclosure goes, we have noticed that among the deeper balconies, it is those with half-open enclosures around them—columns, wooden slats, rose-covered trellises—which are used most. Apparently, the partial privacy given by a half-open screen makes people more comfortable—see HALF-OPEN WALL (193).

And recesses seem to have a similar effect. On a cantilevered balcony people must sit outside the mass of the building; the balcony lacks privacy and tends to feel unsafe. In an English study ("Private Balconies in Flats and Maisonettes," *Architect's Journal*, March 1957, pp. 372–76), two-thirds of the people that never used their balconies gave lack of privacy as their reason,

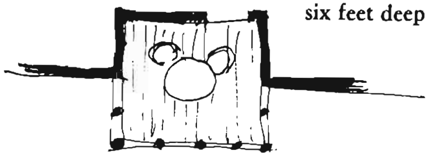


Not this . . .   . . . this.

and said that they preferred recessed balconies, because, in contrast to cantilevered balconies, the recesses seemed more secure.

Therefore:

Whenever you build a balcony, a porch, a gallery, or a terrace always make it at least six feet deep. If possible, recess at least a part of it into the building so that it is not cantilevered out and separated from the building by a simple line, and enclose it partially.



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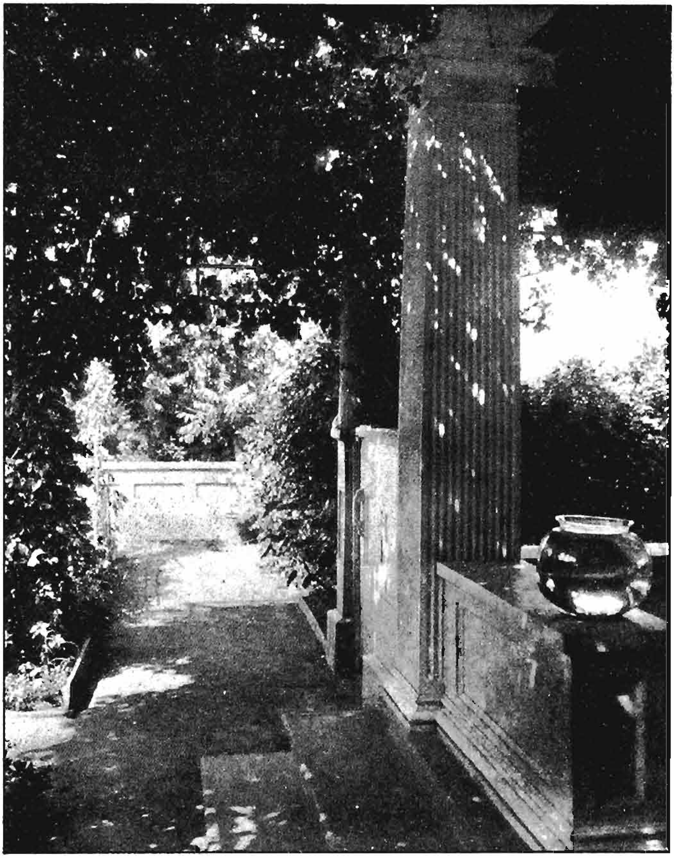
Enclose the balcony with a low wall—SITTING WALL (243), heavy columns—COLUMN PLACES (226), and half-open walls or screens—HALF-OPEN WALL (193). Keep it open toward the south—SUNNY PLACE (161). Treat it as an OUTDOOR ROOM (163), and get the details of its shape and its construction from THE SHAPE OF INDOOR SPACE (191). . . .

168 CONNECTION TO THE EARTH**



. . . this pattern helps to create the BUILDING EDGE (160) and its ARCADES (119), PRIVATE TERRACE ON THE STREET (140), the GALLERY SURROUND (166), and SIX-FOOT BALCONY (167), by specifying the way the floor of the building reaches out into the land and gardens round about it.

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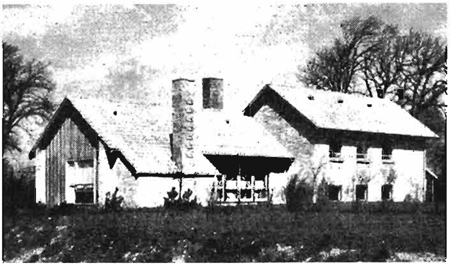
A house feels isolated from the nature around it, unless its floors are interleaved directly with the earth that is around the house.

We shall understand this best by contrasting those houses which are sharply separated from the earth with those in which there is a continuity between the two.

Look first at this house where there is no continuity.



An average house—but look at it closely.
It lacks this pattern utterly.

The inside and the outside are abruptly separate. There is no way of being partly inside, yet still connected to the outside; there is no way in which the inside of the house allows you, in your bare feet, to step out and feel the dew collecting or pick blossoms off a climbing plant because there is no surface near the house on which you can go out and yet still be the person that you are inside.

Compare it with the house in our main picture, where there *is* continuity. Here, there is an intermediate area, whose surface is connected to the inside of the house—and yet it is in plain outdoors. This surface is part of the earth—and yet a little smoother, a little more beaten, more swept—stepping out on it is not like stepping out into a field in your bare feet—it is as if the earth itself becomes in that small area a part of your indoor terrain.

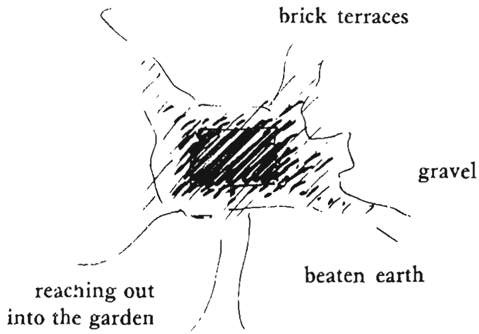
When we compare the examples, there seems little doubt that some deep feeling is involved, and we are confident in presenting this pattern as a fundamental one. But we can only speculate about its origins or why it is important.

Perhaps the likeliest of all the explanations we are able to imagine is one which connects the earth boundness and rootedness of a man or a woman to their physical connection to the earth. It is very plain, and we all discover for ourselves, that our lives become satisfactory to the extent that we are rooted, "down to earth," in touch with common sense about everyday things—not flying high in the sky of concepts and fantasies. The path toward this rootedness is personal and slow—but it may just be true that it is helped or hindered by the extent to which our physical world is itself rooted and connected to the earth.

In physical terms, the rootedness occurs in buildings when the building is surrounded, along at least a part of its perimeter, by terraces, paths, steps, gravel, and earthen surfaces, which bring the floors outside, into the land. These surfaces are made of intermediate materials more natural than the floors inside the house—and more man-made than earth and clay and grass. Brick terraces, tiles, and beaten earth tied into the foundations of the house all help make this connection; and, if possible, each house should have a reasonable amount of them, pushing out into the land around the house and opening up the outdoors to the inside.

Therefore:

Connect the building to the earth around it by building a series of paths and terraces and steps around the edge. Place them deliberately to make the boundary ambiguous—so that it is impossible to say exactly where the building stops and earth begins.



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Use the connection to the earth to form the ground for outdoor rooms, and entrances, and terraces—ENTRANCE ROOM (130), PRIVATE TERRACE ON THE STREET (140), OUTDOOR ROOM (163), TERRACED SLOPE (169); prepare to tie the terraces continuously into the wall which forms the edge of the ground floor slab, to make the very structure of the building feel connected to the earth—GROUND FLOOR SLAB (215); and where you come to form the terrace surfaces, use things like hand-made bricks and soft-baked crumbling biscuit-fired tile—SOFT TILE AND BRICK (248); and further out, along the paths a little distance from the house, leave cracks between the tiles to let the grass and flowers grow between them—PAVING WITH CRACKS BETWEEN THE STONES (247). . . .

decide on the arrangement of the gardens, and the places in the gardens;

169. TERRACED SLOPE
170. FRUIT TREES
171. TREE PLACES
172. GARDEN GROWING WILD
173. GARDEN WALL
174. TRELLISED WALK
175. GREENHOUSE
176. GARDEN SEAT
177. VEGETABLE GARDEN
178. COMPOST

169 TERRACED SLOPE*

. . . this pattern helps to complete SITE REPAIR (104). Where there are buildings, it ties into the BUILDING EDGE (160) and can help form it; and it helps create the CONNECTION TO THE EARTH (168). If the ground is sloping at all, this pattern tells you how to handle the slope of the ground in a way that makes sense for the people in the building, and for the plants and grasses on the ground.

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On sloping land, erosion caused by run off can kill the soil. It also creates uneven distribution of rainwater over the land, which naturally does less for plant life than it could if it were evenly distributed.

Terraces and bunds, built along contour lines, have been used for thousands of years to solve this problem. Erosion starts when the water runs down certain lines, erodes the earth along these lines, makes it hard for plants to grow there, then forms rills in the mud and dust, which are then still more vulnerable to more runoff, and get progressively worse and worse. The terraces control erosion by slowing down the water, and preventing the formation of these rills in the first place.

Even more important, the terraces spread the water evenly over the entire landscape. In a given area, each square meter of earth gets the s..me amount of water since the water stays where it falls. Under these conditions, plants can grow everywhere—on the steepest parts of hillsides as easily as in the most luscious valleys.

The pattern of terracing makes as much sense on a small house lot as it does on the hills around a valley. Proper terracing on a small lot creates a stable micro-system of drainage, and protects the top soil for the local gardens. Our main photograph shows a small building that is built on a terraced site. Once the terracing has been accomplished, the building can fit to it, and stretch across the lines of the terrace.

At both scales—the house lot and the hills—this method of conserving the land and making it healthy is ancient. "Only very lately has modern anti-erosion practice, for example, through contour ploughing, managed to match the effectiveness of traditional methods of terracing long practiced in countries as far apart as Japan and Peru." (M. Nicholson, *The Environmental Revolution*, New York: McGraw Hill, 1970, p. 192.)

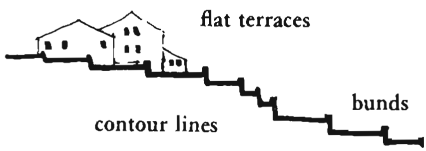
At the scale of hillsides and valleys, China is making an impressive attempt to reclaim her eroded land in this way. For instance, Joseph Alsop, "Terraced Fields in China":

> In the Chinese countryside, no effort has ever been spared to get a maximum crop with the resources available. Even so, I was hardly prepared for the "terrace fields" that they took me to see in the farming communes around Chungking.
>
> The countryside hereabouts is both rocky and largely composed of such steep hills that even Chinese would not think of trying to grow rice on them. The old way, ruinously eroding, was to grow as much rice as possible in the valleys: and then plant the hillsides, too, where soil remained.
>
> The new way is to make "terrace fields." The rocks are dynamited to get the needed building materials. Heavy dry-stone walls are then built to heights of six or seven feet, following the contours of the land. And earth is finally brought to fill in behind the stone walls, thereby producing a terrace field.

Therefore:

On all land which slopes—in fields, in parks, in public gardens, even in the private gardens around a house—make a system of terraces and bunds which follow the contour lines. Make them by building low walls along the contour lines, and then backfilling them with earth to form the terraces.

There is no reason why the building itself should fit into the terraces—it can comfortably cross terrace lines.



169 TERRACED SLOPE

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Plant vegetables and orchards on the terraces—VEGETABLE GARDEN (177), FRUIT TREES (170); along the walls which form the terraces, plant flowers high enough to touch and smell—RAISED FLOWERS (245). And it is also very natural to make the walls so people can sit on them—SITTING WALL (243). . . .

170 FRUIT TREES*

. . . both the COMMON LAND (67) outside the workshops, offices and houses, and the private gardens which belong to individual buildings—HALF-HIDDEN GARDEN (111), can be helped by planting fruit trees. After all, a garden, whether it is public or private, is a thing of use. Yet it is not a farm. That half way kind of garden which is useful, but also beautiful in spring and autumn, and a marvelous place to walk because it smells so wonderful, is the orchard.

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In the climates where fruit trees grow, the orchards give the land an almost magical identity: think of the orange groves of Southern California, the cherry trees of Japan, the olive trees of Greece. But the growth of cities seems always to destroy these trees and the quality they possess.

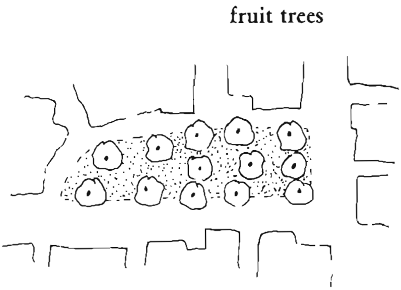
The fact that the trees are seasonal and bear fruit has special consequences. The presence of orchards adds an experience that has all but vanished from cities—the experience of growth, harvest, local sources of fresh food; walking down a city street, pulling an apple out of a tree, and biting into it.

Fruit trees on common land add much more to the neighborhood and the community than the same trees in private backyards: privately grown, the trees tend to produce more fruit than one household can consume. On public land, the trees concentrate the feeling of mutual benefit and responsibility. And because they require yearly care, pruning, and harvesting, the fruit trees naturally involve people in their common land. It is an obvious place where people can take responsibility for their local common land, have pride in the results, employ themselves and their children part time.

Imagine a community gradually being able to produce a portion of its own need for fruit, or cider, or preserves. In the beginning it would be a small portion indeed, but it would serve as a beginning. There is not much work involved if it is tackled communally, and the satisfaction is great.

Therefore:

Plant small orchards of fruit trees in gardens and on common land along paths and streets, in parks, in neighborhoods: wherever there are well-established groups that can themselves care for the trees and harvest the fruit.



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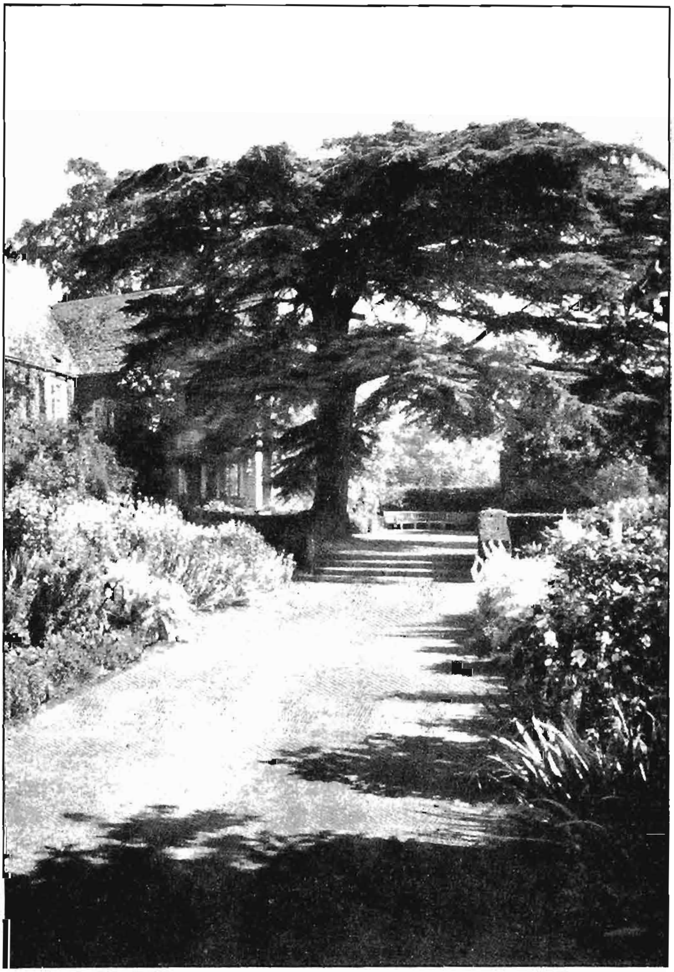
If you have an especially nice fruit tree, make a TREE PLACE (171) under it, with a GARDEN SEAT (176), or arrange a path so the tree can provide a natural goal along the path—PATHS AND GOALS (120). . . .

171 TREE PLACES**



. . . trees are precious. Keep them. Leave them intact. If you have followed SITE REPAIR (104), you have already taken care to leave the trees intact and undisturbed by new construction; you may have planted FRUIT TREES (170); and you may perhaps also have other additional trees in mind. This pattern re-emphasizes the importance of leaving trees intact, and shows you how to plant them, and care for them, and use them, in such a way that the spaces which they form are useful as extensions of the building.

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When trees are planted or pruned without regard for the special places they can create, they are as good as dead for the people who need them.

Trees have a very deep and crucial meaning to human beings. The significance of old trees is archetypal; in our dreams very often they stand for the wholeness of personality: "Since . . . psychic growth cannot be brought about by a conscious effort of will power, but happens involuntarily and naturally, it is in dreams frequently symbolized by the tree, whose slow, powerful involuntary growth fulfills a definite pattern." (M. L. von Franz, "The process of individuation," in C. G. Jung, *Man and his Symbols*, New York: Doubleday, 1964, pp. 161, 163–64.)

There is even indication that trees, along with houses and other people, constitute one of the three most basic parts of the human environment. The House-Tree-Person Technique, developed by Psychologist John Buck, takes the drawings a person makes of each of these three "wholes" as a basis for projective tests. The mere fact that trees are considered as full of meaning, as houses and people, is, alone, a very powerful indication of their importance (V. J. Bieliauskas, *The H-T-P Research Review*, 1965 Edition, Western Psychological Services, Los Angeles, California, 1965; and Isaac Jolles, *Catalog for the Qualitative Interpretation of the House-Tree-Person*, Los Angeles, California: Western Psychological Services, 1964, pp. 75–97).

But for the most part, the trees that are being planted and transplanted in cities and suburbs today do not satisfy people's craving for trees. They will never come to provide a sense of beauty and peace, because they are being set down and built around *without regard for the places they create.*

The trees that people love create special social places: places to be in, and pass through, places you can dream about, and places you can draw. Trees have the potential to create various kinds of social places: an *umbrella*—where a single, low-sprawling tree like an oak defines an outdoor room; a *pair*—where two trees form a gateway; a *grove*—where several trees cluster together; a *square*—where they enclose an open space; and an *avenue*—where a double row of trees, their crowns touching, line a path or street. It is only when a tree's potential to form places is realized that the real presence and meaning of the tree is felt.

The trees that are being set down nowadays have nothing of this character—they are in tubs on parking lots and along streets, in specially "landscaped areas" that you can see but cannot get to. They do not form places in any sense of the word—and so they mean nothing to people.

Now, there is a great danger that a person who has read this argument so far, may misinterpret it to mean that trees should be "used" instrumentally for the good of people. And there is, unfortunately, a strong tendency in cities today to do just that —to treat trees instrumentally, as means to our own pleasure.

But our argument says just the opposite. Trees in a city, round a building, in a park, or in a garden are not in the forest. They need attention. As soon as we decide to have trees in a city, we must recognize that the tree becomes a different sort of ecological being. For instance, in a forest, trees grow in positions favorable to them: their density, sunlight, wind, moisture are all chosen by the process of selection. But in a city, a tree grows where it is planted, and it will not survive unless it is most carefully tended —pruned, watched, cared for when its bark gets pierced . . .

But now we come to a very subtle interaction. The trees will not get tended unless the places where they grow are liked and used by people. If they are randomly planted in some garden or in the shrubbery of some park, they are not near enough to people to make people aware of them; and this in turn makes it unlikely that they will get the care they need.

So, finally, we see the nature of the complex interactive symbiosis between trees and people.

1. First, people need trees—for the reasons given.

2. But when people plant trees, the trees need care (unlike the forest trees).

3. The trees won't get the care they need unless they are in places people like.

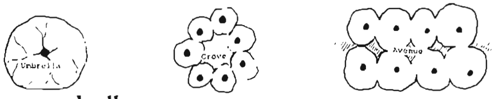
4. And this in turn requires that the trees form social spaces.

5. Once the trees form social spaces, they are able to grow naturally.

So we see, by a curious twist of circumstances, trees in cities can only grow well, and in a fashion true to their own nature, when they cooperate with people and help to form spaces which the people need.

Therefore:

If you are planting trees, plant them according to their nature, to form enclosures, avenues, squares, groves, and single spreading trees toward the middle of open spaces. And shape the nearby buildings in response to trees, so that the trees themselves, and the trees and buildings together, form places which people can use.



umbrella grove avenue

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Make the trees form "rooms" and spaces, avenues, and squares, and groves, by placing trellises between the trees, and walks, and seats under the trees themselves—OUTDOOR ROOM (163), TRELLISED WALK (174), GARDEN SEAT (176), SEAT SPOTS (241). One of the nicest ways to make a place beside a tree is to build a low wall, which protects the roots and makes a seat—SITTING WALL (243). . . .

172 GARDEN GROWING WILD**

. . . with terracing in place and trees taken care of—TERRACED SLOPE (169), FRUIT TREES (170), TREE PLACES (171), we come to the garden itself—to the ground and plants. In short, we must decide what kind of garden to have, what kind of plants to grow, what style of gardening is compatible with both artifice and nature.

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A garden which grows true to its own laws is not a wilderness, yet not entirely artificial either.

Many gardens are formal and artificial. The flower beds are trimmed like table cloths or painted designs. The lawns are clipped like perfect plastic fur. The paths are clean, like new polished asphalt. The furniture is new and clean, fresh from the department store.

These gardens have none of the quality which brings a garden to life—the quality of a wilderness, tamed, still wild, but cultivated enough to be in harmony with the buildings which surround it and the people who move in it. This balance of wilderness and cultivation reached a high point in the oldest English gardens.

In these gardens things are arranged so that the natural processes which come into being will maintain the condition of the garden and not degrade it. For example, mosses and grasses will grow between paving stones. In a sensible and natural garden, the garden is arranged so that this process enhances the garden and does not threaten it. In an unnatural garden these kinds of small events have constantly to be "looked after"—the gardener must constantly try to control and eradicate the processes of seeding, weeds, the spread of roots, the growth of grass.

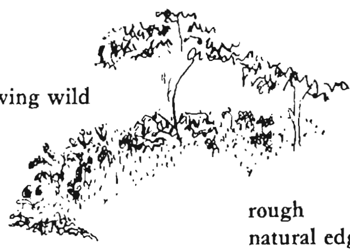
In the garden growing wild the plants are chosen, and the boundaries placed, in such a way that the growth of things regulates itself. It does not need to be regulated by control. But it does not grow fiercely and undermine the ways in which it is planted. Natural wild plants, for example, are planted among flowers and grass, so that there is no room for so-called weeds to fill the empty spaces and then need weeding. Natural stone edges form the boundaries of grass so that there is no need to chop the turf and clip the edge every few weeks. Rocks and stones are placed where there are changes of level. And there are small rock plants placed between the stones, so that once again there is no room for weeds to grow.

A garden growing wild is healthier, more capable of stable growth, than the more clipped and artificial garden. The garden can be left alone, it will not go to ruin in one or two seasons.

And for the people too, the garden growing wild creates a more profound experience. The gardener is in the position of a good doctor, watching nature take its course, occasionally taking action, pruning, pulling out some species, only to give the garden more room to grow and become itself. By contrast, the gardens that have to be tended obsessively, enslave a person to them; you cannot learn from them in quite the same way.

Therefore:

Grow grasses, mosses, bushes, flowers, and trees in a way which comes close to the way that they occur in nature: intermingled, without barriers between them, without bare earth, without formal flower beds, and with all the boundaries and edges made in rough stone and brick and wood which become a part of the natural growth.



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Include no formal elements, except where something is specifically called for by function—like a greenhouse—GREENHOUSE (175), a quiet seat—GARDEN SEAT (176), some water—STILL WATER (71), or flowers placed just where people can touch them and smell them—RAISED FLOWERS (245). . . .

173 GARDEN WALL*

. . . in private houses, both the HALF-HIDDEN GARDEN (111) and the PRIVATE TERRACE ON THE STREET (140) require walls. More generally, not only private gardens, but public gardens too, and even small parks and greens—QUIET BACKS (59), ACCESSIBLE GREEN (60), need some kind of enclosure round them, to make them as beautiful and quiet as possible.

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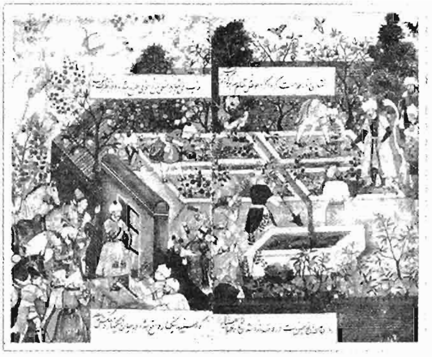
Gardens and small public parks don't give enough relief from noise unless they are well protected.

People need contact with trees and plants and water. In some way, which is hard to express, people are able to be more whole in the presence of nature, are able to go deeper into themselves, and are somehow able to draw sustaining energy from the life of plants and trees and water.

In a city, gardens and small parks try to solve this problem; but they are usually so close to traffic, noise, and buildings that the impact of nature is entirely lost. To be truly useful, in the deepest psychological sense, they must allow the people in them to be in touch with nature—and must be shielded from the sight and sound of passing traffic, city noises, and buildings. This requires walls, substantial high walls, and dense planting all around the garden.

In those few cases where there are small walled gardens in a city, open to the public—Alhambra, Copenhagen Royal Library Garden—these gardens almost always become famous. People understand and value the peace which they create.

. . . your garden or park wall of brick . . . has indeed often an unkind look on the outside, but there is more modesty in it than unkindness. It generally means, not that the builder of it wants to shut you out from the view of his garden, but from the view of himself: it is a frank statement that as he needs a certain portion of time to himself, so he needs a certain portion of ground to himself, and must not be stared at when he digs there in his shirt-



Walled gardens—Mughal.

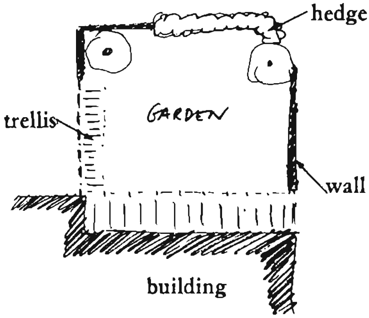
sleeves, or plays at leapfrog with his boys from school, or talks over old times with his wife, walking up and down in the evening sunshine. Besides, the brick wall has good practical service in it, and shelters you from the east wind, and ripens your peaches and nectarines, and glows in autumn like a sunny bank. And, moreover, your brick wall, if you build it properly, so that it shall stand long enough, is a beautiful thing when it is old, and has assumed its grave purple red, touched with mossy green. . . . (John Ruskin, *The Two Paths*, New York: Dutton, 1907, pp. 202–205.)

This pattern applies to all private gardens and to small parks in cities. We are not convinced that it applies to *all* small parks—but it is hard to differentiate precisely between the places where a walled garden is desirable and the places where it is not. There are definitely situations where a small park, and perhaps even a small garden that is *open* to the rush of life around it, is just right. However, there are far more parks and gardens left open, that need to be walled, than vice versa, so we emphasize the walled condition.

Therefore:

Form some kind of enclosure to protect the interior of a quiet garden from the sights and sounds of passing traffic. If it is a large garden or a park, the enclosure can

be soft, can include bushes, trees, slopes, and so on. The smaller the garden, however, the harder and more definite the enclosure must become. In a very small garden, form the enclosure with buildings or walls; even hedges and fences will not be enough to keep out sound.



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Use the garden wall to help form positive outdoor space—POSITIVE OUTDOOR SPACE (106); but pierce it with balustrades and windows to make connections between garden and street, or garden and garden—PRIVATE TERRACE ON THE STREET (140), TRELLISED WALK (174), HALF-OPEN WALL (193), and above all, give it openings to make views into other larger and more distant spaces—HIERARCHY OF OPEN SPACE (114), ZEN VIEW (134). . . .

174 TRELLISED WALK**

. . . suppose the main spots of the garden have been defined—OUTDOOR ROOM (163), TREE PLACES (171), GREENHOUSE (175), FRUIT TREES (170). Now, where there is a special need to emphasize a path—PATHS AND GOALS (120)—or, even more important, where the edges between two parts of a garden need to be marked without making a wall, an open trellised walk which can enclose space, is required. Above all, these trellised walks help to form the POSITIVE OUTDOOR SPACES (106) in a garden or a park; and may perhaps help to form an ENTRANCE TRANSITION (112).

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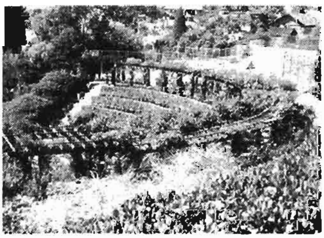
Trellised walks have their own special beauty. They are so unique, so different from other ways of shaping a path, that they are almost archetypal.

In PATH SHAPE (121), we have described the need for outdoor paths to have a shape, like rooms. In POSITIVE OUTDOOR SPACE (106), we have explained the need for larger outdoor areas to have positive shape. A trellised walk does both. It makes it possible to implement both these patterns at the same time—simply and elegantly. But it does it in such a fundamental way that we have decided to treat it as a separate pattern; and we shall try to define the places where a trellised structure over a path is appropriate.

1. Use it to emphasize the path it covers, and to set off one part of the path as a special section of a longer path in order to make it an especially nice and inviting place to walk.



A trellis gives shape to an outdoor area.

2. Since the trellised path creates enclosure around the spaces which it bounds, use it to create a virtual wall to define an outdoor space. For example, a trellised walk can form an enormous outdoor room by surrounding, or partially surrounding, a garden.

Therefore:

Where paths need special protection or where they need some intimacy, build a trellis over the path and plant it with climbing flowers. Use the trellis to help shape the outdoor spaces on either side of it.

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Think about the columns that support the trellis as themselves capable of creating places—seats, bird feeders—COLUMN PLACES (226). Pave the path with loosely set stones—PAVING WITH CRACKS BETWEEN THE STONES (247). Use climbing plants and a fine trellis work to create the special quality of soft, filtered light underneath the trellis—FILTERED LIGHT (238), CLIMBING PLANTS (246). . . .

175 GREENHOUSE

. . . to keep a garden alive, it is almost essential that there be a "workshop"—a kind of halfway house between the garden and the house itself, where seedlings grow, and where, in temperate climates, plants can grow in spite of cold. In a HOUSE CLUSTER (37) or a WORK COMMUNITY (41), this workshop makes an essential contribution to the COMMON LAND (67).

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Many efforts are being made to harness solar energy by converting it into hot water or electric power. And yet the easiest way to harness solar energy is the most obvious and the oldest: namely, to trap the heat inside a greenhouse and use it for growing flowers and vegetables.

Imagine a simple greenhouse, attached to a living room, turned to the winter sun, and filled with shelves for flowers and vegetables. It has an entrance from the house—so you can go into it and use it in the winter without going outdoors. And it has an entrance from the garden—so you can use it as a workshop while you are out in the garden and not have to walk through the house.

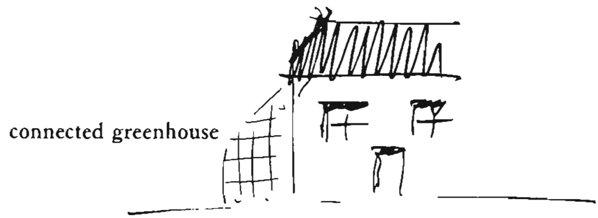
This greenhouse then becomes a wonderful place: a source of life, a place where flowers can be grown as part of the life of the house. The classic conservatory was a natural part of countless houses in the temperate climates.

For someone who has not experienced a greenhouse as an extension of the house, it may be hard to recognize how fundamental it becomes. It is a world unto itself, as definite and wonderful as fire or water, and it provides an experience which can hardly be matched by any other pattern. Hewitt Ryan, the psychiatrist for whom we built the clinic in Modesto with the help of this pattern language, thought greenhouses so essential that he included one as a basic part of the clinic: a place beside the common area, where people could reintegrate themselves by growing seedlings that would be gradually transplanted to form gardens for the clinic.

Several recent "energy-systems" inspired by the ecology movement have sought to make greenhouses a fundamental part of human settlements. For example, Grahame Gaines' self-contained eco-house includes a large greenhouse as a source of heat and food. (See *London Observer*, October 1972.) And Chahroudi's Grow Hole—a glazed sunken pit for growing vegetables in winter—is another kind of greenhouse (*Progressive Architecture*, July 1970, p. 85).

Therefore:

In temperate climates, build a greenhouse as part of your house or office, so that it is both a "room" of the house which can be reached directly without going outdoors and a part of the garden which can be reached directly from the garden.



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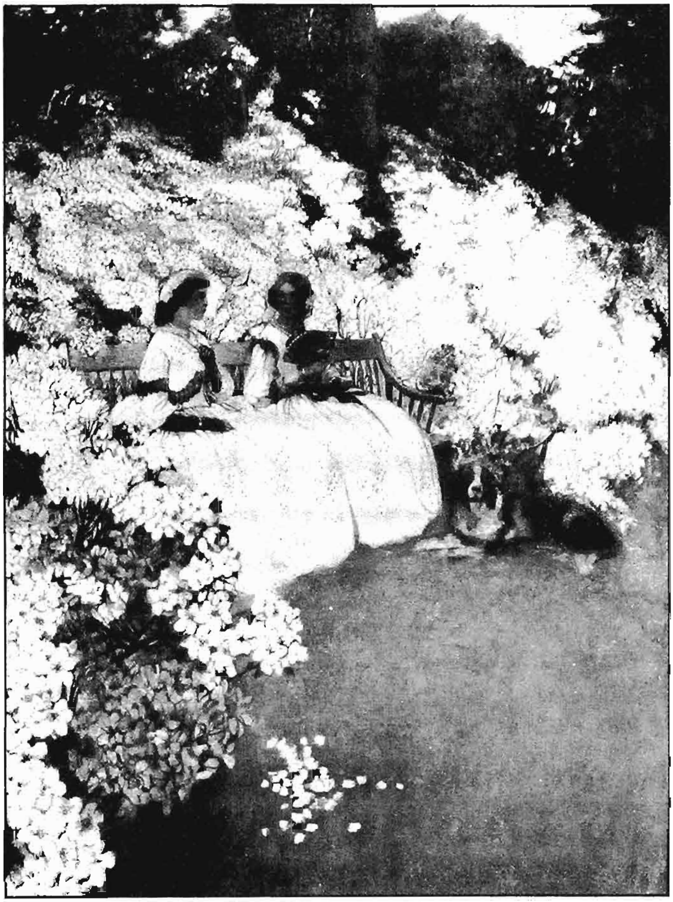
Place the greenhouse so that it has easy access to the VEGETABLE GARDEN (177) and the COMPOST (178). Arrange its interior so that it is surrounded with WAIST-HIGH SHELVES (201) and plenty of storage space—BULK STORAGE (145); perhaps give it a special seat, where it is possible to sit comfortably—GARDEN SEAT (176), WINDOW PLACE (180). . . .

176 GARDEN SEAT



. . . with the character of the garden fixed—GARDEN GROWING WILD (172), we consider the special corners which make the garden valuable and somewhat secret. Of these, the most important is the SUNNY PLACE (161), which has already been described, because it is so fundamental to the building. Now we add to this another seat, more private, where a person can go to sit and think and dream.

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Somewhere in every garden, there must be at least one spot, a quiet garden seat, in which a person—or two people—can reach into themselves and be in touch with nothing else but nature.

Throughout the patterns in this pattern language we have said, over and again, how very essential it is to give ourselves environments in which we can be in touch with the nature we have sprung from—see especially CITY COUNTRY FINGERS (3) and QUIET BACKS (59). But among all the various statements of this fact there is not one so far which puts this need right in our own houses, as close to us as fire and food.

Wordsworth built his entire politics, as a poet, around the fact that tranquility in nature was a basic right to which everyone was entitled. He wanted to integrate the need for solitude-in-nature with city living. He imagined people literally stepping off busy streets and renewing themselves in private gardens—every day. And now many of us have come to learn that without such a place life in a city is impossible. There is so much activity, days are so easily filled with jobs, family, friends, things to do—that time alone is rare. And the more we live without the habit of stillness, the more we tie ourselves to this active life, the stranger and more disquieting the experience of stillness and solitude becomes: city people are notoriously busy-busy, and cannot be alone, without "input," for a moment.

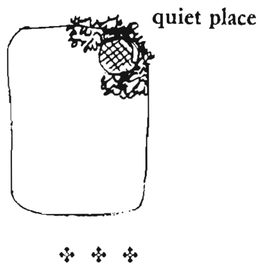
It is in this context that we propose the isolated garden seat: a place hidden in the garden where one or two people can sit alone, undisturbed, near growing things. It may be on a roof top, on the ground, perhaps even half-sunken in an embankment.

There are literally hundreds of old books about gardens which testify to this pattern. One is Hildegarde Hawthorne's *The Lure of the Garden*, New York: The Century Co., 1911. We quote from a passage describing the special kind of small talk that is drawn out of people by quiet garden seats:

> Perhaps, of all the various forms of gossip overheard by the garden, the loveliest is that between a young and an old person who are friends. Real friendship between the generations is rare, but when it exists it is of the finest. That youth is fortunate who can pour his perplexities into the ear of an older man or woman, and who knows a comradeship and an understanding exceeding in beauty the facile friendships created by like interests and common pursuits; and fortunate too the girl who is able to impart the emotions and ideas aroused in her by her early meetings with the world and life to some one old in experience but comprehendingly young in heart. Both of them will remember those hours long after the garden gate has closed behind their friend forever; as long, indeed, as they remember anything that went to the making of the best in them.

Therefore:

Make a quiet place in the garden—a private enclosure with a comfortable seat, thick planting, sun. Pick the place for the seat carefully; pick the place that will give you the most intense kind of solitude.



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Place the garden seat, like other outdoor seats, where it commands a view, is in the sun, is sheltered from the wind—SEAT SPOTS (241); perhaps under bushes and trees where light is soft and dappled—FILTERED LIGHT (238). . . .

177 VEGETABLE GARDEN*

. . . we have one pattern, already, which brings out the useful character of gardens—both public and private ones—FRUIT TREES (170); we supplement this with a smaller, but as important aspect of the garden—one which every public and private garden should contain: enhance common land—COMMON LAND (67) and private gardens—HALF-HIDDEN GARDEN (111) with a patch where people can grow vegetables.

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In a healthy town every family can grow vegetables for itself. The time is past to think of this as a hobby for enthusiasts; it is a fundamental part of human life.

Vegetables are the most basic foods. If we compare dairy products, vegetables and fruits, meats, and synthetic foods, the vegetables play the most essential role. As a class, they are the only ones which are by themselves wholly able to support human life. And, in an ecologically balanced world, it seems almost certain that man will have to work out some balanced relationship with vegetables for his daily food. (See, for example, F. Lappe, *Diet for a Small Planet*, New York: Ballantine, 1971.)

Since the industrial revolution, there has been a growing tendency for people to rely on impersonal producers for their vegetables; however, in a world where vegetables are central and where self-sufficiency increases, it becomes as natural for families to have their own vegetables as their own air.

The amount of land it takes to grow the vegetables for a household is surprisingly small. It takes about one-tenth of an acre to grow an adequate year round supply of vegetables for a family of four. And apparently vegetables give a higher "nutrient return" for fixed quantities of energy—sun, labor—than any other food. This means that every house or house cluster can create its own supply of vegetables, and that every household which does not have its own private land attached to it should have a portion of a *common vegetable garden* close at hand.

Beside this fundamental need for vegetable gardens in cities, there is a subtler need. Parks, street trees, and manicured lawns do very little to establish the connection between us and the land. They teach us nothing of its productivity, nothing of its capacities. Many people who are born, raised, and live out their lives in cities simply do not know where the food they eat comes from or what a living garden is like. Their only connection with the productivity of the land comes from packaged tomatoes on the supermarket shelf. But contact with the land and its growing process is not simply a quaint nicety from the past that we can let go of casually. More likely, it is a basic part of the process of organic security. Deep down, there must be some sense of insecurity in city dwellers who depend entirely upon the supermarkets for their produce.

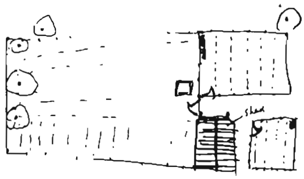
Community gardens needn't be expensive propositions either. When Santa Barbara residents decided to start a downtown garden back in May, 1970, they used their ingenuity. A vacant downtown lot was acquired (at a cost of one dollar for 6 months), and the city provided free water and a tractor with operator for two days. Compost was no problem. The group got leaves from the park department, hard sludge from the local sanitation district, and horse manure from a nearby riding club. Tools and seeds were donated. ("Community Gardens," Bob Rodale, *San Francisco Chronicle,* May 31, 1972, p. 16.)

School garden in Amsterdam, worked by the children.

Therefore:

Set aside one piece of land either in the private garden or on common land as a vegetable garden. About one-tenth of

an acre is needed for each family of four. Make sure the vegetable garden is in a sunny place and central to all the households it serves. Fence it in and build a small storage shed for gardening tools beside it.



1/40 acre per person

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To fertilize the vegetables, use the natural compost which is generated by the house and the neighborhood—COMPOST (178); and if possible, try to use water from the sinks and drains to irrigate the soil—BATHING ROOM (144). . . .

178 COMPOST*

In Chekiang Province, as in many other parts of China, roadside toilets abound. They are built by farmers to entice passersby into favoring them with a gift of valued fertilizer.

. . . the garden is a valuable part of the house, because it can help you grow fruit and vegetables—FRUIT TREES (170), VEGETABLE GARDEN (177). But it can only flourish if it gets nourishment; and this nourishment, in the form of compost, can only be created when the garbage and the wastes from the individual houses and HOUSE CLUSTERS (37) and from the ANIMALS (74) are properly organized.

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Our current ways of getting rid of sewage poison the great bodies of natural water, and rob the land around our buildings of the nutrients they need.

To the average individual in the city, it probably appears that the sewage system works beautifully—no muss, no fuss. Just pull the toilet chain, and everything is fine. In fact, city dwellers who have had the experience of using a smelly outhouse would probably argue that our modern system of sewage disposal is a tremendous advance over earlier practices. Unfortunately, this is simply not the case. Almost every step in modern sewage disposal is either wasteful, expensive, or dangerous.

We can start by remembering that every single time a toilet is flushed, seven gallons of drinking water go down the drain. In fact, around half of our domestic water consumption goes to flushing out the toilet.

Beyond the cost of the water, there is an enormous cost in the hardware of the sewer system. The average new homeowner today, living on a 50 x 150 foot lot in the city, has paid $1500 as his share of the collection system which takes sewage from his house to the sewage treatment plant. In lower density residential areas, this cost may be $2000 or even $6000. Each house pays an additional $500 toward the cost of the sewage treatment plant. We see then that the initial cost of today's sewage system is at least $2000 per house, often more. And these prices do not include monthly service charges for water and sewer facilities: around $50 per year for a single family household.

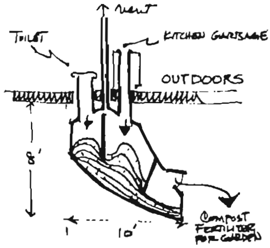
In addition we must add those costs which are less easily measurable in dollars and cents, but which may, in the long run, prove even higher than those already discussed. These include: (1) the value of lost nutrients which are allowed to flow away into the rivers and oceans—nutrients which could have been used to build up the soil they came from; and (2) the cost of the pollution: effluents cause "eutrophication"—the sewage depletes the oxygen in water and causes it to become clogged with algae.

What can be done? Some of this effluent might be recycled back to the land in the form of sludge. But residential sewage is usually mixed with industrial waste which often contains extremely noxious elements. And even if industrial wastes were not allowed into the sewage system, an additional distribution system would be needed to get the sludge back to the land. We see, therefore, that additional costs required to make the existing system ecologically sound are prohibitive.

What is needed is not a larger, more centralized and complex system, but a smaller, more decentralized and simpler one. We need a system that is less expensive; and we need a system that is an ecological benefit rather than an ecological drain.

We propose that individual small-scale composting plants begin to replace our present disposal system. Small buildings would be equipped with their own miniature sewage plants, located directly under the toilets. All bulky garbage produced on-site would be added to the plants. The resultant humus would be used to replenish the soil surrounding the building and throughout the neighborhood, as would the waste water from bathing and washing.

Such miniature sewage plants are commercially available and are currently in use in Sweden, Norway, and Finland. They are sold under the trade names Multrum or Clivus, and they can even be imported to the United States for a total price of $1500: much lower than the lowest figure of $2000, currently being charged for the conventional system. For a worked example, see Van der Ryn, Anderson and Sawyer, "Composting Privy", Technical Bulletin #1, Natural Energy Design Center, University of California, Berkeley, Dept. of Architecture, January 1974.



Clivus compost chamber.

These composting plants are so simple that they can be built by amateurs for much less money. An extremely simple homemade composting system is described below:

The privy is built adjoining a larger outbuilding which is built over a root cellar. From overhead joists to floor, the cellar is about 7′ deep. And so it was simplest to make the composting chamber beneath the privy 7′ deep. . . .

In the composting chamber underneath our privy, we have been using peat-moss—both because it is highly absorbent, and because it comes compactly baled and is convenient to store. We also use some garden dirt and a little lime.

We keep a garbage can full of peat moss in the privy, and dump in about a quart of the moss after each use. The privy is fairly odorless. Whenever there gets to be a smell I add lime, dirt and an extra layer of peat moss. That takes care of it. I figure that we will use three or four bales of peat moss a year—for a family of four plus a large number of guests.

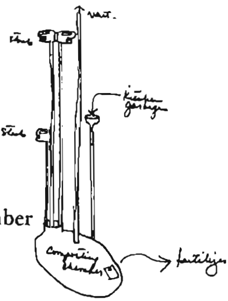
My privy is of the kind familiarly known as a two-holer, which seems necessary for my composting system.

We use only one hole at a time. We use A until there is an accumulation 18 inches deep. We then shift to B and use it until the accumulation there is as great as that of A. Then the heap at A is shoveled to C, and so on. When all four positions are filled, C and D are shoveled into a heap on the ground outside, where I mean to let it stay for at least several weeks before use. (*Organic Gardening and Farming*, Emmaus, Pennsylvania: Rodale Press, February 1972.)

Therefore:

Arrange all toilets over a dry composting chamber. Lead

organic garbage chutes to the same chamber, and use the combined products for fertilizer.



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Add to the effect of dry composting by re-using waste water; run all water drains into the garden to irrigate the soil; use organic soap—BATHING ROOM (144). . . .

go back to the inside of the building and attach the necessary minor rooms and alcoves to complete the main rooms;

179. ALCOVES

180. WINDOW PLACE

181. THE FIRE

182. EATING ATMOSPHERE

183. WORKSPACE ENCLOSURE

184. COOKING LAYOUT

185. SITTING CIRCLE

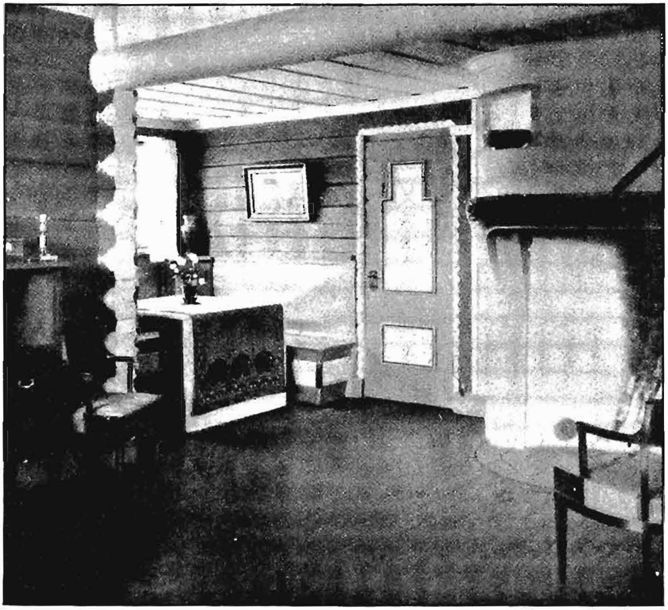
186. COMMUNAL SLEEPING

187. MARRIAGE BED

188. BED ALCOVE

189. DRESSING ROOM

179 ALCOVES**



. . . many large rooms are not complete unless they have smaller rooms and alcoves opening off them. This pattern, and several which follow it, define the form of minor rooms and alcoves which help to complete COMMON AREAS AT THE HEART (129), FARMHOUSE KICHEN (139), SEQUENCE OF SITTING SPACES (142), FLEXIBLE OFFICE SPACE (146), A PLACE TO WAIT (150), SMALL MEETING ROOMS (151), and many others.

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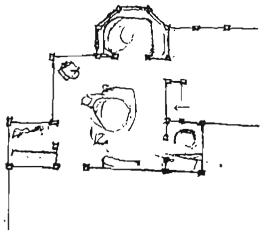
No homogeneous room, of homogeneous height, can serve a group of people well. To give a group a chance to be together, as a group, a room must also give them the chance to be alone, in one's and two's in the same space.

This problem is felt most acutely in the common rooms of a house—the kitchen, the family room, the living room. In fact, it is so critical there, that the house can drive the family apart when it remains unsolved. Therefore, while we believe that the pattern applies equally to workplaces and shops and schools—in fact, to all common rooms wherever they are—we shall focus our discussion on the house, and the use of alcoves around the family common rooms.

In modern life, the main function of the family is emotional; it is a source of security and love. But these qualities will only come into existence if the members of the house are *physically able to be together as a family.*

This is often difficult. The various members of the family come and go at different times of day; even when they are in the house, each has his own private interests: sewing, reading, homework, carpentry, model-building, games. In many houses, these interests force people to go off to their own rooms, away from the family. This happens for two reasons. First, in a normal family room, one person can easily be disturbed by what the others are doing: the person who wants to read, is disturbed by the fact that the others are watching TV. Second, the family room does not usually have any space where people can leave things and not have them disturbed. Books left on the dining table get cleared away at meal times; a half-finished game cannot be left standing. Naturally, people get into the habit of doing these things somewhere else—away from the family.

To solve the problem, there must be some way in which the members of the family can be together, even when they are doing different things. This means that the family room needs a number of small spaces where people can do different things. The spaces need to be far enough away from the main room, so that any clutter that develops in them does not encroach on the communal uses of the main room. The spaces need to be connected, so that people are still "together" when they are in them: this means they need to be open to each other. At the same time they need to be secluded, so a person in one of them is not disturbed by the others. In short, the family room must be surrounded by small alcoves. The alcoves should be large enough for one or two people at a time: about six feet wide, and between three and six feet deep. To make it clear that they are separate from the main room, so they do not clutter it up, and so that people in them are secluded, they should be narrower than the family room walls, and have lower ceilings than the main room.



Family room alcoves.

Since this pattern is so fundamental, we now present several quotes from various writers to underscore the fact that many people have made roughly similar observations:

From *Psychosocial Interior of the Family*, Gerald Handel, ed., Chicago, Ill.: Aldine Publishing Company, 1967, p. 13.

This fundamental duality of family life is of considerable significance, for the individual's efforts to take his own kind of interest

> in the world, to become his own kind of person, proceed apace with his efforts to find gratifying connection to the other members. At the same time, the other members are engaged in taking their kinds of interest in him, and in themselves. This is the matrix of interaction in which a family develops its life. The family tries to cast itself in a form that satisfies the ways in which its members want to be together and apart. . . .

From *Children in the Family* by Florence Powdermaker and Louise Grimes, New York: Farrar & Reinhart, Inc., 1940, p. 108: "Even if a child has a room of his own, he doesn't like being kept there all day long but wants to spend much of his time in other parts of the house. . . ." And p. 112: ". . . he enjoys and craves attention. He likes to show things to adults and have them share in the pleasure of his discoveries. Besides, he is entranced by their activities and would like to have a finger in every pie."

And from Svend Riemer, "Sociological Theory of Home Adjustment," *American Soc. Rev.*, Vol. 8, No. 3, June 1943, p. 277:

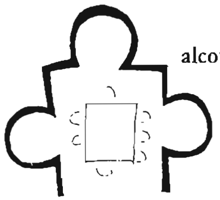
> In adjustment to the activities of other members of the family, it will be necessary to "migrate" . . . between the different rooms of the family home. Even the same activity may have to be moved from one room to the other at different times of the day.
>
> Home studies for example may have to be carried out in the living room during the afternoon, while food is being prepared in the kitchen; they may have to be continued in the kitchen during the evening hours, when the living room is occupied by leisure time activities of other members of the family. This "migration" between different rooms is apt to impair intellectual concentration. It may convey a sense of insecurity. Its possible disadvantages have to be seriously considered whenever children are reared in the family home.

It is clear then, that the opposing needs for some seclusion and some community at the same time in the same space, occur in almost every family. It is not hard to see that only slightly different versions of the very same forces exist in all communal rooms. People want to be together; but at the same time they want the opportunity for some small amount of privacy, without giving up community.

If ten people, or five, are together in a room, and two of them want to pull away to one side to have a quiet talk together, they need a place to do it. Only the alcove, or some version of the alcove, can give them the privacy they need, without forcing them to give the group up altogether.

Therefore:

Make small places at the edge of any common room, usually no more than 6 feet wide and 3 to 6 feet deep and possibly much smaller. These alcoves should be large enough for two people to sit, chat, or play and sometimes large enough to contain a desk or a table.



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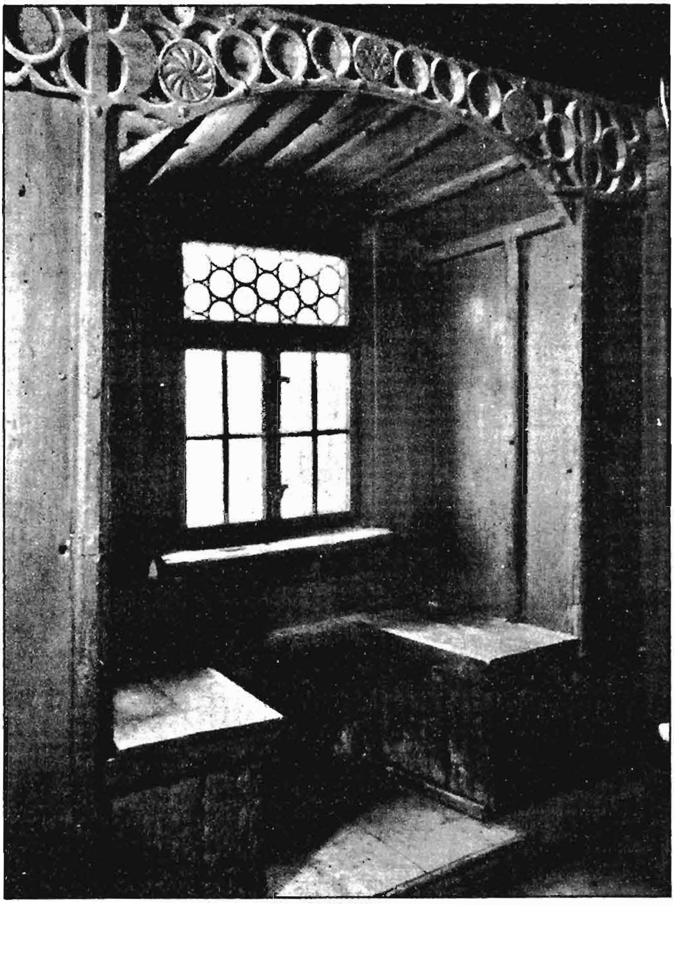
Give the alcove a ceiling which is markedly lower than the ceiling height in the main room—CEILING HEIGHT VARIETY (190); make a partial boundary between the alcove and the common room by using low walls and thick columns—HALF-OPEN WALL (193), COLUMN PLACE (226); when the alcove is on an outside wall, make it into a window place, with a nice window, low sill, and a built-in seat—WINDOW PLACE (180), BUILT-IN SEATS (202); and treat it as THICKENING THE OUTER WALLS (211). For details on the shape of the alcove, see THE SHAPE OF INDOOR SPACE (191). . . .

180 WINDOW PLACE**



. . . this pattern helps complete the arrangement of the windows given by ENTRANCE ROOM (130), ZEN VIEW (134), LIGHT ON TWO SIDES OF EVERY ROOM (159), STREET WINDOWS (164). According to the pattern, at least one of the windows in each room needs to be shaped in such a way as to increase its usefulness as a space.

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Everybody loves window seats, bay windows, and big windows with low sills and comfortable chairs drawn up to them.

It is easy to think of these kinds of places as luxuries, which can no longer be built, and which we are no longer lucky enough to be able to afford.

In fact, the matter is more urgent. These kinds of windows which create "places" next to them are not simply luxuries; they are *necessary*. A room which does not have a place like this seldom allows you to feel fully comfortable or perfectly at ease. Indeed, a room without a window place may keep you in a state of perpetual unresolved conflict and tension—slight, perhaps, but definite.

This conflict takes the following form. If the room contains no window which is a "place," a person in the room will be torn between two forces:

1. He wants to sit down and be comfortable.
2. He is drawn toward the light.

Obviously, if the comfortable places—those places in the room where you most want to sit—are away from the windows, there is no way of overcoming this conflict. You see, then, that our love for window "places" is not a luxury but an organic intuition, based on the natural desire a person has to let the forces he experiences run free. A room where you feel truly comfortable will always contain some kind of window place.

Now, of course, it is hard to give an exact definition of a "place." Essentially a "place" is a partly enclosed, distinctly identifiable spot within a room. All of the following can function as "places" in this sense: bay windows, window seats, a low window sill where there is an obvious position for a comfortable armchair, and deep alcoves with windows all around them. To make the concept of a window place more precise, here are some examples of each of these types, together with discussion of the critical features which make each one of them work.

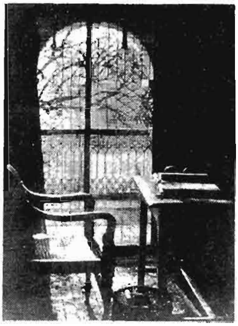
A bay window. A shallow bulge at one end of a room, with windows wrapped around it. It works as a window place because of the greater intensity of light, the views through the side windows, and the fact that you can pull chairs or a sofa up into the bay.

A bay window.

A window seat. More modest. A niche, just deep enough for the seat. It works best for one person, sitting parallel to the window, back to the window frame, or for two people facing each other in this position.

A window seat.

A low sill. The most modest of all. The right sill height for a window place, with a comfortable chair, is very low: 12 to 14 inches. The feeling of enclosure comes from the armchair—best of all, one with a high back and sides.



A low sill.

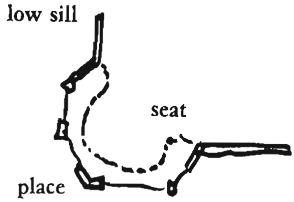
A glazed alcove. The most elaborate kind of window place: almost like a gazebo or a conservatory, windows all around it, a small room, almost part of the garden.

A glazed alcove.

And, of course, there are other possible versions too. In principle, any window with a reasonably pleasant view can be a window place, provided that it is taken seriously as a space, a volume, not merely treated as a hole in the wall. Any room that people use often should have a window place. And window places should even be considered for waiting rooms or as special places along the length of hallways.

Therefore:

In every room where you spend any length of time during the day, make at least one window into a "window place."



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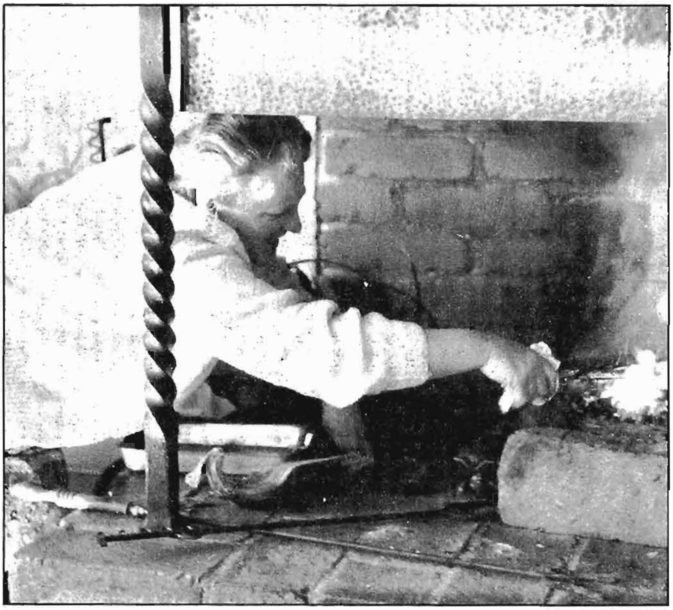
Make it low and self-contained if there is room for that—ALCOVES (179); keep the sill low—LOW SILL (222); put in the exact positions of frames, and mullions, and seats after the window place is framed, according to the view outside—BUILT-IN SEATS (202), NATURAL DOORS AND WINDOWS (221). And set the window deep into the wall to soften light around the edges—DEEP REVEALS (223). Under a sloping roof, use DORMER WINDOWS (231) to make this pattern. . . .

181 THE FIRE*



. . . this pattern helps to create the spirit of the COMMON AREAS AT THE HEART (129), and even helps to give its layout and position, because it influences the way that paths and rooms relate to one another.

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There is no substitute for fire.

Television often gives a focus to a room, but it is nothing but a feeble substitute for something which is actually alive and flickering within the room. The need for fire is almost as fundamental as the need for water. Fire is an emotional touchstone, comparable to trees, other people, a house, the sky. But the traditional fireplace is nearly obsolete, and new ones are often added to homes as "luxury items." Perhaps this explains why these showpiece fireplaces are always so badly located. Stripped of the logic of necessity, they seem an afterthought, not truly integrated.

The most convincing statement of the need for fire that we have found is in Gaston Bachelard's book, *The Psychoanalysis of Fire*. Here is a long quote from Bachelard to give you some idea of the power of his argument.

> The fire confined to the fireplace was no doubt for man the first object of reverie, the symbol of repose, the invitation to repose. One can hardly conceive of a philosophy of repose that would not include a reverie before a flaming log fire. Thus, in our opinion, to be deprived of a reverie before a burning fire is to lose the first use and the truly human use of fire. To be sure, a fire warms us and gives us comfort. But one only becomes fully aware of this comforting sensation after quite a long period of contemplation of the flames; one only receives comfort from the fire when one leans his elbows on his knees and holds his head in his hands. This attitude comes from the distant past. The child by the fire assumes it naturally. Not for nothing is it the attitude of the Thinker. It leads to a very special kind of attention which has nothing in common with the attention involved in watching or observing. Very rarely is it utilized for any other kind of contemplation. When near the fire, one must be seated; one must rest without sleeping; one must engage in reverie on a specific object. . . .

Of course the supporters of the theory of the utilitarian formation of the mind will not accept a theory so facile in its idealism, and they will point out to us the multiple uses of fire in order to ascertain the exact interest that we have in it: not only does fire give heat, but it also cooks meats. As if the complex hearth, the peasant's hearth, precluded reverie! . . .

. . . From the notched teeth of the chimney hook there hung the black cauldron. The three-legged cooking pot projected over the hot embers. Puffing up her cheeks to blow into the steel tube, my grandmother would rekindle the sleeping flames. Everything would be cooking at the same time: the potatoes for the pigs, the choice potatoes for the family. For me there would be a fresh egg cooking under the ashes . . . on days when I was on my good behavior, they would bring out the waffle iron. Rectangular in form, it would crush down the fire of thorns burning red as the spikes of sword lilies. And soon the *gaufre* or waffle would be pressed against my pinafore, warmer to the fingers than to the lips. Yes, then indeed I was eating fire, eating its gold, its odor and even its crackling while the burning gaufre was crunching under my teeth. . . .

And it is always like that, through a kind of extra pleasure—like dessert—that fire shows itself a friend of man. It does not confine itself to cooking; it makes things crisp and crunchy. It puts the golden crust on the griddle cake; it gives a material form to man's festivities. As far back in time as we can go, the gastronomic value has always been more highly prized than the nutritive value, and it is in joy and not in sorrow that man discovered his intellect. The conquest of the superfluous gives us a greater spiritual excitement than the conquest of the necessary. Man is a creation of desire, not a creation of need.

But the reverie by the fireside has axes that are more philosophical. Fire is for the man who is contemplating it an example of a sudden change or development and an example of a circumstantial development. Less monotonous and less abstract than flowing water, even more quick to grow and to change than the young bird, we watch every day in its nest in the bushes, fire suggests the desire to change, to speed up the passage of time, to bring all of life to its conclusion, to its hereafter. In these circumstances the reverie becomes truly fascinating and dramatic; it magnifies human destiny; it links the small to the great, the hearth to the volcano, the life of a log to the life of a world. The fascinated individual hears the call of the funeral pyre. For him destruction is more than a change, it is a renewal. . . .

Love, death and fire are untied at the same moment. Through its sacrifice in the heart of the flames, the mayfly gives us a lesson in eternity. This total death which leaves no trace is the guarantee that our whole person has departed for the beyond. To lose everything in order to gain everything. The lesson taught by the fire is clear: "After having gained all through skill, through love or through violence you must give up all, you must annihilate yourself." (Gaston Bachelard, *The Psychoanalysis of Fire*, Boston: Beacon Press, 1964, pp. 14–16. Originally published as *La Psychanalyse du Feu*, Librarie Gallimard, 1938. Reprinted by permission of Beacon Press.)

Another, more down-to-earth, view of the need for fire comes from Mrs. Field, quoted in Robert Woods Kennedy, *The House and the Art of Its Design*, New York: Reinhold, 1953, pp. 192–93:

During the winter months, when the children are often confined indoors for their play, it often happens that around four o-clock or a little after they become cross and grumpy in their playroom, or wild and almost hysterical with boredom. Then I light a fire in the living-room fireplace, and send the children in there to watch it; if the fire were not lighted they would continue their quarreling and perhaps try to turn the quiet room into another bedlam, but with the burning flames on the hearth, they relax into easy interest. They see things in the fire, someone tells a story that interests the whole group, they quiet down, leaving me free to prepare the supper and serve it. It has a definitely hypnotic quality that can be turned to good account.

Of course, we must face the fact that in many parts of the world wood and coal fires are ecologically unsound. They pollute the air; they are inefficient for heating; they are a drain on wood reserves. If we wish to maintain the habit of burning fires in the home, we shall have to find a way of supplementing wood fuel. For example, we can cultivate the habit of burning the inflammable materials that become waste around the house and throughout the community—paper, cloth, non-chlorinated plastics, wood scraps and sawdust. In short, if we want the emotional comfort that can be drawn from a fireplace, we shall have to learn to use the fireplace in a concentrated way, producing our own fuel from materials that would otherwise go to waste in our neighborhoods. It is easy to imagine, a simple hand press which people can use in their homes to press this waste into dense "logs" to make the fire more substantial.

Assume then that we are to have some kind of fireplace—perhaps something entirely simple, but an open fire nonetheless. Where shall we put it? There are four points to consider:

1. Certainly, the main fireplace should be located in the com-

mon area of the house. It will help to draw people together in this area, and when it is burning, it provides a kind of counterpoint to conversation.

2. However, the fireplace should be in view for people passing through the room and people in adjoining rooms, especially the kitchen. The fire will tend to pull people in and make it more likely for the family to gather. And also it is good to view the fire in passing. A welcome time for a fire is in the evening when the family is gathering for the evening meal; and the activity tends to balance between the kitchen and the fire.

3. Make certain, too, that there is a space where people can sit in front of the fire; and that this space is not cut by paths between doors or adjacent rooms.

4. And be sure that the fire is not a dead place when the fire is *not* burning. A fireplace without a fire, full of ashes and dark, will turn the chairs away, unless the chairs which face the fire when it is lit face something else—a window, or activity, or a view—when it is not lit. Only then will the circle of chairs which forms around the fire be stable and keep the place alive, both when the fire is burning and when it isn't.

A daytime focus.

Therefore:

Build the fire in a common space—perhaps in the kitchen—where it provides a natural focus for talk and dreams and thought. Adjust the location until it knits together the social spaces and rooms around it, giving them each a glimpse of the fire; and make a window or some other focus to sustain the place during the times when the fire is out.

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Even where the traditional open fireplace is obsolete for heating or where fuel is scarce, find some way of converting refuse, paper, scraps of wood and cardboard into logs which can be burned, and which smell good—perhaps with some kind of natural resin in a home-made press. Burn all the dry organic materials that do not go to the COMPOST (178), so that the leftovers from the materials which come into the house all serve a useful function, either as fertilizer or as fuel; indeed, the ashes from the fire may go into the compost. Make a circle of chairs around the fire—SITTING CIRCLE (185); perhaps these chairs include a WINDOW PLACE (180).

182 EATING ATMOSPHERE

. . . we have already pointed out how vitally important all kinds of communal eating are in helping to maintain a bond among a group of people—COMMUNAL EATING (147); and we have given some idea of how the common eating may be placed as part of the kitchen itself—FARMHOUSE KITCHEN (139). This pattern gives some details of the eating atmosphere.

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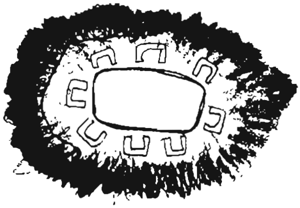
When people eat together, they may actually be together in spirit—or they may be far apart. Some rooms invite people to eat leisurely and comfortably and feel together, while others force people to eat as quickly as possible so they can go somewhere else to relax.

Above all, when the table has the same light all over it, and has the same light level on the walls around it, the light does nothing to hold people together; the intensity of feeling is quite likely to dissolve; there is little sense that there is any special kind of gathering. But when there is a soft light, hung low over the table, with dark walls around so that this one point of light lights up people's faces and is a focal point for the whole group, then a meal can become a special thing indeed, a bond, communion.

Therefore:

Put a heavy table in the center of the eating space—large enough for the whole family or the group of people using it. Put a light over the table to create a pool of light over the group, and enclose the space with walls or with contrasting darkness. Make the space large enough so the chairs can be pulled back comfortably, and provide shelves and counters close at hand for things related to the meal.



light in the middle

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Get the details of the light from POOLS OF LIGHT (252); and choose the colors to make the place warm and dark and comfortable at night—WARM COLORS (250); put a few soft chairs nearby—DIFFERENT CHAIRS (251); or put BUILT-IN SEATS (202) with big cushions against one wall; and for the storage space—OPEN SHELVES (200) and WAIST-HIGH SHELF (201). . . .

183 WORKSPACE ENCLOSURE**

. . . this pattern plays a vital role in helping to create an atmosphere in which people can work effectively. You can use it piecemeal to generate the larger patterns for workspace like FLEXIBLE OFFICE SPACE (146), HALF-PRIVATE OFFICE (152), and HOME WORKSHOP (157). Or, of course, it can be used to help complete these larger patterns, if you have already built them into your design. Even in an alcove off the family commons—ALCOVES (179), you can make the workspace more suitable for work, by placing and shaping the enclosure immediately around it according to this pattern.

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People cannot work effectively if their workspace is too enclosed or too exposed. A good workspace strikes the balance.

In many offices, people are either completely enclosed and feel too isolated, or they are in a completely open area as in the office landscape and feel too exposed. It is hard for a person to work well at either of these two extremes—the problem is to find the right balance between the two.

To find the proper balance, we conducted a simple experiment. We first defined 13 variables, which we thought might influence a person's sense of enclosure in his workspace.

These 13 variables are:

1. Presence or absence of a wall immediately behind you.
2. Presence or absence of a wall immediately beside you.
3. Amount of open space in front of you.
4. Area of the workspace.
5. Total amount of enclosure around the immediate workspace.
6. View to the outside.
7. Distance to nearest person.
8. Number of people you are aware of from your workplace.
9. Noise: level and type.
10. Presence or absence of a person facing you directly.
11. Number of different positions you can sit in.

12. Number of people you can see from your workspace.
13. The number of people you can talk to without raising your voice.

We then formulated thirteen hypotheses which connect these variables with the comfort of the work space. The hypotheses are listed below. We interviewed 17 men and women who had all worked in several different offices. In the interview, we first asked each person to think of the very best workspace he (or she) had ever worked in and the very worst; and then asked him (or her) to make a sketch plan of both spaces. Then we asked questions to identify the value of each of these 13 variables in the "best" and "worst" workspaces. Thus, for instance, we might point to one of the sketches a person had drawn, and say "How far away was that wall" to establish the value of the third variable. The values of the variables for the 17 best and worst workspaces are given in the following table.

On the basis of this table, we then calculated the probable significance of our hypotheses, according to the chi-squared test. Nine of the hypotheses appear to be significant according to the chi-squared test, and four are not. We now list the nine "significant" hypotheses, and with each one, in parentheses, we venture an explanation for its success.

1. You feel more comfortable in a workspace if there is a wall behind you. (If your back is exposed you feel vulnerable—you can never tell if someone is looking at you, or if someone is coming toward you from behind.) The data support this hypothesis at the 1 per cent level of significance.

2. You feel more comfortable in a workspace if there is a wall to one side. (If your workspace is open in front and on both sides, you feel too exposed. This is probably due to the fact that though it is possible to be vaguely aware of everything that goes on 180 degrees around you, you cannot feel in real control of such a wide angle without moving your head all the time. If you have a wall on one side, you only have to manage an angle of 90 degrees, which is much easier, so you feel more secure.) The data support this hypothesis at the 5 per cent level of significance.

3. There should be no blank wall closer than 8 feet in front of you. (As you work you want to occasionally look up and rest your

	Wall Behind in Workspace?		Wall to Side in Workspace?		Wall in Front Within 8'?		Area of Workspace?		Enclosure		View to Outside?		Aural Privacy?		No. of People in Awareness		Bother by Noise of a Different Kind?		Catch Somebody's Eye?		No. of Different Views While Working		No. of People in Sight		No. of People Available for Chat	
Question Number	1		2		3		4		5		6		7		8		9		10		11		12		13	
*	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W	B	W
Tony	Y	N	Y	N	N	Y	35	20	50	37	Y	N	–	–	2	1	Y	Y	Y	N	1	2	2	1	2	1
Irene	Y	N	Y	N	Y	N	135	35	60	0	Y	N	Y	N	3	4	N	Y	N	N	3	2	2	2	0	1
Effie	Y	N	Y	N	Y	Y	150	35	86	25	Y	Y	Y	N	4	5	N	Y	N	N	2	2	0	5	0	3
Peggy	Y	N	Y	N	N	N	90	36	50	2	Y	N	Y	N	8	16	N	Y	Y	N	4	2	8	16	0	1
Ron	Y	N	Y	Y	Y	Y	63	22	57	44	Y	N	Y	N	8	1	N	Y	N	N	2	1	4	1	3	1
Joan	Y	N	Y	N	N	N	120	20	50	0	Y	N	Y	N	3	9	N	N	N	Y	2	1	3	9	3	2
Leslie	Y	N	N	N	N	N	50	20	25	0	Y	Y	Y	Y	10	0	N	Y	N	N	3	1	9	0	7	0
Virginia	Y	N	Y	Y	N	N	80	20	50	25	Y	N	Y	N	3	50	N	Y	N	N	2	1	3	8	1	4
Fran	N	N	Y	N	N	Y	100	50	55	50	Y	N	N	N	2	2	N	Y	N	N	1	4	1	2	1	1
Dendal	N	N	N	Y	Y	Y	20	20	25	50	Y	N	N	N	4	150	N	N	N	N	1	1	4	2	4	1
Phyllis	Y	Y	Y	Y	N	N	70	150	50	0	Y	Y	Y	Y	3	1	Y	Y	N	N	3	3	0	15	0	1
Ina	Y	Y	Y	Y	N	N	20	20	37	25	Y	N	Y	Y	3	1	Y	Y	N	N	2	2	2	0	2	0
Mary	Y	N	Y	Y	N	N	400	20	75	25	Y	N	Y	N	21	2	Y	N	N	Y	2	2	1	1	0	1
Fred	N	Y	Y	Y	N	N	200	100	37	43	Y	Y	Y	N	1	5	N	Y	N	N	1	1	1	15	1	3
Jerry	N	N	Y	N	N	Y	20	40	25	31	N	Y	N	Y	3	3	N	Y	N	N	2	1	3	2	2	2
Gerry	N	N	Y	Y	Y	N	50	64	50	25	Y	N	N	Y	2	60	N	N	N	N	2	1	2	60	2	1
Lyle	Y	Y	Y	Y	N	Y	100	112	75	95	Y	Y	Y	N	20	16	Y	Y	N	N	1	1	20	2	0	0

* Best & Worst

Values of the variables for each hypothesis.

eyes by focusing them on something farther away than the desk. If there is a blank wall closer than 8 feet your eyes will not change focus, and they get no relief. In this case you feel too enclosed.) The data support this hypothesis at the 5 per cent level of significance.

4. Workspaces where you spend most of the day should be at least 60 square feet in area. (If your workspace is any smaller than 60 square feet you feel cramped and claustrophobic.) The data support this hypothesis at the 5 per cent level of significance.

5. Each workspace should be 50 to 75 per cent enclosed by walls or windows. (We guess that enclosure by windows creates about half the feeling of enclosure that solid walls have, so that a workspace which is surrounded half by wall and half by

window is considered to have 75 per cent enclosure, while a workspace completely surrounded by a half-height wall and otherwise open, is considered to have 50 per cent enclosure.) The data support this hypothesis at the 1 per cent level of significance.

6. Every workspace should have a view to the outside. (If you do not have a view to the outside, you feel too enclosed and oppressed by the building, even if you are working in a large open office. See WINDOWS OVERLOOKING LIFE (192).) The data support this hypothesis at the 0.1 per cent level of significance.

7. No other person should work closer than 8 feet to your workspace. (You should be able to hold conversations either on the phone or in person with someone, without feeling as though someone else can hear every word you are saying. The noise level in an average office is 45 db. At 45 db people closer than 8 feet to you are virtually forced to overhear your conversations. From the *Handbook of Noise Measurement* by Peterson and Gross, Sixth Edition, West Concord, Mass.: General Radio Company, 1967.) The data support this hypothesis at the 5 per cent level of significance.

8. It is uncomfortable if you are not aware of at least two other persons while you work. On the other hand, you do not want to be aware of more than eight people. (If you are aware of more than eight people, you lose a sense of where you are in the whole organization. You feel like a cog in a huge machine. You are exposed to too many people. On the other hand, if you are not aware of anyone else around you, you feel isolated and as though no one cares about you or your work. In this case, you are too enclosed.) The data support this hypothesis at the 5 per cent level of significance.

9. You should not be able to hear noises very different from the kind of noise you make, from your workplace. (Your workplace should be sufficiently enclosed to cut out noises which are of a different kind from the ones you make. There is some evidence that one can concentrate on a task better if people around him are doing the same thing, not something else.) The data support this hypothesis at the 5 per cent level of significance.

Four of the hypotheses we tested were not supported to a statistically significant extent by the data. They are the following:

10. No one should be sitting directly opposite you and facing you.

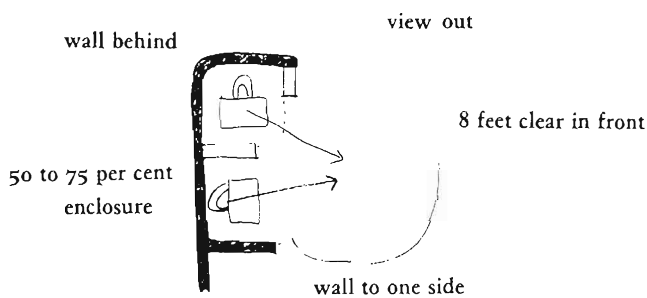
11. Workspaces should allow you to face in different directions.

12. From your workspace, you should be able to see at least two other persons; but no more than four.

13. There should be at least one other person close enough to talk to.

Therefore:

Give each workspace an area of at least 60 square feet. Build walls and windows round each workspace to such an extent that their total area (counting windows at one-half) is 50 to 75 per cent of the full enclosure that would be there if all four walls around the 60 square feet were solid. Let the front of the workspace be open for at least 8 feet in front, always into a larger space. Place the desk so that the person working at it has a view out, either to the front or to the side. If there are other people working nearby, arrange the enclosure so that the person has a sense of connection to two or three others; but never put more than eight workspaces within view or earshot of one another.



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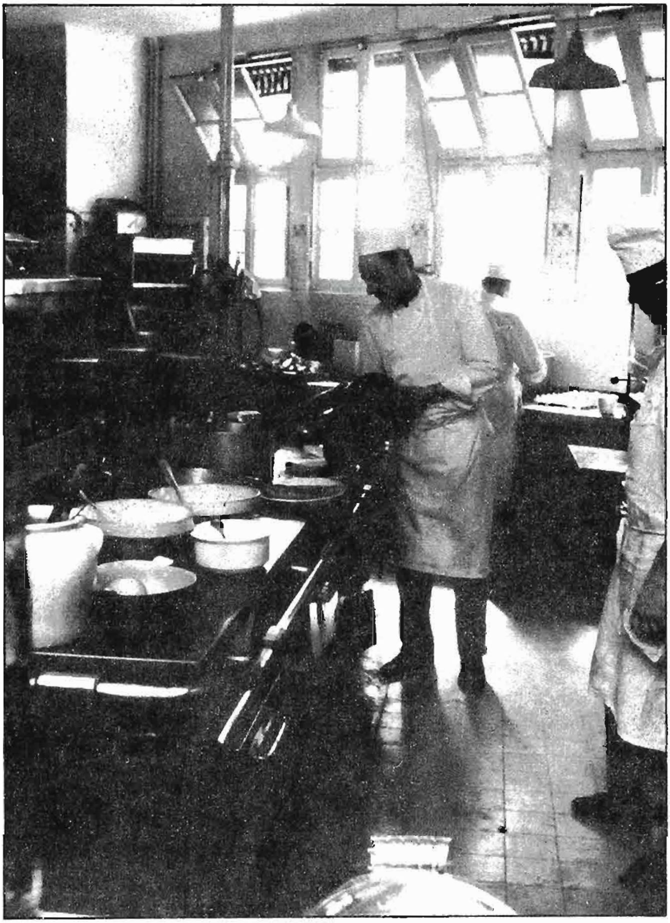
For the view, give each workspace a window to the outside—WINDOWS OVERLOOKING LIFE (192); surround the space with thick walls which contain shelves and storage space—HALF-OPEN WALL (193), THICK WALLS (197), OPEN SHELVES (200), WAIST-HIGH SHELF (201); arrange a pool of incandescent light over the work table to set it off—POOLS OF LIGHT (252); and try to make a sitting place, next to the workspace, so that the pulse of work, and talk can happen easily throughout the day—SITTING CIRCLE (185). For details on the shape of the workspace, see THE SHAPE OF INDOOR SPACE (191). . . .

184 COOKING LAYOUT*



. . . within the FARMHOUSE KITCHEN (139), or any other kind of kitchen, it is essential that the cooking area be fashioned as a workshop for the preparation of food, and not as some kind of magazine kitchen with built-in counters and decorator colors. This down-to-earth and working character of a good kitchen comes in large part from the arrangement of the stove and food and counter.

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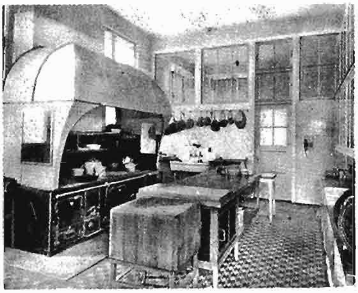
Cooking is uncomfortable if the kitchen counter is too short and also if it is too long.

Efficiency kitchens never live up to their name. They are based on the notion that the best arrangement is one that saves the most steps; and this has led to tiny, compact kitchens. These compact layouts do save steps, but they usually don't have enough counter space. Preparing dinner for a family is a complex operation; several things must go on at once, and this calls for the simultaneous use of counter space for different projects. If there isn't enough counter space, then the ingredients and utensils for one thing must be moved, washed, or put away before the next thing can be prepared; or else things become so jumbled that extra time and effort must be taken to find what's needed at the proper moment. On the other hand, if the counter is too long or too spread out, the various points along its length are too far apart—and cooking is again uncomfortable, because your movements as you cook are so inefficient and slow.

Empirical support for the notion that there is insufficient counter space in many kitchens comes from a recent work by the Small Homes Council, University of Illinois. The Council found that in over a hundred housing developments, 67 per cent had too little counter space. No one complained that their kitchens were too large.

In *The Owner Built Home* (Yellow Springs, Ohio, 1961, Volume IV, p. 30), Ken Kern notes that a principal concept in cooking design is to provide for storage and workspace at each of the major cooking centers in the kitchen. Drawing on a Cornell University study he identifies the major cooking centers as the sink, the stove, the refrigerator, the mixing, and the serving areas. To provide storage for each center requires 12 to 15 feet of free counter space, excluding the sink, drainboards, and stove. (*The Cornell Kitchen*, Glenn Beyer, Cornell University, 1952.)

As far as the limits on the distance between these major cooking centers are concerned, there is less empirical evidence. Estimates vary. The rule of thumb we postulate is that no two of them should be more than three or four steps, or about 10 feet, apart.



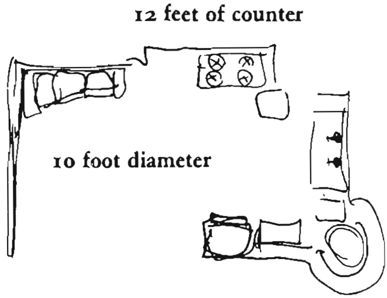
A kitchen that really works: huge, but great.

Therefore:

To strike the balance between the kitchen which is too small, and the kitchen which is too spread out, place the stove, sink, and food storage and counter in such a way that:

1. **No two of the four are more than 10 feet apart.**
2. **The total length of counter—excluding sink, stove, and refrigerator—is at least 12 feet.**
3. **No one section of the counter is less than 4 feet long.**

There is no need for the counter to be continuous or entirely "built-in" as it is in many modern kitchens—it can even consist of free-standing tables or counter tops. Only the three functional relationships described above are critical.



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Place the most important part of the working surface in the sunlight—SUNNY COUNTER (199); put all the kitchen tools and plates and saucepans and nonperishable food around the walls, one deep, so all of it is visible, and all of it directly open to reach—THICK WALLS (197), OPEN SHELVES (200). . . .

185 SITTING CIRCLE*

. . . according to the SEQUENCE OF SITTING SPACES (142), there will be a variety of different kinds of sitting space throughout an office building or a house or workshop—some formal, some informal, some large, some small, laid out in part according to the INTIMACY GRADIENT (127). This pattern deals with the actual physical layout of any one of these sitting spaces. And of course, it can be used to help create the sequence of sitting spaces, piecemeal, one space at a time.

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A group of chairs, a sofa and a chair, a pile of cushions —these are the most obvious things in everybody's life— and yet to make them work, so people become animated and alive in them, is a very subtle business. Most seating arrangements are sterile, people avoid them, nothing ever happens there. Others seem somehow to gather life around them, to concentrate and liberate energy. What is the difference between the two?

Most important of all, perhaps, is their position. A sitting circle needs essentially the same position as a COMMON AREA AT THE HEART (129), but in miniature: a well defined area, with paths running past it, not cutting through it, and placed so that people naturally pass by it, stop and talk, lean on the backs of chairs, gradually sit down, move position, get up again. These characteristics are vital. The reasons are exactly the same as those given in COMMON AREAS AT THE HEART (129); only the scale is different.

Second, the rough shape of a circle. When people sit down to talk together they try to arrange themselves roughly in a circle. Empirical evidence for this has been presented by Margaret Mead ("Conference Behavior," *Columbia University Forum*, Summer, 1967, pp. 20–25). Perhaps one reason for the circle, as opposed to other forms, is the fact that people like to sit at an angle to one another, not side by side (Robert Sommer, "Studies in Personal Space," *Sociometry*, 22 September 1959, pp. 247–60.)

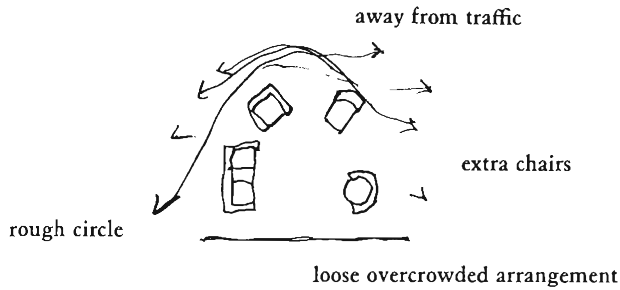
In a circle, even neighbors are at a slight angle to one another. This, together with the first point, suggests that a rough circle is best.

But it is not enough for the chairs to be in a circle. The chairs themselves will only hold this position if the actual architecture—the columns, walls, fire, windows—subtly suggest a partly contained, defined area, which is roughly a circle. The fire especially helps to anchor a sitting circle. Other things can do it almost as well.

Third, we have observed that the seating arrangement needs to be slightly loose—not too formal. Relatively loose arrangements, where there are many different sofas, cushions, and chairs, all free to move, work to bring a sitting circle to life. The chairs can be adjusted slightly, they can be turned at slight angles; and if there are one or two too many, all the better: this seems to animate the group. People get up and walk around, then sometimes sit back down in a new chair.

Therefore:

Place each sitting space in a position which is protected, not cut by paths or movement, roughly circular, made so that the room itself helps to suggest the circle—not too strongly—with paths and activities around it, so that people naturally gravitate toward the chairs when they get into the mood to sit. Place the chairs and cushions loosely in the circle, and have a few too many.



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Use a fire, and columns, and half-open walls to form the shape of the circle—THE FIRE (181), THE SHAPE OF INDOOR SPACE (191), HALF-OPEN WALL (193); but do not make it too formal or too enclosed—COMMON AREAS AT THE HEART (129), SEQUENCE OF SITTING SPACES (142). Use DIFFERENT CHAIRS (251), big ones, small ones, cushions, and a few too many, so that they are never too perfectly arranged, but always in a bit of a jumble. Make a POOL OF LIGHT (252) to mark the sitting circle, and perhaps a WINDOW PLACE (180). . . .

186 COMMUNAL SLEEPING

. . . by this time the sleeping areas have been defined—COUPLE'S REALM (136), CHILDREN'S REALM (137), SLEEPING TO THE EAST (138), BED CLUSTER (143). It remains only to build in the actual detailed space which forms the beds themselves—MARRIAGE BED (187), BED ALCOVE (188). However, before we consider these patterns, we wish to draw attention to a slightly more general pattern which may affect their detailed positions.

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In many traditional and primitive cultures, sleep is a communal activity without the sexual overtones it has in the West today. We believe that it may be a vital social function, which plays a role as fundamental and as necessary to people as communal eating.

For instance, in Indian villages during the dry season the men pull their beds into the compound at sundown and talk and smoke together, then drift off to sleep. It is a vital part of the social life of the community. The experience of the campfire is the closest western equivalent: people's love of camping suggests that the urge is still a common one.

It is possible that sleep as a communal activity may be a vital part of healthy social life, not only for children, but for all adults. How might we harmonize this need with the obvious facts of privacy and sexuality that are linked with sleeping?

Of course, it is a beautifully intimate thing—the moment in the morning and at night when a couple are together, in private, falling asleep or waking up together. But we believe that it is also possible to create a situation where, occasionally, people can sleep together in big, family-size groups.

In particular, we can imagine a special version of this activity for metropolitan culture, where so often friends live many miles away from each other. How many times have you experienced this situation: You have been out for the night with your friends and end up back at their house for drinks, to talk, to build a fire. Finally, late into the night, it is time to leave. Often they will say, "Please, spend the night"—but this rarely happens. You decline, and make the weary, half-drunken drive home to "your own bed."

It seems to us that under these conditions especially, communal sleeping makes sense. It would help to intensify the social occasions when we do see our friends who live far away.

But the environment must invite it, or we shall never overcome our reluctance. People are uneasy about spending the night because it usually means having to make up a guest bed, or sleeping on the rug, or cramped on the sofa. Think how much more inviting it would be if, at the end of the night, people simply dozed off, in ones and twos, in alcoves, and on mats with quilts, around the main sleeping area of the house, or around the commons.

From a practical point of view, there are two alternative positions for the alcoves:

1. There might be a place in the commons—not in any one person's private space—a place where late at night after people have been together for the evening and the fire is dying out, it is simple to draw together and sleep—a place where children and parents can sleep together on special nights. It could be very simple: one large mat and some blankets.

2. The other solution is a more deliberate version of the pattern: the couple's realm in a family house could be slightly larger than normal, with one or two alcoves or window seats that could double as beds. A built-in seat, for example, that is wide enough and long enough to lay down on, with a thin mat spread across it, becomes a bed. A few places like this, and, at a moment's notice the couple's bedroom becomes a setting for communal sleeping.

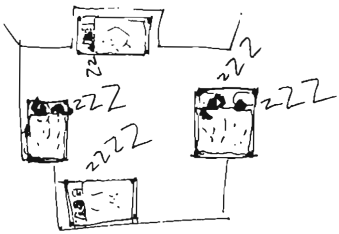
In either case, the solution must be simple and must involve nothing more than reaching for a blanket and a mat. If special beds must be made and the room rearranged, it will never happen. And, of course, the space for guest's beds must be made so that it is not dead when it is not used for sleeping. It needs a compatible double function—a place to put a crib, a seat, a place to lay out clothes—ALCOVE (179), WINDOW PLACE (180), DRESSING ROOM (189).

This pattern may seem strange at first, but when our typist, read it, she was fascinated and decided to try it one Saturday night with her family. They spread a big mat across the living room. They all got up together and helped the youngest son on his paper route; then they had some breakfast. Ed: Are they still doing it? ? Au: No, after 2 weeks they were arrested.

Seriously though:

Arrange the sleeping area so that there is the possibility for children and adults to sleep in the same space, in sight and sound of one another, at least as an occasional alternative to their more usual sleeping habits.

This can be done in the common area near the fireplace, where the entire household and guests can sleep together—one large mat and some blankets in an alcove. It is also possible to build bed alcoves for overnight guests, in an extended couple's realm.



beds within sight and sound of other beds

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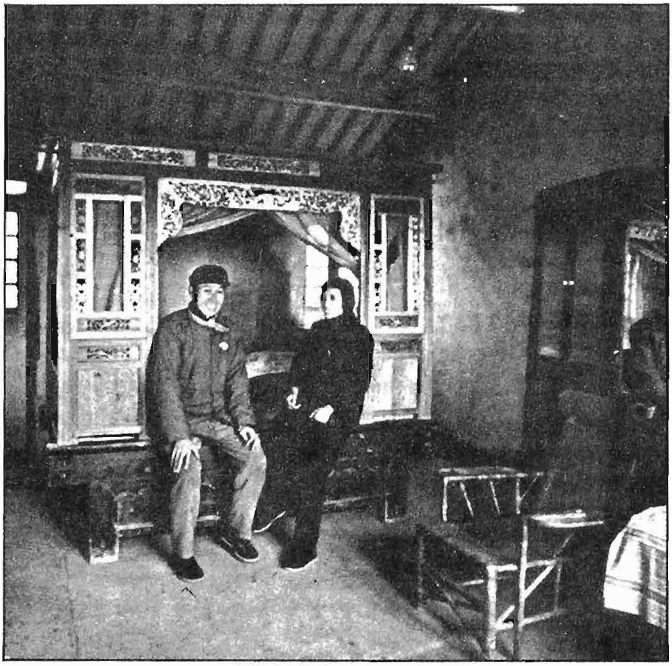
Place the ALCOVES (179) and MARRIAGE BED (187) and the BED ALCOVES (188) and DRESSING ROOMS (189) accordingly. The children have this pattern for themselves already—if bed alcoves are placed in a cluster—BED CLUSTER (143). . . .

187 MARRIAGE BED



. . . the pattern COUPLE'S REALM (136) gives emphasis to the importance of the couple's private life together within a household. Within that couple's realm, the placing and nature of the bed is naturally the most important thing.

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The bed is the center of a couple's life together: the place where they lie together, talk, make love, sleep, sleep late, take care of each other during illness. But beds and bedrooms are not often made in ways which intensify their meaning, and these experiences cannot take hold.

It is true that there are extra wide beds, special bedspreads and frames, water beds, soft lighting, and all kinds of accessories on the night table. But these are all essentially gadgets. They still don't make a bed which nourishes intimacy and love.

There are three far more basic points which go to establish the marriage bed.

1. The space around the bed is *shaped* around the bed. There is a low ceiling, or a partial ceiling, over the bed. The walls and windows are made to contain the bed. See BED ALCOVE (188).

2. It is crucial that the couple choose the right time to build the bed, and not buy one at the drop of the hat. It is unlikely that the bed can come to have the right feeling until a couple has weathered some hard times together and there is some depth to their experience.

3. Find a way of adding to the bed and the space around it, so that it will become more personal and unique over the years; for example, a headboard that can be carved, painted, repainted, or a cloth ceiling that can be changed, embroidered.

The importance of the bed as an anchor point in a couple's life is brought home in this passage from Homer. Odysseus is home after 20 years of wandering and misadventure. His wife, Penelope, does not recognize him—there have been so many imposters, and he has been away so long. He pleads with her to believe it is him, but she is unsure. Frustrated, Odysseus turns away from her. Penelope speaks:

"Strange man, I am not proud, or contemptuous, or offended, but I know what manner of man you were when you sailed away from Ithaca. Come Eurycleia, make the bed outside the room which he built himself; put the fine bedstead outside, and lay out the rugs and blankets and fleeces."

This was a little trap for her husband. He burst into a rage:

"Wife, that has cut me to the heart! Who has moved my bed? That would be a difficult job for the best workman, unless God himself should come down and move it. It would be easy for God, but no man could easily prize it up, not the strongest man living! There is a great secret in that bed. I made it myself, and no one else touched it. There was a strong young olive tree in full leaf growing in an enclosure, the trunk as thick as a pillar. Round this I built our bridal chamber; I did the whole thing myself, laid the stones and built a good roof over it, jointed the doors and fitted them in their places. After that I cut off the branches and trimmed the trunk from the root up, smoothed it carefully with the adze and made it straight to the line. This tree I made the bedpost. That was the beginning of my bed; I bored holes through it, and fitted the other posts about it, and inlaid the framework with gold and silver and ivory, and I ran through it leather straps coloured purple. Now I have told you my secret. And I don't know if it is still there, wife, or if some one has cut the olive at the root and moved my bed!"

She was conquered, she could hold out no longer when Odysseus told the secret she knew so well. She burst into tears and ran straight to him, throwing her arms about his neck. She kissed his head, and cried:

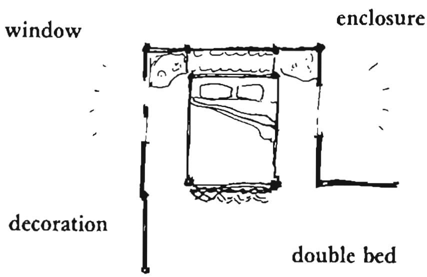
"Don't be cross with me, my husband, you were always a most understanding man! The gods brought affliction upon us because they grudged us the joy of being young and growing old together! Don't be angry, don't be hurt because I did not take you in my arms as soon as I saw you! My heart has been frozen all this time with a fear that some one would come and deceive me with a false tale; there were so many imposters! But now you have told me the secret of our bed, that settles it." (From *The Odyssey*, translated by W. H. D. Rouse. Reprinted by arrangement with The New American Library, Inc., New York, New York.)

The translator footnotes this incident as follows: "This is the first time in all the eventful tale when Odysseus speaks on impulse; he has been prepared for everything, but this unexpected trifle unlocks his heart."

Quite honestly, we are not certain whether or not this pattern makes sense. On the one hand, it does: it is a beautiful idea; idyllic almost. Yet, face to face with cold hard fact and with the dissolution and struggles in the marriages around us, it seems hard to hope that it could ever be quite real. We have decided to leave it in, just because it is a beautiful idea. But we ask you to treat it like Oblomov's dream, a picture more real than reality, an impossible dream of perfect and idyllic circumstances, which may help perhaps, to make a little more sense of our muddled everyday reality—but only if we take it with a pinch of salt.

Therefore:

At the right moment in a couple's life, it is important that they make for themselves a special bed—an intimate anchor point for their lives; slightly enclosed, with a low ceiling or a canopy, with the room shaped to it; perhaps a tiny room built around the bed with many windows. Give the bed some shape of its own, perhaps as a four-poster with head board that can be hand carved or painted over the years.



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Make two separate dressing rooms or alcoves near the bed—DRESSING ROOMS (189); for more details on the space around the bed, see BED ALCOVE (188); lower the ceiling over the bed—CEILING HEIGHT VARIETY (190), and provide some way of creating special ornament all around it—ORNAMENT (249). For the detailed shape of the space around the bed, see THE SHAPE OF INDOOR SPACE (191). . . .

188 BED ALCOVE**

. . . bed alcoves help to generate the form of BED CLUSTERS (143), COMMUNAL SLEEPING (186) and MARRIAGE BED (187). For children, each alcove also functions as A ROOM OF ONE'S OWN (141), so that even in the smallest house, not only the adults, but every child can have at least a small place to call his own.

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Bedrooms make no sense.

The valuable space around the bed is good for nothing except access to the bed. And all the other functions—dressing, working, and storage of personal belongings which people stuff uncomfortably into the corners of their bedrooms—in fact, need their own space, and are not at all well met by the left over areas around a bed.

In BED CLUSTERS (143), we have already argued that each child in a family should have a bed alcove of his own, opening off a common play-space. This is based purely on the balance between community and privacy. We shall now try to establish the fact that, for everyone in the house, isolated beds, not only those in clusters, are better off in alcoves than in bedrooms. There are two reasons.

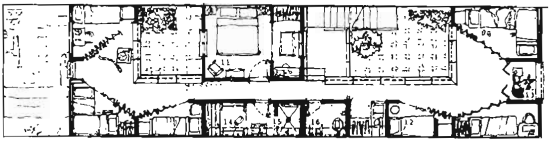
First, the bed in a bedroom creates awkward spaces around it: dressing, working, watching television, sitting, are all rather foreign to the side spaces left over around a bed. We have found that people have a hard time adapting the space around the bed to their needs for bedroom space.

Second, the bed itself seems more comfortable in a space that is adjusted to it. In our design experiments, where lay people have used these patterns to design their own houses, we have noticed a rather strong urge to give the bed a nook of its own, some kind of enclosure. Apparently this particular pattern strikes a chord in people.

Once the bed has been built into a space that is right for it, then the rest of the bedrom space is free to shape itself around the needs for sitting space, play areas, dressing, and storage.

What are the issues at stake in making a good bed alcove?

Spaciousness. Don't make it too tight. It must be comfortable to get in and out and to make the bed. If the alcove is going to function as A ROOM OF ONE'S OWN (141) for a child, then it needs to be almost a tiny room, with one wall missing.

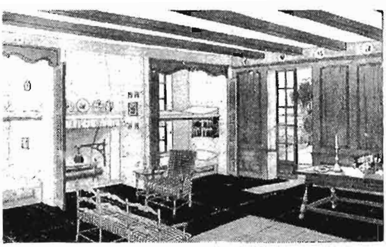


Six bed alcoves in one of our houses in Peru.

Ventilation. Bed alcoves need fresh air; at least a vent of some kind that is adjustable, and better still a window.

Privacy. People will want to draw into the alcove and be private. The opening of the alcove needs a curtain or some other kind of enclosure.

Ceiling. According to the arguments developed with the pattern CEILING HEIGHT VARIETY (190), the bed, as an intimate social space for one or two, needs a ceiling height somewhat lower than the room beside it.



Bed alcoves off a family room.

Therefore:

Don't put single beds in empty rooms called bedrooms, but instead put individual bed alcoves off rooms with other nonsleeping functions, so the bed itself becomes a tiny private haven.

If you are building a very small house no more than 300 or 400 square feet—perhaps with the idea of adding to it gradually—this pattern plays an essential role. It will probably be best then to put the alcoves off the family room.

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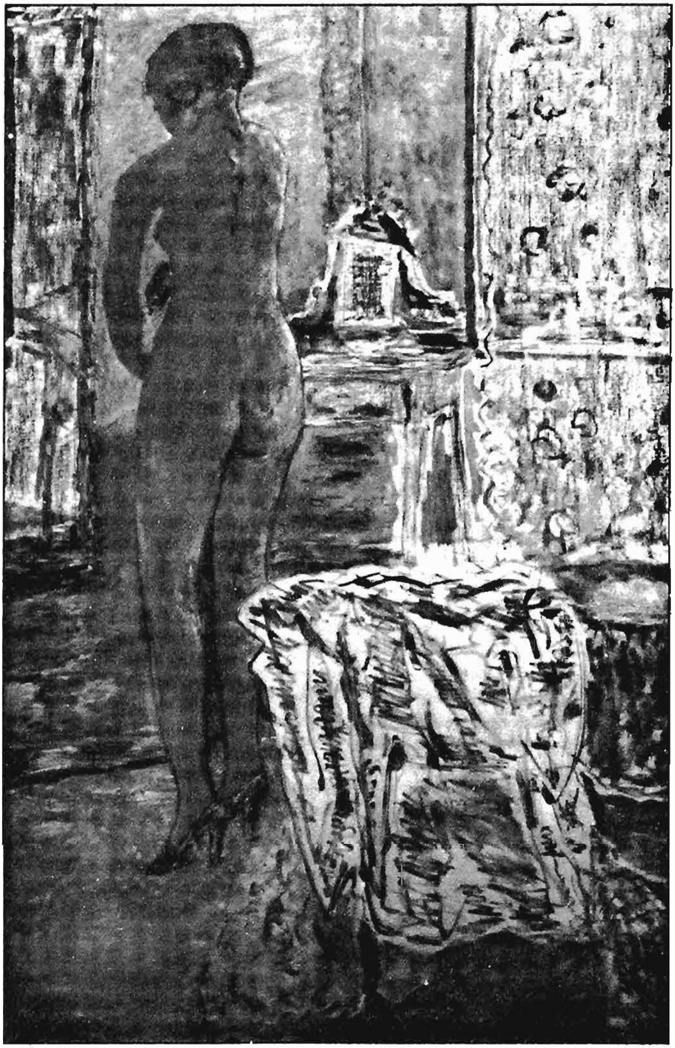
Build the ceiling low—CEILING HEIGHT VARIETY (190); add some storage in the walls around the alcove—THICK WALLS (197), OPEN SHELVES (200), and a window, in a natural position—NATURAL DOORS AND WINDOWS (221). Perhaps HALF-OPEN WALL (193) will help to give the alcove the right enclosure. Where space is very tight, combine the bed alcove with DRESSING ROOM (189). And finally, give each alcove, no matter how small, the characteristics of any indoor space—THE SHAPE OF INDOOR SPACE (191). . . .

189 DRESSING ROOMS*



. . . if the beds are in position—MARRIAGE BED (187), BED ALCOVES (188)—we can give detailed attention to the dressing spaces—both to the closets where people keep their clothes and to the space they use for dressing. These dressing spaces may also help to form the BATHING ROOM (144).

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Dressing and undressing, storing clothes, having clothes lying around, have no reason to be part of any larger complex of activities. Indeed they disturb other activities: they are so self-contained that they themselves need concentrated space which has no other function.

We have argued, in BED ALCOVES (188), that the concept of the bedroom leads to wasted space around the bed. This pattern lends further support to the idea that "bedrooms" in their present form are not valuable entities to have in a house.

The arguments are:

1. Clothes lying around are messy; they can take over a great deal of space; they need some kind of individual space. A dressing space can be for one person or shared by a couple. The important thing is that it be organized as a small space where it is comfortable to store clothes and to dress. When such a space is not provided, *the whole bedroom* is potentially the dressing room; and this can destroy its integrity as a room. It becomes more a big closet to "keep neat," than a room to stay in and relax.

2. People tend to take up a private position while they dress, even where they are relatively intimate with the people they live with. Even in a locker room, people will make a half-turn away from others as they dress. This suggests that the space for dressing be relatively private. The old fashioned standing screens in a green room or a boudoir worked this way; they created a half-private dressing space.

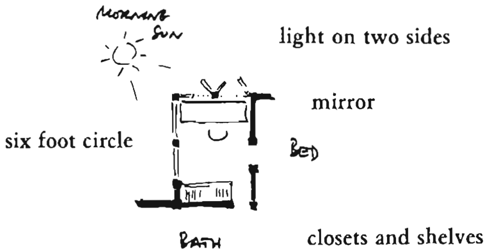
3. The time of dressing, the activity, is a natural moment of transition in the day. It is a time when people think about the day ahead, or unwind at the end of the day and get ready for bed. If you dwell, for a moment, on this transitional quality of

dressing, it seems clear that the dressing space can be made to help support it. For example, a good place to dress will have beautiful natural light; this requires as much thought in your design as any room—see, for example, LIGHT ON TWO SIDES OF EVERY ROOM (159).

4. The dressing space should be large enough, with room to stretch your arms and turn around. This means six or seven feet of open area. It must also have about six feet of clothes hanging space, another six feet of open shelves, and a few drawers for each person. These figures are rough. Check your own closet and shelves, think about what you really need, and make an estimate.

Therefore:

Give everyone a dressing room—either private or shared—between their bed and the bathing room. Make this dressing room big enough so there is an open area in it at least six feet in diameter; about six linear feet of clothes hanging space; and another six feet of open shelves; two or three drawers; and a mirror.



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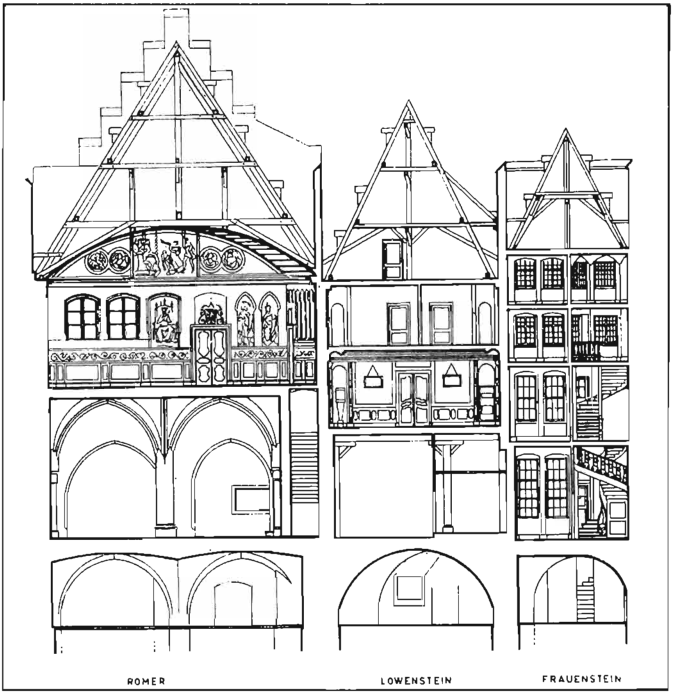
Place each dressing room so that it gets plenty of natural LIGHT ON TWO SIDES (159). Use THICK WALLS (197), CLOSETS BETWEEN ROOMS (198), and OPEN SHELVES (200) to form its walls; include a wide shelf around the edge—WAIST-HIGH SHELF (201); and for the detailed shape of the room, see THE SHAPE OF INDOOR SPACE (191). . . .

fine tune the shape and size of rooms and alcoves to make them precise and buildable;

190. CEILING HEIGHT VARIETY
191. THE SHAPE OF INDOOR SPACE
192. WINDOWS OVERLOOKING LIFE
193. HALF-OPEN WALL
194. INTERIOR WINDOWS
195. STAIRCASE VOLUME
196. CORNER DOORS

190 CEILING HEIGHT VARIETY**



. . . this pattern helps to form the rooms. It therefore helps to complete all the patterns which define rooms, or arcades, or balconies, or outdoor rooms or minor rooms: in short, just about all of the last 100 patterns. If you have been imagining these spaces while you walk about on the actual site, then all these spaces will already be three-dimensional in your mind: they will be volumes of space, not merely areas on plan. Now, with this pattern, which determines ceiling heights, the next pattern which determines the exact shape of each room, and the remaining patterns in the language, we fill out this three dimensional conception of the building.

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A building in which the ceiling heights are all the same is virtually incapable of making people comfortable.

In some fashion, low ceilings make for intimacy, high ceilings for formality. In older buildings which allowed the ceiling heights to vary, this was almost taken for granted. However, in buildings which are governed by standard components, it is very hard to make the ceiling height vary from room to room, so it tends to be forgotten. And people are willing to let it go, because they have forgotten what an important psychological reason there is for making the heights vary.

We have presented three different theories over the years in our attempts to explain the significance of ceiling height variety, and we shall present the evolution of all three theories here, because it puts the matter in perspective and will perhaps allow you to formulate the pattern most coherently for yourself.

Theory one. The ceiling height should be related to the length and breadth of the room, because the problem is one of proportion, and people feel comfortable or uncomfortable according to the room's proportions.

Many efforts have been made to establish rules which will make sure that rooms are "well proportioned." Thus, for instance, Palladio laid down three rules of proportion: all of them shared the feature that the height of a room should be intermediate between its length and its breadth.

In traditional Japanese architecture, this idea is captured by a simple rule of thumb. The ceiling height of a room is 6 feet 3 inches + (3.7 × the number of tatami in the room) inches. This creates a direct relationship between floor area and ceiling height. A very small room (3 mats) has a ceiling height of 7 feet 2 inches. A large room (12 mats) has a ceiling height of 9 feet 11 inches. (See Heinrich Engle, *The Japanese House*, Rutland Vermont: Charles E. Tuttle Company, 1964, pp. 68–71.)

However sound this approach may seem in certain cases, it is clearly not a completely valid geometric principle. There are many rooms with extremely low ceilings, especially in cottages and informal houses, which are extremely pleasant—even though they violate Palladio's principle and the Japanese rule of thumb utterly.

Theory two. The ceiling height is related to the *social distance* between people in the room, and is therefore directly related to their relative intimacy or nonintimacy.

This theory makes it clear what is wrong with badly proportioned rooms, and gives the beginning of a functional basis for establishing the right height for different spaces. The problem hinges on the question of appropriate social distance. It is known that in various kinds of social situations there are appropriate and inappropriate distances between people. (See Edward Hall, *The Silent Language*, New York: Doubleday, 1959, pp. 163–64; and Robert Sommer, "The Distance for Comfortable Conversation," *Sociometry*, 25, 1962, pp. 111–16.) Now, the ceiling height in a room has a bearing on social distance in two ways:

A. The height of a ceiling appears to affect the *apparent distance* of sound sources from a hearer. Thus, under a low ceiling sound sources seem nearer than they really are; under a high ceiling they seem further than they really are.

Since the sound is an important cue in the perception of distance between people (voice, footstep, rustle, and so on), this means that the ceiling height will alter the apparent distance between people. Under a high ceiling people seem further apart than they actually are.

On the basis of this effect, it is clear that intimate situations require very low ceilings, less intimate situations require higher ceilings, formal places require high ceilings, and the most public situations require the highest ceilings: for example, the canopy over the double bed, a fireside nook, high-ceilinged formal reception room, Grand Central Station.

B. Through the medium of three-dimensional "bubbles". We know that each social situation has a certain horizontal dimension or diameter. We may think of this as a kind of membrane or bubble which encloses the situation. It is likely that this bubble needs a vertical component—equal in height to its diameter. If so, the height of the ceiling should, for comfort, be equal to the dominant social distance in the room. Since people in Grand Central are strangers, and have an effective social distance of as much as 100 feet, this would explain why the ceiling has to be very high; similarly, in an intimate nook, or over a double bed, where the social distance is no more than five or six feet, the ceiling has to be very low.

Theory three. Although both of the previous theories contain valuable insights, they must be at least slightly wrong because they assume that the absolute ceiling height in any one room has a critical functional effect. In fact, the *absolute* ceiling height does not matter as much as one would expect from theories one and two.

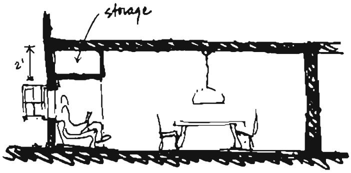
For example, the most intimate room in an igloo may be no more than five feet high; yet in a very hot climate even the most intimate rooms may be nine feet high. This makes it clear that the absolute height of rooms is governed by other factors too—climate and culture. Obviously, then, no theory which prescribes an absolute height for any given social situation, or room size, can be correct. What then, is going on? Why do ceiling heights vary? What functional effect does their variation have?

We have been led, finally, to the conclusion that it is the *variation itself* which matters, not merely the absolute height in any given room. For if a building contains rooms with several different ceiling heights in it and the height has an effect on social relationships (for the reasons given), then the mere fact that the ceiling heights vary, allows people to move from high rooms to low rooms, and vice versa, according to the degree of intimacy they seek—because they know that everyone correlates intimacy with ceiling height.

According to this theory, the effect of the ceiling height is not direct; there is instead a complex interaction between people and space, in which people read the different ceiling heights in a building as messages, and take up positions according to these messages. They are comfortable or uncomfortable according to whether they can take part in this process, and can then feel secure in the knowledge that they have chosen a place of appropriate intimacy.

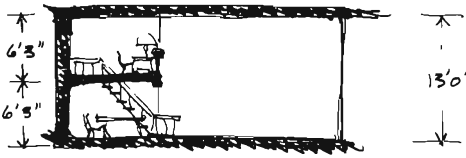
Finally, some special notes are required on the implementation of this pattern. In a one story structure there is no problem; the ceiling heights may vary freely. In buildings with several stories however, it is not so clear cut. The floors of the upper stories must be more or less flat; and this obviously creates problems as you try to vary the ceiling heights underneath. Here are some notes which may help you to solve this problem:

1. Build storage between floors and ceilings—at least two feet deep—where you want to lower ceiling heights.



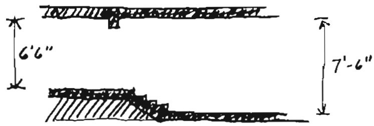
Storage over a low ceiling.

2. Put two alcoves over each other. If each is 6 feet 3 inches, this gives a main ceiling of 13 feet, which is good for very public spaces.



Stacked alcoves.

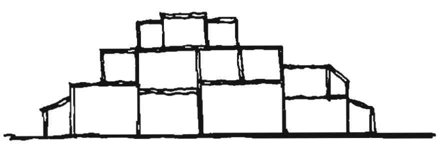
3. Raise the floor level with steps, instead of lowering the ceiling.



The floor does it.

4. It is very important to have some rooms with ceilings as low as 7 feet or 7 feet 6 inches—these are very beautiful.

5. Except in one-story buildings, the low ceilinged rooms will make most sense on upper stories; indeed, the average ceiling height will probably get lower and lower with successive stories—the most public rooms, for the largest gatherings, are typically on the ground, and rooms get progressively more intimate the further they are from the ground.

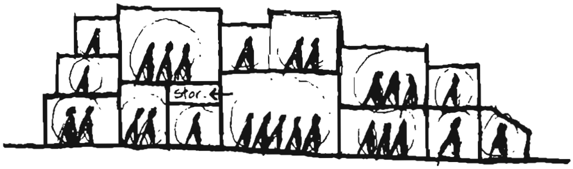


Lower ceilings upstairs.

Therefore:

Vary the ceiling heights continuously throughout the building, especially between rooms which open into each other, so that the relative intimacy of different spaces can be felt. In particular, make ceilings high in rooms which are public or meant for large gatherings (10 to 12 feet), lower in rooms for smaller gatherings (7 to 9 feet), and very low in rooms or alcoves for one or two people (6 to 7 feet).

complete range of ceiling heights



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The construction of floor vaults will create variations in ceiling height almost automatically since the vault starts about 6 feet 6 inches high and rises a further distance which is one-fifth of the room diameter—FLOOR-CEILING VAULTS (219). Where ceiling height varies within one story, put storage in the spaces between the different heights—BULK STORAGE (145). Get the shape of individual rooms under any given ceiling height from THE SHAPE OF INDOOR SPACE (191) and STRUCTURE FOLLOWS SOCIAL SPACES (205); and vary ceiling heights from story to story—the highest ceilings on the ground floor and the lowest on the top floor—see the table in FINAL COLUMN DISTRIBUTION (213). . . .

191 THE SHAPE OF INDOOR SPACE**

. . . from CEILING HEIGHT VARIETY (190) you have an overall conception of each floor in the building as a cascade of heights, typically highest in the middle where the largest rooms are, lower toward the edge where the small rooms are, and varying with floor also, so that the lower floors will tend to have a higher average ceiling height than upper floors. This pattern takes each individual space, within this overall cascade, and gives it a more definite shape.

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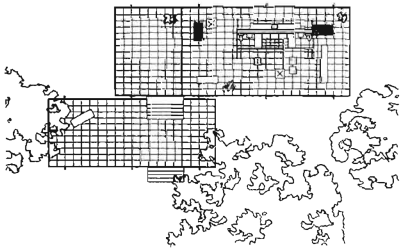
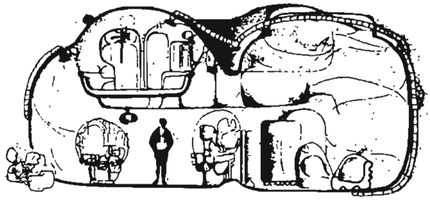
The perfectly crystalline squares and rectangles of ultra-modern architecture make no special sense in human or in structural terms. They only express the rigid desires and fantasies which people have when they get too preoccupied with systems and the means of their production.



. . . *crystalline* . . .

To get away from this madness a new wave of thought has thrown the right angle away completely. Many of the new organic technologies create buildings and rooms shaped more or less like wombs and holes and caves.



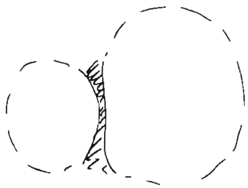
. . . *pseudo biological* . . .

But these biological rooms are as irrational, as much based on images and fantasies as the rigid crystals they are trying to replace. When we think about the human forces acting on rooms, we see that they need a shape which lies between the two. There are reasons why their sides should be more or less straight; and there are reasons why their angles, or many of them anyway, should be rough right angles. Yet their sides have no good reason to be perfectly equal, their angles have no good reason to be perfectly right angles. They only need to be irregular, rough, imperfect rectangles.

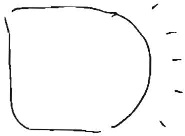
The core of our argument is this. We postulate that every space, which is recognizable and walled enough to be distinct, must have walls which are roughly straight, except when the walls are thick enough to be concave in both directions.

The reason is simple. Every wall has social spaces on both sides of it. Since a social space is convex—see the extensive argument in POSITIVE OUTDOOR SPACE (106)—it must either have a wall which is concave (thus forming a convex space) or a wall which is perfectly straight. But any "thin" wall which is concave toward one side, will be convex toward the other and will, therefore, leave a concave space on at least one side.

Two convex spaces pressed up against each other, form a straight wall between them.



A wall thick enough to be concave on both sides.

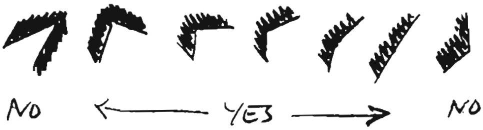


A thin wall, makes a convex space on one side,
and destroys the other side.

Essentially then, every wall with social spaces on both sides of it, must have straight walls, except where it is thick enough to be concave on both sides. And, of course, a wall may be curved whenever there is no significant social space on the outside of it. This happens sometimes in a position where an entrance butts out into a street, or where a bay window stands in a part of a garden which is unharmed by it.

A place where a wall can be curved,
because it works with the outside.

So much for the walls. They must most often be roughly straight. Now for the angles between walls. Acute angles are hardly ever appropriate, for reasons of social integrity again. It is an uphill struggle to make an acute angle in a room, which works. Since the argument for convexity rules out angles of more than 180 degrees, this means that the corners of spaces must almost always be obtuse angles between 80 and 180 degrees. (We say 80, because a few degrees less than a right angle makes no difference.)

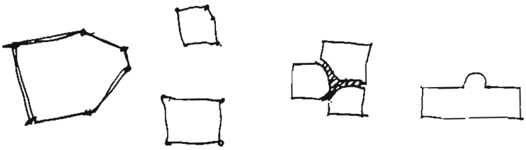


The range of possible corners.

And one further word about the angles. Most often rooms will pack in such a way that angles somewhere near right angles (say between 80 and 100 degrees) make most sense. The reason, simply, is that other obtuse angles do not pack well at corners where several rooms meet. Here are the most likely typical kinds of corners:

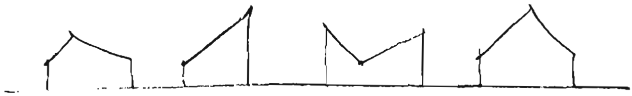
Only angles that are nearly right angles pack successfully.

This means that the majority of spaces in a building must be polygons, in plan, with roughly straight walls and obtuse-angled corners. Most often they will probably be irregular, squashed, rough rectangles. Indeed, respect for the site and the subtleties of the plan will inevitably lead to slightly irregular shapes. And occasionally they may have curved walls—either if the wall is thick enough to be concave on both sides or, on an exterior wall, where there is no important social space outside.



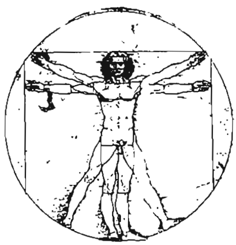
Polygon, rough rectangle, thick curved wall, exterior curved wall.

A final point. Our experience has led us to an even stronger version of this pattern—which constrains the shape of ceilings too. Specifically, we believe that people feel uncomfortable in spaces like these:



Rooms whose ceilings can make you uncomfortable.

We can only speculate on the possible reasons for these feelings. It seems just possible that they originate from some kind of desire for a person to be surrounded by a spherical bubble roughly related to the human axis. Room shapes which are more or less versions of this bubble are comfortable; while those which depart from it strongly are uncomfortable. *Perhaps when the space around us is too sharply different from the imaginary social bubble around us, we do not feel quite like persons.*

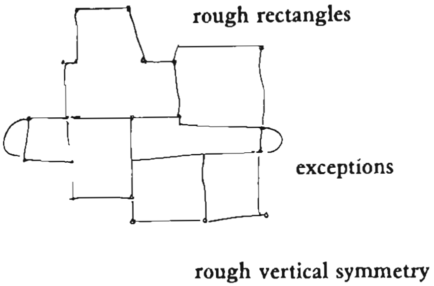


The shape of the space bubble.

A ceiling that is flat, vaulted in one direction or vaulted in two directions, has the necessary character. A ceiling sloping to one side does not. We must emphasize that this conjecture is not intended as an argument in favor of rigidly simple or symmetric spaces. It only speaks against those rather abnormal spaces with one-sided sloping ceilings, high apexed ceilings, weird bulges into the room, and re-entrant angles in the wall.

Therefore:

With occasional exceptions, make each indoor space or each position of a space, a rough rectangle, with roughly straight walls, near right angles in the corners, and a roughly symmetrical vault over each room.



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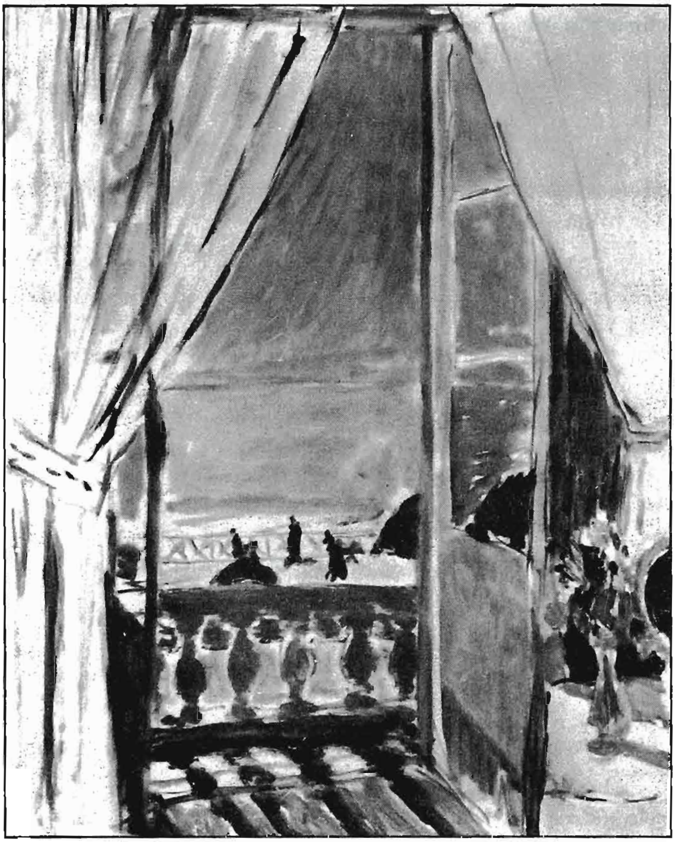
You can define the room with columns, one at each corner—COLUMNS AT THE CORNERS (212); and the shape of the ceiling can be given exactly by the ceiling vault—FLOOR AND CEILING LAYOUT (210), FLOOR-CEILING VAULT (219). Avoid curved walls except where they are strictly necessary—WALL MEMBRANES (218). Where occasional curved walls like bay windows do jut out into the outside, place them to help create POSITIVE OUTDOOR SPACES (106). Make the walls of each room generous and deep —THICK WALLS (197), CLOSETS BETWEEN ROOMS (198); and where it is appropriate, make them HALF-OPEN WALLS (193). For the patterns on the load-bearing structure, engineering, and construction, begin with STRUCTURE FOLLOWS SOCIAL SPACES (205). . . .

192 WINDOWS OVERLOOKING LIFE*



. . . this pattern helps to complete the earlier patterns which give each room its shape: LIGHT ON TWO SIDES OF EVERY ROOM (159), CEILING HEIGHT VARIETY (190), and THE SHAPE OF INDOOR SPACE (191). Once these patterns are clear, this pattern helps to place the windows rather more precisely in the walls. It defines just how many windows there should be, how far apart, and what their total area should be.

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Rooms without a view are prisons for the people who have to stay in them.

When people are in a place for any length of time they need to be able to refresh themselves by looking at a world different from the one they are in, and with enough of its own variety and life to provide refreshment.

Amos Rapoport gives written descriptions of three windowless seminar rooms at the University of California. The descriptions —by teachers and students of English who were asked to write descriptions of the rooms as part of a writing exercise—are heavily negative, even though they were not asked to be, and in many cases refer directly to the windowless, boxed-in, or isolated-from-the-world character of the rooms.

Here are two examples:

> Room 5646 is an unpleasant room in which to attend class because in it one feels detached and isolated from the rest of the world under the buzzing fluorescent lights and the high sound-proofed ceilings, amid the sinks, cabinets, and pipes, surrounded by empty space.
>
> The large and almost empty, windowless room with its sturdy, enclosing, and barren grey walls inspired neither disgust nor liking; one might easily have forgotten how trapped one was. (Amos Rapoport, "Some Consumer Comments on a Designed Environment," *Arena—The Architectural Association Journal*, January 1967, pp. 176–78.)

Brian Wells, studying office workers' choice of working positions, found that 81 per cent of all subjects chose positions next to a window. (*Office Design: A Study of Environment*, Peter Manning, ed., Pilkington Research Unit, Department of Building Science, University of Liverpool, 1965, pp. 118–21.) Many of the subjects gave "daylight" rather than "view" as a reason for their choice. But it is shown elsewhere in the same report that subjects who are far from windows grossly overestimate the amount of daylight they receive as compared with artificial light (*Office Design* p. 58). This suggests that people want to be near windows for other reasons over and above the daylight. Our conjecture that it is the view which is critical is given more weight by the fact that people are less interested in sitting near windows which open onto light wells, which admit daylight, but present no view.

And Thomas Markus presents evidence which shows clearly that office workers prefer windows with meaningful views—views of city life, nature—as against views which also take in large areas, but contain uninteresting and less meaningful elements. (Thomas A. Markus, "The Function of Windows: A Reappraisal," *Building Science*, 2, 1967, pp. 97–121; see especially p. 109.)

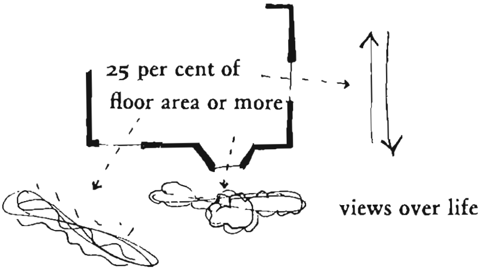
Assume then that people do need to be able to look out of windows, at some world different from their immediate surroundings. We now give very rough figures for the total area of the windows in a room. The area of window needed will depend to a large extent on climate, latitude, and the amount of reflecting surfaces around the outside of the building. However, it is fairly reasonable to believe that the floor/window ratio, though different in different regions, may be more or less constant within any given region.

We suggest, therefore, that you go round the town where you live, and choose half a dozen rooms in which you really like the light. In each case, measure the window area as a percentage of the floor area; then take the average of the different percentages.

In our part of the world—Berkeley, California—we find that rooms are most pleasant when they have about 25 per cent window—sometimes as much as 50 per cent—(that is, 25–50 square feet of window for every 100 square feet of floor). But we repeat, obviously this figure will vary enormously from one part of the world to another. Imagine: Rabat, Timbuctoo, Antarctica, Northern Norway, Italy, Brazilian jungle. . . .

Therefore:

In each room, place the windows in such a way that their total area conforms roughly to the appropriate figures for your region (25 per cent or more of floor area, in the San Francisco Bay Area), and place them in positions which give the best possible views out over life: activities in streets, quiet gardens, anything different from the indoor scene.



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Fine tune the exact positions of the windows at the time that you build them—NATURAL DOORS AND WINDOWS (221); break the area of each window into SMALL PANES (239); give each window a very LOW SILL (222) to improve the view and DEEP REVEALS (223) to make the light as soft as possible inside. . . .

193 HALF-OPEN WALL*

. . . THE SHAPE OF INDOOR SPACE (191) defines the shapes of rooms and minor rooms. This pattern gives more detail to the walls between these rooms. Wherever there are HALF-PRIVATE OFFICES (152), SIX-FOOT BALCONIES (167), ALCOVES (179), SITTING CIRCLES (185), BED ALCOVES (188), BUILDING THOROUGHFARES (101), ARCADES (119), or THE FLOW THROUGH ROOMS (131), the spaces must be given a subtle balance of enclosure and openness by partly opening up the walls or keeping them half-open.

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Rooms which are too closed prevent the natural flow of social occasions, and the natural process of transition from one social moment to another. And rooms which are too open will not support the differentiation of events which social life requires.

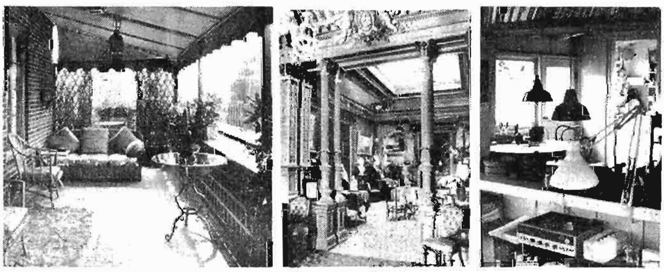
A solid room, for instance, with four walls around it can obviously sustain activities which are quite different from the activities in the next room. In this sense it is excellent. But it is very hard for people to join in these activities or leave them naturally. This is only possible if the door is glazed, or if there is a window in the wall, or if there is an opening, so that people can gradually come forward, just when there is a lull in the conversation, and naturally become a part of what is happening.

On the other hand, an open space with no walls around it, just a place marked by a carpet on the floor and a chair arrangement, but entirely open to the spaces all around it, is so exposed that people never feel entirely comfortable there. No one activity can establish itself because it is too vulnerable; and so the things that happen there tend to be rather bland—a drink, reading the paper, watching television, staring at the view, "sitting around": you will not find animated conversations, arguments, excitement, people making things, painting, card games, charades, or someone practicing the violin. People let themselves go into these more highly differentiated activities, when there is some degree of enclosure around them—at least a half-wall, a railing, columns, some separation from the other nearby spaces.

In short, the subtle conflict between exposure and enclosure naturally requires a balance. But for some reason the modern images of rooms and indoor space lead people to the two extremes, and hardly ever to the balance which is needed.

The kind of space which most easily supports both differentiation of activities and the transition between different activities has less enclosure than a solid room, and more enclosure—far more—than a space inside an open plan.

A wall which is half-open, half-enclosed—an arch, a trellised wall, a wall that is counter height with ornamented columns, a wall suggested by the reduction of the opening or the enlargement of the columns at the corners, a colonnade of columns in the wall—all these help get the balance of enclosure and openness right; and in these places people feel comfortable as a result.



Examples.

From WORKSPACE ENCLOSURE (183) we have some evidence for the amount of enclosure required. We found there that a person is comfortable when he is about "half" enclosed—when he has material around him on about two sides, or the four sides around him are about half solid and half-open.

We therefore guess that the enclosure of any half-open wall should itself consist of about 50 per cent void and 50 per cent solid. This does not mean that it has to be a screen. For example, a combination of thick columns, deep beams, arched openings, also creates this balance of openings and enclosures. A railing is too open. But a balustrade with thick supports will often be just right.

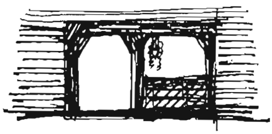
This applies very strongly to outdoor rooms and balconies; and equally to all those indoor spaces which are connected to larger rooms but partly separate from them—an alcove, workspace, kitchen, bed. In all these cases the wall which forms the enclosure and separates the smaller space from the larger one, needs to be partially open and partially closed.

Among ourselves and many of our friends, we have found that the urge to remodel a house is virtually one and the same with the urge to create half-open walls between various parts of the house. It seems that without ever naming this pattern, people have the instinct to "open up" a room; or to give "more enclosure" to some other space.

Therefore:

Adjust the walls, openings, and windows in each indoor space until you reach the right balance between open, flowing space and closed cell-like space. Do not take it for granted that each space is a room; nor, on the other hand, that all spaces must flow into each other. The right balance will always lie between these extremes: no one room entirely enclosed; and no space totally connected to another. Use combinations of columns, half-open walls, porches, indoor windows, sliding doors, low sills, french doors, sitting walls, and so on, to hit the right balance.

50 per cent opening



50 per cent solid

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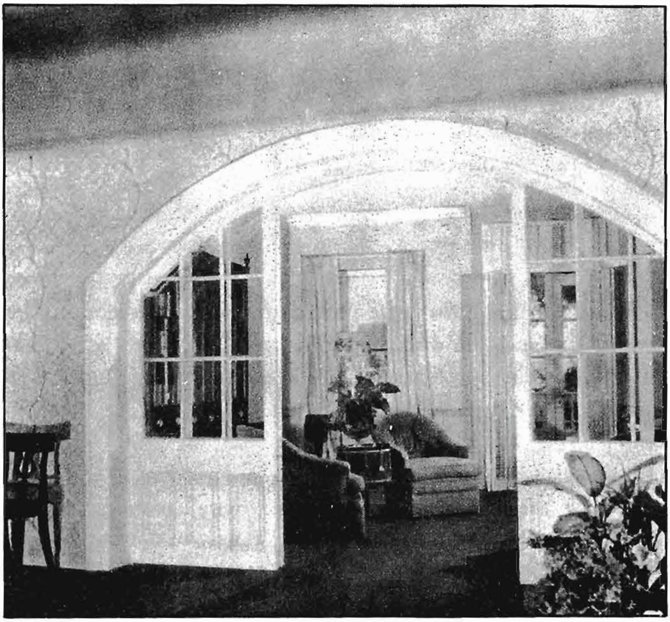
Wherever a small space is in a larger space, yet slightly separate from it, make the wall between the two about half-open and half-solid—ALCOVES (179), WORKSPACE ENCLOSURE (183). Concentrate the solids and the openings, so that there are essentially a large number of smallish openings, each framed by thick columns, waist high shelves, deep soffits, and arches or braces in the corners, with ornament where solids and openings meet—INTERIOR WINDOWS (194), COLUMNS AT THE CORNERS (212), COLUMN PLACE (226), COLUMN CONNECTIONS (227), SMALL PANES (239), ORNAMENT (249). . . .

194 INTERIOR WINDOWS



. . . at various places in the building, there are walls between rooms where windows would help the rooms to be more alive by creating more views of people and by letting extra light into the darkest corners. For instance, between passages and rooms or between adjacent living rooms, or between adjacent work rooms —BUILDING THOROUGHFARE (101), ENTRANCE ROOM (130), THE FLOW THROUGH ROOMS (131), SHORT PASSAGES (132), TAPESTRY OF LIGHT AND DARK (135), SEQUENCE OF SITTING SPACES (142), HALF-OPEN WALL (193).

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Windows are most often used to create connections between the indoor and the outdoors. But there are many cases when an indoor space needs a connecting window to another indoor space.

This is most often true for corridors and passages. These places can easily seem deserted. People feel more connected to one another by interior windows, and the passages in the building become less deserted.

The same may hold for certain rooms, especially small rooms. Three bare walls and a window can seem like a prison. Windows placed between rooms, or between a passage and a room, will help to solve these problems and will make both the passages and the rooms more lively.

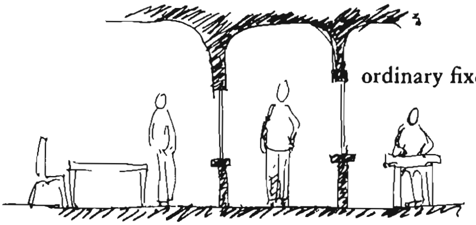
Furthermore, when rooms and passages are visibly connected to one another, it is possible to grasp the overall arrangement of a building far more clearly than in a building with blank walls between all the rooms.

It is enough if these windows allow people to see through them; they do not need to be open nor the kind which can be opened. Ordinary, cheap, fixed glazing will do all that is required.

Therefore:

Put in fully glazed fixed windows between rooms which

tend to be dead because they have too little action in them or where inside rooms are unusually dark.



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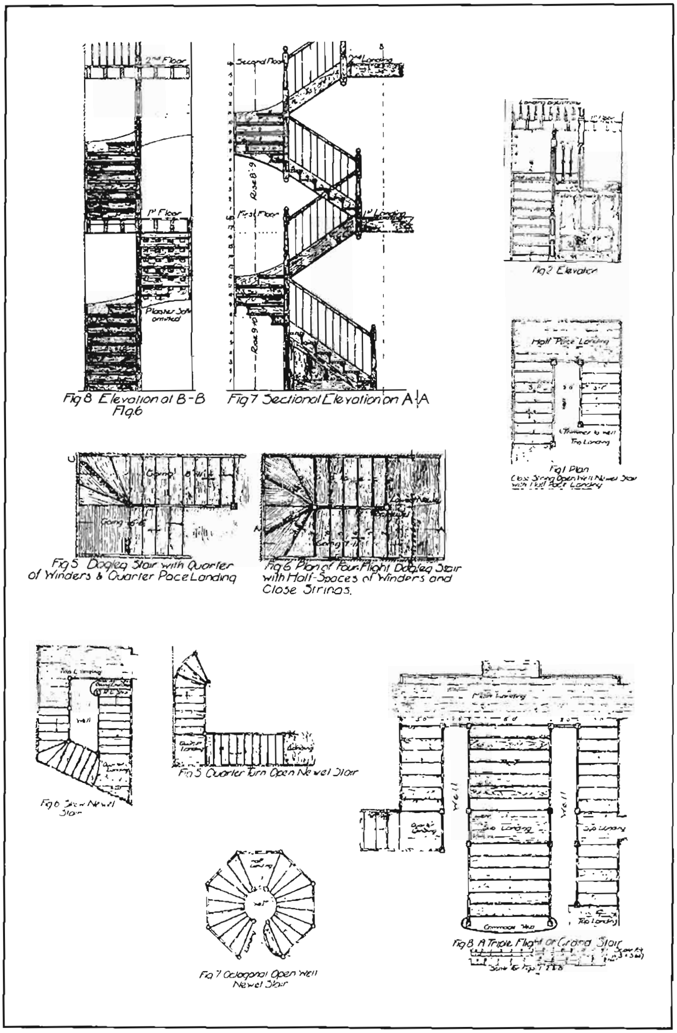
Make the windows the same as any other windows, with small panes of glass—SMALL PANES (239). In some case it may be right to build interior windows in the doors—SOLID DOORS WITH GLASS (237). . . .

195 STAIRCASE VOLUME*



. . . STAIRCASE AS A STAGE (133) and OPEN STAIRS (158) will tell you roughly where to place the various stairs, both indoors and outdoors. This pattern gives each stair exact dimensions and treats it like a room so that it becomes realistic in the plan.

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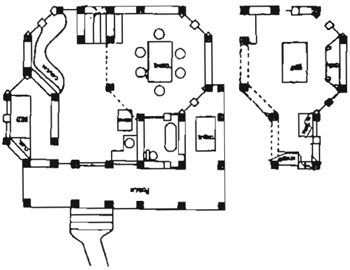
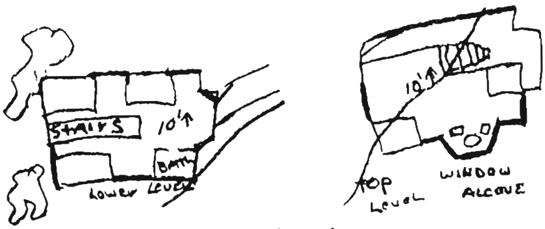
We are putting this pattern in the language because our experiments have shown us that lay people often make mistakes about the volume which a staircase needs and therefore make their plans unbuildable.

Here are some examples of the stairs which people who are not used to building, draw, or think of, when they try to lay out houses for themselves.



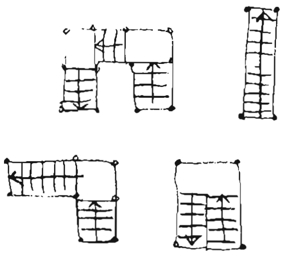
Staircase problems—too short



. . . *no upstairs volume.*

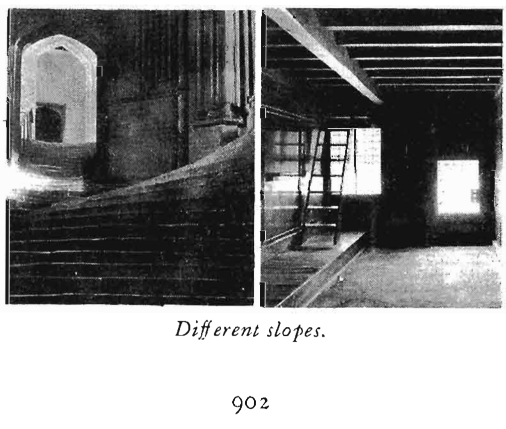
Obviously, these stairs will not work; and the misunderstandings of the nature of the stair are so basic, that it is hard to correct these plans without destroying them. In order to put in a realistic stair, it would be necessary to rethink the plan entirely. To avoid this kind of mental backtracking, it is essential that stairs be more or less realistic *from the very start.*

The simplest way to understand a stair is this. *Every staircase occupies a volume, two stories high.* If this volume is the right shape, and large enough to give the stair its rise, then it will be possible to fill it later, with a stair which works.



Two-story space.

There are several possible layouts for this volume: any one of them will work, provided that the length of run is long enough for the slope of the stair, and the floor to floor height. We urge you to be as free as possible when you decide the slope of the stair. Unfortunately, the search for perfect safety in housing laws, insurance standards, and bank policies, has exaggerated the



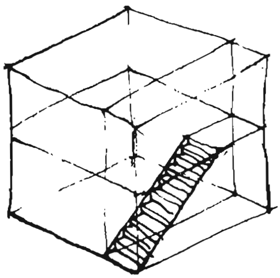
Different slopes.

standardisation of slopes. For example, Federal Housing Authority regulations specify that stairs should be between 30 and 35 degrees in slope. But in some cases—a very small house, a stair to the roof—such a shallow stair is a waste of space; a steep stair is far more appropriate. And in other cases—a main stair in a public building, or an outdoor stair—a much shallower stair is more generous, and more appropriate.

Therefore:

Make a two story volume to contain the stairs. It may be straight, L-shaped, U-shaped, or C-shaped. The stair may be 2 feet wide (for a very steep stair) or 5 feet wide for a generous shallow stair. But, in all cases, the entire stairwell must form one complete structural bay, two stories high.

Do not assume that all stairs have to have the "standard" angle of 30 degrees. The steepest stair may almost be a ladder. The most generous stair can be as shallow as a ramp and quite wide. As you work out the exact slope of your stair, bear in mind the relationship: riser + tread = 17½ inches.



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Construct the staircase as a vault, within a space defined by columns, just like every other room—COLUMNS AT THE CORNERS (212), STAIR VAULT (228). And make the most of the staircase; underneath it is a place where the children can play and hide—CHILD CAVES (203); and it is a place to sit and talk—STAIR SEATS (125). . . .

196 CORNER DOORS*

. . . this pattern helps you place doors exactly. Use it to help create the larger FLOW THROUGH ROOMS (131). You can use it too, to generate a SEQUENCE OF SITTING SPACES (142), by leaving small corners for sitting, uninterrupted by the doors; and you can use it to create TAPESTRY OF LIGHT AND DARK (135), since every door, if glazed and near a window, will create a natural pool of light which people gravitate toward.

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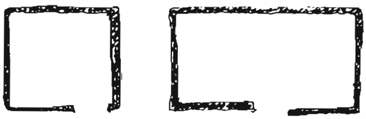
The success of a room depends to a great extent on the position of the doors. If the doors create a pattern of movement which destroys the places in the room, the room will never allow people to be comfortable.

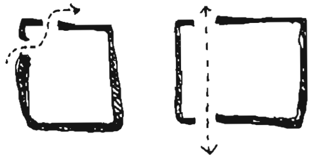
First there is the case of a room with a single door. In general, it is best if this door is in a corner. When it is in the middle of a wall, it almost always creates a pattern of movement which breaks the room in two, destroys the center, and leaves no single area which is large enough to use. The one common exception to this rule is the case of a room which is rather long and narrow. In this case it makes good sense to enter from the middle of one of the long sides, since this creates two areas, both roughly square, and therefore large enough to be useful. This kind of central door is especially useful when the room has two partly separate functions, which fall naturally into its two halves.



Rooms with one door.

Now, the case of a room with two or more doors: the individual doors should still be in the corners for the reasons given above. But we must now consider not only the position of the individual doors, but the relation between the doors. If possible, they should be placed more or less along the same side, so as to leave the rest of the room untouched by movement.

More generally, if we draw lines which connect the doors, then the spaces which are left uncut by these lines, should be large enough to be useful, and should have a strong positive shape—a triangular space left between paths of circulation will hardly ever be used.

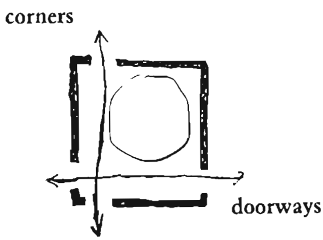


Rooms with more than one door.

Finally, note that this pattern does not apply to very large rooms. In a very large room, or in a room with a big table in the middle, the doors can be in the middle, and still create a special formal, spacious feeling. In fact, in this case, it may even be better to put them in the middle, just to create this feeling. But this only works when the room is large enough to benefit from it.

Therefore:

Except in very large rooms, a door only rarely makes sense in the middle of a wall. It does in an entrance room, for instance, because this room gets its character essentially from the door. But in most rooms, especially small ones, put the doors as near the corners of the room as possible. If the room has two doors, and people move through it, keep both doors at one end of the room.



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When a door marks a transition, as it does into a bedroom or a private place, for instance, make it as low as you dare—LOW DOORWAY (224); and thicken the entry way with closet space where it needs to be especially private—CLOSETS BETWEEN ROOMS (198). Later, when you make the door frame, make it integral with the wall, and decorate it freely—FRAMES AS THICKENED EDGES (225), ORNAMENT (249); except when rooms are very private, put windows in the door—SOLID DOORS WITH GLASS (237). . . .

give all the walls some depth, wherever there are to be alcoves, windows, shelves, closets or seats.

197. THICK WALLS

198. CLOSETS BETWEEN ROOMS

199. SUNNY COUNTER

200. OPEN SHELVES

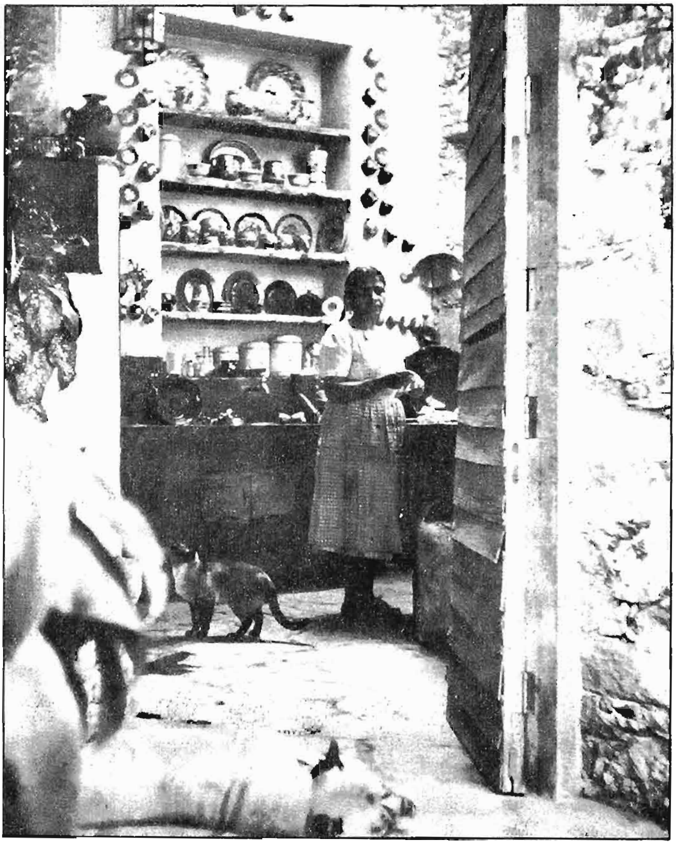
201. WAIST-HIGH SHELF

202. BUILT-IN SEATS

203. CHILD CAVES

204. SECRET PLACE

197 THICK WALLS**



. . . once the plan is accurate to the nearest 5 or 6 feet, there is a final process in which the smallest spaces—niches, built-in seats, counters, closets and shelves—get built to form the walls. Or of course, you can build this pattern into an existing house. In either case, use the pattern so that it helps to create the proper shapes for rooms—THE SHAPE OF INDOOR SPACE (191), the ceiling heights—ALCOVES (179), WINDOW PLACES (180), and CEILING HEIGHT VARIETY (190), and, on the outside of the rooms, the nooks and crannies of the BUILDING EDGE (160).

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Houses with smooth hard walls made of prefabricated panels, concrete, gypsum, steel, aluminum, or glass always stay impersonal and dead.

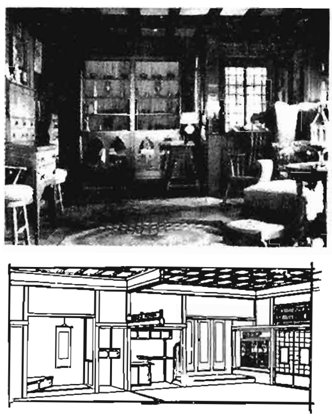
In the world we live in today, newly built houses and apartments are more and more standardized. People no longer have a chance to make them personal and individual. A personal house tells us about the people who live there. A child's swing hanging in a doorway reflects the attitude of parents to their children. A window seat overlooking a favorite bush supports a contemplative, dreamy nature. Open counters between kitchen and living space are specific to informal family life; small closable hatches between the two are specific to more formal styles. An open shelf around a room should be seen at one height to display a collector's porcelain, best seen from above; at another height and depth if it is to be used to support a photographer's latest pictures; at another height again for setting down drinks in the house of a perennial party-giver. A large enough fireplace nook, with enough built-in seats, invites a family of six to sit together.

Each of these things gives us a sense about the people living in the house because each expresses some special personal need. And everyone needs the opportunity to adapt his surroundings to his own way of life.

In traditional societies this personal adaptation came about very easily. People lived in the same place for very long periods, often for whole lifetimes. And houses were made of hand-processed materials like wood, brick, mud, straw, plaster, which are easily modified by hand by the inhabitants themselves. Under these conditions, the personal character of the houses came about almost automatically from the fact of occupancy.

However, in a modern technological society, neither of these two conditions holds good. People move frequently, and houses are increasingly built of factory-made, factory-finished materials, like 4 x 8 foot sheets of finished plaster board, aluminum windows, prefabricated baked enamel steel kitchens, glass, concrete, steel—these materials do not lend themselves at all to the gradual modification which personal adaptation requires. Indeed, the processes of mass production are almost directly incompatible with the possibility of personal adaptation.

The crux of the matter lies in the walls. Smooth hard flat industrialized walls make it impossible for people to express their own identity, because most of the identity of a dwelling lies in or near its surfaces—in the 3 or 4 feet near the walls. This is where people keep most of their belongings; this is where special lighting fixtures are; this is where special built-in furniture is placed; this is where the special cosy nooks and corners are that individual family members make their own; this is where the identifiable small-scale variation is; this is the place where people



The identity of a house comes from its walls.

can most easily make changes and see the product of their own craftsmanship.

The house will become personal only if the walls are so constructed that each new family can leave its mark on them—they must, in other words, invite incremental fine adjustments, so that the variety of the inhabitants who live in it rubs off on them. And the walls must be so constructed that these fine adjustments are permanent—so that they do accumulate over time and so that the stock of available dwellings becomes progressively more and more differentiated.

All this means that the walls must be extremely deep. To contain shelves, cabinets, displays, special lights, special surfaces, deep window reveals, individual niches, built in seats and nooks, the walls must be at least a foot deep; perhaps even three or four feet deep.

And the walls must be made of some material which is inherently structural—so that however much of it gets carved out, the whole remains rigid and the surface remains continuous almost no matter how much is removed or added.

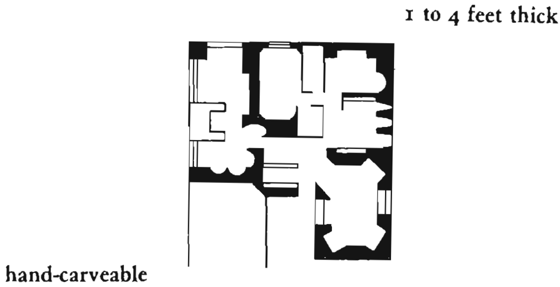
Then, as time goes on, each family will be able to work the wall surfaces in a very gradual, piecemeal, incremental manner. After a year or two of occupancy, each dwelling will begin to show its own characteristic pattern of niches, bay windows, breakfast nooks, seats built into the walls, shelves, closets, lighting arrangements, sunken parts of the floor, raised parts of the ceiling.

Each house will have a memory; the characteristics and personalities of different human individuals can be written in the thickness of the walls; the houses will become progressively more and more differentiated as they grow older, and the process of personal adaptation—both by choice and by piecemeal modification—has room to breathe. The full version of this pattern was originally published by Christopher Alexander: "Thick Walls," *Architectural Design*, July 1968, pp. 324–26.

Therefore:

Open your mind to the possibility that the walls of your building can be thick, can occupy a substantial volume—even actual usable space—and need not be merely thin

membranes which have no depth. Decide where these thick walls ought to be.



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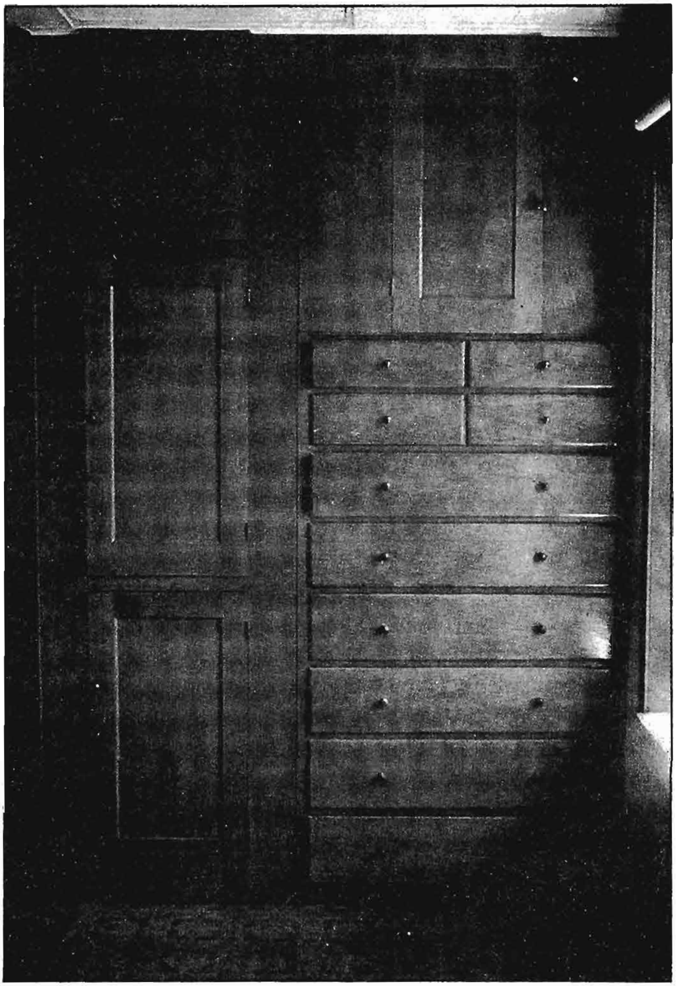
Where the thickness is 3 or 4 feet, build the thickness and the volume of the walls according to the process described in THICKENING THE OUTER WALLS (211); where it is less, a foot or 18 inches, build it from open shelves stretched between deep vertical columns—OPEN SHELVES (200), COLUMNS AT THE CORNERS (212). Get the detailed position of the various things within the wall from the patterns which define them: WINDOW PLACE (180), CLOSETS BETWEEN ROOMS (198), SUNNY COUNTER (199), WAIST HIGH SHELF (201), BUILT-IN SEATS (202), CHILD CAVES (203), SECRET PLACE (204). . . .

198 CLOSETS BETWEEN ROOMS*



. . . given the layout of rooms, it is now necessary to decide exactly where to put the built-in cupboards and closets. Use them, especially, to help form the enclosure around a workspace—WORKSPACE ENCLOSURE (183), around a dressing space—DRESSING ROOM (189), and around the doors of rather private rooms so that the doorway itself gets some depth—CORNER DOOR (196).

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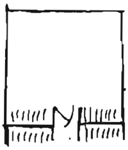
The provision of storage and closets usually comes as an afterthought.

But when they are correctly placed, they can contribute greatly to the layout of the building.

Perhaps the most important secondary feature of storage space is its sound insulating quality. The extra wall sections, and the doors enclosing the closet, as well as the clothes, boxes, and so on, that are being stored, all work to create substantial acoustical barriers. You can take advantage of this feature of closet space by locating all required storage areas within the walls separating rooms rather than in exterior walls, where they cut off natural light.

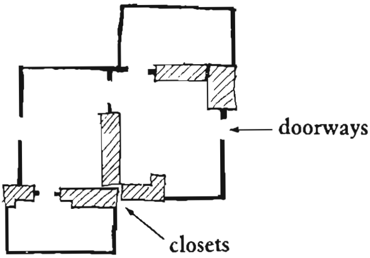
In addition, when storage is placed in the interior walls of a room, around the doorway, the resulting thickness will make the transitions between rooms and corridors more distinct. For the person entering such a room, the thickness of the wall creates a subtle "entry" space, which makes the room more private. This way of making the closet "thickness" around an entrance is therefore appropriate for spaces like the COUPLE'S REALM (136) and the various private rooms—A ROOM OF ONE'S OWN (141).



Closets form the entrance to the room.

Therefore:

Mark all the rooms where you want closets. Then place the closets themselves on those interior walls which lie between two rooms and between rooms and passages where you need acoustic insulation. Place them so as to create transition spaces for the doors into the rooms. On no account put closets on exterior walls. It wastes the opportunity for good acoustic insulation and cuts off precious light.



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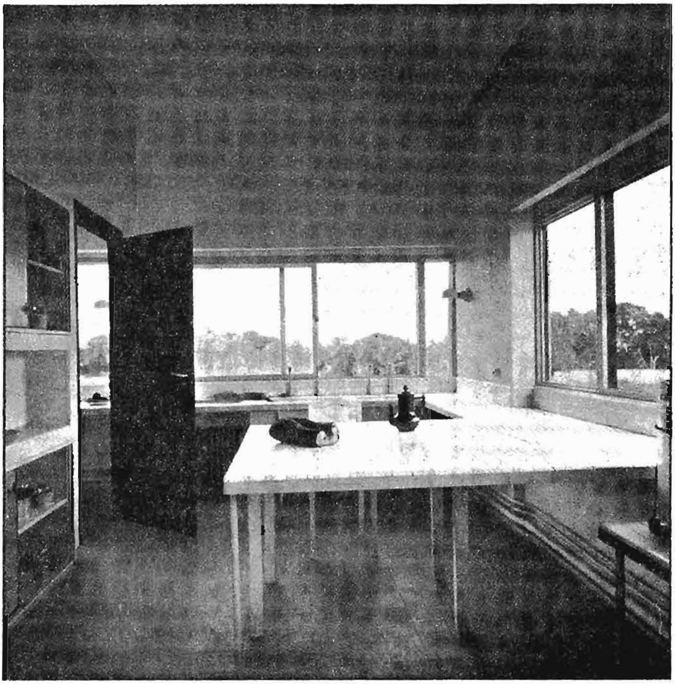
Later, include the closets as part of the overall building structure—THICK WALLS (197). . . .

199 SUNNY COUNTER*



. . . FARMHOUSE KICHEN (139) and COOKING LAYOUT (184) give the overall design of the kitchen, and its workspace. INDOOR SUNLIGHT (128) makes sure of sunshine in the kitchen. But to help create these larger patterns, and to make the kitchen as warm and beautiful as possible, it is worth taking a great deal of care placing the counter and its windows.

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Dark gloomy kitchens are depressing. The kitchen needs the sun more than the other rooms, not less.

Look how beautiful the workspace in our main picture is. Nearly the whole counter is lined with windows. The work surface is bathed in light, and there is a sense of spaciousness all around. There is a view out, an air of calm.

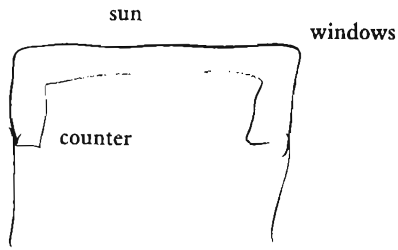
A gloomy kitchen.

Compare it with this gloomy kitchen. There is no natural light on the work counter, the cabinets are a clutter; it is a shabby experience to work there—to work below a cabinet, facing a wall with artificial light in the middle of the day.

This gloomy kitchen is typical of many thousands of kitchens in modern houses. It happens for two reasons. First, people often place kitchens to the north, because they reserve the south for living rooms and then put the kitchen in the left over areas. And it happens, secondly, when the kitchen is thought of as an "efficient" place, only meant for the mechanical cooking operations. In many apartments, efficiency kitchens are even in positions where they get no natural light at all. But, of course, the arguments we have presented in FARMHOUSE KITCHEN (139) for making the kitchen a living room, not merely a machine-shop, change all this.

Therefore:

Place the main part of the kitchen counter on the south and southeast side of the kitchen, with big windows around it, so that sun can flood in and fill the kitchen with yellow light both morning and afternoon.



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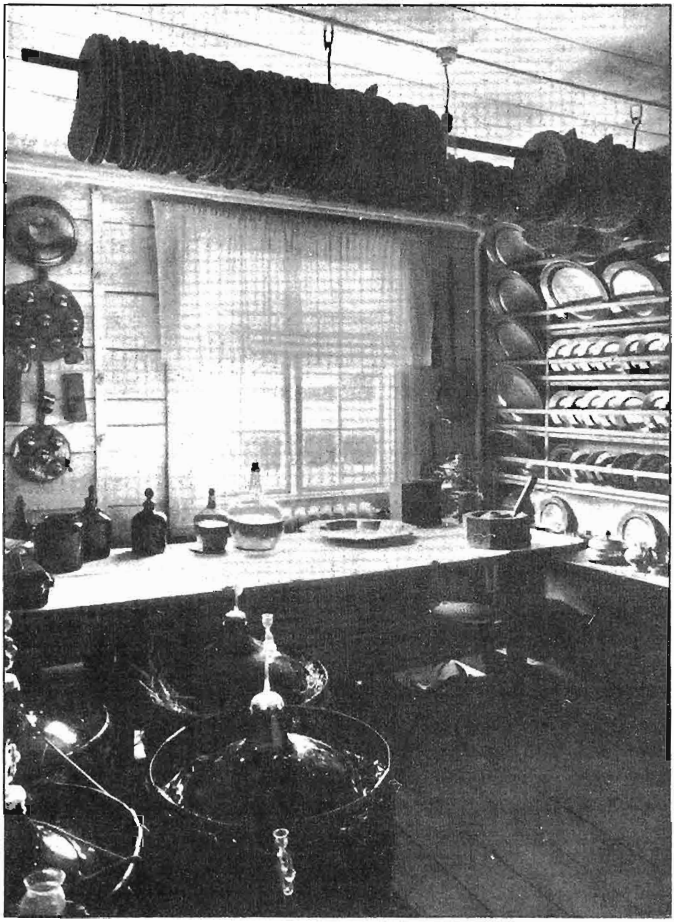
Give the windows a view toward a garden or the area where children play—WINDOWS OVERLOOKING LIFE (192). If storage space is tight, you can build open shelves for bowls and plates and plants right across the windows and still let in the sun—OPEN SHELVES (200). Build the counter as a special part of the room, integral with the building structure, able to take many modifications later—THICKENING THE OUTER WALLS (211). Use WARM COLORS (250) around the window to soften and warm the sunlight. . . .

200 OPEN SHELVES*



. . . within the THICK WALLS (197), especially around the FARMHOUSE KITCHEN (139) and WORKSPACE ENCLOSURE (183), but possibly throughout the building, there is a need for shelves. This pattern helps you decide exactly where you want them and how they shall be organized. Mary Louise Rogers first made the pattern explicit for us.

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Cupboards that are too deep waste valuable space, and it always seems that what you want is behind something else.

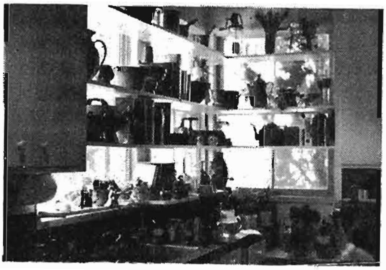
It is easy to think that you have good storage in a room or in a building just because you have enough closets, cupboards, and shelves. But the value of storage depends as much on the ease of access as on the amount. An enormous amount of cupboard space in a place where no one can get to it is not very useful. It is useful when you can find the things which you have put away at a glance.

This means, essentially, that except for BULK STORAGE (145), things should be stored on open shelves, "one deep." Then you can see them all. It means, in effect, that you are flattening out the total storage all over the walls—instead of having it in solid lumps, hidden, and hard to reach.

The need for open storage is most obvious in kitchens. In badly planned kitchens, the shelves are filled with things three or four items deep, sometimes stacked on top of each other, and something is always in the way of what you need. But in well-planned kitchens, all storage is one item deep. Shelves are one can deep, glasses are stored one row deep, pots and pans are hung one deep on the wall; for small jars and spices there are special spice shelves that hold the items just one deep.

We think this property is common to all convenient storage. A family's most prized possessions, gifts, whether for the kitchen or any place else in the house, are hidden away when they are stored in cupboards and the back shelves of closets. Openly stored, one deep, these things are beautiful around the house.

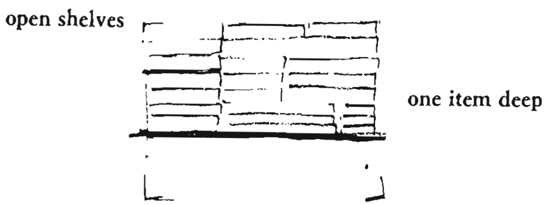
Many forms of storage can be one-deep: swinging cabinets that have shelves inside the doors; pegboards for pots and pans; tool racks. It is even possible to create narrow open shelves in front of windows. When things are just one deep, there is still enough light coming in to make the window useful.



Open shelves across a window.

Therefore:

Cover the walls with narrow shelves of varying depth but always shallow enough so that things can be placed on them one deep—nothing hiding behind anything else.



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At waist height put in an extra deep shelf for plates, phonograph, TV, boxes, displays, treasures—WAIST-HIGH SHELF (201). Mark the open shelves along with all the other deep spaces in the walls—THICKENING THE OUTER WALL (211). . . .

201 WAIST-HIGH SHELF

. . . anywhere where there are open shelves, and around any room which tends to accumulate potted plants, books, plates, bits of paper, boxes, beautiful vases, and little things you have picked up along your travels, there is a need for space where these things can lie undisturbed, without making the room a mess—THICK WALLS (197), OPEN SHELVES (200).

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In every house and every workplace there is a daily "traffic" of the objects which are handled most. Unless such things are immediately at hand, the flow of life is awkward, full of mistakes; things are forgotten, misplaced.

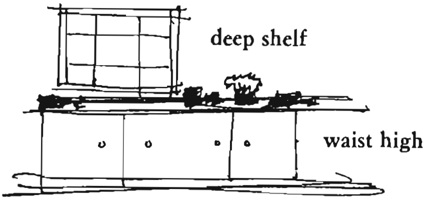
The essence of this problem lies in the phrase "at hand." This is literally true and needs to be interpreted as such. When a person reaches for something, his hands are roughly at waist height. When there are surfaces here and there, around the rooms and passages and doors, which are at waist height, they become natural places to leave things and later pick them up. Pocket change, pictures, open books, an apple, a package, a newspaper, the day's mail, a reminder note: these things are at hand on a waist high shelf. When there are no such surfaces, then things either get put away and are then forgotten and lost, or they are in the way and must continually be cleared aside.

Furthermore, the things that tend to collect on waist high shelves become a natural, evolving kind of display of the most ordinary things—the things that are most immediately a part of one's life. And since for each person these things will vary, the waist high shelf helps a room become unique and personal, effortlessly.

Therefore:

Build waist-high shelves around at least a part of the

main rooms where people live and work. Make them long, 9 to 15 inches deep, with shelves or cupboard underneath. Interrupt the shelf for seats, windows, and doors.



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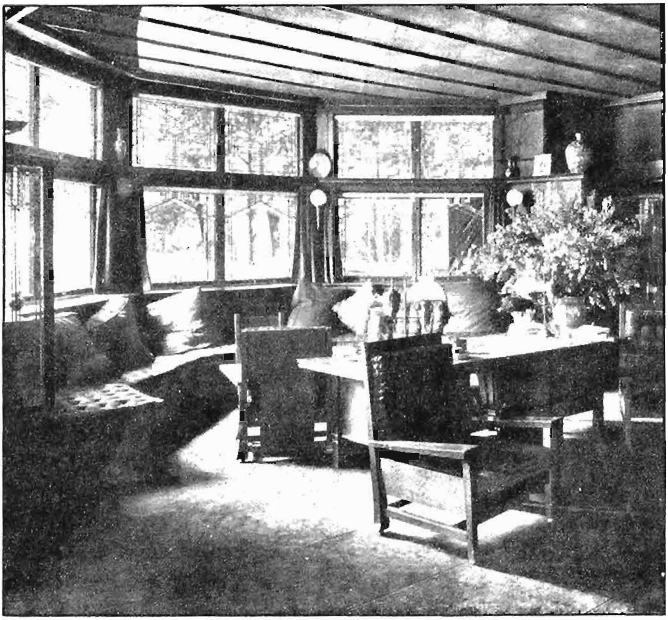
Build the shelf right into the structure of the building—THICKENING THE OUTER WALL (211). It is a good place to put your personal treasures—THINGS FROM YOUR LIFE (253). . . .

202 BUILT-IN SEATS*



. . . throughout the building—SEQUENCE OF SITTING SPACES (142)—there are alcoves, entrances, corners, and windows where it is natural to make built-in seats—ENTRANCE ROOM (130), ALCOVES (179), WINDOW PLACE (180). This pattern helps complete them.

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Built-in seats are great. Everybody loves them. They make a building feel comfortable and luxurious. But most often they do not actually work. They are placed wrong, or too narrow, or the back does not slope, or the view is wrong, or the seat is too hard. This pattern tells you what to do to make a built-in seat that really works.

Why do built-in seats so often not work properly? The reasons are simple and fairly easy to correct. But the problems are critical. If the seats are wrongly made, they just will not be used, and they will be a waste of space, a waste of money, and a wasted golden opportunity. What are the critical considerations?

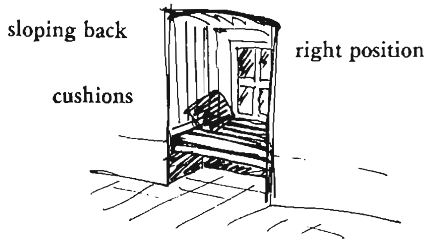
Position: It is natural to put the built-in seat into an unobtrusive corner—that is where it melts most easily into the structure and the wall. But, as a result, it is often out of the way. If you want to build a seat, ask yourself where you would place a sofa or a comfortable armchair—and build the seat *there*, not tucked into some hopeless corner.

Width and comfort: Built-in seats are often too hard, too narrow, and too stiff-backed. No one wants to sit on a shelf, especially not for any length of time. Make the seat as wide as a really comfortable chair (at least 18 inches), with a back that slopes gently (not upright), and put a warm soft cushion on it and on the back, so that it is really comfortable.

View: Most people want to look at something when they sit—either at other people or a view. Built-in seats often place you so that you are facing away from the view or *away* from the other people in the room. Place the seat so that a person sitting down is looking at something interesting.

Therefore:

Before you build the seat, get hold of an old arm chair or a sofa, and put it into the position where you intend to build a seat. Move it until you really like it. Leave it there for a few days. See if you enjoy sitting in it. Move it if you don't. When you have got it into a position which you like, and where you often find yourself sitting, you know it is a good position. Now build a seat that is just as wide, and just as well padded—and your built-in seat will work.



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Once you decide where to put the seat, make it part of the THICK WALLS (197), so that it is a part of the structure, not just an addition—THICKENING THE OUTER WALL (211). . . .

203 CHILD CAVES

. . . the places specially devoted to children's play—ADVENTURE PLAYGROUND (73), CHILDREN'S HOME (86), CHILDREN'S REALM (137)—and THICK WALLS (197)—can be embellished with a special detail.

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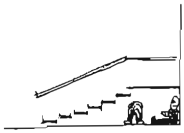
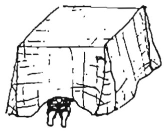
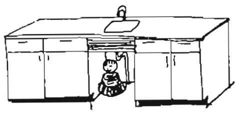
Children love to be in tiny, cave-like places.

In the course of their play, young children seek out cave-like spaces to get into and under—old crates, under tables, in tents, etc. (For evidence see L. E. White, "The Outdoor Play of Children Living in Flats," *Living in Towns*, Leo Kuper, ed., London, 1953, pp. 235–64.)





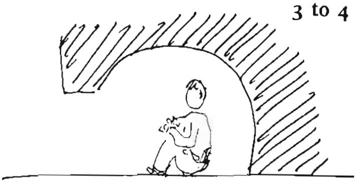


They try to make special places for themselves and for their friends—most of the world about them is "adult space" and they are trying to carve out a place that is kid size.

When children are playing in such a "cave"—each child takes up about 5 square feet; furthermore, children like to do this in groups, so the caves should be large enough to accommodate this: these sorts of groups range in size from three to five—so 15 to 25 square feet, plus about 15 square feet for games and circulation, gives a rough maximum size for caves.

Therefore:

Wherever children play, around the house, in the neighborhood, in schools, make small "caves" for them. Tuck these caves away in natural left over spaces, under stairs, under kitchen counters. Keep the ceiling heights low—2 feet 6 inches to 4 feet—and the entrance tiny.



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Build the caves right into the fabric of the walls—THICKENING THE OUTER WALLS (211). Make the doors very tiny to match the caves—an extreme version of LOW DOORWAY (224). . . .

204 SECRET PLACE

. . . and here is a finishing touch to the thick walls, perhaps even to the low ceilings—THICK WALLS (197), CEILING HEIGHT VARIETY (190).

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Where can the need for concealment be expressed; the need to hide; the need for something precious to be lost, and then revealed?

We believe that there is a need in people to live with a secret place in their homes: a place that is used in special ways, and revealed only at very special moments.

To live in a home where there is such a place alters your experience. It invites you to put something precious there, to conceal, to let only some in on the secret and not others. It allows you to keep something that is precious in an entirely personal way, so that no one may ever find it, until the moment you say to your friend, "Now I am going to show you something special"—and tell the story behind it.

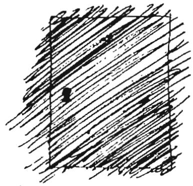
There is strong support for the reality of this need in Gaston Bachelard's *The Poetics of Space* (New York: The Omen Press, 1964). We quote from Chapter 3:

> With the theme of drawers, chests, locks and wardrobes, we shall resume contact with the unfathomable store of daydreams of intimacy.
>
> Wardrobes with their shelves, desks with their drawers, and chests with their false bottoms are veritable organs of the secret psychological life. Indeed, without these "objects" and a few others in equally high favor, our intimate life would lack a model of intimacy. They are hybrid objects, subject objects. Like us, through us and for us, they have a quality of intimacy. . . .
>
> If we give objects the friendship they should have, we do not open a wardrobe without a slight start. Beneath its russet wood, a wardrobe is a very white almond. To open it, is to experience an event of whiteness.

An anthology devoted to small boxes, such as chests and caskets, would constitute an important chapter in psychology. These complex pieces that a craftsman creates are very evident witnesses of the need for secrecy, of an intuitive sense of hiding places. It is not merely a matter of keeping a possession well guarded. The lock doesn't exist that could resist absolute violence, and all locks are an invitation to thieves. A lock is a psychological threshold. . . .

Therefore:

Make a place in the house, perhaps only a few feet square, which is kept locked and secret; a place which is virtually impossible to discover—until you have been shown where it is; a place where the archives of the house, or other more potent secrets, might be kept.



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Classic types of secret places are the panel that slides back, revealing the cavity in the wall, the loose board beneath the rug, the trap door—CLOSETS BETWEEN ROOMS (198), THICKENING THE OUTER WALLS (211), FLOOR-CEILING VAULTS (219). . . .

CONSTRUCTION

At this stage, you have a complete design for an individual building. If you have followed the patterns given, you have a scheme of spaces, either marked on the ground, with stakes, or on a piece of paper, accurate to the nearest foot or so. You know the height of rooms, the rough size and position of windows and doors, and you know roughly how the roofs of the building, and the gardens are laid out.

The next, and last part of the language, tells you how to make a buildable building directly from this rough scheme of spaces, and tells you how to build it, in detail.

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The patterns in this last section present a physical attitude to construction that works together with the kinds of buildings which the second part of the pattern language generates. These construction patterns are intended for builders—whether professional builders, or amateur owner-builders.

Each pattern states a principle about structure and materials. These principles can be implemented in any number of ways when it comes time for actual building. We have tried to state various ways in which the principles can be built. But, partly because these patterns are the least developed, and partly because of the nature of building patterns, the reader will very likely have much to add to these patterns. For example, the actual materials used to implement them will vary greatly from region to region . . .

Perhaps the main thing to bear in mind, as you look over this material, is this: Our intention in this section has been to provide an alternative to the technocratic and rigid ways of building that have become the legacy of the machine age and modern architecture.

The way of building described here leads to buildings that are unique and tailored to their sites. It depends on builders taking responsibility for their work; and working out the details of the building as they go—mocking up entrances and windows and the dimensions of spaces, making experiments, and building directly according to the results.

The patterns in this section are unique in several ways.

First, the sequence of the patterns is more concrete than in any of the earlier portions of the language. It not only corresponds to the order in which a design matures *conceptually*, in the user's mind, but also corresponds to the actual physical order of construction. That is, except for the first four patterns, which deal with structural philosophy, the remaining patterns can actually be used, in the sequence given, to build a building. The sequence of the language corresponds almost exactly, to the actual sequence of operations on the building site. In addition, the patterns themselves in this section are both more concrete, and more abstract, than any other patterns in the language.

They are more concrete because, with each pattern, we have always given at least one interpretation which can be built directly. For instance, with the pattern ROOT FOUNDATION, we have given one particular interpretation, to show that it can be done, and also to give the reader an immediate, and practical, buildable approach to construction.

Yet at the same time, they are also more abstract. The particular concrete formulation which we have given for each pattern, can also be interpreted, and remade in a thousand ways. Thus, it is also possible to take the general idea of the pattern, the idea that the foundation functions like a tree root, in the way that it anchors the building in the ground—and invent a dozen entirely different physical systems, which all work in this fundamental way. In this sense, these patterns are more abstract than any others in the book, since they have a wider range of possible interpretations.

To illustrate the fact that a great variety of actual building systems can be developed, based on these patterns, we present three versions that we have developed, in response to different contexts.

In Mexico: Concrete block foundations with re-bar connectors; hollow self-aligning molded earth blocks reinforced with bamboo for walls and columns; burlap formed concrete beams; steep barrel vaults with earth and asphalt covering—everything whitewashed.

In Peru: Slab floors poured integrally with wall foundations; finished with soft baked tiles; hard wood (diablo fuerte) columns and beams; plaster on bamboo lath acting as shear walls between columns; diagonal wood plank ceiling/floors; bamboo lattice partitions.

In Berkeley: Concrete slab finished with colored wax; walls of exterior skin of 1 x boards and interior skin of gypboard filled with light weight concrete; box columns made of 1 x boards, filled with lightweight concrete; 2-inch concrete ceiling/floor vaults formed with wood lattice and burlap forms.

As you can see from these examples, we have formulated these patterns with very careful attention to cost. We have tried to give examples of these patterns which use the cheapest, and most easily available, materials; we have designed them in such a way that such buildings can be built by lay people (who can therefore avoid the cost of labor altogether); and we have designed it so that the cost of labor, if done professionally, is also low.

Of the three parts of the language, this third part is the least developed. Both the part on *Towns* and the part on *Buildings* have been tested, one partially, the other very thoroughly, in practice. This third part has so far only been tested in a small number of relatively minor buildings. That means, obviously, that this material needs a good deal of improvement.

However, we intend, as soon as possible, to test all these patterns thoroughly in various different buildings —houses, public buildings, details, and additions. Once again, as soon as we have enough examples to make it worth reporting on them, we shall publish another volume which describes them, and our findings.

In many ways, rough though it is, this is the most exciting part of the language, because it is here, in these few patterns, that we can most vividly see a building literally grow before our eyes, under the impact of the patterns.

The actual process of construction, in which the sequence of their patterns creates a building, is described in chapter 23 of *The Timeless Way*.

Before you lay out construction details, establish a philosophy of structure which will let the structure grow directly from your plans and your conception of the buildings.

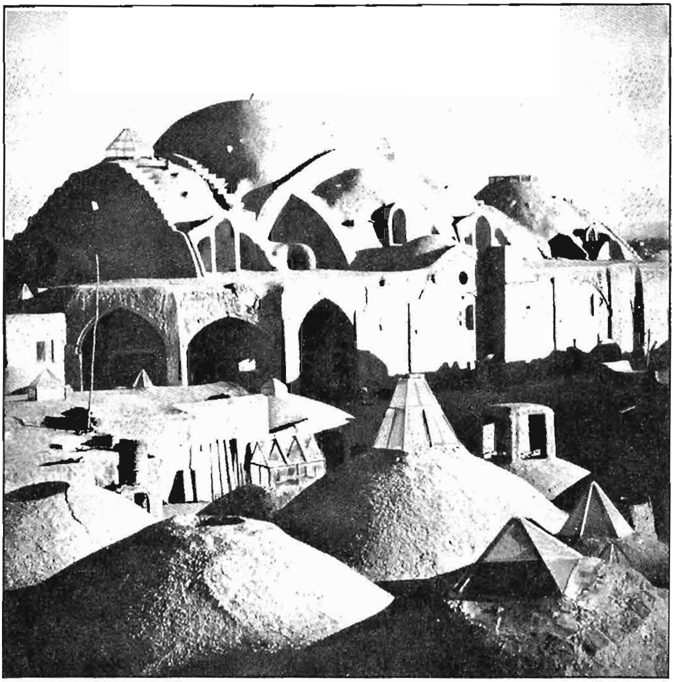
205. STRUCTURE FOLLOWS SOCIAL SPACES

206. EFFICIENT STRUCTURE

207. GOOD MATERIALS

208. GRADUAL STIFFENING

205 STRUCTURE FOLLOWS SOCIAL SPACES**



. . . if you have used the earlier patterns in the language, your plans are based on subtle arrangements of social spaces. But the beauty and subtlety of all these social spaces will be destroyed, when you start building, unless you find a way of building which is able to follow the social spaces without distorting or re-arranging them for engineering reasons.

This pattern gives you the beginning of such a way of building. It is the first of the 49 patterns which deal specifically with structure and construction; it is the bottleneck through which all languages pass from the larger patterns for rooms and building layout to the smaller ones which specify the process of construction. It not only has its own intrinsic arguments about the relation between social spaces and load-bearing structure—it also contains, at the end, a list of all the connections which you need for patterns on structure, columns, walls, floors, roofs, and all the details of construction.

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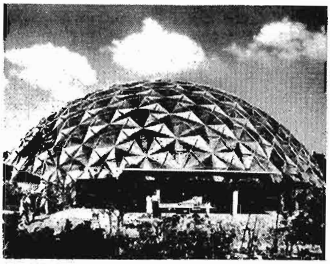
No building ever feels right to the people in it unless the physical spaces (defined by columns, walls, and ceilings) are congruent with the social spaces (defined by activities and human groups).

And yet this congruence is hardly ever present in modern construction. Most often the physical and social spaces are incongruent. Modern construction—that is, the form of construction most commonly practiced in the mid-twentieth century—usually forces social spaces into the framework of a building whose shape is given by engineering considerations.

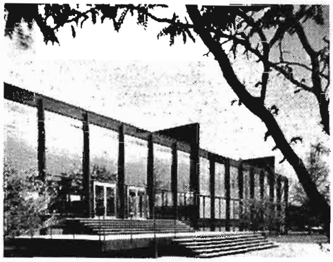
There are two different versions of this incongruence.

On the one hand, there are those buildings whose structural form is very demanding indeed and actually forces the social space to follow the shape of the construction—Buckminster Fuller domes, hyperbolic paraboloids, tension structures are examples.

On the other hand, there are those buildings in which there are very few structural elements—a few giant columns and no



Geodesic dome.

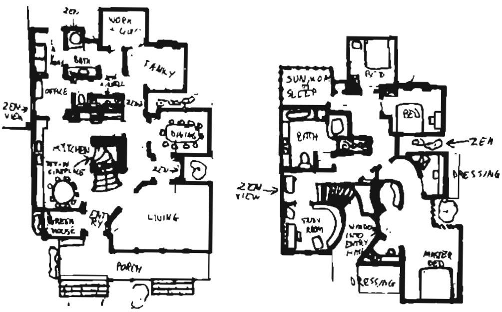


Steel and glass.

more. In these buildings the social spaces are defined by lightweight nonstructural partitions floating free within the "neutral" physical structure given by the engineering. The buildings of Mies van der Rohe and Skidmore Owings and Merrill are examples.

We shall now argue that both these kinds of incongruence do fundamental damage—for entirely different reasons.

In the first case the structure does damage simply because it constrains the social space and makes it different from what it naturally wants to be. To be specific: we know from our experiments that people are able to use this pattern language to design buildings for themselves; and that the plans they create, unhampered by other considerations, have an astonishing range of free arrangements, always finely tuned to the details of their lives and habits.



User's house plan.

Any form of construction which makes it impossible to implement these plans and forces them into the strait jacket of an alien geometry, simply for structural reasons, is doing social damage.

Of course, it could be argued that the structural needs of a building are as much a part of its nature as the social and psychological needs of its inhabitants. This argument might perhaps, perhaps, hold water if there were indeed no way of building buildings which conform more exactly to the loose plans based on activities alone.

But the next few patterns in this book make it very clear that there do exist ways of building which are structurally sound and yet perfectly congruent with social space, without any compromise whatever. It is therefore clear that we may legitimately reject any form of construction which cannot adapt itself perfectly to the forms of space required by social action.

What of the second kind of incongruence between social space and building form—the kind where the structure creates huge areas of almost uninterrupted "flexible" space, punctuated by occasional columns, and the social spaces are created inside this framework by nonstructural partitions.

Once again, many important patterns cannot be incorporated into the design—LIGHT ON TWO SIDES OF EVERY ROOM (159), for example simply cannot be included in a giant rectangle. But in this type of building, there is an additional kind of incongruence between social space and engineering structure which comes from the fact that the two are virtually independent of each other. The engineering follows its own laws, the social space follows its laws—and they do not match.

This mismatch is perceived and felt not merely as a mismatch, but as a fundamental and disturbing incoherence in the fabric of the building, which makes people feel uneasy and unsure of themselves and their relation to the world. We offer four possible explanations.

First: the spaces called for by the patterns dealing with social and psychological needs are critical. If the spaces are not right, the needs are not met and problems are not solved. Since these spaces are so critical, it stands to reason that they must be felt as real spaces, not flimsily or haphazardly partitioned spaces, which only pay lip-service to the needs people experience. For instance, if an entrance room is created with flimsy partitions, it will not take hold; people won't take it seriously. Only when the most solid elements of the building form the spaces will the spaces be fully felt and the needs which call for the space then fully be satisfied.

Second: a building will also seem alien unless it gives to its users a direct and intuitive sense of its structure—how it is put together. Buildings where the structure is hidden leave yet another gap in people's understanding of the environment around them. We know this is important to children and suspect it must be important to adults too.

Third: when the social space has, as its own surrounding, the fabric of the load-bearing structure which supports that space, then the forces of gravity are integrated with the social forces, and one feels the resolution of *all* the forces which are acting in this one space. The experience of being in a place where the forces are resolved together at once is completely restful and whole. It is like sitting under an oak tree: things in nature resolve all the forces acting on them together: they are, in this sense, whole and balanced.

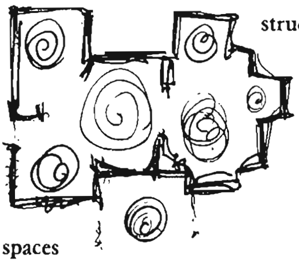
Fourth: it is a psychological fact that a space is defined by its corners. Just as four dots define a rectangle to your eye, so four posts (or more) define an imaginary space between them.

Four points make a rectangle.

This is the most fundamental way in which solids define space. Unless the actual solids which make up the building lie at the corners of its social spaces, they must, instead, be creating *other* virtual spaces at odds with the intended ones. The building will only be at rest psychologically if the corners of its rooms are clearly marked and coincide, at least in the majority of cases, with its most solid elements.

Therefore:

A first principle of construction: on no account allow the engineering to dictate the building's form. Place the load bearing elements—the columns and the walls and floors—according to the social spaces of the building; never modify the social spaces to conform to the engineering structure of the building.



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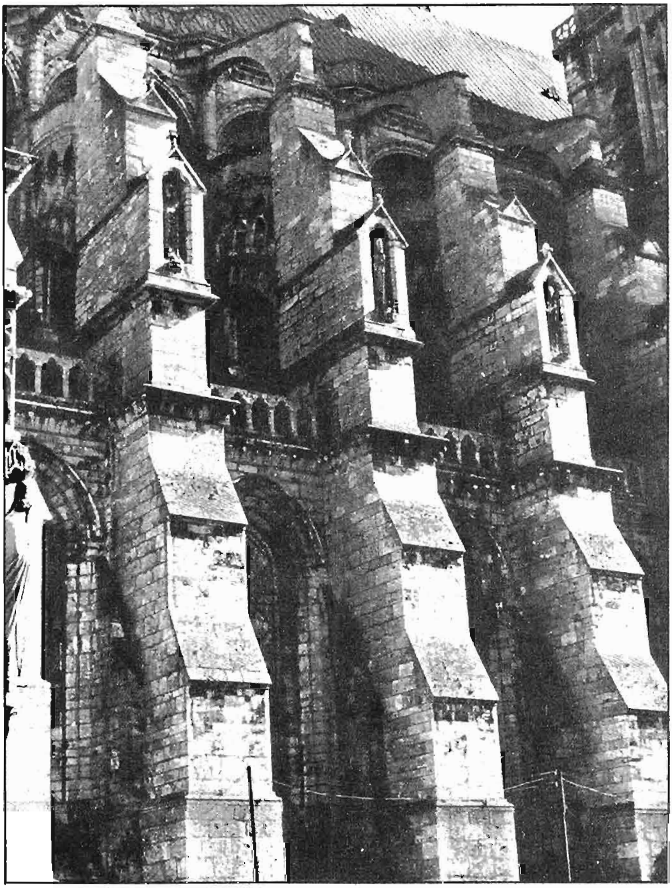
You will be able to guarantee that structure follows social spaces by placing columns at the corner of every social space—COLUMNS AT THE CORNERS (212); and by building a distinct and separate vault over each room and social spacc—FLOOR-CEILING VAULTS (219).

For the principles of structure which will make it possible to build your building according to this pattern, begin with EFFICIENT STRUCTURE (206); for the class of compatible materials, see GOOD MATERIALS (207); for the fundamentals of the process of construction, see GRADUAL STIFFENING (208). . . .

206 EFFICIENT STRUCTURE*



. . . this pattern complements the pattern STRUCTURE FOLLOWS SOCIAL SPACES (205). Where that pattern defines the relationship between the social spaces and the structure, this pattern lays down the kind of structure which is dictated by pure engineering. As you will see, it is compatible with STRUCTURE FOLLOWS SOCIAL SPACES, and will help to create it.

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Some buildings have column and beam structures; others have load-bearing walls with slab floors; others are vaulted structures, or domes, or tents. But which of these, or what mixture of them, is actually the most efficient? What is the best way to distribute materials throughout a building, so as to enclose the space, strongly and well, with the least amount of material?

Engineers usually say that there is no answer to this question. According to current engineering practice it is first necessary to make an arbitrary choice among the basic possible systems—and only then possible to use theory and calculation to fix the size of members within the chosen system. But, the basic choice itself—at least according to prevailing dogma—cannot be made by theory.

To anyone with an enquiring mind, this seems quite unlikely. That such a fundamental choice, as the choice between column and beams systems and load-bearing wall systems and vaulted systems, should lie purely in the realm of whim—and that the possible myriad of mixed systems, which lie between these archetypes, cannot even be considered—all this has more to do with the status of available theory than with any fundamental insight.

Indeed, as we shall now try to show, the archetypal, best solution to the problem of efficient structure in a building is one which does lie in between the three most famous archetypes. It is a system of load-bearing walls, supported at frequent intervals by thickened stiffeners like columns, and floored and roofed by a system of vaults.

We shall derive the character of the most efficient structure in three steps. First, we shall define the three-dimensional character of a typical system of rooms and spaces in a building. We shall then define an efficient structure as the smallest cheapest amount of stable material, placed only in the interstices between the rooms, which can support itself and the loads which the rooms generate. Finally, we shall obtain the details of an efficient structure. For a similar discussion, see Christopher Alexander, "An attempt to derive the nature of a human building system from first principles," in Edward Allen, *The Responsive House*, M.I.T. Press, 1974.

I. The three-dimensional character of a typical building based purely on the social spaces and the character of rooms.

In order to obtain this from fundamental considerations, let us first review the typical shape of rooms—see THE SHAPE OF INDOOR SPACE (191)—and then go on to derive the most efficient structure for a building made up of these kinds of rooms:

1. The boundary of any space, seen in plan, is formed by segments which are essentially straight lines—though they need not be perfectly straight.

2. The ceiling heights of spaces vary according to their social functions. Roughly speaking, the ceiling heights vary with floor areas—large spaces have higher ceilings, small ones lower—CEILING HEIGHT VARIETY (190).

3. The edges of the space are essentially vertical up to head height—that is, about 6 feet. Above head height, the boundaries of the space may come in toward the space. The upper corners between wall and ceiling of a normal room serve no function, and it is therefore not useful to consider them as an essential part of the space.

4. Each space has a horizontal floor.

5. A building then is a packing of polygonal spaces in which each polygon has a beehive cross section, and a height which varies according to its size.

If we follow the principle of STRUCTURE FOLLOWS SOCIAL SPACES (205), we may assume that this three-dimensional array of spaces must remain intact, and not be interrupted by structural

A packing of polygonal beehive spaces.

elements. This means that an efficient structure must be one of the arrangements of material which occupies only the interstices between the spaces.

We may visualize the crudest of these possible structures by means of a simple imaginary process. Make a lump of wax for each of the spaces which appears in the building, and construct a three-dimensional array of these lumps of wax, leaving gaps between all adjacent lumps. Now, take a generalized "structure fluid," and pour it all over this arrangements of lumps, so that it completely covers the whole thing, and fills all the gaps. Let this fluid harden. Now dissolve out the wax lumps that represent spaces. The stuff which remains is the most generalized building structure.

II. The most efficient structure for a given system of spaces.

Obviously, the imaginary structure made from the structure fluid is not real. And besides, it is rather inefficient: it would, if actually carried out, use a great deal of material. We must now ask how to make a structure, similar to this imaginary one, but one which uses the smallest amount of material. As we shall see, this most efficient structure will be *a compression structure*, in which bending and tension are reduced to a minimum and *a continuous structure*, in which all members are rigidly connected in such a way that each member carries at least some part of the stresses caused by any pattern of loading.

1. *A compression structure.* In an efficient structure, we want every ounce of material to be working to its capacity. In more precise terms, we want the stress distributed throughout the materials in such a way that every cubic inch is stressed to the same degree. This is not happening, for example, in a simple wooden beam. The material is most stressed at the top and bottom

of the beam; the middle of the beam has only very low stresses, because there is too much material there relative to the stress distribution.

As a general rule, we may say that members which are in bending always have uneven stress distributions and that we can therefore only distribute stresses evenly throughout the materials if the structure is entirely free of bending. In short, then, a perfectly efficient structure must be free of bending.

There are two possible structures which avoid bending altogether: pure tension structures and pure compression structures. Although pure tension structures are theoretically interesting and suitable for occasional special purposes, the considerations described in GOOD MATERIALS (207) rule them out overwhelmingly on the grounds that tension materials are hard to obtain, and expensive, while almost all materials can resist compression. Note especially that wood and steel, the two principle tension materials in buildings, are both scarce, and can—on ecological grounds—no longer be used in bulk—again, see GOOD MATERIALS (207).

2. *A continuous structure.* In an efficient structure, it is not only true that individual elements have even stress distributions in them when they are loaded. It is also true that the structure acts as a whole.

Consider, for example, the case of a basket. The individual strands of the basket are weak. By itself no one strand can resist much load. But the basket is so cunningly made, that all the strands work together to resist even the smallest load. If you press on one part of the basket with your finger, all the strands in the basket—even those in the part furthest from your finger—work together to resist the load. And of course, since the whole structure works as one, to resist the load, no one part has, individually, to be very strong.

This principle is particularly important in a structure like a building, which faces a vast range of different loading conditions. At one minute, the wind is blowing very strong in one direction; at another moment an earthquake shakes the building; in later years, uneven settlement redistributes dead loads because some foundations sink lower than others; and, of course, throughout its life the people and furniture in the building are moving all the time. If each element is to be strong enough, by itself, to resist the maximum load it can be subjected to, it will have to be enormous.

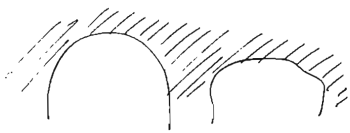
But when the building is continuous, like a basket, so that each part of the building helps to carry the smallest load, then, of course, the unpredictable nature of the loads creates no difficulties at all. Members can be quite small, because no matter what the loads are, the continuity of the building will distribute them among the members as a whole, and the building will act as a whole against them.

The continuity of a building depends on its connections: actual continuity of material and shape. It is very hard, almost impossible, to make continuous connections between different materials, which transfer load as efficiently as a continuous material; and it is therefore essential that the building be made of one material, which is actually continuous from member to member. And the shape of the connections between elements is vital too. Right angles tend to create discontinuities: forces can be distributed throughout the building only if there are diagonal fillets wherever walls meet ceilings, walls meet walls, and columns meet beams.

III. The details of an efficient structure.

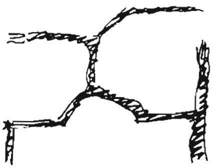
If we assume now that an efficient building will be both compressive and continuous, we can obtain the main morphological features of its structure by direct inference.

1. Its ceilings, floors, and rooms must all be vaulted. This follows directly. The dome or vault shape is the only shape which works in pure compression. Floors and roofs can only be continuous with walls, if they curve downward at their edges. And the shape of social spaces also invites it directly—since the triangle of space between the wall and ceiling serves no useful purpose, it is a natural place for structural material.



Vaults.

3. *Walls must all be load-bearing.* Any non load-bearing partition evidently contradicts the principle of continuity which says that every particle of the building is helping to resist loads. Furthermore, columns with non load-bearing partitions between them need shear support. The wall provides it naturally; and the continuity of the walls, floor, and ceiling can only be created by the action of a wall that ties them together.



Load-bearing walls.

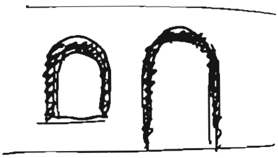
3. *Walls must be stiffened at intervals along their length by columnar ribs.* If a wall is to contain a given amount of material, then the wall acts most efficiently when its material is redistributed, nonhomogeneously, to form vertical ribs. This wall is most efficient in resisting buckling—indeed, at most thicknesses this kind of stiffening is actually *required* to let the wall act at its full compressive capacity—see FINAL COLUMN DISTRIBUTION (213). And it helps to resist horizontal loads, because the stiffeners act as beams against the horizontal forces.

Vertical stiffeners.

4. *Connections between walls and floors, and between walls and walls, must all be thickened by extra material that forms a fillet along the seam.* Connections are the weakest points for continuity, and right-angled connections are the worst. However, we know from THE SHAPE OF INDOOR SPACE (191) that we cannot avoid rough right angles where walls meet walls; and of course, there must be rough right angles where walls meet floors. To counteract the effect of the right angle, it is necessary to "fill" the angle with material. This principle is discussed under COLUMN CONNECTIONS (227).

Thickened connections.

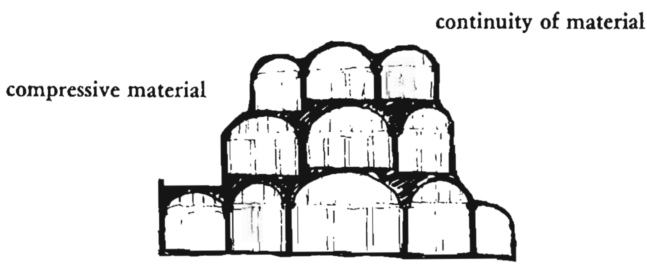
5. *Openings in walls must have thickened frames, and rounding in the upper corners.* This follows directly from the principle of continuity and is fully discussed in FRAMES AS THICKENED EDGES (225).



Openings.

Therefore:

Conceive the building as a building made from one continuous body of compressive material. In its geometry, conceive it as a three-dimensional system of individually vaulted spaces, most of them roughly rectangular; with thin load-bearing walls, each stiffened by columns at intervals along its length, thickened where walls meet walls and where walls meet vaults and stiffened around the openings.



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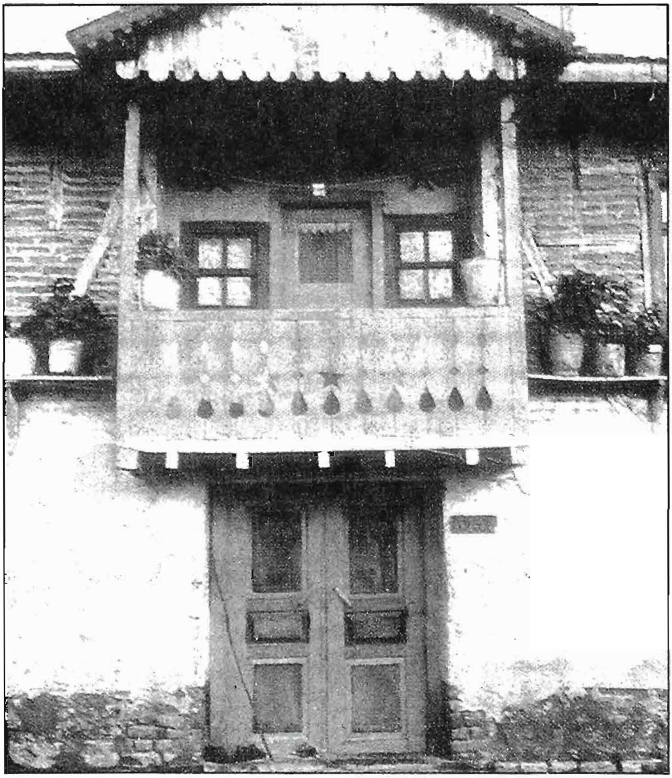
The layout of the inner vaults is given in FLOOR AND CEILING LAYOUT (210) and FLOOR-CEILING VAULTS (219); the layout of the outer vaults which form the roof is given in ROOF LAYOUT (209) and ROOF VAULTS (220). The layout of the stiffeners which make the walls is given in FINAL COLUMN DISTRIBUTION (213); the layout of the thickening where walls meet walls is given by COLUMNS AT THE CORNERS (212); the thickening where walls meet vaults is given by PERIMETER BEAMS (217); the construction of the columns and the walls is given by BOX COLUMNS (216) and WALL MEMBRANES (218); the thickening of doors and window frames is given by FRAMES AS THICKENED EDGES (225); and the non-right-angled connection between columns and beams by COLUMN CONNECTION (227). . . .

207 GOOD MATERIALS**



. . . the principles of structure allow you to imagine a building in which materials are distributed in the most efficient way, congruent with the social spaces given by the plan—STRUCTURE FOLLOWS SOCIAL SPACES (205), EFFICIENT STRUCTURE (206). But of course the structural conception is still only schematic. It can only become firm and cogent in your mind when you know what materials the building will be made of. This pattern helps you settle on materials.

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There is a fundamental conflict in the nature of materials for building in industrial society.

On the one hand, an organic building requires materials which consist of hundreds of small pieces, put together, each one of them hand cut, each one shaped to be unique according to its position. On the other hand, the high cost of labor, and the ease of mass production, tend to create materials which are large, identical, not cuttable or modifiable, and not adaptable to idiosyncracies of plan. These "modern" materials tend to destroy the organic quality of natural buildings and, indeed, to make it impossible. In addition, modern materials tend to be flimsy and hard to maintain—so that buildings deteriorate more rapidly than in a pre-industrial society where a building can be maintained and improved for hundreds of years by patient attention.

The central problem of materials, then, is to find a collection of materials which are small in scale, easy to cut on site, easy to work on site without the aid of huge and expensive machinery, easy to vary and adapt, heavy enough to be solid, longlasting or easy to maintain, and yet easy to build, not needing specialized labor, not expensive in labor, and universally obtainable and cheap.

Furthermore, this class of good materials must be ecologically sound: biodegradable, low in energy consumption, and not based on depletable resources.

When we take all these requirements together, they suggest a rather startling class of "good materials"—quite different from the materials in common use today. The following discussion is our attempt to begin to define this class of materials. It is certainly incomplete; but perhaps it can help you to think through the problem of materials more carefully.

We start with what we call "bulk materials"—the materials that occur in the greatest volume in a given building. They may account for as much as 80 per cent of the total volume of materials used in a building. Traditionally, bulk materials have been earth, concrete, wood, brick, stone, snow. . . . Today the bulk materials are essentially wood and concrete and, in the very large buildings, steel.

When we analyze these materials strictly, according to our criteria, we find that stone and brick meet most of the requirements, but are often out of the question where labor is expensive, because they are labor intensive.

Wood is excellent in many ways. Where it is available people use it in great quantities, and where it is not available people are trying to get hold of it. Unfortunately the forests have been terribly managed; many have been devastated; and the price of heavy lumber has skyrocketed. From today's paper: "Since the end of federal economic controls the price of lumber has been jumping about 15 percent a month and is now about 55 percent above what it was a year ago." *San Francisco Chronicle*, February 11, 1973. We shall therefore look upon wood as a precious material, which should not be used as a bulk material or for structural purposes.

Steel as a bulk material seems out of the question. We do not need it for high buildings since they do not make social sense—FOUR-STORY LIMIT (21). And for smaller buildings it is expensive, impossible to modify, high energy in production.

Earth is an interesting bulk material. But it is hard to stabilize, and it makes incredibly heavy walls because it has to be so thick. Where this is appropriate, and where the earth is available, however, it is certainly one of the "good materials."

Regular concrete is too dense. It is heavy and hard to work. After it sets one cannot cut into it, or nail into it. And its surface is ugly, cold, and hard in feeling, unless covered by expensive finishes not integral to the structure.

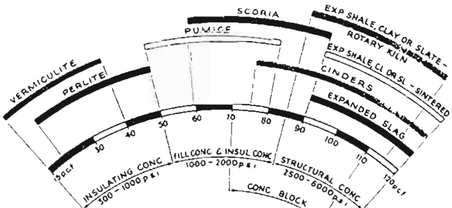
And yet concrete, in some form, is a fascinating material. It is fluid, strong, and relatively cheap. It is available in almost every part of the world. A University of California professor of engineering sciences, P. Kumar Mehta, has even just recently found a way of converting abandoned rice husks into Portland cement.

Is there any way of combining all these good qualities of concrete and also having a material which is light in weight, easy to work, with a pleasant finish? *There is. It is possible to use a whole range of ultra-lightweight concretes which have a density and compressive strength very similar to that of wood. They are easy to work with, can be nailed with ordinary nails, cut with a saw, drilled with wood-working tools, easily repaired.*

We believe that ultra-lightweight concrete is one of the most fundamental bulk materials of the future.

To make this as clear as possible, we shall now discuss the range of lightweight concretes. Our experiments lead us to believe that the best lightweight concretes, the ones most useful for building, are those whose densities lie in the range of 40 to 60 pounds per cubic foot and which develop some 600 to 1000 psi in compression.

Oddly enough, this particular specification lies in the least developed part of the presently available range of concretes. As we can see from the following diagram, the so-called "structural" concretes are usually more dense (at least 90 pounds per cubic foot) and much stronger. The most common "lightweight" concretes use vermiculite as an aggregate, are used for underflooring and insulation, and are very light, but they do not usually develop enough strength to be structurally useful—most



Currently available concrete mixes.

often about 300 psi in compression. However, a range of mixed lightweight aggregates, containing vermiculite, perlite, pumice, and expanded shale in different proportions, can easily generate 40–60 pound, 600 psi concretes anywhere in the world. We have had very good luck with a mix of 1-2-3: cement-kylite-vermiculite.

Beyond the bulk materials, there are the materials used in relatively smaller quantities for framework, surfaces, and finishes. These are the "secondary" materials.

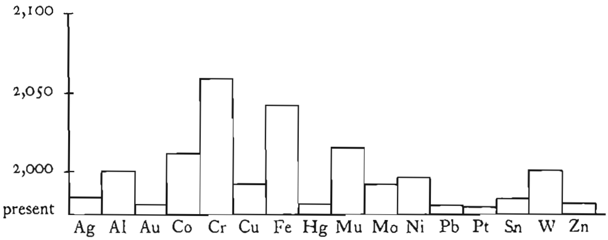
When buildings are built with manageable secondary materials, they can be repaired with the same materials: repair becomes continuous with the original building. And the buildings are more apt to be repaired if it is easy to do so and if the user can do it himself bit by bit without having to rely on skilled workers or special equipment. With prefabricated materials this is impossible, the materials are inherently unrepairable. When prefabricated finish materials are damaged they must be replaced with an entirely new component.

Take the case of a garden patio. It can be made as a continuous concrete slab. When the ground shifts slightly underneath this slab, the slab cracks and buckles. This is quite unrepairable for the user. It requires that the entire slab be broken out (which requires relatively heavy-duty equipment) and replaced—by professional skilled labor. On the other hand, it would have been possible to build the patio initially out of many small bricks, tiles, or stones. When the ground shifts, the user is then able to lift up the broken tiles, add some more earth, and replace the tile—all without the aid of expensive machinery or professional help. And if one of the tiles or bricks becomes damaged, it can be easily replaced.

What are the good secondary materials? Wood, which we want to avoid as a bulk material, is excellent as a secondary material for doors, finishes, windows, furniture. Plywood, particle board, and gypsum board can all be cut, nailed, trimmed, and are relatively cheap. Bamboo, thatch, plaster, paper, corrugated metals, chicken wire, canvas, cloth, vinyl, rope, slate, fiberglass, non-chlorinated plastics are all examples of secondary materials which do rather well against our criteria. Some are dubious ecologically —that is, the fiberglass and the corrugated metals—but again, these sheet materials need only be used in moderation, to form and finish and trim the bulk materials.

Finally, there are some materials which our criteria exclude entirely—either as bulk or secondary materials. They are expensive, hard to adapt to idiosyncratic plans, they require high energy production techniques, they are in limited reserves. . . . for example: steel panels and rolled steel sections; aluminum; hard and prestressed concrete; chlorinated foams; structural lumber; cement plaster; immense sections of plate glass. . . .

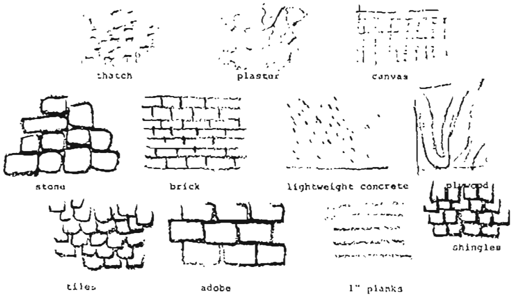
And, for any optimist who thinks he can go on using steel reinforcing bars forever—consider the following fact. Even iron, abundant as it is all over the earth's surface, is a depletable resource. If consumption keeps growing at its present rate of increase (as it very well may, given the vast parts of the world not yet using resources at American and western consumption levels), the resources of iron will run out in 2050.



Years at which various metals will be depleted assuming current usage rate continues to increase as it did between 1960 and 1968.

Therefore:

Use only biodegradable, low energy consuming materials, which are easy to cut and modify on site. For bulk materials we suggest ultra-lightweight 40–60 lbs. concrete and earth-based materials like tamped earth, brick, and tile. For secondary materials, use wood planks, gypsum, plywood, cloth, chickenwire, paper, cardboard, particle board, corrugated iron, lime plasters, bamboo, rope, and tile.



ultra-light weight concrete or organic or earth-based materials

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In GRADUAL STIFFENING (208), we shall work out the way of using these materials that goes with STRUCTURE FOLLOWS SOCIAL SPACES (205) and EFFICIENT STRUCTURE (206). Try to use the materials in such a way as to allow their own texture to show themselves—LAPPED OUTSIDE WALLS (234), SOFT INSIDE WALLS (235). . . .

208 GRADUAL STIFFENING**

. . . in STRUCTURE FOLLOWS SOCIAL SPACES (205) and EFFICIENT STRUCTURE (206) we have set down the beginnings of a philosophy, an approach, to construction. GOOD MATERIALS (207) tells us something about the materials we ought to use in order to meet human and ecological demands. Now, before we start the practical task of making a structural layout for a building, it is necessary to consider one more philosophical pattern: one which defines the process of construction that will make it possible to use the right materials and get the overall conception of the structure right.

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The fundamental philosophy behind the use of pattern languages is that buildings should be uniquely adapted to individual needs and sites; and that the plans of buildings should be rather loose and fluid, in order to accommodate these subtleties.

This requires an entirely new attitude toward the process of construction. We may define this attitude by saying that it is desirable to build a building in such a way that it starts out loose and flimsy while final adaptations in plan are made, and then gets stiffened gradually during the process of construction, so that each additional act of construction makes the structure sounder.

To understand this philosophy properly, it is helpful to imagine a building being made like a basket. A few strands are put in place. They are very flimsy. Other strands are woven in. Gradually the basket gets stiffer and stiffer. Its final structural strength is only reached from the cooperation of all the members, and is not reached until the building is completely finished. In this sense, such a process produces a building in which all parts of it are working structurally—see EFFICIENT STRUCTURE (206).

Why does the principle of gradual stiffening seem so sensible as a *process* of building?

To begin with, such a structure allows the actual building process to be a creative act. It allows the building to be built up gradually. Members can be moved around before they are firmly in place. All those detailed design decisions which can never be worked out in advance on paper, can be made during the building process. And it allows you to see the space in three dimensions as a whole, each step of the way, as more material is added.

This means that since each new material that is added in the process must adapt perfectly to the framework that is there, each new material must be more adaptable, more flexible, more capable of coping with variation, than the last. Thus, though the building as a whole goes from flimsy to strong, the actual materials that are added go from the strongest and stiffest, to the gradually less stiff, until finally fluid materials are added.

The essence of this process is very fundamental indeed. We may understand it best by comparing the work of a fifty-year-old carpenter with the work of a novice. The experienced carpenter keeps going. He doesn't have to keep stopping, because every action he performs, is calculated in such a way that some later action can put it right to the extent that it is imperfect now. What is critical here, is the sequence of events. The carpenter never takes a step which he cannot correct later; so he can keep working, confidently, steadily.

The novice, by comparison, spends a great deal of his time trying to figure out what to do. He does this essentially because he knows that an action he takes now may cause unretractable problems a little further down the line; and if he is not careful, he will find himself with a joint that requires the shortening of some crucial member—at a stage when it is too late to shorten that member. The fear of these kinds of mistakes forces him to spend hours trying to figure ahead: and it forces him to work as far as possible to exact drawings because they will guarantee that he avoids these kinds of mistakes.

The difference between the novice and the master is simply that the novice has not learnt, yet, how to do things in such a way that he can afford to make small mistakes. The master knows that the sequence of his actions will always allow him to cover his mistakes a little further down the line. It is this simple but essential knowledge which gives the work of a master carpenter its wonderful, smooth, relaxed, and almost unconcerned simplicity.

In a building we have exactly the same problem, only greatly magnified. Essentially, most modern construction has the character of the novice's work, not of the master's. The builders do not know how to be relaxed, how to deal with earlier mistakes by later detailing; they do not know the proper sequence of events; and they do not, usually, have a building system, or a construction process, which allows them to develop this kind of relaxed and casual wisdom. Instead, like the novice, they work exactly to finely detailed drawings; the building is extremely uptight as it gets made; any departure from the exact drawings is liable to cause severe problems, may perhaps make it necessary to pull out whole sections of the work.

This novice-like and panic-stricken attention to detail has two very serious results. First, like the novice, the architects spend a great deal of time trying to work things out ahead of time, not smoothly building. Obviously, this costs money; and helps create these machine-like "perfect" buildings. Second, a vastly more serious consequence: the details control the whole. The beauty and subtlety of the plan in which patterns have held free sway over the design suddenly becomes tightened and destroyed because, in fear that details won't work out, the details of connections, and components, are allowed to control the plan. As a result, rooms get to be slightly the wrong shape, windows go out of position, spaces between doors and walls get altered just enough to make them useless. In a word, the whole character of modern architecture, namely the control of larger space by piddling details of construction, takes over.

What is needed is the opposite—a process in which details are fitted to the whole. This is the secret of the master carpenter; it is described in detail in *The Timeless Way of Building* as the foundation of all organic form and all successful building. The process of gradual stiffening, which we describe here, is the physical and procedural embodiment of this essential principle. We now ask how, in practice, it is possible to create a gradually stiffened structure within the context defined by the pattern GOOD MATERIALS (207).

Facts about materials give us the starting point we need.

1. Sheet materials are easy to produce and make the best connections.

In traditional society there are few sheet materials. However, factory production tends to make sheets more easily than other forms of material. As we move into an age of mass production, sheet materials become plentiful and are naturally strong, light, and cheap. Gypsum board, plywood, cloth, vinyl, canvas, fiberglass, particle board, wood planks, corrugated metals, chicken wire, are all examples.

And sheet materials are the strongest for connections. Connections are the weak points in a structure. Sheet materials are easy to connect, because connections can join surfaces to one another. Anything made out of sheets is inherently stronger than something made of lumps or sticks.

2. *Ultra-lightweight concrete is an excellent fill material—it has the density of wood, is strong, light, easy to cut, easy to repair, easy to nail into—and is available everywhere.* This is discussed fully in GOOD MATERIALS (207).

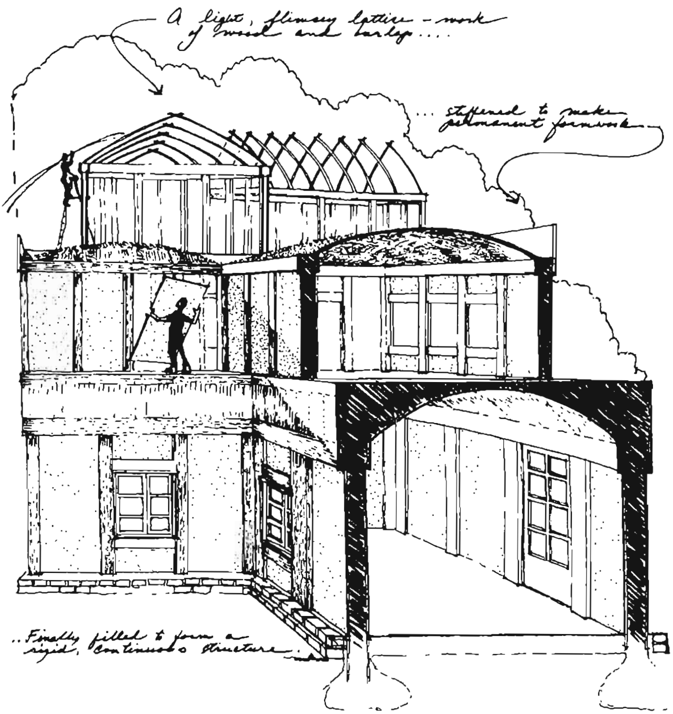
3. *However, any kind of concrete needs formwork: and the cost of formwork is enormous.*

This makes it very expensive indeed to build any complex form; and within conventional building systems, it more or less rules out the kind of "organic" structure which we have described. Furthermore, in regular concrete work, the formwork is eventually wasted, thrown away.

We believe that the finishes in any sensible building system should be integral with the process of construction and the structure itself (as they are in almost all traditional buildings)—and that any building system in which finishes have to be "added" to the building are wasteful, and unnatural.

4. *We therefore propose that ultra-lightweight concrete be poured into forms which are made of the easily available sheet materials: and that these materials are then left in place to form the finish.*

The sheet materials can be any combination of cloth, canvas, wood planks, gypsum boards, fiberboards, plywood, paper, plastered chickenwire, corrugated metals, and where it is possible, tile, brick, or stone—see GOOD MATERIALS (207). For the ultra-lightweight concrete we recommend a perlite, expanded shale, or pumice aggregate. Tamped earth, adobe, nonchlorinated foams, may also do instead of the concrete, if loads allow it.



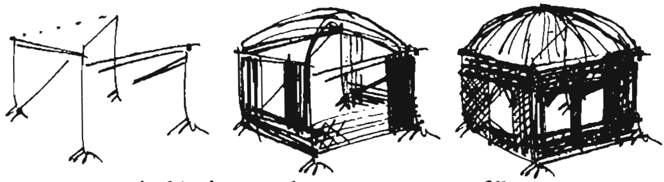
One version of gradual stiffening, using one inch planks, gypsum board and burlap as sheets, with ultra-lightweight concrete as fill.

The drawing above, shows one particular realisation of this kind of gradual stiffening. But the principle is far more general than this particular use of it. Indeed, it occurs, in one way or another, in almost all traditional forms of building. Eskimo igloo construction and African basket structures are both gradually stiffened structures, where each next step copes with the existing framework, adds to it, and stiffens it. The stone buildings of Alberobello in southern Italy are examples. So is Elizabethan half-timber construction.

Therefore:

Recognize that you are not assembling a building from components like an erector set, but that you are instead weaving a structure which starts out globally complete, but flimsy; then gradually making it stiffer but still rather flimsy; and only finally making it completely stiff and strong.

We believe that in our own time, the most natural version of this process is to put up a shell of sheet materials, and then make it fully strong by filling it with a compressive fill.



soft skin formwork compressive fill

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Choose the most natural materials you can, for the outer shell itself—thin wood planks for columns, canvas or burlap for the vaults, plaster board or plank or bricks or hollow tiles for walls—GOOD MATERIALS (207).

Use ultra-lightweight 40 to 60 pounds perlite concrete for the compressive fill—it has the same density as wood and can be cut and nailed like wood, both during the construction and in later years when repairs become necessary—GOOD MATERIALS (207).

Build up the columns first, then fill them with the ultra-lightweight concrete; then build up the beams and fill them; then the vaults, and cover them with a thin coat of concrete which hardens to form a shell; then fill that shell with even lighter weight materials to form the floors; then make the walls and window frames, and fill them; and finally, the roof, again a thin cloth vault covered with a coat of concrete to form a shell—BOX COLUMNS (216), PERIMETER BEAM (217), WALL MEMBRANE (218), FLOOR-CEILING VAULTS (219), ROOF VAULTS (220). . . .

within this philosophy of structure, on the basis of the plans which you have made, work out the complete structural layout; this is the last thing you do on paper, before you actually start to build;

209. ROOF LAYOUT

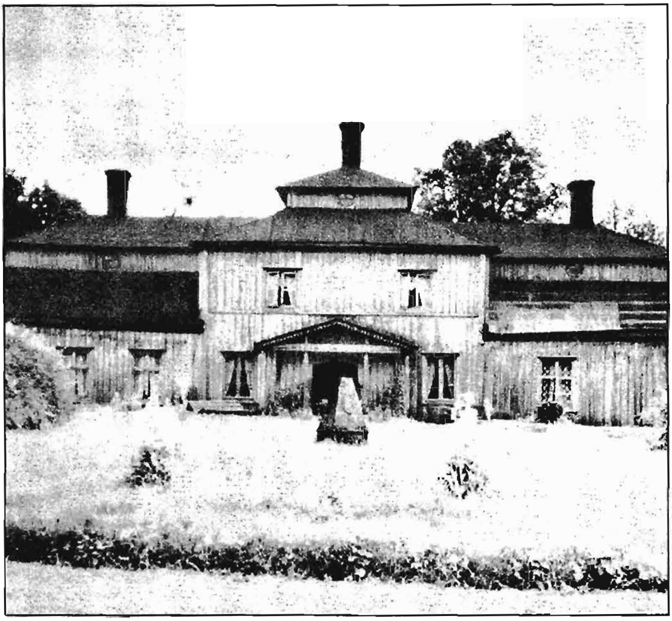
210. FLOOR AND CEILING LAYOUT

211. THICKENING THE OUTER WALLS

212. COLUMNS AT THE CORNERS

213. FINAL COLUMN DISTRIBUTION

209 ROOF LAYOUT*



. . . assume now that you have a rough plan, to scale, for each floor of the building. In this case you already know roughly how the roofs will go, from CASCADE OF ROOFS (116) and SHELTERING ROOF (117); and you know exactly where the roof is flat to form roof gardens next to rooms at different floors—ROOF GARDEN (118). This pattern shows you how to get a detailed roof plan for the building, which helps those patterns come to life, for any plan which you have drawn.

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What kind of roof plan is organically related to the nature of your building?

We know, from arguments presented in THE SHAPE OF INDOOR SPACE (191), that the majority of spaces in an organic building will have roughly—not necessarily perfectly—straight walls because it is only then that the space on *both* sides of the walls can be positive, or convex in shape.

And we know, from similar arguments, that the majority of the angles in the building will be roughly—again, not exactly—right angles, that is, in the general range of 80 to 100 degrees.

We know, therefore, that the class of natural plans may contain a variety of shapes like half circles, octagons, and so on—but that for the most part, it will be made of very rough, sloppy rectangles.

We also know, from SHELTERING ROOF (117), that entire wings should be under one roof whenever possible and that the building is to be roofed with a mixture of flat roofs and sloping or domical roofs, with the accent on those which are *not* flat.

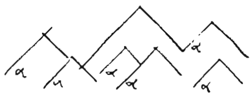
We may therefore state the problem of defining a roof layout as follows: *Given an arbitrary plan of the type described above, how can we fit to it an arrangement of roofs which conforms to the* CASCADE OF ROOFS *(116) and* SHELTERING ROOF *(117) and* ROOF GARDENS *(118)?*

Before explaining the procedure for laying out roofs in detail, we underline five assumptions which provide the basis for the procedure.

1. The "pitched" roofs may actually be pitched, or they may be vaults with a curved pitch, or barrel vaults—as described in ROOF VAULTS (220). The general procedure, in all three cases, is the same. (For curved vaults, define slope as height-to-width ratio.)

The "pitch" of a vaulted roof.

2. Assume that all roofs in the building, which are not flat, have roughly the same slope. For a given climate and roof construction, one slope is usually best; and this greatly simplifies construction.

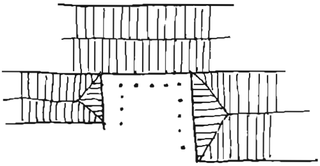


The same slope throughout.

3. Since all roofs have the same slope, the roofs which cover the widest wings and/or rooms will have the highest peaks; those covering smaller wings and rooms will be relatively lower. This is consistent with MAIN BUILDING (99), CASCADE OF ROOFS (116), and CEILING HEIGHT VARIETY (190).

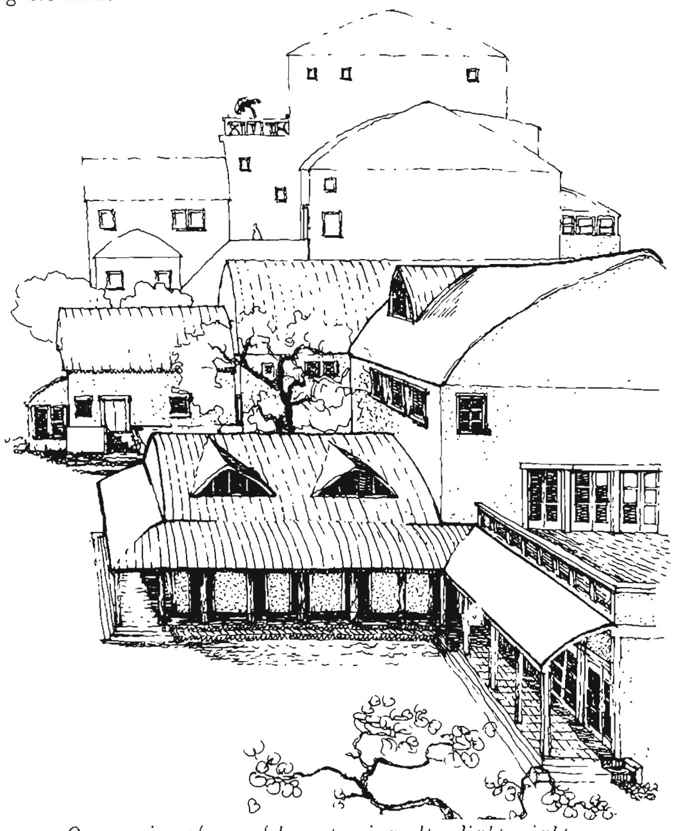
Wide roofs are highest.

4. Any place where the building helps to enclose an outdoor room or courtyard needs an even eave line so that it has the space of a "room." An irregular roof line, with gable ends, will usually destroy the space of a small courtyard. It is necessary, therefore, that roofs be hipped in these positions to make the roof edge horizontal.



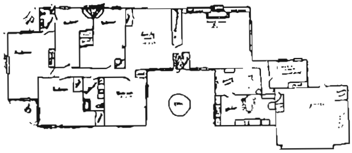
Low roof edge round a courtyard.

5. In all other positions, leave the ends of buildings and wings as gable ends.

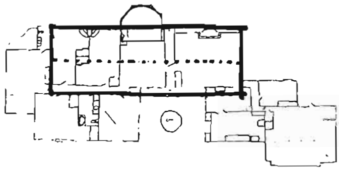


One version of a roof layout, using ultra-lightweight concrete vaults as roofs.

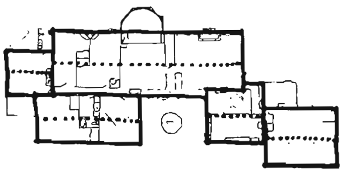
We shall now discuss the rules for roofing a building by using an example of a house designed by a layman using the pattern language. This building plan is shown below. It is a single-story house and it contains no roof gardens or balconies.



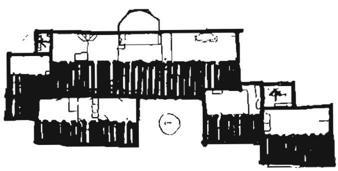
We first identify the largest rectangular cluster of rooms and roof it with a peaked roof, the ridge line of which runs the long direction:



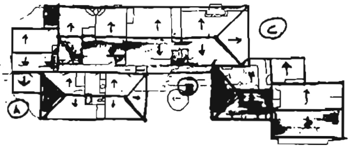
Then we do the same with smaller clusters, until all the major spaces are roofed.



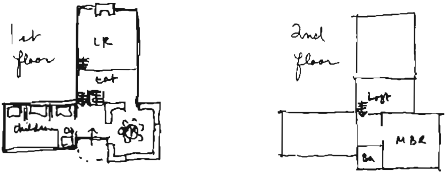
Then we roof remaining small rooms, alcoves, and thick walls with shed roofs sloping outward. These roofs should spring from the base of the main roofs to help relieve them of outward thrusts; their outside walls should be as low as possible.



Finally, we identify the outdoor spaces (shown as A, B, and C), and hip the roofs around them to preserve a more continuous eave line around the spaces.

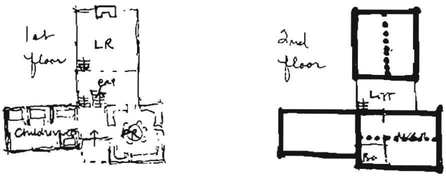


We shall now discuss a slightly more complicated example, a two story building.

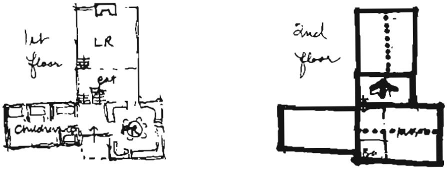


We begin with the top story, roofing the entire master bedroom and bath under one peaked roof with the ridge running lengthwise:

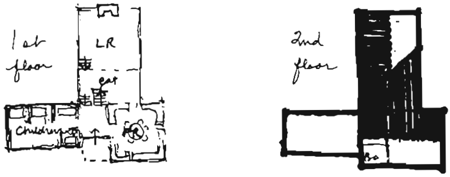
Next we move to the lower story, roofing the children's wing under a flat roof to form a ROOF GARDEN (118) for the master bedroom, and the larger living room under a pitched roof, again with the ridge running lengthwise.



Then we bring the roof over the master bedroom down over the interior loft.



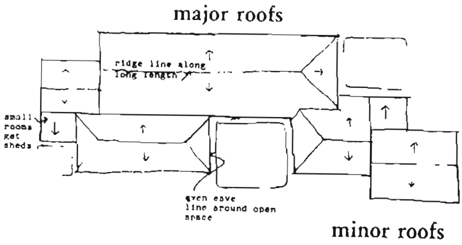
Finally, we smooth the living room roof ridge line into the side of the roof over the loft. This completes the roof layout.



It is very helpful, when you are laying out roofs, to remember the structural principle outlined in CASCADE OF ROOFS (116). When you have finished, the overall arrangement of the roofs should form a self-buttressing cascade in which each lower roof helps to take up the horizonal thrust generated by the higher roofs—and the overall section of the roofs, taken in very very general terms, tends toward a rough upside down catenary.

Therefore:

Arrange the roofs so that each distinct roof corresponds to an identifiable social entity in the building or building complex. Place the largest roofs—those which are highest and have the largest span—over the largest and most important and most communal spaces; build the lesser roofs off these largest and highest roofs; and build the smallest roofs of all off these lesser roofs, in the form of half-vaults and sheds over alcoves and thick walls.



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You can build all these roofs, and the connections between them, by following the instructions for roof vaults—ROOF VAULTS (220). When a wing ends in the open, leave the gable end at full height; when a wing ends in a courtyard, hip the gable, so that the horizontal roof edge makes the courtyard like a room—COURTYARDS WHICH LIVE (115).

Treat the smallest shed roofs, which cover thick walls and alcoves, as buttresses, and build them to help take the horizontal thrust from floor vaults and higher roof vaults—THICKENING THE OUTER WALLS (211). . . .

210 FLOOR AND CEILING LAYOUT

. . . EFFICIENT STRUCTURE (206) tells us that the spaces in the building should be vaulted so that the floors and ceilings can be made almost entirely of compression materials. To lay out the floor and ceiling vaults, we must fit them to the variety of ceiling heights over individual rooms—CEILING HEIGHT VARIETY (190) and, on the top story, to the layout of the roof vaults—ROOF LAYOUT (209).

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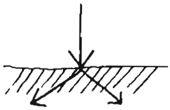
Again, the basic problem is to maintain the integrity of the social spaces in the plan.

We know, from STRUCTURE FOLLOWS SOCIAL SPACES (205), that floor and ceiling vaults must correspond to the important social spaces in the plan. But there are a great number of social spaces, and they range in size from spaces like WINDOW PLACE (180), perhaps five feet across, to spaces like FARMHOUSE KITCHEN (139), perhaps 15 feet across, to collections of spaces, like COMMON AREAS AT THE HEART (129), perhaps 35 feet across.

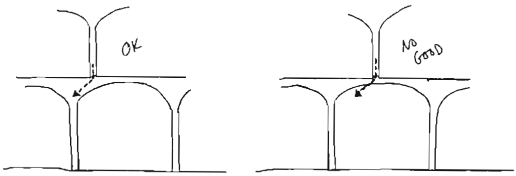
Where vaults of different width are near each other, you must remember to pay attention to the level of the floor above. Either you can level out the floor by making the smaller vaults have proportionately higher arches, or you can put extra material in between to keep the small vaults low—see CEILING HEIGHT VARIETY (190), or you can make steps in the floor above to correspond to changes in the vault sizes below.

Vaults on different floors do not have to line up perfectly with one another. In this sense they are far more flexible than column-beam structures, and for this reason also better adapted to STRUCTURE FOLLOWS SOCIAL SPACES (205). However, there are limits. If one vault is placed so that its loads come down over the arch of the vault below, this will put undue stress on the lower vault. Instead, we make use of the fact that vertical forces, passing through a continuous compressive medium, spread out downward in a 45 degree angle cone. If the lower columns are always within this cone, the upper vault will do no structural damage to the vault below it.



The angle at which a vertical force spreads downward.

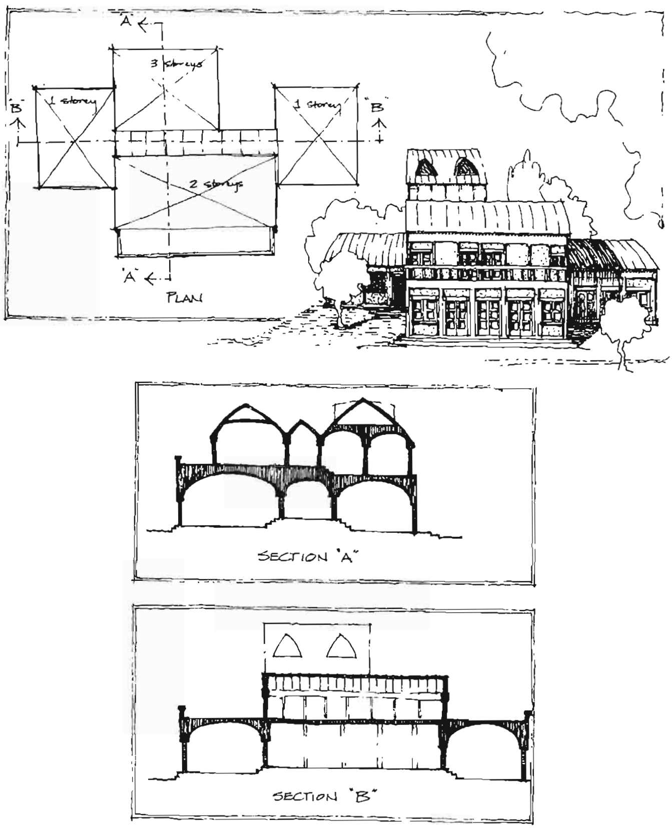
To maintain reasonable structural integrity in the system of vaults as a whole, we therefore suggest that every vault be placed so that its loads come down in a position from which the forces can go to the columns which support the next vault down, by following a 45 degree diagonal.



Good . . .   . . . no good.

With all this in mind then, work out a vault plan for your building. We suggest that you try to keep the vaults aligned with the rooms, with occasional adjustments to suit a very big room, or a very small nook or alcove. The drawing on the next page shows a floor and ceiling layout for a simple building.

Each space that you single out for a vault may have either a two-way vault (a domical ceiling on a rectangular base) or a one-way vault (a barrel vault). The two-way vaults are the most efficient structurally; but when a space is long and narrow, the domical shape begins to act like a barrel vault. We therefore



A version of floor-ceiling layout, shown in plan and section, for a simple ultra-lightweight concrete building.

suggest domical vaults for spaces where the long side is not more than twice the short side and barrel vaults for the spaces which are narrower.

We also suggest that you use barrel vaults for the rooms immediately under the roof. The roof itself is generally a barrel vault—see ROOF VAULT (220)—so it is most natural to give the ceiling of the space just under the roof a barrel vault as well.

The vaults described in FLOOR-CEILING VAULTS (219) may span from 5 to 30 feet. And they require a rise of at least 13 per cent of the short span.

Therefore:

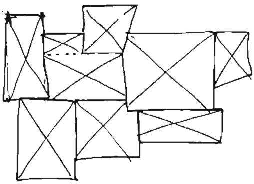
Draw a vault plan, for every floor. Use two-way vaults most often; and one-way barrel vaults for any spaces which are more than twice as long as they are wide. Draw sections through the building as you plan the vaults, and bear the following facts in mind:

1. Generally speaking, the vaults should correspond to rooms.

2. There will have to be a support under the sides of each vault: this will usually be the top of a wall. Under exceptional circumstances, it can be a beam or arch.

3. A vault may span as little as 5 feet and as much as 30 feet. However, it must have a rise equal to at least 13 per cent of its shorter span.

4. If the edge of one vault is more than a couple of feet (in plan) from the edge of the vault below it—then the lower vault will have to contain an arch to support the load from the upper vault.



vaults over rooms

upper vaults/lower vaults reconciled

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Put a PERIMETER BEAM (217) on all four sides of every vault, along the top of the bearing wall, or spanning openings. Get the shape of the vaults from FLOOR-CEILING VAULTS (219) and as you lay out the sections through the vaults, bear in mind that the perimeter beams get lower and lower on higher floors, because the columns on upper stories must be shorter (top floor columns about 4 feet, one below top 6 feet, two below top 6 to 7 feet, three below top 8 feet)—FINAL COLUMN DISTRIBUTION (213). Make sure that variations in floor level coincide with the distinctions between quiet and more public areas—FLOOR SURFACE (233). Complete the definition of the individual spaces which the vaults create with COLUMNS AT THE CORNERS (212). Include the smallest vaults of all, around the building edge, in THICKENING THE OUTER WALLS (211). . . .

211 THICKENING THE OUTER WALLS*

. . . the arrangement of roof and floor vaults will generate horizontal outward thrust, which needs to be buttressed—CASCADE OF ROOFS (116). It also happens, that in a sensibly made building every floor is surrounded, at various places, by small alcoves, window seats, niches, and counters which form "thick walls" around the outside edge of rooms—WINDOW PLACE (180), THICK WALLS (197), SUNNY COUNTER (199), BUILT-IN SEATS (202), CHILD CAVES (203), SECRET PLACE (204). The beauty of a natural building is that these thick walls—since they need lower ceilings, always, than the rooms they come from—can work as buttresses.

Once the ROOF LAYOUT (209), and the FLOOR AND CEILING LAYOUT (210) are clear these thick walls can be laid out in such a way as to form the most effective butresses, against the horizontal thrust developed by the vaults.

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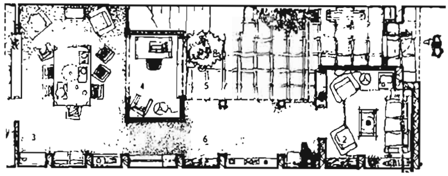
We have established in THICK WALLS (197), how important it is for the walls of a building to have "depth" and "volume," so that character accumulates in them, with time. But when it comes to laying out a building and constructing it, this turns out to be quite hard to do.

The walls will not usually be thick in the literal sense, except in certain special cases where mud construction, for example, lends itself to the making of walls. More often, the thickness of the wall has to be built up from foam, plaster, columns, struts, and membranes. In this case columns, above all, play the major role, because they do the most to encourage people to develop the walls. For instance, if the framework of a wall is made of columns standing away from the back face of the wall, then the wall invites modification—it becomes natural and easy to nail planks to the columns, and so make seats, and shelves, and changes there. But a pure, flat, blank wall does not give this kind of encouragement. Even though, theoretically, a person can always add things which stick out from the wall, the very smoothness of the wall makes it much less likely to happen. Let us assume then, that a thick wall becomes effective when it is a volume defined by columns.

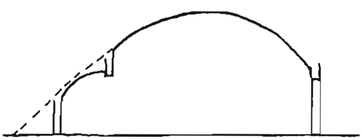


Thick walls made effective by columns.

How is it possible for a wall of this kind to justify its expense by helping the structure of the building? The fact that the building is conceived as a compressive structure, whose floors and roofs are vaults—EFFICIENT STRUCTURE (206), means that there are horizontal thrusts developed on the outside of the building, where the vaults do not counterbalance one another.

To some extent this horizontal thrust can be avoided by arranging the overall shape of the building as an upside down catenary—see CASCADE OF ROOFS (116). If it were a perfect catenary, there would be no outward thrust at all. Obviously, though, most buildings are narrower and steeper than the ideal structural catenary, so there are horizontal thrusts remaining. Although these thrusts can be resolved by tensile reinforcing in the perimeter beams—see PERIMETER BEAMS (217)—it is simplest, and most natural, and stable to use the building itself to buttress the horizontal thrusts.

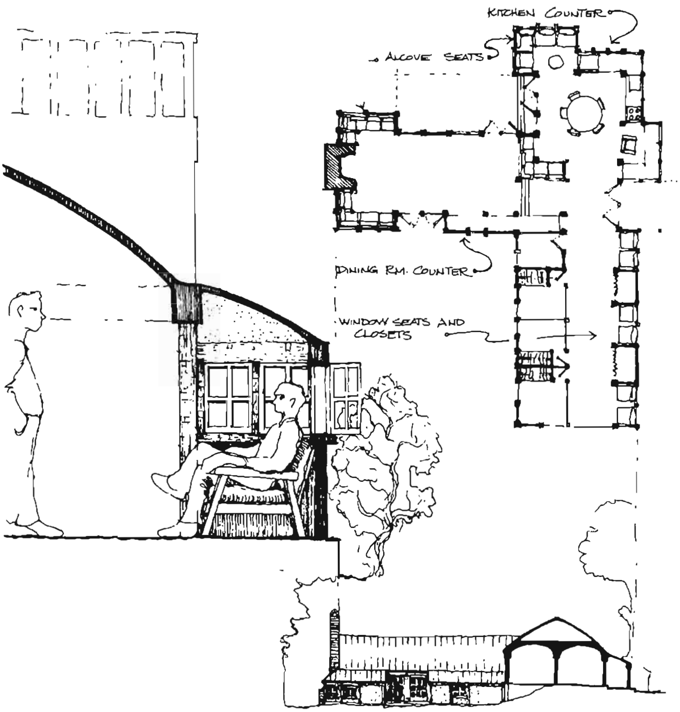
This possibility occurs naturally wherever there are "thick walls"—alcoves, window seats, or any other small spaces at the outside edge of rooms, which can have lower ceilings than the main room and can therefore have their roofs shaped as continuations of the ceiling vault inside. This requires that thick walls be outside the structure of the main room, so that their roofs and walls come close to forming a catenary with the main vault.



Alcoves within the catenary.

It is of course rare to be able to have the alcove or thick walls approach a true catenary section—we hardly ever want them that deep or that low. But even when the thick walls and alcoves are inside the line of the catenary, they are still helping to counter outward thrusts. And their buttressing effect can be improved still more by making their roofs heavy. The extra weight will tend to redirect the forces coming from the main vault slightly more toward the ground.

The drawing below shows the way this pattern works, and the kind of effect it has on a building.

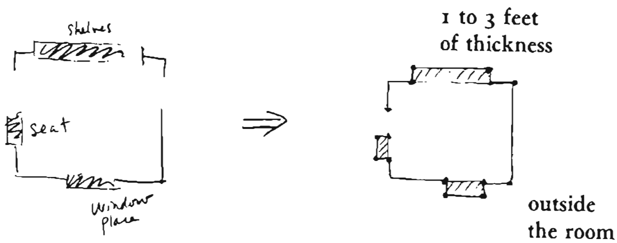


The effect of thickening the outer walls, shown in plan and section.

Therefore:

Mark all those places in the plan where seats and closets are to be. These places are given individually by ALCOVES (179), WINDOW PLACES (180), THICK WALLS (197), SUNNY COUNTER (199), WAIST-HIGH SHELF (201), BUILT-IN SEATS (202), and so on. Lay out a wide swath on the plan to correspond to these positions. Make it two or three feet deep; recognize that it will be outside the main space of the room; your seats, niches, shelves, will feel attached to the main space of rooms but not inside them. Then, when you lay out columns and minor columns, place the columns in such a way that they surround and define these thick volumes of wall, as if they were rooms or alcoves.

For shelves and counters less than 2 feet deep, there is no need to go to these lengths. The thickening can be built simply by deepening columns and placing shelves between them.



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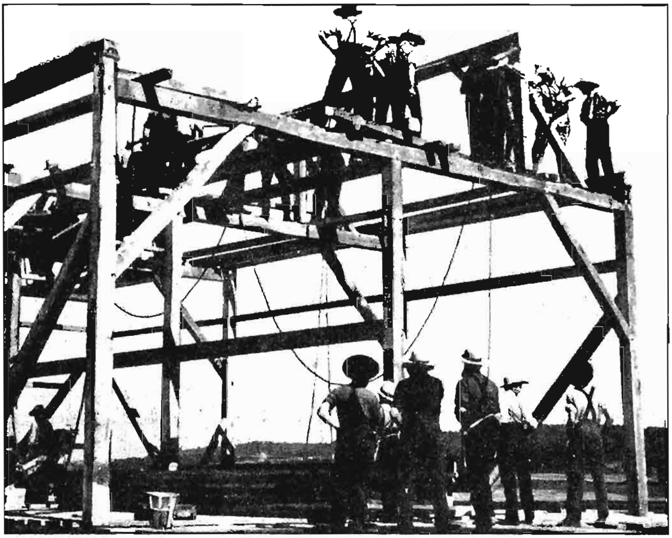
In order to make an alcove or thick wall work as a buttress, build its roof as near as possible to a continuation of the curve of the floor vault immediately inside. Load the roof of the buttress with extra mass to help change the direction of the forces—ROOF VAULTS (220). Recognize that these thick walls must be *outside* the main space of the room, below the main vault of the room—FLOOR-CEILING VAULTS (219), so that they help to buttress the horizontal forces generated by the main vault of the ceiling. When you lay out columns and minor colunms, put a column at the corner of every thick wall, so that the wall space, like other social spaces, becomes a recognizable part of the building structure—COLUMNS AT THE CORNERS (212). . . .

212 COLUMNS AT THE CORNERS**



. . . assume that you have worked out the roof plan, and laid out ceiling vaults for every room on every floor—ROOF LAYOUT (209), FLOOR AND CEILING LAYOUT (210). These vaults are not only the basis of the structure, but also define the social spaces underneath them. Now it is time to put columns at the corners of the vaults. This will both complete them as clearly defined social spaces—STRUCTURE FOLLOWS SOCIAL SPACES (205)—and also be the first constructive step in the erection of the building —GRADUAL STIFFENING (208).

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We have already established the idea that the structural components of a building should be congruent with its social spaces.

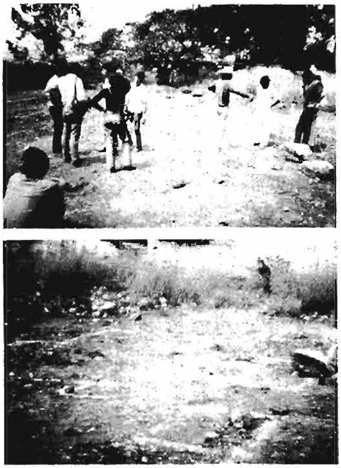
In STRUCTURE FOLLOWS SOCIAL SPACES (205) we have established that the columns need to be at corners of social spaces for psychological reasons. In EFFICIENT STRUCTURE (206) we have established that there needs to be a thickening of material at the corners of a space for purely structural reasons.

Now we give yet a third still different derivation of the same pattern—not based on psychological arguments or structural arguments, but on the process by which a person can communicate a complex design to the builder, and ensure that it can be built in an organic manner.

We begin with the problem of measurement and working drawings. For the last few decades it has been common practice to specify a building plan by means of working drawings. These measured drawings are then taken to the site; the builder transfers the measurements to the site, and every detail of the drawings is built in the flesh, on site.

This process cripples buildings. It is not possible to make such a drawing without a T-square. The necessities of the drawing itself change the plan, make it more rigid, turn it into the kind of plan which can be drawn and can be measured.

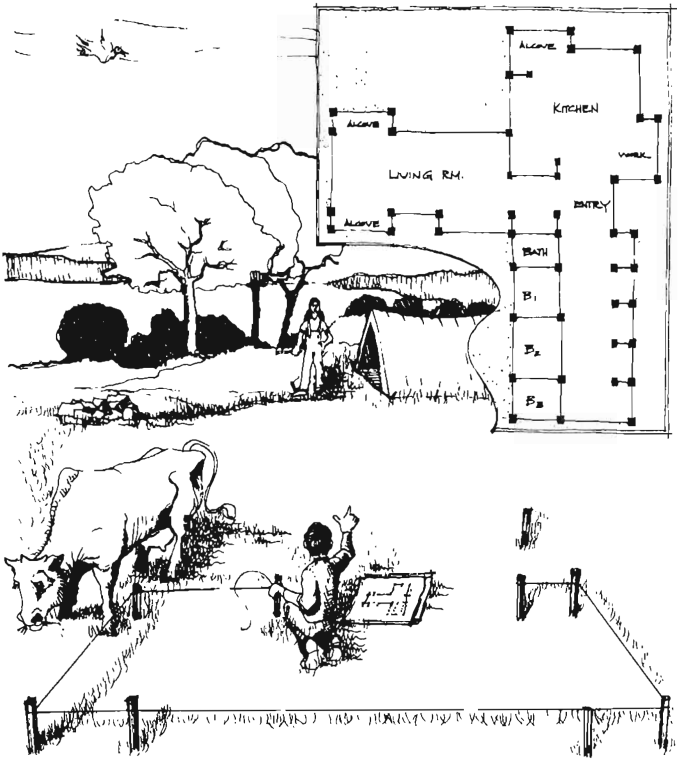
But the kind of plans which you can make by using the pattern language are much freer than that—and not so easy to draw and measure. Whether you conceive these plans out on the site—and mark them on the site with sticks and stones and chalk marks—or draw them roughly on the back of envelopes or scraps of tracing paper—in all events, the richness which you want to build into the plan can only be preserved if the builder is able to generate a living building, with all its slightly uneven lines and imperfect angles.



Chalk marks on the ground.

In order to achieve this aim, the building must be generated in an entirely different manner. It cannot be made by following a working drawing slavishly. What must be done, essentially, is to fix those points which generate the spaces—*as few of them as possible*—and then let these points generate the walls, right out on the building site, during the very process of construction.

You may proceed like this: first fix the corner of every major space by putting a stake in the ground. There are no more than a few dozen of these corners in a building, so this is possible, even if the measurements are intricate and irregular. Place these corner markers where they seem right, without regard for the exact distances between them. There is no reason whatever to try and make modular distances between them. If angles are slightly off, as they often will be, the modular dimensions are impossible anyway.



"Staking out"

These simple marks are all you need to build the building. Once construction starts, you can start very simply, by building a column, over each of these marks. These columns will then generate the rest of the building, by their mere presence, without any further need for detailed measurements or drawings, because the walls will simply be built along the lines which connect adjacent columns: and everything else follows.

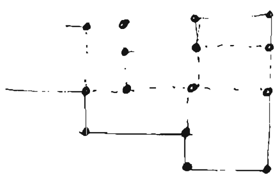
For the upper storys, you can make drawings of the column positions and once again transfer them to the actual building while it is being built. As you will see from FINAL COLUMN DISTRIBUTION (213), upper story columns do not need to line up perfectly with downstairs columns.

With this procedure, it becomes possible to transfer a rather complex building from your mind, or from a scrap of paper, to the site—and regenerate it in a way which makes it live out there.

The method hinges on the fact that you can fix the corners of the spaces first—and that these corners may then play a significant role in the construction of the building. It is interesting that although it is based on entirely different arguments from STRUCTURE FOLLOWS SOCIAL SPACES (205), it leads to almost exactly the same conclusion.

Therefore:

On your rough building plan, draw a dot to represent a column at the corner of every room and in the corners formed by lesser spaces like thick walls and alcoves. Then transfer these dots onto the ground out on the site with stakes.



columns at corners

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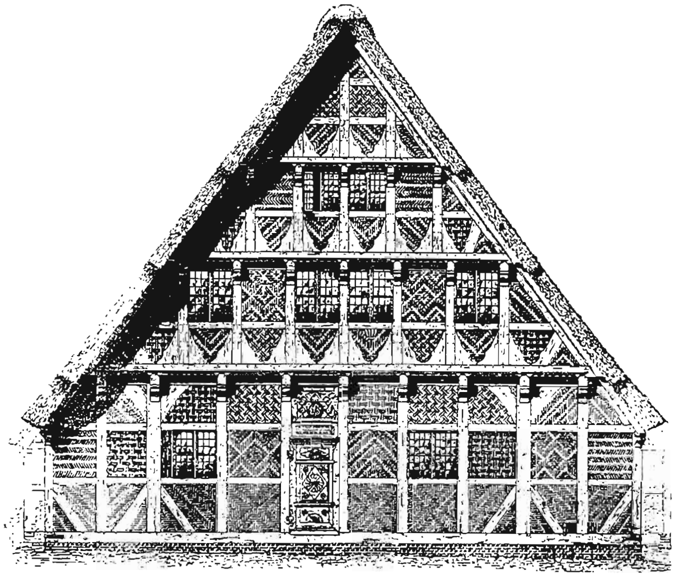
Once you have the columns for each floor on your vault plan, reconcile them from floor to floor and put in intermediate columns—FINAL COLUMN DISTRIBUTION (213). Note, especially, that it is not necessary for the corner columns to fall on a grid. The floor vaults and roof vaults can be made to fit any arrangement of columns, and still make a coherent structure—thus allowing the social spaces to determine the building shape without undue constraint from purely structural considerations—FLOOR-CEILING VAULTS (219), ROOF VAULTS (220).

These columns will not only guide your mental image of the building, they will also guide construction: first put the columns and the column foundations in place; then, to make the frame complete, tie the columns together around each room with the perimeter beam—ROOT FOUNDATIONS (214), BOX COLUMNS (216), PERIMETER BEAMS (217). Give special emphasis to all free-standing columns with the idea that when you build them, you will make them very thick—COLUMN PLACE (226). . . .

213 FINAL COLUMN DISTRIBUTION**



. . . assume that you have placed the corner columns which define the spaces—COLUMNS AT THE CORNERS (212). It is now necessary to fill in the gaps between the columns with intermediate stiffener columns as required by EFFICIENT STRUCTURE (206). This pattern gives the spacing of these intermediate stiffener columns, and helps to generate the kind of walls which EFFICIENT STRUCTURE (206) requires. It also helps to generate CEILING HEIGHT VARIETY (190).

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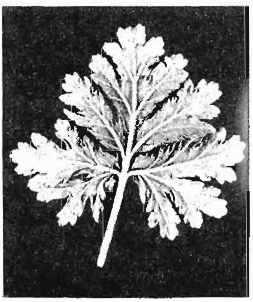
How should the spacing of the secondary columns which stiffen the walls, vary with ceiling height, number of stories and the size of rooms?

In some very gross intuitive way we know the answer to this question. Roughly, if we imagine a building with the walls stiffened at intervals along their length, we can see that the texture of these stiffeners needs to be largest near the ground, where social spaces are largest and where loads are largest, and smallest near the roof, where rooms are smallest and where loads are least. In its gross intuitive form this is the same as the intuition which tells us to expect the finest texture in the ribbing at the fine end of a leaf where everything is smallest, and to expect the grosser, cruder structure to be near the large part of the leaf.



Leaf.

These intuitions are borne out by many traditional building forms where columns, or frames, or stiffeners are larger and further apart near the ground, and finer and closer together higher up. Our key picture shows examples. But what is the structural basis for these intuitions?

Elastic plate theory gives us a formal explanation.

Consider an unstiffened thin wall carrying an axial load. This wall will usually fail in buckling before it fails in pure compression because it is thin. And this means that the material in the wall is not being used efficiently. It is not able to carry the compressive loads which its compressive strength makes possible because it is too thin.

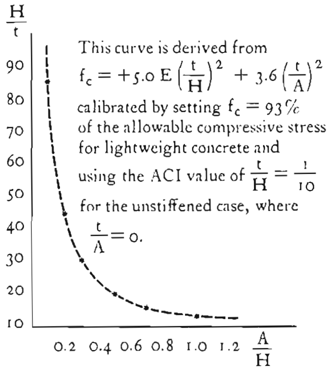
It is therefore natural to design a wall which is either thick enough or stiffened enough so that it can carry loads up to its full compressive capacity without buckling. Such a wall, which uses its material to the limits of its compressive capacity, will then also satisfy the demands of EFFICIENT STRUCTURE (206).

The critical factor is the slenderness of the wall: the ratio of its height to its thickness. For the simple case of an unstiffened concrete wall, the ACI code tells us that the wall will be able to work at 93 per cent efficiency (that is, carry 93 per cent of its potential compressive load without buckling), if it has a slenderness ratio of 10 or less. A wall 10 feet high and 1 foot thick is therefore efficient in this sense.

Suppose now, that we extrapolate to the case of a stiffened wall using elastic plate theory. By using the equation which relates allowable stress to the spacing of stiffeners, we can obtain similar figures for various walls with stiffeners. These figures are presented in the curve below. For example, a wall with a slenderness of 20 needs stiffeners at 0.5H apart (where H is the height) thus creating panels half as wide as they are high. In general, obviously, the thinner the wall is, in relation to its height, the more often it needs to be stiffened along its length.

In every case, the curve gives the spacing of stiffeners which is needed to make the wall work at 93 per cent of its compressive strength. In short, we may say that a wall built according to the principle of EFFICIENT STRUCTURE (206) ought to be stiffened in accordance with this curve.

The gradient of column spacing over different floors follows



The curve which relates wall slenderness to the spacing of stiffeners.

directly from this curve. We may see this in the following manner. The walls in a four story building carry loads which are very roughly in the ratio 4:3:2:1 (only very roughly). In any case, the loads the walls carry get less and less the higher we go in the building. If all the walls are reaching their full compressive capacity, this means that they must be getting steadily thinner too, the higher one goes in the building. If we assume that the walls all have the same height, then the four walls will therefore have progressively greater and greater slenderness ratios, and *will therefore fall further and further to the left on the curve, and will therefore need to be stiffened at closer and closer intervals.*

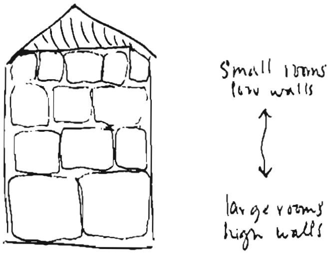
For example, suppose a four story building has 8 foot high walls on all floors and has wall thicknesses of 12 inches, 9 inches, 6 inches, and 3 inches on its four floors. The slenderness ratios are 8, 11, 17, and 33. In this case, reading off the curve, we find the ground floor has no stiffeners at all (they are infinitely far apart), the second floor has stiffeners at about 8 feet apart, the third floor has them about 5 feet apart, and the top floor has them about 2 feet apart.

In another case, where the walls are thinner (because materials are lighter and loads smaller), the spacing will be closer. Suppose, for example, that the necessary wall thicknesses are 8, 6, 4, and

2 inches. Then the slenderness ratios are 12, 16, 24, and 48, and the stiffeners need to be spaced closer together than before: nine feet apart on the ground story, 5 feet apart on the second story, 3 feet apart on the third, and 15 inches apart on the top.

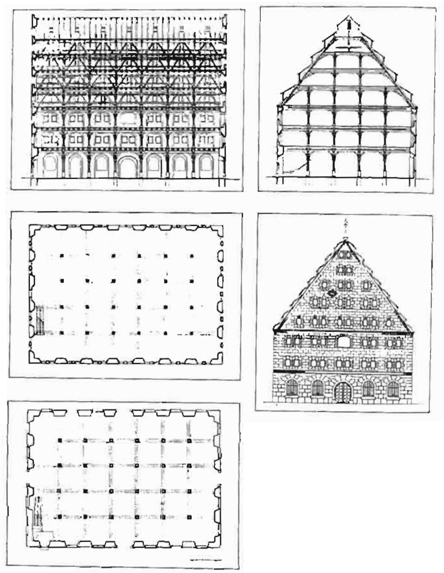
As you can see from these examples, the variation in column spacing is surprisingly great; greater, in fact, than intuition would allow. But the variation is so extreme because we have assumed that ceiling heights are the same on every floor. In fact, in a correctly designed building, the ceiling height will vary from floor to floor; and under these circumstances, as we shall see, the variation in column spacing becomes more reasonable. There are two reasons why the ceiling height needs to vary from floor to floor, one social and one structural.

In most buildings, the spaces and rooms on the first floor will tend to be larger—since communal rooms, meeting rooms, and so on, are generally better located near the entrance to buildings, while private and smaller rooms will be on upper stories, deeper into the building. Since the ceiling heights vary with the size of social spaces—see CEILING HEIGHT VARIETY (190)—this means that the ceiling heights are higher on the ground floor, getting lower as one goes up. And the roof floor has either very short walls or no wall at all—see SHELTERING ROOF (117).



Variation of room sizes.

And there is a second, purely structural explanation of the fact that ceilings need to be lower on upper stories. It is embodied in the drawing of the granary shown below. Suppose that a system of columns is calculated for pure structure. The columns on upper stories will be thinner, because they carry less load than those on lower stories. But because they are thinner, they have less capacity to resist buckling, and must therefore be shorter if we are to avoid wasting material. As a result, even in a granary, where there are no social reasons for variation in ceiling height, purely structural considerations create the necessity for thick columns and high ceilings on the lower stories and for thinner and thinner columns and lower and lower ceilings the higher one gets in the building.



German granary.

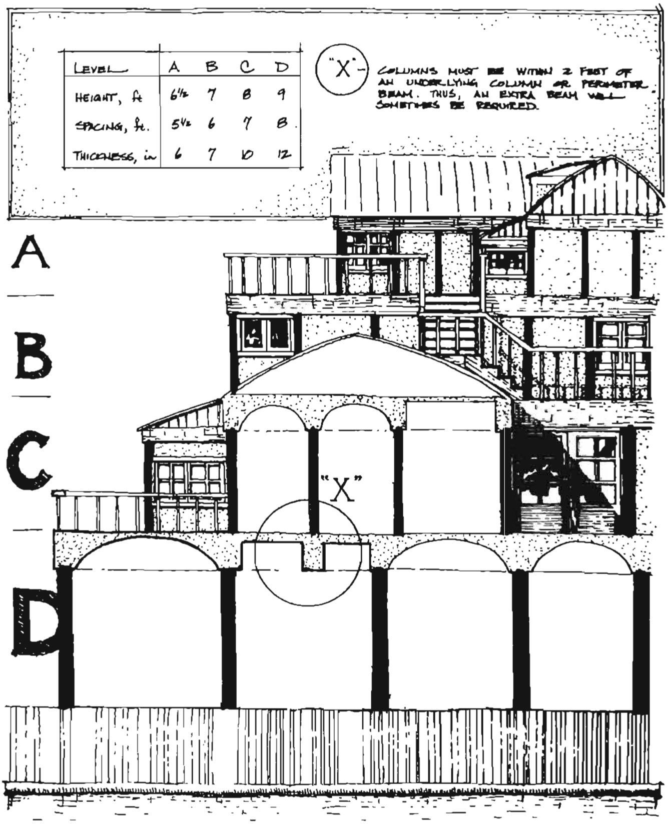
The same conclusion comes from consideration of our curve. We have used the curve, so far, to tell us that stiffeners need to be closer together on upper stories, because the walls are more slender. We may also use the curve to tell us that, for a given load, we should try to keep the slenderness ratio as low as possible. On the upper stories, where walls are most apt to be thin, we should therefore make the walls as low as possible, in order to keep the slenderness ratios low.

Let us assume now, that the wall heights do vary in a building, in a manner consistent with these arguments. A four story building, with an attic story on top, might then have these wall heights (remember that the vault height, in a vaulted room, is higher than the wall height): 9 feet on the ground floor, 7 feet on the second, 6 feet on the third, and 4 feet on the fourth, where the pitched roof comes down low over the eaves. And let us assume that the wall thicknesses are 12 inches, 6 inches, 5 inches, and 3 inches, respectively. In this case, the slenderness ratios will be 9, 14, 14, 15. The ground floor needs no stiffeners at all; the second has them 6 feet apart; the third has them 5 feet apart; and the fourth has them 3 feet apart. We show a similar distribution in the drawing opposite.

When you try to apply this pattern to floor plan, you will find a certain type of difficulty. Since the corners of rooms may already be fixed by COLUMNS AT THE CORNERS (212), it is not always possible to space the stiffeners correctly within the wall of any given room. Naturally this does not matter a great deal; the stiffeners only need to be *about* right; the spacing can comfortably vary from room to room to fit the dimensions of the walls. However, on the whole, you must try and put the stiffeners closer together where the rooms are small and further apart where rooms are large. If you do not, the building will seem odd, because it defies one's structural intuitions.

Consider two rooms on the same floor, one twice as large as the other. The larger room has twice the perimeter, but its ceiling generates four times the load; it therefore carries a greater load per unit length of wall. In an ideal efficient structure, this means that the wall must be thicker; and therefore, by the arguments already given, it will need stiffeners spaced further apart than the smaller room which carries less load and has thinner walls.

We recognize that few builders will take the trouble to make wall thicknesses vary from room to room on one floor of the building. However, even if the wall is uniformly thick, we believe that the stiffeners must at least not contradict this rule. If, for reasons of layout, it is necessary that the spacing of stiffeners varies from room to room, then it is essential that the larger spacings of the stiffeners fall on those walls which enclose the



The final column distribution in a four story building, built according to our patterns for columns, walls and vaults.

larger rooms. If the greater spacing of stiffeners were to coincide with smaller rooms, the eye would be so deceived that people might misunderstand the building.

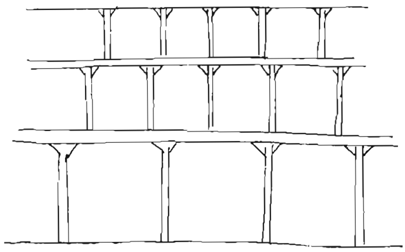
One important note. All of the preceding analysis is based on the assumption that walls and stiffeners are behaving as elastic plates. This is roughly true, and helps to explain the general phenomenon we are trying to describe. However, no wall behaves perfectly as an elastic plate—least of all the kind of lightweight concrete walls we are advocating in the rest of the construction patterns. We have therefore used a modified form of the elastic plate theory, calibrated according to the ACI code, so that the numbers in our analysis are based on the elastic behavior of concrete (and fall within the limits of its tension and compression). However, when the plate goes out of the elastic range and cracks, as it almost certainly will in a concrete design, other factors will enter in. We therefore caution the reader most strongly not to take the actual numbers presented in our analysis as more than illustrations. The numbers reflect the general mathematical behavior of such a system, but they are not reliable enough to use in structural computations.

Therefore:

Make column stiffeners furthest apart on the ground floor and closer and closer together as you go higher in the building. The exact column spacings for a particular building will depend on heights and loads and wall thicknesses. The numbers in the following table are for illustration only, but they show roughly what is needed.

building height in stories	ground floor	2nd floor	3rd floor	4th floor
1	2′-5′			
2	3′-6′	1′-3′		
3	4′-8′	3′-6′	1′-3′	
4	5′-∞′	4′-8′	3′-6′	1′-3′

Mark in these extra stiffening columns as dots between the corner columns on the drawings you have made for different floors. Adjust them so they are evenly spaced between each pair of corner columns; but on any one floor, make sure that they are closer together along the walls of small rooms and further apart along the walls of large rooms.



floor by floor variation

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To the extent consistent with CEILING HEIGHT VARIETY (190), make walls and columns progressively shorter the higher you go in the building to keep slenderness ratios low.

And make wall thicknesses and column thicknesses vary with the height—see WALL MEMBRANE (218). Our calculations, for a typical lightweight concrete building of the kind we have been discussing, suggest the following orders of magnitude for wall thicknesses: Top story—2 inches thick; one below top story—3 inches; two below top story—4 inches; three storys below top (ground floor on a four story building)—5 inches. Of course these numbers will change for different loads, or for different materials, but they show the type of variation you can expect.

Column thicknesses must be proportional to wall thicknesses, so that the thinnest walls have the thinnest columns. If they are very thin, it will be possible to make them simply by placing boards, or one thickness of material, outside the outer skins which form the wall membrane—see WALL MEMBRANE (218). If the walls are thick, they will need to be full columns, twice as thick as the walls, and roughly square in section, built before the walls, but made in such a way that they can be poured integrally with the walls—BOX COLUMNS (216). . . .

put stakes in the ground to mark the columns on the site, and start erecting the main frame according to the layout of these stakes;

214. ROOT FOUNDATIONS

215. GROUND FLOOR SLAB

216. BOX COLUMNS

217. PERIMETER BEAMS

218. WALL MEMBRANES

219. FLOOR-CEILING VAULTS

220. ROOF VAULTS

214 ROOT FOUNDATIONS

. . . once you have a rough column plan for the building—COLUMNS AT THE CORNERS (212), FINAL COLUMN DISTRIBUTION (213)—you are ready to start the site work itself. First, stake out the positions of the ground floor columns, before you do any other earthwork, so that you can move the columns whenever necessary to leave rocks or plants intact—SITE REPAIR (104), CONNECTION TO THE EARTH (168). Then dig the foundation pits and prepare to make the foundations.

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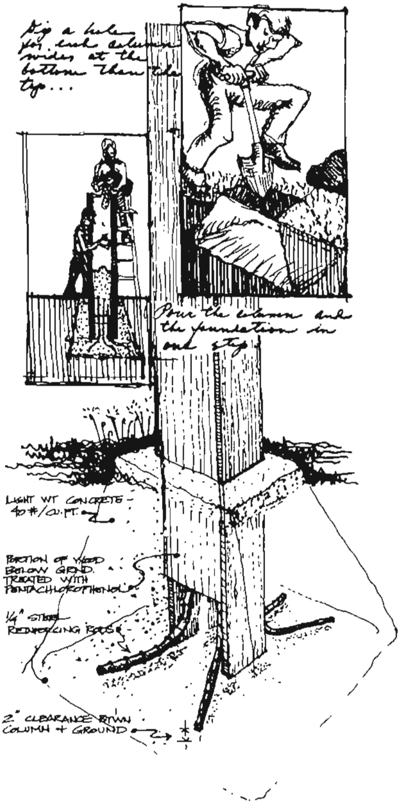
The best foundations of all are the kinds of foundations which a tree has—where the entire structure of the tree simply continues below ground level, and creates a system entirely integral with the ground, in tension and compression.

When the column and the foundations are separate elements which have to be connected, the connection becomes a difficult and critical joint. Both bending and shear stresses are extremely high just at the joint. If a connector is introduced as a third element, there are even more joints to worry about, and each member works less effectively to resist these stresses.

We suspect that it would be better to build the foundations and the columns in such a way that the columns get rooted in the foundation and become integral and continuous with the ground.

In the realization of this pattern which we illustrate, the root foundation takes a very simple form. Since columns start out hollow, BOX COLUMNS (216), we can form a root foundation by setting the hollow column into the foundation pit, and then pouring the lower part of the column and the foundation, integrally, in a single pour.

As far as the wood version is concerned, the problem of placing

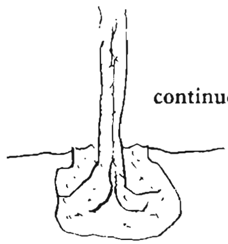


One version of a root foundation for a hollow wooden box column which we have built.

wood in contact with wet underground concrete is very serious. The wood of the column can be protected from dry rot and termites by pressure dipping in pentachlorophenol. We also believe that painting with thick asphalt or dampproof mastic might work; but the problem isn't really solved. Of course, masonry versions in which columns are made of terracotta pipe or concrete pipe and filled with dense concrete, ought to work alright. But even in these cases, we are doubtful about the exact structural validity of the pattern. We believe that some kind of structure which is continuous with the ground is needed: but we quite haven't been able to work it out. Meanwhile, we state this pattern as a kind of challenge.

Namely:

Try to find a way of making foundations in which the columns themselves go right into the earth, and spread out there—so that the footing is continuous with the material of the column, and the column, with its footing, like a tree root, can resist tension and horizontal shear as well as compression.



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To make foundations like this for hollow concrete, filled box columns, start with a pit for each foundation, place the hollow column in the pit, and pour the column and the foundation integrally, in one continuous pour—BOX COLUMNS (216). Later, when you build the ground floor slab, tie the concrete into the foundations—GROUND FLOOR SLAB (215).

215 GROUND FLOOR SLAB

. . . this pattern helps to complete CONNECTION TO THE EARTH (168), EFFICIENT STRUCTURE (206), COLUMNS AT THE CORNERS (212), and ROOT FOUNDATIONS (214). It is a simple slab, which forms the ground floor of the building, ties the root foundations to one another, and also allows you to form simple strip foundations as part of the slab, to support the walls.

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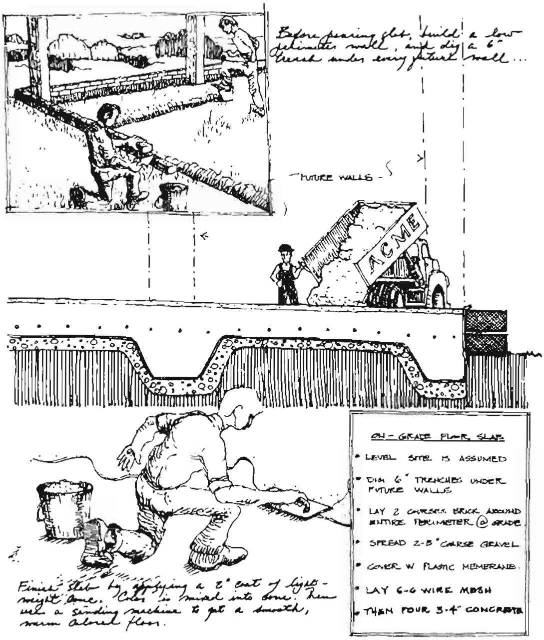
The slab is the easiest, cheapest, and most natural way to lay a ground floor.



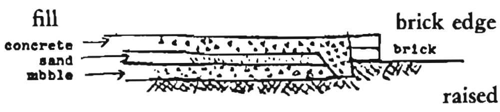
A raised ground floor slab built inside a brick perimeter wall.

When the ground is relatively level, a concrete slab which sits directly on the ground is the most natural and cheapest way of building a ground floor. Wood floors are expensive, need air space underneath them, and need to be built up on continuous foundation walls or beams. Prefabricated floor panels also need a structure of some sort to support them. A slab floor, on the other hand, uses the earth for support, and can supply the foundations which are needed to support walls, by simple thickening.

The one trouble with slabs is that they can easily feel cold and damp. We believe that this feeling is at least as much a psychological one as a physical one (given a well-made and insulated slab), and that the feeling is most pronounced with slabs that are on grade. We therefore propose that the slab be raised from the ground. This can be done by not excavating the ground at all, instead only leveling it, and placing the usual bed of rubble and gravel on top of the ground. (In normal practice, the ground is excavated so that the top of the rubble is slightly below grade, and the top of the slab only *just* above the ground.)

Therefore:

Build a ground floor slab, raised slightly—six or nine inches above the ground—by first building a low perimeter wall around the building, tied into the column foundations, and then filling it with rubble, gravel, and concrete.



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Finish the public areas of the floor in brick, or tile, or waxed and polished lightweight concrete, or even beaten earth; as for those areas which will be more private, build them one step up or one step down, with a lightweight concrete finish that can be felted and carpeted—FLOOR SURFACE (233).

Build the low wall which forms the edge of the ground floor slab out of brick, and tie it directly into all the terraces and paths around the building—CONNECTION TO THE EARTH (168), SOFT TILE AND BRICK (248). If you are building on a steep sloped site, build part of the ground floor as a vaulted floor instead of excavating to form a slab—FLOOR-CEILING VAULTS (219). . . .

216 BOX COLUMNS**

. . . if you use ROOT FOUNDATIONS (214), the columns must be made at the same time as the foundations, since the foundation and the column are integral. The height, spacing, and thickness of the various columns in the building are given by FINAL COLUMN DISTRIBUTION (213). This pattern describes the details of construction for the individual columns.

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In all the world's traditional and historic buildings, the columns are expressive, beautiful, and treasured elements. Only in modern buildings have they become ugly and meaningless.

The fact is that no one any longer knows how to make a column which is at the same time beautiful and structurally efficient. We discuss the problem under seven separate headings:

1. Columns feel uncomfortable unless they are reasonably thick and solid. This feeling is rooted in structural reality. A long thin column, carrying a heavy load, is likely to fail by buckling: and our feelings, apparently, are particularly tuned in to this possibility.

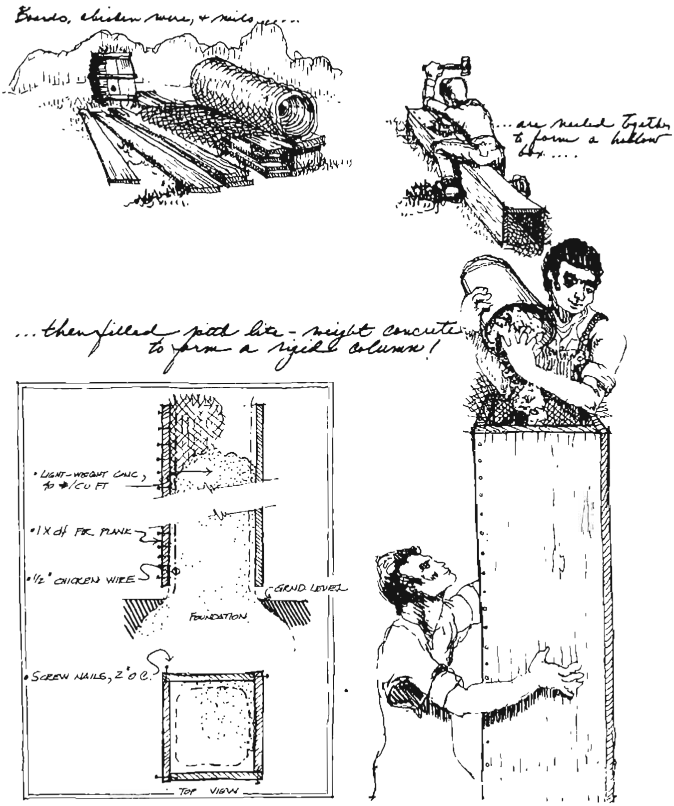
We do not wish to exaggerate the need for thickness. Taken too far, it could easily become a mannerism of a rather ridiculous sort. But columns do need to be comfortable and solid, and only thin when they are short enough to be in no danger of buckling. When the column is a free-standing one, then the need for thickness becomes essential. This is fully discussed under COLUMN PLACE (226).

2. Structural arguments lead to exactly the same conclusion. Thin, high strength materials, like steel tubes and prestressed concrete, are ruled out by GOOD MATERIALS (207). Lower strength materials which are ecologically sound have to be relatively fat to cope with the loads.

3. The column must be cheap. An 8 by 8 solid wood column is too expensive; thick brick or stone columns are almost out of the question in today's market.

4. It must be warm to the touch. Concrete columns and painted steel columns have an unpleasant surface and are not very easy to face.

5. If the column takes bending, the highest strength materials should be concentrated toward the outside. Buckling and bending strength both depend on the moment of inertia, which is highest when the material is as far as possible from the neutral axis. A stalk of grass is the archetypal example.



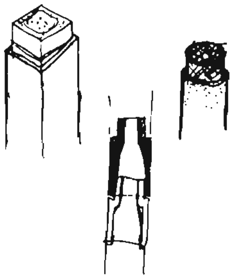
A version of box columns made of 1 inch wood planks, nailed together with spiral groove nails, and filled with chicken wire and ultra-lightweight concrete.

6. The column must be easy to connect to foundations, beams, and walls. Precast concrete columns are very hard to connect. So are metal columns. Brick columns are easy to connect to brick walls—not to the lighter weight skin structures required by WALL MEMBRANE (218).

7. The column must be hand nailable, and hand cuttable to make on-site modification and later repair as easy as possible. Again, current materials do not easily meet this requirement.

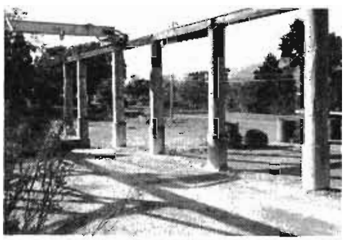
A column which has all these features is a box column, where the hollow tube can be made as thick as is required, and then filled with a strong compressive material. Such a column can be made cheaper than comparable wood and steel columns; the outer skin can be made with a material that is beautiful, easy to repair, and soft to the touch; the column can be stiffened for bending, either by the skin itself, or by extra reinforcing; and, for structural integrity, the fill material can be made continuous with the column's footings and beams.

An example of a box column which we have built and tested is a wooden box column, made with 1 inch wooden planks and filled with lightweight concrete the same density as wood, so that it has the overall volume and mass of a heavy 8 inch solid column. The drawing opposite shows these wooden box columns being made.



Possible box columns

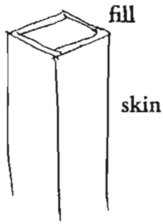
Box columns can be made in many other ways. One kind is made by stacking 8 by 8 inch lightweight concrete blocks, and filling the cavity with a concrete of the same density. Some wire reinforcing inside the column is required to give the column tensile strength. A hollow brick column, filled with earth is another possibility. Concrete, vinyl, and terracotta sewer pipe filled with lightweight concrete and reinforced with mesh; a resin-impregnated cardboard tube filled with earth; or two concentric cardboard tubes with the outer ring filled with concrete and the inner ring filled with earth; still another is made from a tube of chicken wire wesh, filled with rubble, plastered and whitewashed on the outside. And still another can be made with self-aligning hollow tiles for the skin. The tiles can be molded by hand with a hand press—in concrete or tile; the soft tile will make beautiful rose red, soft warm columns.



Box columns made from concrete sewer pipe, filled with concrete.

Therefore:

Make the columns in the form of filled hollow tubes, with a stiff tubular outer skin, and a solid core that is strong in compression. Give the skin of the column some tensile strength—preferably in the skin itself, but perhaps with reinforcing wires in the fill.



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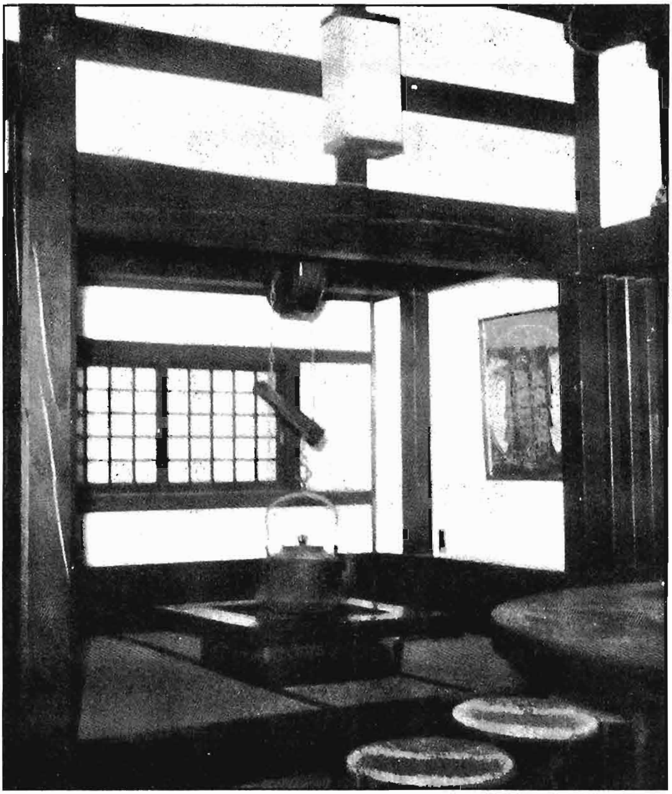
As you already know, it is best to build the columns integral with ROOT FOUNDATIONS (214) on the ground floor, or integral with the FLOOR-CEILING VAULTS (219) on upper floors, and to fill them in one continuous pour. Once the columns are in position, put in the PERIMETER BEAMS (217), and fill the beams at the same time that you fill the upper part of the column. If the column is free standing, put in column braces or column capitals—COLUMN CONNECTION (227)—to brace the connection between the two. And make the columns especially thick, or build them in pairs, where they are free-standing, so that they form a COLUMN PLACE (226). . . .

217 PERIMETER BEAMS*



. . . this pattern helps to complete BOX COLUMNS (216), by tying the tops of the columns together once they are in position. It also helps to form the bearing surface for the edge of the FLOOR-CEILING VAULTS (219). For this reason, the positions of the perimeter beams must correspond exactly to the edges of the vaults laid out in FLOOR AND CEILING LAYOUT (210).

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If you conceive and build a room by first placing columns at the corners, and then gradually weaving the walls and ceiling round them, the room needs a perimeter beam around its upper edge.

It is the beam, connecting the columns which creates a volume you can visualize, before it is complete; and when the columns are standing in the ground, you need the actual physical perimeter beam, to generate this volume before your eyes, to let you see the room as you are building it, and to tie the tops of the columns together, physically.

These reasons are conceptual. But of course, the conceptual simplicity and rightness of the beam around the room comes, in the end, from the more basic fact that this beam has a number of related structural functions, which make it an essential part of any room built as a natural structure. The perimeter beam has four structural functions:

1. It forms the natural thickening between the wall membrane and vault membrane, described in EFFICIENT STRUCTURE (206).

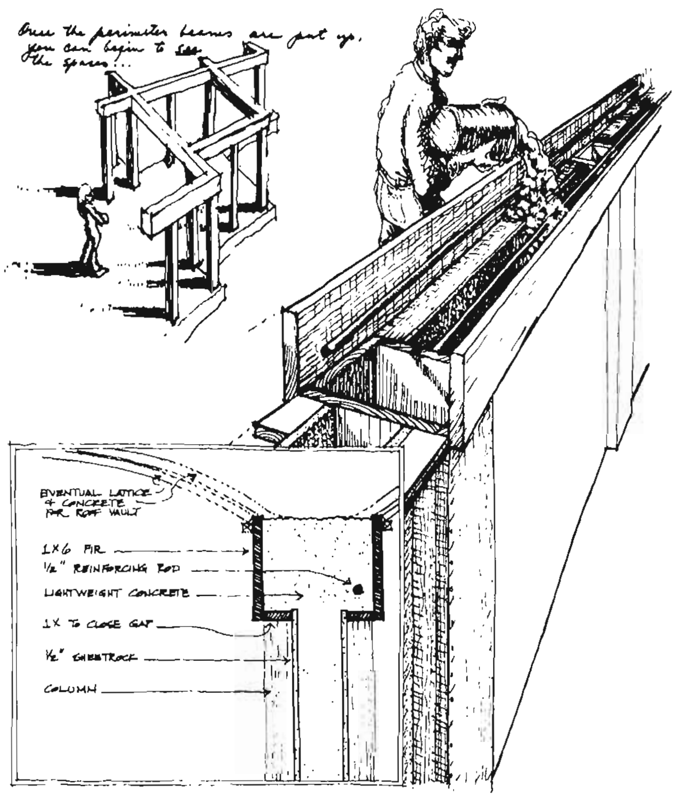
2. It resists the horizontal thrust of the ceiling vault, wherever there are no outside external buttresses to do it, and no other vaults to lean against.

3. It functions as a lintel, wherever doors and windows pierce the wall membrane.

4. It transfers loads from columns in upper storys to the columns and the wall membrane below it, and spreads these loads out to distribute them evenly between the columns and the membrane.

These functions of the perimeter beam show that the beam must be as continuous as possible with walls and columns above, the walls and columns below, and with the floor. If we follow GOOD MATERIALS (207), the beam must also be easy to make, and easy to cut to different lengths.

Available beams do not meet these requirements. Steel beams and precast or prestressed beams cannot easily be tied into the wall and floor to become continuous with these membranes. Far more important, they cannot easily be cut on site to conform to the exact dimensions of the different rooms which will occur in an organic plan.



A version of the perimeter beam consistent with the box column shown before.

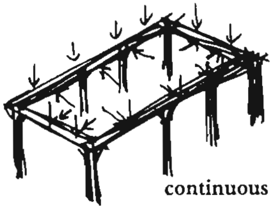
Of course, wood beams meet both requirements: they are easy to cut and can be tied along their lengths to wall and floor membranes. However, as we have said in GOOD MATERIALS (207), wood is unavailable in many places, and even where it is available, it is becoming scarce and terribly expensive, especially in the large sizes needed for beams.

To avoid the use of wood, we have designed a perimeter beam—shown opposite—which is consistent with our box column, and designed to be used together with it. It is a beam made by first nailing up a channel made of wooden planks to the columns, before the wall membranes are made; then putting in reinforcing, and filling up with ultra-lightweight 60 pounds per cubic foot concrete, after the walls are made and filled. This beam is excellent for continuity. The wooden channel can first be made continuous with other skin elements by nailing, and the fill can then be made continuous by filling columns and beams and walls and vault in one continuous pour—see WALL MEMBRANES (218) and FLOOR-CEILING VAULTS (219).

Of course, there are many other ways of making a perimeter beam. First of all, there are several variants of our design: the U-shaped channel can be made of fiberboard, plywood, precast lightweight concrete, and, in every case, filled with lightweight concrete. Then there are various traditional perimeter beams—the Japanese version or the early American versions come to mind. And then there are a variety of structures which are not exactly even beams—but still act to spread vertical loads and counteract horizontal thrusts. A row of brick arches might function in this way, in a far fetched case so might a tension ring of jungle creeper.

Therefore:

Build a continuous perimeter beam around the room, strong enough to resist the horizontal thrust of the vault above, to spread the loads from upper stories onto columns, to tie the columns together, and to function as a lintel over openings in the wall. Make this beam continuous with columns, walls and floor above, and columns and walls below.



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Remember to place reinforcing in such a way that the perimeter beam acts in a *horizontal* direction as well as vertical. When it forms the base for a FLOOR-CEILING VAULT (219) it must be able to act as a ring beam to resist all those residual horizontal outward thrusts not contained by the vault. Strengthen the connection between the columns and the perimeter beam with diagonal braces where the columns are free standing—COLUMN CONNECTION (227). . . .

218 WALL MEMBRANE*

. . . according to EFFICIENT STRUCTURE (206) and FINAL COLUMN DISTRIBUTION (213), the wall is a compressive load-bearing membrane, "stretched" between adjacent columns and continuous with them, the columns themselves placed at frequent intervals to act as stiffeners. The intervals vary from floor to floor, according to column height; and the wall thickness (membrane thickness) varies in a similar fashion. If the column stiffeners are already in place according to BOX COLUMN (216), this pattern describes the way to stretch the membrane from column to column to form the walls.

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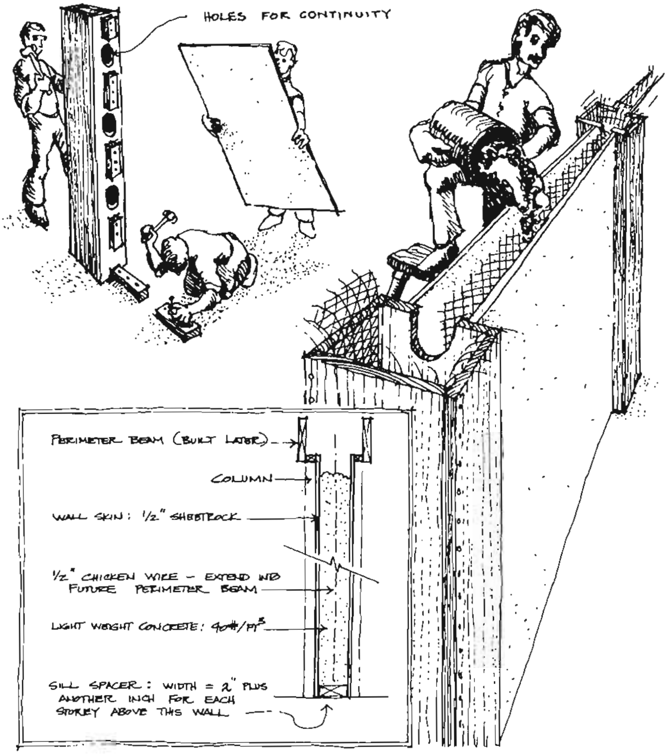
In organic construction the walls must take their share of the loads. They must work continuously with the structure on all four of their sides; and act to resist shear and bending, and take loads in compression.

When walls are working like this, they are essentially structural membranes: they are continuous in two dimensions; together with stiffeners and columns they resist loads in compression; and they create a continuous rigid connection between columns, beams, and floors, both above and below, to help resist shear and bending.

By contrast, curtain walls and walls which are essentially "in-fill," do not act as membranes. They may function as walls in other respects—they insulate, enclose, they define space—but they do not contribute to the overall structural solidity of the building. They let the frame do all the work; structurally they are wasted. [For the details of the argument that every part of the structure must cooperate to take loads, see EFFICIENT STRUCTURE (206).]

A membrane, on the other hand, makes the wall an integral thing, working with the structure around it. How should we build such a wall membrane?



A version of an interior wall membrane which uses gypsum board as skin, and ultra-lightweight concrete for the fill.

GOOD MATERIALS (207) tells us that we should use hand cuttable, nailable, ecologically sound materials, which one can work with home tools, with the emphasis on earthen fill materials and sheet materials.

GRADUAL STIFFENING (208) tells us that the process of building should be such that one can start with a flimsy structure and stiffen it during the course of construction, as materials are put in place, so that the process can be smooth and continuous.

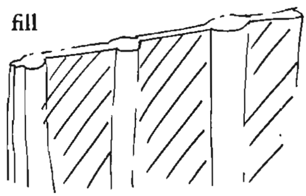
An example of such a wall that we have built and tested uses gypboard for the inner skin, ship-lapped wooden boards for the outer skin and ultra-lightweight concrete for the fill. The wall is built by fixing nailing blocks to the sides of columns. We nail the skin to the nailing blocks, put chickenwire into the cavity to reinforce the concrete against shrinkage, and then pour the lightweight concrete into the cavity. The wall needs to be braced during pouring, and you can't pour more than two or three feet at a time: the pressure gets too great. The last pour fills the perimeter beam and the top of the wall, and so makes them integral. The drawing opposite shows one way that we have made this particular kind of wall membrane.

This wall is solid (about the density of wood), has good acoustic and thermal properties, can easily be built to conform to free and irregular plans, and can be nailed into. And because of its stiffeners, the wall is very strong for its thickness.

Other versions of this pattern: (1) The skin can be formed from hollow structural tiles or concrete blocks, with a concrete or earthen fill. (2) The exterior skin might be brick, the interior skin plywood or gypboard. In either case the columns would have to be hollow tile, or concrete pipe, or other masonry box columns. (3) The skin might be formed with wire mesh, gradually filled with concrete and rubble, and stuccoed on the outside, with plaster on the inside. The columns in this case can be built in the same way—out of a wire mesh tube filled with rubble and concrete. (4) It may also be possible to use gypboard for both skins, inside and out. The gypboard on the outer side could then be covered with building paper, lath, and stucco.

Therefore:

Build the wall as a membrane which connects the columns and door frames and windows frames and is, at least in part, continuous with them. To build the wall, first put up an inner and an outer membrane, which can function as a finished surface; then pour the fill into the wall.



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Remember that in a stiffened wall, the membranes can be much thinner than you might expect, because the stiffeners prevent buckling. In some cases they can be as thin as two inches in a one story building, three inches at the bottom of a two-story building and so on—see FINAL COLUMN DISTRIBUTION (213).

Membranes can be made from hollow tile, lightweight concrete block, plywood, gypboard, wood planks, or any other sheet type material which would make a nice surface, which is easy to nail into, comfortable to touch, and so on. If the inner sheet is gypsum board, it can be finished with a skim coat of plaster—SOFT INSIDE WALLS (235). The outer sheet can be made of 1 inch boards, tongue and grooved; or exterior grade plywood; or exterior board hung with tile, shingles, or plastered—LAPPED OUTSIDE WALLS (234). It is also possible to build the outer skin of brick or tile: in this case, columns must be of the same material—SOFT TILE AND BRICK (248). . . .

219 FLOOR-CEILING VAULTS**

. . . we have already discussed the fact that ordinary joist floors and slab floors are inefficient and wasteful because the tension materials they use to resist bending are less common than pure compression materials—EFFICIENT STRUCTURE (206), GOOD MATERIALS (207), and that it is therefore desirable to use vaults wherever possible. This pattern gives the shape and construction of the vaults. The vaults will help to complete FLOOR AND CEILING LAYOUT (210), and PERIMETER BEAMS (217); and, most important of all, they will help to create the CEILING HEIGHT VARIETY (190) in different rooms.

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We seek a ceiling vault shape which will support a live load on the floor above, form the ceiling of the room below, and generate as little bending and tension as possible so that compressive materials can be relied on.

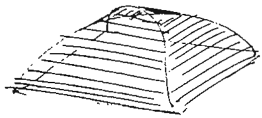
The vault shape is governed by two constraints: the ceiling cannot be lower than about 6 feet at the edge of the room, except in occasional attic rooms; and the ceiling in the middle of the room should vary with the room size (8 to 12 feet for large rooms, 7 to 9 feet for middle sized rooms, and 6 to 7 feet for the very smallest alcoves and corners—see CEILING HEIGHT VARIETY (190)).

We know, from structural considerations, that a circular shell dome will generate virtually no bending moments when its rise is at least 13 to 20 per cent of its diameter. (This is established in studies and tests of shell structures, and is corroborated by our own computer studies.) For a room 8 feet across, this requires a rise of about 18 inches, making a total height of 7 to 8 feet in the middle; for a room 15 feet across, it requires a rise of 2–3 feet, making a height of 8 to 10 feet in the middle.

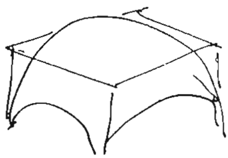
Luckily, these vault heights are just congruent with the needed ceiling heights. We may say, therefore, that the ideal vault for an inhabited space is one which springs from 6 to 7 feet at the edge, and rises 13 to 20 per cent of the smaller diameter.

There are various possible ways of making a circular or elliptical vault spring from a square or rectangular room.

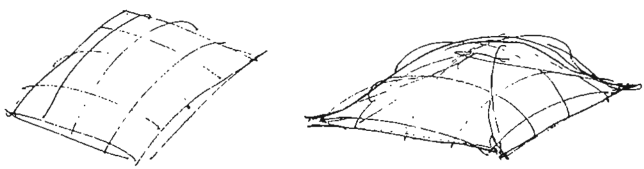
1. One type of vault is made by arching diagonal ribs from corner to corner; and then spacing straight line elements across the ribs.



2. Another type is a pure dome supported on squinches.



3. Another is based on a rectangular grid of arched ribs. The edge ribs are entirely flat, and the center ribs have the greatest curvature. In the end, each part of the vault is curved in three dimensions, and the corners are slightly flattened.



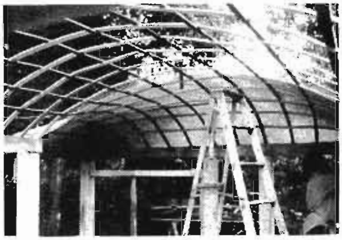
Each of these three vaults makes sense in slightly different circumstances. The first is the easiest to conceive, but it has a slight structural disadvantage: its surface panels are curved in one direction only—because they are made of straight line elements—and cannot therefore achieve the strength of a doubly curved vault. The second is the hardest to conceive; however, it comes naturally from the intersection of a spherical shape and a rectangular one. If one were to make a vault by using a balloon as a form, pushed up within the perimeter beams, the second type would be the easiest to use. In the particular building technique we have been using, the third type is easiest to use, because it is particularly simple to lay out the arched ribs which provide the formwork. It flattens out at the corners, which could create bending moments and require tension materials. However, in lightweight concrete we have found that it does not require any more than the shrinkage reinforcement, which is needed anyway.

We shall now describe a very simple way of making a vault. Bear in mind that we considered it essential that the vault be built up gradually, and that it could be fitted to any room shape, without difficulty. This technique is not only cheap and simple. It is also one of the only ways we have found of fitting a vault to an arbitrary room shape. It works for rectangular rooms, rooms that are just off-rectangles, and odd-shaped rooms. It can be applied to rooms of any size. The height of the vault can be varied according to its position in the overall array of ceiling heights and floors—CEILING HEIGHT VARIETY (190), STRUCTURE FOLLOWS SOCIAL SPACES (205), FLOOR AND CEILING LAYOUT (210).

First, place lattice strips at one foot centers, spanning in one direction, from one perimeter beam to the opposite perimeter beam, bending each strip to make a sensible vault shape. Now weave strips in the other direction, also at almost one foot centers, to form a basket. The strips can be nailed onto the form of the perimeter beam around the room. You will find that the basket is immensely strong and stable.

Lattice strips in position.

Now stretch burlap over the lattice strips, tacking it on the strips so it fits tightly. Paint the burlap with a heavy coat of polyester resin to stiffen it.



Burlap over the lattice work.

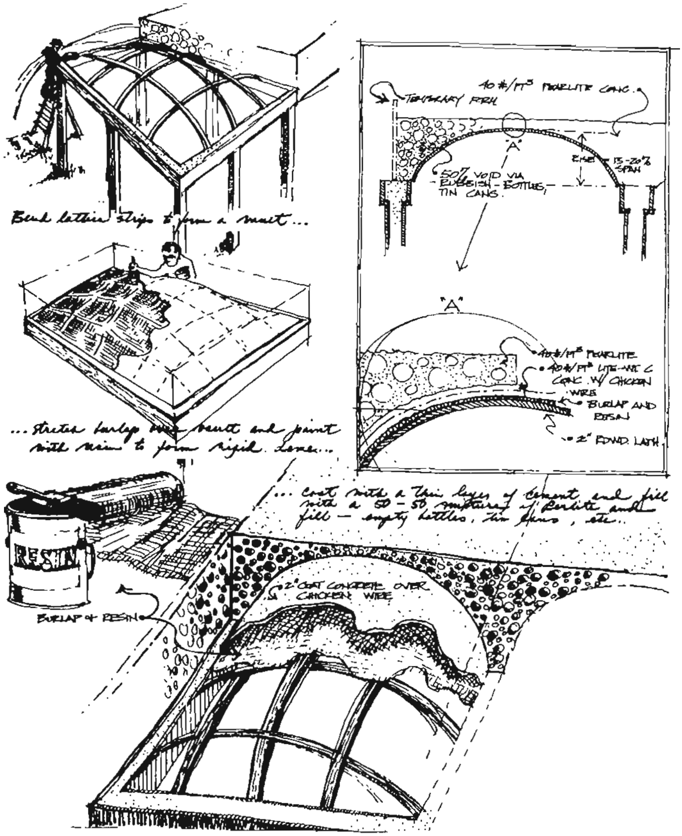
The burlap-resin skin is strong enough to support 1 to 2 inches of lightweight concrete. In preparation for this, put a layer of chickenwire, as shrinkage reinforcement, over the stiffened burlap. Then trowel on a 1- to 2-inch layer of lightweight concrete. Once again, use the ultra-lightweight 40–60 pound concrete described in GOOD MATERIALS (207).

Resin over burlap.

The shell which forms is strong enough to support the rest of the vault, and the floor above.

Lightweight concrete on.

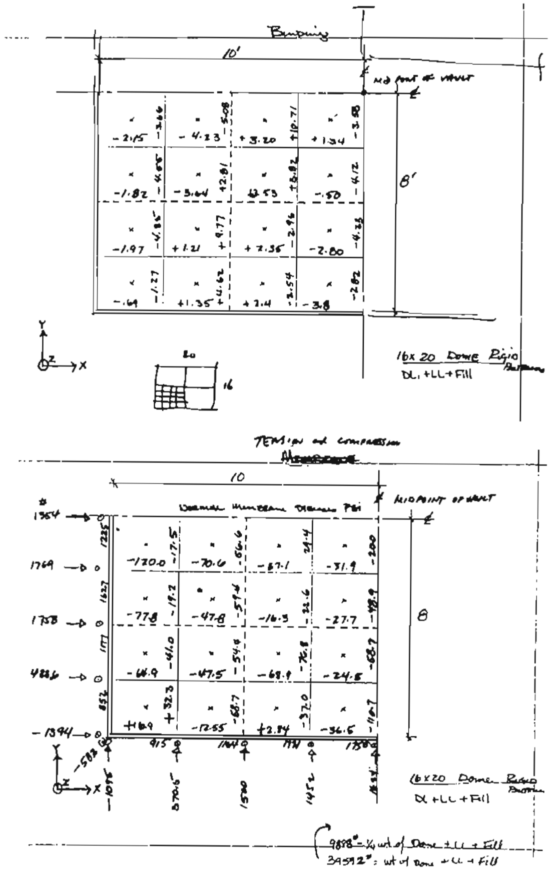
The rest of the vault should not be poured until all edges are in, columns for the next floor are in position, and ducts are in—see BOX COLUMNS (216), DUCT SPACE (229). In order to keep the weight of the vault down, it is important that even the ultra-lightweight concrete be further lightened, by mixing it with 50 per cent voids and ducts. Any kind of voids can be used—empty



One version of a floor-ceiling vault, made of thin wooden lattice strips woven like a basket, burlap, resin, chicken-wire and ultra lightweight concrete.

beer cans, wine jugs, sono tubes, ducts, chunks of polyurethane. Or voids can be made very much like the vaults themselves by making arches with latticing between columns and then stretching burlap from these arches to the dome. The drawing opposite shows the sequence of construction.

A 16 by 20 foot vault similar to the one shown in our photographs has been analyzed by a computerized finite element analysis. The concrete was assumed to be 40 pounds perlite, with a



Results of computer analysis.

test compressive strength of 600 psi. Tensile strength is taken as 34 psi, and bending as 25.5 inch pounds per inch. These figures are based on the assumption that the concrete is unreinforced. Dead loads were figured at 60 pounds per square foot assuming 50 per cent voids in the spandrels of the vault. Live loads were taken to be 50 pounds per square foot.

According to the analysis, under such loading the largest compressive stress in this dome occurs near the base at mid points of all four sides and is 120 psi. Outward thrust is the greatest at quarter points along all four walls, and is 1769 pounds. The maximum tension of 32 psi occurs at the corners. Maximum bending is 10 inch pounds per inch. All of these are well within the capacity of the vault, and besides, shrinkage reinforcement in the vault will make it even stronger.

The analysis shows, then, that even though the vault is an impure form (it contains square panels which are actually sagging within the overall configuration of the vault shape), its structural behavior is still close enough to that of a pure vault to work essentially as a compression structure. There are small amounts of local bending; and the corner positions of the dome suffer small amounts of tension, but the chickenwire needed for shrinkage will take care of both these stresses.

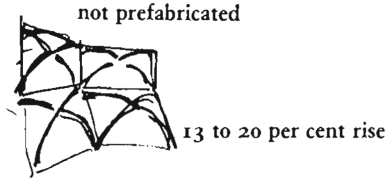
Here are some other possible ways of building such a vault:

To begin with, instead of wood for the lattice work, many other materials can be used: plastic strips, thin metal tubes, bamboos. Other resins besides polyester resins can be used to stiffen the burlap. If resins are unavailable, then the form for the vault can be made by placing lattice strips as described, and then stretching chickenwire over it, then burlap soaked in mortar which is allowed to harden before concrete is placed. It might also be possible to use matting stiffened with glue, perhaps even papier mache.

It is possible that similar vaults could be formed by altogether different means: perhaps with pneumatic membranes or balloons. And it is of course possible to form vaults by using very traditional methods: bricks or stones, on centering, like the beautiful vaults used in renaissance churches, gothic cathedrals, and so on.

Therefore:

Build floors and ceilings in the form of elliptical vaults which rise between 13 and 20 per cent of the shorter span. Use a type of construction which makes it possible to fit the vault to any shaped room after the walls and columns are in position: on no account use a prefabricated vault.



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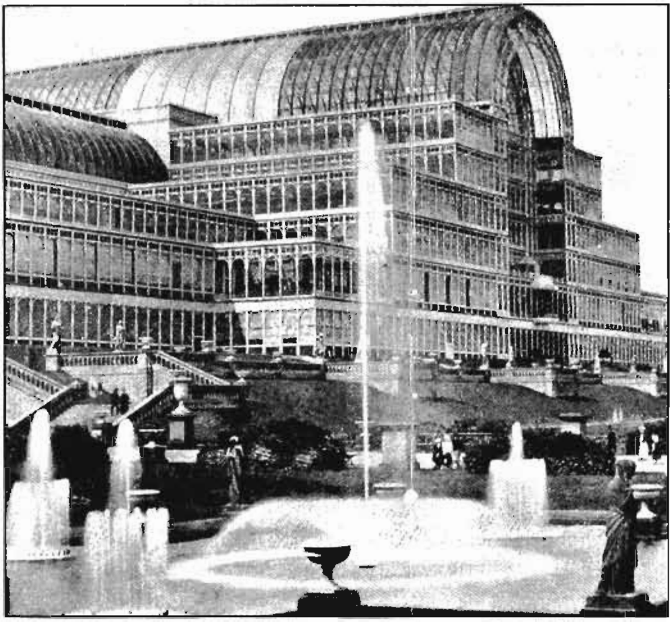
When the main vault is finished, mark the positions of all those columns which will be placed on the floor above it—FINAL COLUMN DISTRIBUTION (213). Whenever there are columns which are more than 2 feet away from the perimeter beam, strengthen the vault with ribs and extra reinforcing to withstand the vertical forces.

Put all the upper columns in position before you pour the floor of the vault, so that when you pour it, the concrete will pour around the column feet, and anchor them firmly in the same way that they are anchored in the foundations—ROOT FOUNDATIONS (214).

To finish the under surface of the vault paint it or plaster it—SOFT INSIDE WALLS (235). As for the floor surface above, either wax it and polish it or cover it with soft materials—FLOOR SURFACE (233). . . .

220 ROOF VAULTS*



. . . if the roof is a flat ROOF GARDEN (118), it can be built just like any FLOOR-CEILING VAULT (219). But when it is a sloping roof, according to the character of SHELTERING ROOF (117), it needs a new construction, specifically adapted to the shape which can enclose a volume.

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What is the best shape for a roof?

For some reason, this is the most loaded, the most emotional question, that can be asked about building construction. In all our investigations of patterns, we have not found any other pattern which generates so much discussion, so much disagreement, and so much emotion. Early childhood images play a vital role; so does cultural prejudice. It is hard to imagine an Arab building with a pitched roof; hard to imagine a New England farmhouse with a Russian onion roof over a tower; hard to imagine a person who has grown up among pitched steep wooden roofs, happy under the stone cones of the trulli.

All over the world.

For this reason, in this pattern we make our discussion as fundamental as we can. We shall do everything we can to obtain the necessary features which we can treat as invariant for all roofs, regardless of people or culture—yet deep enough to allow a rich assortment of cultural variations.

We approach the problem with the assumption that there are no constraints created by techniques or availability of materials. We are merely concerned with the optimum shape and distribution of materials. Given a roughly rectangular plan, or plan composed of rectangular pieces connected, what is the best shape for the shell of the roof which covers them?

The requirements influencing the shape are these:

1. The feeling of shelter—SHELTERING ROOF (117). This requires that the roof cover a whole wing (that is, not merely room by room). It requires that some of the roof be highly visible—hence, that it have a fairly steep slope—and that some of the roof be flat and usable for gardens or terraces.

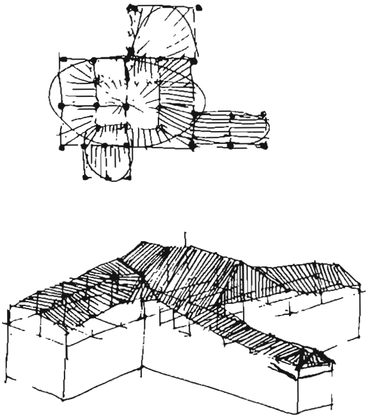
2. The roof must definitely contain lived-in space—that is, not just sit on top of the rooms which are all below—see SHELTERING ROOF (117). This means it needs rather a steep slope at the edge—because otherwise there is no headroom. This requires an elliptical section dome, or a barrel vault (which starts going up vertically at the edge), or a very steep slope.

3. In plan, each individual roof is a very rough rectangle, with occasional variations. This follows from the way the roofs of a building must, together, follow the social layout of the plan—ROOF LAYOUT (209).

4. The roof shape must be relaxed—that is, it can be used in any plan layout—and can be generated very simply from a few generating lines which follow automatically from the plan—that is, it must not be a tricky or contrived shape which needs a lot of fiddling around to define it—STRUCTURE FOLLOWS SOCIAL SPACES (205).

5. Structural considerations require a curved shell, dome or vault to eliminate as much bending as possible—see EFFICIENT STRUCTURE (206) and GOOD MATERIALS (207). Of course, to the extent that wood or steel or other tension materials are available, this requirement can be relaxed.

6. The roof is steep enough to shed rain and snow in climates



. . . *relaxed.*

where they occur. Obviously, this aspect of the roof will vary from climate to climate.

These requirements eliminate the following kinds of roofs:

1. *Flat roofs.* Flat roofs, except ROOF GARDENS (118), are already eliminated by the psychological arguments of SHELTERING ROOFS (117) and, of course, by structural considerations. A flat roof is necessary where people are going to walk on it; but it is a very inefficient structural shape since it creates bending.

2. *Pitched Roofs.* Pitched roofs still require materials that can withstand bending moment. The most common material for pitched roofs—wood—is becoming scarce and expensive. As we have said in GOOD MATERIALS (207), we believe it is most sensible to keep wood for surfaces and not to use it as a structural material, except in wood rich areas. Pitched roofs also need to be very steep, indeed, to enclose habitable space as required by SHELTERING ROOF (117)—and hence rather inefficient.

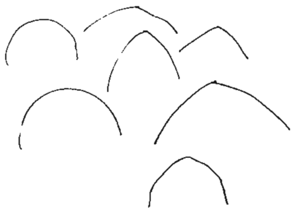
3. *Dutch barn and mansard roofs.* These roofs enclose habitable space more efficiently than pitched roofs; but they have the same structural drawbacks.

4. *Geodesic domes.* These domes cover essentially circular areas, and are not therefore useful in their ordinary form—CASCADE OF ROOFS (116), STRUCTURE FOLLOWS SOCIAL SPACES (205). In the modified form, which comes when you stretch

the base into a rough rectangle, they become more or less congruent with the class of vaults defined by this pattern.

5. *Cable nets and tents.* These roofs use tensile materials instead of compressive ones—they do not conform to the requirements of GOOD MATERIALS (207). They are also very inefficient when it comes to enclosing habitable space—and thus fail to meet the requirements of STRUCTURE FOLLOWS SOCIAL SPACES (205).

The roofs which satisfy the requirements are all types of rectangular barrel vaults or shells, with or without a peak, gabled or hipped, and with a variety of possible cross sections. Almost any one of these shells will be further strengthened by additional undulations in the direction of the vault. Examples of possible cross sections are given below. (Remember that this does not include those flat ROOF GARDENS (118) built over FLOOR-CEILING VAULTS (219).)



Possible roof vaults.

We have developed a range of roof vaults which are rather similar to a pitched roof—but with a convex curve great enough to eliminate bending, in some cases actually approaching barrel vaults. One is shown in the drawing opposite; another is shown below.

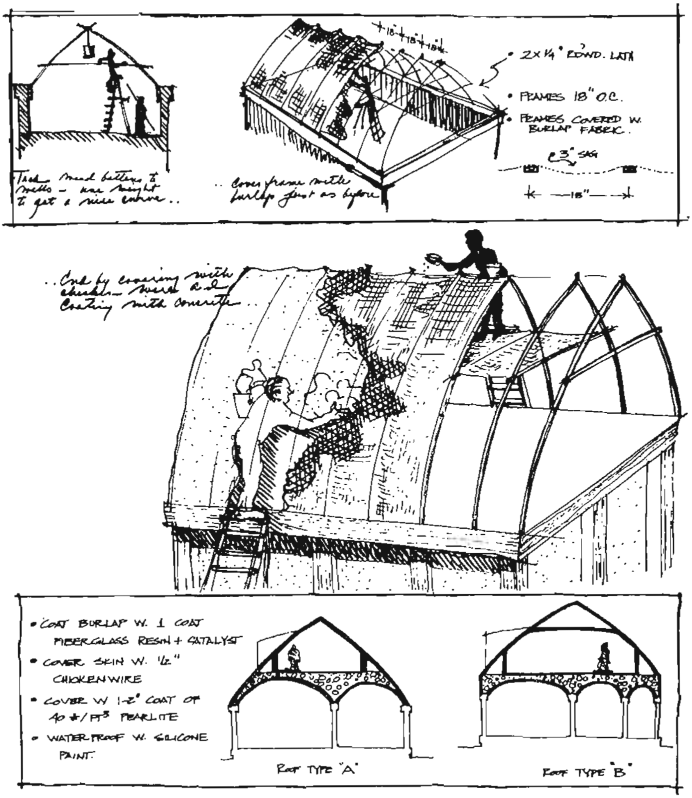
Another version of a roof vault, built by Bob Harris in Oregon.

We build the roof vault very much like the floor vaults:

1. First span the wing to be roofed with pairs of lattice strips which are securely nailed at their ends to the perimeter beam, and weighted at their apex so that the two pieces become slightly curved.

2. Make the frame for the ceiling under the roof frame at the same time according to FLOOR-CEILING VAULTS (219).

3. Repeat this frame every 18 inches, until the entire wing is



A type of roof vault, similar to the floor-ceiling vault, made from lattice strips, burlap, chicken-wire and ultra-lightweight concrete, but with an apex, and a pitch, and undulations for strength.

framed. The outer one will be the same, while the inner frame for the ceiling may change according to the rooms under it.

4. Now lay burlap over the ceiling frame, then resin, then 1½ inches of ultra-lightweight concrete—as for FLOOR-CEILING VAULTS (219).

5. Now lay burlap over the roof frame, tacking it onto the lattice strips so that there is a 3-inch scallop in between the ribs—to form structural undulations in the skin. Again, paint the burlap with resin; lay chickenwire and put a layer of lightweight concrete over the entire roof.

We have analyzed a 48-foot roof of this type by means of a computerized finite element analysis similar to the one described for FLOOR-CEILING VAULTS (219). The analysis shows that the maximum membrane compressive stress in the roof is 39.6 psi; the maximum membrane tensile stress is 2.5 psi, and the maximum diagonal membrane stress which develops from the maximum shear of 41.7 psi is 15.2 psi. These stresses are within the capacity of the material (See allowable stresses given in FLOOR-CEILING VAULT (219)). The maximum membrane bending moment is 46 inch pounds per inch which is higher than the capacity of the unreinforced section, but extrapolations from our data show that this will be comfortably taken care of by the reinforcing which is needed anyway for shrinkage. Roofs with smaller spans, for a typical WING OF LIGHT (106), will be even stronger.

Of course there are dozens of other ways to make a roof vault. Other versions include ordinary barrel vaults, lamella structures in the form of barrel vaults, elongated geodesic domes (built up from struts), vaults built up from plastic sheets, or fiberglass, or corrugated metal.

But, in one way or another, build your roofs according to the invariant defined below, remembering that it lies somewhere in between the Crystal Palace, the stone vaults of Alberobello, mud huts of the Congo, grass structures of the South Pacific, and the corrugated iron huts of our own time. This shape is required whenever you are working with materials which are in pure compression.

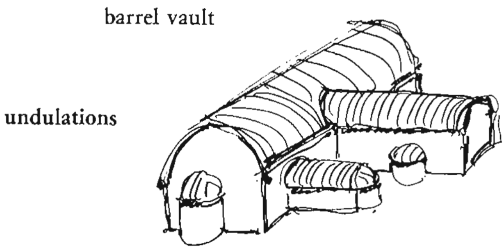
Obviously, if you have access to wood or steel and want to use it, you can modify this shape by adding tension members. However, we believe that these tension materials will become more

Experimental roof vaults.

and more rare as time goes on and that the pure compression shape will gradually become a universal.

Therefore:

Build the roof vault either as a cylindrical barrel vault, or like a pitched roof with a slight convex curve in each of the two sloping sides. Put in undulations along the vault, to make the shell more effective. The curvature of the main shell, and of the undulations, can vary with the span; the bigger the span, the deeper the curvature and undulations need to be.



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Leave space for dormers at intervals along the vault—DORMER WINDOWS (231), and build them integral with it. Finish the roof with ROOF CAPS (232). And once the vault is complete, it needs a waterproof paint or skin applied to its outer surface—LAPPED OUTSIDE WALLS (234). It can be painted white to protect it against the sun; the undulations will carry the rainwater. . . .

within the main frame of the building, fix the exact positions for openings—the doors and the windows —and frame these openings.

221. NATURAL DOORS AND WINDOWS

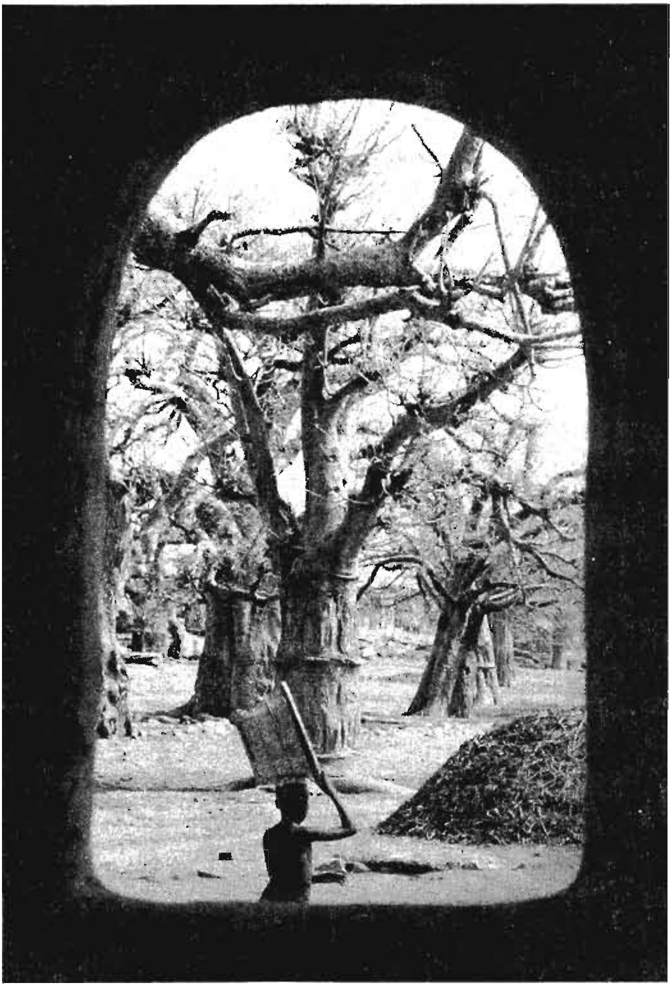
222. LOW SILL

223. DEEP REVEALS

224. LOW DOORWAY

225. FRAMES AS THICKENED EDGES

221 NATURAL DOORS AND WINDOWS**



. . . imagine that you are now standing in the built-up frame of a partly constructed building, with the columns and beams in place—BOX COLUMNS (216), PERIMETER BEAMS (217). You know roughly where you want doors and windows from ZEN VIEW (134), STREET WINDOWS (164), WINDOW PLACE (180), WINDOWS OVERLOOKING LIFE (192), CORNER DOORS (196). Now you can settle on the exact positions of the frames.

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Finding the right position for a window or a door is a subtle matter. But there are very few ways of building which take this into consideration.

In our current ways of building, the delicacy of placing a window or a door has nearly vanished. But it is just this refinement, down to the last foot, even to the last inch or two, which makes an immense difference. Windows and doors which are just right are always like this. Find a beautiful window. Study it. See how different it would be if its dimensions varied a few inches in either direction.

Now look at the windows and doors in most buildings made during the last 20 years. Assume that these openings are in roughly the right place, but notice how they could be improved if they were free to shift around, a few inches here and there, each one taking advantage of its own special circumstances—the space immediately inside and the view outside.

It is almost always a rigid construction system, combined with a formal aesthetic, which holds these windows in such a death grip. There is nothing else to this regularity, for it is possible to relax the regularity without losing structural integrity.

It is also important to realize that this final placing of windows and doors can only be done on site, with the rough frame of the building in position. It is impossible to do it on paper. But on the site it is quite straightforward and natural: mock up the openings with scraps of lumber or string and move them around until they feel right; pay careful attention to the organization of the view and the kind of space that is created inside.

Getting it just right.

As we shall see in a later pattern—SMALL PANES (239), it is not necessary to make the windows any special dimensions, or to try and make them multiples of any standard pane size. Whatever dimensions this pattern gives each window, it will then be possible to divide it up, to form small panes, which will be different in their exact shape and size, according to the window they are in.

However, although there is no constraint on the exact dimension of the windows, there is a general rule of thumb, which will make window sizes vary: Windows, as a rule, should become smaller as you get higher up in the building.

1. The area of windows needed for light and ventilation depends on the size of rooms, and rooms are generally smaller on upper stories of the building—the communal rooms are generally on the ground floor and more private rooms upstairs.

2. The amount of daylight coming through a window depends on the area of open sky visible through the window. The higher the window, the more open sky is visible (because nearby trees and buildings obscure less)—so less window area is needed to get sufficient daylight in.

3. To feel safe on the upper stories of a building, one wants more enclosure, smaller windows, higher sills—and the higher off the ground one is, the more one needs these psychological protections.

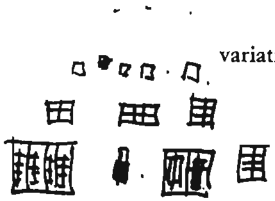
Therefore:

On no account use standard doors or windows. Make each window a different size, according to its place.

Do not fix the exact position or size of the door and win-

dow frames until the rough framing of the room has actually been built, and you can really stand inside the room and judge, by eye, exactly where you want to put them, and how big you want them. When you decide, mark the openings with strings.

Make the windows smaller and smaller, as you go higher in the building.



variation in window size

the position of the doors and windows "felt"

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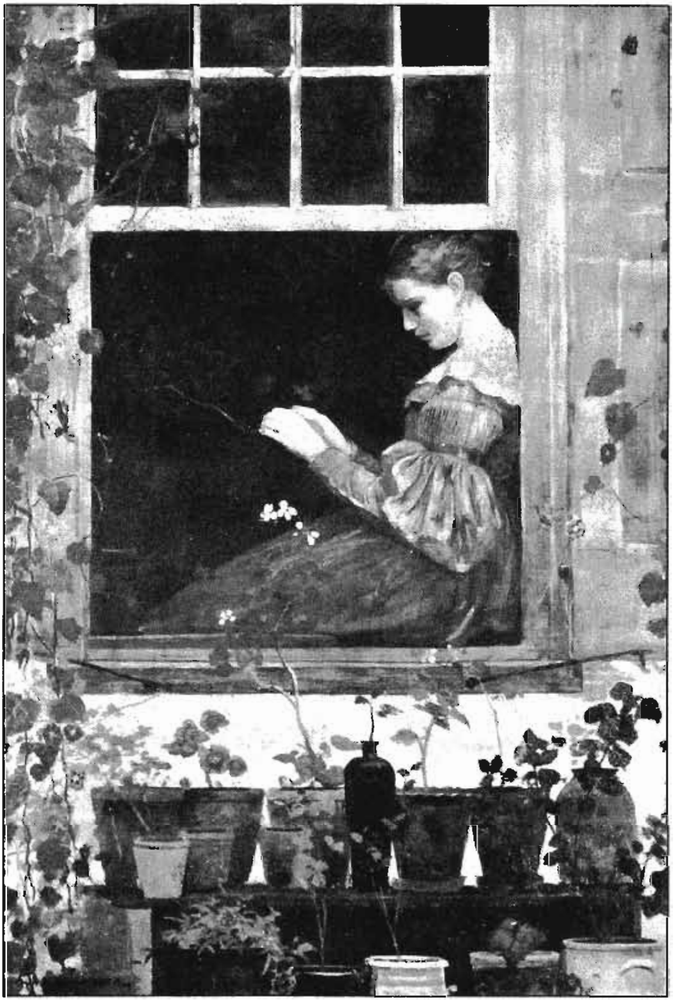
Fine tune the exact position of each edge, and mullion, and sill, according to your comfort in the room, and the view that the window looks onto—LOW SILL (222), DEEP REVEALS (223). As a result, each window will have a different size and shape, according to its position in the building. This means that it is obviously impossible to use standard windows and even impossible to make each window a simple multiple of standard panes. But it will still be possible to glaze each window, since the procedure for building the panes makes them divisions of the whole, instead of making up the whole as a multiple of standard panes—SMALL PANES (239). . . .

222 LOW SILL



. . . this pattern helps to complete NATURAL DOORS AND WINDOWS (221), and the special love for the view, and for the earth outside, which ZEN VIEW (134), WINDOW PLACE (180) and WINDOWS OVERLOOKING LIFE (192) all need.

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One of a window's most important functions is to put you in touch with the outdoors. If the sill is too high, it cuts you off.

The "right" height for a ground floor window sill is astonishingly low. Our experiments show that sills which are 13 or 14 inches from the floor are perfect. This is much lower than the window sills which people most often build: a standard window sill is about 24 to 36 inches from the ground. And it is higher than French doors and windows which usually have a bottom rail of 8 to 10 inches. The best height, then, happens to be a rather uncommon one.

We first give the detailed explanation for this phenomenon, and we then explain the modifications which are necessary on upper floors.

People are drawn to windows because of the light and the view outside—they are natural places to sit by when reading, talking, sewing, and so on, yet most windows have sill heights of 30 inches or so, so that when you sit down by them you cannot see the ground right near the window. This is unusually frustrating—you almost have to stand up to get a complete view.

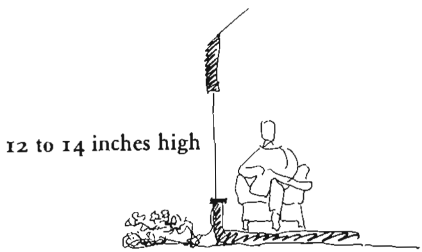
In "The Function of Windows: A Reappraisal" (*Building Science,* Vol. 2, Pergamon Press, 1967, pp. 97–121), Thomas Markus shows that the primary function of windows is not to provide light but to provide a link to the outside and, furthermore, that this link is most meaningful when it contains a view of the ground and the horizon. Windows with high sills cut out the view of the ground.

On the other hand, glass all the way down to the floor is undesirable. It is disturbing because it seems contradictory and even dangerous. It feels more like a door than a window; you have the feeling that you ought to be able to walk through it. If the sill is 12 to 14 inches high, you can comfortably see the ground, even if you are a foot or two away from the window, and it still feels like a window rather than a door.

On upper stories the sill height needs to be slightly higher. The sill still needs to be low to see the ground, but it is unsafe if it is too low. A sill height of about 20 inches allows you to see most of the ground, from a chair nearby, and still feel safe.

Therefore:

When determining exact location of windows also decide which windows should have low sills. On the first floor, make the sills of windows which you plan to sit by between 12 and 14 inches high. On the upper stories, make them higher, around 20 inches.



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Make the sill part of the frame, and make it wide enough to put things on—WAIST-HIGH SHELF (201), FRAMES AS THICKENED EDGES (225), WINDOWS WHICH OPEN WIDE (236). Make the window open outward, so that you can use the sill as a shelf, and so that you can lean out and tend the flowers. If you can, put flowers right outside the window, on the ground or raised a little, too, so that you can always see the flowers from inside the room—RAISED FLOWERS (245). . . .

223 DEEP REVEALS

. . . this pattern helps to complete the work of LIGHT ON TWO SIDES OF EVERY ROOM (159), by going even further to reduce glare; and it helps to shape the FRAMES AS THICKENED EDGES (225).

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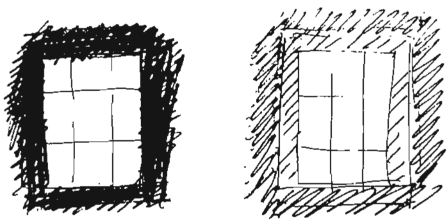
Windows with a sharp edge where the frame meets the wall create harsh, blinding glare, and make the rooms they serve uncomfortable.

They have the same effect as the bright headlights of an oncoming car: the glare prevents you from seeing anything else on the road because your eye cannot simultaneously adapt to the bright headlights and to the darkness of the roadway. Just so, a window is always much brighter than an interior wall; and the walls tend to be darkest next to the window's edge. The difference in brightness between the bright window and the dark wall around it also causes glare.



Glare . . . and no glare.

To solve this problem, the edge of the window must be splayed, by making a reveal between the window and the wall. The splayed reveal then creates a transition area—a zone of intermediate brightness—between the brightness of the window and the darkness of the wall. If the reveal is deep enough and the angle just right, the glare will vanish altogether.

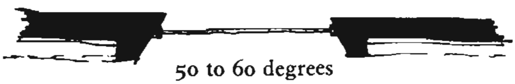
But the reveal must be quite deep, and the angle of the splay quite marked. In empirical studies of glare, Hopkinson and

Petherbridge have found: (1) that the larger the reveal is, the less glare there is; (2) the reveal functions best, when its brightness is just halfway between the brightness of the window and the brightness of the wall. ("Discomfort Glare and the Lighting of Buildings," *Transactions of the Illuminating Engineering Society*, Vol. XV, No. 2, 1950, pp. 58–59.)

Our own experiments show that this happens most nearly, when the reveal lies at between 50 and 60 degrees to the plane of the window; though, of course, the angle will vary with local conditions. And, to satisfy the need for a "large" reveal, we have found that the reveal itself must be a good 10 to 12 inches wide.

Therefore:

Make the window frame a deep, splayed edge: about a foot wide and splayed at about 50 to 60 degrees to the plane of the window, so that the gentle gradient of daylight gives a smooth transition between the light of the window and the dark of the inner wall.



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Build the depth of the frame so that it is continuous with the structure of the walls—FRAMES AS THICKENED EDGES (225); if the wall is thin, make up the necessary depth for the reveal on the inside face of the wall, with bookshelves, closets or other THICK WALLS (197); embellish the edge of the window even further, to make light even softer, with lace work, tracery, and climbing plants—FILTERED LIGHT (238), HALF-INCH TRIM (240), CLIMBING PLANTS (246). . . .

224 LOW DOORWAY

. . . some of the doors in a building play a special role in creating transitions and maintaining privacy: it may be any of the doors governed by FAMILY OF ENTRANCES (102), or MAIN ENTRANCE (110), or THE FLOW THROUGH ROOMS (131) or CORNER DOORS (196), or NATURAL DOORS AND WINDOWS (221). This pattern helps to complete these doors by giving them a special height and shape.

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High doorways are simple and convenient. But a lower door is often more profound.

The 6′ 8″ rectangular door is such a standard pattern, and is so taken for granted, that it is hard to imagine how strongly it dominates the experience of transition. There have been times, however, when people were more sensitive to the moment of passage, and made the shape of their doors convey the feeling of transition.

An extreme case is the Japanese tea house, where a person entering must literally kneel down and crawl in through a low hole in the wall. Once inside, shoes off, the guest is entirely a guest, in the world of his host.

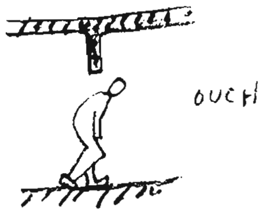
Among architects, Frank Lloyd Wright used the pattern many times. There is a beautifully low trellised walk behind Taliesin West, marking the transition out of the main house, along the path to the studios.

If you are going to try this pattern, test it first by pinning cardboard up to effectively lower the frame. Make the doorway low enough so that it appears "lower than usual"—then people will immediately adapt to it, and tall people will not hit their heads.

Therefore:

Instead of taking it for granted that your doors are simply 6′ 8″ rectangular openings to pass through, make at least some of your doorways low enough so that the act of going through the door is a deliberate thoughtful passage

from one place to another. Especially at the entrance to a house, at the entrance to a private room, or a fire corner—make the doorway lower than usual, perhaps even as low as 5′ 8″.



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Test the height before you build it, in place—NATURAL DOORS AND WINDOWS (221). Build the door frame as part of the structure—FRAMES AS THICKENED EDGES (225), and make it beautiful with ORNAMENT (249) around the frame. If there is a door, glaze it, at least partially—SOLID DOORS WITH GLASS (237). . . .

225 FRAMES AS THICKENED EDGES**

. . . assume that columns and beams are in and that you have marked the exact positions of the doors and windows with string or pencil marks—NATURAL DOORS AND WINDOWS (221). You are ready to build the frames. Remember that a well made frame needs to be continuous with the surrounding wall, so that it helps the building structurally—EFFICIENT STRUCTURE (206), GRADUAL STIFFENING (208).

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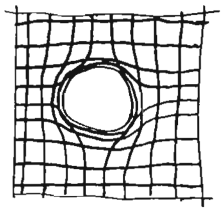
Any homogeneous membrane which has holes in it will tend to rupture at the holes, unless the edges of the holes are reinforced by thickening.

The most familiar example of this principle at work is in the human face itself. Both eyes and mouth are surrounded by extra bone and flesh. It is this thickening, around the eyes and mouth, which gives them their character and helps to make them such important parts of human physiognomy.

A building also has its eyes and mouth: the windows and the doors. And following the principle which we observe in nature, almost every building has its windows and doors elaborated, made more special, by just the kind of thickening we see in eyes and mouths.

The fact that openings in naturally occurring membranes are invariably thickened can be easily explained by considering how the lines of force in the membrane must flow around the hole.



The density of the lines represent increasing stress concentrations.

The increasing density of lines of force around the perimeter of the hole requires that additional material be generated there to prevent tearing.

Consider a soap film. When you prick the film, the tension pulls the film apart, and it disintegrates. But if you insert a ring of string into the film, the hole will hold, because the tensile forces which accumulate around the opening can be held by the thicker ring. This is in tension. The same is true for buckling and compression. When a thin plate is functioning in compression and a hole is made in it, the hole needs stiffening. It is important to recognize that this stiffening is not only supporting the opening itself against collapse, but it is taking care of the stresses in the membrane which would normally be distributed in that part of the membrane which is removed. Familiar examples of such stiffening in plates are the lips of steel around the portholes in a ship or in a locomotive cab.

A door frame as a thickening.

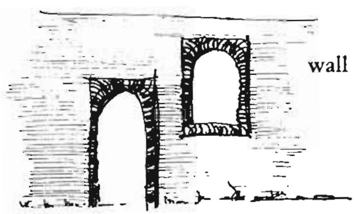
The same is true for doors and windows in a building. Where the walls are made of wood planks and lightweight concrete fill—see WALL MEMBRANES (218)—the thickened frames can be made from the same wood planks, placed to form a bulge, and then filled to be continuous with the wall. If other types of skin are used in the wall membranes, there will be other kinds of thickening: edges formed with chicken wire, burlap, and resin, filled with concrete; edges formed with chicken wire filled with rubble, and then mortar, plaster; edges formed with brick, filled, then plastered.

More general examples of frames as thickened edges exist all over the world. They include the thickening of the mud around the windows of a mud hut, the use of stone edges to the opening in a brick wall because the stone is stronger, the use of double studs around an opening in stud construction, the extra stone around the windows in a gothic church, the extra weaving round the hole in any basket hut.

Therefore:

Do not consider door and window frames as separate rigid structures which are inserted into holes in walls. Think of them instead as thickenings of the very fabric of the wall itself, made to protect the wall against the concentrations of stress which develop around openings.

In line with this conception, build the frames as thickenings of the wall material, continuous with the wall itself, made of the same materials, and poured, or built up, in a manner which is continuous with the structure of the wall.



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In windows, splay the thickening, to create DEEP REVEALS (223); the form of doors and windows which will fill the frame, is given by the later patterns—WINDOWS WHICH OPEN WIDE (236), SOLID DOORS WITH GLASS (237), SMALL PANES (239). . . .

as you build the main frame and its openings, put in the following subsidiary patterns where they are appropriate;

226. COLUMN PLACE

227. COLUMN CONNECTION

228. STAIR VAULT

229. DUCT SPACE

230. RADIANT HEAT

231. DORMER WINDOWS

232. ROOF CAPS

226 COLUMN PLACE*

. . . certain columns, especially those which are free standing, play an important social role, beyond their structural role as COLUMNS AT THE CORNERS (212). These are, especially, the columns which help to form arcades, galleries, porches, walkways, and outdoor rooms—PUBLIC OUTDOOR ROOM (69), ARCADES (119), OUTDOOR ROOM (163), GALLERY SURROUND (166), SIX-FOOT BALCONY (167), TRELLISED WALK (174). This pattern defines the character these columns need to make them function socially.

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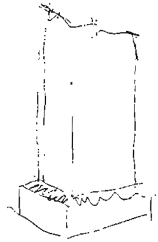
Thin columns, spindly columns, columns which take their shape from structural arguments alone, will never make a comfortable environment.

The fact is, that a free-standing column plays a role in shaping human space. It marks a point. Two or more together define a wall or an enclosure. The main function of the columns, from a human point of view, is to create a space for human activity.

In ancient times, the structural arguments for columns coincided in their implications with the social arguments. Columns made of brick, or stone, or timber were always large and thick. It was easy to make useful space around them.



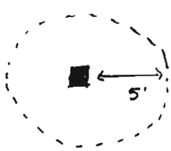
A big thick column.

But with steel and reinforced concrete, it is possible to make a very slender column; so slender that its social properties disappear altogether. Four inch steel pipes or 6 inch reinforced concrete columns break up space, but they destroy it as a place for human action, because they do not create "spots" where people can be comfortable.

Thin columns of the plastic world.

In these times, it is therefore necessary to reintroduce, consciously, the social purposes which columns have, alongside their structural functions. Let us try to define these social purposes exactly.

A column affects a volume of space around it, according to the situation. The space has an area that is roughly circular, perhaps 5 feet in radius.



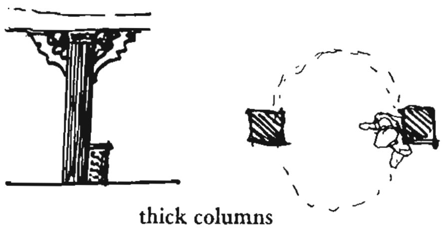
The space around the column.

When the column is too thin, or lacks a top or bottom, this entire volume—an area of perhaps 75 square feet—is lost. It cannot be a satisfactory place in its own right: the column is too thin to lean against, there is no way to build a seat up against it, there is no natural way to place a table or a chair against the column. On the other hand, the column still breaks up the space. It subtly prevents people from walking directly through that area: we notice that people tend to give these thin columns a wide berth; and it prevents people from forming groups.

In short, if the column has to be there, it will destroy a considerable area unless it is made to be a place where people feel comfortable to stay, a natural focus, a place to sit down, a place to lean.

Therefore:

When a column is free standing, make it as thick as a man—at least 12 inches, preferably 16 inches: and form places around it where people can sit and lean comfortably: a step, a small seat built up against the column, or a space formed by a pair of columns.



thick columns

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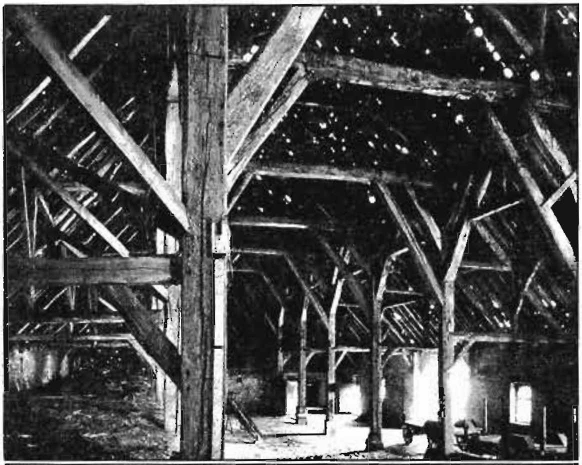
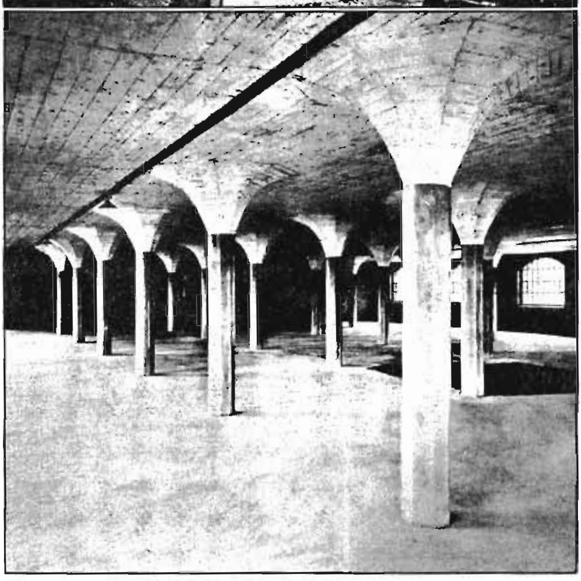
You can get the extra thickness quite cheaply if you build the column as a BOX COLUMN (216); complete the "place" the column forms, by giving it a "roof" in the form of a column capital, or vault which springs from the column, or by bracing the column against the beams—COLUMN CONNECTION (227). And when it makes sense, make the column base a SITTING WALL (243), a place for flowers—RAISED FLOWERS (245), or a place for a chair or table—DIFFERENT CHAIRS (251). . . .

227 COLUMN CONNECTIONS**





. . . the columns are in position, and have been tied together by a perimeter beam—BOX COLUMNS (216), PERIMETER BEAMS (217). According to the principles of continuity which govern the basic structure—EFFICIENT STRUCTURE (206), the connections need stiffening to lead the forces smoothly from the beams into the columns, especially when the columns are free standing as they are in an arcade or balcony—ARCADE (119), GALLERY SURROUND (166), SIX-FOOT BALCONY (167), COLUMN PLACE (226). You may also do the same in the upper corners of your door and window frames—FRAMES AS THICKENED EDGES (225)—making arched openings.

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The strength of a structure depends on the strength of its connections; and these connections are most critical of all at corners, especially at the corners where the columns meet the beams.

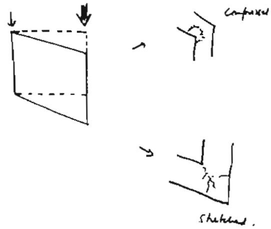
There are two entirely different ways of looking at a connection:

1. As a source of rigidity, which can be strengthened by triangulation, to prevent racking of the frame. This is a moment connection: a brace. See the upper picture.

2. As a source of continuity, which helps the forces to flow easily around the corner in the process of transferring loads by changing the direction of the force. This is a continuity connection: a capital. See the lower picture.

1. A column connection as a brace.

As a building is erected, and throughout its life, it settles, creating tiny stresses within the structure. When the settling is uneven, as it most always is, the stresses are out of balance; there is strain in every part of the building, whether or not that part of the building was designed to accept strain and transmit the forces on down to the ground. The parts of the building that are not designed to carry these forces become the weak points of the building subject to fracture and rupture.



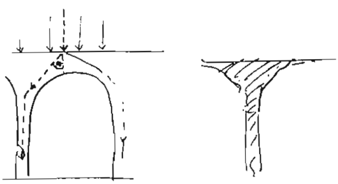
Effects of uneven stresses on a frame.

Rectangular frames, especially, have these cracks at the corners because the transmission of the load is discontinuous there. To solve this problem the frame must be braced—made into a rigid frame that transmits the forces around it as a whole without distorting. The bracing is required at any right-angled corner between columns and beams or in the corners of door and window frames.

2. *A column connection as a capital.*

This happens most effectively in an arch. The arch creates a continuous body of compressive material, which transfers vertical forces from one vertical axis to another. It works effectively because the line of action of a vertical force in a continuous compressive medium spreads out downward at about 45 degrees.

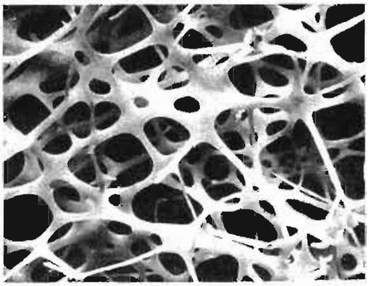
And a column capital is, in this sense, acting as a small, underdeveloped arch. It reduces the length of the beam—and so reduces bending stress. And it begins to provide the path for the forces as they move from one vertical axis to another, through the medium of the beam. The larger the capital, the better.



A capital that acts the same way as an arch.

A column connection will work best when it acts both as a column capital and as a column brace. This means that it needs to be thick and solid, like a capital, so that there is a lot of material for the forces to travel through, and stiff and strong and completely continuous with the column and perimeter beam, like the brace, so that it can work against shear and bending.

The bone structure, shown below uses both principles, to transfer compressive stress from one strut to another, continuously, throughout a three-dimensional space frame of struts. The structure is most massive at the connections, where the forces change direction.



Connections inside a bone.

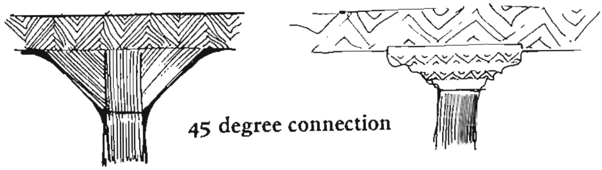
A similar column connection can be made integral with poured hollow columns and beams. The forms for the connection are gussets made of skin material: then fill the column and the gussets and the beam in a continuous concrete pour.

Of all the patterns in the book, this is one of the most widespread and has taken the greatest variety of outward forms throughout the course of history. A solid wood capital on a wood column, or a continuously poured column top, and arches of stone, brick, or poured concrete are all examples. And, of course, typical column capitals—a larger stone on a stone column or typical gusset plate or brace—even if weak in some ways, also help a great deal. But only relatively few of the historical column connections succeed fully in acting both as braces and as capitals.

Therefore:

Build connections where the columns meet the beams. Any distribution of material which fills the corner up will do: fillets, gussets, column capitals, mushroom column, and

most general of all, the arch, which connects column and beam in a continuous curve.



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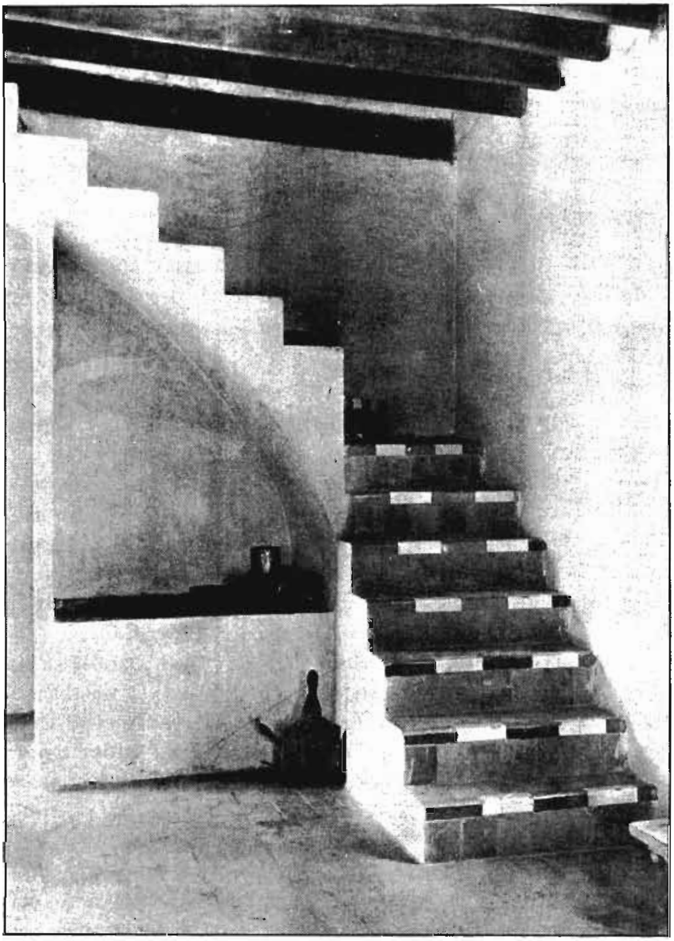
The connection is one of the most natural places for ORNAMENT (249): there is a wide variety of possible connections, carvings, fretwork, painting, for this critical position. In certain cases, the connection may act as an umbrella for a COLUMN PLACE (226). . . .

228 STAIR VAULT*



. . . this pattern helps complete the rough shape and location of stairs given by STAIRCASE AS A STAGE (133) and by STAIRCASE VOLUME (195). If you want to build a conventional stair, you can find what you need in any handbook. But how to build a stair in a way which is consistent with the compressive structure of EFFICIENT STRUCTURE (206), without using wood or steel or concrete—GOOD MATERIALS (207)?

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Within a building technology which uses compressive materials as much as possible, and excludes the use of wood, it is natural to build stairs over a vaulted void, simply to save weight and materials.

A concrete stair is usually made from precast pieces supported by steel stringers; or it is formed in place, and then stripped of its forms. But for the reasons already given in GOOD MATERIALS (207), precast concrete and steel are undesirable materials to use—they call for modular planning; they are unpleasant materials to touch, look at, and walk on; they are hard to work with and modify in any relaxed way, since they call for special tools.

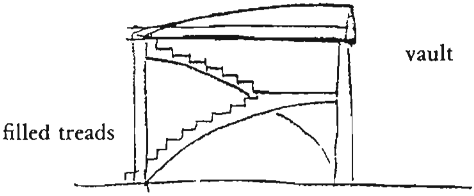
Given the principles of EFFICIENT STRUCTURE (206), GOOD MATERIALS (207), and GRADUAL STIFFENING (208), we suggest that stairs be made like FLOOR-CEILING VAULTS (219)—by making a half-vault (to the slope of the stair), with lattice strips, burlap, resin, chickenwire, and lightweight concrete. The steps themselves can then be formed by using wood planks, or tiles, as risers, and filling in the steps with trowelled concrete.

When we first wrote this pattern, we thought it was very doubtful—and put it in mainly to be consistent with floor and roof vaults. Since then we have built a vaulted stair. It is a great success—beautiful—and we recommend it heartily.

Therefore:

Build a curved diagonal vault in the same way that you

build your FLOOR-CEILING VAULTS (219). Once the vault hardens, cover it with steps of lightweight concrete, trowel-formed into position.



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A lightweight concrete tread, colored, waxed, and polished can be quite beautiful and soft enough to be comfortable—see FLOOR SURFACE (233)—and will eventually take on the patina of wear called for in SOFT TILE AND BRICK (248).

The vaulted space under the stair can be used as an ALCOVE (179) a CHILD CAVE (203), or CLOSETS BETWEEN ROOMS (198). If it is plastered, like a regular ceiling—see FLOOR-CEILING VAULTS (219), it makes a much more pleasant and useful space than the space under an ordinary stair.

229 DUCT SPACE

. . . in a building built according to the principles of EFFICIENT STRUCTURE (206) and built with vaulted floors—FLOOR-CEILING VAULTS (219), there is a triangular volume, unused, around the edge of every room. This is the most natural place to put the ducts.

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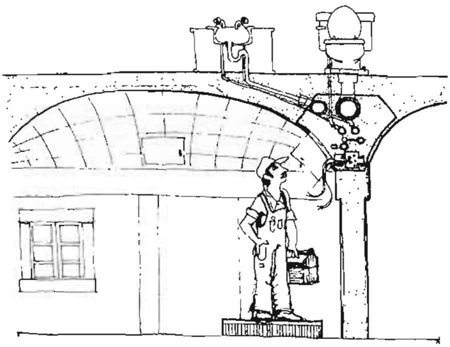
You never know where pipes and conduits are; they are buried somewhere in the walls; but where exactly are they?

In most buildings electric conduits, plumbing, drains, gas pipes, telephone wires, and so on, are buried in the walls, in a completely uncoordinated and disorganized way. This makes the initial construction of the building complicated since it is difficult to coordinate the installation of the various services with the building of various parts of the building. It makes it difficult to think about making any changes or additions to the building once it is built since you don't know where the service lines are. And it leaves a gap in our understanding of our surroundings: the organization of utilities and services in the buildings we live in are a mystery to us.

We propose that all the services be located together and run around the ceiling of each room in the spandrel between the vaulted ceiling and the floor above—FLOOR-CEILING VAULTS (219).

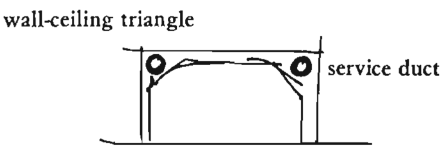
Heating and electrical conduits will be universal throughout the building and should thus be run around every room. Plumbing and gas lines will be around some rooms only. All lines will also be concentrated vertically at the corners of rooms. Thus the lines form vertical trunks from which horizontal loops spring. This configuration of pipes and conduits is easy to understand and plug into.



All in one place.

Therefore:

Make ducts to carry hot air conduit, plumbing, gas, and other services in the triangular space, within the vault, around the upper edge of every room. Connect the ducts for different rooms by vertical ducts, in special chases, in the corners of rooms. Build outlets and panels at intervals along the duct for access to the conduits.



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Once the duct is in, you can fill up the triangle with lightweight concrete—FLOOR-CEILING VAULTS (219). Place heating panels along the surface of the triangle—RADIANT HEAT (230); and place outlets for lights at frequent intervals below the duct, with leads and conduits running down in rebates along the window frames—POOLS OF LIGHT (252). . . .

230 RADIANT HEAT*

. . . to complete WALL MEMBRANES (218), FLOOR-CEILING VAULTS (219) and DUCT SPACE (229), use a biologically sensible heating system.

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This pattern is a biologically precise formulation of the intuition that sunlight and a hot blazing fire are the best kinds of heat.

Heat can be transmitted by radiation (heat waves across empty space), convection (flow in air or liquids by mixing of molecules and hot air rising), and conduction (flow through a solid).

In most places, we get heat in all three ways from our environment: conducted heat from the solids we touch, convected heat in the air around us, and radiated heat from those sources of radiation in our line of sight.

Of the three, conducted heat is trivial, since any surface hot enough to conduct heat to us directly is too hot for comfort. As far as the other two are concerned—convected heat and radiant heat—we may ask whether there is any biological difference in their effects on human beings. In fact there is.

It turns out that people are most comfortable when they receive radiant heat at a slightly higher temperature than the temperature of the air around them. The two most primitive examples of this situation are: (1) Outdoors, on a spring day when the air is not too hot but the sun is shining. (2) Around an open fire, on a cool evening.

Most people will recognize intuitively that these are two unusually comfortable situations. And in view of the fact that we evolved as organisms in the open air, with plenty of sun, it is not surprising that this condition happens to be so comfortable for us. It is built into our systems, biologically.

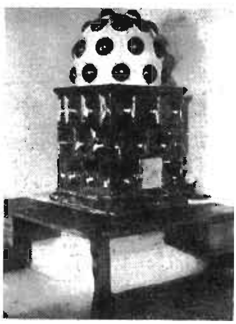
Unfortunately, it happens that many of the most widely used heating systems ignore this basic fact.

Hot air systems, and buried pipes, and the so-called hot water "radiators" do transmit some of their heat to us by means of radiation, but most of the heat we get from them comes from convection. The air gets heated and warms us as it swirls around us. But, as it does so it creates that very uncomfortable stuffy, over-heated, dry sensation. When convection heaters are warm enough to heat us we feel stifled. If we turn the heat down, it gets too cold.

The conditions in which people feel most comfortable require a subtle balance of convected heat and radiant heat. Experiments have established that the most comfortable balance between the two, occurs when the average radiant temperature is about two degrees higher than the ambient temperature. To get the average radiant temperature in a room, we measure the temperature of all the visible surfaces in a room, multiply the area of each surface by its temperature, add these up, and divide by the total area. For comfort, this average radiant temperature needs to be about two degrees higher than the air temperature.

Since some of the surfaces in a room (windows and outside walls), will usually be cooler than the indoor air temperature, this means that at least some surfaces must be considerably warmer to get the average up.

An open fire, which has a small area of very high temperature, creates this condition in a cool room. The beautiful Austrian and Swedish tiled stoves also do it very well. They are massive stoves, made of clay bricks or tiles, with a tiny furnace



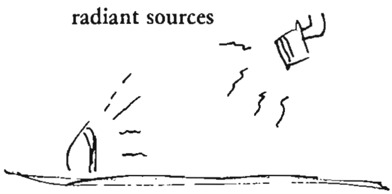
Austrian tiled stove.

in the middle. A handful of twigs in the furnace give all their heat to the clay of the stove itself, and this clay, like the earth, keeps this heat and radiates it slowly over a period of many hours.

Radiant panels, with individual room control, and infrared heaters hung from walls and ceilings, are possible high technology sources of radiant heat. It is possible that sources of low-grade radiant heat—like a hot water tank—might also work to very much the same effect. Instead of insulating the tank, it might be an excellent source of radiant heat, right in the center of the house.

Therefore:

Choose a way of heating your space—especially those rooms where people are going to gather when it is cold—that is essentially a radiative process, where the heat comes more from radiation than convection.



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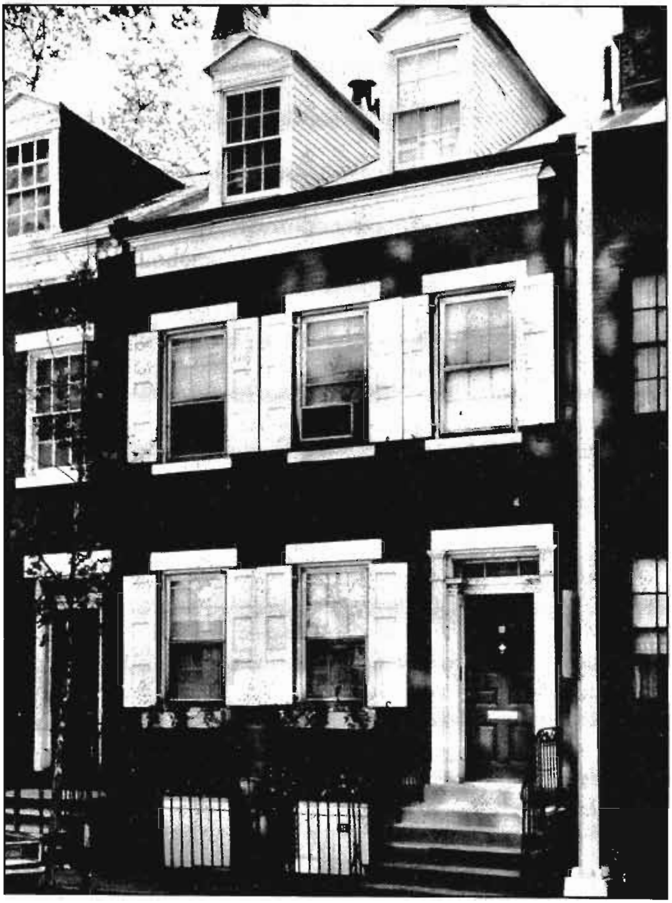
If you have followed earlier patterns, you may have rooms which have a vaulted ceiling, with a steeply sloping surface close to the wall, and with the major ducts behind that surface—FLOOR-CEILING VAULTS (219), DUCT SPACE (229). In this case, it is natural to put the radiant heating panels on that sloping surface.

But it is also very wonderful to make at least some part of the radiant surfaces low enough so that seats can be built round them and against them; on a cold day there is nothing better than a seat against a warm stove—BUILT-IN SEATS (202). . . .

231 DORMER WINDOWS*



. . . this pattern helps to complete SHELTERING ROOF (117). If you have followed sheltering roof, your roof has living space within it: and it must therefore have windows in it, to bring light into the roof. This pattern is a special kind of WINDOW PLACE (180), which completes the ROOF VAULTS (220), in these situations.

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We know from our discussion of SHELTERING ROOF (117) that the top story of the building should be right inside the roof, surrounded by it.

Obviously, if there is habitable space inside the roof, it must have some kind of windows; skylights are not satisfactory as windows—except in studios or workshops—because they do not create a connection between the inside and the outside world—WINDOWS OVERLOOKING LIFE (192).

It is therefore natural to pierce the roof with windows; in short, to build dormer windows. This simple, fundamental fact would hardly need mentioning if it were not for the fact that dormer windows have come to seem archaic and romantic. It is important to emphasize how sensible and ordinary they are—simply because people may not build them if they believe that they are old fashioned and out of date.

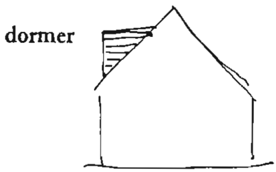
Dormers make the roof livable. Aside from bringing in light and air and the connection to the outside, they relieve the low ceilings along the edge of the roofs and create alcoves and window places.

How should the dormers be constructed? Within the roof vault we have described, the basket which forms the vault can simply be continued to form the roof of the dormer, over a frame of columns and perimeter beams which form the opening.

The other ways of building dormer windows depend on the construction system you are using. Whatever you are using for lintels, columns, and walls, can simply be modified and used in combination to build the dormer.

Therefore:

Wherever you have windows in the roof, make dormer windows which are high enough to stand in, and frame them like any other alcoves in the building.



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Frame them like ALCOVES (179) and WINDOW PLACE (180) with GRADUAL STIFFENING (208), COLUMNS AT THE CORNERS (212), BOX COLUMNS (216), PERIMETER BEAMS (217), WALL MEMBRANES (218), FLOOR-CEILING VAULTS (219), ROOF VAULTS (220) and FRAMES AS THICKENED EDGES (225).

Put WINDOWS WHICH OPEN WIDE (236) in them, and make SMALL PANES (239). . . .

232 ROOF CAPS

. . . and this pattern finishes the ROOF GARDENS (118) or the ROOF VAULTS (220). Assume that you have built the roof vaults —or at least that you have started to build up the splines which will support the cloth which forms the vault. Or assume that you have begun to build a roof garden, and have begun to fence it or surround it. In either case—how shall the roof be finished?

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There are few cases in traditional architecture where builders have not used some roof detail to cap the building with an ornament.

The pediments on Greek buildings; the caps on the trulli of Alberobello; the top of Japanese shrines; the venting caps on barns. In each of these examples there seems to be some issue of the building system that needs resolution, and the builder takes the opportunity to make a "cap."

We suspect there is a reason for this which should be taken seriously. The roof cap helps to finish the building; it tops the building with a human touch. Yet, the power of the cap, its overall effect on the feeling of the building, is of much greater proportions than one would expect. Look at these sketches of a building, with and without a roof cap. They look like different buildings. The difference is enormous.

With and without a roof cap.

Why is it that these caps are so important and have such a powerful effect on the building as a whole?

Here are some possible reasons.

1. They crown the roof. They give the roof the status that it deserves. The roof is important, and the caps emphasize this fact.

2. They add detail. They make the roof less homogeneous, and

they relieve the roof from being a single uninterrupted thing. The walls get this relief from windows, doors, balconies, which add scale and character; when a roof has many dormers, it seems to need the caps less.

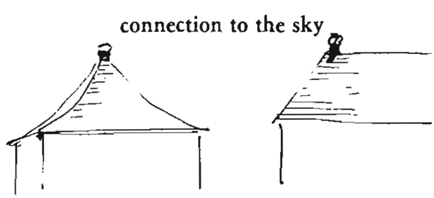
3. The caps provide a connection to the sky, in a way that might have had religious overtones at one time. Just as the building needs a sense of connection to the earth—see CONNECTION TO THE EARTH (168)—perhaps the roof needs a connection to the sky.

In the building system we propose, the roof caps are weights we use at the ridge of the roof to make the slight curve in the pitched sides of the roof. They happen at regular intervals, at the ridges of the scallops. They need not be large—a small bag of sand or a stone will do, plastered with concrete and shaped so the bulge is obvious. It may be nice to paint them a different color from the roof.

Of course, there are hundreds of other possible kinds of roof caps. They can be brick chimneys, statues, vents, structural details, the pinnacles on a gothic buttress, weather vanes, or even windmills.

Therefore:

Choose a natural way to cap the roof—some way which is in keeping with the kind of construction, and the meaning of the building. The caps may be structural; but their main function is decorative—they mark the top—they mark the place where the roof penetrates the sky.



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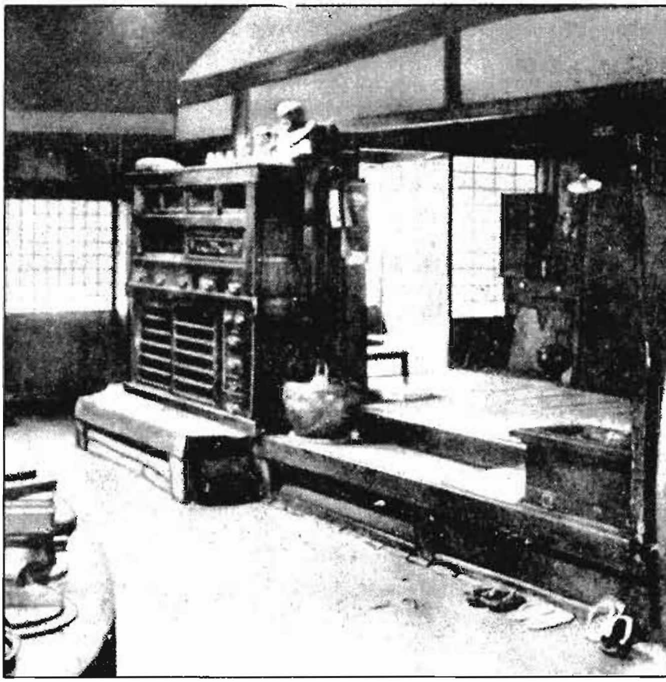
Finish the roof caps any way you want, but don't forget them—ORNAMENT (249). . . .

put in the surfaces and the indoor details;

233. FLOOR SURFACE
234. LAPPED OUTSIDE WALLS
235. SOFT INSIDE WALLS
236. WINDOWS WHICH OPEN WIDE
237. SOLID DOORS WITH GLASS
238. FILTERED LIGHT
239. SMALL PANES
240. HALF-INCH TRIM

233 FLOOR SURFACE**



. . . this pattern tells you how to put the surface on the floors, to finish the GROUND FLOOR SLAB (215) and FLOOR-CEILING VAULTS (219). When properly made, the floor surfaces will also help intensify the gradient of intimacy in the building—INTIMACY GRADIENT (127).

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We want the floor to be comfortable, warm to the touch, inviting. But we also want it to be hard enough to resist wear, and easy to clean.

When we think of floors, we think of wood floors. We hope, if we can afford it, to have a wooden floor. Even in hot countries, where tiles are beautiful, many people want hardwood floors whenever they can afford them. But the wood floor, though it seems so beautiful, does little to solve the fundamental problem of floors. The fact is that a room in which there is a bare wood floor, seems rather barren, forbidding, makes the room sound hollow and unfurnished. To make the wooden floor nice, we put down carpets. But then it is not really a wood floor at all. This confusion makes it clear that the fundamental problem of "the floor" has not been properly stated.

When we look at the problem honestly, we realize that the wooden floor, *and* the wooden floor with a carpet on it, are both rather uneven compromises. The bare wooden floor is too bare, too hard to be comfortable; but not in fact hard enough to resist wear particularly well if it is left uncovered—it scratches and dents and splinters. And when the floor is covered with a carpet, the whole point of the beauty of the wood is lost. You cannot see it any more, except round the edges of the carpet; and the carpet on the floor is certainly not hard enough to resist any substantial wear. Furthermore, the most beautiful carpets, handmade rugs and tapestries, are so delicate that they cannot take very rough wear. The practice of walking on a Persian rug with outdoor shoes on is a barbarian habit, never practiced by the people who make those rugs, and know how to treat them—they always take their shoes off. But the modern nylon and acrylic rugs, machine-made for hard wear, lose all the sumptuousness and pleasure of the carpet: they are, as it were, soft kinds of concrete.

The problem cannot be solved. The conflict is fundamental. The problem can only be *avoided* by making a clear distinction in the house between those areas which have heavy traffic and so need hard wearing surfaces which are easy to clean, and those other areas which have only very light traffic, where people can take off their shoes, and where lush, soft, beautiful rugs, pillows, and tapestries can easily be spread.

Traditional Japanese houses and Russian houses solve the problem in exactly this way: they divide the floor into two zones—serviceable and comfortable. They use very clean, and often precious materials in the comfortable zone, and often make the serviceable zone an extension of the street—that is, dirt, paving, and so on. People take their shoes off, or put them on, when they pass from one zone to the other.

The threshold between hard and soft.

We are not sure whether taking shoes off and on could become a natural habit in our culture. But it still makes sense to zone the house so that the floor material changes as one gets deeper into the house. The pattern INTIMACY GRADIENT (127) calls for a gradient of public, semi-public, and private rooms. It follows that one wants the floor to get softer as one goes deeper into the house—that is, the entrance and the kitchen are better floored with a hard, serviceable surface, while the dining, family room, and children's playrooms need a serviceable floor but with comfortable spots, and the bedrooms, studies, rooms of one's own need soft comfortable floors, on which people can sit, lie, and walk barefoot.

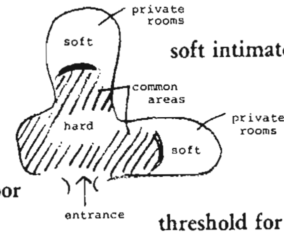
What should the materials be? Of the hard and soft materials, the hard is more of a problem. Since children are close to these floors, as well as the soft ones, they must be warm to the touch, —and at the same time they must be easy to clean. For these hard floors, a "soft" concrete might work. It can be made serviceable and pleasant at the same time if it is finished off with a light-weight textured floor finish, which is relatively porous. It can be made to wear and repel water by making the color integral with the mix and by waxing and polishing after it is set. It is fairly cheap and makes sense if the floor is a concrete floor anyway. Other materials which would work as hard floors are earth, rubber or cork tile, soft unbaked tile known as pastelleros in Peru—see SOFT TILE AND BRICK (248)—and wood planks, but these materials are more expensive.

For soft materials, carpet is the most satisfactory—for sitting, lying, and being close to the ground. We doubt that an improvement can be made on it—in fact we guess that if a substitute is used instead, it will eventually get carpeted over, anyway. This means that the areas which are going to be carpeted might as well have a cheap subfloor with matting laid wall to wall.

To emphasize the two zones, and to promote the taking off and on of shoes from one zone to the next, we suggest that there be a step up or a step down between the zones. This will help tremendously in keeping each zone "pure," and it is sure to help the activities in each zone.

Therefore:

Zone the house, or building, into two kinds of zones: public zones, and private or more intimate zones. Use hard materials like waxed, red polished concrete, tiles, or hardwood in the public zones. In the more intimate zone, use an underfloor of soft materials, like felt, cheap nylon carpet, or straw matting, and cover it with cloths, and pillows, and carpets, and tapestries. Make a clearly marked edge between the two—perhaps even a step—so that people can take their shoes off when they pass from the public to the intimate.



soft intimate floor

hard public floor

threshold for shoes

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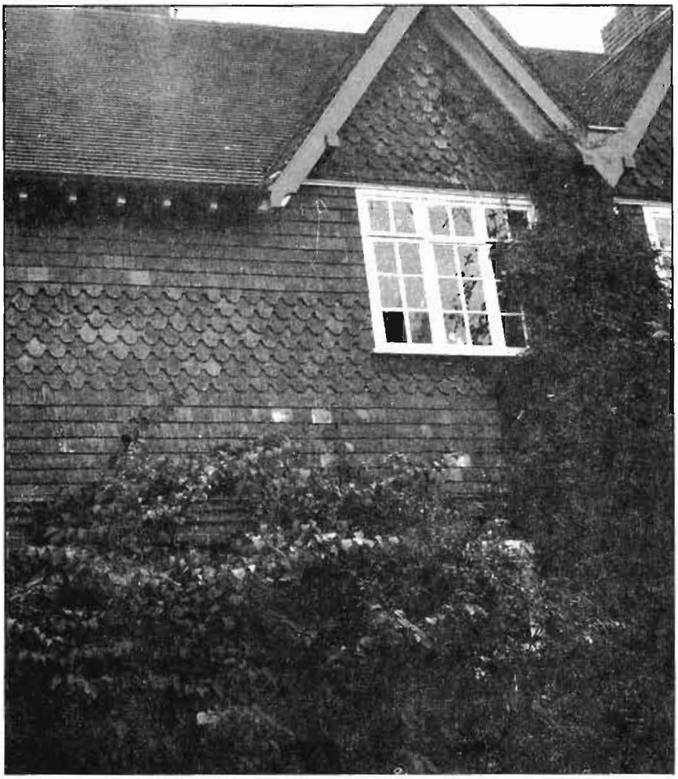
On the hard floor, you can use the same floor as you use on outdoor paths and terraces—hand fired brick and tile—SOFT TILE AND BRICK (248). On the soft intimate floors, use materials and cloths that are rich in ornament and color—ORNAMENT (249), WARM COLORS (250). . . .

234 LAPPED OUTSIDE WALLS



. . . this pattern finishes the WALL MEMBRANES (218), and ROOF VAULTS (220). It defines the character of their outside surfaces.

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The main function of a building's outside wall is to keep weather out. It can only do this if the materials are joined in such a way that they cooperate to make impervious joints.

At the same time, the wall must be easy to maintain; and give the people outside some chance of relating to it.

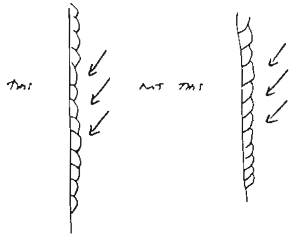
None of these functions can be very well managed by great sheets of impervious material. These sheets, always in the same plane, have tremendous problems at the joints. They require highly complex, sophisticated gaskets and seals, and, in the end, it is these seals and joints which fail.

Consider a variety of natural organisms: trees, fish, animals. Broadly speaking, their outside coats are rough, and made of large numbers of similar but not identical elements. And these elements are placed so that they often overlap: the scales of a fish, the fur of an animal, the crinkling of natural skin, the bark of a tree. All these coats are made to be impervious and easy to repair.

In simple technologies, buildings follow suit. Lapped boards, shingles, hung tiles, thatch, are all examples. Even stone and brick though in one plane, are still in a sense lapped internally to prevent cracks which run all the way through. And all of these walls are made of many small elements, so that individual pieces can be replaced as they are damaged or wear out.

Bear in mind then, as you choose an exterior wall finish, that it should be a material which can be easily lapped against the weather, which is made of elements that are easy to repair locally, and which therefore can be maintained piecemeal, indefinitely. And of course, whatever you choose, make it a surface which invites you to touch it and lean up against it.

In making our filled lightweight concrete structures, we have

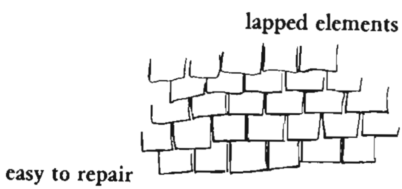


The internal structure of an imaginary lapped material.

used lapped boards as the exterior formwork for the lightweight concrete fill. And it is, of course, possible to use many other kinds of external cladding if they are available and if one can afford them. Slate, corrugated iron, ceramic tiles will produce excellent shingled wall claddings, and can all be placed in such a way as to provide exterior formwork for the pouring of a wall. It is also conceivable (though we have no evidence for it), that scientists might be able to create an oriented material whose internal crystal or fiber structure is in effect "lapped," because all the split lines run diagonally outward and downward.

Therefore:

Build up the exterior wall surface with materials that are lapped against the weather: either "internally lapped," like exterior plaster, or more literally lapped, like shingles and boards and tiles. In either case, choose a material that is easy to repair in little patches, inexpensively, so that little by little, the wall can be maintained in good condition indefinitely.



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235 SOFT INSIDE WALLS*

. . . and this pattern finishes the inner surface of the WALL MEMBRANES (218), and the under surface of FLOOR-CEILING VAULTS (219). If it is possible to use a soft material for the inner sheet of the wall membrane, then the wall will have the right character built in from the beginning.

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A wall which is too hard or too cold or too solid is unpleasant to touch; it makes decoration impossible, and creates hollow echoes.

A very good material is soft white gypsum plaster. It is warm in color (even though white), warm to the touch, soft enough to take tacks and nails and hooks, easy to repair, and makes a mellow sound, because its sound absorption capacity is reasonably high.

However, cement plaster, though only slightly different—and even confused with gypsum plaster—is opposite in all of these respects. It is too hard to nail into comfortably; it is cold and hard and rough to the touch; it has very low absorption acoustically—that is, very high reflectance—which creates a harsh, hollow sound; and it is relatively hard to repair, because once a crack forms in it, it is hard to make a repair that is homogeneous with the original.

In general, we have found that modern construction has gone more and more toward materials for inside walls that are hard and smooth. This is partly an effort to make buildings clean and impervious to human wear. But it is also because the kinds of materials used today are machine made—each piece perfect and exactly the same.

Buildings made of these flawless, hard and smooth surfaces leave us totally unrelated to them. We tend to stay away from them not only because they are psychologically strange, but because in fact they are physically uncomfortable to lean against; they have no give; they don't respond to us.

The solution to the problem lies in the following:

1. Gypsum plaster as opposed to cement plaster. Soft baked tiles as opposed to hard fired ones. When materials are porous and low in density they are generally softer and warmer to the touch.

2. Use materials which are granular and have natural texture, and which can be used in small pieces, or in such a way that there is repetition of the same small element. Walls finished in wood have the quality—the wood itself has texture; boards repeat it at a larger scale. Plaster has this character when it is hand finished. First there is the granular quality of the plaster and then the larger texture created by the motion of the human hand.

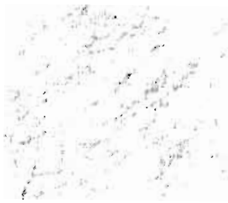
One of the most beautiful versions of this pattern is the one used in Indian village houses. The walls are plastered, by hand, with a mixture of cow dung and mud, which dries to a beautiful soft finish and shows the five fingers of the plasterer's hand all over the walls.

Cow dung plaster in an Indian village house.

Therefore:

Make every inside surface warm to the touch, soft enough to take small nails and tacks, and with a certain slight "give" to the touch. Soft plaster is very good; textile hangings, canework, weavings, also have this character. And wood is fine, where you can afford it.

soft to the touch



enough "give" for nails

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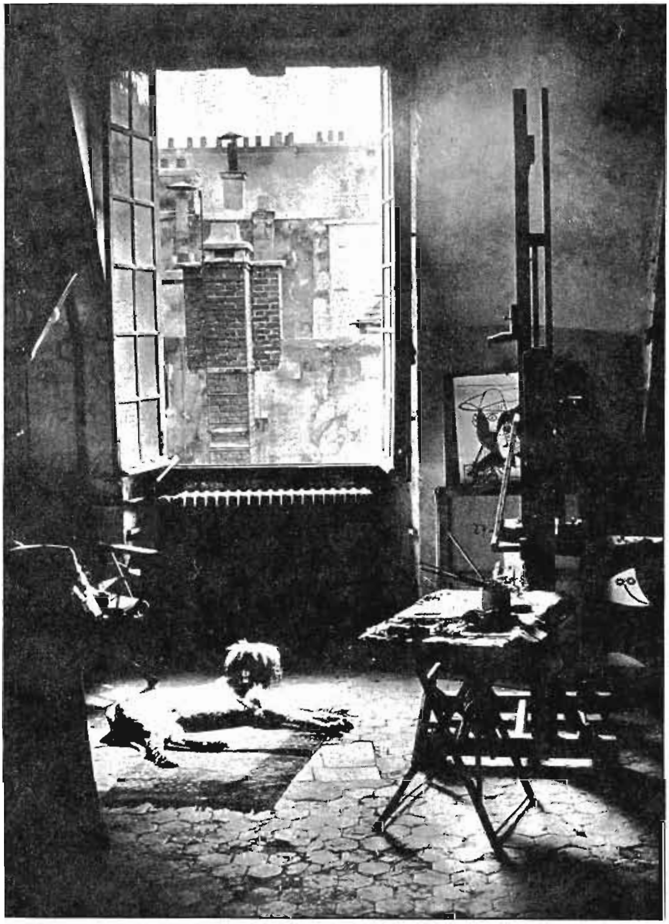
In our own building system, we find it is worth putting on a light skim coat of plaster over the inner surfaces of the WALL MEMBRANE (218) and FLOOR-CEILING VAULTS (219). Wherever finish plaster meets columns, and beams, and doors and window frames, cover the joint with half-inch wooden trim—HALF-INCH TRIM (240). . . .

236 WINDOWS WHICH OPEN WIDE*



. . . this pattern helps to complete WINDOW PLACE (180), WINDOWS OVERLOOKING LIFE (192), and NATURAL DOORS AND WINDOWS (221).

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Many buildings nowadays have no opening windows at all; and many of the opening windows that people do build, don't do the job that opening windows ought to do.

It is becoming the rule in modern design to seal up windows and create "perfect" indoor climates with mechanical air conditioning systems. This is crazy.

A window is your connection to the outside. It is a source of fresh air; a simple way of changing the temperature, quickly, when the room gets too hot or too cold; a place to hang out and smell the air and trees and flowers and the weather; and a hole through which people can talk to each other.

What is the best kind of window?

Double-hung windows cannot be fully opened—only half of the total window area can ever be opened at once. And they often get stuck—sometimes because they have been painted, sometimes because their concealed operating system of cords, counter-weights, and pulleys gets broken; it becomes such an effort to open them that no one bothers.

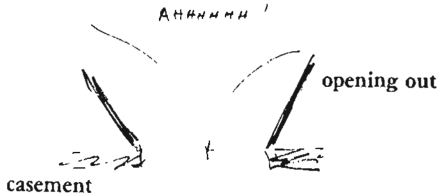
Sliding windows have much of the same problem—only part of the window area can be open, since one panel goes behind another; and they often get stuck too.

The side hung casement is easy to open and close. It gives the greatest range of openings, and so creates the greatest degree of control over air and temperature; and it makes an opening which is large enough to put your head and shoulders through. It is the easiest window to climb in and out of too.

The old time French windows are a stunning example of this pattern. They are narrow, full length upstairs windows, which swing out onto a tiny balcony, large enough only to contain the open windows. When you open them you fill the frame, and can stand drinking in the air: they put you intensely close to the outside—yet in a perfectly urban sense, as much in Paris or Madrid as in the open countryside.

Therefore:

Decide which of the windows will be opening windows. Pick those which are easy to get to, and choose the ones which open onto flowers you want to smell, paths where you might want to talk, and natural breezes. Then put in side-hung casements that open outward. Here and there, go all the way and build full French windows.



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Complete the subframe of the casement with SMALL PANES (239). . . .

237 SOLID DOORS WITH GLASS

. . . this pattern finishes the doors defined by CORNER DOORS (196) and LOW DOORWAY (224). It also helps to finish TAPESTRY OF LIGHT AND DARK (135) and INTERIOR WINDOWS (194), since it requires glazing in the doors, and can help to create daylight in the darker parts of indoor places.

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An opaque door makes sense in a vast house or palace, where every room is large enough to be a world unto itself; but in a small building, with small rooms, the opaque door is only very rarely useful.

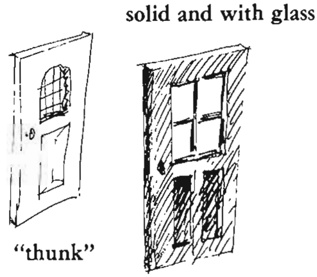
What is needed is a kind of door which gives some sense of visual connection together with the possibility of acoustic isolation: a door which you can see through but can't hear through.

Glazed doors have been traditional in certain periods—they are beautiful, and enlarge the sense of connection and make the life in the house one, but still leave people the possibility of privacy they need. A glazed door allows for a more graceful entrance into a room and for a more graceful reception by people in the room, because it allows both parties to get ready for each other. It also allows for different degrees of privacy: You can leave the door open, or you can shut it for acoustical privacy but maintain the visual connection; or you can curtain the window for visual and acoustic privacy. And, most important, it gives the feeling that everyone in the building is connected—not isolated in private rooms.

Therefore:

As often as possible build doors with glazing in them, so that the upper half at least, allows you to see through them. At the same time, build the doors solid enough, so

that they give acoustic isolation and make a comfortable "thunk" when they are closed.



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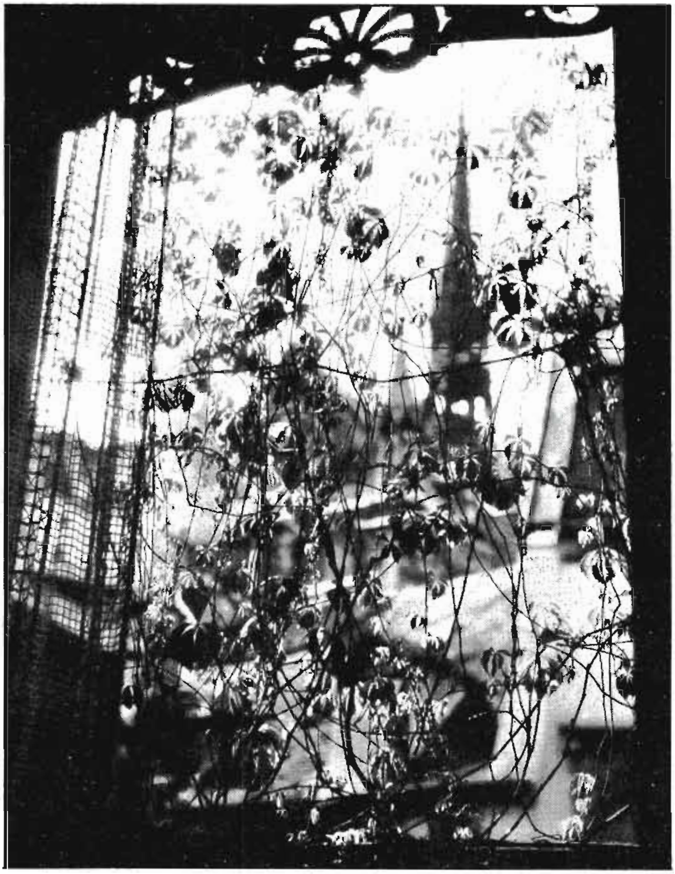
Glaze the door with small panes of glass—SMALL PANES (239); and make the doors more solid, by building them like WALL MEMBRANES (218). . . .

238 FILTERED LIGHT*



. . . even if the windows are beautifully placed, glare can still be a problem—NATURAL DOORS AND WINDOWS (221). The softness of the light, in and around the window, makes an enormous difference to the room inside. The shape of the frames can do a part of it—DEEP REVEALS (223)—but it still needs additional help.

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Light filtered through leaves, or tracery, is wonderful. But why?

We know that light filtering through a leafy tree is very pleasant—it lends excitement, cheerfulness, gaiety; and we know that areas of uniform lighting create dull, uninteresting spaces. But why?

1. The most obvious reason: direct light coming from a point source casts strong shadows, resulting in harsh images with strong contrasts. And people have an optical habit which makes this contrast worse: our eye automatically reinforces boundaries so that they read sharper than they are. For example, a color chart with strips of different colors set next to each other will appear as though there are dark lines between the strips. These contrasts and hard boundaries are unpleasant—objects appear to have a hard character, and our eyes, unable to adjust to the contrast, cannot pick up the details.

For all these reasons, we have a natural desire to diffuse light with lamp shades or indirect lighting, so that the images created by the light will be "softer," that is, that the boundaries perceived are not sharp, there is less contrast, fewer shadows, and the details are easier to see. This is also why photographers use reflected light instead of direct light when photographing objects; they pick up details which otherwise would be lost in shadow.

2. The second reason: to reduce the glare around the window. When there is bright light coming in through the window, it creates glare against the darkness of the wall around the window —see DEEP REVEALS (223). Filtering the light especially at the

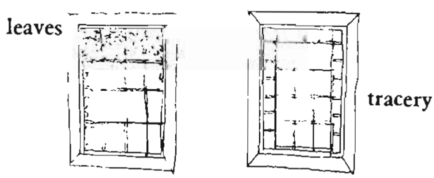
edges of the window cuts down the glare by letting in less light.

3. A third reason which is pure conjecture: it may simply be that an object which has small scale patterns of light dancing on it is sensually pleasing, and stimulates us biologically. Some film-makers claim the play of light upon the retina is naturally sensuous, all by itself.

To create filtered light, partially cover those windows which get direct sunlight, with vines and lattices. Leaves are special because they move. And the edge of the window can have fine tracery—that is, the edge of the glass itself, not the frame, so that the light coming in is gradually stronger from the edge to the center of the window; the tracery is best toward the top of the window where the light is strongest. Many old windows combine these ideas.

Therefore:

Where the edge of a window or the overhanging eave of a roof is silhouetted against the sky, make a rich, detailed taspestry of light and dark, to break up the light and soften it.



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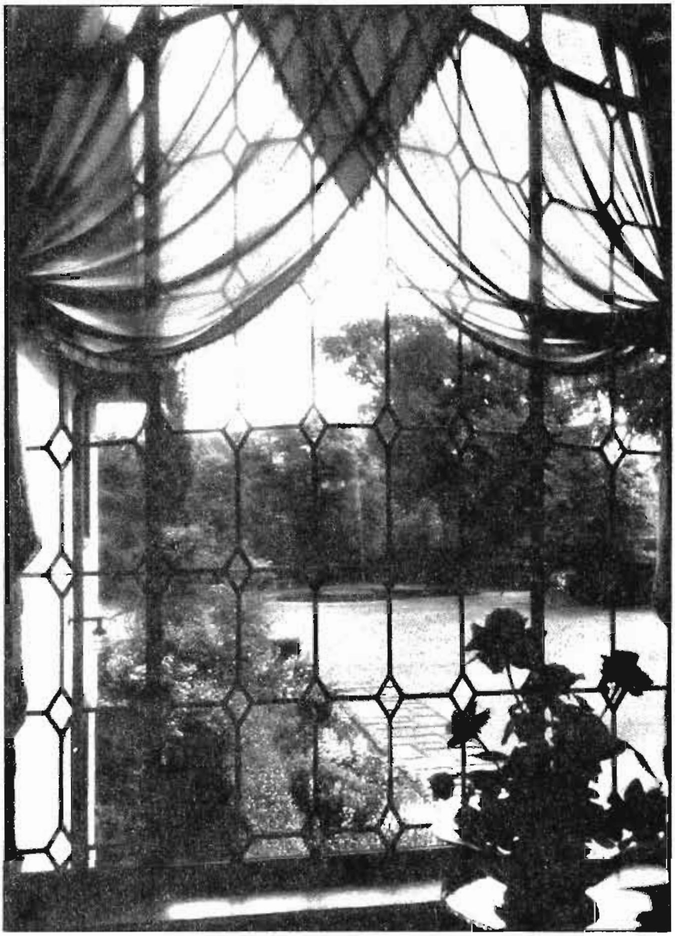
You can do this, most easily, with climbing plants trained to climb around the outside of the window—CLIMBING PLANTS (246). If there are no plants, you can also do it beautifully with simple canvas awnings—CANVAS ROOFS (244), perhaps colored—WARM COLORS (250). You can also help to filter light by making the panes smaller, more delicate, and more elaborate high in the window where the light is strong—SMALL PANES (239). . . .

239 SMALL PANES**



. . . this pattern gives the glazing for the windows in INTERIOR WINDOWS (194), NATURAL DOORS AND WINDOWS (221), WINDOWS WHICH OPEN WIDE (236), and SOLID DOORS WITH GLASS (237). In most cases, the glazing can be built as a continuation of the FRAMES AS THICKENED EDGES (225).

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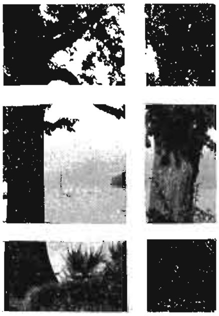
When plate glass windows became possible, people thought that they would put us more directly in touch with nature. In fact, they do the opposite.

They alienate us from the view. The smaller the windows are, and the smaller the panes are, the more intensely windows help connect us with what is on the other side.

This is an important paradox. The clear plate window seems as though it ought to bring nature closer to us, just because it seems to be more like an opening, more like the air. But, in fact, our contact with the view, our contact with the things we see through windows is affected by the way the window frames them. When we consider a window as an eye through which to see a view, we must recognize that it is the extent to which the window frames the view, that increases the view, increases its intensity, increases its variety, even increases the number of views we seem to see—and it is because of this that windows which are broken into smaller windows, and windows which are filled with tiny panes, put us so intimately in touch with what is on the other side. It is because they create far more frames: and it is the multitude of frames which makes the view.

Thomas Markus, who has studied windows extensively, has arrived at the same conclusion: windows which are broken up make for more interesting views. ("The Function of Windows—A Reappraisal," *Building Science*, Vol. 2, 1967, pp. 101–4). He points out that small and narrow windows afford different views from different positions in the room, while the view tends to be the same through large windows or horizontal ones.

We believe that the same thing, almost exactly, happens within the window frame itself. The following picture shows a simple landscape, broken up as it might be by six panes. Instead of one view, we see six views. The view becomes alive because the small panes make it so.



Six views.

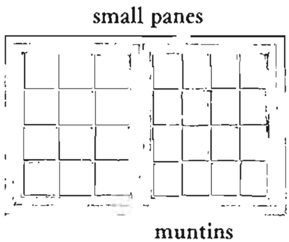
Another argument for small panes: Modern architecture and building have deliberately tried to make windows less like windows and more as though there was nothing between you and the outdoors. Yet this entirely contradicts the nature of windows. It is the function of windows to offer a view and provide a relationship to the outside, true. But this does not mean that they should not at the same time, like the walls and roof, give you a sense of protection and shelter from the outside. It is uncomfortable to feel that there is nothing between you and the outside, when in fact you are *inside* a building. It is the nature of windows to give you a relationship to the outside *and* at the same time give a sense of enclosure.

Small panes in Mendocino.

Not only that. Big areas of clear glass are sometimes even dangerous. People walk into plate glass windows, because they look like air. By comparison, windows with small panes give a clear functional message—the frames of the panes definitely tell you that something is there separating you from the outside. And they help to create FILTERED LIGHT (238).

Therefore:

Divide each window into small panes. These panes can be very small indeed, and should hardly ever be more than a foot square. To get the exact size of the panes, divide the width and height of the window by the number of panes. Then each window will have different sized panes according to its height and width.



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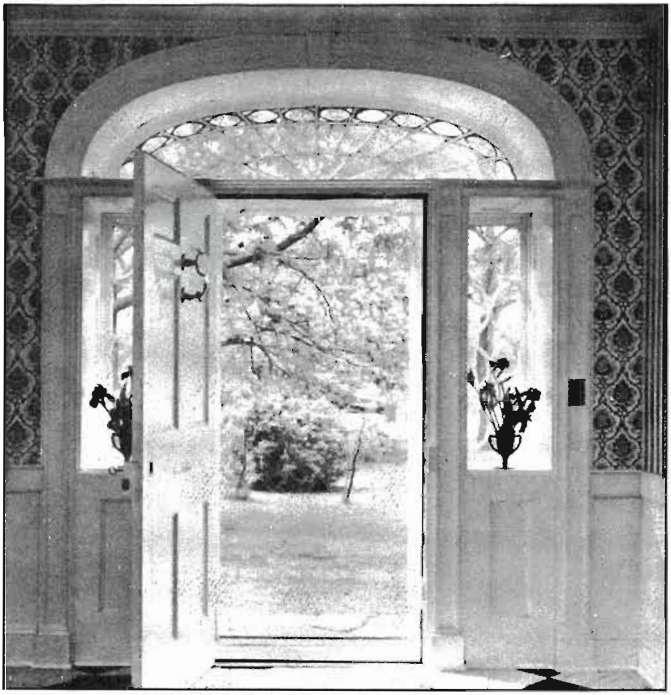
In certain cases you may want to make the small panes even finer near the window edge, to filter the light around the upper edge of windows which stand out against the sky—FILTERED LIGHT (238). As for the muntins, they can be made from the same materials as trim—HALF-INCH TRIM (240). . . .

240 HALF-INCH TRIM**



. . . and this pattern finishes the joints between SOFT INSIDE WALLS (235), or LAPPED OUTSIDE WALLS (234) and the various floors and vaults and frames and stiffeners and ornaments which are set into the walls: BOX COLUMNS (216), PERIMETER BEAMS (217), FLOOR-CEILING VAULTS (219), FRAMES AS THICKENED EDGES (225), and ORNAMENT (249).

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Totalitarian, machine buildings do not require trim because they are precise enough to do without. But they buy their precision at a dreadful price: by killing the possibility of freedom in the building plan.

A free and natural building cannot be conceived without the possibility of finishing it with trim, to cover up the minor variations which have arisen in the plan, and during its construction.

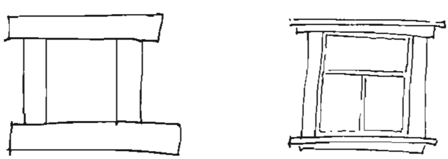
For example, when nailing a piece of gypsum board to a column—if the board is cut on site—it is essential that the cut can be inaccurate within a half-inch or so. If it has to be more accurate, there will be a great waste of material, and on-site cutting time and labor will increase, and, finally, the very possibility of adapting each part of the building to the exact subtleties of the plan and site will be in jeopardy.

It is in response to difficulties of this sort that modern system building has arisen. Here tolerances are very low indeed—⅛ inch and even lower—and there is no need for trim to cover up inaccuracies. However, the precision of the components can only be obtained by the most tyrannical control over the plan. This one aspect of construction has by itself destroyed the builder's capacity to make a building which is natural, organic, and adapted to the site.

If, as we suggest, the building procedure is looser and allows much larger tolerance—even mistakes on the order of half an inch or more—then the use of trim to cover the connection between materials becomes essential. Indeed, within this attitude to building, the trim is not a trivial decoration added as a finishing touch, but an essential phase of the construction. We see, then, that trim, so often associated with older buildings, and treated as an emblem of nostalgia, is in fact a vital part of the process of making buildings natural.

Finally, it is worth adding a note about the actual size of the trim pieces. Buildings built in the last 25 years often make a virtue out of boldness, and there is a tendency to use very large oversized pieces of trim instead of small pieces. Within the framework of this philosophy, it might seem right to use pieces of trim 2 or 3 inches thick for their effect and heaviness. We believe that this is wrong: Trim which is too large, or too thick, doesn't do its job. This is not a matter of style. There is a psychological reason for making sure that every component in the building has at least some pieces of trim which are of the order of half an inch or an inch thick, *and no more.*

Compare the following two examples of trim. For some reason the right-hand one, in which the trim is finer, is closer and better adapted to our feelings than the left-hand one.



Chunky trim . . . . . fine scale trim.

The reason for this seems to be the following. Our own bodies and the natural surroundings in which we evolved contain a continuous hierarchy of details, ranging all the way from the molecular fine structure to gross features like arms and legs (in our own bodies) and trunks and branches (in our natural surroundings).

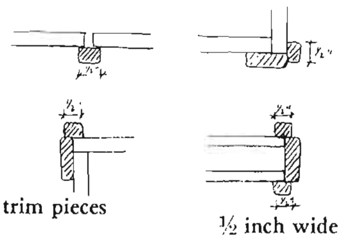
We know from results in cognitive psychology that any one step in this hierarchy can be no more than 1:5, 1:7, or 1:10 if we are to perceive it as a natural hierarchy. We cannot understand a hierarchy in which there is a jump in scale of 1:20 or more. It is this fact which makes it necessary for our surroundings, even when man-made, to display a similar continuum of detail.

Most materials have some kind of natural fibrous or crystalline structure at the scale of about 1/20 inch. But if the smallest building detail dimensions are of the order of 2 or 3 inches, this leaves a jump of 1:40 or 1:60 between these details and the fine structure of the material.

In order to allow us to perceive a connection between the fine building construction and the fine structure of the materials, it is essential that the smallest building details be of the order of a half inch or so, so that it is no more than about 10 times the size of the granular and fibrous texture of the materials.

Therefore:

Wherever two materials meet, place a piece of trim over the edge of the connection. Choose the pieces of trim so that the smallest piece, in each component, is always of the order of ½ inch wide. The trim can be wood, plaster, terracotta. . . .



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In many cases, you may be able to use the trim to form the ornaments—ORNAMENT (249); and trims may occasionally be colored: even tiny amounts can help to make the light in a room warm—WARM COLORS (250). . . .

build outdoor details to finish the outdoors as fully as the indoor spaces;

241. SEAT SPOTS
242. FRONT DOOR BENCH
243. SITTING WALL
244. CANVAS ROOFS
245. RAISED FLOWERS
246. CLIMBING PLANTS
247. PAVING WITH CRACKS BETWEEN THE STONES
248. SOFT TILE AND BRICK

241 SEAT SPOTS**

. . . assume that the main structure of the building is complete. To make it perfectly complete you need to build in the details of the gardens and the terraces around the building. In some cases, you will probably have laid out the walls and flowers and seats, at least in rough outline; but it is usually best to make the final decisions about them after the building is really there—so that you can make them fit the building and help to tie it into its surroundings—PATH SHAPE (121), ACTIVITY POCKETS (124), PRIVATE TERRACE ON THE STREET (140), BUILDING EDGE (160), SUNNY PLACE (161), OUTDOOR ROOM (163), CONNECTION TO THE EARTH (168), TRELLISED WALK (174), GARDEN SEAT (176), etc. First, the outdoor seats, public and private.

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Where outdoor seats are set down without regard for view and climate, they will almost certainly be useless.

We made random spot checks on selected benches in Berkeley, California, and recorded these facts about each bench: Was it occupied or empty? Did it give a view of current activity or not? Was it in the sun or not? What was the current wind velocity? Three of the eleven benches were occupied; eight were empty.

At the moment of observation, all three occupied benches looked onto activity, were in the sun, and had a wind velocity of less than 1.5 feet per second. At the moment of observation, none of the eight empty benches had all three of these characteristics. Three of them had shelter and activity but no sun; three of them had activity but no sun, and wind greater than 3 feet per second; two of them had sun and shelter but no activity.

A second series of observations compared the numbers of old people sitting in Union Square at 3:00 P.M. on a sunny day with the number at 3:00 P.M. on a cloudy day: 65 people on the sunny day and 21 on the cloudy day, even though the air temperature was the same on both days.

It's obvious, of course—but the point is this—when you are going to mark in spots in your project for the location of outdoor seats, sitting walls, stair seats, garden seats, look for places with these characteristics:

1. Benches facing directly onto pedestrian activity.

2. Benches open to the south for sun exposure during winter months.

3. A wall on those sides where the winter wind comes down.

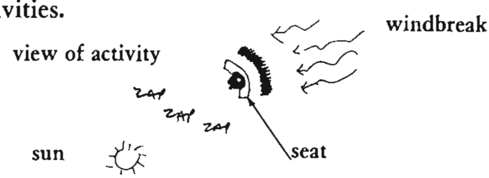
4. In hot climates—cover to give sun protection during the midday hours of summer months, and the bench open to the direction of the summer breeze.

New England benches.

Therefore:

Choosing good spots for outdoor seats is far more important than building fancy benches. Indeed, if the spot is right, the most simple kind of seat is perfect.

In cool climates, choose them to face the sun, and to be protected from the wind; in hot climates, put them in shade and open to summer breezes. In both cases, place them to face activities.



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If these seats can be made continuous with stairs or building entrances or low walls or ballustrades, so much the better—STAIR SEATS (125), FRONT DOOR BENCH (242), SITTING WALL (243). . . .

242 FRONT DOOR BENCH*

. . . SEAT SPOTS (241), acting within several larger patterns, creates an atmosphere around the edge of the building which invites lingering—ARCADES (119), BUILDING EDGE (160), SUNNY PLACE (161), CONNECTION TO THE EARTH (168); it is most marked and most important near the entrance—ENTRANCE ROOM (130). This pattern defines a special SEAT SPOT (241): a bench which helps to form the entrance room and the building edge around the entrance. It is always important; but perhaps most important of all, at the door of an OLD AGE COTTAGE (155).

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People like to watch the street.

But they do not always want a great deal of involvement with the street. The process of hanging out requires a continuum of degrees of involvement with the street, ranging all the way from the most private kind to the most public kind. A young girl watching the street may want to be able to withdraw the moment anyone looks at her too intently. At other times people may want to be watching the street, near enough to it to talk to someone who comes past, yet still protected enough so that they can withdraw into their own domain at a moment's notice.

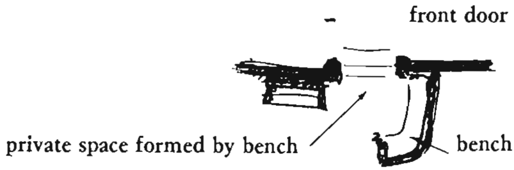
The most public kind of involvement with the street is sitting out. Many people, especially older people, pull chairs out to the front door or lean against the front of their houses, either while

Front door benches in Peru.

they are working at something or just for the pleasure of watching street life. But since there is some reluctance to be too public, this activity requires a bench or seat which is clearly private, even though in the public world. It is best of all when the bench is placed so that people are sitting on the edge of *their* world on private land—yet so placed that the personal space it creates overlaps with land that is legally public.

Therefore:

Build a special bench outside the front door where people from inside can sit comfortably for hours on end and watch the world go by. Place the bench to define a half-private domain in front of the house. A low wall, planting, a tree, can help to create the same domain.



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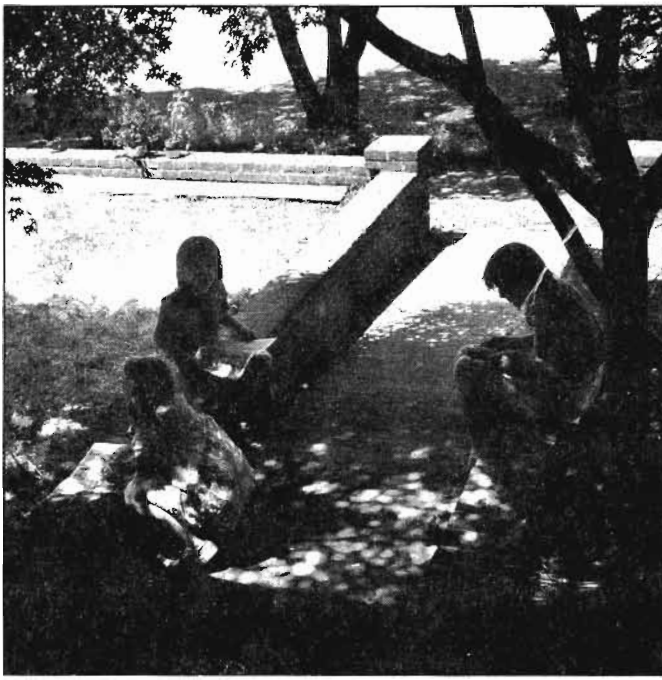
The bench may help to make the entrance visible—MAIN ENTRANCE (110); it can be part of a wall—SITTING WALL (243), with flowers in the sunshine next to it—RAISED FLOWERS (245). Place it with care, according to the rules given in SEAT SPOTS (241). . . .

243 SITTING WALL**



. . . if all is well, the outdoor areas are largely made up of positive spaces—POSITIVE OUTDOOR SPACES (106); in some fashion you have marked boundaries between gardens and streets, between terraces and gardens, between outdoor rooms and terraces, between play areas and gardens—GREEN STREETS (51), PEDESTRIAN STREET (100), HALF-HIDDEN GARDEN (111), HIERARCHY OF OPEN SPACE (114), PATH SHAPE (121), ACTIVITY POCKETS (124), PRIVATE TERRACE ON THE STREET (140), OUTDOOR ROOM (163), OPENING TO THE STREET (165), GALLERY SURROUND (166), GARDEN GROWING WILD (172). With this pattern, you can help these natural boundaries take on their proper character, by building walls, just low enough to sit on, and high enough to mark the boundaries.

If you have also marked the places where it makes sense to build seats—SEAT SPOTS (241), FRONT DOOR BENCH (242)—you can kill two birds with one stone by using the walls as seats which help enclose the outdoor space wherever its positive character is weakest.

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In many places walls and fences between outdoor spaces are too high; but no boundary at all does injustice to the subtlety of the divisions between the spaces.

Consider, for example, a garden on a quiet street. At least somewhere along the edge between the two there is a need for a seam, a place which unites the two, but does so without breaking down the fact that they are separate places. If there is a high wall or a hedge, then the people in the garden have no way of being connected to the street; the people in the street have no way of being connected to the garden. But if there is no barrier at all—then the division between the two is hard to maintain. Stray dogs can wander in and out at will; it is even uncomfortable to sit in the garden, because it is essentially like sitting in the street.

The problem can only be solved by a kind of barrier which functions as a barrier which separates, and as a seam which joins, at the same time.

A low wall or balustrade, just at the right height for sitting, is perfect. It creates a barrier which separates. But because it invites people to sit on it—invites them to sit first with their legs on one side, then with their legs on top, then to swivel round still further to the other side, or to sit astride it—it also functions as a seam, which makes a positive connection between the two places.

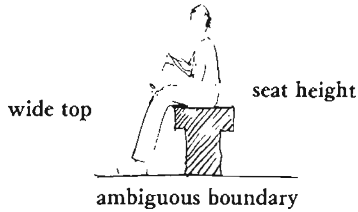
Examples: A low wall with the children's sandbox on one side, circulation path on the other; low wall at the front of the garden, connecting the house to the public path; a sitting wall that is a retaining wall, with plants on one side, where people can sit close to the flowers and eat their lunch.

Ruskin describes a sitting wall he experienced:

> Last summer I was lodging for a little while in a cottage in the country, and in front of my low window there were, first, some beds of daisies, then a row of gooseberry and currant bushes, and then a low wall about three feet above the ground, covered with stone-cress. Outside, a corn-field, with its green ears glistening in the sun, and a field path through it, just past the garden gate. From my window I could see every peasant of the village who passed that way, with basket on arm for market, or spade on shoulder for field. When I was inclined for society, I could lean over my wall, and talk to anybody; when I was inclined for science, I could botanize all along the top of my wall—there were four species of stone-cress alone growing on it; and when I was inclined for exercise, I could jump over my wall, backwards and forwards. That's the sort of fence to have in a Christian country; not a thing which you can't walk inside of without making yourself look like a wild beast, nor look at out of your window in the morning without expecting to see somebody impaled upon it in the night. (John Ruskin, *The Two Paths*, New York: Everyman's Library, 1907, p. 203.)

Therefore:

Surround any natural outdoor area, and make minor boundaries between outdoor areas with low walls, about 16 inches high, and wide enough to sit on, at least 12 inches wide.



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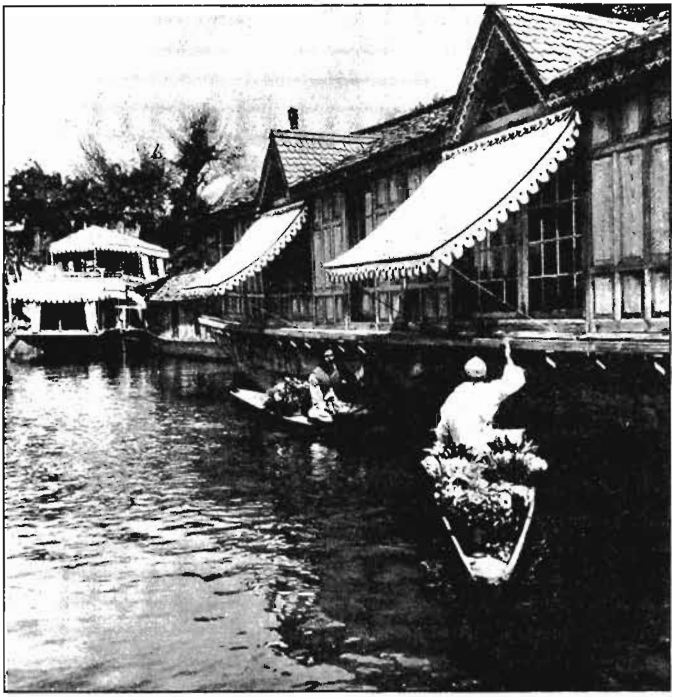
Place the walls to coincide with natural seat spots, so that extra benches are not necessary—SEAT SPOTS (241); make them of brick or tile, if possible—SOFT TILE AND BRICK (248); if they separate two areas of slightly different height, pierce them with holes to make them balustrades—ORNAMENT (249). Where they are in the sun, and can be large enough, plant flowers in them or against them—RAISED FLOWERS (245). . . .

244 CANVAS ROOFS*



. . . around every building there are ROOF GARDENS (118), ARCADES (119), PRIVATE TERRACES ON THE STREET (140), OUTDOOR ROOMS (163), GALLERY SURROUNDS (166), TRELLISED WALKS (174), and WINDOW PLACES (180), even SMALL PARKING LOTS (103), which all become more subtle and more beautiful with canvas roofs and awnings. And the awnings always help to create FILTERED LIGHT (238).

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There is a very special beauty about tents and canvas awnings. The canvas has a softness, a suppleness, which is in harmony with wind and light and sun. A house or any building built with some canvas will touch all the elements more nearly than it can when it is made only with hard conventional materials.

In conventional building, it is easy to think that walls and roofs must either be solid, or missing altogether. But cloth and canvas lie just exactly halfway in between. They are translucent, let a little breeze pass through, and they are very cheap, and easy to roll up and easy to pull down.

We can identify three kinds of places that need these properties:

1. Awnings—sunshades over windows, retractable, and used to filter very bright hot sunlight.

2. Curtains—moveable, half-open walls on outdoor rooms, balconies, and galleries—places that are occupied mainly during the day, but might benefit from extra wind protection.

3. Tent-like roofs on outdoor rooms—a tent which can hold off a drizzle and make outdoor rooms, or trellises, or courtyards habitable in the spring and autumn and at night.

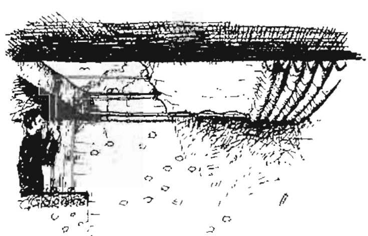
Here is Frank Lloyd Wright describing his use of the canvas roof in the very early structures at Taliesin West:

> . . . the Taliesin Fellowship (is a) desert camp on a great Arizona mesa which the boys, together with myself, are now building to work and live in during the winter-time. Many of the building units have canvas tops carried by red-wood framing resting on massive

stone walls made by placing the flat desert stones into wood boxes and throwing in stones and concrete behind them. Most of the canvas frames may be opened or kept closed. . . . The canvas overhead being translucent, there is a very beautiful light to live and work in; I have experienced nothing like it elsewhere except in Japan somewhat, in their houses with sliding paper walls or "shoji." (*The Future of Architecture*, London: The Architectural Press, 1955, pp. 255–56.)

Another example: In Italy, the canvas awning is used quite commonly as a simple awning over south and west windows. The canvas is often a bright and beautiful orange, giving color to the street and a warm glow to the interior rooms.

As a final example, we report on our own use of this pattern in the housing project in Lima. We roofed interior patios with movable canvas material. In hot weather the covers are rolled back, and a breeze blows through the house. In cold weather, the canvas is rolled out, sealing the house, and the patio is still useful. In Lima, there is a winter dew which normally makes patio floors damp and cold for eight months in the year. The cover on the patios keeps them dry and warm and triples their useful life. They eliminate the need for glass windows almost entirely. The windows which look into patios give light to rooms and may be curtained for visual control—but since the cold and damp are kept out by the patio canvas there need be no glass in the windows and no expensive moving parts.

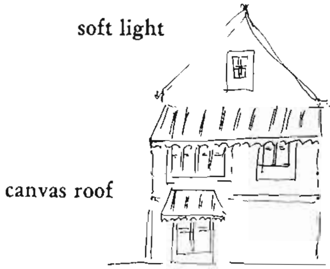


Our patio covers in Peru.

Therefore:

Build canvas roofs and walls and awnings wherever there are spaces which need softer light or partial shade in sum-

mer, or partial protection from mist and dew in autumn and winter. Build them to fold away, with ropes or wires to pull them, so that they can easily be opened.



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Use the canvas awnings, especially, to filter light over those windows which face west and south and glare because they face the sky—FILTERED LIGHT (238). Colored canvas will add special life—ORNAMENT (249), WARM COLORS (250). . . .

245 RAISED FLOWERS*

. . . outdoors there are various low walls at sitting height—SITTING WALL (243); terraced gardens, if the garden has a natural slope in it—TERRACED SLOPE (169); and paths and steps and crinkled building edges—PATHS AND GOALS (120), STAIR SEATS (125), BUILDING EDGE (160), GARDEN WALL (173). These are the best spots for flowers, and flowers help to make them beautiful.

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Flowers are beautiful along the edges of paths, buildings, outdoor rooms—but it is just in these places that they need the most protection from traffic. Without some protection they cannot easily survive.

Look at the positions that wildflowers take in nature. They are as a rule in protected places when they occur in massive quantities: places away from traffic—often on grassy banks, on corners of fields, against a wall. It is not natural for flowers to grow in bundles like flower beds; they need a place to nestle.

What are the issues?

1. The sun—they need plenty of sun.
2. A position where people can smell and touch them.
3. Protection from stray animals.
4. A position where people see them, either from inside a house or along the paths which they naturally pass coming and going.

Typical flower borders are often too deep and too exposed. And they are so low the flowers are out of reach. Concrete planter boxes made to protect flowers often go to the other extreme. They are so protected that people have no contact with them, except from a distance. This is next to useless. The flowers need to be close, where you can touch them, smell them.

Therefore, instead of putting the flowers in low borders, on the ground, where people walk, or in massive concrete tubs, build them up in low beds, with sitting walls beside them, along the sides of paths, around entrances and edges. Make quite certain that the flowers are placed in positions where people really can enjoy them—and not simply as ornament: outside favorite windows, along traveled paths, near entrances and round doorways, by outdoor seats.

Raised flowers.

Therefore:

Soften the edges of buildings, paths, and outdoor areas with flowers. Raise the flower beds so that people can touch the flowers, bend to smell them, and sit by them. And build the flower beds with solid edges, so that people can sit on them, among the flowers too.

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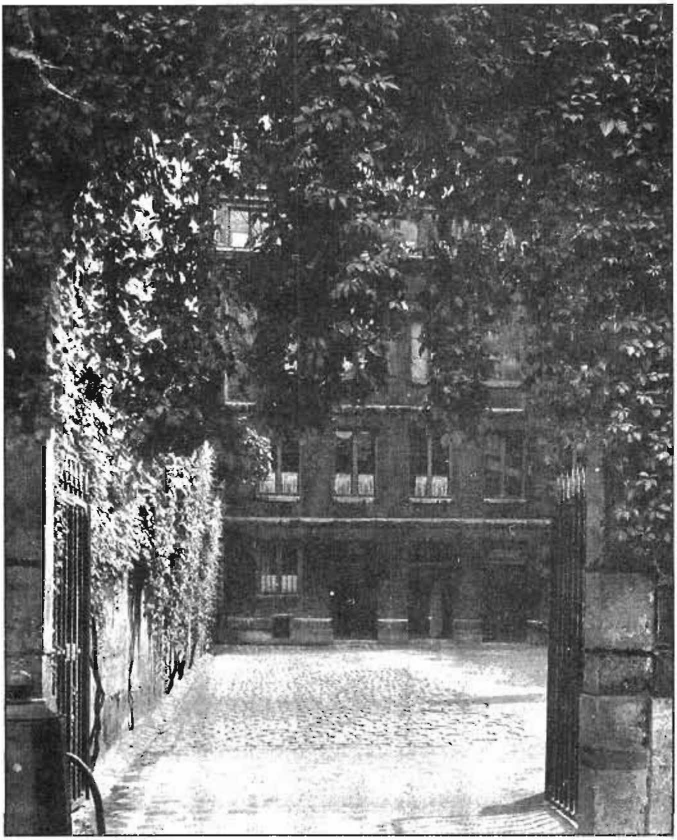
246 CLIMBING PLANTS



. . . two earlier patterns can be helped by climbing plants around the building: TRELLISED WALK (174) and FILTERED LIGHT (238).

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A building finally becomes a part of its surroundings when the plants grow over parts of it as freely as they grow along the ground.

There is no doubt that buildings with roses or vines or honeysuckle growing on them mean much more to us than buildings whose walls are blank and bare. That is reason enough to plant wild clematis around the outside of a building, to make boxes to encourage plants to grow at higher storys, and to make frames and trellises for them to climb on.

We can think of four ways to ground this intuition in function.

1. One argument, consistent with others in the book, is that climbing plants effect a smooth transition between the built and the natural. A sort of blurring of the edges.

2. The quality of light. When the plants grow around the openings of buildings, they create a special kind of filtered light inside. This light is soft, reduces glare, and stark shadows—FILTERED LIGHT (238).

3. The sense of touch. Climbing and hanging plants also give the outside walls a close and subtle texture. The same kind of texture can be achieved in the building materials, but it is uniquely beautiful when it comes from a vine growing across a wall or winding around the eaves of an arcade. Then, the texture invites you to touch and smell it, to pick off a leaf. Perhaps most important, the texture of climbing plants is ever different; it is subtly different from day to day, as the wind and sun play upon it; and it is greatly different from season to season.

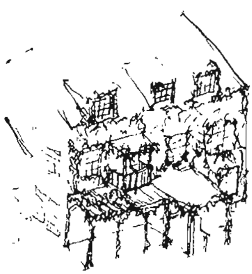
4. Tending the plants. When they are well-tended, healthy plants and flowers growing around the windows and out of flower boxes in the upper storys, make the street feel more

comfortable. They bespeak a social order of some repose within the buildings, and therefore it is comfortable to be on the streets —one feels at home. It is as if the plants were a gift from the people inside to people on the street.

The contribution to the street.

Therefore:

On sunny walls, train climbing plants to grow up round the openings in the wall—the windows, doors, porches, arcades, and trellises.



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247 PAVING WITH CRACKS BETWEEN THE STONES**

. . . many patterns call for paths and terraces and places where the outdoor areas around a building feel connected to the earth—GREEN STREETS (51), PATH SHAPE (121), PRIVATE TERRACE ON THE STREET (140), OUTDOOR ROOM (163), CONNECTION TO THE EARTH (168), TERRACED SLOPE (169). This pattern provides a way of building the ground surface that makes these larger patterns come to life.

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Asphalt and concrete surfaces outdoors are easy to wash down, but they do nothing for us, nothing for the paths, and nothing for the rainwater and plants.

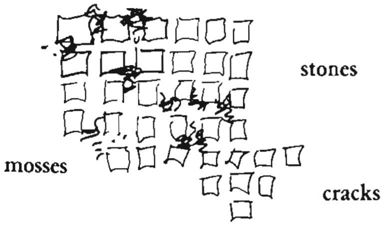
Look at a simple path, made by laying bricks or paving stones directly in the earth, with ample cracks between the stones. It is good to walk on, good for the plants, good for the passage of time, good for the rain. You walk from stone to stone, and feel the earth directly under foot. It does not crack, because as the earth settles, the stones move with the earth and gradually take on a rich uneven character. As time goes by, the very age and history of all the moments on that path are almost recorded in its slight unevenness. Plants and mosses and small flowers grow between the cracks. The cracks also help preserve the delicate ecology of worms and insects and beetles and the variety of plant species. And when it rains, the water goes directly to the ground; there is no concentrated run-off, no danger of erosion, no loss of water in the ground around the path.

All these are good reasons to set paving stones loosely. As for the flat, smooth, hard concrete and asphalt surfaces, they have almost nothing to recommend them. They are built when people forget these small advantages that come about when paving is made out of individual stones with cracks between the stones.

Therefore:

On paths and terraces, lay paving stones with a 1 inch crack between the stones, so that grass and mosses and

small flowers can grow between the stones. Lay the stones directly into earth, not into mortar, and, of course, use no cement or mortar in between the stones.



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Use paving with cracks, to help make paths and terraces which change and show the passage of time and so help people feel the earth beneath their feet—CONNECTION TO THE EARTH (168); the stones themselves are best if they are simple soft baked tiles—SOFT TILE AND BRICK (248). . . .

248 SOFT TILE AND BRICK

. . . several patterns call for the use of tiles and bricks—CONNECTION TO THE EARTH (168), GOOD MATERIALS (207), FLOOR SURFACE (233), SITTING WALL (243), PAVING WITH CRACKS BETWEEN THE STONES (247).

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How can a person feel the earth, or time, or any connection with his surroundings, when he is walking on the hard mechanical wash-easy surfaces of concrete, asphalt, hard-fired architectural paving bricks, or artificially concocted mixes like terrazo.

It is essential, above all, that the ground level surfaces we walk on—both around our buildings and indoors in those places like passages and kitchens where the floor has to be hard—be soft enough, at least, to show the passage of time, in gradual undulations and unevenness, that tell the story of a thousand passing feet, and make it clear that buildings are like people—not impervious and alien, but alive, changing with time, remembering the paths which people tread.

Nothing shows the passage of time so well as very soft, baked or lightly fired, bricks and tiles. They are among the cheapest tiles that can be made; they use ordinary clay, are biodegradable, and always develop a beautiful sense of wear and time in the undulations made by people walking over them.

In addition, those paved areas around a building required by CONNECTION TO THE EARTH (168) play a special role. They are the places which are halfway between the building—with its artificial materials—and the earth—which is entirely natural. To make this connection felt, the materials themselves must also be halfway, in character, between the building and the earth. Again, soft, lightly fixed tiles are most appropriate.

We consider this so important, that we advocate, specifically, that the people who are making the building, make the quantity of bricks and tiles they need for ground floor and outdoor surfaces—and that these be made in local clay and soft fired, in stacks, right on the site.

It is easy to do. We shall now give detailed instructions for making the tiles themselves and for making a rudimentary outdoor firing pit.

We start with the clay: it would be best to make one's own clay from scratch.

Clay is decomposed feldspathic rock. There is an abundance of it all over the earth. One may be fortunate enough to find it in one's back yard.

To test whether it is clay, pick up a bit of it and wet it. If it is plastic and sticky enough to form a smooth ball, it is clay. . . .

Process the clay as follows:

1. First, remove impurities such as twigs, leaves, roots and stones.
2. Then, let the chunks dry in the sun.
3. Break up these chunks and grind them up as finely as possible.
4. Put this ground-up clay in water so that there is a mound above water.
5. Let this mixture soak for one day, then stir it, and sieve it through a screen.
6. Let stand again for another day, and remove excess water.
7. Then put the clay in a plaster container; plaster absorbs water, thus stiffening the mixture into workable clay.
8. Work the clay a little to test it. If cracks appear, it is "short"; when that happens, add to the mixture, up to 7% bentonite. If clay is too plastic, add "grog." . . .

Shrinkage may be decreased by adding flint or grog to the clay. Grog is clay that has been biscuit-fired and then crushed. Some people prepare their own grog from broken biscuit-fired pieces. It can be bought at very little cost at any supply company in varying degrees of fineness. The coarser the particles of grog added to the clay, the coarser the texture of the fired object will be.

Grog makes clay porous and is used for objects which are not intended to hold water. Grog also prevents warpage and is, therefore, very useful for tile making and for sculpture. 20% is a good proportion of grog in a clay mixture.

(Muriel Pargh Turoff, *How to Make Pottery and Other Ceramic Ware*, New York: Crown Publishers, 1949, p. 13.)

Once you have the clay, you can make the tiles.

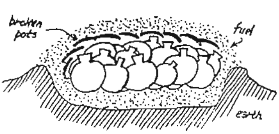
In this method of tile making, a wooden form is used that has the dimensions desired for the finished tiles. It is put together by nailing four strips of wood to a smooth piece of board. The strips should be 1 inch wide and their height may vary from ⅜ inch to ¾ inch, depending on how thick you wish the finished tiles to be. It is a good plan to put a piece of oilcloth on the base board before nailing down the strips. This will keep the board from warping. . . .

Roll out a slab of clay. . . . Then cut from the slab a piece that will fit comfortably into the form and roll it down with a rolling pin. Do not roll the pin all the way across the surface of the clay, but work from the center outwards to all four sides. . . . Let the tile dry until it is leather-hard; then separate it from the form by running a knife around its edges. . . .

Clay tiles should be allowed to dry very slowly, and for this reason should be put in a cool place. If they dry too quickly under heat, they are apt to crack or warp. The edges have a tendency to dry more rapidly than the center and usually should be dampened from time to time to prevent this. (Joseph Leeming, *Fun With Clay*, Philadelphia and New York: J. B. Lippincott Company.)

To fire soft tiles and bricks, it is not necessary to build real kilns. They can be fired in open pits much like those which primitive potters used to fire their pottery. This type of open pit firing is described in detail by Daniel Rhodes, in *Kilns: Design, Construction and Operation*, Philadelphia: Chilton Book Company. Briefly:

Dig a shallow pit about 14 to 20 inches deep, and several square feet in area. Line this pit (bottom and sides) with branches, reeds, twigs, etc. Place the tiles and bricks to be fired on the lining, so that they are compactly piled with just a tiny bit of airspace between them—(they can be criss-crossed). . . . If you use old tiles to line the pit, it will keep the heat in even better; and air holes low down at one end will help combustion. . . . Put some fuel in between stacks and over them. Then light the fuel in the pit, and allow it to burn slowly—which it will to begin with because not much air can get to it. Pile more fuel on as the fire burns up to a level above the pit. After the entire pit and its contents reach red heat, allow the fire to die down, and cover the top of the fire with wet leaves, dung or ashes to retain the heat. After the fire has died down, and the embers cooled, the tiles can be removed.

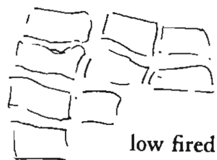


A simple kiln.

Therefore:

Use bricks and tiles which are soft baked, low fired—so that they will wear with time, and show the marks of use.

You can make them in a simple mold from local clay, right on the site; surround the stack with twigs and firewood; and fire them, to a soft pink color which will leave them soft enough to wear with time.



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The soft pink color helps to create WARM COLORS (250). Before firing, you may want to give the tiles some ORNAMENT (249). . . .

complete the building with ornament and light and color and your own things.

249. ORNAMENT

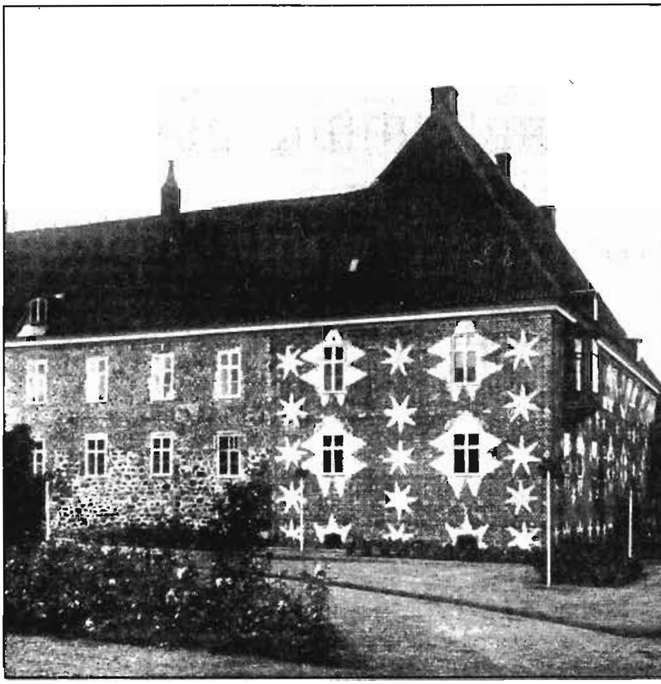
250. WARM COLORS

251. DIFFERENT CHAIRS

252. POOLS OF LIGHT

253. THINGS FROM YOUR LIFE

249 ORNAMENT**



. . . once buildings and gardens are finished; walls, columns, windows, doors, and surfaces are in place; boundaries and edges and transitions are defined—MAIN ENTRANCE (110), BUILDING EDGE (160), CONNECTION TO THE EARTH (168), GARDEN WALL (173), WINDOW PLACE (180), CORNER DOORS (196), FRAMES AS THICKENED EDGES (225), COLUMN PLACE (226), COLUMN CONNECTION (227), ROOF CAPS (232), SOFT INSIDE WALLS (235), SITTING WALL (243), and so on—it is time to put in the finishing touches, to fill the gaps, to mark the boundaries, by making ornament.

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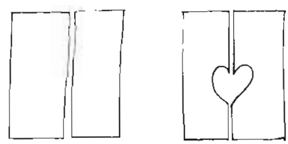
All people have the instinct to decorate their surroundings.

But decorations and ornaments will only work when they are properly made: for ornaments and decorations are not only born from the natural exuberance and love for something happy in a building; they also have a function, which is as clear, and definite as any other function in a building. The joy and exuberance of carvings and color will only work, if they are made in harmony with this function. And, further, the function is a necessary one —the ornaments are not just optional additions which may, or may not be added to a building, according as the spirit moves you—a building needs them, just as much as it needs doors and windows.

In order to understand the function of ornament, we must begin by understanding the nature of space in general. Space, when properly formed, is whole. Every part of it, every part of a town, a neighborhood, a building, a garden, or a room, is whole, in the sense that it is both an integral entity, in itself, and at the same time, joined to some other entities to form a larger whole. This process hinges largely on the boundaries. It is no accident that so many of the patterns in this pattern language concern the importance of the boundaries between things, as places that are as important as the things themselves—for example, SUBCULTURE BOUNDARY (13), NEIGHBORHOOD BOUNDARY (15), ARCADES (119), BUILDING EDGE (160), GALLERY SURROUND (166), CONNECTION TO THE EARTH (168), HALF-OPEN WALLS (193), THICK WALLS (197), FRAMES AS THICKENED EDGES (225), HALF-INCH TRIM (240), SITTING WALL (243).

A thing is whole only when it is itself entire and also joined to its outside to form a larger entity. But this can only happen when the boundary between the two is so thick, so fleshy, so ambiguous, that the two are not sharply separated, but can function either as separate entities or as one larger whole which has no inner cleavage in it.

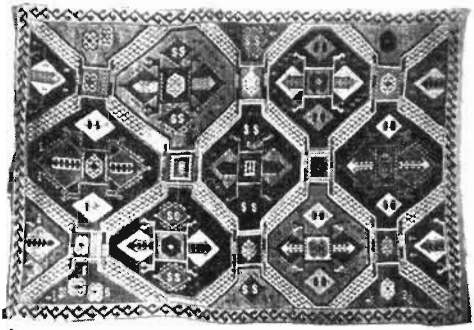


Split . . . and whole.

In the left-hand diagram where there is a cleavage that is sharp, the thing and its outside are distinct entities—they function individually as wholes—but they do not function together as a larger whole. In this case the world is split. In the right-hand diagram where there is ambiguous space between them, the two entities are individually entire, as before, but they are also entire together as a larger whole. In this case the world is whole.

This principle extends throughout the material universe, from the largest organic structures in our surroundings, to the very atoms and molecules.

Extreme examples of this principle at work in manmade objects are in the endless surfaces of objects from the so-called "dark ages" and in the carpets and tilework of Turkey and Persia. Leaving aside the profound meaning of these "ornaments," it is a fact that they function mainly by creating surfaces in which each part is simultaneously figure and boundary and in which the design acts as boundary and figure at several different levels simultaneously.



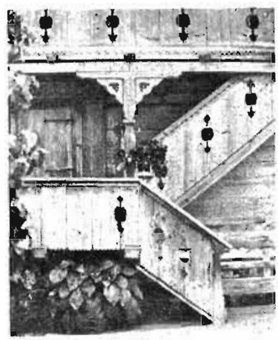
A decoration which is whole, because it cannot be broken into parts.

Since none of the parts can be separated from their surroundings, because each part acts as figure and as boundary, at several levels, this ancient carpet is whole, to an extraordinary degree.

The main purpose of ornament in the environment—in buildings, rooms, and public spaces—is to make the world more whole by knitting it together in precisely the same way this carpet does it.

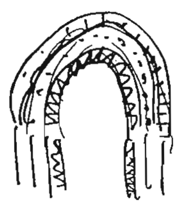
If the patterns in this language are used correctly, then these unifying boundaries will already come into existence without ornament at almost all the scales where they are necessary in spaces and materials. It will happen in the large spaces, like the entrance transition or the building edge. And, of course, it happens of its own accord, in those smaller structures which occur within the materials themselves—in the fibers of wood, in the grain of brick and stone. But there is an intermediate range of scales, a twilight zone, where it will not happen of its own accord. *It is in this range of scales that ornament fills the gap.*

As far as specific ways of doing it are concerned, there are hundreds, of course. In this balustrade the ornament is made entirely of the boundary, of the space between the boards. The boards are cut in such a way, that when they are joined together in the fence, they make something of the space between them.



. . . *A balustrade.*

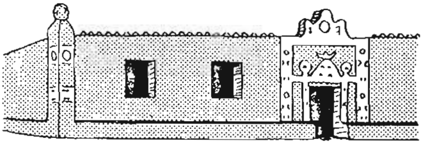
Here is a more complicated case—the entrance to a Romanesque church.



A doorway.

The ornament is built up around the edge of the entrance. It creates a unifying seam between the entrance *space* and the stone. Without the ornament, there would be a gap between the arch of the entry and the passage itself: the ornament works on the seam, between the two, and holds them together. It is especially lavish and developed in this place, because just this seam—the boundary of the entrance to the church—is so important, symbolically, to the people who worship there.

In fact, doors and windows are always important for ornament, because they are places of connection between the elements of buildings and the life in and around them. It is very likely that we shall find a concentration of ornament at the edges of doors and windows, as people try to tie together these edges with the space around them.



Nubian door.

And exactly the same happens at hundreds of other places in the environment; in rooms, around our houses, in the kitchen, on a wall, along the surface of a path, on tops of roofs, around a column—in fact, anywhere at all where there are edges between things which are imperfectly knit together, where materials or objects meet, and where they change.

Early American stencilling.

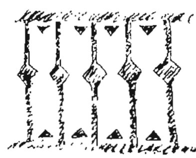
Most generally of all, the thing that makes the difference in the use of ornament is the eye for the significant gap in the continuum: the place where the continuous fabric of interlock and connectivity is broken. When ornament is applied badly it is always put into some place where these connections are not really missing, so it is superfluous, frivolous. When it is well used, it is always applied in a place where there is a genuine gap, a need for a little more structure, a need for what we may call metaphorically "some extra binding energy," to knit the stuff together where it is too much apart.

Therefore:

Search around the building, and find those edges and transitions which need emphasis or extra binding energy.

Corners, places where materials meet, door frames, windows, main entrances, the place where one wall meets another, the garden gate, a fence—all these are natural places which call out for ornament.

Now find simple themes and apply the elements of the theme over and again to the edges and boundaries which you decide to mark. Make the ornaments work as seams along the boundaries and edges so that they knit the two sides together and make them one.



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Whenever it is possible, make the ornament while you are building—not after—from the planks and boards and tiles and surfaces of which the building is actually made—WALL MEMBRANE (218), FRAMES AS THICKENED EDGES (225), LAPPED OUTSIDE WALLS (234), SOFT INSIDE WALLS (235), SOFT TILE AND BRICK (248). Use color for ornament—WARM COLORS (250); use the smaller trims which cover joints as ornament—HALF-INCH TRIM (240); and embellish the rooms themselves with parts of your life which become the natural ornaments around you—THINGS FROM YOUR LIFE (253). . . .

250 WARM COLORS**

. . . this pattern helps to create and generate the right kind of GOOD MATERIALS (207), FLOOR SURFACE (233), SOFT INSIDE WALLS (235). Where possible leave the materials in their natural state. Just add enough color for decoration, and to make the light inside alive and warm.

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The greens and greys of hospitals and office corridors are depressing and cold. Natural wood, sunlight, bright colors are warm. In some way, the warmth of the colors in a room makes a great deal of difference between comfort and discomfort.

But just what are warm colors and cold colors? In a very simple minded sense, red and yellow and orange and brown are warm; blue and green and grey are cold. But, obviously, it is not true that rooms with red and yellow feel good; while rooms with blue and grey feel cold. There is some superficial truth to this simple statement: it is true that reds and browns and yellows *help* to make rooms comfortable; but it is also true that white and blue and green can all make people comfortable too. After all, the sky is blue, and grass is green. Obviously, we feel comfortable out in the green grass of a meadow, under the blue sky.

The explanation is simple and fascinating. It is not the color of the things, the surfaces, which make a place warm or cold, *but the color of the light.* What exactly does this mean? We can estimate the color of the light at a particular point in space by holding a perfectly white surface there. If the light is warm, this surface will be slightly tinted toward the yellow-red. If the light is cold, this surface will be slightly tinted toward the blue-green. This tinting will be very slight: indeed, on a small white surface it may be so hard to see that you need a spectrometer to do it.

But when you realize that everything in that space is lightly tinted—people's faces, hands, shirts, dresses, food, paper, everything—it is not so hard to see that this can have a huge effect on the emotional quality that people experience there.

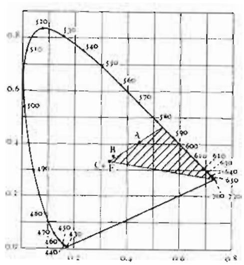
Now, the color of the light in a space does not depend in any simple way on the color of the surface. It depends on a complex interaction between the color of the light sources and the way this light then bounces on and off the many surfaces. In a meadow, on a spring day, the sunlight bouncing off the green grass is still warm light—that is, in the yellowish reddish range. The light in a hospital corridor, lit by fluorescent tubes, bouncing off green walls is cold light—in the green-blue range. In a room with lots of natural light, the overall light is warm. In a room whose windows face onto a grey building across the street, the light may be cold, unless there is a very strong concentration of yellow and red fabrics.

If you are in any doubt about the objective character of the light in the room and you don't have a spectrometer, all you need to do is to try to use color film. If the light is warm and the film is properly exposed, white walls will come out slightly pink. If the light is cold, white walls will come out slightly blue.

So, in order to make a room comfortable, you must use a collection of colors which together with the sources of light and the reflecting surfaces outside the room, combine to make the reflected light which exists in the middle of the room warm, that is, toward the yellow-red. Yellow and red colors will always do it. Blues and greens and whites will only do it in the proper places, balanced with other colors, and when the light sources are helping.

To complete the discussion we now make the concept of warm light precise in terms of chromaticity. Consider the light falling on any given surface in the middle of the room. This light contains a variety of different wavelengths. Its character is specified, exactly, by some distribution of spectral energies $p(\lambda)$, which gives the relative proportions of different wavelengths present in this light.

We know that any light whatsoever—in short, any $p(\lambda)$—can be plotted as a single point on the color triangle—more formally known as the two-dimensional chromaticity diagram—by means of the standard color matching functions given in Gunter Wyszecki and W. S. Stiles, *Color Science*, New York, 1967, pp. 228–317. The coordinates of a plot in this color triangle define the *chromaticity* of any given energy distribution.



Chromaticity diagram.

We may now identify a region on the chromaticity diagram which we shall call the *warm region*. It is shown hatched on the drawing.

This hatched area is based on a number of empirical results. For example, we know that people have a clear subjective impression of the relative warmth, or coldness, of different spaces. See, for instance, Committee on Colorimetry of the Optical Society of America, *The Science of Color*, New York, 1953, p. 168. One study which attempts to identify the objective correlates of perceived "warmth" is S. M. Newhall, "Warmth and Coolness of Colors," *Psychological Record*, 4, 1941, pp. 198–212. This study revealed a maximum for "warmest" judgments at dominant wave-length 610 millimicrons, which is in the middle of the orange range. And individual observer stability in such judgments is high. Thus, one study gives reliability coefficients of 0.95 for warmth and 0.82 for coolness—N. Collins, "The Appropriateness of Certain Color Combinations in Advertising," M. A. thesis, Columbia University, New York, 1924.

Finally, it is vital to remember that this pattern requires only that the *light*—the total light in the middle of a room, coming from sunlight, artificial lights, reflections from walls, reflections from outside, from carpets—the total *light*, lies in that part of the color triangle we call "warm." It does not require that any individual color surfaces in the room should be red or orange or yellow—only that the combined effect of all the surfaces and lights together, creates light in the middle of the room which lies in the warm part of the color triangle.

Therefore:

Choose surface colors which, together with the color of the natural light, reflected light, and artificial lights, create a warm light in the rooms.

warm light

yellows

Yellow

Red Orange

Brown

reds

oranges

and browns

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This means that yellows, reds, and oranges will often be needed to pick out trim and lampshades and occasional details—HALF-INCH TRIM (240), ORNAMENT (249), POOLS OF LIGHT (252). Colored CANVAS ROOFS (244) and SOFT TILE AND BRICK (248) also help to make warm colored light. Blues and greens and greys are much harder to use; especially on the north side where the light is cold and grey, but they can always be used for ornament, where they help to set off the warmer colors—ORNAMENT (249). . . .

251 DIFFERENT CHAIRS

. . . when you are ready to furnish rooms, choose the variety of furniture as carefully as you have made the building, so that each piece of furniture, loose or built in, has the same unique and organic individuality as the rooms and alcoves have—each different, according to the place it occupies—SEQUENCE OF SITTING SPACES (142), SITTING CIRCLE (185), BUILT-IN SEATS (202).

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People are different sizes; they sit in different ways. And yet there is a tendency in modern times to make all chairs alike.

Of course, this tendency to make all chairs alike is fueled by the demands of prefabrication and the supposed economies of scale. Designers have for years been creating "perfect chairs"—chairs that can be manufactured cheaply in mass. These chairs are made to be comfortable for the average person. And the institutions that buy chairs have been persuaded that buying these chairs in bulk meets all their needs.

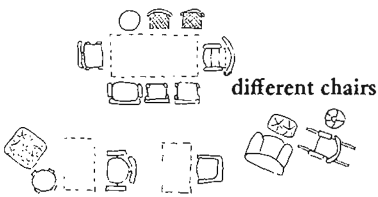
But what it means is that some people are chronically uncomfortable; and the variety of moods among people sitting gets entirely stifled.

Obviously, the "average chair" is good for some, but not for everyone. Short and tall people are likely to be uncomfortable. And although situations are roughly uniform—in a restaurant everyone is eating, in an office everyone is working at a table—even so, there are important distinctions: people sitting for different lengths of time; people sitting back and musing; people sitting aggressively forward in a hot discussion; people sitting formally, waiting for a few minutes. If the chairs are all the same, these differences are repressed, and some people are uncomfortable.

What is less obvious, and yet perhaps most important of all, is this: we project our moods and personalities into the chairs we sit in. In one mood a big fat chair is just right; in another mood, a rocking chair; for another, a stiff upright; and yet again, a stool or sofa. And, of course, it isn't only that we like to switch according to our mood; one of them is our favorite chair, the one that makes us most secure and comfortable; and that again is different for each person. A setting that is full of chairs, all slightly different, immediately creates an amosphere which supports rich experience; a setting which contains chairs that are all alike puts a subtle straight jacket on experience.

Therefore:

Never furnish any place with chairs that are identically the same. Choose a variety of different chairs, some big, some small, some softer than others, some rockers, some very old, some new, with arms, without arms, some wicker, some wood, some cloth.



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Where chairs are placed alone and where chairs are gathered, reinforce the character of the places which the chairs create with POOLS OF LIGHT (252), each local to the group of chairs it marks. . . .

252 POOLS OF LIGHT**

. . . this pattern helps to finish small social spaces like ALCOVES (179) and WORKSPACE ENCLOSURE (183), larger places like COMMON AREAS AT THE HEART (129), ENTRANCE ROOM (130), and FLEXIBLE OFFICE SPACE (146), and the furnishing of rooms like EATING ATMOSPHERE (182), SITTING CIRCLE (185), and DIFFERENT CHAIRS (251). It even helps to generate WARM COLORS (250).

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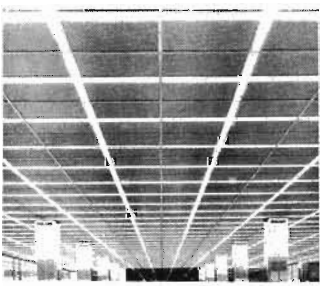
Uniform illumination—the sweetheart of the lighting engineers—serves no useful purpose whatsoever. In fact, it destroys the social nature of space, and makes people feel disoriented and unbounded.

Look at this picture. It is an egg-crate ceiling, with dozens of evenly spaced fluorescent lights above it. It is meant to make the light as flat and even as possible, in a mistaken effort to imitate the sky.



Flat, even light.

But it is based on two mistakes. First of all, the light outdoors is almost never even. Most natural places, and especially the conditions under which the human organism evolved, have dappled light which varies continuously from minute to minute, and from place to place.

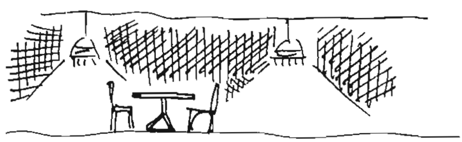
More serious, it is a fact of human nature that the space we use as social space is in part defined by light. When the light is perfectly even, the social function of the space gets utterly destroyed: it even becomes difficult for people to form natural human groups. If a group is in an area of uniform illumination, there are no light gradients corresponding to the boundary of the group, so the definition, cohesiveness, and "existence" of the group will be weakened. If the group is within a "pool" of light, whose size and boundaries correspond to those of the group, this enchances the definition, cohesiveness, and even the phenomenological existence of the group.

One possible explanation is suggested by the experiments of Hopkinson and Longmore, who showed that small bright light sources distract the attention less than large areas which are less bright. These authors conclude that local lighting over a work table allows the worker to pay more attention to his work than uniform background lighting does. It seems reasonable to infer that the high degree of person to person attention required to maintain the cohesiveness of a social group is more likely to be sustained if the group has local lighting, than if it has uniform background lighting. (See R. G. Hopkinson and J. Longmore, "Attention and Distraction in the Lighting of Workplaces," *Ergonomics*, 2, 1959, p. 321 ff. Also reprinted in R. G. Hopkinson, *Lighting*, London: HMSO, 1963, pp. 261–68.)

On-the-spot observation supports this conjecture. At the International House, University of California, Berkeley, there is a large room which is a general waiting and sitting lounge for guests and residents. There are 42 seats in the room, 12 of them are next to lamps. At the two times of observation we counted a total of 21 people sitting in the room; 13 of them chose to sit next to lamps. These figures show that people prefer sitting near lights ($X^2 = 11.4$, significant at the 0.1% level). Yet the overall light level in the room was high enough for reading. We conclude that people do seek "pools of light."

Everyday experience bears out the same observation in hundreds of cases. Every good restaurant keeps each table as a separate pool of light, knowing that this contributes to its priva and intimate ambience. In a house a truly comfortable old chai "yours," has its own light in dimmer surroundings—so tha you retreat from the bustle of the family to read the paper in peace. Again, house dining tables often have a single lamp suspended over the table—the light seems almost to act like glue for all the people sitting round the table. In larger situations the same thing seems to be true. Think of the park bench, under a solitary light, and the privacy of the world which it creates for a pair of lovers. Or, in a trucking depot, the solidarity of the group of men sipping coffee around a brightly lit coffee stand.

One word of caution. This pattern is easy to understand; and perhaps it is easy to agree with. But it is quite a subtle matter to actually create functioning pools of light in the environment. We know of many failures: for example, places where small lights do break down even illumination, but do not correspond in any real way with the places where people tend to gather in the space.



Light pools at odds with social space.

Therefore:

Place the lights low, and apart, to form individual pools of light which encompass chairs and tables like bubbles to reinforce the social character of the spaces which they form. Remember that you can't have pools of light without the darker places in between.

pools of light

252 POOLS OF LIGHT

⁘ ⁘ ⁘

Color the lampshades and the hangings near the lights to make the light which bounces off them warm in color—WARM COLORS (250). . . .

253 THINGS FROM YOUR LIFE*

. . . lastly, when you have taken care of everything, and you start living in the places you have made, you may wonder what kinds of things to pin up on the walls.

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"Decor" and the conception of "interior design" have spread so widely, that very often people forget their instinct for the things they really want to keep around them.

There are two ways of looking at this simple fact. We may look at it from the point of view of the person who owns the space, and from the point of view of the people who come to it. From the owner's point of view, it is obvious that the things around you should be the things which mean most to you, which have the power to play a part in the continuous process of self-transformation, which is your life. That much is clear.

But this function has been eroded, gradually, in modern times because people have begun to look outward, to others, and over their shoulders, at the people who are coming to visit them, and have replaced their natural instinctive decorations with the things which they believe will please and impress their visitors. This is the motive behind all the interior design and decor in the women's magazines. And designers play on these anxieties by making total designs, telling people they have no right to move anything, paint the walls, or add a plant, because they are not party to the mysteries of Good Design.

But the irony is, that the visitors who come into a room don't want this nonsense any more than the people who live there. It is far more fascinating to come into a room which is the living expression of a person, or a group of people, so that you can see their lives, their histories, their inclinations, displayed in manifest form around the walls, in the furniture, on the shelves. Beside such experience—and it is as ordinary as the grass—the artificial scene-making of "modern decor" is totally bankrupt.

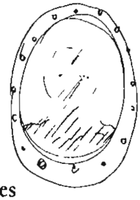
Jung describes the room that was his study, how he filled the stone walls with paintings that he made each day directly on the stones—mandalas, dream images, preoccupations—and he tells us that the room came gradually to be a living thing to him—the outward counterpart to his unconscious.

Examples we know: A motel run by a Frenchman, mementos of the Resistance all around the lounge, the letter from Charles de Gaulle. An outdoor market on the highway, where the proprietor has mounted his collection of old bottles all over the walls; hundreds of bottles, all shapes and colors; some of them are down for cleaning; there is an especially beautiful one up at the counter by the cash register. An anarchist runs the hot dog stand, he plasters the walls with literature, proclamations, manifestoes against the State.

A hunting glove, a blind man's cane, the collar of a favorite dog, a panel of pressed flowers from the time when we were children, oval pictures of grandma, a candlestick, the dust from a volcano carefully kept in a bottle, a picture from the news of prison convicts at Attica in charge of the prison, not knowing that they were about to die, an old photo, the wind blowing in the grass and a church steeple in the distance, spiked sea shells with the hum of the sea still in them.

Therefore:

Do not be tricked into believing that modern decor must be slick or psychedelic, or "natural" or "modern art," or "plants" or anything else that current taste-makers claim. It is most beautiful when it comes straight from your life —the things you care for, the things that tell your story.



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