

Christopher Alexander

The Search for Beauty

Patterns

- Patterns and pattern languages for software
- **Pattern Languages of Programs**
- Hillside Group
- “Pattern Languages of Program Design” (Coplien and Schmidt)

Christopher Alexander

- **Notes on the Synthesis of Form**, 1964
- **The Oregon Experiment**, 1975
- **A Pattern Language**, 1977
- **The Timeless Way of Building**, 1979
- **The Production of Houses**, 1985
- **A New Theory of Urban Design**, 1987
- **A Foreshadowing of 21st Century Art: The Color and Geometry of Very Early Turkish Carpets**, 1993
- **The Nature of Order**, 199x

Fact and Value

- Mind and matter separated by philosophy and science in the 17th and 18th centuries
- Descartes
- Science searched for what was, not for what made things beautiful
- Contingency—a thing is beautiful *to* some observer

Fact and Value

Myself, as some of you know, originally a mathematician, I spent several years, in the early sixties, trying to define a view of design, allied with science, in which values were also let in by the back door. I too played with operations research, linear programming, all the fascinating toys, which mathematics and science have to offer us, and tried to see how these things can give us a new view of design, what to design, and how to design.

Finally, however, I recognized that this view is essentially not productive, and that for mathematical and scientific reasons, if you like, it was essential to find a theory in which value and fact are one, in which we recognize that here is a central value, approachable through feeling, and approachable by loss of self, which is deeply connected to facts, and forms a single indivisible world picture, within which productive results can be obtained.

The Timeless Way of Building

There is one timeless way of building.

It is thousands of years old, and the same today as it has always been.

The great traditional buildings of the past, the villages and tents and temples in which man feels at home, have always been made by people who were very close to the center of this way. It is not possible to make great buildings, or great towns, beautiful places, places where you feel yourself, places where you feel alive, except by following this way. And, as you will see, this way will lead anyone who looks for it to buildings which are themselves as ancient in their form, as the trees and hills, and as our faces are.

The Quality

To seek the timeless way we must first know the quality without a name.

There is a central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilderness. This quality is objective and precise, but it cannot be named.

The Gate

To reach the quality without a name we must then build a living pattern language as a gate.

This quality in buildings and in towns cannot be made, but only generated, indirectly, by the ordinary actions of the people, just as a flower cannot be made, but only generated from the seed.

The people can shape buildings for themselves, and have done it for centuries, by using languages I call pattern languages. A pattern language gives each person who uses it the power to create an infinite variety of new and unique buildings, just as his ordinary language gives him the power to create an infinite variety of sentences.

The Way

Once we have built the gate, we can pass through it to the practice of the timeless way.

Now we shall begin to see in detail how the rich and complex order of a town can grow from thousands of creative acts. For once we have a common pattern language in our town, we shall all have the power to make our streets and buildings live, through our most ordinary acts. The language, like a seed, is the genetic system which gives our millions of small acts the power to form a whole.

The Quality

I was no longer willing to start looking at any pattern unless it presented itself to me as having the capacity to connect up with some part of this quality [the quality without a name]. Unless a particular pattern actually was capable of generating the kind of life and spirit that we are now discussing, and that it had this quality itself, my tendency was to dismiss it, even though we explored many, many patterns.

The Quality

The first place I think of when I try to tell someone about this quality is a corner of an English country garden where a peach tree grows against a wall.

The wall runs east to west; the peach tree grows flat against the southern side. The sun shines on the tree and, as it warms the bricks behind the tree, the warm bricks themselves warm the peaches on the tree. It has a slightly dozy quality. The tree, carefully tied to grow flat against the wall; warming the bricks; the peaches growing in the sun; the wild grass growing around the roots of the tree, in the angle where the earth and roots and wall all meet.

This quality is the most fundamental quality there is in anything.

The Quality

It is a subtle kind of freedom from inner contradictions.

BART Study

Notes on the Synthesis of Form

- in a good design there must be an underlying correspondence between the structure of the problem and the structure of the solution— good design proceeds by writing down the requirements, analyzing their interactions on the basis of potential misfits, producing a hierarchical decomposition of the parts, and piecing together a structure whose

structural hierarchy is the exact counterpart of the functional hierarchy established during the analysis of the program.

BART Study

- study the system of forces surrounding a ticket booth
- 390 requirements about what ought to be happening near it
 - being there to get tickets
 - being able to get change
 - being able to move past people waiting in line to get tickets
 - not having to wait too long for tickets
- certain parts of the system were not subject to the requirements, and the system itself could become bogged down because these other forces—forces not subject to control by requirements—acted to come to their own balance within the system
 - For example, if one person stopped and another also stopped to talk with the first, congestion could build up that would defeat the mechanisms designed to keep traffic flow smooth. Of course there was a requirement that there not be congestion, but there was nothing the designers could do to prevent it with designed mechanism.

BART Study

So it became clear that the free functioning of the system did not purely depend on meeting a set of requirements. It had to do, rather, with the system coming to terms with itself and being in balance with the forces that were generated internal to the system, not in accordance with some arbitrary set of requirements we stated. I was very puzzled by this because the general prevailing idea at the time [1964] was that essentially everything was based on goals. My whole analysis of requirements was certainly quite congruent with the operations research point of view that goals had to be stated and so on. What bothered me was that the correct analysis of the ticket booth could not be based purely on one's goals, that there were realities emerging from the center of the system itself and that whether you succeeded or not had to do with whether you created a configuration that was stable with respect to these realities.

The Quality—Alive

- “alive” captures some of the meaning when you think about a fire that is alive.

Such a fire is not just a pile of burning logs, but a structure of logs in which there are sufficient and well-placed air chimneys within the structure of logs. When someone has built such a fire you don't see them push the logs about with a poker but you see them lift a particular log and move it an inch or maybe a half inch, so that the air flows more smoothly or the flame curls around the log in a specific way to catch a higher-up log. Such a fire burns down to a small quantity of ash. This fire has the quality without a name.

[rpg]

- The problem with this word is that it is a metaphor—it is hard to know whether something literally not alive, like a fire, is *alive*

The Quality—Whole

- “Whole” captures part of the meaning—a thing that is whole is free from internal contradictions or inner forces that can tear it apart.

...a ring of trees around the edge of a windblown lake: the trees bend in a strong wind, and the roots of the trees keep the bank from eroding, and the water in the lake helps nourish the trees. Every part of the system is in harmony with every other part. On the other hand, a steep bank with no trees is easily eroded—the system is not whole, and the system can destroy itself: the grasses and trees are destroyed by the erosion, the bank is torn down, and the lake is filled with mud and disappears. The first system of trees, bank, and lake has the quality without a name. [rpg]

- The problem with this word is that “whole” implies, to some, being enclosed or separate. A lung is whole but it is not whole while still completely within a person—a lung requires air to breathe, which requires plants to absorb carbon dioxide and to produce oxygen.

The Quality—Comfortable

Imagine yourself on a winter afternoon with a pot of tea, a book, a reading light, and two or three huge pillows to lean back against. Now, make yourself comfortable. Not in some way you can show to other people and say how much you like it. I mean so that you really like it for yourself.

You put the tea where you can reach it; but in a place where you can't possibly knock it over. You pull the light down to shine on the book, but not too brightly, and so that you can't see the naked bulb. You put the cushions behind you and place them, carefully, one by one, just where you want them, to support your back, your neck, your arm: so that you are supported just comfortably, just as you want to sip your tea, and read, and dream.

When you take the trouble to do all that, and you do it carefully, with much attention, then it may begin to have the quality with no name.

- The problem with “comfortable” is that it has too many other meanings. For example, a family with too much money and a house that is too warm is also comfortable.

The Quality—Free

- The word “free” helps define the quality by implying that things that are not completely perfect or over-planned or precise can have the quality too. It also frees us from the confines and limitations of “whole” and “comfortable.”
- “Free” is not correct because it can imply reckless abandon or not having roots in its own nature.

The Quality—Exact

- The word “exact” counterbalances “comfortable” and “free”, which can give the impression that there is a fuzziness or over-looseness.

The quality is loose and fluid, but it involves precise, exact forces acting in balance. If you try to build a small table on which to put birdseed in the winter for blackbirds, you must know the exact forces that determine the blackbirds' behavior so that they will be able to use the table as you planned. The table cannot be too low, because blackbirds don't like to swoop down near the ground, and it cannot be too high because the wind might blow them off course, it cannot be too near to things that could frighten the birds like clotheslines, and it cannot be too exposed to predators. Almost every size for the table and every place to put it you can think of won't work. When it does work, the birdseed table has the quality with no name. [rpg]

The Quality—Exact

- “Exact” fails because it means the wrong sort of thing to many people.

Usually when we say something is exact, we mean that it fits some abstract image exactly. If I cut a square of cardboard and make it perfectly exact, it means that I have made the cardboard perfectly square: its sides are exactly equal: and its angles are exactly ninety degrees. I have matched the image perfectly.

The meaning of the word “exact” which I use here is almost the opposite. A thing which has the quality without a name never fits any image exactly. What is exact is its adaptation to the forces which are in it.

The Quality—Egoless

When a place is lifeless or unreal, there is almost always a mastermind behind it. It is so filled with the will of the maker that there is no room for its own nature.

Think, by contrast, of the decoration on an old bench—small hearts carved in it; simple holes cut out while it was being put together—these can be egoless.

They are not carved according to some plan. They are carefree, carved into it wherever there seems to be a gap.

- The word “egoless” is wrong because it is possible to build something with the quality without a name while retaining some of the personality of its builder.

The Quality—Eternal

- Finally is the word “eternal”—something with the quality is so strong, so balanced, so clearly self-maintaining that it reaches into the realm of eternal truth, even if it lasts for only an instant.
- But “eternal” hints at the mysterious, and there is nothing mysterious about the quality.

The quality which has no name includes these simpler sweeter qualities. But it is so ordinary as well that it somehow reminds us of the passing of our life.

It is a slightly bitter quality.

The Quality—What About Software?

- Is Alexander merely pining after the days when quaint villages and eccentric buildings were the norm?
- Architecture has a very long history and the artifacts of architecture from a lot of that history are visible today
- We in software are not so lucky—all of our artifacts were conceived and constructed firmly within the system of fact separated from value.
- But, there are programs we can look at and about which we say, “no way I’m maintaining that kluge”
- And there are other programs about which we can say, “wow, who wrote this!”

The Quality in Software—Modularity?

Suppose, for example, that an architect makes the statement that buildings have to be made of modular units. This statement is already useless to me because I know that quite a few things are not made of modular units, namely people, trees, and stars, and so therefore the statement is completely uninteresting—aside from the tremendous inadequacies revealed by a critical analysis on its own terms. But even before you get to those inadequacies, my hackles are already up because this statement cannot possibly apply to everything there is in the universe and therefore we are in the wrong ballgame....In other words, I actually do not accept buildings as a special class of things unto themselves, although of course I take them very seriously as a special species of forms. But beyond that is my desire to see them belong with people, trees, and stars as part of the universe.

The Quality in Software—Modularity?

In order for the building to be alive, its construction details must be unique and fitted to their individual circumstances as carefully as the larger parts....The details of a building cannot be made alive when they are made from modular parts.

The Quality in Software

- it was not written to an unrealistic deadline
- its modules and abstractions are not too big—if they were too big their size and inflexibility would have created forces that would over-govern the overall structure of the software; every module, function, class, and abstraction is small and named so I know what it is without looking at its implementation
- any bad parts were repaired during maintenance, or are being repaired now
- if it was small, it was written by an extraordinary person, someone I would like as a friend; if it was large, it was not designed by one person, but over time in a slow, careful, incremental way
- if I look at any small part of it, I can see what is going on—I don't need to refer to other parts to understand what something is doing; this tells me that the abstractions make sense for themselves—they are whole
- if I look at any large part in overview, I can see what is going on—I don't need to see all the details to get it
- it is like a fractal, in which every level of detail is as locally coherent and as well-thought-out as any other level

The Quality in Software

- every part of the code is transparently clear—there are no sections that are obscure to gain efficiency
- everything about it seems familiar
- I can imagine changing it, adding some functionality
- I am not afraid of it, I will remember it

Pattern Languages

- *A farmer in a particular Swiss valley wishes to build a barn....*
 - a double door to accommodate the haywagon
 - a place to store hay, a place to house the cows
 - a place to put the cows so they can eat the hay
 - this last place must be convenient to hay storage
 - there must be a good way to remove the cow excrement
 - the whole building has to be structurally sound enough to withstand harsh winter snow and wind.
- *If each farmer were to design and build a barn based on these functional requirements, each barn would be different, probably radically different. Some would be round, the sizes would vary wildly, some would have double naves, doubly pitched roofs.*
- *Alexander says that each farmer is copying a set of patterns which have evolved to solve the Swiss-valley-barn problem.*

Patterns

- *a picture, which shows an archetypal example of that pattern*
- *an introductory paragraph, which sets the context for the pattern by explaining how it helps to complete certain larger patterns*
- *three diamonds to mark the beginning of the problem*
- *a headline, in bold type—this headline gives the essence of the problem in one or two sentences*
- *the body of the problem—it describes the empirical background of the pattern, the evidence for its validity, the range of different ways the pattern can be manifested in a building, and so on*
- *the solution—the heart of the pattern—which describes the field of physical and social relationships which are required to solve the stated problem, in the stated context. This solution is always stated in the form of an instruction—so that you know exactly what you need to do, to build the pattern*
- *a diagram, which shows the solution in the form of a diagram, with labels to indicate its main components*
- *another three diamonds, to show that the main body of the pattern is finished*
- *a paragraph which ties the pattern to all those smaller patterns in the language, which are needed to complete the pattern, to embellish it, to fill it out*

Patterns

And yet, we do believe, of course, that this language which is printed here is something more than a manual, or a teacher, or a version of a possible pattern language. Many of the patterns here are archetypal—so deep, so deeply rooted in the nature of things, that it seems likely that they will be a part of human nature, and human action, as much in five hundred years, as they are today....

In this sense, we have also tried to penetrate, as deep as we are able, into the nature of things in the environment....

A Pattern

179. *Alcoves***

...many large rooms are not complete unless they have smaller rooms and alcoves opening off them....



A Pattern

No homogeneous room, of homogeneous height, can serve a group of people well. To give a group a chance to be together, as a group, a room must also give them the chance to be alone, in one's and two's in the same space.

This problem is felt most acutely in the common rooms of a house—the kitchen, the family room, the living room. In fact, it is so critical there, that the house can drive the family apart when it remains unsolved....

In modern life, the main function of a family is emotional; it is a source of security and love. But these qualities will only come into existence if the members of the house are physically able to be together as a family.

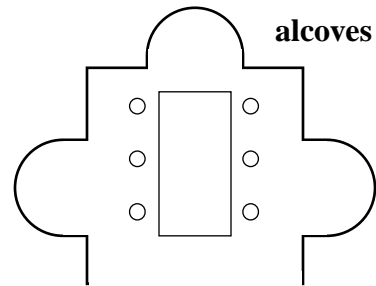
This is often difficult. The various members of the family come and go at different times of day; even when they are in the house, each has his own private interests.... In many houses, these interests force people to go off to their own rooms, away from the family. This happens for two reasons. First, in a normal family room, one person can easily be disturbed by what the others are doing....Second, the family room does not usually have any space where people can leave things and not have them disturbed....

To solve the problem, there must be some way in which the members of the family can be together, even when they are doing different things.

A Pattern

Therefore:

Make small places at the edge of any common room, usually no more than 6 feet wide and 3 to 6 feet deep and possibly much smaller. These alcoves should be large enough for two people to sit, chat, or play and sometimes large enough to contain a desk or table.



Give the alcove a ceiling which is markedly lower than the ceiling height in the main room....

Other Patterns

- Ring Roads (17)
- Quiet Backs (59)
- Small Public Squares (61)
- Sleeping in Public (94)
- Wings of Light (107)
- Sheltering Roof (117)
- Common Areas at the Heart (129)
- Zen View (134)
- Light on Two Sides of Every Room (159)
- Low Sill (222)
- Climbing Plants (246)
- Things From Your Life (253)

Generativeness

Generative patterns—patterns that generate the quality without a name

- hit a point beyond the tennis ball in the direction the racket is moving
- random number generator

Patterns and Software

People have done the obvious thing:

- develop patterns that are a prescription of how to solve particular problems that come up in development
- Knuth

What do pattern languages provide?

- common vocabulary
- common base of understanding what's important in programming
- a large corpus of solutions makes developers more effective

A Software Pattern

Pattern: *Concrete Behavior in a Stateless Object*

Context: *You have developed an object. You discover that its behavior is just one example of a family of behaviors you need to implement.*

Problem: *How can you cleanly make the concrete behavior of an object flexible without imposing an unreasonable space or time cost, and with minimal effect on the other objects in the system?*

Constraints: *No more complexity in the object... Flexibility—the solution should be able to deal with system-wide, class-wide, and instance-level behavior changes. The changes should be able to take place at any time... Minimal time and space impact...*

Solution: *Move the behavior to be specialized into a stateless object which is invoked when the behavior is invoked.*

Example: *The example is debug printing.... [Beck 1993]*

A Software Pattern

The idea is that you define a side object (and a class) that has the behavior you want by defining methods on it. All the methods take an extra argument which is the real object on which to operate. Then you implement the desired behavior on the original object by first sending a message to self to determine the appropriate side object and then sending the side object a message with the real object as an extra argument. By defining the method that returns the side object you can get either instance-level, class-level, or global changes in behavior.

Patterns in Software

- take advantage of common patterns without building costly, confusing, and unnecessary abstractions when the goal is merely to write something understandable. That is, when there are more idioms to use, using them is far better than inventing a new vocabulary
- most useful patterns are quite large—architecture patterns
- patterns interact with larger and smaller patterns in such a way that the actual manifestation of any given pattern is influenced by and influences several or many other patterns

A Danger in Software Patterns

Compression

It is quite possible that all the patterns for a house might, in some form, be present, and overlapping, in a simple one-room cabin. The patterns do not need to be strung out, and kept separate. Every building, every room, every garden is better, when all the patterns which it needs are compressed as far as it is possible for them to be. The building will be cheaper; and the meanings in it will be denser.

OK, So What's With Alexander?

- Alexander is merely pining after the days when quaint villages and eccentric buildings were the norm
- Alexander likes buildings that have survived for centuries and are hence selected for beauty
- Alexander likes (old) European and third-world buildings
 - small space implies mistakes and imperfections are small and hence nice
 - small space implies things packed in
 - small space implies constraints and the Poetry Effect
 - small space implies you should use nonflammable materials which are harder to work with and look more natural
- Alexander likes things that look like nature—fractal-like

The Perfection of Imperfection

House of Tiles in Mexico City:

We have become used to almost fanatical precision in the construction of buildings. Tile work, for instance, must be perfectly aligned, perfectly square, every tile perfectly cut, and the whole thing accurate on a grid to a tolerance of a sixteenth of an inch. But our tilework is dead and ugly, without soul.

In this Mexican house the tiles are roughly cut, the wall is not perfectly plumb, and the tiles don't even line up properly. Sometimes one tile is as much as half an inch behind the next one in the vertical plane.

And why? Is it because these Mexican craftsmen didn't know how to do precise work? I don't think so. I believe they simply knew what is important and what is not, and they took good care to pay attention only to what is important: to the color, the design, the feeling of one tile and its relationship to the next—the important things that create the harmony and feeling of the wall. The plumb and the alignment can be quite rough without making any difference, so they didn't bother to spend too much effort on these things. They spent their effort in the way that made the most difference. And so they produced this wonderful quality, this harmony...simply because that is what they paid attention to, and what they tried to produce.

The Perfection of Imperfection

The reason that American craftsmen cannot achieve the same thing is that they are concerned with perfection and plumb, and it is not possible to concentrate on two things at the same time—perfection and the field of centers.

In our time, many of us have been taught to strive for an insane perfection that means nothing. To get wholeness, you must try instead to strive for this kind of perfection, where things that don't matter are left rough and unimportant, and the things that really matter are given deep attention. This is a perfection that seems imperfect. But it is a far deeper thing.

The Failure of Pattern Languages

The Modesto Clinic

*All the architects and planners in christendom, together with **The Timeless Way of Building** and the **Pattern Language**, could still not make buildings that are alive because it is other processes that play a more fundamental role, other changes that are more fundamental.*

...

Up until that time I assumed that if you did the patterns correctly, from a social point of view, and you put together the overall layout of the building in terms of those patterns, it would be quite alright to build it in whatever contemporary way that was considered normal. But then I began to realize that it was not going to work that way.

...

It's somewhat nice in plan, but it basically looks like any other building of this era. One might wonder why its plan is so nice, but in any really fundamental terms there is nothing to see there. There was hardly a trace of what I was looking for.

The Failure of Pattern Languages

Architects were trying it out on the sly:

Bootleg copies of the pattern language were floating up and down the West Coast and people would show me projects they had done and I began to be more and more amazed to realize that, although it worked, all of these projects basically looked like any other buildings of our time. They had a few differences. They were more like the buildings of Charles Moore or Joseph Esherick, for example, than the buildings of S.O.M. or I. M. Pei; but basically, they still belonged perfectly within the canons of mid-twentieth century architecture. None of them whatsoever crossed the line.

The Failure of Pattern Languages

These architects thought it was working, but Alexander didn't:

They thought the buildings were physically different. In fact, the people who did these projects thought that the buildings were quite different from any they had designed before, perhaps even outrageously so. But their perception was incredibly wrong; and I began to see this happening over and over again—that even a person who is very enthusiastic about all of this work will still be perfectly capable of making buildings that have this mechanical death-like morphology, even with the intention of producing buildings that are alive.

So there is the slightly strange paradox that, after all those years of work, the first three books are essentially complete and, from a theoretical point of view, do quite a good job of identifying the difference but actually do not accomplish anything. The conceptual structures that are presented are just not deep enough to actually break down the barrier. They actually do not do anything.

The Failure of Pattern Languages

Geometry is central:

...the majority of people who read the work, or tried to use it, did not realize that the conception of geometry had to undergo a fundamental change in order to come to terms with all of this. They thought they could essentially graft all the ideas about life, and patterns, and functions on to their present conception of geometry. In fact, some people who have read my work actually believe it to be somewhat independent of geometry, independent of style—even of architecture.

Growth Process

What (D'Arcy) Thompson insisted on was that every form is basically the end result of a certain growth process. When I first read this I felt that of course the form in a purely static sense is equilibrating certain forces and that you could say that it was even the product of those forces—in a non-temporal, non-dynamic sense, as in the case of a raindrop, for example, which in the right here and now is in equilibrium with the air flow around it, the force of gravity, its velocity, and so forth—but that you did not really have to be interested in how it actually got made. Thompson however was saying that everything is the way it is today because it is the result of a certain history—which of course includes how it got made. But at the time I read this I did not really understand it very well; whereas I now realize that he is completely right.

Development Process

The ideal process has to answer the following questions satisfactorily:

- *What kind of person is in charge of the building operation itself?*
An architect-builder is in charge
- *How local to the community is the construction firm responsible for building?*
Each site has its own builder's yard, each responsible for local development
- *Who lays out and controls the common land between the houses, and the array of lots and houses?*
This is handled by the community itself, in groups small enough to come to agreement in face-to-face meetings
- *Who lays out the plans of individual houses?*
Families design their own homes

Development Process

- *Is the construction system based on the assembly of standard components, or is it based on acts of creation which use standard processes?*

Construction is based on a standard process rather than by standard components

- *How is cost controlled?*

Cost is controlled flexibly so that local decisions and trade-offs can be made

- *What is the day-to-day life like, on-site, during the construction operation?*

It is not just a place where the job is done, but a place where the importance of the houses themselves as homes infuses the everyday work

Organic Order

Alexander's philosophy extends to the building process, through a series of principles:

Organic Order: ...the kind of order that is achieved when there is a perfect balance between the needs of the parts and the needs of the whole.

The Principle of Organic Order

The principle of organic order: Planning and construction will be guided by a process which allows the whole to emerge gradually from local acts.

The Principle of Participation

The Principle of Participation: All decisions about what to build, and how to build it, will be in the hands of the users.

- Who is a user in software?
 - the end-user?
 - the developer (inhabitant)?
 - both?

Master Plans

It is not possible to produce a master plan for building:

It is simply not possible to fix today what the environment should be like [in the future], and then to steer the piecemeal process of development toward that fixed, imaginary world.

Master Plans

Master plans have two additional unhealthy characteristics. To begin with, the existence of a master plan alienates the users.... After all, the very existence of a master plan means, by definition, that the members of the community can have little impact on the future shape of their community, because most of the important decisions have already been made. In a sense, under a master plan people are living with a frozen future, able to affect only relatively trivial details. When people lose the sense of responsibility for the environment they live in, and realize that there are merely cogs in someone else's machine, how can they feel any sense of identification with the community, or any sense of purpose there?

Second, neither the users nor the key decision makers can visualize the actual implications of the master plan.

Piecemeal Growth

...each new building is not a “finished” thing....They are never torn down, never erased; instead they are always embellished, modified, reduced, enlarged, improved. This attitude to the repair of the environment has been commonplace for thousands of years in traditional cultures. We may summarize the point of view behind this attitude in one phrase: piecemeal growth.

Large Lump Development

Large lump development hinges on a view of the environment which is static and discontinuous; piecemeal growth hinges on a view of the environment which is dynamic and continuous....According to the large lump point of view, each act of design or construction is an isolated event which creates an isolated building—“perfect” at the time of its construction, and then abandoned by its builders and designers forever. According to the piecemeal point of view, every environment is changing and growing all the time, in order to keep its use in balance; and the quality of the environment is a kind of semi-stable equilibrium in the flux of time....Large lump development is based on the idea of replacement. Piecemeal growth is based on the idea of repair.

The Principle of Piecemeal Growth

The principle of piecemeal growth: The construction undertaken in each budgetary period will be weighted overwhelmingly toward small projects.

The Principle of Patterns

The principle of patterns: All design and construction will be guided by a collection of communally adopted planning principles called patterns.

The Principle of Diagnosis

The principle of diagnosis: The well being of the whole will be protected by an annual diagnosis which explains, in detail, which spaces are alive and which ones are dead, at any given moment in the history of the community.

The Principle of Coordination

The principle of coordination: Finally, the slow emergence of organic order in the whole will be assured by a funding process which regulates the stream of individual projects put forward by users.

Grassroots Housing Process

- a sponsor—a group of people, a corporation—would provide land at a reasonable price.
- a builder who is actually an architect, a builder, and a manager rolled into one
- families would get an allotment of money to begin construction
- the builder would help and with the pattern language each family would build its own home
- each family pays a fee per year with the following characteristics.
 - ❖ the fee is based on square footage and the fee declines from a very high rate in the early years to very low in later years
 - ❖ it is assumed to take around 13 years to pay off things
 - ❖ materials for building are free to families (of course, it is paid for by the fees)

This means that families are encouraged to initially build small homes. Because materials are free and the only fees are for square footage, each family is encouraged to improve or embellish its existing space and the cluster's common space. As time goes on and the fees drop in later years, homes can be enlarged. These clusters would nest in the sense that there would be a larger "political" unit responsible for enhancing structures larger than any particular cluster. For example, roads would be handled this way and the political unit would be a sort of representative government. [rpg]

The Mexicali Housing Project

Alexander gets to try his entire process:

The Mexican government became convinced that Alexander would be able to build a community housing project for far less than the usual cost. So they gave him the power he needed to organize the project as he felt proper. The land was provided in such a way that the families together owned the encompassed public land and each family owned the land on which their home was built. The point of the experiment was to see whether, with a proper process and a pattern language, a community could be built that demonstrated the quality without a name. Because of the expected low cost of the project and the strong recommendation of the University of Mexico regarding Alexander's work, the Mexican government was willing to allow Alexander to put essentially his grassroots system of production into practice.

[rpg]

The Failure of Pattern Languages and Grassroots Process

First the Mexican government:

The almost naïve, childish, rudimentary outward character of the houses disturbed them extremely. (Remember that the families, by their own frequent testimony, love their houses.)

The builder's yard was abandoned within 3 years of the end of the project

The Failure of Pattern Languages

The quality without a name is not apparent:

The buildings, for example, are very nice, and we are very happy that they so beautifully reflect the needs of different families. But they are still far from the limpid simplicity of traditional houses, which was our aim. The roofs are still a little awkward, for example. And the plans, too, have limits. The houses are very nice internally, but they do not form outdoor space which is as pleasant, or as simple, or as profound as we can imagine it. For instance, the common land has a rather complex shape, and several of the gardens are not quite in the right place. The freedom of the pattern language, especially in the hands of our apprentices, who did not fully understand the deepest ways of making buildings simple, occasionally caused a kind of confusion compared with what we now understand, and what we now will do next time.

The Failure of Pattern Languages

Maybe artistry has something to do with it:

When their [the government's] support faded, the physical buildings of the builder's yard had no clear function, and, because of peculiarities in the way the land was held, legally, were not transferred to any other use, either; so now, the most beautiful part of the buildings which we built stand idle. And yet these buildings, which we built first, with our own deeper understanding of the pattern language, were the most beautiful buildings in the project. That is very distressing, perhaps the most distressing of all.

The Failure of Pattern Languages

The patterns produce nice homes and buildings, but not the Quality:

There was one fact above everything else I was aware of, and that was that the buildings were still a bit more funky than I would have liked. That is, there are just a few little things that we built down there that truly have that sort of limpid beauty that have been around for ages and that, actually, are just dead right. That's rare; and it occurred in only a few places. Generally speaking, the project is very delightful—different of course from what is generally being built, not just in the way of low-cost housing—but it doesn't quite come to the place where I believe it must.

...But what I am saying now is that, given all that work (or at least insofar as it came together in the Mexican situation) and even with us doing it (so there is no excuse that someone who doesn't understand it is doing it), it only works partially. Although the pattern language worked beautifully—in the sense that the families designed very nice houses with lovely spaces and which are completely out of the rubric of modern architecture—this very magical quality is only faintly showing through here and there.

The Failure of Pattern Languages

Simplicity is not quite what it seems:

We were running several little experiments in the builder's yard. There is an arcade around the courtyard with each room off of the arcade designed by a different person. Some of the rooms were designed by my colleagues at the Center and they also had this unusual funkiness—still very charming, very delightful, but not calm at all. In that sense, vastly different from what is going on in the four-hundred year old Norwegian farm where there is an incredible clarity and simplicity that has nothing to do with its age. But this was typical of things that were happening. Here is this very sort of limpid simplicity and yet the pattern language was actually encouraging people to be a little bit crazy and to conceive of much more intricate relationships than were necessary. They were actually disturbing. Yet in all of the most wonderful buildings, at the same time that they have all of these patterns in them, they are incredibly simple. They are not simple like an S.O.M. building;—sometimes they are incredibly ornate—so I'm not talking about that kind of simplicity. There is however a kind of limpidity which is very crucial; and I felt that we just cannot keep going through this problem. We must somehow identify what it is and how to do it—because I knew it was not just my perception of it.

The Failure of Pattern Languages

Simplicity:

...The problem is complicated because the word simplicity completely fails to cover it; at another moment it might be exactly the opposite. Take the example of the columns. If you have the opportunity to put a capital or a foot on it, it is certainly better to do those two things than not—which is different from what the modern architectural tradition tells you to do. Now, in a peculiar sense, the reasons for it being better that way are the same as the reasons for being very simple and direct in the spacing of those same columns around the courtyard. I'm saying that, wherever the source of that judgment is coming from, it is the same in both cases.... The word simplicity is obviously not the relevant word. There is something which in one instance tells you to be simple and which in another tells you to be more complicated. It's the same thing which is telling you those two things.

The Failure of Pattern Languages

Skill and artistry:

Only recently have I begun to realize that the problem is not merely one of technical mastery or the competent application of the rules—like trowelling a piece of concrete so that it's really nice—but that there is actually something else which is guiding these rules. It actually involves a different level of mastery. It's quite a different process to do it right; and every single act that you do can be done in that sense well or badly. But even assuming that you have got the technical part clear, the creation of this quality is a much more complicated process of the most utterly absorbing and fascinating dimensions. It is in fact a major creative or artistic act—every single little thing you do—and it is only in the years since the Mexican project that I have begun to see the dimensions of that fact.

The Failure of Pattern Languages

I had been watching what happens when one uses pattern languages to design buildings and became uncomfortably aware of a number of shortcomings. The first is that the buildings are slightly funky—that is, although it is a great relief that they generate these spontaneous buildings that look like agglomerations of traditional architecture when compared with some of the concrete monoliths of modern architecture, I noticed an irritatingly disorderly funkiness. At the same time that it is lovely, and has many of these beautiful patterns in it, it's not calm and satisfying. In that sense it is quite different from traditional architecture which appears to have this looseness in the large but is usually calm and peaceful in the small.

To caricature this I could say that one of the hallmarks of pattern language architecture, so far, is that there are alcoves all over the place or that the windows are all different. So I was disturbed by that—especially down in Mexico. I realized that there were some things about which the people putting up the buildings did not know—and that I knew, implicitly, as part of my understanding of pattern languages (including members of my own team). They were just a bit too casual about it and, as a result, the work was in danger of being too relaxed. As far as my own efforts were concerned, I realized that there was something I was tending to put in it in order to introduce a more formal order—to balance this otherwise labyrinthine looseness.

The Failure of Pattern Languages

...

*The other point is that even although the theory of pattern languages in traditional society clearly applies equally to very great buildings—like cathedrals—as well as to cottages, there was the sense that, somehow, our own version of it was tending to apply more to cottages. In part, this was a matter of the scale of the projects we were working on; but it also had to do with something else. It was almost as if the grandeur of a very great church was inconceivable within the pattern language as it was being presented. It's not that the patterns don't apply; just that, somehow, there is a wellspring for that kind of activity which was not present in either **A Pattern Language** or **The Timeless Way of Building**.*

The Search for Beauty

- Alexander went off in search of a universal formative principle, a generative principle governing form that would be shared by both the laws of nature and great art.
- If the principle could be written down and was truly formative then aesthetic judgment and beauty would be objective and not subjective, and it would be possible to produce art and buildings with the quality without a name
- If there were such a universal principle, any form that stirs us would do so at a deep cognitive level rather than at a representational level where its correspondence to reality is most important.

That is, the feeling great form in art gives us would be a result of the form operating directly on us and in us rather than indirectly through nature; and nature would share the same forms because the principle is universal.

The Bead Game Conjecture

That it is possible to invent a unifying concept of structure within which all the various concepts of structure now current in different fields of art and science, can be seen from a single point of view. This conjecture is not new. In one form or another people have been wondering about it, as long as they have been wondering about structure itself; but in our world, confused and fragmented by specialisation, the conjecture takes on special significance. If our grasp of the world is to remain coherent, we need a bead game; and it is therefore vital for us to ask ourselves whether or not a bead game can be invented.

The Search for Beauty

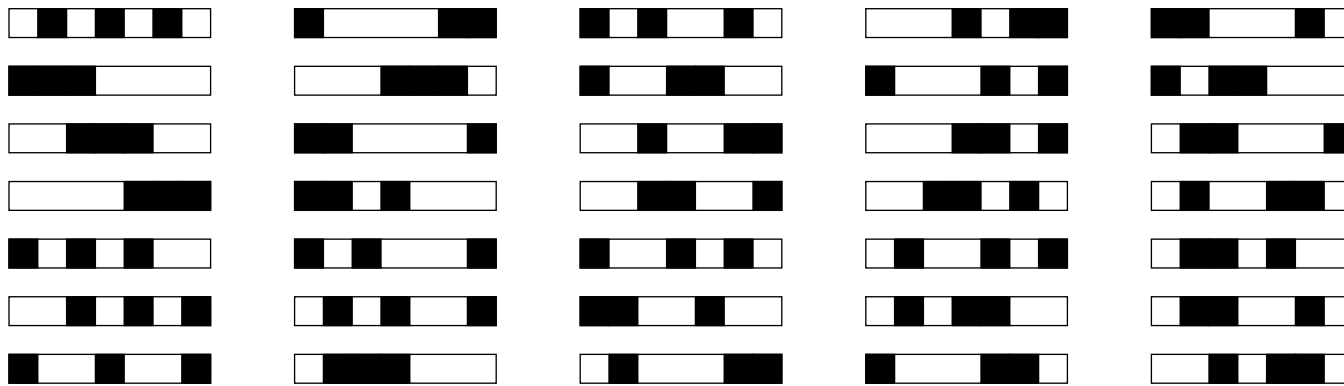
One problem with the pattern language is that the importance of geometry is not explicit:

The point is that I was aware of some sort of field of stuff—some geometrical stuff—which I had actually had a growing knowledge of for years and years, had thought that I had written about or explained, and realized that, although I knew a great deal about it, I had never really written it down....

In a diagnostic sense, I can say that if this geometrical field is not present in something then there is something wrong there and I can assess that fact within a few seconds.

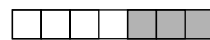
Is Beauty Objective?

Subsymmetry work in the '60's



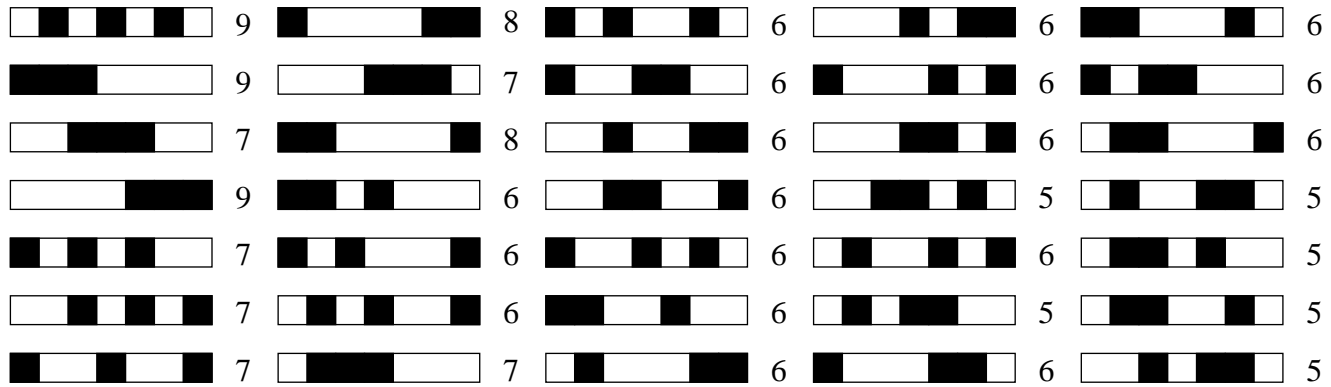
Is Beauty Objective?

Subsymmetries of length 3:



Is Beauty Objective?

Counting subsymmetries:



Turkish Carpets

His friends mentioned to him that his carpets had some special something:

When people started telling me this I began to look more carefully to discover that there was indeed something I was attracted to in a half-conscious way. It seemed to me that the rugs I tended to buy exuded or captured an incredible amount of power which I did not understand but which I obviously recognized.

In the course of buying so many rugs I made a number of discoveries. First, I discovered that you could not tell if a rug had this special property—a spiritual quality—until you had been with it for about a week.... So, as a short cut, I began to be aware that there were certain geometrical properties that were predictors of this spiritual property. In other words, I made the shocking discovery that you could actually look at the rug in a sort of superficial way and just see if it had certain geometrical properties, and if it did, you could be almost certain that it had this spiritual property as well.

Small Scale

In short, the small structure, the detailed organization of matter—controls the macroscopic level at a way that architects have hardly dreamed of.

But twentieth century art has been very bad at handling this level. We have become used to a “conceptual” approach to building, in which like cardboard, large superficial slabs of concrete, or glass, or painted sheetrock or plywood create very abstract forms at the big level. But they have no soul, because they have no fine structure at all....

It means, directly, that if we hope to make buildings in which the rooms and building feel harmonious—we too, must make sure that the structure is correct down to $\frac{1}{8}^{\text{th}}$ of an inch. Any structure which is more gross, and which leaves this last eighth of an inch, rough, or uncalculated, or inharmonious—will inevitably be crude.

Detail Leads to Color

The geometric micro-organization which I have described leads directly to the glowing color which we find in carpets. It is this achievement of color which makes the carpet have the intense “being” character that leads us to the soul.

A Carpet is a Picture of God

A carpet is a picture of God. That is the essential fact, fundamental to the people who produced the carpets, and fundamental to any proper understanding of these carpets....

The Sufis, who wove most of these carpets, tried to reach union with God. And, in doing it, in contemplating this God, the carpet actually tries, itself, to be a picture of the all seeing everlasting stuff. We may also call it the infinite domain or pearl-stuff.

Wholeness

The depth of feeling in a carpet is related to ***wholeness***:

Both the animal-being which comes to life in a carpet, and the inner light of its color, depend directly on the extent to which the carpet achieves wholeness in its geometry. The greatest carpets—the ones which are most valuable, most profound—are, quite simply, the carpets which achieve the greatest degree of this wholeness within themselves.

Alexander's Test of the Objective Quality of Beauty

If you had to choose one of these two carpets, as a picture of your own self, then which one of the two carpets would you choose?...

In case you find it hard to ask the question, let me clarify by asking you to choose the one which seems better able to represent your whole being, the essence of yourself, good and bad, all that is human in you.

Alexander's Test of the Objective Quality of Beauty



Flowered Carpet



Waving Border Carpet

Alexander's Test of the Objective Quality of Beauty

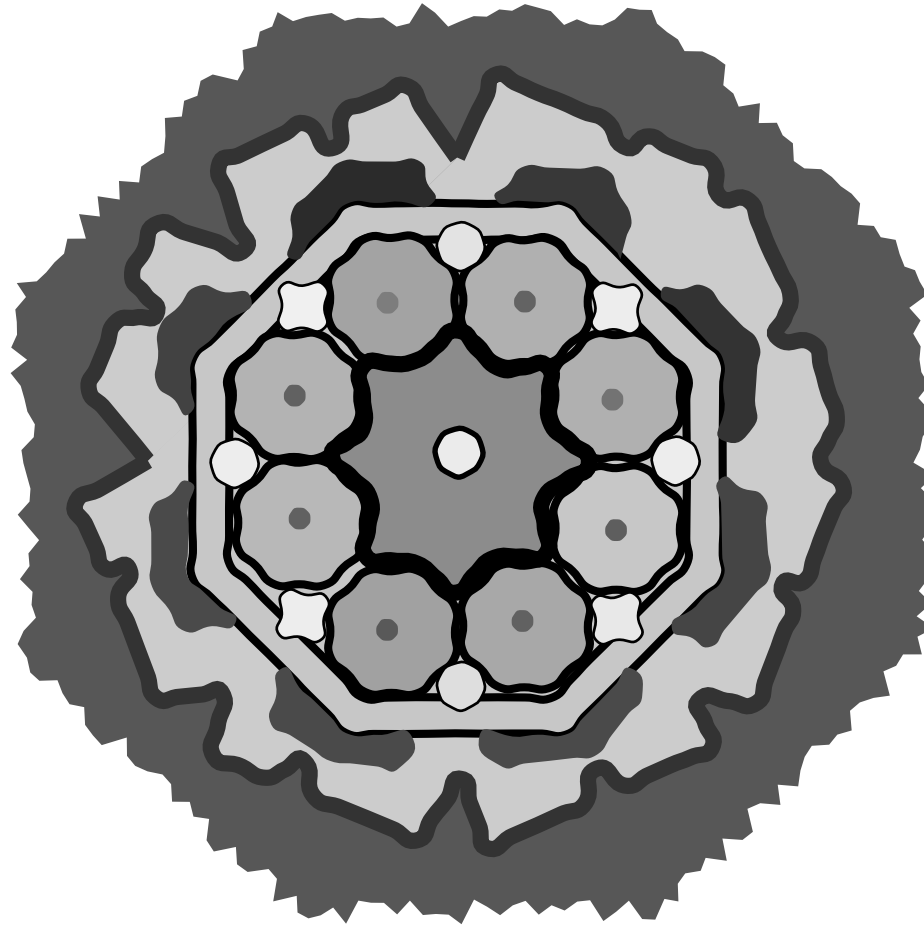
I believe that almost everyone, after careful thought, will choose the left-hand example. Even though the two are of roughly equal importance, and of comparable age, I believe most people will conclude that the left-hand one is more profound: that one feels more calm looking at it; that one could look at it, day after day, for more years, that it fills one more successfully, with a calm and peaceful feeling. All this is what I mean by saying that, objectively, the left-hand carpet is the greater—and the more whole, of the two.

Where Does this Quality Come From?

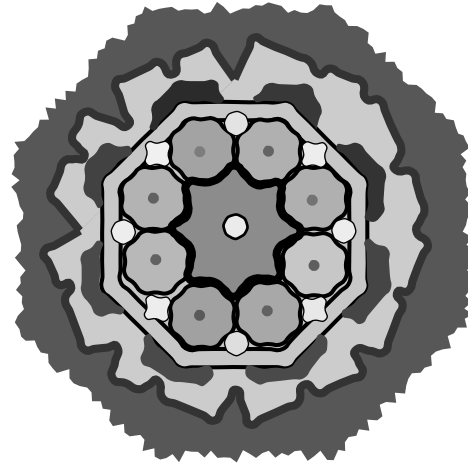
Centers:

As a first approximation, a “center” may be defined as a psychological entity which is perceived as a whole, and which creates the feeling of a center, in the visual field.

Centers in the Blossom Fragment



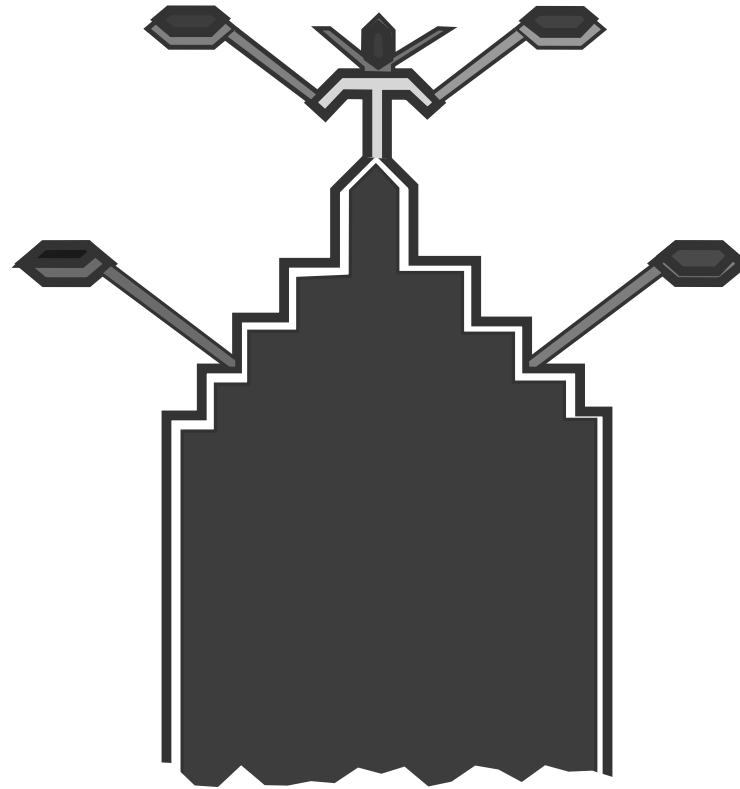
Centers in the Blossom Fragment:



Notice that this figure has a strong center—in the very middle. But that's not the main point. Each of the lighter octagons and diamonds forms another center, the darker dots at the centers of the smaller blossoms form others. The asymmetrical black leaves are kinds of centers. The sharp indentations of the outer press towards the middle, reinforcing the center.

[rpg]

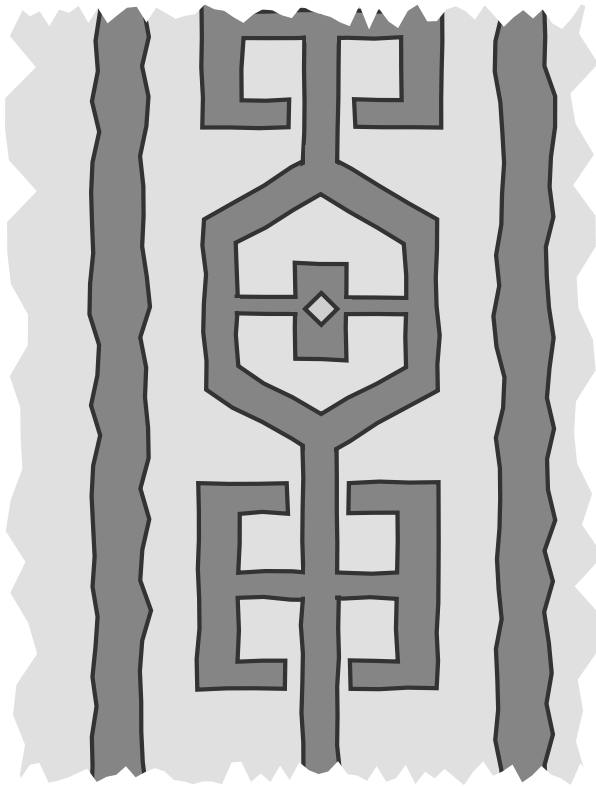
Niche of the Coupled Column Prayer Rug



Multiplicity of Centers

The degree of wholeness which a carpet achieves is directly correlated to the number of centers which it contains. The more centers it has in it, the more powerful and deep its degree of wholeness.

Border of the Seljuk Prayer Carpet



Here both the dark design elements and the lighter background form centers wherever there is a convex spot, wherever linear parts cross, and at bends. There are perhaps a dozen or more centers here. [rpg]

Local Symmetries

Centers are made up of local symmetries

- 1. Most centers are symmetrical. This means they have at least one bilateral symmetry.*
- 2. Even when centers are asymmetrical, they are always composed of smaller elements or centers which are symmetrical.*
- 3. All centers are made of many internal local symmetries, which produce smaller centers within the larger center (most of them not on the main axis of the larger center), and have a very high internal density of local symmetries. It is this property which gives them their power.*

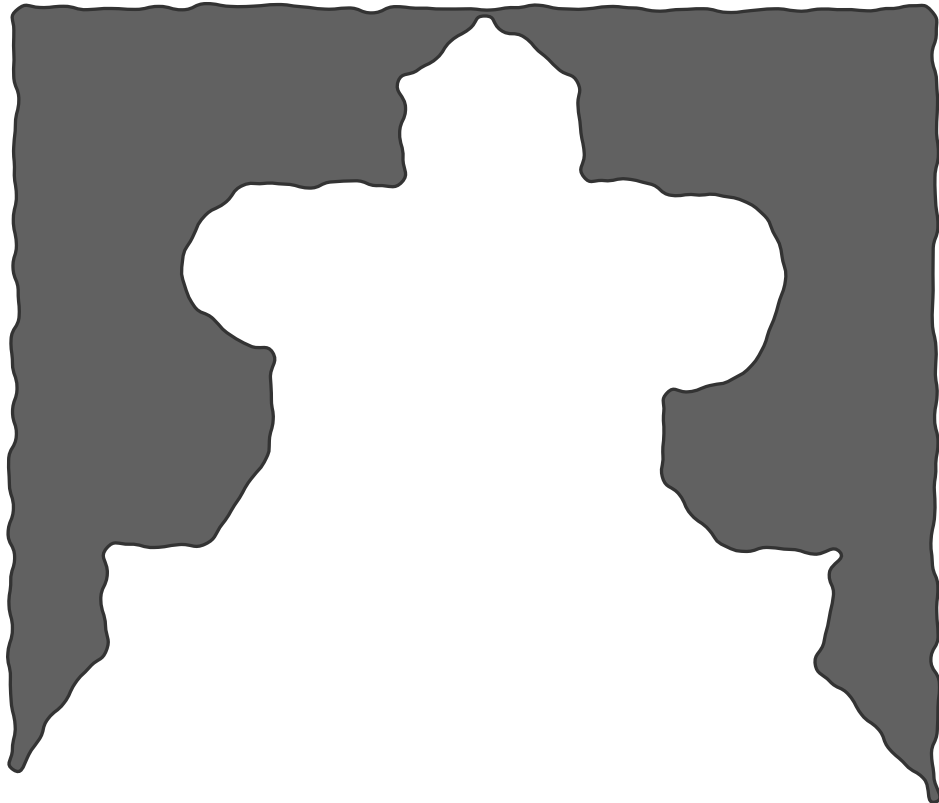
Symmetries?



Centers Recursively Defined

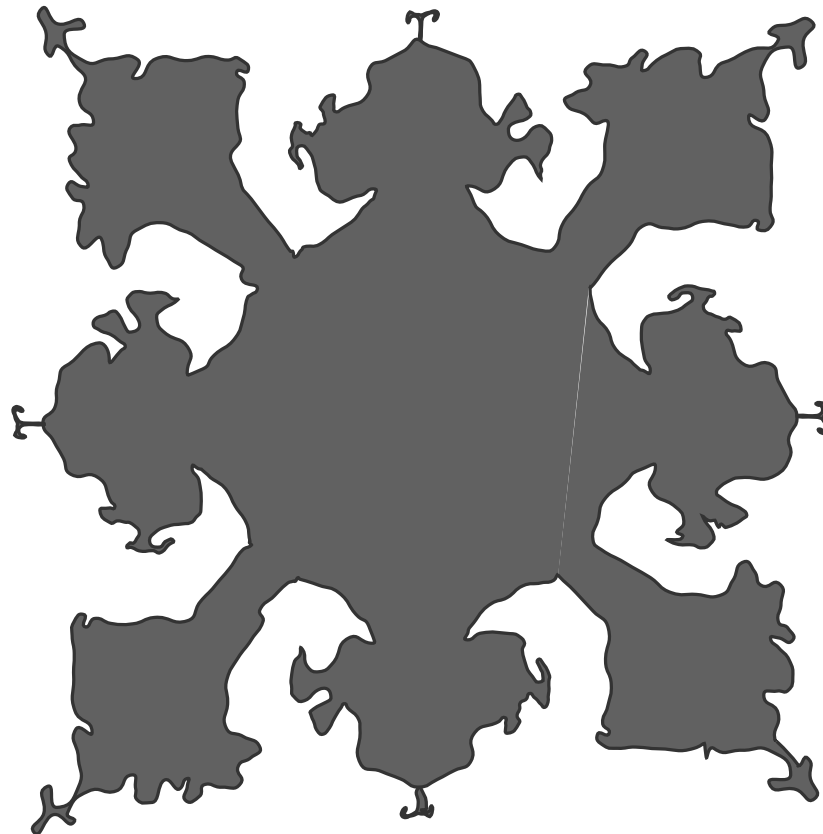
A center will become distinct, and strong, only when it contains, within itself, another center, also strong, and no less than half its own size.

Positive Space



Differentiation of Centers

Central Star of the Star Ushak Rug



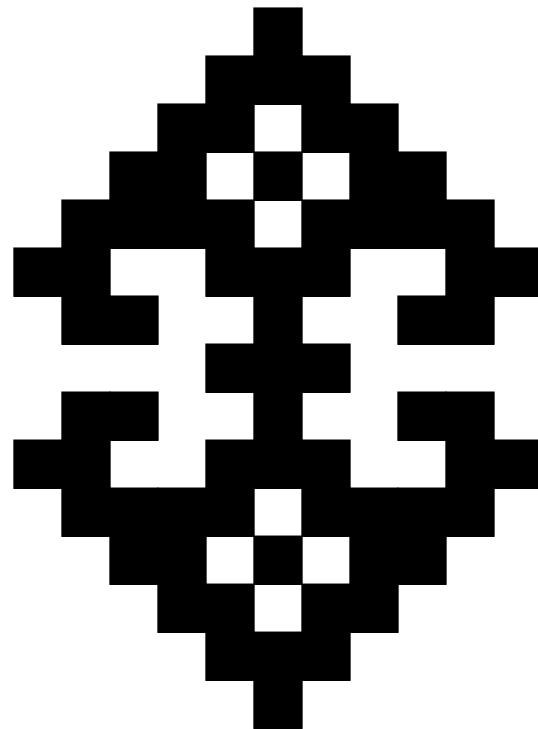
Central Star of the Star Ushak Rug

- 1. The centers next to the figure—those created by the space around it—are also very strong.*
- 2. These strong centers are extremely different in character from the star itself—thus the distinctness is achieved, in part, by the differences between the centers of the figure, and the centers of the ground.*
- 3. There are very strong color differences between field and ground.*
- 4. The complex character of the boundary line seems, at least in this case, to contribute to the distinctiveness of the form....*
- 5. The hierarchy of levels of scale in the centers also help create the effect, by increasing the degree to which the form is perceived as a whole, entity, or being in its own right.*

Definition of Centers

Every successful center is made of a center surrounded by a boundary which is itself made of centers.

Two-Dimensional Strips in Konya Carpets



Design Process for Carpets

*...the greatest structures, the greatest centers, are created not within the framework of a standard pattern—no matter how dense the structures it contains—but in a more spontaneous frame of mind, in which the centers lead to other centers, and the structure evolves, almost of its own accord, under completely autonomous or spontaneous circumstances. Under these circumstances **the design is not thought out, conceived—it springs into existence, almost more spontaneously, during the process by which it is made.***

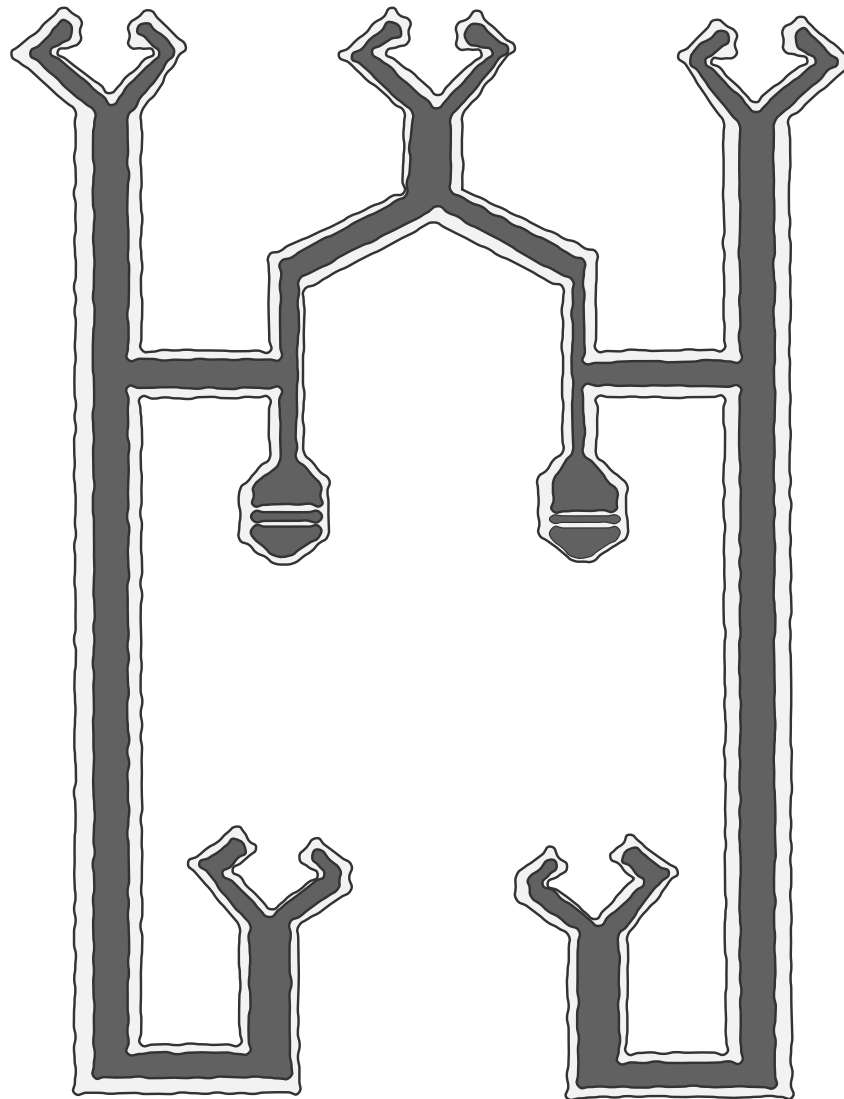
And, of course, this process corresponds more closely to the conditions under which a carpet is actually woven—since working, row by row, knot by knot, and having to create the design as it goes along, without ever seeing the whole, until the carpet itself is actually finished—this condition, which would seem to place such constraint and difficulty on the act of creation—is in fact just that circumstance in which the spontaneous, unconscious knowledge of the maker is most easily released from the domination of thought—and thus allows itself most easily to create the deepest centers of all.

The Emergence of Beings

I now present the culmination of the argument. This hinges on an extraordinary phenomenon—closely connected to the nature of wholeness—and fundamental to the character of great Turkish carpet art. It may be explained in a single sentence: As a carpet begins to be a center (and thus to contain the densely packed structure of centers...), then, gradually, the carpet as a whole also begins to take on the nature of “being.” We may also say that it begins to be a picture of a human soul.

The subject is delicate, because it is not quite clear how to discuss it—not even how to evaluate it—nor even in what field or category to place it. It opens the door to something we can only call “spirit” and to the empirical fact—a fact of psychology if of nothing else—that after all, when a carpet does achieve some greatness, the greatness it achieves seems to lie in the realm of the spirit, not merely in the realm of art.

The Being in the Seljuk Prayer Rug



Beginnings

I see the beginnings of an attitude in which the structure may be understood, concretely, and with a tough mind—not only with an emotional heart. And I see the rebirth of an attitude about the world, perhaps based on new views of ethics, truth, ecology, which will give us a proper ground-stuff for the mental attitude from which these works can spring.

I do not believe that these works—the works of the 21st century—will resemble the Turkish carpets in any literal sense. But I believe some form of the same primitive force, the same knowledge of structure, and the same desire to make a work in which the work carries and illuminates the spirit—will be present.

I am almost certain, that in the 21st century, this ground-stuff will appear.

Is the Story Over?

In order to better understand how these problems might be solved in software engineering, we might look at where Richard Gabriel's examination of my work stops short and at the remainder of my work, particularly, the progress my colleagues and I have made since 1985. It is in this time period that the goal of our thirty-year program has been achieved for the first time. We have begun to make buildings which really do have the quality I sought for all those years. It may seem immodest, to presuppose such success, but I have been accurate, painfully accurate in my criticism of my own work, for thirty years, so I must also be accurate about our success. This has come about in large part because, since 1983, our group has worked as architects and general contractors. Combining these two aspects of construction in a single office, we have achieved what was impossible when one accepts the split between design and construction. But it has come about, too, because theoretical discoveries, considerably more potent than the pattern language have supplemented the power of the patterns, and the way they work, and their effectiveness.

Is the Story Over?

The articles describe a number of my building projects that have indeed succeeded; they are both large and small, and include both private and public buildings. The first article gives concrete glimpses of material beauty, achieved in our time. Here the life, dreamed about, experienced in ancient buildings, has been arrived at by powerful new ways of unfolding space. These methods have their origin in pattern languages, but rely on new ways of creating order, in space, by methods that are more similar to biological models, than they are to extant theories of construction. Above all, they reach the life of buildings, by a continuous unfolding process in which structure evolves almost continuously, under the criterion of emerging life, and does not stop until life is actually achieved. The trick is, that this is accomplished with finite means, and without back-tracking. The second article describes the nature of the social process I believe is needed in the design-construction business to get these results; it is a kind of Hippocratic oath for the future. The second shows what kind of social and professional program may be needed to change things effectively in the world. If anything similar is needed for computer programmers, it would be fascinating. Both these articles may have a bearing on the way software people understand this material.

Is the Story Over?

*A full description of all these new developments, together with a radical new theoretical underpinning, will appear shortly in **The Nature of Order**, the book on geometry and process which has taken more than 20 years to write, and is just now being published. The book, being published by Oxford, will appear in three volumes: **Book 1: The Phenomenon of Life**, **Book 2: The Process of Creating Life**, and **Book 3: The Luminous Ground**. These three books show in copious detail, with illustrations from many recently-built projects all over the world, how, precisely how, these profound results can be achieved. What is perhaps surprising, is that in these books I have shown, too, that a radical new cosmology is needed to achieve the right results. In architecture, at least, the ideas of **A Pattern Language** cannot be applied mechanically. Instead, these ideas—patterns—are hardly more than glimpses of a much deeper level of structure, and is ultimately within this deeper level of structure, that the origin of life occurs. The quality without a name, first mentioned in **The Timeless Way of Building**, finally appears explicitly, at this level of structure.*

The Nature of Order

In the Winter of 1997 I obtained draft copies of the first two books of The **Nature of Order**. In those books Alexander presents a new theory of how beauty arises from a field of *centers*. The theory includes a process for creating beauty along with numerous examples.

The Nature of Order

Our idea of matter is essentially governed by our idea of order. What matter is is governed by our idea of how space can be arranged; and that in turn is governed by our idea of how orderly arrangement in space creates matter. So it is the nature of order which lies at the root of the whole thing. Hence the title of this book.

What is Order?

What is order? We know that everything in the world around us is governed by an immense orderliness. We experience order every time we take a walk. The grass, the sky, the leaves on the trees, the flowing water in the river, the windows in the houses along the street—all of it is immensely orderly. It is this order which makes us gasp when we take our walk. It is the changing arrangement of the sky, the clouds, the flowers, leaves, the faces round about us, the order, the dazzling geometrical coherence, together with its meaning in our minds. But this geometry which means so much, which makes us feel the presence of order so clearly—we do not have a language for it.

Mechanistic Idea of Order

The mechanistic idea of order can be traced to Descartes, about 1640. His idea was: If you want to know how something works, you can find out by pretending that it is a machine. You completely isolate the thing you are interested in from everything else, and you just say, suppose that thing, whatever it happens to be—the rolling of a ball, the falling of an apple, anything you want, in isolation—can you invent a mechanical model, a little toy, a mental toy, which does this and this and this, and which has certain rules, which will then replicate the behavior of that thing? It was because of this kind of Cartesian thought that one was able to find out how things work in the modern sense.

Two Devastating Results

The appearance of this 20th century mechanistic view had two tremendous consequences, both devastating for artists. The first was that the “I” went out of our world-picture. The picture of the world as a machine doesn’t have an “I” in it. The “I”, what it means to be a person, the inner experience of being a person, just isn’t part of this picture. Of course, it is still there in our experience. But it isn’t part of the picture we have of how things are. So what happens? How can you make something which has no “I” in it, when the whole process of making anything comes from the “I”? The process of trying to be an artist in a world which has no sensible notion of “I” and no natural way that the personal inner life can be part of our picture of things—leaves the art of building in a vacuum. You just cannot make sense of it.

The second devastating thing that happened with the onset of the 20th-century mechanistic world-picture was that our understanding about value went out of the world. The picture of the world we have from physics, because it is built only out of mental machines, no longer has any definite feeling of value in it: value has become sidelined as a matter of opinion, not intrinsic to the nature of the world at all.

The real nature of this deep order hinges on a simple and fundamental question: “What kinds of statements do we recognize as being true or false?”

Statements of Fact in the 20th Century

“One door frame is more harmonious and more in keeping with the life of the room than another door frame.” “One door creates more life in the room than another door.” “A pale yellow on this door has more life than a dark grey.” Within the canon of 20th century science, these are not considered statements which can be true or false. They are thought of as statements of opinion. As a matter of principle within the 20th century mechanistic view, statements of this kind may not be considered potentially true or false.

A New Concept of Life

So—my aim in this book is to create a scientific view of the world in which this concept—that everything has its degree of life—is well defined. We can then ask very precise questions about what must be done to create life in the world—whether in a single room, even in a doorknob, or in a neighborhood, or in a vast region

Life

I claim that this quality is not merely the basis for a distinction between beautiful things and ugly things. It is something which is detectable as a subtle distinction, in every corner of the world, as we walk about, in the most ordinary places, during the most ordinary events. It is a quality which changes from place to place and from moment to moment, and which marks, in varying degrees, every moment, every event, every point in space.

Alexander's Hypothesis

I state this by means of the following hypothesis: What we call “life” is a general condition which exists to some degree or other in every part of space: brick, stone, grass river, painting, building, daffodil, human being, forest, city. And further: The key to this idea is that every part of space—every connected region of space, small or large—has some degree of life, and that this degree of life is well-defined, objectively existing and measurable.

Centers and Wholeness

There is a class of entities which I call centers appearing everywhere in space. They appear where they do, as a result of the configuration which appears in the world. Every part of the world, at every scale, has centers appearing in it.

The system of these centers plays a vital role in determining what happens in the world. The system as a whole—that is to say, its pattern—is the thing which we generally think of when we speak about something as a whole. Although the system of centers is fluid, and changes from time to time as the configuration and arrangement and conditions all change. Still, at any given moment, these centers form a definite pattern. This pattern of all the centers appearing in a given part of space—constitutes the wholeness of that part of space. It is this structure, which is responsible for its degree of life.

Wholeness

The wholeness of a window is the coherence which binds the window together—its sill, glass, the sloping reveals, its mullions, the landscape outside, the light coming in, the soft light on the wall next to the window, the chair drawn up toward the window's light—and the arrangement of the larger entities which makes them one: the space of the window seat which binds reveals, seat, sill, and window plane; the view which combines chair, outdoor landscape, and the glazing bars into a single entity; the light falling on the window reveal and on the floor. In each case the wholeness is defined by the major wholes and the way these wholes are arranged to form still larger wholes.

Centers

<Centers> are those particular identified sets, or systems, which appear within the larger whole as distinct and noticeable parts. They appear because they have noticeable distinctness, which makes them separate out from their surroundings and makes them cohere, and it is from the arrangements of these coherent parts that other coherent parts appear.

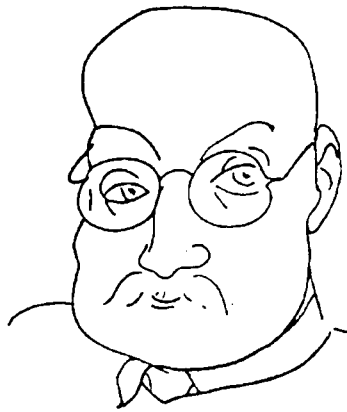
Centers

The crux of the matter is this: A center is a kind of entity which can be defined only in terms of other centers. Centers are—and can only be—made of other centers.

Centers

1. *Centers arise in space.*
2. *Each center is created by configurations of other centers.*
3. *Each center has a certain life or intensity. . . . This life or intensity is not inherent in the center by itself, but is a function of the whole configuration in which the center occurs.*
4. *The life or intensity of one center gets increased or decreased according to the position and intensity of other nearby centers. Above all, centers become most intense when the centers which they are made of help each other.*
5. *The centers are the fundamental elements of the wholeness, and the degree of wholeness or life, of any given part of the poem depends entirely on the presence and structure of the centers there.*

Centers



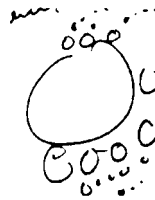
Fifteen Properties

Over a 20+ year period, Alexander examined objects for life and wholeness. He identified 15 structural features which appear again and again in things which have life:

- Levels of Scale
- Strong Centers
- Boundaries
- Repetition
- Positive Space
- Good Shape
- Local Symmetries
- Deep Interlock and Ambiguity
- Contrast
- Gradients
- Roughness
- Echoes
- The Void
- Simplicity and Inner Calm
- Not-Separateness

Levels of Scale

- Centers of all sizes
- Centers of all sizes support or help each other
- Small jumps (2:1 to 4:1 is best)



Strong Centers

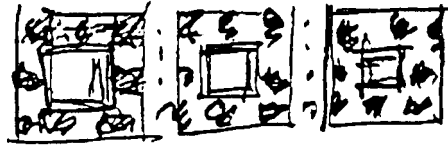
- Not just centers but strong centers
- A strong center is one toward which other centers point

... the eye rests on it, one keeps coming back to it, going away from it, coming back to it. In short, the entire design sets up a vector field so that every point has the property that from that point the center is in a certain direction



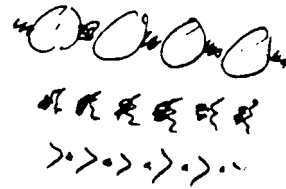
Boundaries

- A boundary separates a center from other centers
- A boundary focuses attention on the center
- A boundary is itself made of centers



Alternating Repetition

- Strong centers repeated with alternating centers
- Not simple repeating
- Pattern with variation

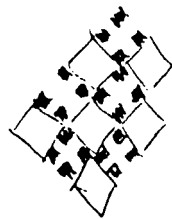


Positive Space

- Positive space is the characteristic of a center that moves outward from itself, seemingly oozing life rather than collapsing on itself

We may see it like ripening corn, each kernel swelling until it meets the others, each one having its own positive shape caused by its growth as a cell from the inside.

In poor design, sometimes, in order to give an entity good shape, the background space where it lies has left-over shape, or no shape at all. It is merely left over.



Good Shape

- Good shape is the characteristic of a center that it is somehow beautiful by itself
- A center has good shape when it is reinforced by other centers of good shape
- A center has good shape when it is made of centers of good shape



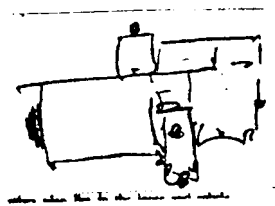
Local Symmetries

Wherever there is a local symmetry, there tends to be a center.

Living things, though often symmetrical, rarely have perfect symmetry. Indeed, perfect symmetry is often a mark of death in things rather than life.

Observe, first, that overall symmetry in a system, by itself, is not a strong source of life or wholeness.

In general, a large symmetry of the simplified neoclassicist type rarely contributes to the life of a thing, because in any complex whole in the world, there are nearly always complex, asymmetrical forces at work—matters of location, and context, and function—which require that symmetry be broken.



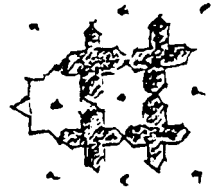
Deep Interlock and Ambiguity

- Centers are sometimes “hooked” into their surroundings
- It is sometimes difficult to disentangle a center from its surroundings
- . . . through actual interlock
- . . . through an ambiguous zone which belongs both to the center and to its surroundings
- A Go board in mid-game



Contrast

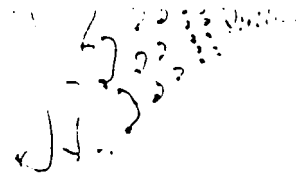
Another feature I have found repeatedly in works of art which have great life is that they often have surprisingly intense contrast in them—far more than one remembers, more than one imagines would be helpful or even possible to sustain.



Gradients

You have noticed I am sure, as I have, that almost anything which has real life has a certain softness. Qualities vary, slowly, subtly, gradually, across the extent of each thing. Gradients occur. One quality changes slowly across space, and becomes another.

Almost always the strengthened field-like character of the center is caused, in part, by the fact that an organization of smaller centers creates gradients which "point to" some new and larger virtual center. Sometimes the arrows and gradients set up in the field give the center its primary strength.



Roughness

Things which have real life always have a certain ease, a morphological roughness. It is not a residue of technically inferior culture, or the result of handcraft or inaccuracy. It is an essential structural feature which they have and without which a things cannot be whole.



Roughness

Often the border of an ancient carpet is “irregular” where it goes round the corner—that is, the design breaks, the corner seems “patched together.” This does not happen through carelessness or inaccuracy. On the contrary, it happens because the weaver is paying close attention to the positive and negative, to the alternating repetition of the border, to the good shape of each compartment of the wave and each bit of open space—and makes an effort all along the border to be sure these are “just right.” To keep all of them just right along the length of the border, some loose and makeshift composition must be done at the corner.

If the weaver wanted instead to calculate or plot out a so-called “perfect” solution to the corner, she would then have to abandon her constant paying attention to the right size, right shape, right positive-negative of the border elements, because these would all be determined mechanically by outside considerations—i.e., by the grid of the border. The corner solution would then dominate the design in a way which would destroy the weaver’s ability to do what is just right at each point. The life of the design would be destroyed.

<continued>

Roughness

All my examples show how the seemingly rough solution—which seems superficially inaccurate—is in fact more precise, not less so, because it comes about as a result of paying attention to what matters most, and letting go of what matters less. As the power of this completed carpet clearly shows, a perfect corner does not matter nearly as much as the correct balance and positive space in the border. The seemingly rough arrangement is more precise because it comes from a much more careful guarding of the essential centers in the design.

In a man-made thing, another essential aspect of the property of roughness, is its abandon. Roughness can never be consciously or deliberately created. Then it is merely contrived. To make a thing live, its roughness must be the product of egolessness, the product of no will.

Echoes

When Echoes is present, the various smaller elements and centers, from which the larger centers are made, are all members of the same family, they contain echoes of one another, there are deep internal similarities between them which tie them together to form a single unity.

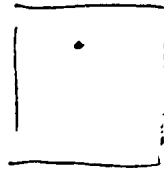


The Void

In the most profound centers which have perfect wholeness, there is at the heart a void, which is like water, in infinite depth—surrounded by and contrasted with the clutter of the stuff and fabric all around it.

- The altar
- The empty space at the crossing of a church or mosque

The need for the void arises in all centers. A cup or a bowl rests, as a living center, on the quiet of the space in the bowl itself, its stillness.

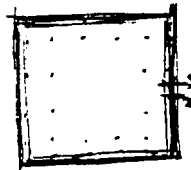


Simplicity and Inner Calm

It has to do with a certain slowness, majesty, quietness, which I think of as inner calm.

This quality comes about when everything unnecessary is removed. All centers that are not actively supporting other centers are stripped out, cut out, excised. What is left, when boiled away, is the structure in a state of inner calm.

It is essential that the great beauty and intricacy of ornament go only just far enough to bring this calm into being, and not so far that it destroys it.



Simplicity and Inner Calm

Shaker furniture:

- *It uses very simple shapes (the actual pieces of wood have simple shapes and are usually close to the form in which they were first milled).*
- *The ornament is very sparse, but does occasionally exist to offset the classical line, with an off curve here or there, but less than in other American pieces.*
- *The proportions are unusual. Pieces are unusually long, unusually high, elongated, tall, broad, etc. They are marked by their proportions as slightly unusual or remarkable—even startling. Often this has a good reason in it (i.e. use all the space available, etc.).*
- *Many of the pieces are strange in some specific way which marks them as indeed unusual. For instance, chest with drawers opening from different sides; two beds sliding under a bigger bed; table with drawers hanging on either side of pedestal; peg boards. Always these “strange” configurations have good reasons and come from an uncompromising steadfastness to function, following the thing to its logical conclusion, refusing to be deterred by convention. An extreme freedom.*

<continued>

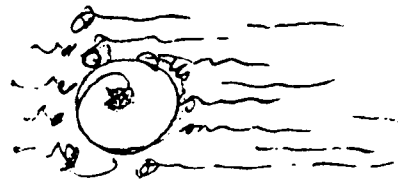
Simplicity and Inner Calm

- *Pieces were colored—beautiful colors, most often worked into the wood (not paint), and coded, yellow, blue, red, green, etc., each for its specific type of furniture. Yet they were always severe. What this means is the essence, but very hard to pin down.*
- *Finally, everything is still, silent.*

Not Separateness

What Not Separateness means, quite simply, is that we experience a living whole as being at one with the world, and not separate from it—according to its degree of wholeness.

This is, finally, perhaps the most important property of all. In my experiments with shapes and buildings, I have discovered that the other fourteen ways in which centers come to life, will make a center which is compact, beautiful, determined, subtle—but, without this fifteenth property, are still often somehow strangely separate, cut off from what lies around it, lonely, awkward in its loneliness, too brittle, too sharp, perhaps too well delineated—above all too egocentric, because it shouts “Look at me, look at me, look how beautiful I am.”



An Empirical Test for Comparing the Degree of Life of Different Centers (Mirror of the Self)

- *Which of the two seems to generate a greater feeling of life in me?*
- *Which of the two makes me more aware of my own life?*
- *Which of the two makes me feel a greater wholesomeness in myself?*
- *Which of the two is more like my best self, or which of the two seems more like a picture of the self?*
- *Which of the two makes me feel devotion, or inspires devotion in me?*
- *Which of the two makes me more aware of God, or makes me feel close to God?*
- *How do I observe the rising and falling of my humanity: Which of the two causes a greater rising of my humanity?*
- *Which of the two has more feeling in it or, more accurately: Which of the two makes me experience a deeper feeling of unity in myself?*

Unfolding

- In nature, order unfolds smoothly
- In general, order emerges from a process which is integral to the thing being created
 - a painting emerges through a seemingly random process of adding and altering paint
 - a wood carving emerges through a seemingly random process of removing and smoothing wood

Structure-Preserving Transformations

A structure-preserving transformation strengthens existing centers by doing one or several of the following:

- adding new centers that reinforce existing ones
- strengthening or developing one or several existing centers into a more complex, stronger center
- removing weak or dysfunctional centers

The process, in general, adds one or several of the 15 characteristics discussed earlier

Image-based Architecture and Building

Modern (and post-modern) architecture is based on coming up with a picture or image and then constructing it, usually out of components and modular parts

Alexander's Definition of Architecture

Architecture is just that stuff—material organization—which has unfolded.

Four Conditions Necessary for Unfolding to Happen

- **Step-by-Step Adaptation:** *The process, whether large or small, must be step-by-step, and gradual. Each part of the environment, at every stage of its planning, conception, and construction, must evolve, be developed step-by-step. The form must be created step-by-step, each step being an adaptation in which things get fitted more and more closely to a harmonious whole.*
- **Feedback:** *To guide the adaptation, at each step in the process there must be a continuous and relatively immediate feedback about whether what has been done is a living structure in sufficient degree. In human society this requires as a minimum a common shared understanding of “life”. The process is then capable of adapting to this feedback, instantaneously, so that what has life can be kept and what doesn’t have life will be rejected—with agreement—all while the process is going on.*

<continued>

Four Conditions Necessary for Unfolding to Happen

- **Unpredictability:** *To make the adaptation successful, the process must be relaxed about the unpredictable character of where it goes. Unfolding cannot occur except in a framework which allows the whole to go where it must go. The dire modern passion for planning and advance control must be replaced by an attitude which recognizes that openness to the future, and lack of predictability, is a condition for success. It must be alright for the thing to become whatever it becomes, under the influence of adaptation and feedback, even though one does not know, in detail, what that thing is going to be.*
- **Awareness of the Whole:** *Fourth, and this is the most difficult for us, there must be an ever-present awareness of the whole, throughout the process. For the adaptation to allow wholes to unfold successfully, the unfolding must take place within a framework of true awareness of the whole.*

Fundamental Process (1–5)

1. *At every step of the process—whether conceiving, designing, making, maintaining, or repairing—we must always be concerned with the whole within which we are making anything. We look at this wholeness, absorb it, try to feel its deep structure.*
2. *We ask which kind of thing we can do next that will do the most to give this wholeness the most positive increase of life.*
3. *As we ask this question, we necessarily direct ourselves to centers, the units of energy within the whole, and ask which one center could be created (or extended or intensified or even pruned) that will most increase the life of the whole.*
4. *As we work to enhance this new living center, we do it in such a way as also to create or intensify (by the same action) the life of some larger center.*
5. *Simultaneously we also make at least one center of the same size (next to the one we are concentrating on), and one or more smaller centers—increasing their life too.*

Fundamental Process (6–8)

6. *We check to see if what we have done has truly increased the life and feeling of the whole. If the feeling of the whole has not been deepened by the step we have just taken, we wipe it out. Otherwise we go on.*
7. *We then repeat the entire process, starting at step 1 again, with the newly modified whole.*
8. *We stop altogether when there is no further step we can take that intensifies the feeling of the whole.*

What of Patterns and Pattern Languages?

- The Fundamental Process needs some idea of what is being built:
 - e.g. for a fireplace you need a firebox, a fireback, splayed sides, a hearth, a throat, a smoke shelf, and a chimney
- What you are building has a cultural component because of how cultures have come to live:
 - tea for an Englishman involves sitting on chairs
 - tea for an Indian involves sitting on the floor
- Therefore one needs a set of generic centers
- These generic centers form the pattern language for the project

The essence of it is that the generic centers must unfold from the culture.

What of Patterns and Pattern Languages?

There was always one great difficulty with the theory of pattern languages, and with the languages my colleagues and I, and others, published. Where did the patterns come from?

Much of our early work implicitly made use of the idea that good patterns were to be derived, somehow, from existing culture thus ensuring a relation to the subtleties of culture variation, and preserving things that were good and important, which had been swept aside in the onrush of technocivilization. But there was always hanging over this process, a sword of Damocles. If—as a procedure—one takes the patterns from existing culture, then one merely reiterates what is being built. That is not necessarily good.

The unfolding process takes existing cultural patterns and moves the culture forward.

Sequences

A sequence is the ordering of an unfolding. It is a series of statements that describe the thing to be created.

Japanese Tea House Sequence

1. *SECLUDED TEA HOUSE. The tea house is in a secluded garden.*
2. *GARDEN WALL. Some kind of wall or barrier surrounds the entire garden. From inside the garden the public world is not visible, and hardly audible. If there is a family dwelling associated with the tea house, the dwelling may be part of this wall.*
3. *INNER AND OUTER GARDEN. A low barrier divides the garden into two parts: an outer garden and an inner garden. The tea house is in the inner garden.*
4. *GARDEN PATH. There is a slightly meandering path running through the outer garden, past the low barrier, and through the inner garden to the tea house.*
5. *STONE PATH. The meandering garden path is composed of mossy stepping stones, and is loosely bordered by trees and bushes.*
6. *OUTER GATE. Where the garden path meets the edge of the outer garden there is a gate, connecting the outer garden to the public walk. The gate is opaque. There are no direct view of the public path into the outer garden.*

Japanese Tea House Sequence

7. *MIDDLE GATE.* Where the garden path crosses the low barrier, between the inner garden and the outer garden, there is a gate called the middle gate. The middle gate is small with a roof or low door on hinges.
8. *BRANCHING PATHS.* In the outer garden the garden path may branch in several places along its length. Any given branching path may or may not lead eventually to the tea house.
9. *GUIDE STONES.* Where the path branches there are guide stones set near the stepping stones. The host closes off some branches by placing a guide stone on the stepping stone at the branching point. Before the guest arrives on a given day there is only one path open through the garden to the tea house.
10. *WAITING BENCH.* In the outer garden, near the middle gate, there is a waiting bench. The bench is roughly 7 feet long, and may be covered.
11. *WAITING NEAR HOUSE.* If there is a family dwelling associated with the tea house, then the waiting bench is usually near the dwelling. If so, the waiting area may be connected with the physical structure of the dwelling.
12. *TEA HOUSE APPROACH.* The length of the path from the middle gate and waiting bench to the tea house, is rarely more than 20 feet.

Japanese Tea House Sequence

13. *STONE WATER BASIN.* Somewhere along this 20 foot path through the inner garden, between the middle gate and tea house, there is a stone water basin and running water.
14. *RECESS SHELTER* If the tea house is to accommodate long meal sessions, then there is a covered bench a few steps away from the tea house where people can sit and view the garden.
15. *KNEELING-IN ENTRANCE.* Where the stone path meets the tea house there is a window like entrance—a small opening in the face of the tea house. The entrance is roughly 2 feet high and 2 feet wide, and 2 feet above the path. Thus a man entering must stoop down and kneel in.
16. *TEA HOUSE HAS THREE PARTS.* The tea house is made up of three parts in plan: the tea-room proper, the tokonoma and an anteroom. The tea-room is the largest part—it is where the guests gather and the tea ritual occurs. The anteroom is a tiny area off the tea room where equipment is kept and some preparation is made. The tokonoma is a shallow alcove off the tea-room where objects, art, and flowers are displayed.
17. *SIZE OF THE TEA HOUSE.* The floor area of the tea room is limited to four sizes: 1.5 mat, 2 mat, 3 mat and 4.5 mat (a mat is roughly 6'x 3').

Japanese Tea House Sequence

18. *4.5 MAT CONFIGURATION. In the 4.5 mat tea room, the half mat is placed in the center, and the 4 mats laid evenly around it in a spiral.*
19. *CENTRAL HEARTH. A small square hearth is fitted into the floor at approximately the center of the tea room. Guests sit on pillows around the heart.*
20. *HOST'S ENTRANCE. The host enters the tea house through a sliding screen door. The hosts entrance is always in a different wall than the kneeling-in entrance.*
21. *CEILING HEIGHT. The tea room has a roughly 6.5 foot ceiling in it.*
22. *DIM LIGHTING. There are very few windows in the tea house walls. Where there are windows they are high, near the ceiling—and placed to give a dim indirect light throughout the tea house.*
23. *TOKONOMA. The tokonoma is an alcove off the tea room, which is visible on entering the tea house. The size of the tokonoma varies with the size of the tea room. In the smallest tea-house the tokonoma is simply a curve in the wall.*
24. *TOKONOMA PILLAR. The tokonoma contains a small pillar on which an object, a work of art, or a vase of flowers may be placed. The pillar is made of wood—a kind of wood not used in the rest of the tea house.*

Sequences

A generative sequence not only guarantees feasibility and the emergence of a coherent form. It also provides the conditions in which structure-preserving transformations can occur.

For instance, in the tea house. if I try to locate the waiting bench too early, at a moment when I do not yet have the location of the middle barrier, the context for placing it does not yet exist. But more important, it is also not possible, in this case, for me to use the waiting bench and its location to preserve the structure of the rest. For the waiting bench to preserve the structure of the garden, I have to put it in at a time when the garden has developed. I can make the structure-preserving process work only if things come at the right time, in the right order.

Sequences

If there is no sequence, the fundamental process guarantees you'll find a good sequence, but it might take more work.

Design and Construction at the Same Time

If we look at any one sequence of unfolding, we may think of it as a long sequence of experiments to find out which centers should, most appropriately, unfold next, and in what way they will unfold best, to do the most, for the emerging wholeness. As far as possible, we do this with real life experiments, full size simulations so that one by one we check the various features. Whenever we cannot do real life size experiments, we do the most realistic simulation we can to check experimentally whatever aspect we are trying to fix.

As the features get fixed one by one, the whole takes its form. This is the practical way in which the unfolding happens.

The experimental nature of this activity is vital. I find that while I am working, I am often wrong ten times for every one time I am right. This is why the experiments are so essential. You cannot tell what next step has the biggest effect on the life and wholeness of the larger whole, without trying things out. This trying out is the human equivalent of the feedback which nature accomplishes in even smaller increments during every physical process. And of course, because you are finding out, you must be wrong some of the time, even much of the time. In many cases, it is by being wrong, by trying things out and seeing how they do not work, that you first get a realistic sense of how to do it differently, and right.

This is always so, and is fundamental to all success.

Deep Feeling

In the end, it is the quality that a building can generate deep feelings in people that matters most.

People are able to judge the whole, to see and experience the whole, by paying attention to the question: Is it increasing my own wholeness? Is it increasing the feeling I experience when in contact with the thing? Is it becoming like a mirror of the self? Is it becoming like the soul? More succinctly, the extent to which a thing is coming to life, can be steered by the extent to which it has deep feeling.

...

Being guided by the whole, and being guided by feeling are thus synonymous. Real feeling, true feeling, is the experience of the whole.

This principle may be formulated as an essential rule: In any building process, the way forward, the next step which is most structure preserving, is that step which intensifies the feeling most.

Feeling gives us our access to structure preserving transformations. It is the process of intensifying deep feeling in the whole which is thus the key of the unfolding process—whenever it is in human hands.

Deep Feeling

Obviously, the key issue in all these statements is the precise definition of the word “feeling,” and what we mean, exactly, by saying that a structure feels right. It requires a holistic, non-emotional approach to feeling, where we ask ourselves to what extent a given structure feels right, in the sense of “possesses life,” “possesses unity.”

This almost rarefied and abstract feeling, going to the highest level, is something very different from rank emotionalism: and it is this which I claim correlates correctly, and universally, with functional rightness.

It is not an artist expressing or recording feeling or emotion in a work of art—it is making a building (or work of art) generate feeling in people (in me).

Conclusion?

Alexander is trying to develop software which will embody the ideas of wholeness, unfolding, centers, structure-preserving transformations, and sequences. In his 1996 OOPSLA keynote address, he called on the computing community to come to the aid of his anti-Cartesian crusade.

What do you think?