A DEVELOPMENT OF A SPATIAL PROTOTYPE
RELATED TO BUILDING A HIGH DENSITY URBAN FORM

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ABSTRACT

It has been observed that the form of most American cities is the result of the use of a single inappropriate prototype applied uniformly over the urban area to create many of the problems which currently beset our cities. This thesis develops another prototype which may be used to develop other organizations than the one now employed. Typical urban conditions are analyzed in terms of the projected prototype to demonstrate how it may be applied within the existing organizations to produce local changes. Building methods are discussed to investigate how one may actually build the projected prototype.
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CAPSULES
The form of existing American cities is partly due to the use of a single prototype, applied to produce a hierarchic organization which increases as the city gets denser. The only way to increase the density is to extend the hierarchic sequence which has a disastrous effect on urban space. Towers, adding more people to the same area of ground by new vertical corridors—elevators—cause congestion, noise, and dirt on the existing streets. The solution is to add more circulation space to accommodate more people; a new scale is added but the quality remains the same or is decreased because the hierarchic sequence remains the same. It is essential to the future of the cities that the existing hierarchy be broken and new methods of organization be employed. The following is a projection of a new organization, an explanation of the principles behind it, how it may be applied to
THE ORTHOGONAL GRID STRETCHES ACROSS THE CONTINENT FROM EAST COAST TO WEST COAST.

UPPER EAST SIDE
MANHATTAN

VANCOUVER, B.C.

SAN FRANCISCO

LOWER NEW YORK NOW AND THEN (1763)
existing situations, and how it may be built.

In the current tradition of urban design, space is categorized into two elements—the use cell and the movement corridor. These two categories form the absolute minimal way space can be organized—the cell is the minimum form of a place to be, and the corridor is the minimum form through which one may move. Once this separation into categories is made each is considered as isolated from the other. The cell is thought to be a complete unit capable of existing only by itself, with a minimum contact on the corridor. It is designed to operate very efficiently as a unit for a specific use. Since it is considered to be independent of everything external, its edge is minimized to completely enclose the use space as efficiently as possible. The movement area is considered to be a separate element whose only function
is to service the cell. It is thought to be a non-use; therefore the edges are minimized and the corridor is made as straight as possible to facilitate the flow of movement. The contact of the cell on the corridor is only large enough to allow efficient servicing and to pack as many along the corridor as possible.

In general the key concepts to the negative qualities of the cell/corridor prototype are¹:

1. use-circulation duality
2. optimization of the independent parameters
3. isolation of the use cells
4. a one to one association of a specific use with a specific cell.

.independence of corridor lines
.completeness of built definition
cauing - cellularity
- packing
- uniformity

The cell corridor prototype
and the desire to pack unrelated cells
along a corridor result in the common
form or organization we see in the
cities today. The cells are gene-

rally organized perpenndicular to
the movement space--either vertically
or horizontally. An importan physi-
cal feature of this perpendicular
organization is that major built
definitions run perpendicular to
the major reference direction. The
row house is a well known example
of this type of organization. The
row house is quite separate from
the street, lacks privacy, often
must have special service roads
behind it, and has practically use-
less backyards with little privacy.²

2. Ibid., p. 22.
Generally the characteristics of the perpendicular organization are:

- distinct separation between use cell and corridor eliminating the possibility of double use.
- limited growth possibilities — due to packing situation one can only add more of the same.
- privacy is difficult and expensive — privacy by built definition is often more economical in the city than privacy through distance.

To avoid these characteristics, one might build partial or open definitions not completely filling the space and allowing the movement area to be used along with the use cells, which in turn could be used for moving through. The major definitions will be built to run in the same direction, parallel as the major reference direction defined by the movement. New spatial prototypes might be developed through this parallel organization.
DIRECTION:

A key concept to understanding physical form, which must exist in a context and respond to forces and influences around it, is direction. It is a quality which may be ascribed to any physical form and it is intimately associated with change and growth. If one looks at a contour map of a ground surface which changes elevation, two directions are apparent—one along the contours and one perpendicular to the contours, the fall line. The contour line is a line of constant elevation. Every point on the contour line is the same vertical distance from any point on another contour line. In order to change elevation slowly and easily one moves closely parallel to the contour lines. The fall line represents the path of maximum elevation change. It is perpendicular to the contour lines and every point on the fall line is at a different elevation. A stream tends to follow the fall line, the
path of least resistance.

Clearly movement paths changing elevation will tend to move in close association to the contour lines if the slope is too steep to negotiate safely. A road zig-zags up a mountain traversing the slope with hairpin turns to stay in close proximity to the contours. The local direction of travel is roughly parallel to the contours, but the major direction is along the fall line up the slope. Some roads may spiral up around a small isolated hill or peak for the same reasons.

Direction is the only attribute of a line. It describes how the line runs relative to something else, or a movement relative to the line. A movement parallel to the line is one which does not change relative to the line, and the opposite is a movement in a direction perpendicular to the line which has
CLOSE ASOCIATION OF PARALLEL DIRECTIONS AND HILLS IN BERKELEY, CALIF.
the maximum change relative to the line. In coastal towns major roads frequently run parallel to the coast, the major influence in the region, and do not change their relationship to it having a constant association. Any change in direction is usually due to a change in the direction of the coast. The roads perpendicular to the coast are constantly changing relative to the major influence in the region, and get inland to a new condition as quickly as possible, rapidly changing association to the coast.

Generally one may say that a direction parallel to a given directional reference is closely associated with it because it does not change its relationship to the reference abruptly. Physically the lack of change aids orientation if one is changing other spatial references. A direction perpendicular to a given
directional reference is constantly changing and has little association with the reference. An abrupt change at the point of intersection is often very disorienting and tends to have an isolating effect separating the two directional organizations. A person making a 90° direction change while moving has to completely stop all motion, turn in the new direction and resume moving. The two directions of motion are separated by a completely different action, turning. In order to avoid the separation one may turn while moving and make a gradual change, which has a characteristics of both.

The perpendicular organization previously described is characterized by the abrupt direction change, ensuing qualities of isolation, and separation of cell from corridor. Applying the directional principles just stated, one can align the major built definitions in the same direction as the street, the directional reference,
and to a great extent eliminate the directional change causing isolation. By bending the street or movement flow from side to side, and up and down, one could enter the use area with no change from the movement direction. Obviously if the street turns the directional reference changes and so would the built definition to remain parallel. The places where the different directions of built definition come together would produce a great many different spatial definitions increasing the variety of the built form in the total field of organization, the city. Of course, it is possible to make isolated cellular definitions in a parallel organization just as uniformly as in a perpendicular field, but the disorienting effect of an abrupt direction change is eliminated as one changes from one kind of space to another (as public to private). Other characteristics of the parallel organization include privacy in
SKIPPING WALLS HELPS BREAK UP PERPENDICULAR ORGANIZATION

MOVEMENT OCCURS PARALLEL TO THE LOCAL DIRECTIONAL DEFINITION

A FIELD OF COLUMNS MAY BE NON-DIRECTIONAL AND MOVEMENT IN ANY DIRECTION IS EASILY POSSIBLE.

NOT PERPENDICULAR TO THE DEFINITION
a dense region and a more economical use of space since the use space and corridor are capable of expanding into each other as needs change.

VIEW ALONG A PARALLEL ORGANIZATIONAL FIELD

FROM: ALBRECHT A. SANFORD III
MIT. B. ARCH. THESIS 1969
P. 18

SHOWS INTERESTING SPATIAL CONDITIONS RESULTING FROM MEETING OF TWO ORGANIZATIONAL PROTOTYPES.
A PARALLEL, THICK-EDGE ORGANIZATION FROM SOUTH AMERICA: TERRA DEL FUEGO

A PROJECTED PARALLEL PEDESTRIAN/COMMERCIAL STREET ORGANIZATION/LANDSCAPE;
KENDALL SQUARE, CAMBRIDGE, MASS.
A FIELD OF PERMANENT PARTIAL DEFINITIONS,
BUILDING UP A THICK EDGE OF INTERACTION
BETWEEN PUBLIC/PRIVATE; USE/CIRCULATION;
OUTSIDE/INSIDE...
PROJECT: ISLAND HOUSE
- MAJOR DEFINITIONS
- PARALLEL TO MOVEMENT AND ORGANIZATION
- PARALLEL ENTRANCE

PARALLEL WALKS: INDIA
A PARALLEL FIELD IN B.C. CANADA
CONCAVITY:

Related to the application of some of the ideas projected for building an urban form is the notion of concavity. A concave definition is one that partially encloses space, either in plan, section, or both. The quality of closure is usually associated with interior use spaces, and not with exterior spaces. In the city today the exterior spaces are usually defined by convex edges as Tech Square is. This is a result of considering buildings as isolated cells unrelated to each other or to the exterior. In order to make useful exterior spaces it is necessary to build concave definitions on the exterior edges of building exterior spaces with interior qualities. The concave definition makes a space which cannot be used for moving through and lends itself to other
activities which could make up an urban life. This notion of concavity can be extended to making definitions on any scale as valleys in mountains or low density urban areas, partially enclosed by a ridge of high density building. Of course any large high density region will be composed of smaller definitions much as a mountain has rocks and trees on it. A local concavity associated with a movement flow makes a region of space next to the flow but not in it which might be used as an entrance, as a site for a house, as a place for a sidewalk cafe, etc. These activities and places are generally lacking in our urban environment today. Following is a series of typical urban conditions and different ways of dealing with them.

FORMATION OF CONCAVITY FROM A CONVEX EDGE TO A TOTAL ENCLOSURE

THE ISOLATION OF COLD AIR POCKETS
EDGES

An edge is a place where one thing stops and another begins. The following discussion will specifically deal with street edges, but the principles are the same for dealing with almost any built edge. A straight "hard" impermeable edge is a great discontinuity and separator because it minimizes the use potential at the very place where the potential is greatest - the place where two regions meet. If the edge is allowed to move around making concavities in each side, new places begin to occur with characteristics of both sides. Also the actual line of contact which is often considered valuable is increased. Natural edges always seem to be the latter type (straight lines never occur in nature), and our built edges in the city usually seem to be of the former type.

Street space in the city is normally composed of three regions - the
EDGE DEFINITIONS
SOME MORE INHABITABLE THAN OTHERS.
road for vehicular traffic, the
sidewalk for pedestrian traffic,
and a habitable edge of building.
Probably 90% of the cities in this
country are composed of only such
a sequence: street-sidewalk-building.
If one believes that the pedestrian
might be protected from the traffic
by the definition of the edge, that
the edges could give enclosure, that
it might be desirable to vary the edge
to break the stultifying uniformity;
one might consider the following:
raising the sidewalk above the road,
breaking the horizontal sequence by
introducing elements between the
road and the sidewalk, overhanging the
sidewalk through a colonnade, walking
over or under the road, the road may
be part of the building it must service,
and on and on. The most important
points are that the street edge can
and should be varied and that the
pedestrian could be protected and
enclosed in several ways making
walking in the city a richer ex-
perience. Protection from the
traffic offers quiet, fresh air, less noise and dirt; and one might also be protected from the elements - rain, sun, heat, and cold. Clearly the notion of edge definition is an amenable one.
ENTRANCES

An entrance is a region where one may move from one space to another, one use or another, or one kind of definition to another. A hole in a plane or a surface is the most minimal kind of entrance; there is no shared space common to both to constitute the entrance region hence the two spaces are isolated even though it is possible to move from one to another. To minimize the separation, a transition zone which has elements common to both spaces must be built, particularly if the two spaces are organized in different directions. Since the act of entering is a movement, it may generally be effected in three ways: a change of motion, a direction change, and a level change. Any entrance which stops motion, changes direction, and changes level all at once will tend to separate the two spaces, particularly if the entrance
is differentiated from both. A typical row house entrance in the Back Bay or Southend does this. The entrance of a typical detached house, as in Cambridge, is less isolating than that of the row house: the direction change occurs slightly before the level change and the porch is an actual space associated minimally with both outside and inside. However the whole entering motion is straight through and is perpendicular to the street. A better entrance region might be made if the steps were not opposite the door; then part of the motion is parallel to the street.

Unless the major system of definition implies a space at an entrance, one needs another system of definition to create an entrance zone, and there will be little or no reinforcement between the building methods. Not only is this inefficient and expensive because all the place
definition comes from the secondary system, but it further separates both major spaces by introducing something different between them, causing a one to one hierarchical relationship, and reinforcing the notion of the structure only as structure and not as space definer. If the major definition does respond to the entrance and makes a partial definition, the secondary system completes the definition and the entrance zone is defined by all the elements used, breaking down the hierarchy and separation. Row houses and detached houses could be built with entrances parallel to the street, making a space not singly associated with either street or house, public or private, outside or inside. The entrance can screen the actual door from the street aiding privacy. An entrance region in the city could also build hierarchically from public to private with a series of partially enclosed open spaces with varying
degrees of association and public use. The hierarchic order could be broken down by allowing a direct access or communication between the extremes.
PLAZAS

A plaza is basically exterior use space, and as such has the following general characteristics: enclosed exterior space, non-circulation space, defined by concave definitions. The simplest form of plaza may be a niche or concavity in the building edge along a street, as might be produced by slipping a row house back. Jogging the street will also create a slight opening which can be a plaza. If the concavity or opening is made by moving the jog in the same direction as the street, a cul-de-sac results which begins to get privacy from the street. Such a plaza could be used for an entrance court for houses or shops. Intersections mark important points in the movement through cities and by breaking the built edge lend themselves to making plazas. The concentration of movement demands widening and is traditionally a coveted
commercial site. A wall may separate a plaza at a corner from the street traffic. A series of plazas may make up an urban environment or part of the urban environment.
L'Enfant's Plan for the Capitol in Washington, D.C., an example of a non-plaza formed entirely by convex definition.

A cul-de-sac used as a harbor for a town. (An entrance)
PROJECT: BOSTON GAS OFFICE BLDG.

ENTRANCES ARE CONCAVITIES ORGANIZED PARALLEL TO THE MOVEMENT DIORCTION.

MOVEMENT DEAD ENDS IN CUL-DE-SAC

THROUGH MOVEMENT SNIPS AROUND THE BUILT DEFINITION

ELEVATOR-LOBBY ENTRANCE SPACES MAY BE USED AS A PLACE ASSOCIATED WITH PUBLIC MOVEMENT AND AS BUILDING ENTRANCE.

THE BUILDING SEPARATES THE SIDEWALK FROM THE ROAD, MAKING A STOPPING PLACE IN THE CIRCULATION AND ENCLOSING A PLAZA.
INTERSECTIONS

Two types of intersections occur most frequently in cities today, the four way intersection of crossing streets and the three way or "T" intersection. Intersections of a greater number of streets do exist but they are generally handled by rotaries which as a variation of a "T" intersection. According to Camillo Sitte crossing streets is much the worst situation. Pointing out that at such intersections there are 54 possible traffic encounters and of these 16 actually cross trajectories, one 4 times, busy crossings tend to slow traffic down; and for pedestrians the situation is even worse because he has to leave the sidewalk at every intersection which is the busiest place. The modern solution is to put traffic lights at every crossing to stop one flow while the other goes. The

3. Camillo Sitte, City Planning According to Artistic Principles; p. 94.
traffic light in effect builds a wall to allow each path to move without any interference from the other. Non-interference implies a spatial separation, and indeed the most efficient crossings are made by bridges which allow both lanes to move with no interference or effect by the other. They are both independent. If one diagrams the effect of the traffic light, the result is the commonly used map-making symbol for bridge. Unfortunately actual built bridge crossings do have a certain amount of interference, being close enough together, spatially, to allow the dirt and noise from each to reinforce the other, with a detrimental effect on the surrounding area. The spatial separation must be great enough so that in the region of one, a person will be totally unaware of the other, and the uses and associations of each are unaffected by
the other. However it is often desirable to let the two movements reinforce certain uses which are associated by having access to the movement; a corner is a prime commercial site because of the increased exposure to two streets. Without interfering with the movement flow, a relation may be made through these associative elements if the two paths share an edge, or define a region in between both. Parallel directions near the crossing point will maximize such a desirable region.

A three way intersection of streets causes total interference of the two because they share a common path for an interval. The shared region allows traffic to change from one path to another without stopping movement, and it creates a combined region bigger than either alone. Such a combined region may be commercially desirable
INTERSECTIONS:

6 WAY INTERSECTIONS OCCUR RARELY
IN NATURAL FORM

FARMING IN LAVENDE, WESTERN FRANCE

NOTICE WHERE THE CROSSING STREETS OCCUR:

STAINED GLASS WINDOW

OYSTER BEDS IN FRANCE

LACK OF CROSSING STREETS
WIDENING AT INTERSECTIONS TO FORM PLAZAS
ENCLOSED EXTERIOR SPACES

EL DUED
much as the corner is in the crossing situation. Formally a "T" intersection is more continuous because one edge remains unbroken, and, according to Sitte, is more desirable from the pedestrians point of view because he does not have to leave the sidewalk as often. Spatially the continuous edge helps enclose the intersection and make a sense of place. It gives dominance to the through street, which remains less effected by the intersection than the street which ends. In building a "T" intersection between two crossing paths, the distance between the actual intersection, the combined region, is critical and must be large enough to allow the moving traffic to sort itself out without causing any tie up.

A rotary is basically a compressed and bent "T" intersection. It combines the movement paths of the different intersecting directions and
allows the cars to sort themselves out with no halting of motion. It must be designed to store a certain number of cars until they find their new movement path, and if the critical dimension, between intersecting paths, is too small; it will not work. A bad feature of a rotary is the loss of space in the center, but if the rotary were large enough, several blocks, the center would be useful space.
VERTICAL MOVEMENT

Any high density urban situation must build up in space and change levels to accommodate more use space, and obviously people must move vertically to use those levels. Vertical organization generally tends to be treated by a corridor-cell prototype with the same problem of cellular isolation as horizontal organizations and the same discontinuity associated with an abrupt 90° direction change. The issues are not as clear however due to the difficulty of moving against gravity which is a directional influence. Generally vertical movement is confined to a vertical corridor, a stacked stair shaft, or an elevator shaft, each existing independently in the building, or built field. The elevator is generally a totally enclosed box in which one has no orientation to any directional reference (except gravity) on the ground level or any other built
level. The elevator has the same relationship to each floor and helps separate the levels from each other, only relating them back to the ground reference. The stacked stairway is similar to the elevator - a vertical corridor reinforcing the isolation of each floor, generally enclosed, and unsuitable for anything but circulation.

If one considers the ground a directional reference plan and wants to use vertical movement as an element relating different levels (as an entrance does), a horizontal movement must be introduced with the vertical movement in order to create a direction associated with the horizontal organizational direction of the ground. A flight of stairs is directional by nature and by not stacking them in an enclosed shaft, a continuous change could be made from a horizontal to a vertical movement. Half levels, balconies, double height spaces may all occur with a diagonal vertical movement.
and help relate the levels.

Even the elevator as traditionally used could be made much better. If the street or a plaza were used as the elevator lobby at the ground, and the elevator were at the edge of the building, instead of buried, with windows looking to both the outside and the inside, the vertical trip might not be as disorienting as it is now. One might consider the elevator to be part of the street and not even enter the building until after one gets off the elevator at a use level.
Today density is increased in the city by extending the built area upward from the ground in order to increase the amount of use area resulting in the familiar towers which make up the skyline. Currently in Boston the economical height is 50-60 stories or approximately 500-700 feet. Due to the organization at the ground level and the prototype established by private ownership of the detached building, these towers all are serviced by the same plane in space - ground level. No matter how high the structure, or how many more people it accommodates as it gets higher and higher, the service facilities remain at the ground limited by the amount of area available when the land was laid out in a street pattern—usually a time of much lower density. The results are confusion, congestion, dirt, noise, and untenable traffic conditions on the ground; and the incredible isolation of cells 600 feet in the air which essentially have
no reference other than the elevator shaft. People live and work in such an isolated environment. There is indeed a difference in how one can live at different distances from the ground - living in a row house 3 to 5 stories from the street, walking distance is much different than being several hundred feet away from the ground, so high one cannot even see the street out of the window.

The idea is projected that it would be valuable to build additional reference planes above the ground, but with many of the same qualities presently existing only on the ground. Certainly horizontal movement, pedestrian, vehicular, mass transit; telephone, and gas; shops, gardens, and houses could conveniently be related to and part of such reference planes. A critical feature is actual uses associated with these reference levels to prevent them from becoming movement channels, and being another
discontinuous element in the built field. This type of reference is essential to break the hierarchical stratification which crowds and pollutes the existing ground. A reference with ground qualities in the air could be used both from underneath and above since it is not solid like the actual ground.

One might be able to take the elevator up 20 stories to another street; stopping at use levels along the way. Then, leaving the 12th story, one could go up to the street or back down to the ground, depending on the ultimate destination.

Many city streets today are already several stories in the air with service tunnels and subways underneath. Park Avenue is about 30' above the actual ground level yet it has a garden down the median strip. Clearly the raised ground reference would be different than the actual ground. One would only expect to find a forest growing
on real ground, but there is no reason why small plants and shrubs cannot be grown in the air. The actual ground might be used for those things which require ground and add further variety to an urban environment.

Potential references such as that just described already exist in the cities. Expressways several hundred feet from the ground have a tremendous load bearing capacity and are often up to a hundred feet wide. Roofs of buildings such as M.I.T. are unused sites for additional structures or uses. High rise towers might be considered as habitable columns for supporting other structures and streets. Parking garages are used very inefficiently and could be jumping off places for streets above the ground. Now they are merely coiled dead end streets.
THE NATURAL LANDSCAPE AND THE BUILT ORDER

The natural landscape is still the dominant "built" order in the world, and as such provides our major reference as to space, scale, range and type of definition, material, texture, light, etc., all of which are normally (and somewhat glibly) ascribed to the man-made landscape. If man is indeed a product of his environment, then it would seem reasonable to describe the qualities of the natural landscape in order to discern what man is trying to accomplish in the environment he creates for himself.

The natural landscape is a continuous, directional, multiple, changeable field of partial reciprocal definitions and qualities. Movement through the natural order is a continuous experience of varying forms and qualities, with near-alikes and opposites juxtaposed and interdependent...

little/bigger/open/cold/windy/
smaller/just right/smooth/
rougher/rocky/large/above/
on top of/wide open/enormous/
out of sight/misty/clear/lower/
underneath/shady/inside/shadowy/
next to/around/outside of/bright/
hot/beneath/cooler...
a real trip...
The natural landscape is a directional field. There is almost invariably a norm, a directional ground, i.e., contour and fall lines, upon which a virtually unlimited number and variety of local changes, directions, definitions, concavities, places, etc., can occur, always in relation to a larger order.

The directional ground is further characterized by thick edges; zones of interaction and reciprocity between major definition types; i.e., coastlines, river courses, mountain ranges and plains, etc. Violent and invariant edge changes are eroded and overgrown until the actual edge is a zone exhibiting qualities of both.

The naturally habitable portions of the landscape, that is parts where the climate will support life, are further characterized by multiple definition types; rocks, trees, grass, sand etc.
which reinforce and subdefine definitions in the piecewise continuous ground. The full range of natural definition is constructed of reciprocal "building types": the more or less permanent definitions, mountains, rivers, oceans, rocks, ridges (generally continuous surface types of definitions) and the growing, changing, seasonal and daily variant forms; trees, grass, leaves, moss, ferns (generally linear and planar assemblages).

Definitions in the natural landscape are partial, directional, continuous, and multiple; they range from very open and implied to relatively contained and complete. Because of their partial quality and extended directional reference, natural definitions are locally non-isolated and non-cellular.

The actual responsive and interpretive quality of the landscape is of course dependent on the changing, ephemeral activities of nature, light, shadow, rain, mist, wind, waves, erosion, upheaval etc.
Perhaps the most associative quality of the landscape is its sense of time and change; time, continuity from the bits and pieces and parts and wholes of old and new, and the clear formal and existential interdependence of it all.

The built order can of course and even sometimes does possess the qualities of the natural order. Indeed, the older, timeless, most personal parts of the built landscape seem so clearly generated in their own formal and material consistency from their immediate natural context that it seems almost superfluous to state that such places are desirable and valuable both in themselves and as prototypes for a larger order. Yet in a time when virtually any feat of form and/or structure is considered readily accessible, the actual form and quality of the built environment is sterile, monotonous, piecewise
discontinuous, and locally invariant. The intellectual and spatial prototypes the geometric ordering of conceptualized and containerized space have virtually exterminated the continuity of the natural landscape in the cities, and reduced any association with nature to an occasional tree and bits of grass. The built landscape as we know it now is merely a collection of geometric habitable rocks, depending on the change of light and shadow, and the rather frantic circulation efforts of its captured populace to give it any of the quality of change and density which occur so effortlessly in the natural landscape.

Yet there are numerous examples of built landscapes so clear in their natural associations of form, methods, and materials that they seem to us now to have an almost religious quality but were understood and accepted as commonplace by those who built and inhabited them.
The need for shelter in a difficult and sometimes hostile environment did not dictate cellular isolation and local domination of the natural order; the inhabitants lived on and with the land, taking their forms, materials and sustenance from it. It is becoming clear in our own time that a technological society which contends that the natural order is at best irrelevant and at worst, hostile and to be conquered, is non-the-less dependent on and part of, that same order, and is exterminating itself simultaneously with it.

A built order whose prototype was the natural order would not be a collection of discontinuous closed objects (buildings) but an open continuous assemblage of partial definitions, themselves of varying degrees of containment, which were in turn reinforced and completed by lighter, changeable systems of definition. There would, of course, be much more than the so called minimum, the same way that the natural landscape has more than "necessary". The partial definitions
would be a directional field in themselves, and the building systems that provided the actual closure and protection and ownership etc. would not dominate and obscure the permanent definitions, but further them and make the field locally habitable.
BUILDING METHODS

Building methods may generally be described by four families of definitions: continuous surface, linear assemblage, planar assemblage, and capsules. Each family has particular characteristics which are responses to material, how it is made, what it will add up to, and also how it goes together. Each family has inherent economies associated with its form and material which further define how it should be used. Any kind of definition may technologically be made with almost any type of material, unit masonry produced rose windows, and stud walls make caves, but generally there is a formal and economic range associated with a particular building method which defines how it should be used. Of course there is a great deal of overlap between building methods which adds richness and range.
to any definition. It will also be clear that many of these families of definitions will not form a complete enclosure by itself and must be combined with other methods to produce a complete definition. Although one particular building method is able to produce a complete closure, often a more economical construction may be made using several systems each performing what it does best. The intent is not to limit any particular building program by a building method, but to expand the range of all buildings by using more than one family of definitions. Each family of definitions will be described, examples given, and a building system of each explained. Sweet's catalogue abounds with building systems of almost every description which are already developed and being used today. What is lacking is a clear understanding of the formal implications of each and the ability to combine methods. For instance, all of the panel systems
already designed are merely infill systems with no attempt made to use them as structural pieces. Infill housing as the name implies is a dry wall panel system, but it is not used with any other system and always makes complete enclosures.
CONTINUOUS SURFACE
CONTAINMENT CONTINUITIES...
KRAC DES CHEVALIERS

LINEAR FRAMEWORK
INSIDE/OUTSIDE CONTINUITIES...
MULTIPLE SPACIAL ORDERS AND DEFINITION TYPES IN A CONTINUOUS FIELD...

ORDERS OF SIZE, SURFACE, LIGHT...

INDIA

STANDARD OIL, NEW JERSEY
A sequence of building methods/families of definitions, from single-sided grounds form to linear/planar/surface assemblages.
CONTINUOUS SURFACE

Continuous surface definitions consist of three basic building methods: ground form, poured concrete, and unit masonry. Other common building methods used to make continuous surface definitions are frame and panel stud walls, wet plastered stud walls and shingle siding. A continuous surface is a "ground like" definition which is only single sided by use and perception. The two sides of a concrete wall may move independently of each other forming concavities and convexities varying the thickness of the wall.

Ground Form:

Ground form definitions are single sided, continuous definitions built in and by the actual ground. Since the surface is formed by the actual ground it is impenetrable. A cave is a natural example of such a definition, and a retaining wall is
HABITABLE SURFACES...
a built example. The defining surface may be inhabitable for a limited depth. Since the defining surface is actual ground, it is possible to do such things as grow plants and trees easily anywhere on the surface, or change the surface by digging out almost indefinitely.

Walls:

Walls are built, continuous surface, single sided definitions. They are continuous through corners and joints forming a containing surface. Since the side of the wall is a surface, the other side may move independently; the wall varying in thickness. Continuous surface wall definitions are generally associated with local containment qualities whether partial or complete, which may or may not reflect a larger directional context. A wall definition will certainly have a local directional characteristic. Wall materials are generally "wet" construction systems like
poured concrete and unit masonry. These systems have great compressive strength and naturally give rise to compressive arced forms like vaults, domes, corbels, and arches.
CONTINUOUS SURFACES...
SINGLE SIDED GROUND...
Walls Made
With Modular
Formwork...

Continuous Surface - Curves
Formwork.

A modern wall system used
in Sennott Memorial Park,
Cambridge, Massachusetts,
Designed by Bruce Silverman

A continuous surface... ...

With concavities
PARTIAL DEFINITIONS IN
CONTINUOUS SPACE....

MULTIPLE USE OF STRUCTURE,
SURFACE, LIGHT & SHADOW TO
CREATE PLACES WITHIN PLACE
AND SPATIAL SEQUENCES....
TWO-SIDED...

LINEAR BUILT-UP SURFACE...

SINGLE-SIDED...
LINEAR / SURFACE
RECIPIROAL DEFINITIONS...
A SENSE OF PLACE WITHOUT
A SENSE OF SOLUTION...
A CONTINUOUS FIELD...
LINEAR ASSEMBLAGES:

An assemblage of linear elements is essentially a directional supporting structure with very open spatial definitions. Any actual closure or use surface must be made by the introduction of another building system which may be structure in its own right, infill hung on the linear framework, or both. The linear assemblage defines a region of space but it does not produce enclosure even though it may build up into very strong local definitions. Actual use surfaces may be made by building up linear pieces, as wood decking or wood siding, but the definitions then made by the total surface as a plane and not the linear pieces. A screen implies a plane but it is only a partial surface, being spatially penetrated. The actual connection details may have a great deal to do with the definitions made by a linear assemblage. An
in-plane connection with the edges in the same plane imply a planar surface. The only spatial definition results from the thickness of the pieces, and this trapped space is contained within the planes established by the common edges of the pieces. A butt joint always implies a major direction because one piece is continuous. The introduction of a third piece to provide continuity through the joint is necessary to make a good butt joint unless one is able to weld which makes a physically continuous joint.

Out-of-plane connections allow each piece to be continuous through the joint, not emphasizing any direction. The actual connection is made through a large shear surface to give great continuity, and depending on the shape of the section, additional pieces are not necessary. Formally a local concavity is produced which may be of a use dimension if the members are large enough. Off setting a column may help decrease the moment as well
as making a useful concavity in the structure. Generally the out-of-plane connection is much more spatial because it potentially affects a larger region of space which is not defined by implied planes.

A screen is an open partial definition built up of linear members. The total assemblage usually defines a plane or a planar region of space. The openings in the screen are often filled with glass or an opaque material to produce varying degrees of enclosure. A screen can be built up into a three dimensional spatial framework which could be habitable if infilled with other systems. A large truss is an example of a screen with habitable dimensions.
SCREEN DEFINITIONS ...

ACTUAL & IMPLIED SURFACES;
DEGREES OF CONTAINMENT;
WALL - SCREEN & SCREEN-WALL ...
SCREEN SURFACE: QUALITY OF LIGHT/DARK, LARGE/SMALL DEPENDS ON DIRECTIONALITY AND RANGE OR SIZE OF INDIVIDUAL PIECE AS WELL AS OVERALL ORGANIZATION... 10,000 LOCAL DECISIONS....
LINEAR ASSEMBLAGES...
HABITABLE SCREENS....
SCREEN-STRUCTURE
PARTIAL DEFINITIONS

Spatial sequence created by different light qualities of interchangeable building materials & methods...
Spatial continuity of inside & outside...

FRANCE

ENGLAND

Morocco
Locally Continuous Surface
& Infilled Linear Screen...
Zones of Enclosure Rather Than a Hard Edge...
A planar piece has a constant thickness which is not of usable depth and has a two sided reference since one always knows where the other side is. A planar piece is a directional piece due to its inherent structural uses. Its thinness relative to its extent means that it has to span short distances, but its nature as a surface leads it to making large surfaces. Consequently it has to be reinforced or supported in a long direction. This one way support gives the piece a directional shape because a square shape is most efficient for a two way structure. A two way structure is best made in a continuous material like concrete. A planar assemblage must be used with another system to make complete definitions. A panel is a planar piece of specific dimension, and panel infill
systems have been widely used. The characteristics of a panel become clear if one considers the methods of joining or adding panels to form definitions. It is clear that planar systems imply continuity of direction through corners as contrasted to walls which imply continuity of surface around corners. A typical planar piece is plywood.

**PANEL JOINTS**

The in-plane joint creates a continuous surface. It is often a difficult joint to make which requires much hand finishing to the built up surface locally continuous.

A lap joint is an out of plane joint which makes a continuous surface with a local discontinuity at the joint. The introduction of a third piece is necessary to make an in-plane lap joint. Lap joints are easier to make as exact fitting of the pieces is not critical.
This lap joint makes use of the stiffening member needed by the panel. The four inch jog begins to be of a use dimension.

This common building method (wood frame) could be used to make panel definitions instead of a continuous surface by exposing the studs. The studs could then be used.

If the studs are spaced farther apart and made larger a real useable depth could result. Panels might be 2" thick.

If the concavity is needed it may be increased and the third piece making the joint will become a built up space in its own right. It could be linear pieces or molded as a continuous piece.

Slipping the planar definitions is a way to get through.
SCREEN - SURFACE
RELATIONSHIPS...

PARTIAL COMPLETION; PLACE DEFINITION IN
LARGER DIRECTIONAL ORDER...
MOROCCO

TANGENTIAL COMPLETION; MOVABLE
PORTION OF CONTINUOUS SURFACE...
MOROCCO

MULTIPLE COMPLETION; LOCALLY THICK
INSIDE/OUTSIDE CONTINUITY...
SPAIN
CAPSULES

Capsules are premade completed partial definitions which may be added to another system to complete closure. It is essential that the capsule not be a complete definition by itself because it would not add and become an isolated cell. An automobile is an example of a completed capsule. Critical to the usefulness of such a premade piece is ease of transportation. Presently this puts a physical limitation on the size of the piece of about 60' x 12', the size of a mobile home, but this limitation is variable as transportation methods change. The advantage of this building method lies in the production of the piece. As a pre-made partial definition, it is particularly adaptable to parts of buildings requiring highly skilled labor. For instance, parts of housing such as bathrooms and kitchens could be made in a factory and shipped to
a site where the rest of the structure is being built, or already built as in the case of a rehab project. Plumbing, fixtures, and much wiring could be installed in the factory on a production line basis (economical), with effective quality control. This technique may be particularly useful for reducing the cost of housing.
a beginning...