To my father Wing-kin...
and the memory of my mother.

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I am indebted to Professor Maurice Smith, who has not only inspired my design work and shared generously valuable observations and thoughts, but has extended continued support throughout my stay at M.I.T. I would like to extend my gratitude to Professor Paul Stewart at the University of Michigan, who has taught me perseverance and was an encouraging friend through difficult times. I would also like to thank Professor Imre Halasz and Barry Zevin.

Most of all I am thankful for T, who makes it all meaningful.
EXPLORATIONS IN ADDITIVE, ASSOCIATIVE DESIGN
...an assemblage of collective use forms
for part of the M.I.T. West Campus...

by Vivian Fung

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the requirements for the degree of
Master of Architecture

ABSTRACT

My thesis is an attempt at synthesizing a series of
observations of built and unbuilt environments which
exemplify the elusive physical qualities of harmonic
diversity – unity with variety. This synthesis will be
the basis for a workable language with which a diverse
harmonic order may be constructed.

The projective design involves reorganizing part of the
M.I.T. nearer west campus into a supportive
institutional environment. Each exercise was treated as
a process to construct the vocabulary (generating
ranges of definition, thematic form and variations) and
to delineate the syntactical rules (specifying a
process of assemblage and generating continuity) for
that operative architectural language.
Though structural expression was part of the vocabulary explorations, the scope of this thesis does not include detailed or extensive building technology studies. The first part of this thesis - "WORDS" represents a brief look at associative additive environments and their generative principles respectively. The second part - "WORK", in the form of form-making exercises, is a documentation of my investigative explorations, toward the building of a language of continuity and reciprocity.

Thesis Supervisor:
Maurice Smith

Title:
Professor of Architecture

Juan Gris.
Le Vrai et le Faux.
2 Rene Magritte. The Unexpected Answer. 1933 (overleaf)
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soorelikaar van 't niet en de verschijning
ekleine vervoemelde almanak
die men ondersteboven leest

**N KLOK STAAT STIL**
uitgekauwd sigaretteeindie op 't
**WITTE SERVET**

zag

tig bruin
binding

**VRTCH ATMO TO MIEL**

trillend onvruchtbaar middelpunt

zuur der zwaarte
o electroco

rose en grauw en diep wijnrood
van de kosmos vind ik in m'n thee
An object is not so possessed of its name that one cannot find for it another which suits it better:

There are objects which do without a name:

A word sometimes only serves to designate itself:

An object encounters its image, an object encounters its name. It happens that the image and the name of that object encounter each other:

Sometimes the name of an object takes the place of an image:

A word can take the place of an object in reality:
An image can take the place of a word in a proposition:

An object can imply that there are other objects behind it:

Everything tends to make one think that there is little relation between an object and that which represents it:

The words which serve to designate two different objects do not show what may distinguish those objects from one another:

In a painting the words are of the same substance as the images:
One sees differently the images and the words in a painting:

Any shape whatever may replace the image of an object:

An object never performs the same function as its name or its image:

The visible contours of objects in reality touch each other as if they formed a mosaic:

Vague figures have a meaning as necessary and as perfect as precise ones:
Sometimes, the names written in a painting designate precise things, and the images vague things:

Or the contrary:

Rene Magritte's essay on the use of words.
Saul Steinberg. Cacographer. 1968
The complex generative order of a diverse environment is seldom readily recognizable. But since a harmonic order can initiate a sublime rapport with our intuitive senses, evoking direct responses that preceed cognitive analysis, the effect of such an order on one's experience is immediate. Although we usually experience our environment on a fundamental level whereon the workings of architectural semantics play only a small part, even our most unexamined readings of the environment are by no means univalent. They occur on several different levels, each encompassing a different set of physical information and the continued interaction or the simple passage of time will change our perception by
revealing many new facets of that same environment with which we are supposed to be well acquainted.

A vital, eloquent architectural language will enable a built project to withstand the harshest test of time by providing effective means of communication, adequate and appropriate physical definitions and the potential for poetic expression. To avoid the pitfalls of designing for some nonexistent 'universal modern values' or of being derivative of 'current styles and fads' I have opted for an approach which draws on the power of generic form behaviour.

Physical definitions provide clues which invariably affect our perception and behaviour within the environment. Life becomes difficult when use and architectural meanings are at odds, for example, when private uses are confined to highly accessible zones. Major difficulties arise when the intended use and generative behaviour of the thematic form(s) are so ill-matched that the latter cannot support the former. Problems will also arise when the language itself, though not completely missing the mark, is internally incoherent, leading to confusion and frustration for the learned readers.
The generative attributes of a specific form predicate specific physical, metaphorical and functional parameterers. These parameters determine the relationship between different uses as well as the intrinsic form messages that are perceived by the user. When the form messages support the use intentions, the outcome is usually positive, at least the correlation between form and meaning will be appropriate: housing will look and function as housing, not offices or prison; public forums will welcome their audiences instead of turning them out with the language of a defence stronghold. (We must remember however, that the appropriate use of form, analogous to correct diction in writing, does not guarantee the quality of a project. The author's artistry and talent ultimately determine whether the end product is to be poetry or a collection of banal limericks.)

It is the designer's responsibility to search for the appropriate form and organization, to uncover the associative correlation of geometrical, physical and metaphorical values between form and intended use. For example, a religious function, imbued with mysticism, removed from ordinary domestic and

MIES VAN DER ROHE. IIT Cathedral/Boiler House. Chicago, 1941. The traditional form of a basilica with central nave and two side aisles. There are even clerestory lights, a regular bay system and campanile to show that this is the cathedral.

A case of mistaken identity: Mies Van Der Rohe's IIT boiler house (left) which looks like a church, and vice versa (opposite).
In terms of Mies' curtain wall this solution shows the horizontal emphasis—long spans and underplayed verticals in bronze, especially rusted steel. Except for the Picasso sculpture out front, you would not recognise the civic importance of this building, nor the various political functions that occur within. (Hedrich-Blessing).

The greater problem, that housing looks like offices, was never raised. (John Winter).
corporate life, may be better served by a centrous
object-like form which suggests internalization and
disassociation than an aggregate form which suggests
communality between parts. Housing or community
facilities on the other hand, are more suited to the
latter than centrally generated forms.

Although the scope of this thesis does not include a
discussion of the interrelation between the
functional, symbolic and metaphorical contents of
physical form; they are recognized as essential
ingredients for architectural communication:
"the more the metaphors, the greater the drama, and
the more they are slightly suggestive, the greater
the mystery" --Charles Jencks. This thesis does
assume however, that the generative design principles
extracted from formal attributes of diverse natural
environments and supportive vernacular architecture
as the "basic framework" for architectural design --
the fundamental structure in which syntactic gymnastics,
metaphorical flourishes and the bending of rules find
their roots, not the other way around. It is also
assumed that an architectural language generated from
the behaviour of form, while allowing symbolic,
functional and metaphorical efforts to flourish,
operates on a more inclusive and fundamental level,
and is more able to provide the formal contents for that positive associative environment which appeals to us with urgency. For example, one is aware of the sensual curvature, voluminous space, close containment, mystical light quality, the malleability and weightiness of the walls and roof, in other words, the behaviour of the physical definitions in Le Corbusier's Ronchamp Chapel, long before one's mind is ready to conjure up the metaphors illustrated by Hillel Schocken.

Life itself is in a state of flux. With time, changes in a social order mandate changes in its physical context. In ordering an environment which must support ongoing changes, an austere and minimal approach does not usually invite positive responses. It is through the support of a multiplicity of associative codes that various social values can be comfortably accommodated. Diverse needs and aspirations cannot be supported by univalent architecture which tends to dehumanize and coat the environment with anonymity. An optimal environment encompasses an "adequate range" of physical clues. Within the larger continuum, the designer needs to provide intensifications, particularization that
The most effective use of suggested metaphor that I can think of in modern architecture is Le Corbusier's chapel at Ronchamp which has been compared to all sorts of things, varying from the white houses of Mykonos to Swiss cheese. Part of its power is this suggestiveness - to mean many different things at once, to set the mind off on a wild goose chase where it actually catches the goose, among other animals. For instance a duck (once again this famous character of modern architecture) is vaguely suggested in the south elevation; but so also are a ship and, appropriately, praying hands. The visual codes, which here take in both elitist and popular meanings, are working mostly on an unconscious level, unlike the hot dog stand. We read the metaphors immediately without bothering to name or draw them (as done here), and clearly the skill of the artist is dependent on his ability to call up our rich storehouse of visual images without our being aware of his intention. Perhaps it is also a somewhat unconscious process for him. Le Corbusier only admitted to two metaphors, both of which are esoteric: the 'visual acoustics' of the curving walls which shape the four horizons as if they were 'sounds', responding in antiphony, and the 'crab shell' form of the roof. But the building has many more metaphors than this, so many that it is overcoded, saturated with possible interpretations. This explains why critics such as Pevsner and Stirling have found the building so upsetting, and others have found it so enigmatic. It seems to suggest precise ritualistic meanings, it looks like the temple of some very complicated sect which reached a high degree of metaphysical sophistication; whereas we know it is simply a pilgrimage chapel created by someone who believed in a natural religion, a pantheon.

Put another way, Ronchamp creates the fascination that the discovery of a new archaic language does; we stumble upon this Rosetta stone, this fragment of a lost civilisation, and every time we decode its surface we come up with coherent meanings we know do not refer to any precise social practice - as they appear to do. Le Corbusier has so overcoded his building with metaphor, and so precisely related part to part, that the meanings seem as if they had been fixed by countless generations engaged in ritual: something as rich as the delicate patterns of Islam, the exact iconology of Shinto, is suggested. How frustrating, how enjoyable it is to experience this game of signification, which we know rests mostly on imaginative brilliance.
74-78 METAPHORS of Ronchamp, drawn by Hillel Schocken in a seminar on architectural semiotics at the Architectural Association. The mapping is amazingly literal when compared to the actual views.

Charles Jencks in "The Language of Post-Modern Architecture". 19
support the essential humanist values of "place", "identity", "personality" and "home-coming".
I am not searching for references in univalent projects because I am not looking to create univalent form -- "...an architecture created around one (or a few) simplified values...[one] which makes use of few materials..." -- Charles Jencks.
I believe that a cogent, logical language peppered with the ingredient for poetry, already exists around us and can be unearthed from the generative formal principles of rich, diverse environments, as well as reconstructed, reinterpreted and embellished. I have limited the scope of my explorations to the building of "diversity in harmony" and assembling diverse rather than homogeneous elements, even though the latter undoubtedly assumes an important role in the three dimensional design world, simply because diversity, taken to mean the inclusiveness of different formal elements offers not only more use options but also more levels of association, more interesting readings and, in general, diversity generates a richer environment.
Built environments can facilitate or inhibit use. A designer's responsibilities lie not in the creation of architectural marvels independent of use, but in the making of physical contexts that can reinforce people's needs and aspirations.

A supportive and pluralistic environment includes an appropriate range of built differences. It is the designer's responsibility to generate and deploy these differences to better support use intentions.
Users' needs change with time. Minimal and single-purpose built environments, lacking adequate lateral ranges in physical definition, are unable to provide the use/association options to accommodate changes.

Environments with inclusive ranges of variably completable differences, on the other hand, can remain comfortable for and supportive of the many specific needs arising from changing moods, lifestyles and events.

As a counter-example to the UNESCO headquarters, the partially contained peristyle of Diocletian's palace furnishes enough physical clues to support uses which have changed throughout the ages.
The lack of above-ground containment and definition at the UNESCO headquarters in Paris does not invite use, but instead, perhaps appropriately, bids passers-by to keep off its grounds.

The building of a pluralistic environment demands a positive, additive design method; one that maximizes physical definition as a means of providing inclusive options for use and association.
The delightful variety in built form at Barcelona's Pueblo Espanol (above) as well as Mykonos, Greece, generated diverse and lively fabrics.
Less is not more. Positive pluralizing, the basis for options and true flexibility, results from adequate physical definition.

Buildings should, in general, be positive intensifications of their (rural or urban) contextual environments.

The organization of a positive environment is territorial, not hierarchical.

The three primary environmental components (Access, Building and Landscape Continuities) should be developed as different but equally important three-dimensional fields, varying in both intensity and density.
The fact that each level of definition in an additive, associative organization, regardless of size, is important and essential to the whole may be emphasized through mutual dependence and reciprocal exchange among diverse field participants.

While the fundamental attitude, of opting for an inclusive architecture in which the generic behaviour of form rather than studied symbolism provides the basis for association, prevails, the methodologies, influenced by use and varying contexts, are modifiable and project specific. The scope of changing design issues mandates the gathering of a wide range of references for the building of a multifarious, deeply associative building vocabulary. Such references may be found in inhabitable built or natural landscapes. The principles revealed by their physical attributes must, however, be reinterpreted appropriately in contemporary terms, with great care taken to avoid a literal transposition of styles as evinced in the Habitat projects.
Among the positive attributes of inhabitable natural landscapes and those built worlds which are clearly intensifications thereof, are the following:

1. Non-hierarchical, three-dimensional, variable field distribution.
2. Sympathetic intensification and transformation.
3. Minor, object incursion.
4. Range in continuity.
5. Range in reciprocity.
6. Range in containment.
7. Range in completion.

Paul Klee. Exotic Bird Park. 1925
"Form encourages or hinders ranges of use/associations. The intrinsic intrinsic behaviour of particular definitions is (considered) constant/predictable. Each participating behaviour family encompasses polar opposites, for e.g.:"

1. Continuity 2. Reciprocity
   Separation   Adjacency

3. Direction 4. Completion
   Focus       Partial definition

5. Containment 6. Collage
   Openness     Subdivision

Maurice Smith
Space & Society
#18
The notion "to build" describes the act of ordering and assembling materials or parts into a composite whole. Like the natural habitable landscape, an inclusive built assemblage is that collage of diverse parts, wherein different definitions in a range of form and sizes coexist and maintain a continuing associative rapport. There is optional association and reciprocity between each size and level of definition, such that separation or discontinuity is discretionary rather than inevitable.
In a compositional organization, buildings are deployed as objects separated from the landscape.

In an additive, associative field organization, isolation and adjacency give way to reciprocity. The environmental triumverate is defined as partially completed virtual continuities that may be variably completed by one another. Access, landscape and buildings share formal and dimensional similarities which establish the primary correspondence among built definitions, generate polar definitions* and make optional reversals between mass and space possible. Access and landscape are no longer perceived as passive backdrops but rather, vital generative components of the total work.

*polar definitions -- identical forms articulated alternately as built mass and spatial volume.
Designing involves developing the three environmental Continuities -- Access, Building and Landscape -- into different but virtually continuous definitions. While continuity in one demands continuity in the others, LITERAL, planar continuity in all three would inadvertently result in a dissassociative, stratified mess. In developing the triumbrerate into VIRTUAL continuities however, reciprocity as well as associative field continuity can be maintained.

Max Ernst. Stratified Rocks. 1920
Beride (city by the water).
the primary environmental triumvirate...
continuity of access...
continuity of building......
......continuity of landscape......
Architecture which intensifies the reference landscape shares with it a mutually generative relationship characterized by optional association, reciprocal exchange and mutual correspondence. This supportive relationship should also be developed for habitable man-made environments. The following section provides a brief look at a number of basic, associative attributes of habitable natural landscapes and supportive vernacular architecture which were references for my design explorations.
Although camping and non-adaptive inhabitation such as nomadic settlements do take place, the most prevalent form of inhabitation in the natural landscape involves adaptive landscape intensification and transformation.

Engraving from Rubruquis's *Voyage en Tartarie*.
The diagram of a tent structure (right) is from J. Chapelle, *Nomades noirs du Sahara.*
"CAMPING:
Buildings out of context. Conceived elsewhere for anywhere, sited here, or there, no matter --
objects with the life of
containers
garbage cans. No continuities.
vegetable boxes
Isolation or graph paper."

Maurice Smith
in Space and Society
#18
The extent of built intensifications, relative to the size of the inhabited landscape, are generally small. The collective building form reinforces the landscape direction, intensifying and reciprocating with the larger continuing landform.

Loarre Castle, Heusca, Spain.
"LANDSCAPE INTENSIFICATION:
Continuity of partial shelter/access/etc. is found directly in the <<landscape>> supplied by of moderate climates...
claim build small zones of much larger <<habitable>> territories.
  e.g., water-formed bays, valleys island, hills ravines, cliffs, promontories...

  On-going definitions are directional
  Access and containments (with contours), open to light...

Habitable outside is still outside.
Inside is inside.

LANDSCAPE TRANSFORMATION:
An equally honoured adaptive tradition,
predominantly in less welcoming harboring climates,
which must be countered for comfort.

The (desert) tent is first open, then dwarf-walled, <<habitable-walled>> and cool-courtyarded: the new habitable outside is inside.

Built-form here is double-directional,
squares, domes, accretions of <<self-centered>> stable units..."
The Calabrian town of Pentedattilo, where "...houses [are] being built on, under and among, separate masses of rock, as if it had been intended to make them look as much like natural bits of scenery as possible...".
The range of landscape inhabitation includes gentle reductive adaptations, involving modest surface changes to the larger landscape form, as well as intense, additive and reductive transformations.
Cave houses are built into eroded mountains in the Spanish town of Gaudix.
Buildings extending from an 'infilled' abris, Sentenil, Spain.
Courtyarded troglodyte dwellings in the Loess area in China.
Houses in this part of Mojacar, in the province of Almeria, Spain succumbed to the demands of its tourist economy. Before most of the buildings shown here were torn down, the dense, crystalline-form hill town was an explicit example of a generated, inhabitable stepped world.

Inhabited areas are usually clustered and concentrated in a few choice regions rather than uniformly distributed over all available terrains. The built parts may drastically transform the existing landscape in the same way that the Mojacar building accretions redefined the entire hill.
In most geographic regions, whether urban, rural, flat or mountainous, the initial intervention may begin with directional aggregations of use-surfaces, generating a basic inhabitable three-dimensional field.

The reorganization of a natural slope into single and double sided use terraces.
Generating site-size, use surface aggregations for a flat site.
Access and use levels set up during fundamental landscape reorganizations are usually generated from single and double sided, continuous-surface ground form.

Santorini, Greece.
The initial stepped reference form, inclusive of various sizes, may be prepared for a variety of readings so that each subsequent intervention may selectively inhabit and complete it.
Buildings along the terrace edges may be generated as partial displacements of the terraced reference form; they need not be confined by the edges and may extend over two separate terraces.
The terraced reference may be left as open territories or intensified by groups of buildings.

Santorini, Greece.
Takachiho, Miyazaki, Japan.
Every house worth considering as a work of art must have a grammar of its own. “Grammar,” in this sense, means the same thing in any construction—whether it be of words or of stone or wood. It is the shape-relationship between the various elements that enter into the constitution of the thing. The “grammar” of the house is its manifest articulation of all its parts. This will be the “speech” it uses. To be achieved, construction must be grammatical.

Your limitations of feeling about what you are doing, your choice of materials for the doing (and your budget, of course), determine largely what grammar your building will use. It is largely inhibited (or expanded) by the amount of money you have to spend, a feature only of the latitude you have. When the chosen grammar is finally adopted (you go almost indefinitely with it into everything you do) walls, ceilings, furniture, etc., become inspired by it. Everything has a related articulation in relation to the whole and all belong together; look well together because all together are speaking the same language. If one part of your house spoke Choctaw, another French, another English, and another some sort of gibberish, you would have what you mostly have now—not a very beautiful result. Thus, when you do adopt the “grammar” of your house—it will be the way the house is to be “spoken,” “uttered.” You must be consistently grammatical for it to be understood as a work of art.

Consistency in grammar is therefore the property—solely—of a well-developed artist-architect. Without that property of the artist-architect not much can be done about your abode as a work of art. Grammar is no property for the usual owner or the occupant of the house. But the man who designs the house must, inevitably, speak a consistent thought language in his design. It properly may be and should be a language of his own if appropriate. If he has no language, so no grammar, of his own, he must adopt one; he will speak some language or other whether he so chooses or not. It will usually be some kind of argot.

Frank Lloyd Wright in "The Natural House" 77
The work of Frank Lloyd Wright and Carlo Scarpa illustrate two equally expressive approaches wherein the form language engages a broad range of physical definitions. In the two projects that are included for reference: Frank Lloyd Wright's Taliesin West and Carlo Scarpa's Brion-Vega Cemetery, the multiplicity of formal definition on all design levels yielded rich jewel-like environments which are also spatially interesting. Note that this complex jewel-like quality is constructed not by arbitrary "decorations" but by warranted intensifications of the formal elements.

The two projects, one being a workplace and residence for the living and the other, a garden for the dead, differ in scale, use, form as well as materials. However, the penchant for a deliberate profusion of physical definitions and strong associative relationship between varied definitions share by both architects seem to have served these two categorically different projects equally well.
Both projects display a notable "consistency in grammar". Each exemplifies, in its own special language, the essential aspects of an "organic architecture": "Perfect correlation, integration... no part of anything is of any great value in itself except as [an integral] part of the harmonious whole...". Every level of definition is "born from things instead of superimposing on them..." and, the resulting formal relationships, whether deliberately concordant or exceptional and contradictory, remain associatively congruent and readily comprehensible.

The associative formal continuity in both projects may be attributed to the mutually generative relationship and active formal dialogue established between the different definitions and different design sizes. The direct formal correspondence between the large and small size interventions is one of many examples: 1. Scarpa generated, within a multi-rectangular "L"-shaped site, a compositional site organization with completed centrous building forms. Though the site and building forms are different they share related definitions -- the buildings are intensified with multi-rectangular, directional stepped prism forms reminiscent of the sloped
prism-form garden walls that define the site form.

2. While Wright's project comprises mainly multi-rectangular directional building forms, thematic non-directional complete forms (the rotated-square and the related right triangle) are articulated as site-size as well as smaller size definitions.

1. Frank Lloyd Wright in "The Natural House".

802. Paolo Portoghesi's text on Scarpa's Cemetery BrionVega, "Global Architecture 1979".
Even as the plans of the projects are read on a superficial level, it is clear that both are firmly rooted in their surrounds. Irrespective of depth and extent, the formal relationships between the different levels of intervention and the larger, immediate contexts are undeniably generative.

The natural north-east edge of Taliesin West may be read as the reference edge, along which the square plan is generated. At the Brion cemetery, a dialogue between project and ongoing context exists even as separation and isolation are desired. This correspondence is established as the Brion site wraps around the edges of the small pre-existing cemetery, reinforcing and incorporating the given geometry as part of its own framework. The thematic shapes -- the rotated square and right triangle, generated from the 45° juxtaposition of buildings and sites, are clearly appropriated by the subsequent ranges of definitions, as their progenitors.
Unlike Brion-Vega, where buildings are isolated, object-like shelters befitting prayers and eternal rest, Taliesin West, as work place and residence, consists mainly of directional buildings. Even though the site form is square, it is assembled from directional forms, and in elevation, the project is lengthy and continuous, connoting the movement and activities it contains.

The theme of rotation, initially established with the main building cluster and site, is replayed at smaller sizes, as diagonally expanded territories are generated along otherwise linear built zones. The respective thematic shapes are freely adapted for smaller definitions: square for some of the rooms, planters, thresholds and paved patios; right triangle for the swimming pool, various planters, and the furniture which, unfortunately, lacks the general aesthetic savvy of the project.
The site-size, thematic square is only partially suggested. Subtly anchored on the north-west edge, by a small building that sits next to the corner. Virtual completion is frequently invoked in both projects. Here, completion is accomplished by replacing a built corner, with a spatial territory of recognizable form and dimensions.

The south-east corner is expanded by the geometry of the main building cluster. The remaining stretch of boundary includes two opposite "L" shapes: the south-west "L", enclosing the swimming pool and built landscape, is defined with garden walls, and is in contrast with its counterpart, the north-east "L", which is outlined by natural landform.
Incidentally, at most sizes, the "L" shape is a ubiquitous constant. For example, the main building cluster may be perceived as an addition of L-shaped wings. The major slope roof, and its roof frames are all L-shaped. The small square plot located along the large square's extended diagonal, is inhabited by a predominantly L-shaped building. The L-shaped return is even incorporated into the design of the furniture.

The low-slung buildings hug the ground in the same manner that the gentle rolling hills populate the region; the coarsely textured ground definitions, and foundations for wood frame structures, are generated with earthy field stones; the variety and rough hewn quality of these building materials resemble the colorful rugged texture of the Arizona desert. At Taliesin West, harmony between built complex and natural landscape is enhanced by a compassionate correspondence in form and materials.
Paul Klee. Church and Castle. 1927
Key to the plan

1 Entrance of the existing village cemetery
2 Porch
3 Cloister
4 Glass door
5 Pool with aedicule
6 Spring
7 Brion’s tomb
8 Family tomb
9 Carlo Scarpa’s tomb
10 Cloister
11 Chapel
12 Priests’ cemetery
13 Entrance for funeral service
14 Artesian well
15 Corner openings of the enclosing wall
16 Access to the village cemetery from the chapel
The **Brion-Vega Cemetery** comprises four independent built forms: the cubic chapel, the saucer-like Brion's tomb, the trapezoidal family tomb and the rectangular pavilion. Of these only the chapel offers habitable containment. All the buildings are object-like, introverted entities, fashioned as concrete monoliths, expressive of rest and eternal peace.

The project includes several different geometries. Some of the access and site size definitions are directional, the site form is double-directional, Brion's tomb and the chapel are centrally focused and non-directional.

Brion's tomb consists of a shallow arched shelter, rising above the circular basin which contains the sarcophagi. Except for the tenuous connection to the small water channel, the entire structure hovers on a green lawn, isolated from all surrounding definitions. In contrast, the chapel's surrounding is elaborately defined. The building itself is rotated $45^\circ$ relative to its surrounding walls, and is partially surrounded by
The built forms are organized so that conditions of change always occur opposite conditions of contancy: junctions are resolved by territorial passings; when one definition changes direction or is terminated altogether, another in its vicinity continues.
a square moat -- an assemblage of prism-form edges, steps, walkways and the platform which houses the water pump.

The sombre theme is injected at every turn with precise and plastic intensifications, details that communicate the dynamism of growth and movement, thriving in their own form of architectural pseudo life. From this rich collection of physical definitions, which imparts an eerie liveliness to this garden of the that contrasts with the quietude and repose suggested by the otherwise uncomplicated composition, and from the "symbols of death[,] in that they are symbols of life, since death isn't given except dialectically, as life which bears within itself its negation and the negation of its negation..." , a paradoxical narrative on the continuity of life emerges.

1. Portogehesi's text on Cemetery Brion-Vega. See appendix 1.
Gli anni Settanta

1970/75 Cimitero Brion, San Vito di Altivole (Treviso).
Complesso congegno di spazi labirinticamente smembrati, il Cimitero Brion si dilata, con una sequenza dinamica di episodi minori e maggiori, in un'area di circa 2400 m², imposta ai proprietari dall'Amministrazione comunale. Architettura eretta per commemorare se stessa, celebre "summa" e "metafora monumentale" (Mazzoni) della produzione scarpiana, in essa compaiono tutti i pregi e i difetti dell'autore.
L'incontro con una committenza generosa e disponibile, infatti, gli consente di sventagliare l'intero repertorio della sua ricerca linguistica. La narrazione procede così per mirabili frammenti, ipotesi di grande tensione, il più delle volte lasciate in sospeso. I nuclei costituiti si autoaccompongono, isolandosi, in visioni introverse che rinunciano allo spazio interiore: oggetti a carica lirica ma non architetture. Ogni volume viene geometricamente corroso da tagli, modanature e intarsi osessivi: sembra quasi che Scarpa abbia bisogno di stereomatrici elementari per aggredire poi snodi, passaggi, spigoli, in un'autocontestazione efferata. Il metodo è quello di una paziente ricomposizione a mosaico di parti essenziali, dipanate lungo il filo inquietante di un’autobiografia sofferta.

1 Veduta d’insieme dal padiglione della meditazione.
2 Disegni per l'ingresso principale. Soluzione definitiva.
3 L'ingresso dal cimitero comunale.
4 Pianta ancora in fase di elaborazione.
5 Pianta.
   1 Ingresso.
   2 Percorso coperto.
   3 Padiglione della meditazione.
   4 Vasca recinto.
   5 Arca dei committenti.
   6 Tomba di Carlo Scarpa.
   7 Percorso con i priapi.
   8 Sepolcro dei familiari.
   9 Cappella sull'acqua.
   10 Orto dei cipressi.

Nelle pagine successive:
6 Vista dall'alto con, in primo piano, il percorso d'arrivo al padiglione e, sullo sfondo, l'arco di scaturire.
The square form of Brion-Vega's chapel is reestablished in other sizes. The 45° direction change is assumed by the nearby garden wall, steps and Brion's tomb.

The slope of the steps are echoed by the sloping outerwalls.

Prism-shaped, stepped definition is used for benches and surface treatment while its negative spatial counterpart is used for wall openings.
14 La ripetizione di elementi continui collega concettualmente gli episodi architettonici.

15 Visita della tomba dei capostipiti.

16 Studi preliminari per l'arco tombale.
17/18 Veduta
dell'arcosolium
19 Sepolcro dei familiari
scorcio.
20 Disegno definitivo per la
tomba dei capostipiti.
Cappella-tempio
21 Prospetto e sezione.
22 La suggestiva copertura conica.
23 Vista interna con lo spazio schermato dal diaframma bidimensionale dell'apertura curvilinea.
24 Studi di incastri e dettagli per l'interno.
25 Vista angolare degli spigoli squarciati.

26 Fianco.
27 Scorcio con la passerella sull'acqua.
A pluralistic project is generated with *
**SEVERAL** different families of built form,
each inclusive of a range of forms and sizes.
An extensive project may include landscape-size or site-size reference definitions, building aggregations that inhabit part of the reference structure as well as a modicum of small, object-like *compositional forms.*

Differences generated within a project enable it to adapt to changes and support a generous range of use and association options.
Built differences may be generated through the inclusion of:

1. Families of related directions, forms and dimensions.

2. Variations in intensity and density.

3. Lateral variations in the continuity of......

......access.
......building.
......landscape.
......territories.
......view.
......light.

4. Variations in the extent of reciprocity among design variables.
5. Appropriate variations in the different form families:

- Single-sided continuous surface.
- Two-sided continuous surface.
- Multi-rectangular extrusions.
- Planes (panels).
- Screens.
- Lineal frameworks.

Although it is impractical to quantify a workable apportionment of differences and continuity, it is helpful to establish that the extent of generated, optional variations is usually substantially less than that of the theme and, in order to maintain overall continuity, contradictions should be few in number.
"...the [Blanchland] village center is treated as an urban space in contrast to the surrounding countryside; it has no trees and is paved. It establishes itself as manmade and orderly. Furthermore the buildings have been arranged to create a sense of enclosure, of cosiness, and of drama in the progressive revealing of space and use. These things are the stuff of towns...

...The approach at Crawley appears to be a pure recoil from the physical conditions of traffic jams and overcrowding...And yet of tension, drama, enclosure, surprise, there appears to be none. All the elements are there but the insistence on isolation is such that we are left with what we started with: a collection of roads, trees and buildings. Instead of townscape we have tree worship; instead of punctuated streets, AAAA, O000, instead of a conception of the town as a homely, folksy living place where citizens can get together to drink, play, talk, and grow old as partakers in the greatest of all the privileges of civilization, social intercourse, we have ebbiness; the theory that everybody else stinks and so you must have as much room as possible between."

Gordon Cullen in The Concise Townscape
The village of Blanchland and the proposed town center of Crawley (bottom).
Paul Klee. *Flowers in a Wheatfield*. 1920
1. families of related directions, forms and dimensions......
The landscape direction is reinforced by a number of additive built directions. Montefrio, Spain.
A family of related forms in a family of sizes.

Santorini, Greece
Marcel Duchamp.  The Large Glass.  (opposite)  1915-1923
2. variations in intensity and density......
Variations in intensity and density at landscape size.

Logone-Birni (Cameroun) (at right) Casares, Spain (below)
Building size variations.
Varied distribution in fenestration
at the Piazza Vittorio Emanuele.
Detail size variations. Concentrated near edges, surface intensifications occupy only a small part of the reference definition.

In Otto Wagner's Schutzenhaus, the edge treatment succeeds in generating a delicate tension within a balanced facade composition.

Carlo Scarpa's Brion-Vega cemetery, (below).
3. lateral variations in continuity of....

access, building, landscape.....

Giorgio De Chirico. Gare Montparnasse. 1914 119
access edge displacements
continuity ----> discontinuity
between access and use territories.
Separation between use and movement brought about by the planar opening.

The orientation of access in relation to use may be regulated to establish continuity or separation.

Continuity between access and use is weakened by multiple turns.
Continuity of access edges reinforces movement, displacements of these edges generate use territories.

Continuity between access and neighbouring use territories varies according to the positioning and definition of these edges and may range from adequately continuous to disassociatively discontinuous.
Mykonos, Greece
Displacements of edges generate partially defined territories that are spatially continuous with the access.

Level changes distinguish access from territories and help establish use stabilities.

Mykonos, Greece
reciprocity between access and building

continuity of edges reinforces the directional access form and encourages movement

displacements of access edges generate territories

the generous size of the access node helps orchestrate a symphony of different directions

the almost square, self-stable form encourages a respite from movement, generating a semi-private, claimable territory in an intensely public zone

Mykonos, Greece
In Montefrio, Spain, the Continuities of Access, Building and Landscape are each optionally continuable and variably distributed. Landscape and buildings alternate in being the predominant continuity.
Montefrio
Montefrio
Alberto Giacometti. Cage. 1931
Intermediate territories which are claimable by either public or private domains may be generated through mutual definition among the access, building and landscape forms, and also by building or access elements.
Varying relationships between the inside and outside, or private and public territories, ranging from associatively continuous to discontinuous can be generated through variations in the form and extent of containment.
Partial containment generated by building element

Garrovillas, Spain
and operative access element.

Mykonos, Greece
The trullo in Apulia, Italy provides fiercely closed, self-stable containment with clear separation between the inside and outside. (below)

Postponement of weather closure from the entrance and continuation of the outdoor ground plane into the interior establish continuity between the inside and outside, creating a sheltered territory wherein the two merge. (opposite) Carlo Scarpa's Brion-Vega, S. Vito, Treviso, Italy.
from openness to closure,
along a footpath......
The built environment frames the natural landscape, movable screens change the vista.
Ando Hiroshige. Asakusa Tanbo Tori no machi.
Rene Magritte. The Empire of Lights.
1954 145
Le Corbusier.
Notre Dame du Haut, Ronchamp, France.
Boots factory, Beeston, Notts, Britain by Sir E.O. Williams.

A Spanish castle, Montealegre, Valladolid (bottom).
Endless variations in the 'building' of light include maximization, minimization, all intervening permutations, modifications......
Covered streets in Africa.
Covered street in Africa (right) and a vault with clerestories in Isfahan (below).
Dome with luminous disks. Iznic, Turkey

St. Emilion, Girondes, France
4. variations in the extent of reciprocity among design variables......
At landscape size, reciprocity between the town of Qatif, Al Hasa, Saudi Arabia, and its palm grove.
Reciprocity between the built and unbuilt. Santorini.
Buildings by Alvar Aalto and Carlo Scarpa display exchanges between different surface materials. In Scarpa's project (bottom) the interlock is intensified by a window.
The recess of the building front not only addresses entry to the project and attachment to existing building but also engages the surrounding space by drawing down a piece of the sky.


At the smaller size, building elements (landing and steps) reciprocate and embrace each other.
Optional separation constitutes the other extreme and completes the range.
"Form families are identified through their direct physical attributes, for e.g.:

1. **Single-sided surface**
   - Continuous <<Ground-Form>>

2. **Two-sided surface**
   - Inhabited <<Ground-Form>>

3. **Partial containments**
   - Extrusions/Channels

4. Planes

5. Screens (--> 3-D)

6. Lineal frameworks...

Nos. 1 + 2 <<Block>> space directly; while, in Nos. 3 to 6 Light increases towards maximal Space <<openess>>.

Each territorial self-stable form family IN TRANSFORMATION develops the characteristics of another, while maintaining, recognizable, some of its own properties.

Reversals of Material Substitution of Material Densities generate the <<Place Range>> for each Family,

e.g. for No. 2 <<...Glazings displaced from masonry>> walls..."
5. appropriate variations in the different form families......
Aside from a range of form and sizes, each form family may incorporate different building materials, surface treatments and details, e.g. continuous-surface and screen definitions may include opaque, translucent and transparent materials.

Polar form definitions are generated with 'contrasting' materials, e.g. similar continuous-surface forms, one defined by transparent curtain walls the other, opaque masonry. For polar lineal definitions, negative (spatial) lineal forms may be made.

Several different materials may be included in one definition. Chiba house, Tono, Iwate.
Single-sided continuous surface ground form.
The amphitheaters of Muyu-uray, Peru.
Stone masonry generated the continuous-surface ground form and partial containment of this ancient Peruvian ruin.
The continuous-surface form of the Portuguese fortress at Marvão finds its polar counterpart in the curtain walls at La Coruna, Spain.
The lateral range of form transformations for a particular form family is limited by recognizability.

For example, while an opaque perforated surface form usually assumes the form role of lineal framework -- building space continuity -- it can be identified as part of the continuous-surface family when it is non-orthogonal and exhibits adequate surface continuity.

The openings in the perforated South facade of Qal'at Si'man, Syria encompass a variety of shapes and sizes.
At Zaragoza, Spain, surface continuity results from the infilling of the frames around the bullring.

Tekfur Sarayi in Constantinople sports a largely non-orthogonal frame.
Planar structures may be assembled into territorially stable ensembles. In Mies van der Rohe's Barcelona Pavilion, exchanges between different planes are characterized by passings; slabs cantilevered over supporting planes which often extend beyond the covered territories.
The quintessential screens, often assembled to generate three-dimensional zones, dominate both the interior and exterior of the traditional Japanese house. The movable ones encourage variable alterations and arrangements of the continuous interior space.

Shoin window alcove, Ozaki house, Hawai, Tottori (below).

Furuhata house, Hongo Village, Nagano (opposite).
Kusakabe house, Takayama, Gifu.

Oya house, Kawachi Nagano, Osaka.
Dimensional correspondences between screens and floor mats. Yoshijima house, Takayama, Gifu.
The charm of these framework definitions lies in the ways they inhabit and enrich the surrounding space, contributing more than mere structural support.

Plan and interior view of the Mosque at Cordova.

Interior of a Polish salt mine. (Opposite)
Imanishi house, Imai-cho, Kashihara, Nara, Japan.
Beamwork in Kusakabe house, Takayama, Gifu, Japan.
The complementary contrast between heaviness of building walls and delicateness of added wooden structures is shared by the Venetian roofscape and Simopetra, Mount Athos.
Mopp: Drawing from Cabaret Voltaire (Zurich 1916)
Max Ernst. Collage from *Une Semaine De Bonte.*
1934
A discontinuity may be a built or unbuilt morphological deviation from the contextual norm, e.g.:

1. a building which is drastically different from its surrounding fabric in size and height.

2. a completely self-contained building which does not reciprocate with its surroundings.

3. an open space in a solidly built area.

4. a major form of separation, such as a gulch or canal between two areas.
Each different design component of an additive complex is developed into an individual field, inclusive of elements of varying form and sizes.

A discontinuity may just be a common element of one field, displaced into a different one within which it is a minority.

For example, within a low-rise neighborhood, a highrise may be a displaced element from a nearby high-rise neighborhood.

Mutual exchange of displaced elements is usually most intense where the different fields merge.

Although a discontinuity may be a singularity by nature, it is not necessarily in contradiction with the total work.

As an important part of a range of differences, usually the celebrated landmark, an associative discontinuity generates drama and contrast by disrupting the consistent local pattern.
The juxtaposition of juxtapositions.
Singapore
The inescapable monument, the Duomo in Florence.
An etching of an eleventh century German castle.
Villarejo de Salvanes, near Madrid.

(Overleaf) The Tower of Samarra, Iraq.
3.
Where building continuity dominates, landscape becomes a discontinuity, Fenway, Boston.

Along this Italian hillside however, landscape is the major continuity, and the building, a discontinuity.
A rural stream or river is perhaps the most pleasant and romantic associative discontinuity. Generated by the natural landform, providing support for life and recreation, it is seldom thought of as an unfriendly form of separation.
Even though the ravine is a discontinuity it does not contradict the growth form of the village and seems to be the reference for the surrounding inhabitation.

The expressway, on the other hand, presents an uneasy form of separation because it antagonizes the nearby building direction.
While a landscape size discontinuity may fit easily into the relatively large, and therefore more tolerant, size of the regional context, e.g. the ravine in the troglodyte settlement, the integration of an intermediate size, object-like discontinuity may be problematic and hinges on reciprocal exchanges as well as associative correspondences.

Although an additive, associative field organization welcomes self-contained, object-like buildings as minor constituents of the coherent complex, in order to avoid complete discontinuity (which should only be articulated when absolute isolation is required), an optional associative relationship between building and context should be maintained.
Aside from the definition of polar opposites, associative correspondence between discontinuity and context may be established through similarities in building elements, materials or volumetric pieces. For example, colors and textures of the vernacular fabric are incorporated into the Duomo in Florence. Shared similarities establish the discontinuity as a unique but cogent complement, rather than a non sequitur, to the field. As the number of similarities contracts and association becomes tenuous, the message of separation is strengthened.

(See 'associative continuity', 'virtual completion' and 'polar definitions' in the chapter 'Generating an Associative Assemblage'.)
Isolated and defensive structures, intended to be as separated from the local infrastructure as possible, are routinely articulated as complete discontinuities. Extreme physical detachment may be reinforced by:

centrally-focused, self-contained form

processional, circuitous or tortuous access

precursory spaces separating buildings from access

built dimensions exaggerated much beyond human scale

forbidding fortifications, moats or high boundary walls
Perched haphazardly upon contexts with which they do not reciprocate, these introverted buildings appear as other-worldly, flying objects in transit.

Frank Lloyd Wright's Guggenheim Museum, New York.

Eero Saarinen's Kresge Auditorium, Massachusetts Institute of Technology, Cambridge, Massachusetts.
A processional approach, New Delhi.

(from left to right)
A clinic and a coffee shop in Japan (bottom).

These complete, object-like forms suggest disassociative isolation and contradict the nature of the intended activities which mandates user friendliness. It is more appropriate to reserve object-like form for uses which require limited public access.
While protecting an inner world from its outside environment, complete separation excludes reciprocal external relationships and is only appropriate for atypical uses that are drastically different from daily domestic life.

We should, in general, work with use form that reciprocates with other definitions and the landscape, and introduce the complete discontinuity only as a curio, a minority in the field.
Given that the relationship between constancy and change -- continuity and discontinuity -- is *symbiotic*, and that differences are only effective within a framework of overall continuity, the gesture to establish this thematic order becomes crucial to the viability of the entire design. Only after the theme has been established, can variations be effectively introduced.

*Thematic continuity however, does not imply uniformity.*

*Formal continuity*, like built differences, is generated from a *range of related variables.*
The symbiotic relationship between change and constancy is expressed in the staircase of the Olivetti showroom, renovated by Carlo Scarpa, in Venice, Italy. The steps are registered on one side and variable on the other.
Literal continuity -- form uniformity, linear and planar extension -- often hinders a design by limiting it to a sequential, segregated organization, of which the M.I.T. main corridor system is a good example. This linear method of generation restricts positive interaction and reciprocity among the environmental Continuities and supports few optional variations.
The access network fattens to generate and control the building form. The relationship maintained by the environmental components -- Access, Building and Landscape -- is hierarchical and stratified.
"Order has no function, this side of evil, other than to make what is essentially chaotic work."

Aldo Van Eyck in L'Architecture d'Aujourd'hui, Jan-Feb 1975.

Absolute uniformity in every physical variable renders an environment austere and lifeless.

Awful housing developments in Barcelona (above) and Hong Kong (left).
The emphasis on developing inclusive built differences does not imply chaotic complexity; simplicity and understandable order are also part of the operative principles.

Perhaps the best example of a combination of simplicity, order and variation is found in the traditional Japanese house. The serenity and recognizability of its form belie its complex nature, evinced by dimensional correspondences among building components and the layering of territorial, structural and material variations.
Toshima house and outbuildings, Ukiana Village, Ehime.

Gatehouse, Nagatomi house, Ibogawa, Hyogo.
Nishio house, Tottori City, Tottori.

Guest room in Yagumo, Shinji, Shimane.
Our continuing rapport with the environment is generated in relation to direction and movement. In moving through the landscape, our understanding of the collective form is generated from a series of incremental experiences.

Direction continuity facilitates orientation, discontinuity helps distinguish special uses and regions. A directional collective growth form may incorporate directional and centrally-focused elements as well as many different or transversal secondary directions.
Proceeding side by side, access and territories in the natural landscape are usually not disassociated. Although natural definitions provide clues for inhabitation, there is no clear hierarchy. Interaction between the two can be optional and rife with variations supportive of the larger continuum.

The range of continuity encompasses all additional direction or form transformations which reinforce or reaffirm the larger continuity.

For example, direction continuity, on which Access and Building Continuities depend, can be readable despite slight shifts of 15° to 20° from the main built or landscape direction. While slight direction shifts generate coherent variations within the associatively continuous major direction, deviations exceeding 20° begin to define conditions of separation for atypical and special uses.
Major and additional directions are directionally continuous within a 15° to 20° displacement.

Directional continuity decreases as displacement increases toward 90°.

While minor direction changes may occur without elaboration, major ones (especially transversal intersections) need to be resolved by adequate zones of exchange.

In the exchange between transversal directions, lateral displacements can occur without jeopardizing continuity.

The stable displacement dimension for both primary and secondary definitions is identical to the smaller dimension of the latter. Maximum stability of displacement occurs when horizontal and vertical displacement dimensions are identical.
horizontal displacement

vertical displacement

movement deflected by edge

vertical displacement - vertical edge dimension
The collective direction is identical to that of the individual unit. A village in central Japan.
Murotsu, Hyogo, Japan.
Alternating ribbons of buildings and landscape constitute the additive growth form of Montefrio.
Unlike Montefrio which is characterized by directional additions, at Santorini, Greece, most of the territories between built forms have been aggressively transformed into recessed gardens and terraces. The architectonic town resembles a crystalline rock formed by reductive forces.
In the Greek Isles, addition of different directions contributes to a larger directional coherence.
Lineal continuity is prone to problems which arise when interactions are permitted between contiguous entities only.

The breakdown of such ordering makes possible the territorial reciprocity between 'figure and ground' and allows both to maintain actual or virtual continuity.
In deploying successions of structurally self-stable, separate built forms into "virtually continuous" components, territorial as well as linear additions may be included, with the majority of built forms organized as territorial, overlapping relay components, sharing common passing territories. The passing territory between overlapped relay buildings supports directional continuity of landscape and access definitions, thus continuity in each level of definition facilitates continuity in the others.

Virtual continuity, as communicated by built forms that are actually separate and different in specific ways, relies on the directional coherence, physical proximity and stability of the corresponding passing or linear relays.
Linear additions

Grid controls.

Territorial additions

Direction controls.

Exchanges between relay components are negotiated with territorial passings wherein one component stops and the other continues, generating virtual continuity.
Virtual continuity is generated by optional additions and territorial passings. Most one-to-one alignments are replaced by lateral displacements which define continuing territories.

one-to-one alignments

lateral displacements

Directional passing:
When $a$ is greater than $b$, the geometry of the passing reinforces movement.

Territorially-stable passing:
When $a$ and $b$ are similar, the square form of the passing suggests stability.
The stability of a passing relay increases with the relative length of its passing territory; a self-stable passing territory contributes to a minimum stable condition. Stability of a linear relay hinges on its spatial joint which must be small enough, perhaps no more than the width of the narrower built definition, to communicate the perception of continuity.

Form-and-dimension continuity between the built and spatial definitions, similar to that between built definitions, is established through a set of shared constants. As spatial and light seams assume small working dimensions taken from building materials or person size territories, passing territories as well as spatial joints may correspond to the form and dimensions of the participating built definitions and larger recognizable constants.
room and person size territorial passings...

Spatial seams intensify junctions between separate components and allow continuity of space and light.
The extended roof generates an intermediate territory between the inside and outside.

Stable seam thickness is the same as the thickness of participating definition.
Passings safeguard continuity and stability during transitions and prevent disassociative coincidental situations.
In our journeys through changing environments we are able to perceive, at any given moment, only part of the totality. Since a thorough understanding of the whole can only be extracted from cumulated experiences it is necessary, in the ordering of built environments, to develop common physical denominators which tie into the diverse field participants and thereby, establish and strengthen an understandable continuity throughout the whole.

Coherent correspondence between different parts of an inclusive built field -- associative continuity -- may be established through a range of formal and dimensional similarities.
Fernand Leger. *The City*. 1919
These similarities need not be cultivated from one prototypical, repetitive unit but rather, from a family of specific, deployable variables: a range of additive form and dimension constants, with which collective definitions may be generated. An elemental associative correspondence is shared among field participants incorporating similar constants.

Paul Nash. Harbour and Room. 1936
Associative continuity is generated with the inclusion of a family of related forms. Silhouettes of thematic forms are recalled in smaller elemental definitions. For example, compositions involving collective circular spaces are often completed with circular niches, stairs, columns and ground form. Similarly, the 90° direction shift in the Marcus house project, defines indoor use as well as outdoor ground form.

Diagrams by Francis Ching in "Architecture Form, Space & Order".
...families of forms and sizes...

Varied three-dimensional distribution of a range of recognizable forms and sizes at Apanomeria.
The plan and reconstruction model of the monastery for St. Gall show the inclusion of a range of built sizes.
A complete form-and-dimension correspondence requires volumetric parity between the participating definitions and is generated when the different participants are identical or almost identical in all three dimensions. A partial correspondence is defined when only two-dimensional parity is achieved.

Since the factors of associative correspondence are form and dimension similarities, freestanding, completed objects may sustain a stable exchange with the larger field without going through direct connection or reciprocal interlock.
In a built complex where multi-rectangular, orthogonal forms constitute the thematic definitions, a small number of centrally focused definitions --ideal containing forms-- may be included. Additive form-constants, in a range of sizes, may be generated for both of these form families. A family of constants, generated from a specific form, will include additive as well as reductive transformations that fall within the general form silhouette.

A sampling of transformed cylindrical forms.
A family of circular forms, in different sizes, materials and various stages of completion, generated definitions ranging from continuous surface ground form to window frames.

Aldo Van Eyck's Single-Parent Family Home.
Similar forms employed for various definitions.

Gavina Shop, Bologna.
Carlo Scarpa.
Elevation and door design.
For the centrally-focused circular form, small, detail and structure size constants may include elements like spherical, cylindrical fittings and trims, built-in furniture and various sizes of structural components related to the thematic definition. Intermediate-size constants may be spatial or volumetric, like paired-arch openings, cylindrical stairwells, rooms and turrets. Although the smaller constants are similar to the larger building and site size definitions in form, their form roles differ and hence, their process of generation are markedly different.
Circular definitions used in my design projections for the Student Center Building B.

1. 2' and 4' columns defining the entrance and outdoor terrace.
3. Lightwells, chimneys and fire stair.
4. Exterior fireplaces, two cylindrical towers containing lounges with fireplaces. One with clerestory, another surrounded by skylight.
5. Transformed cylinder: home rooms for specific student activities.
The smaller size definitions, room size included, are often generated from homogeneous materials and may be repetitively deployed. They may be incorporated into larger definitions, developed as completed, freestanding entities or packed colonies.
African small capacity graineries.

The Monument of Lysicrates, Athens. (Left)
Theraen houses and Dogon architecture (bottom).
Aside from being reestablished as unbuilt, spatial forms such as courtyards and piazzas, collective gathering, site or landscape size definitions, unlike the repeatable smaller sizes, are basically non-repetitive.

A large size definition works best as a variably completed singularity, assembled from a range of forms, sizes and materials.
Churchyard at Prejmer, Rumania.  
(Church excluded from photograph.)

1. Moat.  
2. Bridge.  
3. Fore-court.  
5. Church.
For the Prejmer Churchyard, the Circular Casino of Hadrian's Villa and Arles's Amphitheatre (the two story barrel vaulted arena is the remaining original structure), the collective containing form is essentially a spatial territory, generated from an addition of smaller inhabitable territories.
Indoor collective containing forms in my design projections are defined with additive, inhabitable volumes and roofs that span between the volumetric structures. Sports Center and Kresge auditoriums (below left).

Open-air collective containing form -- amphitheatre. (below right).
Unlike the previous examples, these buildings are generated with non-territorial, repetitive structural elements which, save for stretching a tight membrane over the containing form, do not support other use definitions.

Such singleness of purpose reinforces a restrictive hierarchy between the separate levels of definition.

Palazzetto dello Sport, Rome, by Pier Luigi Nervi and A. Vitellozzi (above).

Livestock Pavilion, N. Carolina, by Nowicki Dietrick (right).
The distribution and incorporation of person-size definitions into similar larger constants contribute to form and dimensional associativity.

Small enough to be perceived in their entirety, physical definitions of anthropomorphic and functional dimensions are readily recognizable even to the untrained observer. Through repetitive encounters with evocative incremental constants, we come to understand the part within the whole and ultimately, the additive whole through the part.
Members in different form families may share the same normative additive dimensions. For example, 6in., 8in. and 12in., the approximate thicknesses of walls, may be established as the normative range of dimensions for detail-size definitions. In addition, 2in. and 4in. may be used as generative hand-size units of increment. Person-size dimensions - 2ft., 3ft. or 4ft. may be defined as the minimum operating "built" increments. 8ft.x8ft.x8ft. may be designated as the smallest room-size containment for continuous surface as well as framework definitions. The 8ft. standard increment may be an additive constant of much larger definitions. The smaller sizes are much more repeatable and may be incorporated into larger built form repetitively. Thematic forms that are room-size or smaller may be defined as complete, self-contained objects, each homogeneous in structure and material, peppering the larger context as a "small subfield". The larger collective-sizes should behave as natural landscape
definitions - basically non-repetitive, assembled from a collection of different sizes and materials.
A sampling of manufactured and use dimensions included in my design projections.
The shaded glazing dimensions are used for transparent, translucent or opaque enclosure and infill, as well as primary structure surfacing.

1/16th scale building section diagrams taken from my design projection for the Student Center Complex Building B.
The standard columniation includes both large and small dimensions generated with composite twin-columns. Two twin-column units make up the smallest 4-foot square bay, just large enough to be inhabited and small enough to be within an arm's reach.

Buttressing veins and pilasters on the arch planes as well as steel columns are spaced at least two feet apart, sufficient to accommodate a person.
Usable vertical dimensions such as seating, table and workbench heights are also references for surface intensifications such as indented seams, coursings and tilework.
Hans Schwitters: Woodcut, 1919
The definition of identical forms alternately as mass and space --built and unbuilt polar opposites-- generates constancy and change all at once. While complete or partial form-and-dimension correspondence between the opposites maintains an element of constancy, role and material reversals generate, for each of them, a new "use and place" definition. As always, small size polar definitions may be repeatedly deployed while collective size ones remain non-repetitive.

Form similarities between juxtaposed or displaced counterparts contribute to an associative continuity through which the total diverse field is unified.
"Our visual field consists of heterogeneous elements, subject matter that differ in shape, size, color, etc. To better comprehend the structure of a visual field we tend to organize the elements within it into two opposing groups: positive elements that are perceived as figures, and negative elements that provide a background for the figures... At times, the relationship between figures and their background is so ambiguous that we can visually switch their identities back and forth almost simultaneously..."

Francis D.K. Ching in Architecture: Form, Space & Order.
Taj Mahal, Agra, India.

A. Line defining the boundary between form and space.
B. Masonry form rendered as figure.
C. Space rendered as figure.

Fragment of a map of Rome (bottom).

Francis Ching in
Architecture: Form, Space & Order.
material reversals...

The brick form is acknowledged by the plaque.

Pattern of the brick joints is rebuilt in the iron gate wherein the individual brick form has become a light form.

Carlo Scarpa's renovation of the Querini Stampalia, Venice. (opposite)
In Scarpa's Castelvecchio Museum renovation, Verona, Italy, one of many reversals occurs as one of the floor slabs is replaced with a piece of view glass, contrast between opaqueness and transparency as well as view continuity between two floors are established.
A poetic reversal takes place between a concrete pedestal and a viewing balcony: the permanently inhabited concrete channel seems to be floating on an inaccessible spatial territory while the inverted spatial territory of the nearby framed channel is optionally and transitorily inhabitable.

A complete form-and-dimension correspondence plays an important role in this particular definition, note that the forms are laterally and vertically displaced, possibly by their section dimensions.
Part of Maurice Smith's design studio description poster with his drawing of Cassares, Spain.

Access territory, where movement predominates, shares similar dimensions with built use-form.
reciprocity...
"Like an artist's composition, the natural landscape is made up of many parts. And each of these parts -- mountain, boulder, or pebble -- was shaped by processes that continue to change the face of the earth."

Definitions in all sizes coexist in the natural landscape in a non-hierarchical manner. The larger sizes are reference definitions to the smaller ones and do not control them totally; in many instances, larger definitions are generated by the collective aggregation of much smaller elements, thus each level and size of definition is as important as the rest, regardless of size.

Maurice Smith, in Space and Society.
A pluralistic field is essentially an assemblage of several different "subfields". Each size of intervention, each family of form with members in a range of sizes, may be considered an individual subfield. For example, rocks, sand, water and trees are all subfields of the natural landscape; similarly, landscape-size interventions, building-size interventions, continuous-surface ground form, assembled planes and lineal frameworks are subfields within a built field.

In general, the sympathetic, mutually-generative relationships between different design sizes, different families of form and the various definitions within each form family are attributable to reciprocity and continuity.

Terraces in the loess areas in China illustrate reciprocity between definitions within the same form family.
Continuity of a variably stepped world is not lineal, but associative and territorial. Concavity and convexity of slopes in the natural landform contribute to reciprocity between the lower terraces and the protruding, higher terraces.
Basic diagram of reciprocity

Reciprocity between a castle and the rock it embraces. Sotalba in the province of Avila.
The pervasive baywater-land reciprocal form is characteristic of exchanges in the natural landscape, where lineal and planar divisions seldom exist. Through mutual edge displacements and exchange of characteristic constants, participating definitions, such as land and sea or landscape and buildings, interlock directly or virtually in territorial zones of exchange.

In general, the participating definitions and the zone of exchange affect and adjust to one another in the way bay, water and foamy waves appear to modify each other.

Just as beaches are strewn with seashells, a built zone of exchange may accommodate elements other than those belonging to the corresponding definitions.
The zone of exchange may be territorial, three-dimensional and extensive, when large sizes are integrated, or as small as stable territorial passings, when exchanges between intermediate-size definitions, such as access and buildings, are negotiated. Unless small, material and detail sizes are involved, an exchange zone should rarely be planar or lineal.
Baywater-land reciprocity is often established between built and unbuilt definitions, with outreaching buildings sheltering open territories.

Santorini.
Max Ernst. Collage from *Une Semaine De Bonte*. 1934
Reciprocity between self-contained forms and other definitions is sometimes required even though these forms generally do not lend themselves well to mutual edge displacement, a basic characteristic of mutual exchange. Fortunately, self-contained forms are also highly recognizable and can be easily identified even when uncompleted. This is especially true of all circular forms which may be recalled by a mere arc. The method of partial completion is most useful when it is necessary to articulate a geometrically recognizable primary form which reciprocates with other levels of definition.

"Virtual displaced completion" is a related method of assemblage which facilitates not only literal exchange but the generation of associative continuity. This involves replacing a small complementary fragment of a self-contained reference form, a cylindrical form for example, with an "opposite definition" - space, and establishing the built version of this fragment elsewhere in the built field. Once the form of such a fragment is introduced, it can be used as a thematic form reference for other categories of definitions.
A displaced fragment may be established near the reference form, or deployed repetitively in the larger field as displaced constants.

The most stable complementary-form displacement occurs when the territory between displaced fragment and reference approximates the displacement's dimensions, designating it as a virtual extension of the host. As the intervening territory expands, association between displacement and reference must instead rely on their recognizable similarities.

1. A complementary arc of the ampitheatre is established elsewhere as a planter.
2. The rectangular plan of the Student Center Library is formed by the building and its complementary spatial counterpart.
Displaced continuities are the characteristic constants of one particular subfield, transposed and established in a different subfield.

A mutual exchange of displaced continuities, between participating subfields, is most intense around the zone of exchange, however, through further territorial displacements and repetition, displaced continuities may populate areas far beyond the exchange.

Displaced reciprocal exchanges are common in the natural landscape where clear divisions between different families of form do not exist.

In form making, the articulation of reciprocal exchanges and displaced continuities helps establish and strengthen associative continuity.
Mutual exchange of contextual elements, reciprocity by displacements, is a common condition at the interface of land and sea.
Reciprocity through mutual exchange of displaced elements between:

shadow and light;
rocks and sand;
rock and vegetation;
cliff and sea.
The various spatial forms resemble, in a range of additive dimensions, some of the built ones. Within this densely built town, the spatial forms may be read as pockets of displaced continuity of the open space outside the town wall.

Spalato, Yugoslavia.
Reciprocal exchange between built continuity and landscape. A piece of displaced landscape inhabits the built territory.

Cyclades, Greece.
292 Drawing by Yves Tanguy. 1926
In an additive complex, the process of assemblage involves extensive spatial and territorial articulation. The method of addition varies with the sizes of the participating definitions. While detail and structure size definitions may be assembled with "literal" or "spatial" addition, the assemblage of larger sizes (room size and up), especially when the resolution of dissimilar built directions is mandated, would be better served by "spatial and territorial" addition.

Literal addition is less effective in the assemblage of larger sizes because it excludes the continuity of space as an integral component of exchange. Spatial addition, on the other hand, incorporates it as an important operative element. Discreet definitions are "integrated yet separated" by a spatial
Kurt Schwitters. Merz Picture With Rainbow. 1939
exchange zone, thus in the process of assemblage, dissimilar geometries are allowed to retain formal integrity. A spatial exchange territory can accommodate several levels of definition easily and this inclusiveness invariably enlivens its architectural character as well as that of the entire built complex.

A "literal joint" will embody and resolve the directions of the assembled elements with an addition or reduction of material at the junction. Intensification of such joints is accomplished with the variation of color and material. "Spatial joints" or seams are made from a substitution of solid material with space. They may be introduced as: 1. A rhythmic intensification of continuous solid definition, ensuring the continuity of light and space throughout the entire structure. 2. A demarcation territory, celebrating the differences between dissimilar self-stable definitions that are structurally connected but propped apart by spacers. A spatial seam that is infilled with transparent or translucent materials becomes a "light seam" and depending on the strength of the infill material, light seams may be structural.
1. Spacers are used to prop and separate; building light and space into secondary spanning and support structures.

Deckings are spaced from beams. The space in between is as deep as the decking.

I-section or twin pipe columns are set away from the floor, on bases adapted from floor beam jacks.

2. Spatial seams, same thickness as the walls.

Beam depth is reasserted between the walls and joists.

Steel balcony is propped up from the supporting beam.
The participating components of territorial additions that are structurally or territorially stable are, as requisite of virtual continuity, each optionally continuable.

A structurally self-stable component, such as an L-shaped wall, may stand without other structural support, but does not usually furnish adequate territorial definition unless multiple components are assembled.

A territorially stable structure, usually a quadrilateral definition, is both structurally stable and defines within itself one or several partially contained, claimable territories.

Territories that are square, cubic or centrally generated are formally self-stable, the geometry of such territories communicates rest.
 Territories formed by an assemblage of structurally stable walls.
It is assumed that every form "commands" a peripheral "extended territory" within or near which the behaviour of adjacent definitions are strongly influenced by the reference form. The form of this territory is determined by the generative direction(s) of the built definition: the extended territory of a directional form is more pronounced along its growth direction and naturally directional; the form of the extended territory of a non-directional geometry, determined by its generative radius or diagonal, is also non-directional. Territorial and spatial addition is dependent on the preservation and articulation of these territories. In a condition of mutual exchange, the extended territories of participating forms merge to form a "territorial" exchange zone within which variable interlocking, displacement and separation (basic spatial exchange behaviours) of the participants occur.

A building-size exchange zone may be articulated with ground form, partial built definitions (self-stable garden walls, columns etc.) and room-size built objects (displaced complementary fragments of the participants). In the exchange zone, territorial overlapping of built edges establish reciprocity.
between the built and unbuilt, intensify the addition and generate partially contained usable areas. The changibility of these edges enhances the character of the building: movable screens that let the outdoor in in the summer may convert, in the winter, into an insulating weather zone.
One of the positive aspects of spatial exchange behaviour is inclusiveness -- "integration" and "separation" occur simultaneously. Despite its poetic pretences, such duality stems from practicality.

In spatial exchange, "territorial overlapping" provides formal stability. The passing territory shared by the discreet built forms, given adequate dimensions, will behave as a consolidating "virtual joint". Being articulated as separate entities in this "territorial exchange zone", the interacting buildings are able to retain their formal integrity. To ensure separation, connection between these buildings may be articulated as "light linkages" -- bridges or passageways enclosed with transparent rather than opaque materials. Incidentally, since the relative size of a bridge is diminutive within a full scale built world, opaque linkages, acting as barely discernable elements, will also function satisfactorily. However, it is more appropriate to distinguish sizable nodes, which act as built joints, with transparent building materials.

(See also, CONTINUITY......virtual continuity......)
An exchange territory is shaped by the edges as well as the generative geometry of the interacting definitions. While it may inherit the participating definitions' formal characteristics and elemental definitions (structural components, materials and color), the territory possesses an otherwise independent architectural life. It will expand beyond the area of restrain and may also generate its own family of definitions which, while related to the generative reference forms, are articulated differently. For example, the ampitheater and circular planter are displaced definitions "spun off" by the sectorial elevated terraces around Kresge.

302 (See also, ASSOCIATIVE CONTINUITY......reciprocity......)
Kurt Schwitters. The "And" Picture (Das Undbild). 1919 303
Giorgio De Chirico. The Jewish Angel. 1916 (Opposite)
THE EXHAUSTED SOLDIERS, SLEEPLESS FOR FIVE AND SIX DAYS AT A TIME, ALWAYS HUNGRY FOR DECENT CHOW, SUFFERING FROM THE TROPICAL FUNGUS INFECTIONS, KEPT FIGHTING.

The nearer West Campus was chosen as context for the design explorations because it is located where an exchange between urban open space (Briggs Field) and a major portion of the M.I.T. built field takes place. The site size explorations involved the development of a projective built assemblage that addresses such exchange by sharing with the Main Campus complex a set of reinterpreted form and dimensional similarities, thus maintaining the necessary continuity between new and old while introducing an environment of a different built rhythm. The building size explorations involved the development, assemblage and deployment of a range of forms and sizes for the projective field organization.
The numbers on this map refer to M.I.T.'s building numbers. Under this numbering system, a single room number serves to completely identify any location on the campus. In a typical room number, such as 7-111, the figures preceding the hyphen give the building number; the first number following the hyphen, the floor; and the last two numbers the room. Thus Room 7-111 is in Building 7, on the first floor; Room 7-311 is directly above it, on the third floor.

It is useful to know that buildings on the main campus east of the Great Dome (Building 10) have even numbers and those west of it have odd numbers. Don’t expect to find Building 6, for instance, next to Building 5.

Buildings west of Massachusetts Avenue are designated W, those north of the Connai tracks N, those east of Ames Street E, and those north of the railroad and west of Massachusetts Avenue NW.
Major concerns of the design exercises included the addition to an institutional environment of claimable, particularized, friendly "places", the generation of adequate physical definition and a range of containment supportive of a variety of uses.

A finished or comprehensive alternative design was not undertaken. Instead, the design explorations were projective exercises in form making, aimed at the discovery and development of fundamental working principles and a building language that facilitate associative, additive designs.
Many early decisions were revised during the process of generation and the momentum of these revisions is evident in the differences between studies undertaken at different times. I had set out on a journey of discovery and did not expect my studies to conclude in the resolution of all issues in question, but in elucidative vignettes of a continuing series of contemplations. I did not adopt the usual method of problem solving, of determining the basic programmatic, spatial and formal requirements, then designing an environment to address these issues with a completed design and finished documents. Instead the graphic documents included are only in a developmental state. They record explorations in several aspect of design (continuity, differences, method of assemblage etc.) in which I am interested. The scope of these explorations was confined to conditions of exchange only, and even though generalities were implied or supported by particularities, only the latter was the mainstay of the studies. The larger ongoing context in which the conditions of interest exist are not expressly illustrated in this thesis. For example, the exercises on deployment of structural elements, i.e. beam lines and columniation, were limited to areas
where a great deal of changes were occurring. Areas outside these intense exchange zones, where the structural pattern should have been relatively repetitive, were not included.
The M.I.T. campus may be described as an isolated, internalized environment, not unlike a campus in the countryside except it lacks the quiet contemplative ambience, fresh air, trees and dramatic seasonal changes of a bucolic setting. The paucity of support amenities -- inadequate sports facilities, few lounging areas, badly stocked supply store, few eateries -- exacerbates the tremendous pressures of the vigorous M.I.T. education. While the campus offers little, access to nearby city centers is limited both by time and transportation constraints, as is the potential of the city centers to serve as sources of support. It seems that serious academic pursuit and a satisfactory campus life are mutually exclusive.
The projective studies were started with the assumption that a campus should sustain both the practical and emotional needs of its staff, students and visitors. The students should be given places in which to work, play, hold debates, find solitude, relax, contemplate and in the process, develop into well-rounded, caring members of society.

In the projective design, the student-oriented support facilities were located on the nearer west campus which lies between the main built zone and the athletic play field; between student housing and institutional functions; between the privacy of a temporary home and the hustle bustle of academic life. Located along "a path well traveled", it should be a place where one may seek refuge between coming and going. It should boast a character different from that of the rest of the campus. In this varied environment, buildings engage landscape actively, built intensifications — particularizations -- provide the necessary identifying elements, nooks and crannies offer students privacy/semi-privacy while collective, communal activities are within easy reach.
Since the rest of the campus already sports a solemn atmosphere, the nearer West Campus -- an environment of sportive, recreational and festive events, may legitimately share the rompish playful qualities of its inherent uses and be characteristically different.

I saw the reorganized site as a village square in which buildings are informally related to the existing buildings and landscaped gardens -- an ordered but nonetheless friendly, unbureaucratic place. I envisioned an urban builtscaple which is better able to enrich life on campus not only because the buildings service the added uses efficiently but also because, generated from a building language of reinterpreted positive landscape attributes -- a language of multiplicity, the reorganized site may provide adequate spatial excitement and environmental amenities to offset academic doldrums and uplift weary spirits.

I looked to vernacular architecture for references, for the indigenous builders demonstrated, among other facilities, an inherent understanding of the relationship between landscape and building, reference and intensification, continuity and reciprocity.
Such understandings are amply validated in their work by the supportive, sympathetic interplay between buildings and landscape, and have yielded an architecture that seems to possess an immense appeal even to us, the urbanites.

(See also, GENERATING AN ASSOCIATIVE ASSEMBLAGE.)

Wassily Kandinsky. The Sharp-Calm Pink. 1924
The original buildings on west campus were generated as self-defined, object forms scattered over a nondescript flat plane. The three site components: access, building and landscape, lacking mutual definition and reciprocation, were completely disassociated from one another. The scarcity of physical definition produced an inert environment which always seems deserted. The object of the site-size explorations was the development of a directional field organization alternative that would share certain reinterpreted formal similarities with the main campus buildings. A major design concern centered around improving the ambience of the institutional environment while maintaining the essential contextual continuity.

The northeast edge of the site along Mass. Ave. is reorganized as a "built urban edge" by the Student Center Building A. The main entrance to the site is now clearly identified by Building A and Bexley Hall. The west entrance to the site is located across the street from the West parking garage, between Kresge and the athletic auditorium. The south entrance is between Dartmouth St. and Baker House. All vehicular access to the site is limited to the periphery except in the event of fire or emergency, when the buildings may be
reached via ground level pedestrian paths. It is assumed that all on-site parking is relocated to an 'expanded' West Parking Garage. The north entrance to the site facilitates movement from the West Garage. Servicing is addressed by loading docks behind the Student Center and Kresge and a one-way servicing road which enters on Mass. Ave. and exits on Vassar St. On-site pedestrian movement is collected by the elevated access levels, reducing the intensity of ground level movement, allowing the ground to be articulated as an inhabitable landscape or as an outdoor extension of indoor uses, protected from heavy pedestrian traffic. The reference level was generated as an externalization of the interior access network, occasionally expanding to form terraces.

One of the goals of the site organization was the building of a "continuity of spatial territories", defined by built masses which are articulated as "virtual continuities". These spatial territories are generated from a set of additive related dimensions. For example, the courtyard on west campus is a reinterpreted version of the Killian Court, generated by the addition of a series of related dimensions. While Killian Court is oriented towards Charles River and defined by a network of continuous planar
buildings, its west campus counterpart, oriented towards Mass. Ave., is defined by built landscape definitions and discreet but connected built masses with territorial edges. In the design, the zone of exchange between built and unbuilt is usually characterized by the "territorial interlocking" of the cantilevered built edges and the outdoors.
The "intensified ground form" consists of planted and paved areas which are variably stepped to generate well defined access and sheltered rest areas. Portions of the planted areas are articulated as 'displacements' from the larger landscape definition -- the playfield -- which find themselves in an intensely built zone, e.g. the courtyard next to the Student Center Library and the planted Mass. Ave. site entrance.

Two planting patterns were used, both aimed at reinforcing the "directional continuity" of the complex. 'Regulated planting' was used when the vegetation defines movement along a building or a built access edge. 'Casual grouping' -- random grouping of trees -- was used to articulate a change in or termination of a built direction.
The northern edge of the originally flat and open site was partially transformed into a reinterpreted, variably stepped region through minor cutting, moderate filling and aggregation of territorially interlocked terraces. These terraces, in the form of multiple displaced territories, were conceived as part of the generative reference edge which includes the Armory and Rockwell Cage. The territory between the existing buildings and new intervention is claimed by service access, this method of access generation is typical in the project. Throughout the site, the access form is always generated with positive definitions. It ranges from being the variably contained spatial territories "between" adjacent buildings to paths in open gardens, partially defined with garden walls and plantings. This mode of definition increases the amount of associative physical definitions on the site and constitutes a most effective alternative to the minimal "yellow brick road" approach. As the stepped reference displaces vertically forming different levels, the terrace edges displace laterally, generating territories for stairs running parallel to the access direction.
Continuity of the terraced world is not at all times lineal but rather, associative and territorial. Where discontinuity occurs, optional exchange and association are sustained by territorial exchange (an interlocking of two zones).

The zones of the edge are extended at times for transference from one into the other. This furnishes the continuity of the two separate terraces, the zonal overlap makes possible an easy vertical transfer:

The continuous-surface form of the initial stepped/terraced world can also be two-sided 'built' forms, made up of horizontal usable planes, and vertical edges which are present at or near the surfaces' boundaries. There are variations in vertical climbs as well as horizontal dimensions of the use surfaces.
Vertical dimensions must be present at or near the edges in order to define the extent of horizontal use surfaces:
Interventions at a distance to the reference and the zone of exchange, need not register with them. They can adopt a different direction, and behave quite differently from the initial reference.
As is characteristic of a participant in a non-hierarchical mutually-generative relationship to play both active and passive roles, from time to time, access asserts its formal duality of being a definition of 'movement' that is optionally continuuable and transformable into a definition of 'rest'. This behaviour is illustrated when access territories expand into sizable spatial territories that are adequate to accommodate collective use stabilities. In its passive state however, access essentially behaves as a "fluid territory" between the "solid" buildings.

The new stepped reference was intensified with buildings some of which were generated as variably aggregated stepped forms. Since they are very much a part of an inclusive environment, internalized object forms were also included, e.g., Student Center Library and its reading court. They were however, kept relatively small and were often built with space rather than mass.

The additive volumes that make up the individual buildings vary in size, form and height.
Their varied roofscapes, and consequently the composite site silhouette, engage the sky in reciprocal exchange. The variations in size, form and the juxtaposition of the intensely built northeast region with the architecturally subdued southern edge and the open Briggs Field are some of the operative steps taken in order to generate built differences, and create a distinguishable, identity for the new environment.

The nature of sympathetic interruption is that of "mutual exchange". One definition shapes the other and is in turn shaped by the other.
The thematic forms for this project are mainly multi-rectangular and circular. The multi-rectangular form family was chosen for its potential of double directional growth which facilitates reciprocity -- territorial layering and interlocking -- among the design components: access, building and landscape. In this form of reciprocation, the buildings extend into and partially contain patches of ongoing landscape, generating claimable semi-private zones which may alternate, with seasonal changes, as partially contained indoor or outdoor rooms. This duality not only widens the range of potential uses but enhances the character of the buildings.

The circular form family was chosen for its potential to communicate a sense of containment and to maintain a rapport with the existing circular elements in the context: the domes over lobbies 7 and 10, the M.I.T. chapel and Rockwell Cage. Several sizes are included and are articulated in several different ways. The most complete, solid cylindrical form is limited to structural and detail size definitions. Spatial cylindrical forms range from strutural to building sizes (the existing M.I.T. chapel is the largest complete cylindrical definition). Access-size and
collective-size containments are articulated mainly with concentric forms which are partially completed, integrated with other geometries and constructed with a range of definitions. For example, a series of arcs -- the least completed of the circular family -- generated the steps and ground form around Kresge; the interior ground form of Kresge finds its counterpart in the ampitheatre; the M.I.T. chapel silhouette is rebuilt both as a one-sided planted ground form and as a pavillion with a roof that doubles as a terrace. The radial roof form, generated from a series of multi-rectangular truss units, is included as a related member of the circular form family. Each truss unit consists of a pair of steel trusses which are stiffened with cross-braces and share the same column support. The form role of these truss units bridges the multi-rectangular and circular worlds as the trusses are also used for directional shed roofs.
Formal continuity between the two sites is established with the continuity of built direction as well as formal and dimensional correspondences. Existing references were not transposed literally but rather, redefined within the new design framework. For example, the generative aspects of the main buildings: the standard width, multi-rectangular form and the linear access network, were reinterpreted and constructed with a group of buildings that share some of the normative dimensions and inherent formal behaviours of the main buildings but are otherwise quite different from their formal reference.

The main campus built direction is continued into the west campus by the Student Center Complex. This main direction lodges into part of the Kresge complex and terminates at the Vassar St. site entrance. As this direction continues in the form of buildings, reference level definitions and ground form on the northern edge of the site, the Baker House direction pushes in from the south and the two directions pass each other around Kresge.
The following diagrams show the progression of built edges and some of the corresponding dimensions at work within the reorganized site.

The collective sizes in the reorganized site were generated by additions of smaller sizes, the generative dimensions are easily readable and many are small enough so that an individual may comfortably identify with them.

(See also, p. 318-319).
Edges which set up the major built direction.

- Edge of building: -------------------
- Edge of partial or ground definition: ------
- Edge of overhead structure: ..............
Transverse edges, building reciprocity as well as direction. Circular edges facilitate directional transformations.
Paul Klee. *Sketch for Realm of the Plants.* 1920
The total area of built intensification vis-a-vis site area is no more than 40%. The distribution of built form within the site is concentrated and non-uniform. Intense built intervention is confined to the north and northeast portion of the site. The landscaping effort is extensive along the southeastern edge, and gradually lessens towards the playfield. The major built direction and thematic form change as they get further away from the main campus buildings and begin to respond to other nearby geometries. The direction generated by the railway along Vassar St., and carried by Rockwell Cage, is contained within the loading area behind the new Kresge Auditorium. The auditorium, which incorporate both geometries, negotiates the transition between this major site direction and the minor building direction introduced by Alvar Aalto's Baker House. The athletic building adopts the railroad direction and in penetrating the site, symbolically terminates the built intervention into Briggs Field.
Andre Masson. Automatic Sketch. 1925/26
Basic programmatic changes for the west campus buildings include increased provisions for support facilities: recreational areas, eateries, lounges, temporary lodging, offices for student activities, grocery, pharmacy and supply stores.

The site explorations revolved around replacing or reorganizing several west campus buildings in order to accommodate the additional uses:

1. Student Center (replaced with three separate but connected buildings).
2. Kresge Auditorium.
3. Du Pont extension-W23 (removed).
4. Athletic Center.

The Student Center Complex was developed as three buildings: the L-shaped Building A, which houses the Tech Coop, a small campus inn, administrative and student activities offices. Building B consists of collective and private lounges, dining halls, cafes and small shops. Building C is the Student Center Library, connected to Buildings A and B by enclosed walkways and the outdoor reference level.

Kresge Auditorium was reorganized as a stable territorial complex, expanded to included more support functions for performances: a set design workshop and
storage area, music rehearsal rooms, ticketing office, coat room, lounge with wet bar, lockers and storage areas for props, musical instruments etc.
The Athletic Center was reorganized to incorporate a health club, indoor and outdoor swimming pools, ball courts and a small auditorium (the athletic buildings were only developed as 100th scale site diagrams).
REFERENCE LEVEL SITE PLAN

1. Sports Center's small auditorium (remainder of complex excluded).
2. Kroesge Auditorium (gallery level).

Student Center Complex (3 - 5)
4. Building B (student activities).
5. Building A (commercial activities).

9. Reorganized reading area and entrance to bridge. (Building 7, 2nd floor.)
10. Lobby 7.
Early longitudinal site section and elevation study.
(Excluding Sports Center.)
George Grosz and John Heartfield: Dadamerica. Photomontage, 1920
OUTDOOR ELEVATED REFERENCE LEVEL

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HARD-SURFACE GROUND DEFINITION
GROUND DEFINITION (level changes and overlaps are not shown)
building-size explorations

KRESGE AUDITORIUM
The Kresge exercises were part of an investigation into the role of a building-size concentric containing form in a basically orthogonal complex. The sense of rotation embodied in the concentric geometry helps articulate the interacting existing and new building directions. Since there is already a concentric form on the site which is resolutely complete (the M.I.T. chapel), I decided to look into building Kresge as a variably completed additive form wherein the concentric volume is contained "within" assembled, orthogonal use forms. The chapel was employed as reference but the principle of volumetric articulation was reversed. Instead of treating the containing form, as in the case of the chapel, as a built volume surrounded by undefined space, the auditorium was treated as a "volumetric spatial form", generated and completed by a series of surrounding privacies. Inasmuch as it is appropriate for a single-use ceremonious form, the chapel is defined as a self-contained object whose outer form mandates absolute separation from other built forms. The auditorium, however, intended as a multi-use form, is a partial-cylindrical spatial volume, buried inside an orthogonal and "assemblable" outer form.

While the chapel is a simple form in which the
interior volume controls the exterior form, Kresge is an additive form in which the inner and outer forms are mutually generative but formally dissimilar.

The complex comprises: 1. A low tower which carries the main site direction. 2. An inverted "T" (formed by the lobby wing and a series of offices and practice rooms), which carries the Baker House direction and extends southward. 3. The auditorium proper which was generated as a roofed, stepped courtyard. The complex is separated from the Student Center and Athletic Complex by elevated and ground level plazas, respectively. These territories act as spatial exchange zones and help resolve the interacting existing and new directions. Conceived as a 'transformational element', the complex embodies both noted directions which, at building size, were resolved through the deployment of the three major volumes as separate components. The radial roof functions as a symbolic rotational link in the dialogue between the tower and the inverted "T".

Within the Kresge complex, as elsewhere in the project, the interface between circular and orthogonal forms is negotiated with space.
At structure size, the curved walls of the auditorium are in general connected to other geometries by glazed 'light seams'. At building size, the major uses are articulated as three higher volumes separated by lower roof terraces. In defining these uses as distinguishable volumes instead of a single accretion, the formal integrity of the respective volumes is preserved. Territories between the volumes are molded into spatially exciting outdoor rooms.

The zigzag trail.

The vertical displacement --

three-dimensional distribution -- of circular definitions.
The low tower and inverted "T" 'restrain' the extended territory around the auditorium on two sides, and "squeeze" part of it out along the southeast edge. Once free of the clutches of the orthogonal volumes, the extended territory resumes its formal relation to the generative cylindrical container and breaks away as sectorial terraces which cascade southward, accentuating the concentric geometry and thereby, rendering the formal character of the interior volume readable from the outside. Not only does the sweeping motion suggested by these terraces facilitate rapport between the different site geometries, but as they break forth, subtly emphasizing the southeast-northwest axis, they join other related definitions that have been deployed in different strata of the site to establish associative continuity (the half-cylindrical pavilion, ground-level ampitheater, radial roofs, circular roof gardens, the existing M.I.T. chapel and the Lobby 7 dome) in defining a zigzag trail of circular elements which reinforces the general growth direction.
The auditorium is a "public" forum which is ordinarily empty save for occasional film shows, performances and conventions. It is, however, surrounded by built volumes that are filled daily with semi-private and private activities. The use relationship between containing form and peripheral privacies is similar to that of the churchyard at Prejmer -- while there may only be quiet in the container, there are always ongoing activities in the surrounding privacies with which the former was generated.
Pedestrian access through the site was organized in accordance with the notion that the shortest route between two points is not necessarily the best. It is evident that the journey is at least as important as the arrival. In the exercises, buildings were not treated just as visual elements to be appreciated from afar but were designed to construct a spatially interesting journey through which the buildings reveal themselves in a variety of ways. For example, while Kresge and Student Center Building B are prominently situated within most sight lines, the Athletic Complex and Building A are sometimes completely hidden from view. The library and chapel are jewel-like hidden surprises, while the former may be uncovered behind perforated garden walls along the elevated access, the latter is sheltered by low walls and trees. The discontinuous relationship between access and building fosters a sense of isolation which serves the respective uses well.

Access to the auditorium was planned as a series of circumventing movement around the built form, leading the audience through outdoor territories variably defined by the built and unbuilt edges, enhancing their perception of the building by allowing them to generate, with their own movement, portions of the
building's outer form. Access from the northwest site entrance takes the audience partially around the outside of the auditorium and the orthogonal lobby before leading to the formal entrance. The elevated access wraps around the auditorium as descending sectorial terraces, accentuating the building's generative circular geometry. Access from Amherst St., unlike the others, constitutes a processional path to the main entrance. The auditorium may also be reached through the covered ground level network which services all the Student Center buildings.

(The entrance on the elevated level is not really an entrance but a controlled egress for the auditorium and its support functions. It should have been revised and oriented away from the descending reference level path.)
KRESGE
Early sketches.
KRESGE
Preliminary sections.
building-size explorations......

STUDENT CENTER

396 Paul Citroen. *Metropolis*. 1923
The projective design for the Student Center Complex comprises a series of exercises in which some of the building components developed in the Kresge exercises were modified and deployed to generate that varied environment for which I was opting. The design was essentially focused on generating 'territories' and 'reciprocity' through "edge displacements".

Of the three buildings that make up the Student Center Complex, only Building B was developed beyond site-size skethes. Building A was conceived as a mixed use office building which accommodates commercial and administrative activities as well as a small residential scale inn of twenty rooms. The inn occasionally takes in visiting parents but is basically reserved for guest lecturers who are willing to give up the posh services of hotels in order to stay close to the research facilities on campus. The Student Center Library was conceived as a multi-directional object, an addition of three squares, with an outdoor courtyard mirrored in its image. While the composite plan of library and courtyard is rectangular and thus directional as the rest of the complex, the plans of the individual definitions, generated from equal normal growth directions, are trifurcated and non-directional.
The courtyard may be considered a 'spatial rock' or a displaced fragment which anchored itself up north as the landscape definition moved in from the south, thus reinforcing the interlock between the built and 'unbuilt' zones. Since this fragment is displaced by its own dimension, it may be considered a 'stable displaced continuity'.

Diagramatic sections a-a, b-b and c-c show:

1. Access.
2. Ground reference level.
3. Elevated reference level.

Sections e-e and f-f show one set of relationship between the three buildings.
Building A, diagrammatic elevations:

2. North elevation.
3. Partial North elevation.
Access on both the elevated reference level and the ground is generally directional. Non-directional access areas are either partially contained stopping places, distributors or collectors outside entrances. The non-directional areas may be an addition of ground definition, as in the square node outside the library, the upper part is a reversed form of part of building A, the lower part is one of a series of "L"-shaped access forms. The squarish plaza outside the entrance of building A is a laterally displaced, partial negative form of building B and is also mirrored by the adjacent ground level courtyard. These three definitions form a series of platforms that steps inward and westward, off the ground level access, onto the elevated reference level.
Building B was conceived as a student activities building -- a clubhouse of sorts for the student body, as such it was the perfect site for a spate of physical definitions and hence, the subject of further studies. I had envisioned a collection of places of diverse architectural character, an environment which exhibits some of the natural landscape attributes mentioned in the previous sections, a labyrinthian world of nooks and crannies which offers shelter and quietude to the weary, embattled student.

The building is essentially a series of overlapping horizontal use surfaces -- two-sided stepped terraces that open up toward the south. These terraces form an additive "L" the short leg of which extends into the landscaped site like a promontory engaging the emerald sea. The re-entrant corner of the building may be compared to an open bay form which is completed just enough to support use stabilities and continuous enough to be part of the ongoing landscape. The more contained conditions of reciprocity, defined with "U" shaped bays, occur at the smaller sizes along the edges of the building.
Once the initial building form was determined, it was treated as a building-size stepped reference and intensified with various elements many of which are similar forms, articulated in different degrees of completion, sizes and materials. Most of these definitions allude to elements found in the natural landscape, for example: the radial roof, directional glazed roofs and various skylights, may be read as ridges, snowcapped ridges or waterfall, pools and streams, respectively; the additive cylindrical towers were modeled after caves and giant hollow trees, with light occasionally seeping into the trunks; structural components such as freestanding arches and column groupings are reminiscent of ruins.
Most columns are deployed as "trees" that are not planted in a square or rectangular grid, but in a directional pattern in which the varying beam spans make possible a relatively 'free' structural pattern. The truss columns break away from this pattern and adopt a radial sweep which addresses the change in the building's direction.

The small and solid "trees" are deployed as grouped units. "Inhabitable cylinders" that are just large enough to conceal mechanical and electrical conduits are occasionally deployed in pairs but the room-size inhabitable cylinders (which are acting as sheer walls) are, in general, solitary.

Except for the larger cylinders some of which are articulated as close containers, most of the cylindrical definitions, e.g. the circular stair and various ground and terrace definitions, are 'partial' or 'virtual'.
In general similar definitions are found not on one but several strata of the built scape. Such 'territorial distribution' -- a common landscape attribute -- is an alternative to the nonreciprocal, hierarchical approach. Examples of territorial distribution may be found in: the networks of interior and exterior arches articulated as virtual vaults and outdoor rooms; the radial roof, part of which extends down to a lower level; the directional pitched roofs, parts of which cascades to the ground.
...reciprocity and
territorial displacements...

At Harman, Rumania, the tiled roofs of a civilian wartime shelter are vertically displaced and generating other facade definitions.
At Aldo Van Eyck's Home for Single-Parent Families, Amsterdam, the upper-level structures (metal panels and frames) also find their place on the ground.
The **axonometric study** of the Student Center's Building B was developed from earlier plans and sections. Though the general L-shaped building form remains, the organization of interior and exterior spaces have undergone numerous waves of changes.

The circular gathering place, located near the entrance in the original site plan, was moved further toward the bent of the building and established as a separate lobby, away from the entrance lobby where major vertical circulation takes place.

Like all the others, this exercise was undertaken to catalogue built differences at building size; simplicity was compromised to allow for a large collection of different definitions.
PARTIAL

AXONOMETRIC STUDY OF STUDENT CENTER, BUILDING B.
The multi-level circular lobby is variably defined with segments of circular walls encasing runs of stairs. The lobby proper and its peripheral galleries receive north light, let in by the stepping roofs. Movable partitions may be used to control natural lighting and to temporarily isolate the lobby into a forum for gatherings and small performances.

An open air circular forum is defined outside the upper galleries, partially surrounded by the radial roofs' converging eaves.

Natural lighting may be direct and concentrated or reflected and diffused. Built in with lightwells, skylights around the cylindrical tower, studio skylights and various types of light seams: including those between roof sections and between the semi-circular and rectangular portions of the stair towers.
The radial roofs, situated around the circular lobby, are held together with light seams positioned over the paired steel trusses which support roof joists. During the day, shadows of the trusses change with the hours. The three splayed roof sections step down toward the north, collecting mainly north light. The parallel section blips upwards slightly before sloping down on the north side.

The flat roofs are accessible not only for maintenance but also for parties and cook outs. As the shorter leg of the "L" steps down to form study rooms, part of the building's skeleton is exposed. The exposed arch frames and beams contribute partial, virtual containment. Their counterparts are found on the ground, outside the building's eastern front, in the form of alternating upright and inverted arches.
The garden arches complete a virtual cylindrical tunnel, a spatial counterpart of the cylindrical towers.

The **directional, sloped roofs** usually enclose more than one floor, and house lounges, green houses, music practice rooms and cafes etc.

In contrast with the radial roofs, the predominant continuity here is light and the seams between roof segments are opaque.

The two major spines are overlapped laterally and displaced vertically, one is extended to touch both the ground and the higher levels.

As the sloped roofs relay climbs upward, flat usable roof trays cascade down through the exchange territory.

Together, the directional and radial roofs form a displaced but associatively continuous "J" over the "L" shaped building.
Kurt Schwitters: Lithograph from *Die Kathedrale* (1920)
building method explorations
In general, self-stable directional walls generated the Northern portions of all the reorganized buildings. In the Southern portions, this opaque (continuous-surface) definition gave way to light and space continuity and was gradually replaced by (self-stable) perforated walls, paired double-arch units or lineal frameworks.

Continuous-surface structures are made of reinforced cast-in-place concrete.

Primary framework elements - beams, joists, multi-rectangular trays and columns are additive precast units.

Trusses, angled down-turned "roof-trays" are made of steel.

Ground-level or sub-grade containment was mainly defined by self-stable walls which are by no means limited to the lower levels. 3-dimensional field-distribution implies that varying amounts of different definitions will be found on different strata of the field; therefore, earth-bound definitions were included in the upper realms of the project.
Early sketch.
Wall-units were displaced from the lower to upper levels by arches or grouped-columns. Larger inhabitable columns, like stalagmites, were ground definitions that reached the full building heights.

The different building components and the spatial territories they generated correspond to a set of related additive dimensions.

Dimensions of building components:

1. Composite lengths for self-stable, multi-rectangular wall-units include 16', 24', 36', 48', and 72'. Usual additive unit and return dimensions are 8', 16' and 24'.

Smallest units of increments are:

4' for territorial, inhabitable definitions. (e.g. minimum return dimension is 4' and dimensions between paired-surfaces range from 8' to 12').

1' or 2' for non-inhabitable definitions (e.g. edge intensifications) or negative polar definitions (e.g. Width of a light joint between two wall-units is equal to the wall thickness, 1'. Negative lineal definitions may
be 1' or 2', depending on the dimensions of the particular lineal reference).

Additive vertical dimensions of wall units include 2', 4', 8', 16', 24'. Combinations of different pieces generated the varied wall definitions. (e.g. Combination of two 24' high and one 16' high pieces generated the standard high wall.)

As outgrowths of continuous walls, vertical multi-rectangular corners establish person-size containments. Although some of these units may reach the upper floors, many of them are foundations for columns.
2. **Structural Stability** in the "less" perforated surfaces is generated by territorial returns. In this case, a single perforated-surface form *alone* incorporates adequate 3-D stability.

The minimal perforated-surface form --a double-arch plane-- derives structural stability by doubling with another plane. **Stability increases** as the unit becomes more territorial, however, unit depths are limited to 8' and 12' to define room-size dimensions within a collective-size piece. Large dimensions are built by the territorial additions of several units instead of being embodied in only one. **Arch openings** range from 16' to 24'. **Arch column** widths range from 6' to 12'. While the collective-size openings are set in the planes, smaller 6' arches are set in many of the short-spanning braces to support person-size movement.

Paired-units are registered by the arch openings, lined up frequently to form containing virtual vault-forms.
Bracing surfaces are not lined up but staggered vertically throughout the height of the walls.

Long-spanning bracing surfaces (those between separate, far-apart wall units) may be 4' to 8' deep. They are few in number and may be used as wall beams.

Short-spanning braces (those within an individual paired-surface unit) vary in depth, but the usual spans range from 8' to 12'.

Variations in depth and extent of openings in the short braces help define a varying range of room-size containments.

The paired-surfaces are also stabilized by 1' thick vertical veins that are not unlike pilasters.

An individual vein, extending perpendicularly from the wall surface, incorporates three additive sets of dimensions: 1'x 2'x 6', 1'x 4'x 6' and 1'x 6'x 12'. The variations help generate appropriate amounts of closures as well as indentations that can receive spanning structures.
1. Elevation of a tall double-arch unit. (left)

2. Footprints of arch units. (bottom)
Provided that one set of arch openings lines up, the planes of a unit are permitted to **displace laterally.** This is done mainly to extend unit length and vary the territory between two separate units.

**Edges of circular or arched openings** in the continuous-surface definitions may extend perpendicularly from the wall, adding an extended 3-D zone to the wall plane.

3. The 24' common dimension also belongs to the largest **cylindrical containing forms.** All the large columns are hollow and may, in part, be assembled from additive 3/4-round sections, rotated to form appropriate openings. Sometimes, the cylindrical form is defined as a corner, an outgrowth of a larger gathering place.

**Inhabitable columns**, smaller versions of the cylindrical form, may be 4', 6', 8' or 12' in diameter and need not conform to an orthogonal grid. Being able to distribute freely, most of these columns support radial trusses and circular, two-sided ground forms.
4. **Territorial lineal-frameworks** are assembled from the following:

columns

- **Twin-columned units**, in which the columns are 4' apart, and **three- or four-columned units**, in which the columns define self-stable territories ranging from 4sq-ft to 12sq-ft. (See diagrams 2 & 4)

The **Minimum self-stable framework unit** is a 3-D frame, made up of four columns, and transverse spanning structures. The **Minimum non-self-stable lineal unit**, consists of a pair of columns, spaced apart by person-size, usable dimensions (i.e. at least 2', and preferably 4' or 6').

**Standard column-section thicknesses** are 1'(diameter) for **round sections** and 2'(diagonal) for **octagonal sections**. **Standard column-section heights** are 12' and 24'. (See diagrams 2 & 4)

**Composite tall columns** (more than 30' in height) are assemblages of round and octagonal sections, in which the smaller sections are supported by the larger ones. (See diagrams 1 & 3)
beams, joists and spatial-props

Regular-spanning reinforced concrete beams are 2' deep. Proper spans range from 8' to 32'. 16' and 24' are the normative spans. Spans greater than 32' are generated either by bracing surfaces or steel trusses. Cantilevers range from 2' to 6'.

Beam lines are displaced by the capitals and expanded instead into 2' wide beam zones. The beam line patterns of neighboring floors are complementary. Where one beam leaves off another on the next level picks up, so that a virtual double-beam continuity is defined by staggered single beams.

Two types of concrete joists are used, short-spanning joists (for spans up to 12') and 2' deep T-joists (spanning up to 48').

Spatial props -- consisting of a 1' deep, 12' long horizontal piece and four 2' long vertical "rungs"-- resembling a partial ladder form, may be used to elevate joists from supporting beams. Vertical proppings are done to define local level changes and to build spatial beam territories.
Precast capitals, each consisting of a 3' square bearing plate and round support drum (or vice versa), produce stable "passing territories" for the beams.

A circumferential groove, cast 6 feet in from one end of each section, defines a vertical dimensional counterpart of the 1'x 6' connecting sections which negotiate splices in the octagonal columns. Set between 2' thick octagonal columns, these connecting sections form "indented bearing-areas" for both primary and secondary beams.

A concrete bearing ring must be added to the section when primary beams are being carried. When beam and ring are both in place, 2 feet of the connecting section will remain visible, drawing reference from the thickness of the column.
Floor slabs are shallow ½' x 2' x 8' reinforced trays that can cantilever 2' (its own width).

A Multi-rectangular -tray- unit is assembled from a beams-joists-slabs combination. Up-turned trays provide use surfaces and allow light continuity. Down-turned ones provide containment and shelter from light.

5. Steel trusses for radial roofs are articulated as self-stable, down-turned units. Stability is built into an individual unit by the pairing of the 4' or 6' deep trusses (spaced 2' or 4' by steel cross-bracings). Trusses within a unit may be of different lengths and may also displace laterally.

Proper spans vary from 40' to 100'. Cantilevers can be 20'. Truss-columns that define the proper spans, are received by load-bearing inhabitable (concrete) columns, while the cantilevered, down-turned ends are for propping or hinge connections only. Truss-column to concrete-column connections are made by drum-like, metal connectors.
Each truss incorporates both large and small panels, e.g. 10'x 4' and 2'x 4'. Horizontal and vertical components are included to facilitate connections to vertical supports and hanging structures. The open web joist span between truss-units vary as the units splay or converge.

The pre-assembled, down-turned roof-tray-units (each consisting of two end-trusses, joist and metal roofing) of the orthogonal, directional roofs, are sloped in order to differentiate them from their form counterpart -- the accessible, horizontal, concrete trays.

Individual truss-units of the radial roofs are glazed with skylights and act as light seams between the metal roof-sections. Truss-units of the directional roofs are protected by extruded metal-cover, generating the opposite condition in which the units become solid seams of the glass roofs. The transparent and opaque roof-seams are both 3' wide. Normative dimensions of the skylight and metal-cover units are 2'x 3'x 4' and 2'x 3'x 6'.
BUILDING METHOD
Explorations

1/2” scale model
C.I.P. & Precast Concrete...

Primary Structure
Steel & Wood ...
Rene Magritte. Amorous Perspective. 1935 (overleaf)
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APPENDIX
The Brion Cemetery by Carlo Scarpa by Paolo Portoghesi

With the contradictory and enigmatic images of the Brion cemetery, a sequence of objects and spaces linked in a continuous narrative, Carlo Scarpa interrupted his search. He interrupted it, and in a certain sense ended it, as if he had been aware of the approach of death, and to this approach had set up, as in a mirror, an equal and contrary movement: the dismissal of death through its contemplation and transfer in a daily and familiar horizon.

Years ago, Scarpa had refused to enlarge the cemetery of Modena (now designed and partly executed by Aldo Rossi) perhaps because of the inevitable oratorical connotation of the theme of a large urban cemetery; instead, with passionate interest veiled with instinctive irony, he accepted the theme of the small family cemetery desired by the founder of a successful Italian industrial enterprise, the Brion-Vega; perhaps because he was convinced that an architectural result is limited by its contents only marginally, and that the subdued tone, the “undertone”, was the tonality best suited to talking about such an important subject. On the other hand, not at all involved in the temptations of demagogy and in the mechanical equations between architecture and politics, Scarpa was not reluctant to recognize a certain aristocratic calling of architecture from which one certainly cannot flee through good intentions.

The Venetian-ness of Scarpa has been talked about to the point and not infrequently off the point. The Brion cemetery helps clarify the link between its author and the culture of the place where deep roots arose and connected him to it: it was such a jealous and shy connection, so fearful of any outcome which could only graze the “cliche”, that to manifest itself, it required a long journey, at times tortuous, where the first move was always a courageous dismissal. For Scarpa, Venice was probably not so much a body of monuments and structures, a set of places, as a set of people, past and present, who with their eyes, their minds, their touch, had been able to invent a place, building it and living within it, forming and developing a mental complex where, if there is no show of wealth or useless opulence of materials and forms, there is an exceptional and amazing complexity and density which can be found only at an ancient time, born through the stratification of successive interventions. The lack of all merely functional constraints or those of a practical nature freed, even more than in other works, that narrative and magic vein which has always brought Scarpa to explain himself in parenthetic clauses, in open parentheses, one inside the other like Chinese boxes, for long and syncopated periods in which the disobedience to the consecutio temporum is, as in Surrealist painting, an indication of a new temporality which can be run even backwards.
transforming it into a sort of living organism. For Scarpa, then, Venice was a way of seeing and using, a way of connecting things in function of the values of light, texture, color, capable of being grasped only by an eye used to observing (and through observing, measuring) water, glass, together with stones and bricks exposed to an inclement atmosphere which doesn't allow the material to hide its structure, but continually forces it to discover, by consuming itself, its most hidden qualities. In the Brion cemetery, this Venetian-ness is again, and even more clearly, the concrete and tangible arrival point of a free course, of a narrative that follows the unforeseeable thread of the association of ideas. The collective memory is solicited but not spurred on, the reference to the place used as a fixed point with respect to which the diversity and unforeseeable quality of the form is valued.

The private cemetery of the Brion family rises at the edge of a small pre-existing cemetery, and with respect to all current notions of the monument, of the funerary chapel of a "churchyard", it explains itself through antithesis. Instead of a monument, a central structure with the role of the symbolic exchanger, it is a plurality of places, an itinerary traveled, interwoven among various poles which refer to each other. The most direct reference could be that of the artificial landscapes of Chinese culture, to the sequences of pavilions inserted in the gardens, which, avoiding all hierarchies, allow one to "wander" from one place to the next without any of the arrival points ever constituting a definitive goal. Right at the end of the entrance of the portico that leads to the "garden of the dead", two interwoven circles, symbolic form of the eyes and of their visual fields fused into one, offer the first cryptic frame of the significant space. The circles look out on the sloping wall of the boundary: perhaps a metaphor of the Leopardin hedge of the sonnet "To the Infinite" (and that hedge which excludes the vision/from so much of the horizon line..but seated and looking out I imagine interminable spaces and superhuman silences/and drowning is sweet in this sea). At this point, it is the water which enters the scene as the indicator of possible directions: on one side, the tomb of Onorina and Giuseppe Brion, on the other, the water mirror, the pond, doubled in its second image, less luminous and stable, on which the "little pavilion" will be drawn, metal cage held up by an immobile raft.

Between the pond and the entrance portico, a glass door, whose light diaphrags are imperceptible, keeps the water from flooding the course: an obvious recollection of the bulkheads which protect the airships of certain Venetian houses from the "high water". In effect, the use Scarpa makes of the water, canalized and poured off toward the tomb by staggered receptacles, like the system
of the pavilions, comes from an exotic image: the canals of Islamic gardens, images of the four rivers of the paradise of the Koran. But when the astonishment that gives rise to the image with its ingenious winding course (worthy of the useless machines conceived by Hero of Alexandria) is over, it is Venice which reappears in a fade-out, with her waters which rise and cover the pavement with shiny veils. An immobile Venice, oneiric, seen in fragments, in bold sections, which no one will ever be able to recompose in a naturalistic image, just as it is impossible to recompose the faces of the models in Cubist paintings made up of a myriad of small planes.

In the center of the garden of the dead, sunk in a sort of green theater, the two Brion tombs next to each other are covered by a kind of bridge, a large lowered arch which protects without containing, with a structuralist approach, on the word _arca_ (in Italian, _arca_ means both ark and sarcophagus. Translator's note) and its historical meanings, on the Latin origin which defines its sense, close to that of coffin or monumental sarcophagus, on the transformations undergone in the Christian world, which then see a development of a typology endowed with an autonomous development. From the arch of the catacomb niches we pass to the Romanesque and Gothic tomb which
since it is a fragment of interior space woven to act as a closed void. The part for the whole, a synecdoche typical of Scarpa's language, aimed at involving the observer in the plot of the story.

Inside the small temple, light is the protagonist, and it is typically Venetian light, gathered from vertical cracks and animated by reflections of the surrounding water, as if the small temple stood on a stream. Also Venetian is the daring opposition of the background above the altar at the flat draft of the ceiling in the repeated echo of the virtual forms which interpenetrate and interweave.

Signs of Scarpa's Venetian-ness are also found in the use of materials, in the textures of the pavements always alive with indications, with signs that interrupt the modular structures, redeeming from them a geometric inertia from the studied joining of materials, from the attention—especially evident on the exterior of the little temple—to angular passages between orthogonal surfaces mediated by endless plastic inventions. It is important to note, however, how almost always the lens which allowed the architect to discover, reread, and realize the traditional datum is the lived experience of modern architecture, and in particular the examples of congenial masters like Wagner, Loos, and Wright to whom Scarpa was tied also for his curiosity, so natural for a Venetian, towards traditions and radication do not mean stasis but movement towards something different, of which the profoundly assimilated historic inheritance constitutes only an impression to identify and run through towards the origins, in the same way that one follows a riverbed backwards to find its sources.

The Brion cemetery is a summarizing of the investigations carried out by Scarpa also for the linguistic choices that characterize it. The tension towards history and local roots doesn't lead him to quotation and commemoration, but rather towards an elaborate transcription of each mnemonic datum. According to the classifications employed by Charles Jencks in his book "The Language of Post-Modern Architecture", works like this enter into the category of Late-Modernism. That is, they display an attitude of openness towards history which foreshadows the post-modernist attitude without adopting the unprejudiced eclecticism and a willfully contradictory and metathetic character. Scarpa prefers periphrasis to direct intention of tracking down lights whose reflections the architect knew well through the monuments and buildings of his own land. Venice, port of the East, hinge between different cultures nevertheless deeply intertwined, with respect to which she represents the courage of contamination and dialogue. In the exemplary experience of Scarpa, this suggestion works uninterruptedly and profitably; so much so that for his architecture, tradition and radication do not mean stasis but movement towards something different, of which the profoundly assimilated historic inheritance constitutes only an impression to identify and run through towards the origins, in the same way that one follows a riverbed backwards to find its sources. The Brion cemetery is a summarizing of the investigations carried out by Scarpa also for the linguistic choices that characterize it. The tension towards history and local roots doesn't lead him to quotation and commemoration, but rather towards an elaborate transcription of each mnemonic datum. According to the classifications employed by Charles Jencks in his book "The Language of Post-Modern Architecture", works like this enter into the category of Late-Modernism. That is, they display an attitude of openness towards history which foreshadows the post-modernist attitude without adopting the unprejudiced eclecticism and a willfully contradictory and metathetic character. Scarpa prefers periphrasis to direct
evocation, the round of words that avoids the use of the repeated archaic term. The difference, it could be said—referring to Delsuze—doesn't come from the repetition but from the initial removal compensated for by an endless reapproaching. Take the example of the chiaroscuro effects of the shiny vibration of the little temple and the tomb of the Brions. The concrete cast in wooden molds, built with the precision and cure of a woodworker from another era, imitates the severe structures of the architectural order, reproduces effects of transparent shadows, of interior stratifications in the material, of superimpositions of elements and the continuous connection of horizontal and vertical structures. But the analogy rejects all coincidences. Scarpa guarantees himself against the risk of a passive return to a forgotten grammar, by choosing an obviously additive system instead of one based, like order, on proportion: the stepped structure with uniform risers and treads, opposing families of lines that carve out the surfaces to the harshness of the volumes, indicate sections and penetrations in the interior of the crystalline masses with the effects of echoes, of the dilation of a basic orthogonal form in rigid concrete waves.

The theme of the steps, as instruments of plastic adjectivation and luminous vibration, has a precise history in the sphere of the culture of modern architecture. Present in pre-classical cultures, like the Egyptian, changed particularly in the Islamic world, it is recovered during the period of Art Nouveau when unrestrained naturalism enters into crisis and even before that appears in Sullivan's architecture, from which Wright adopts it directly. Scarpa probably inherits it from Wright, but the use he makes of it brings him close to certain results of Art Deco, in its American projection, for the complexity and systematic quality of its use. If decoration can be talked about with regard to Scarpa, it is still in the utopia of "organic decoration", born from things instead of superimposing itself on them. The crystallographic decoration of the Brion cemetery seems to be a result of the "natural" flaking of the crystalline blocks, of the revelation of a hypothetical structure of every prismatic block or of every slab, considered products of successive crystalline layers sedimented around an ideal geometric matrix, a translation in "mineral" terms of the system of growth through the concentric winding typical of the vegetable trunk.

Obliged to indicate for Scarpa's work and for the happy conclusive synthesis of the Brion cemetery a more general and problematic significance, a value of topical interest with regard to the disputes which today divide the field of architectural culture, we cannot overlook the apologia of the craftsman's tradition scandalously displayed by him, with a coherence equal only to his rigor and austerity. In his architecture Scarpa aims, even before
onto the mental image, often even at S. Vito di Avole, fragmentary and tortuous, at the tactile hold and the visual charm of the "beautifully composed" quality of materials prepared with a virtuosity offering their best, showing themselves in their splendor, in their variety, but especially in their truthfulness; a human truth, because it is revealed in the correct use which can be made, in the correct position and in the correct finishing the human hand decides for them. The drawing as abstract program, the project as a precept detached from the concrete work, in which the execution is the task of others, or even a mechanical product. It is at the antipodes of Scarpa's philosophy which intentionally identifies the role of the architect and that of the artisan and of himself works as an artisan among artisans, assembler of building materials, not with contempt for but with a love of architecture, a not at all adventurous love which grows from acquaintance and frequenting. Scarpa spent his formative years in a superintendence of monuments. From this familiarity with the antique, he seems to have obtained the certainty that the deepest emotions, both visceral and intellectual, which give us large and small architectures, are born in a direct line from the material, the color, the grain, the texture, of the materials put together, and from the visual, tactile imprint left on the material by the hand of man.

(Translated from Italian original by Ellen Shapiro)