ELEMENTS OF SPACE
Space Created by Things
... Space was, for Plato, a nothingness existing as an entity [itself]... (in the absence of objects, space would still exist, as an empty, boundless container)... [Thus many of us] understand the nature of architecture as an arrangement of buildings placed within... space. Nevertheless, this conception neither reflects the knowledge of modern physics nor describes the way the perception of space comes about psychologically... It is the mutual influences of material things that determine the space between them... Apart from the energy that pervades between objects, space cannot be said to exist physically... Space perception occurs only in the presence of perceivable things... No 3-dimensional framework exists for [positions]... There is no up or down, no left or right, neither size nor velocity, and no determinable distance of any kind... We can go a step further and separate observer from observed... [Here, space is manufactured] along the axis [of observation]... (experience is dominated by a primary goal)... Note that the connection established between observer and target is experienced as a straight line... (Gestalt's principle of simplicity: any pattern created, adopted, or selected by the nervous system will be as simple as the given conditions permit)... The Fields in Between
... Spontaneous perception (considering space as a container existing [apart from]... physical bodies)... [is a cause of] the visual, functional, and social chaos of modern life. It derives from the tunnel vision employed for immediate practical ends, especially under social conditions that atomize the human community into mere aggregates... Far from being empty, the interstitial space between objects is pervaded by gradients... [Space between objects contributes to the fact that] what is made does not necessarily correspond to what is seen... [At a basic level,] interspace looks looser and thinner as the distance between buildings increases. Conversely, the interspace becomes denser as the distance diminishes... Although the observed density may be a simple function of the distance between the objects, its absolute level of intensity may depend on other perceptual factors, such as the size of the buildings... [or other] neighborhood spaces... Interspace also establishes a particular ratio of remoteness and connectedness between objects,... (which in turn leads to issues of attraction and repulsion: objects that look 'too close' to each other display mutual repulsion)... Social-cultural norms also influence the choice of preferred distances between objects... Objects at times also require each other for mutual completion...

Empty and Forlorn
When distance increases, the density of the interval lessens and eventually disappears entirely... Under such conditions one can say that the space is empty... [Particularly when the space is] not controlled by the surrounding objects... Emptiness is not simply related to the absence of matter... It also comes about when... contours do not impose a structural organization upon surfaces... (every place is like the next)... [Definable objects can either be missing or can] cancel each other out... (it is the chaos of forces impinging on one another in a disorderly fashion, that makes it impossible to determine the place and spatial function of any object within the perceptual field)...

The Dynamics of Surrounding Space
... Space expands not only in the horizontal dimension but also vertically... For example, generally the height above a closed square is imagined as 3 to 4 times the height of the tallest building on the square. It seems to be higher above squares that are dominated by one prominent building, whereas over wide-open squares, the visual distance of the sky is only vaguely perceived... [Also worthy of note,] sharply horizontal boundaries tend
to produce an abrupt break between architecture and sky. This is not the case when we see irregular contours… (where architecture diffuses gradually into the sky)… It is not only the bulk or height of an object that determines the range of its surrounding field of spaces, but also the plainness or richness of its appearance (a very plain façade can be viewed from nearby without offense, whereas one rich in volumes and articulation has more expansive power and thereby asks the viewer to step farther back)… When an object is conceived as a mass suspended above the ground,… proper air space is required for this additional dimension as well… If the interspace above the ground level is large, the building may float like an anchored balloon… If the space is too small, [it might seem on the verge of collapse]

VERTICAL AND HORIZONTAL

Asymmetrical Space

… Among the infinitely many directions of 3d space, along which man theoretically can move, one direction is distinguished by the pull of gravity: the vertical. The vertical acts as the axis and frame of reference for all other directions… [Because of scale factors,] we do not notice that verticals on Earth… do not run parallel but converge toward a common center… Furthermore, the ground plane acts as the zero level for gauging of all vertical distances (distances are perceived as heights when they go upward, and as depths when they go downward, and by digging into the ground one experiences moving, not toward the center of the system, but away from the base)… Geometrically there is no difference between going up and going down, but physically and perceptually the difference is fundamental… Height spontaneously symbolizes things of high value… To rise… is to experience being liberated from weight, sublimated, invested with superhuman abilities,… and to approach the realm of light and overview… Digging below the surface, on the other hand, means becoming involved with matter… To dig is to explore foundations

Vision Takes to the Upright

… The horizontal plane… is the one plane on which one can move freely in any direction without the sensation of climbing or descending. Therefore no direction along the ground plane is spatially distinguished… Symmetry is more readily observed in the upright position than in the reclining one

Piercing the Ground

… Since linear shapes have the dynamic property of continuing visually unless they are stopped, vertical buildings tend to look as though they continue into the ground… The illusion of penetration also comes about when a shape looks incomplete, and when this incompleteness generates a sufficiently strong tendency toward completion… [Also, objects display a need to penetrate when they display a ‘center’ closer to the ground than the sky]… Buffers [between object and ground serve to block ‘penetration’, but] only if they are perceived as belonging to the object, and not to the floor

Horizontality

… Buildings whose main extension is along the horizontal [also connect strongly to the ground]… (through parallelism)… These fit easily into the landscape,… but seem to float on the surface… (parallels do not interlock). Contact is all the more tenuous because the horizontal extension of such buildings undercuts the vertical dimension of gravitational pull… Regarding ‘perfect symmetry’, to the sense of sight, a vertical extension counts more than a horizontal one, so that an upright square must have slightly more width than height for the 4 sides to look equal

Weight and Height

… An object moved to a different height changes in visual weight… [The height of
an object determines its compositional place and function... Visually, objects are more or less powerful in attracting objects in the environment, and also... in issuing directional vectors. The result is a very complex hierarchy of 'weights'... [In structural forms (architecture, sculpture, etc.),] with increasing height, the load decreases... Thus top objects look lighter than those at the bottom... [An opposite effect regards] an object's potential energy. Height is reflected perceptually by an increase in visual weight. In paintings,... and to some extent in sculpture,... the higher a compositional element is, the more its visual weight counts...

Dynamics of the Column
Short columns are relatively passive recipients of pressures... Such columns seem squeezed... Longer columns have enough visual weight to establish a center of their own. From that center, vectors issue in both directions, pushing visually against incoming forces... [Column thickness is respectively what affects all this.] Thus the length of a row of columns strongly controls the effect... The dynamic effect also depends... on shape... The neutrality of pilotis, for example, makes them depend strongly on the forces acting upon them from above and below. At the same time, the dynamic encounter with ceiling and floor is weakened by the impression that these straight-shaped elements pierce the surfaces they meet... Columns broadest at the bottom... favor an upward thrust,... while, when the shaft is broadest at the top,... the dynamics are likely to read downward...

The Plan and the Section
... A paradox derives from a fundamental difference between the world of action and the world of vision. The principal dimension of action is the horizontal surface,... [and its nature is revealed by] the plan. The principal terrain of vision, however, is the vertical... When we walk through space,... the plan is distorted by perspective and broken up by partitions, and the simultaneity of the overall pattern is replaced by a sequence of vistas...

The Second and Third Dimensions
... Reduction to flat plans and sections is more than a mere technical convenience... In these drawings, all sizes and relations can be rendered correctly... In comparison, 3-dimensional conception is too intricate... The usefulness of horizontal plans... depends... on how much happens in the vertical dimension... The complete exclusion of the vertical dimension tends to falsify relations between levels... Certain profiles only show up in vertical sections... At times, axonometric projections (isometric perspective) are required,... combining minimal distortion with the best overview... Nevertheless, a ground plan... has a completeness that no upright section can boast,... since it covers the total range of the space in which man moves... It also shows closeness to... neighbors,... a building's particular place in the environment... In a floor plan, the absent 3rd dimension is not experienced as a missing component of what is shown... An elevation can never have that same completeness. Also, the plan can be looked at from any direction, while the elevation has limiting distinctions (up and down and sideways)...

SOLIDS AND HOLLOWs
Buildings in a Context
It is tempting to deal with buildings as isolated objects... (the human mind finds it easier to handle one thing at a time)... However, a building certainly stands in an environment, and for better or worse these 2 depend on each other... It is not easy to decide how much of the context we must consider... Clearly, there are no fixed bounds in either space or time for any object, [but a context must be described,... considering the relations between 'figure' and 'ground'... (where one visual object lies in front ['figure'] and the other behind ['ground']). The figure has an articulate shape... The ground is induced behind, lacking boundaries... This conception [remain valid when considering],... objects as generators of fields of forces that spread through the surrounding space...
The Interplay of Spaces
It is necessary, however, [to also] consider the very frequent instances in which adjacent areas... assume the role of 'figure'... When adjoining areas are equally qualified to act as figure, a rivalry ensues. They cannot both be figure at the same time. This rivalry is spectacularly evident in the bravura drawings of MC Escher and the works of other 'surrealists'. [Sometimes, although] all areas... can be perceived as figure, some are clearly dominant. Here, the subordinate areas are seen as ground in the total context,... [but also do have] formative powers of their own. They act as 'negative' spaces... As long as the ground is shapeless and endless and therefore devoid of its own structure, the contours are controlled only by the positive figures. But as soon as the negative spaces have any figure power at all, they too influence the contours... Boundaries acquire perceptual stability only when the internal pressure is balanced by a counter-pressure from the outside... 'Contour rivalry' comes about in the 2-dimensional plane when each of 2 adjacent surfaces annex a common contour as its own boundary... The straight-line contour is the exception,... because it happens to be the only possible symmetrical boundary between 2 surfaces...

The Street as Figure
In cities, buildings... are parts of rows,... fitting inseparably into 2-dimensional walls... of 'urban canyons' (streets)... The street 'canyon' is the realm of man's amplified presence and is therefore perceived as figure... With the increased demands of the transportation system, streets have become more important than the arrangement of buildings in determining the layout of town and city... [This has led to a tremendous difference between] the animated life of inner courtyards and the anonymity of street fronts... A change of attitude can rescue the buildings from the subordinate role of 'canyon walls', and allow their own figure character to come to the fore... This happens when... [we turn] sideways and focus on the entrance of a building as a target (the 'indifferent' wall of masonry is revealed as a 'face')... Architecture needs breathing space. If the street is too narrow, buildings... squeeze the interspace unpleasantly. But the street must not be too broad either... If the width of the street extends beyond the 'visual fields' created by the buildings, there will be 'emptiness'... (unless auxiliary shapes, such as flower beds or trees articulate the central strip of the street)... Crossings and Squares
When 2 streets cross at right angles, the area of overlap is spatially ambiguous... Corner buildings are seen as cubic solids... Each of the corner buildings generates a field of forces that advances toward the center of the crossing... A crossing is a configuration of 4 centripetal vectors, formed by the buildings as figure and the center space as ground. This one-sided situation is overcome when the central area acquires some figure character:
1. Relative size is a factor in the determination of 'figure' character. When the area is too small, it has insufficient space to respond to the pressure of the buildings... If it is too large, the dynamic fields of the buildings do not extend far enough toward the center... (note that horizontal distance is relative to the height of the boundary buildings)... 2. The more explicit the contour, the more prominent the square will be... A square has a much greater chance to establish its identity in [a crossing of 4 streets, as opposed to 2 streets]... 3. The more circular a 'square', the more self-contained it is... A circle stresses its identity by the unbreakable coherence of its contour, it also establishes its center with compelling precision... An expanded field of forces... is confirmed by the concavity of the boundary facades... Under any circumstances, it is to the buildings that the boundaries belong...

Inside and Outside
... No spatial problem is more characteristic of the architect's work than the need to see outside and inside in relation... [This problem does not exist for either] the painter, the filmmaker, or the traditional sculptor... (regarding sculpture, it is important to realize that to look through an opening into an interior is different in principle from being inside and surrounded by boundaries)... Concavities are different than an interior (interiors include the idea of 'inhabitation')... The worlds outside and inside are mutually exclusive. One cannot be in both at the same time. And yet they border directly on each other... [They are mutually exclusive yet necessarily coherent] (the erection of a boundary separating inside from outside is the primeval architectural act)... In organic bodies, [the use of space governs the interior]... (every means of maximizing surface is seized upon)... The exterior follows different principles. Symmetry [and visual presentation are emphasized]... (the organism manifests its particular self in the space around it,
exposed to light)... What matters in architecture is that the outer shell of a building and... interior surfaces... inform and gratify the eyes by their appearance... (decorative display). Close packing is most clearly reflected in a building’s plan... From the outside, architecture is never alone. Surrounded,... a work of architecture depends in all its visual dimensions... upon its environment... Dynamically it displaces space, as an object displace water in the bathtub of Archimedes... An interior, on the other hand, is a closed world of its own... Its size tends to be curiously vague and unstable... (what looks huge at first may shrink to more ordinary size after a while)...

Concavity and Convexity
... The architect Steen Eiler Rasmussen wites that the transition from the Gothic to the Renaissance involves a transformation... of the Gothic pillar, expanded on all sides into a cluster of shafts and the cavity enlarged by the addition of niches... Bramante’s plan is indeed a supreme example of negative spaces acquiring figure character by their symmetry and by the multiple layers of boundary shapes. At the same time, pillars... claim a strong positive function... Hollow space has expansive freedom, but at the same time this expansion derives its power from the resistance of the boundary... (as an example of this, note that a cupola tends to expand, but, in so doing, also closes in on the interior space and compresses it from all sides in a gripping pincer movement)... This antagonistic play of force and counterforce approaches neutrality when the boundaries are straight (a cubic room expands... less resolutely than a cylindrical one)... And the coherence of the cubic shell is further strengthened when the corners are defined as mere changes of direction; softening their ‘threat to cut into each other’)...
Perceiving a Solid
… The sense of vision… organizes, completes, and synthesizes the structure found in the particular optical images… (although at times the hidden part of an object does not complete its form in the simplest, most consistent way). In addition, visual experience is not typically limited to one aspect of an object (in the course of moving around in our environment, we see things from different viewpoints)...

Perspective Deformations
For a building to be independent of projective deformation, it must meet 2 perceptual conditions. Its objective shapes and the relations between them must be sufficiently simple; and the system of distortions imposed upon it by optical projections must be sufficiently detachable from the objective shape… Spatial orientation [is a conflict between ego and spatial nature]… A person standing in a rectangular room and facing in the direction indicated by the solid arrow realizes that he is oriented obliquely with regard to the objectively prevailing situation. The discord introduces a tension, which is alleviated if the person changes his position to conform with one of the 2 structural axes of the rectangular room. It is also possible for someone to insist on his own orientation as the central axis of the situation, and to… expect the walls to conform to the occupant’s position...

The Thread of Ariadne
Old European towns, which have grown rather than been planned, are much like natural landscapes. To get lost in them is a delight… One can interpret and enjoy the experience as a sequence of unexpected vistas, stimulating in their variety and not predetermined by a recognizable map of overall order… It makes a difference, however, whether one is roaming through a landscape in quest of pleasant sensations or is trying to find one’s way through it to reach a particular place… For more efficient orientation, one tries to obtain an overall map… What is true for such environments is imperative for the architecture of individual buildings. Architecture is one of the human occupations that… offer organized form to mind and body… [If they have become more complex, it is not true that] buildings no longer present one coherent image...

The Reading of Vistas
… [Architectural understanding] requires mental flexibility, which takes training… (at about 7 to 9 years old, certain relations are understood to vary with changes in the observer’s position, but the comprehensive coordination of viewpoints is not achieved until age 9 or 10).… [Since Baroque times, complexity has been] intended to complicate the viewer’s access to the architectural theme and thereby to the fundamental meaning of the building. This tendency is similar to approaches in the other arts at a comparable stylistic stage. Painters such as Pieter Brueghel or Tintoretto often hide the principal theme of a picture by removing it to the background… Comparable, too, is Shakespeare’s roundabout way of introducing his audience to the core of his plot. In all these instances the path leading the visitor to the heart of the matter is beset with obstacles, and the tension created by the discrepancy between the structure of what is to be understood and the appearance of what is being offered to the senses is an essential quality of the work...

Models and Sizes
… Small-scale models… easily comprehended in the visual field, are much more surveyable than the executed structures… The advantages of using models are evident. To avoid being misled, however, the architect must keep in mind that the final product of his labors is a huge structure to be seen and used by small creatures… Allometry derives from the fact that, geometrically, a large object has more volume in relation to its surface than a small object (surface increases by the 2nd power of the linear dimension,
whereas volume increases by the 3rd)… In the psychological world of perceptual awareness, a similar difference is derived from the disproportion in size between man and surroundings… (in a constricted environment, for example, a relatively small part of a building… fills a large area of the visual field, and may be surveyable only if the eyes and the head rove back and forth in scanning motions)… Correspondences between parts of a building may be evident in a small model, but unobservable in reality… With increasing size, an architectural shell looks flimsier, even though its dimensions have been enlarged proportionately. Walls… look thinner, and fulfill their function… less convincingly, because their specific visual density decreases with size… Large ceilings, quite distant from the supporting walls, look commensurately less firm [than in small models]… Columns or pilotis supporting a bulky architectural volume look thinner than they do in a small model… The walls surrounding a large interior… seem more constrictive [than in a smaller room] because volume grows more rapidly than surface… (this seems paradoxical, since the smaller interior restricts our locomotion so much more severely,… but visual space and motor space are quite different)…

The Range of Images
… Because the building is not only an object to be contemplated but also a part of the human environment,… man must be able to integrate himself and the building in a perceptual continuum… When may we call an object ‘surveyable’? In a purely optical sense, that condition is met when the object in its entirety can be accommodated within the visual field… (a central overlap of about 110°, available for casual observation and for focused attention)… [In real-scale buildings, as opposed to drawings and models,] much of the time the viewer is not far enough to profit from the angle optimal for focused attention (27° from center, or 45° above eye level, which is the case when the viewer’s distance from the building is equal to its height)… Thus the eye roving across the building experiences a sequence rather than a unified image,… a condition that would be fatal for the perception of most paintings, but is not for most buildings. The visual structure of any part of a building tends to be simpler than that of most paintings,… and the formal units, such as windows or columns, are often lined up in rows, which not only makes sequential viewing more acceptable, but almost invites it. A building, moreover, being a 3-dimensional solid, is made… to unfold as one walks around it…

The Parts of the Whole
… It has been good architectural practice through the ages to compose the total image of a building… out of smaller sub-wholes,… The parts of a whole can either be coordinated… or subordinated in a hierarchy… (hierarchic subordination aids the viewer in gauging the size of a large object)… One might say that we see the building, not simply as ‘having’ size, but as ‘acquiring’ it while our eyes climb from the small units to larger and larger ones)… There is an essential difference between the way a viewer interrelates parts in a picture and the way he does so in a building… As one approaches a building,… the sequence of sights… is constrained by the narrowing range of the image,… and since the visitor approaches on the ground level, the entrance of the building is the center toward which the sight converges… (this is acknowledged at Amiens cathedral, where the portals of the west façade are really 3 small gothic buildings of their own, each closed off from the rest of the façade by a protruding gable and each enriched by a world of sculptural figures, more than enough to monopolize the viewer’s attention)… [In providing a range of scales, it is important to allow for] visual continuity. Huge though a building may be as a whole, it can make contact with the visitor by providing a range of sizes, some small enough to be directly relatable to the human body. These human-sized architectural elements serve as connecting links between the organic inhabitant and the inorganic habitation…

The Building made Visible
… As Paul Frankl has pointed out, in buildings designed to give a clear overview, the architectural elements face the viewer frontally… By assuming a frontal position, a building or any of its parts adopts the stance of a good servant paying full attention to his master’s wishes… But eye contact is a 2-way matter; not only is the building receptive to the master’s orders; it also looks at him straight in the face with an almost aggressive initiative. A frontally faced building is always a little like a locomotive frightening us… with its head-on approach… There are ways, however, by which the architect can display the 3-dimensionality of shape and preserve frontality at the same time… Hexagonal or octagonal buildings, such as baptisteries, display their volume for the viewer, and the same is true for buildings at the intersection of 2 streets… A pitched or hipped roof… also continues the shape of the building beyond the frontal plane… Setbacks do something similar for taller buildings… The building can also take notice of the visitor by bending down toward him (the overhanging houses of old towns often make this friendly gesture)…
MOBILITY
The Autonomy of Containers
The bird’s egg is the prototype of an independent dwelling… Rather than being a manifestation of the inhabitant's size and shape, it merely accommodates its own shape and size to those of the inhabitant as far as necessary. Essentially the shape of such a container derives from requirements of its own… Although made for a mobile creature, the shape of the container depends on how little or how much mobility it requires for its own functioning (the egg must lend itself to easy movement within the hen's body, and therefore it is smooth, round, well-enclosed)… [In this way,] the mobile building must be a fully enclosed container… It discourages open form, balconies and bridges… it is a capsule, whose skin is pierced for access only at some risk. Getting in and out, opening the wall to look out or to let air in, must be basically retractable acts… The symbolic message carried by such a shape is that of isolation and detachment… During the Renaissance, sculpture and painting broke loose from their moorings and became adaptable to the requirements of any customer who happened to buy them… Architecture, largely standardized and internationalized even now, may be moving in the same direction… Yet the stable home establishes a richer pattern of being and dwelling pitted against moving, acting, or changing… (coping with counterforces is a prerequisite to maturity, and nature has always been the great provider of antagonists against which man had to maintain himself—with nature largely excluded from the urban precinct, it is all more important that man’s environment should compel him to set the various aspects of his being against one another)…

Dignified Immobility
The building profits from the dignity of things that transcend change… Change of place… affects the permanence of an object. When an object changes context, it changes character… It is disconcerting to see a good house being moved or reconstructed elsewhere. This sensation has 2 different psychological aspects:… 1. By changing context, an object changes character and thereby loses some of its constant identity. 2. By handling the object at will, ones deprives it of some of its ‘autonomy’… Motion [itself is not what] endangers the integrity of the object, but its being reduced to a passive tool… When mobility is perceived as derived from the object’s own initiative, it may increase rather than diminish the object’s power. This is true for kinetic sculpture… Architecture as we know it is the stable counterpart to man’s mobility… Architecture complements the coming and going of people by its own timeless permanence, but also interacts with them in a tangible physical sense. By offering facilities to be entered, walked through, lived in, it acknowledges in its form the human presence… The relationship between the architectural object and its users is one of intense interaction…

Shelter and Burrow
… Architectural task admits of 2 basic solutions, which I shall call the shelter and the burrow. A shelter is a container, which… derives its form from its own function and acknowledges its users’ presence only secondarily… At its theoretical extreme, this is a structure that tolerates entrances and exits only as interruptions of its integrity and as concessions to an imposed function… The opposite kind of building is the burrow,… the result of the inhabitant’s physical penetration… Its 3-dimensionality is formed by a system of linear channels, not by inherently 3-dimensional shapes… The conception of such a ‘burrow’… is as purely dynamic and as devoid of tangible matter as a piece of music written for no instruments in particular. A building of the shelter type, by contrast, is conceived as a timeless form… In practice, any architectural project combines features of both approaches in some ratio…

Motor Behavior
The shelter type of architecture is dominated by visually conceived forms; the burrow type derives from motor behavior… When motor behavior dominates, it tends to favor an uninterrupted flow and to smoothen abrupt changes of direction into gradual curves… Quite in general, however, any deviation form the course is an impediment. Movement tends to straighten the course and eliminate deviations. This is true also for the mental images of spatial connections based on motor experiences. In recalling cuty layouts one tends to overlook bends that complicate the overall direction of a street or route… Two-dimensional layouts tend to be reduced to a linear sequence… The motor approach generates misinformation. This is particularly important if we keep in mind that one rarely acquires the image of a spatial configuration… by looking at a plan or map or just by looking around. Rather, one’s knowledge derives primarily from what one observes in the course of purposeful locomotion…
The Dynamics of the Channel

As we move, our own body or vehicle remains visually immobile. It is only the displacement in the things around us that confirms for the eyes the kinesthetic information of locomotion. When flying through fog or dense clouds, one sees no progress, and the same is true amidst the deadening monotony of corridors in office buildings. A building in which nothing is designed for sequence is a depressing experience. The visitor is able to experience not only a sequence of sights, but the constant gradual transformation created by perspective and lighting in every wall or constellation of elements. By their very nature, buildings must combine passages and dwelling places. A temporary narrowing of a path can act dynamically, by generating the tension of constriction, resolved into new expansion. There is furthermore the stimulating effect of the sudden surprise: the opening up of an unforeseen space. Propelled by a sufficiently directive impulse, through a hallway, the walker may find himself traversing a room. Suddenly without support, he enjoys the freedom tinged with anxiety, guided by the magnetism of a target (arches and niches beckon). Secondary axes may cross a main axis, allowing one to accede to the invitation of lateral spaces. In some cases, a simple strong color on the end wall of a corridor suffices to transform the static passage into a goal-directed track. Counter-movement occurs in almost every experience of locomotion, by a virtue of the fact that, as a person advances, the setting seems to move toward him in the opposite direction. The higher the speed, the more noticeable the countermovement of the environment. In out time we have grown unaware of these visual phenomena. Accordingly, architectural shapes in a path are designed as members of a kind of reception committee. Depending on their appearance, they will either facilitate the journey or restrain it. (A door, for example, is a wall’s reluctant contribution to passage.) A conspicuous example of the teasing Baroque play with the attraction and retardation of movement is the Spanish Steps in Rome.

ORDER AND DISORDER

The meaning of the term order has been distorted by a controversy that identifies order in general with a very particular kind of order—a reduction to simple geometrical shape and the standardization of everything for everybody, the favoring of basic psychological function over expression, and of rationality at the expense of spontaneous invention. However, order must be understood as indispensable for the functioning of any organized system. Order is possible at any level of complexity.

The Constraints of Order

In any situation, as much order will be obtained as circumstances permit. If a situation is a closed system of forces, these forces will arrange themselves so that the tension in the system is at a minimum. At that level of lowest tension all action ceases and the system holds itself in equilibrium unless new forces are introduced form outside to change conditions. Architecture approaches the lowest level of order in the identical housing units of so-called ‘subdivision’, where all homes are interchangeable and the visitor finds himself in the same place wherever he goes. This distressing condition is avoided in most other instances because the tendency toward order is constrained by... the theme of a system...

Three Modifications of Order

1. ... Symmetry is contraindicated by dissimilarity of function. A tree or a flower can afford to be centrally symmetrical when there is no reason for it to respond differently to different directions. In most animals special treatment must be accorded to the principal direction of their mobility, and therefore their symmetry cannot be centric. In the same way, the façade of a building visibly acknowledges the importance of approach, entrance, and exit...

2. Every thing has some independence and completeness of its own, but at the same time is a part of larger contexts. There is much closure in an apple’s symmetry, yet its shape recognizes its dependence upon the system from which it grew. In the same way, a building may... show its subservience to the force of gravity, and... adapt its shape to the intake of air and light. At times, an object’s dependence upon a context manifests itself as interference with its shape. (A tree impeded by its neighbors may be stunted on one side... And when one looks at the windswept pines of the California coast, there, too, one notices incompleteness unless one perceives the wind as a part of the order...

3. Perfection can be considered cold and lifeless. We may find it suitable for décor intended to surround us with undisturbed harmony, but it is hardly appropriate as an image of life in the fuller sense. Imperfection reflects the variety of individual impulses, and documents our freedom from mechanical replication.

How to Make Noise

It is well to remember that the romantic affection for ‘noise’... is not a universal principle. When we cherish the erosions by which the marble of the ancient columns reveal its affinity with the mountains of its origin, we indulge in a sentimentality not shared by the men who carved it... Recently, resentment against the tidiness of simple order has stimulated attempts to include such efforts among the architect’s legitimate devices. Natural irregularity is valued precisely because it shows the forces of physical circumstance at work against the mechanizing efforts of man... But imitating the effect in the absence of the cause would be mischievous trickery...

If a designer, attracted by unruly complexity, were to use it as an inspiration, he could interpret it by a design of his own invention and control, but he could not simply copy or adopt it...
Disorder, Its Causes and Effects

... Disorder is brought about by discord between partial orders... An orderly arrangement is governed by an overall principle; a disorderly one is not. However, the components of a disorderly arrangement must be orderly within themselves (or the lack of controlled relations between them would disrupt nothing)... Levels of Complexity

... Order is found at all levels of complexity. The more complex the structure, the greater the need for order and the more admirable its achievement, because it is harder to obtain... In a complex musical rhythm a pianist may play triplets with his right hand and straight sixteenths with the left. This produces no contradiction... To be sure, it takes an effort to integrate discrepant parallel sequences in a building, but discerning the order in their relation is a rewarding experience... One of the most common sources of orderly complexity is deviation from a norm. When a parallelogram is seen as a leaning rectangle, it is not a shape in its own right, but a deformation of a simpler shape, which serves as the norm. The norm is a genuine aspect of the percept itself, although not tangibly present. Any perceived deviation from a virtually present norm endows the object with a strong dynamic tension, directed either toward the norm or away from it... A strong basic structure can tolerate a certain amount of deviation without being endangered by it... order is endangered when the deviations are strong enough to upset the pattern of the whole...

The Porta Pia

... The portal [of the Porta Pia (Rome)] presents itself as an upright structure... fitted in a wall but quite independent and complete in itself... The portal is a visual indicator of the opening in the wall, embellished with the emblems and associations befitting a city’s principal gateway to and from the papal city. The portal’s design is echoed by the 2 satellite windows to the right and left; they... connect it to the wall through their similarity of shape while at the same time making the doorway loom larger by virtue of their own relative smallness. The portal has the form of an arrow, which probes the resistance of the rooftop without unduly disrupting it (dynamic interplay)... The balancing of contending forces continues within the design of the portal itself. The verticality of the arrow shape is underscored by the pilasters of the frame... The upward movement is opposed by the overhanging pediment and cornices, which burden the relief of the portal with downward-straining loads [(together with the horizontal architrave and rectangular table)... The actual opening is magnified [outwards]... This progression takes place in 3 principal stages. A crescendo begins with the arch of the opening... At the next level, the arch is permitted to run a semicircular course (broken), and at the 3rd level a final increase of intensity transforms the arch into the pointed gable [(whose upward force is countered by the heavy] garland pressing downward)... All in all, we notice in Michelangelo’s design a characteristic difference between a summation of simple shapes, each complete in itself, and the mutual impingement of shapes that complete one another within a larger whole...

Interaction of Shapes

... Each of the 2 rectangles [in the composition of a black and white rectangle] is symmetrical within itself. However, the difference in their proportions as well as their oblique relation to each other, creates a complex dynamics. Lying off center, the black shape squeezes the space on the left and pulls wide the space on the right... The oblique arrangement introduces an emphasis on diagonals, and consequently several oblique but not quite parallel lines try to get along with each other... Or look at the spandrels of the arcade of Brunelleschi’s Foundling Hospital in Florence. They are decorated with della Robbia’s well-known medallions, which are circular- the simplest, least disturbable shape. And yet, squeezed in a narrow space, they are pressed by their neighbors (the horizontal cornice above, and the expansive arches on both sides below). If these neighbors had their way, the discs of the medallions would be deformed into a somewhat triangular shape. The medallions, in turn, exert counter pressure, pushing upward against the cornice and threatening to dent the perfection of the arches. Although these various pressures produce no physical effect, they have a strong influence on the perceptual dynamics...
Balancing Elements

... The procedure of arriving at a design by the fitting together of building blocks seems to have few precedents in the history of architecture... But there certainly can be no objection to such a procedure, and in fact it may be particularly congenial to a modern way of approaching aesthetic and social organization... Traditionally the overall pattern of plan and elevation, once decided upon, governs the formation of components... But each element can derive from its character certain capacities and requirements... On the basis of these characteristics of the units, the whole can arrange itself... What we see at work in a successful piece of architecture of this kind... is the search for a sensible whole achieved by balancing individual relations... The particular quality of the visual patterns deriving from this procedure may be illustrated by the simple example of the 5 heaps of stones in the famous gravel garden of Ryoanji in Kyoto, a Zen temple of the 15th century. Viewed from the temple's wooden platform, the small heaps of stones seem to be distributed over the rectangular surface in a perfectly balanced order... But the constellation of the 5 units is not definable; they form neither a circle nor a pentagon, etc. Their locations avoid any hierarchical patterning... It is as though 5 magnets of unequal power, attracting and repelling one another, were floating on water... Organization 'from below' makes loose ties between parts that are relatively complete in themselves... In 20th century art, there occurs a thinning and multiplying of units... a puncturing of volumes and planes... The connection of parts by mobile joints, and the creation of constellations... And architects have begun to favor screens and free-standing panels, cantilevered canopies, open galleries, and multiple interruptions of walls...

SYMBOLS THROUGH DYNAMICS

... In a well-designed building, there is a structural correspondence between visual properties and functional characteristics. Similar function should be reflected in similar shape; different functions in different shapes. Visual accents should occur in places of importance... Architectural symbolism begins to come into play when a building's design uses shapes that carry a conventional meaning... (such as the 36 columns of the Lincoln Memorial in Washington, that refer to the number of states constituting the country at the time of the president's death)... Intentional and consciously applied symbolism tends to be superficial... When Etienne-Louis Boulée proposes fashioning the outer walls of a law court as the tablets of constitutional law, he is not going beyond superficial labeling; but when he suggests placing the prison entrance underneath that same building, he is relying on symbolism that is plausible to the mind: "By presenting that august edifice as elevated above the dark cave of crime, it seemed to me that I could not only emphasize the nobility of the architecture, by the resulting contrast, but also offer metaphorically an imposing picture of vices crushed under the load of justice"... [As such it is an] 'open symbol',... where the perceivable analogy between the visual character and behavior of an object and a corresponding mental behavior relies on very generic attributes, such as the height or depth, openness or enclosure, outgoingness or withdrawal (as opposed to the conventional symbol, the generic nature of the signifier is applied to a specific thing signified, in which the symbol is thereby officially withheld from the many other meanings it could convey)...  

Inherent Expression

Spontaneous symbolism derives from the expression inherent in perceived objects. To be seen as expressive, the shape of an object must be seen as dynamic... On the contrary, the use of identifiable subject matter as a component of architectural shape may interfere with a building's spontaneous symbolism because of the concessions its dynamics must make to the shape of that subject matter... (Eero Saarinen's TWA Terminal might soar more purely if it looked less like a bird)...  

Dynamic Proportions

Dynamic expression is not the exclusive property of form in the fine and applied arts, such as architecture. It is the primary quality of any perception. This makes it all the more surprising that it has attracted so little explicit attention... Proportions, which artists and architects judge so sensitively, would not provide us with any standard if they were only measurable quantities and not carriers of forces... The golden section is widely considered to be the optimal ratio between 2 lengths... because a ratio approaching the centric symmetry of a square does not bestow the ascendancy on any one direction and therefore looks like a static mass; whereas too great a difference in the 2 dimensions undermines the equilibrium... A ratio approaching the golden section lets the shape stay in place while giving it a lively inherent tension... The same consideration applies to perceptual weight... [In design, at times] what hurts is the inappropriate relation between perceptual cause and perceptual effect... [For example, when a] slender shaft springs from a base but is unable to counteract by pressing downward as a load, the disproportion between the 2 produces the effect of a mountain giving birth to a mouse ([subdividing the base into many slender elements might be one solution])... What the same consideration would apply to is that the scale of the elements is such that the parts are not balanced in the whole... In the ruins of classical buildings, isolated columns, without their entablature, look awkward. Their upward-directed power shoots unchecked into empty space...

The Openness of Buildings

... Openness, looseness, transparency, are well known as characteristic features of much modern architecture... The technology of forged steel and the influence of engineering on architectural style has led to products of diaphanous delicacy, enlightening to the eyes but almost elusive to the touch... Openness explicitly overcomes the dichotomy between outside and inside... The opening of boundaries reveals the architectural volume as 3-dimensional by leading the eyes... into the interior space...

Expansion from a Base
The boundlessness of the ground level prevents us from perceiving the earth as a 3-dimensional mass. The ground appears as a flat, 2-dimensional plane. Thus, it has no visible bulk and therefore is not a suitable generator of perceptual forces. Even a tree is not really seen as sprouting from the ground, but from its own roots… This is even truer for buildings… As Victor Hugo said:… “The substructure of a building was another building to which one descended, instead of climbing, and which arranged its subterranean floor levels under the pile of the external floors of the edifice, as forests and mountains reverse themselves in the reflecting water of a lake”… This means that a building must provide in its own bulk the base from which the perceptual forces issue… [In the way that] the simple shape of a pyramid is a heavy, compact mass resting on the ground, but at the same time it is the wedge-shaped manifestation of an upward force,… the rising of the pyramid is counteracted by a downward pressure, which, starting at the top as a mere point, grows into an ever-larger base as it proceeds toward the ground… The pyramid displaces the air as it pushes upward. At the same time, the surrounding space can be seen as compressing the building…

EXPRESSION AND FUNCTION

… There is no difference of principle between the expression of unadorned straightness in a concrete column and that of the stucco fantasies of a Baroque interior. Each satisfies a sensory need…

Ornament and Beyond

Distinctions between structural necessity and ornament:
The more primitive approach defines the function of buildings simply as the physical requirements of shelter… However, the difference between physical and mental needs is less self-evident than it might appear (all physical requirements of man express themselves as mental needs)… ‘Physical needs= the elements needed to create and uphold the building’s physical structure… (columns, pilasters, beams, and walls [, as opposed to carvings and painting, according to Vitruvius])… Marc-Antoine Laugier, in his ‘Essay on Architecture’, resorted to the notion of the primitive hut… to establish a principle permitting him to distinguish essentials from non-essentials… (only columns, entablature, and pediment are essential components;… even walls are counted among the ‘licenses’)… We realize now that formal abstinence is not necessarily corrective, but simply a stylistic alternative… Ananda K. CoomaraSwamy… recalls that in the world’s great cultures ‘ornament’ or ‘decoration’ did not stand for gratuitous prettification but, on the contrary, referred to necessary attributes… This is evident even in the original meaning of these terms… ‘Ornament’ refers originally to necessary equipment, such as the ornaments of a ship or an altar… ‘Decoration’ comes from ‘decorum’, and indicates what is needed for a thing or person to perform its function properly (such as the crown of a king)… ‘Charming’ is originally something that exerts a deep power, and ‘cosmetic’ derives from ‘cosmos’, and therefore designates what is needed for proper order… [Today we] distinguish ‘ornaments’ as elements that enhance the visual efficiency of a building from others that interfere with it… Consider Beethoven’s 5th Symphony, developed from a 4-tone theme… (where all the music beyond those 4 tones could be considered to be ‘ornamental’)… Design typically evolves from a fully developed blueprint. Sometimes ornament appears accidentally but as a necessary part of the process… But it is modified by the imagination and practical skill of contractor and
construction the designer's task and that of the builder clarified the structural skeleton of a composition. In music, when composers began to write out in explicit detail just what they wanted the audience to hear, the innovation was decried as detrimental to the visual clarity of the melodic line. JS Bach, for instance, was severely criticized, on the ground that “he writes down in actual notes the ornaments and embellishments that performers are accustomed to supply instinctively. Any architect unwilling to limit his statement to a few elementary shapes faces the problem of ensuring that his design’s underlying formal theme emerges. Successful patterns are organized in such a way that all details are understood as elaborations [of various scales] (a hierarchic structure that permits the viewer to grasp a complex whole as the gradual unfolding and enrichment of a theme). The particular quality of a particular work resides neither in its basic theme not in the surface texture of its style, but... in the ‘middleground’ of the design, which tells what the artist has accomplished by applying a style to a theme.

Expression from Dynamics
Function and expression:... Function must refer to the totality of the needs the building is to meet. Expression, on the other hand, relies on the dynamics of visual form... (qualities, such as straightness or flexibility, expansion or contraction, openness or closedness). Dynamic qualities are an inherent part of objects and events... (when a building is nearly devoid of windows and other openings, it conveys the particular quality of closedness).

Function Cannot Make Form
... Clearly, expression is not identical with a building’s physical properties: a building may be soundly built yet look flimsy and precarious. Nor is expression identical with what the viewer believes the physical structure of a building to be... (for example, the amphitheater in Epidaurus reveals by its shape the suitability for assembling large groups of people to receive a common message,... but it also presents a symbolic image of concentration, of democratic unity, unanimity, and equality). How are we to understand the transformation of the sight of a material object... into its immaterial dynamics? Perception is not primarily concerned with particular shapes but with ‘kinds of shapes’. What we see, first of all, when we look at an object, is what kind of thing it is... The more specific the functional requirements of an object are,... the narrower the range of choices available to the designer (thus an engine offers less freedom than a flower vase)... Despite constraints, however, there always remains a margin of freedom sufficient to show the personality of the creator of the work... This ‘margin of freedom’... is what concerns the designer. How is one to use this margin? A desire to display the creator’s own personality must certainly not be the prime mover... [One positive goal is the] ‘harmony of all the parts’,... fitted together with such proportion and connection that nothing could be added, diminished, or altered, but for the worse...

What Vessels Express
[Let us look at] a few types of ancient Greek vessels. They were made to hold wine, water, or oil, and sometimes to display flowers... Their great variety of shapes... cannot be explained by their different uses... The common way of dealing with such objects ‘aesthetically’ [ignores their function altogether]... However, there is no point in evaluating the harmony of pleasant relations between forms ‘in themselves’ when these forms are meant to embody function... The particular dynamics of each shape and each relation between shapes is influenced by that function. Perceptual appearance varies according to use. The neck of an amphora may look elegantly slender when it is seen as the channel through which wine is poured, but the same relative size may look humorously stocky when it is seen as belonging to a human neck... [In vessels,] roundness is an important visual quality to express ‘containing’... Containing, [as well as receiving], and dispensing,... contribute subject matter to the visual dynamics of the image... Most vessels offer a clear visual distinction between the belly, as the representative of containing, and the neck, which stands for receiving and pouring. This distinction can be made by a gentle and gradual turn of the curve from convexity to concavity,... or it can be expressed by a sudden edge... To combine different functions in a common design is a special art. It requires that these various functions be kept visually present in spite of their fusion (when Frank Lloyd Wright, in his Guggenheim Museum, combined the horizontality of floor spaces with the gradual transition from one floor to the next, the resulting spiral kept both functions in sight and demonstrated their union in a strikingly intelligent solution)....

Spontaneous Symbolism: Mies and Nervi
... Functions such as receiving, containing, and dispensing are by no means limited to vases,... but are immediately relatable also to fundamental aspects of human social behavior, to qualities like generosity and exploitation, acquisitiveness, stinginess... There is nothing esoteric, nothing arbitrary, about [this type of symbolism]... What could be more obvious than the observation that something upright rights itself, that a bent shape bends, or that a widening shape expands? What is important (although a bit difficult) is to be aware of what they imply... Verbal language accustoms us to thinking of the properties of objects as adjectives... However, as soon as we consider these properties dynamically, we find that they belong to activities rather than things, and are therefore adverbial rather than adjectival. When we call the shape of a teapot “graceful”, we mean, more accurately, that the teapot pours gracefully. Or that it contains pompously, or that, in the act of receiving, it surrenders unreservedly... The relation between form and function is not simply the physical facilitation of function, Rather, it is the translation between an object’s functions and the language of perceptual expression...
Buildings Mold Behavior

Architectural objects... not only reflect the attitudes of the people by and for whom they were made, they also actively shape human behavior... The physical layout of a situation has been considered important through the ages for all ceremonial occasions. It not only influences the behavior of the participants, it also defines their social status. The questions of how many parties there are, how they are grouped, the distance between them, who is at the head and who below, are symbolized by spatial relations involving shape, distance, height, etc... The channeling of traffic is only the most tangible aspect of the building's impact on its users. Buildings have a large share in determining to what extent every one of us is an individual or a member of a group, and to what extent we act out of freely made decisions or in obedience to spatial boundaries. All these conditions amount to configurations of forces...

How Ideas Gain Shape

... [A designer does not necessarily] start with a relatively simple core concept and proceeds gradually to more and more detail... More often than not, the creative process moves fairly erratically back and forth between conceptions of the whole and of the parts... The central theme also serves as the bridge between the program for a building and its design... For example, the program for a library may speak of the number of books and readers to be accommodated, the variety of materials to be provided, the services to be offered, the requirements for access, ready connection, and separation... None of these functions is directly visual, and not all of them can be, or need be, met by the architecture. A building cannot teach French or manufacture high-quality typewriters. It can serve the user's purposes only... in spatial sizes, shapes, and relations. But how is the translation into spatial properties to be accomplished?... The 'program' of a building is itself bound to assume the form of a visual pattern... (initially as a chart or diagram). It is at that stage of the thought process that programming can develop into... building design. If, for example, the function to be performed requires that a number of branch activities all have equal access to a central control office, the mind automatically conceives of a circular arrangement around a center...

All Thoughts Take to Building

When the human mind organizes a body of thought, it does so almost inevitably in terms of spatial imagery... Kant, toward the end of his 'Critique of Pure Reason', writes a chapter on what he calls the architectonics of pure reason... All good thinking can be said to aspire toward the condition of architecture... In a drawing,... Sigmund Freud once undertook to describe the complex interrelation between the unconscious, preconscious, and conscious, and id, ego, and superego. In this relationship, the principal dimension is... the dimension of depth. Hence an elevation is more appropriate than a horizontal plan... [In Freud's drawing,] the size ratios are mere approximations, and the circular shapes serve simply to convey the notion of containing, just as the dotted straight line merely indicates a general distinction... (no precise boundaries are intended)... [But it manages to depict] general spatial relationships, such as contiguity, sequence, connection, separation, overlap. This conception,... if it were to be executed as a building,... could continue from here without a break... Although Freud's drawing consists inevitably of shapes, it is actually the translation of a system of forces... (forces are visible only through their embodiment, just as the wind needs clouds or water or trees to show up)... The drawing is metaphorical... (because no such architecture exists in the human brain, but it is also factual (it directly illustrates true relations)...