SOME FORMAL TOPICS RELATED TO THE ARCHITECTURE OF DEVELOPING SUBURBAN AND LOW DENSITY URBAN AREAS

by

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ABSTRACT

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The idea is projected that current American cities have been and are primarily designed or formed by the application of many different people of the current prototypical design for housing, highways or whatever. And that much of what is wrong with contemporary cities stems from either inappropriate prototypes or their misapplication.

Part II suggests a number of techniques for developing the current cities into more useful forms concentrating almost entirely on local changes. Particularly the issues of circulation intersections, open non-circulatory spaces, and the direction of building relative to circulation are presented.

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There is a use for cities which allow free people to live close together sympathetically—cities which would eliminate the need for today's extensive suburban areas with their undesirable social and pollution qualities.

The extension of a suburban way of life dependent on mobiles and electronic communication is intolerable to a free population. One way to alleviate the present situation is to develop the current city and city-like suburbs into an interesting place to live where a variegated group of people could follow a wide range of pursuits.

Current American cities are noted for dirt, isolation, lack of privacy, low density, high cost, mechanization—qualities antagonistic to any happy society. Most people with choice choose the more subtle aggravations of the suburbs.

The qualities of the current city most antagonistic to such a population are:

- the refuse—dirt
- noise
- smoke
- the danger from traffic, bandits, government agencies to property or life
- the high cost of space and communication
- the social isolation of the family
- the spatial qualities—iso\-lization
  - lack of privacy
  - lack of outdoor-use spaces
  - difficulty of accommodating unusual uses
  - uniformity, disorientation.

All these characteristics are interdependent. The noise accentuates the danger, which accentuates social isolation, which accentuates the demand for physical isolation, which reduces
--organization into larger cellular blocks
(F. E. Brown, Roman Architecture, Plate 76)
privacy and increases cost, and so on. New building can directly change the spatial qualities of the city and positively affect its other unattractive characteristics.

Look at the city; see how it was designed and how its physical form makes life difficult for its inhabitants. Look at Cambridge—as clear an example as any of a pseudo-urban area depending more on the perseverance of its people than on its buildings for its viability as a place to live.

Cambridge was not directly designed. Rather, certain parts of it were developed according to the prevailing prototype of a residential-commercial area of the time. For the most part, American cities have been designed through the device of the prototype. A prototype is a generalized idealization diagramming a family of designs by fixing certain spatial configurations. Everyone involved in the building process is familiar with the established prototype and knows how to apply his particular talent to its realization. An established prototype is well-defined: its dimensions, materials, construction, financing, and such are determined with precisions. Small changes are constantly made, but the essential spatial decisions affecting a design are entirely made with the choice of the prototype, a choice that often is not thoughtfully made. As well, the prototype, being general, supplies no information for generating any larger specific form or a form sympathetic to the locale, and encourages large uniform areas of stuff to be built. Furthermore, in the mechanistic manner of the past 150 years, the ideal of the prototype is translated directly into a design by the designer assigning to a set of parameters abstracted from the prototype.
Detail of map of Rome
--basic cellular plan

Prototypical building/street organizations--
Corbusier
(Corbusier & Jeanneret, Oeuvre, p.30)
numerical values which determine the specific form. (. . . We will have a core office block, 12 elevators, 33 stories high, mechanical floors at 10-floor intervals . . .)

In considering the design of urban areas, the accepted prototypes and their misuse is of great importance. Most of the faults of current urban forms can be attributed to:

- inappropriate prototypes
- use of a single "optimum" prototype
- derivation of specific design of optimizing parameters of a prototype
- uniform application of prototype without regard for form of larger area.

Current urban designers use a limited set of techniques for rapid development of the countryside into organized pseudo-urban areas. The key to all urban design done in the current tradition is the dualistic categorization of space into two elements: the use cell and the circulation corridor. The use cell and the circulation corridor form the absolute minimal organization of space--one has a cell, the minimal form in which one can be; and the corridor, the minimum form through which one can move to the cell.

Accepting the cell/circulation dichotomy, designers have tried to minimize the amount of circulation corridor by packing regular, uniform, use cells together to make a solid, compact group whose use is uniform and which completely fills the space it affects. A diagram of the prototype close-packed use cells fed by a circulation corridor is:
Project-high density housing
--Only three spatial conditions exist--street-
house-courtyard because of the packing,
cellularity and hierarchic arrangement.

F. L. Wright's Broadacre City
--strict separation of circulation/use space
--cellular division of fields
--use of distance to provide separation/
    median strip for highway
(F. L. Wright, The Living City, p.181)
Dimensions a and c are made as small as possible, while b is made as large as possible to enhance the efficiency of the design. If the prototype is used as a plan for row housing along a street, the dimensions might be set as: \( a = 60-80 \) feet (controlled by visual privacy), \( b = 40-60 \) feet (controlled by light), \( c = 16-25 \) feet (controlled by designer's concern for what is the minimum bearable width. In railroad flats, \( c = 12 \) feet; in old law tenements in New York, \( b = 200 \) feet. The gross efficiency of the plan is \( b/a+b \) and is generally \( \frac{1}{2} \).

Most designs for urban building can be described as made of compact cellular use forms connected by circulation corridors. The more recent and elegant examples are generally made less dense in an effort to alleviate the claustrophobic effects of the prototype, but the results are much the same. The results of lowering the density of building is the amorphous circulation field containing use cells.

Think of: office towers
warehouses
row houses
Kennedy Airport
Lincoln Center
Oakland, California

A hierarchy is inherent in compact cell/corridor organizations. If the cell is to be organized in the same way as the general space, when one enters a cell from a corridor one is within the circulation corridor of the cell. Moving in the other direction of the hierarchy, the compact unit of the corridor with its cells is complete and can be considered a larger cell which must be fed by a larger circulation corridor. In some places a continuous hierarchic chain of corridor-cells can be seen—from city district to dressing closet. It is interesting to compute the efficiency
of such an organization. In general, if the hierarchy of cells and corridors extends indefinitely and has efficiency "x" at each stage, the overall efficiency is 0%. Only when the designer breaks the use cell/circulation corridor dichotomy by substitution of partial/open definitions for cells does he make any non-circulation space.

A further characteristic of the close-packed cellular prototype is the 90-degree change which occurs in the direction of circulation at each change of rank in the hierarchy. The change is caused by the desire to minimize the amount of circulation space relative to cell space.
Washington, D.C.

Houston

New Orleans

Los Angeles
at each particular rank of the hierarchy, considering dichotomy between cell space and circulation space and ignoring the total amount of circulation through the entire hierarchy. The result is a limitation of dimension at each stage of the hierarchy strengthening the separation of the ranks of the hierarchy of the cells, and a disassociation of the direction of built stuff from the directions of the locale.

Towards the end of the 18th century, the circulation channel was idealized into a prototypical element for forming the city. At this time, working in an analytical way, theorists decided that the street was for circulation. Because the minimal form for circulation is a straight line, they argued that streets should have the form of a straight line and street patterns should be compositions of straight lines.

Two simple patterns appealed to them—the rectangular and radial grids. Essential to both patterns and to the concept of straight streets is that streets intersect each other as independent lines having no effect on each other's path, size, or direction. Such forms are found in natural structures only as abstractions of non-material phenomena—light tracks, perspective superposition, etc. The independent-line prototype has been modified down to the present to change nearly every aspect of the grid compositions except that streets remain independent of each other when they intersect. There exist warped, curvilinear, circular, random patterns—but few where streets interfere constructively.

Uses have been associated with the various formal elements of the current prototype. The cells are used as homes, offices,
Detail - chart of Strait of Magellan
--Elements of many directions form directional pattern.
--Circulation spaces are generated by bays and inlets.
(Hydrographic Office #454)
Northern California coast
-- Example of sort of view one gets looking along definitions of the parallel prototype.

West African city
(D. Fraser, Village Planning in the Primitive World, Plate 62)

Project-housing in wide street
-- existing roofs and large concrete forms make another "ground" level
-- street edge definitions
-- bridge
stores and such. Their circulation channels are arranged to make some sort of grid which defines a new order of cell, the block. Large buildings take the form of the block extended vertically; and monumental buildings are designed to fit irregularly within the block, the amount of misfit being a measure of their monumentality. The street space, street intersections--especially enlarged intersections with cut-off corners and traffic islands--and the fringes around irregular perimeters are called open space--plazas, squares. Such are the names, but, spatially, there exist two conditions--corridor and cell. Neither is usable. Both are dead.

A number of concepts--

use-circulation duality
optimization of independent parameters of the prototype
isolation of the use cells and one-one association of the specific use with specific cell
independence of corridor lines
completeness of built definitions--cellularity
packing
uniformity--

are key to the negative qualities of the cell/corridor model. By avoiding them one comes up with other ways to organize a place to live.

Avoiding these characterizations, one can say that built definitions should be partial/broken/open and fit together with other partial definitions to make incomplete compositions in which the circulation areas can be used along with the use spaces which in turn can be used to move through. In such an organization there would be no independent lines of movement, and no particular use would be limited to any one particular space.
Spatial prototypes.

The packing similar use cells along a service system efficiently, currently uses spatial organization such as:

If the physical space of the service system is considered as a benevolent entity which can be used with, and as part of, the use space, then a space may be organized as such:

The overall efficiency of the second scheme is greater because people can use the service space part of the time for non-entity service purposes in housing, the second organization needs less street width for privacy purposes since, generally, openings are directed along the street rather than across it.

The drawing shows the two prototypes and the interesting condition which exists when the two types meet. At the bottom is a condition that is part way between two types.
Detail-map of Venice
--canals generally cross streets rather than run with them
--edges of canals are defined by buildings
--streets lead from edges of islands to center where there is the campo
(Roth Library, map collection)

Corbusier's analysis of existing urban building prototype and suggestion of new one
--highway similar to Wright's
--cellular block similar to Wright's
(Le Corbusier & P. Jeanneret, Oeuvre Complete 1934-1938, p. 70)

Project - housing in wide street
--cellular and parallel prototypes juxtaposed
House types.

There are two main types of single houses used in American cities--the row house and the detached house.

The row house is the most efficient (more square feet of building/foot of roadway length) type of building yet used in America for walk-up buildings. Many were built before the elevator to make dense areas of cities and the type has been standardized. The plan would be 16-25 feet wide between 40-50 foot party walls. A yard would extend beyond for another 50 or 60 feet, where it would meet the back of another yard or a service alley. The yards have no significant privacy from adjoining houses and outdoor living in the city has generally been abandoned. The entrances likewise are very open to the street and are sudden, without privacy. But the serious drawback of the row house from the point of view of high density, city taxes, and the developers profit is that because they are so directional (in the transverse direction to the street) and because the ends have to be predominantly glass to lighten the deep interiors, to achieve privacy in the front rooms the fronts of the houses need to be about 80 feet apart. Even including parking on the street and walks on both sides, the right-of-way needed for circulation is rarely more than 40 feet and at drives/fire hydrants/intersections where parking is not allowable, only 25-feet width is needed. The additional width is taken up by unusable front yards whose existence is demanded by zoning. Above the street level the fronts must remain 80 feet apart even though there are no demands made by traffic. Much space is rendered useless by the form. Generally
one can put an adequate size row house on 2,500 square feet of land and service it with 1,200 square feet of roadway.

The detached house has similar formal characteristics to the row house, the main differences being that it is generally deeper and that it has less privacy than the row house because it has side windows about 10-15 feet from its neighbor which it uses/depends on for light and ventilation. The side yards of the houses are generally useless for outside living and are usually used for services. The advantage of the detached house is that because so much of the land is open and because they are generally irregular in form, additional building can be added to raise the density and to change the overall form. Generally a detached house can be built on about 5,000 square feet of land and serviced by 1,500-2,000 square feet of road (but about 1,000 feet of the 5,000 is side yard which is primarily for service). Detached housing is an attempt to achieve privacy by distance. One must trade off the value of lots of distance from one's neighbor against the cost of low density development on valuably situated land. A balance has generally been struck at about 8-12 houses per net acre, which is an example of the sort of compromise which gives the worst of both worlds: little privacy at a high cost. Distance is most often a bad way to get privacy in a city, built definition a more satisfactory way.

If the direction of the house and lot is turned parallel to the direction of the street, most of the disadvantages of row and detached housing disappear. The party wall of the
house is a niche: with the circulation running across the face of it. The party wall defines an actual space which the other building can make more or less private as required. The house is then built as a membrane between the street and the garden. The views/direction of light/ventilation are primarily along the street rather than across it so that privacy can be achieved even though the street is only wide enough for circulation. A 5,000 square foot lot will support a house with no wasted yard and needs no more street--1,000-1,500 square feet--than a row house. The necessary amount of street per acre is only \( \frac{1}{2} \) that needed for row or detached housing. Much more important is that the orientation of the building makes the street and garden space more usable and desirable than in the other forms.
Project - Country House
--parallel entrance
House entrances/streets.

When the houses run parallel to the circulation ways, a number of advantages accrue. Because there is a long edge, many different types of entrances can be made which might otherwise require separate service channels. On the other hand, if a particular service might not be needed, provision for it need not be built—a choice not available if a special service channel servicing a number of units has been built. Some different types of entrances are: formal front door, kitchen door, trash outlet, parking, entrance to garden, etc.

Because of the direction of the entrances relative to the street, the entrances each have some physical space which is not singly associated with the entrance but both to street and house, so that when the entrance is not being used it can be used for other street or house uses.

Also because of the direction of the entrances one can watch them when approaching from some distance (and from significant places within the house one can watch the street) so that the sudden surprise and consequent lack of privacy, qualities of the cellular entrance, are missing. Likewise the orientation of the entrances makes it easy to screen the actual doors entirely from the main street space so that any degree of visual dissociation can be had. It is an important characteristic that the particular qualities of each door can be chosen independently of the others, so that no individual door is dependent on the total scheme.
Project for housing-industrial complex in rural setting
--Sympathy between direction of road, landscape, and building allows
- many different entrances off single circulation route
- natural definitions along half of building
- lack of corridors.
Building sites.

In a low-density city almost any place is a good building site—building may be done taking advantage of existing definitions while having a beneficial influence on them.

In street spaces is one of the most advantageous places to build: one has the opportunity to control the flow of traffic, eliminate the jam at intersections, provide the pedestrian with a variety of experiences, protect him from the carriageway, get him across the street above or below. There is the opportunity to provide more private and more controllable entrances into houses, to provide a single house which has been subdivided with a number of private entrances, to make direct entrances into gardens and garages.

When the techniques for the work are figured out, there is a large opportunity available to dig out large vaults in under the existing cellars of existing houses—large, easily heated/cooled, accoustically controllable spaces currently not available to the urban dweller.

The areas on the sides of houses offer opportunities to develop secondary circulation paths/apartment entrances/extension of existing apartments. The areas behind houses need additional definition to provide privacy to yards which are generally unsuitable for other use than as neighborhood playgrounds/parks.

The roofs of existing buildings generally can be considered as a fragile ground surface and can generate a level of building. Very little advantage is taken of the sky, treetops, view, quiet, offered by levels far above the general circulation level.
There are a few less appropriate sites:

interiors of existing buildings--because there is such a
great need for more definition outside and remodeling
jobs generally destroy as much old definition as they
make new.

interiors of large gutted buildings--such spaces may make
well-defined exterior plaza-type spaces.

along existing walls as is often done with adjacent build-
ings. Use of existing walls makes sense only if
the wall structure is not duplicated by the new
construction and if the old structure continues to
be used as spatial definition.
Section, housing.

Most contemporary urban housing misuses an opportunity to dig large, cavernous basements which can cheaply provide large, open, sound-proof volumes of space not easily gotten elsewhere. The other structures of the house can be supported above the basement by load-bearing forms sculpted into the dirt. With the dirt removed, raised portions of ground can be made which extend acoustic barriers high into the air and make ground-associated spaces available over a high volume and make possible a house with many autonomous entrances.

When large buildings are envisioned, it is important to develop a large structure which has the ground qualities above the actual ground surface so that the housing section can occur more than once vertically and hence the vertical stratifications inherent in the section can be partially changed.

Opportunities are also missed in sky portions of houses. There can be platforms, walks, lookouts and such.
Japanese Pavilion
--The positive qualities associated with the sky, treetops, areas remote from the ground, are strong enough to be worth exploiting for their own sake.
(J. Conder, Landscape Gardening in Japan, p.114)

Section of housing project
--parking, two layers of housing, made possible by shifting level of ground
Street edges.

The plan of a contemporary residential street is a stratified/hierarchic sequence of linear elements deployed about a line of symmetry, the axis. In order from the center are:

1. moving lane(s) for traffic
2. parking lane
3. curbstone
4. planting strip/trees
5. sidewalk
6. front fence or shrubs
7. front yard/steps
8. porch
9. house

Much of this material (numbers 2, 4, 5, 7, 8) is there not for any use purpose but to fill up the necessary 60-80 feet needed between the house fronts for privacy. In areas where distance is an expensive way to procure privacy, a much richer architectural space can be made to provide privacy by the use of the walls, grounds forms, colonades, arcades, arches, overhangs, corbels, stairs, to define areas of the street space in a non-hierarchic way. The general use of definition in the street space besides privacy is to provide some protection from big, fast-moving vehicles and to make a public extension (threshold) of the private house. Working with existing streets it is important to introduce at intervals a strong definition at the curb-line so that the sidewalk can be as intimately associated with houses as it now is with the carriageway. Transverse definitions may be used so that certain areas will not be devoted entirely to translational movement.
Project - expressway in city
--Overhang takes advantage of space available and further shields city from expressway.

Project - housing in wide street
--overhang along curb
--sidewalk one side only
Intersections.

The typical intersection generated by considering streets as independent linear forms is \(\lambda\)-shaped. It has the faults of:

- creating traffic stoppage
- making spatial discontinuity in each of the intersecting streets
- dividing space into closed blocks
- concentrating traffic stoppages at a few points while encouraging high speeds between the points
- not allowing significant concavities at intersections.

In general, a T-shape intersection does not have these faults.

An \(\lambda\)-shaped intersection can be broken into two T-shaped intersections joined by a link which is then common to both roads. The minimum length of the link is a critical parameter for proper traffic flow and is dependent on the type of traffic. Because two intersecting routes share a common link, less route is needed to service a given area.

If one is working in a gridiron area and wishes to change some of the \(\lambda\) intersections to T, there are a number of ways of doing so. A decision may be made as to the prominent direction. T-shaped qualities may be made by use of one-way signs, new building on corners, overpasses and blocking off of streets. The T-spatial effect of stopping a street can be approximated without stopping the traffic by arching over a street so that the facades along the street are continuous at the upper levels.
Intersection by F. L. Wright --recognizes interaction between two roads but responds by adding a device to sort out the traffic rather than working with the form of the roads themselves --road is independent of what is at edges (Wright, The Living City, p.116)

\[ N = \text{number of terminals which affects overall size of network and in direct service lateral traffic congestion.} \]
\[ \eta = \text{number of regularly scheduled direct routes originating from a point which affects traffic congestion, number of vehicles needed and type of service.} \]
\[ d = \text{distance of shortest practical trip (considering taxi off--landing and load--unload time) which affects fitness of pattern and lowest practical \( \eta \).} \]
\[ p = \text{number of trips scheduled in unit time over a given route which affects traffic congestion, number of vehicles needed and amount of service rendered.} \]

Fig. 82. Traffic pattern: intersecting streets

Fig. 83. Traffic pattern: crossing streets

Street intersection analysis (Camillo Sitte, City Planning According to Artistic Principles, p. 94)
Plazas.

The essential characteristic of a non-circulation space or plaza is that it is defined partly by definitions concave with respect to the circulation routes through it. Many so-called plazas or squares are made entirely of convex definitions and are only enlarged intersections or traffic rotaries. Even though the deployment of the definitions may be highly irregular, the space is uniform and anyone stationary within it at the mercy of the moving traffic.

The most elementary sort of non-circulation space is a niche off a circulation path. Paley Park, Manhattan, is an example. More complicated/sophisticated plazas are formed by complexes of concave definitions such as one might make in a low-density city by shutting off a street at one point and closing off or controlling some of the outlets through the side yards of the buildings.

Major concavities rarely exist on the outside surface of buildings, but where they do exist such as at the crossings of churches they can be further defined to make plazas and to give life to the extension of the building.

Almost all buildings have many concave definitions in their interior and so when the interior of a good building is destroyed, one is presented with the opportunity to rebuild outside the shell rather than within, and to use the open interior as a plaza.
Detail - map of Canton
--Most intersections are "T"-shaped.
--There are many dead ends and niches
Project-expressway in city
--multiple plaza separated from street
--bridges, streets bend to meet each other
--noxious expressway mollified by definition of its edges by buildings.
Aarberg
--plaza formed by houses
(Bresch, Hofer, Flugbild der Schweizer Stadt,
p. 136)
Bridges.

Bridges to be built above existing streets are extensions of the street vertically in the sense that the forces that give the street direction still have some power a short way above the street surface. Regardless of the conditions remote from the street, the circulation level at the higher level will turn towards the direction of the street as they cross. The same is reciprocally true for the street, which can be considered a tunnel.

The junction of two paths via a bridge is an important point which has qualities derivative from two sets of conditions/forms and hence it is appropriate to make extra spaces, both in plan and section, where the rich environment of the bridge occurs.

Bridges that cross streets perpendicularly from abutments at the street edge are cellular, divide the street in two discrete sections, are generally useful only as circulation channels and are structurally weak (especially transversely).
Viaduct of Truyère
-- built relative to turn in river
-- spans more than water width
(E.B. MOCK, The Architecture of Bridges, p. 43)

Repaired Bridge
(E.B. MOCK, The Architecture of Bridges, p. 74)
Extension of ground.

In almost every inch of space in a city there is a need for some definition with ground-like qualities—ability to grow trees and edible plants, hold flowing water, digable, absorbs dust and ash—particularly in housing only if one has a very exposed position near the sky would one be willing to do without ground, and even then roof terraces are used extensively for plantings and such. The desire to keep near the ground has resulted in low-rise/low-density development of horizontally stratified forms.

High density is achieved by covering much of the desirable ground surface and loss of privacy on what land remains because of crowding and the expense and claustrophobic effect of privacy walls. If one multiplies the ground surface and elevates it, one can both break the horizontal stratification and make ground available at various places over high volume. As ground is heavy the forms that hold it need to primarily be of bearing type—walls, corbels, arches—in both longitudinal and transverse section. A good deal of privacy can be associated with such patches of ground, much as now happens with the various floors of high buildings of the "narrow domino" type.

Some details a residential area with such building might have:

- continuous ground-associated circulation to a high level—10th floor or so
- flowing open water systems (analogous to brooks) for washing and recreation
- lots of acoustically very opaque definitions.
Baths of Caracolla - Piranesi
--two levels of ground
(A.H. Mayor, Giovanni Battista Piranesi, p. 180)

Colonial House
--Massive masonry elements are analogous to larger elements of extended ground.
--Chimneys generate rooms, second floor, stairway and utilities (heat).
(J. Frederick Kelly, Early Domestic Architecture of Connecticut, pp. 6 and 15)
Prisons - Piranesi

--many reference levels
--If the space is not filled entirely the vertical sequence of ground, building, roof, can happen a number of times in one section.
(A.H. Mayor, Giovanni Battista Piranesi, p. 14)
Japanese Garden
--Path periodically runs into concave definitions, moves sideways and continues uphill.

Freiburg
(Bresch, Hoffer, Flugbild der Schweizer Stadt, P. 70)

Rural Roads
--generally
-are not straight
-make "T"-shaped intersections.