A Search for Beauty
A Struggle with Complexity

Richard P. Gabriel

Jenny Quillien

Christopher Alexander

Richard P. Gabriel

Jenny Quillien

Only mystery enables us to live

Only mystery

–Federico Garcia Lorca

- 1964: Notes on the Synthesis of Form
- 1965: On Value
- 1965: A City is Not a Tree
- 1965: BART: The Bay Area Takes a Million Dollar Ride
- 1973: The Grass Roots Housing Process
- 1975: The Oregon Experiment
- 1977: A Pattern Language
- 1979: The Timeless Way of Building

- 1982: The San Francisco Waterfront Project
- 1985: The Production of Houses
- 1987: A New Theory of Urban Design
- 1991: The Perfection of Imperfection
- 1993: A Foreshadowing of 21st Century Art
- 1997: The Nature of Order, The Process of Creating Life
  (Draft dated January 26, 1997)

- 2001: The Nature of Order, The Phenomenon of Life, Vol 1
- 2002: The Nature of Order, The Process of Creating Life, Vol 2
- 2004: Sustainability and Morphogenesis: The Birth of a Living World
- 2004: The Nature of Order, The Luminous Ground, Vol 4
- 2005: The Nature of Order, A Vision of a Living World, Vol 3
- 2007: The Long Path that Leads from the Making of Our World to God
- 2012: Battle for the Life and Beauty of the Earth
- 2016: Making the Garden

Sixties, Early Material

Education

- wanted fine arts career / his father said “no”
- BA Architecture, Trinity College, Cambridge
- MA Mathematics, Trinity College, Cambridge
- PhD Architecture, Harvard

Our Lenses

- direct and literary experience
- Warren Weaver & Jane Jacobs on complexity
- trying to reproduce some of his key experiments
- trying to explain his contradictory statements

Complexity

- chaos, fractals
- disorganized complexity
  - tools: probability & statistics
- simple complexity / few variables
- organized complexity
  - nonrandom interaction, unfolding, emergence, appearance of purpose
  - tools: modeling & simulation


RORC YCF
LR

Notes on the Synthesis of Form

- CA's PhD Dissertation
- misfits
- selfconscious / unselfconscious processes

Misfits

If a man wears eighteenth-century dress today, or wears his hair down to his shoulders, or builds Gothic mansions, we very likely call his behavior odd: it does not fit our time. These are abnormalities. Yet it is such departures from the norm which stand out in our minds, rather than the norm itself. Their wrongness is somehow more immediate than the rightness of less peculiar behavior, and therefore more compelling. Thus even in everyday life the concept of good fit, though positive in meaning, seems very largely to feed on negative instances; it is the aspects of our lives which are obsolete, incongruous, or out of tune that catch our attention.

Misfits

Design is the somewhat humble activity of recognizing 'misfits' and correcting them while leaving in place that which worked well.

Unselfconscious

- long-standing building traditions grounded in soil and history
- distributed intelligence because *think local / act local*
- redundancy of information because multiple sources
- geography, weather patterns, cultural demands, local materials

Unselfconscious

- mud huts, igloos, crofts, stave churches
- the person repairing a dwelling is the dweller
- simple, local tools / simple, local materials
- rocks from a cleared field become building blocks

Feedback Loops

If the process is to maintain the good fit of dwelling forms while the culture drifts, it needs a feedback sensitive enough to take action the moment that one of the potential failures actually occurs. The vital feature of the feedback is its immediacy. For only through prompt action can it prevent the build-up of multiple failures which would then demand simultaneous correction....

“I Like it Slow”

...the sensitivity of feedback is not in itself enough to lead to equilibrium. The feedback must be controlled, or damped, somehow. Such control is provided by the resistance to change the unselfconscious culture has built into its traditions. We might say of these traditions, possibly, that they make the system viscous. This viscosity damps the changes made, and prevents their extension to other aspects of the form. As a result only urgent changes are allowed. Once a form fits well, changes are not made again until it fails to fit again. Without this action of tradition, the repercussions and ripples started by the slightest failure could grow wider and wider until they were spreading too fast to be corrected.

Old Shetland Thatch

- no wood; use straw ropes (*ovi*) in place of small roof timbers
- turves (*poan*) for the overlapping underlayer (*turf / peat*)
- a coat of oat straw (*tekk*) would normally follow
- the thatch coatwork never overhangs the walls;
  it is traditionally fixed down with weighted ropes
- the ropes were made of heather;
  the *linksten* (stones) were made of the abundant flagstone

Unselfconscious

The source of this trouble lies with the individual. In the unselfconscious system the individual is no more than an agent. He does what he knows how to do as best he can. Very little demand is made of him. He need not himself be able to invent forms at all. All that is required is that he should recognize misfits and respond to them by making minor changes. It is not even necessary that these changes be for the better. As we have seen, the system, being self-adjusting, finds its own equilibrium—provided only that misfit incites some reaction in the craftsman. The forms produced in such a system are not the work of individuals, and their success does not depend on any one man's artistry, but only on the artist's place within the process.

Selfconscious

The selfconscious process is different. The artist's selfconscious recognition of his individuality has deep effect on the process of form-making. Each form is now seen as the work of a single man, and its success is his achievement only. Selfconsciousness brings with it the desire to break loose, the taste for individual expression, the escape from tradition and taboo, the will to self-determination. But the wildness of the desire is tempered by man's limited invention.

Selfconscious

To achieve in a few hours at the drawing board what once took centuries of adaptation and development, to invent a form suddenly which clearly fits its context—the extent of the invention necessary is beyond the average designer. A man who sets out to achieve this adaptation in a single leap is not unlike the child who shakes his glass-topped puzzle fretfully, expecting at one shake to arrange the bits inside correctly. The designer's attempt is hardly random as the child's is; but the difficulties are the same. His chances of success are small because the number of factors which must fall simultaneously into place is so enormous.

Aside: Fred Brooks OOPSLA 2007 Keynote

The central problem…is to get conceptual integrity in the design itself….

If we look back then at the 19th century and the things that happened…[great works] *were very largely the designs of single designers….*

…most works of art have not been made [by teams]. *And that's true whether we look at literature, whether we look at music…and the exceptions to the notion that most of the great works we know of were done by one mind are in fact done by two minds and not by teams.*

Notes & Computer Scientists

1. they love this book
2. because design as removing misfits sounds great
3. because CA demonstrates that some of it can be treated **mathematically**
4. except #3 is wrong, or at least, CA did a lousy job

CA's Approach

- discover modularity
- break problem into sets of design problems such that:
  - problems in each set need to be solved together
  - there is little or no cross cutting
- automate partitioning into such sets
- invent notation to represent the modules

Indian Village

- an agricultural village of six hundred people
- to be reorganized to make it fit present and future conditions developing in rural India
- 141 “misfit” variables

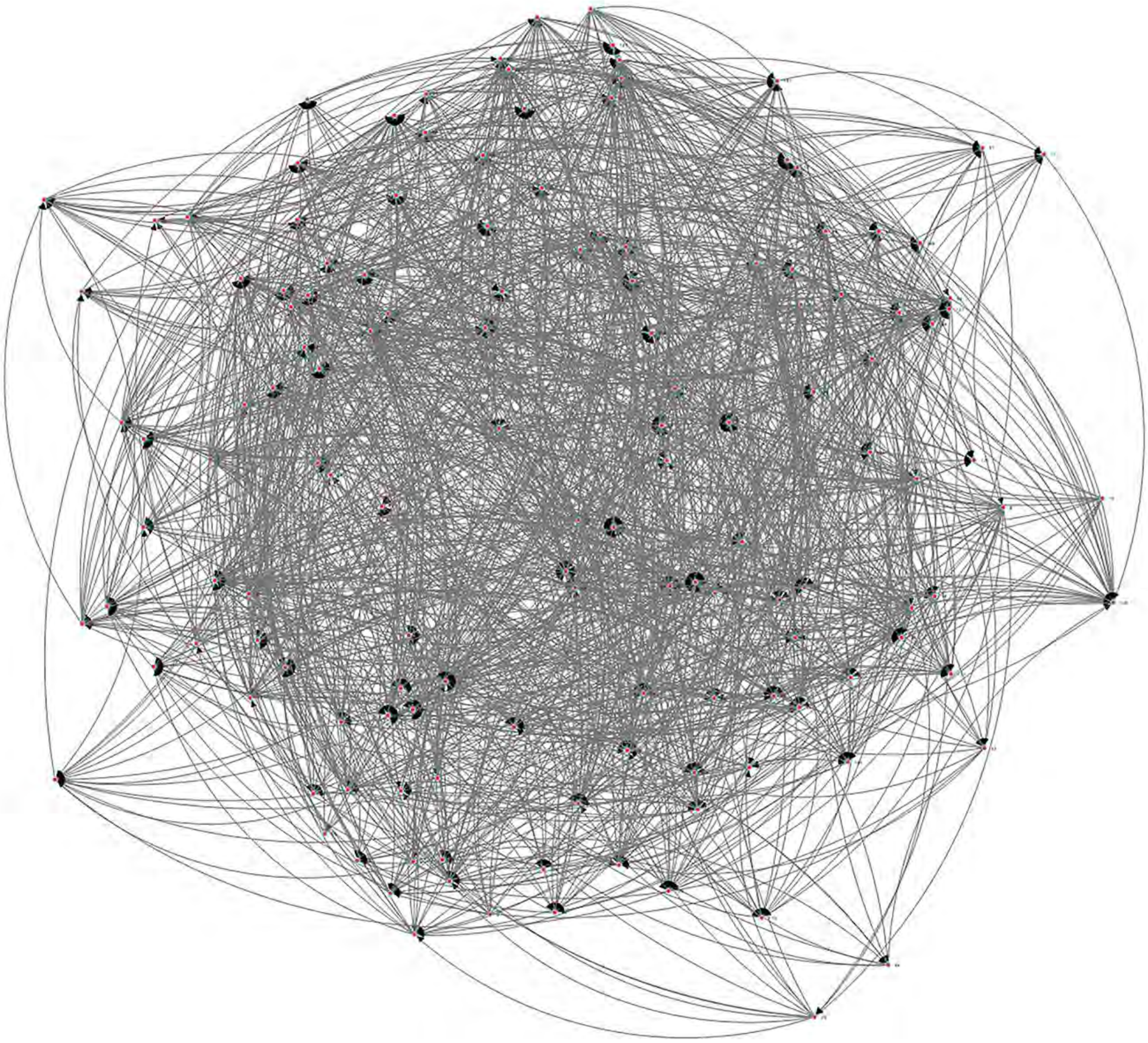
Here Are Some of Them

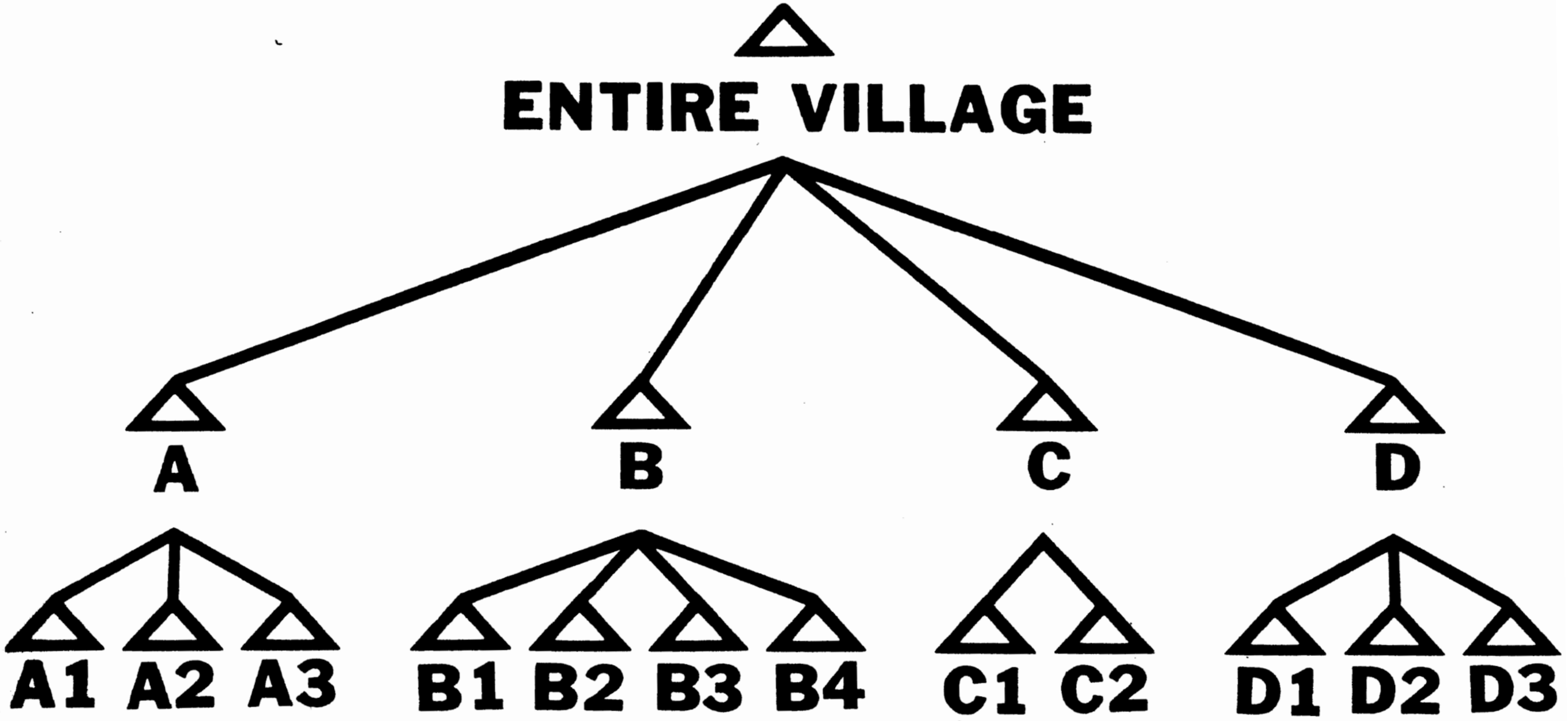
33. *Fertile land to be used to best advantage.*
34. *Full collection of natural manure (animal and human).*
35. *Protection of crops from insects, weeds, disease.*
36. *Protection of crops from thieves, cattle, goats, monkeys, etc.*
37. *Provision of storage for distributing and marketing crops.*
38. *Provision of threshing floor and its protection from marauders.*

Design Interactions

1. interacts with 8, 9, 12, 13, 14, 21, 28, 29, 48, 61, 67, 68, 70, 77, 86, 101, 106, 113, 124, 140, 141
2. interacts with 3, 4, 6, 26, 29, 32, 52, 71, 98, 102, 105, 123, 133
3. interacts with 2, 12, 13, 17, 26, 76, 78, 79, 88, 101, 103, 119
4. interacts with 2, 5, 6, 17, 29, 32, 45, 56, 63, 71, 74, 78, 79, 88, 91, 105, 106, 110, 124
5. …

1 interacts with 8, 9, 12, 13, 14, 21, 28, 29, 48, 61, 67, 68, 70, 77, 86, 101, 106, 113, 124, 140, 141
2 interacts with 3, 4, 6, 26, 29, 32, 52, 71, 98, 102, 105, 123, 133
3 interacts with 2, 12, 13, 17, 26, 76, 78, 79, 88, 101, 103, 119
4 interacts with 2, 5, 6, 17, 29, 32, 45, 56, 63, 71, 74, 78, 79, 88, 91, 105, 106, 110, 124
5 interacts with 4, 6, 10, 14, 17, 21, 24, 46, 102, 113, 116, 118, 131, 133, 140
6 interacts with 2, 4, 5, 20, 21, 53, 58, 61, 63, 82, 102, 111, 117, 130, 134, 135
7 interacts with 20, 31, 34, 53, 57, 58, 59, 80, 85, 86, 94, 105, 106, 123, 124, 125
8 interacts with 1, 9, 14, 15, 21, 22, 25, 27, 48, 58, 59, 61, 62, 63, 64, 65, 89, 95, 96, 99, 111, 112, 114, 115, 116, 121, 129, 136, 140, 141
9 interacts with 1, 8, 11, 12, 13, 15, 17, 18, 20, 21, 28, 29, 36, 43, 49, 56, 62, 64, 80, 81, 101, 113, 118, 124, 129, 136, 140, 141
10 interacts with 5, 13, 14, 15, 18, 24, 26, 65, 68, 93, 102, 134
11 interacts with 9, 12, 64, 95, 96, 114, 133, 134
12 interacts with 1, 3, 9, 11, 17, 18, 19, 25, 26, 28, 34, 36, 41, 43, 49, 56, 62, 63, 76, 80, 81, 85, 86, 87, 90, 91, 93, 121, 122, 129, 140, 141
13 interacts with 1, 3, 9, 10, 17, 20, 25, 28, 33, 34, 36, 37, 41, 45, 56, 62, 68, 79, 80, 81, 83, 86, 91, 94, 101, 106, 108, 121, 122, 129, 137, 140, 141
14 interacts with 1, 5, 8, 10, 15, 19, 20, 21, 28, 30, 40, 43, 44, 47, 54, 62, 63, 64, 65, 86, 97, 121, 129, 130, 133, 138, 141
15 interacts with 8, 9, 10, 14, 18, 21, 22, 37, 39, 41, 44, 45, 46, 58, 59, 61, 62, 63, 64, 65, 66, 95, 96, 97, 98, 112, 116, 125, 127, 128, 129, 130, 132, 133, 135, 137, 138, 141
16 interacts with 27, 29, 34, 68, 78, 79, 82, 88, 95, 101, 114, 117, 119, 122
17 interacts with 3, 4, 5, 9, 12, 13, 20, 23, 27, 37, 38, 43, 49, 65, 69, 80, 81, 86, 89, 101, 110, 115, 116, 117, 118, 126, 129, 135
18 interacts with 9, 10, 12, 15, 19, 26, 28, 31, 33, 42, 43, 44, 47, 48, 49, 60, 65, 69, 70, 74, 77, 79, 85, 97, 98, 103, 110, 140, 141
19 interacts with 12, 14, 18, 22, 26, 28, 32, 33, 36, 37, 38, 41, 45, 49, 69, 71, 86, 104, 106, 107, 110, 118, 126, 140
20 interacts with 6, 9, 13, 14, 17, 24, 29, 30, 36, 37, 43, 54, 64, 68, 80, 84, 89, 102, 116, 117, 129, 131, 133, 140
21 interacts with 1, 5, 6, 8, 9, 14, 15, 24, 61, 63, 89, 95, 96, 111, 112, 113, 115, 116, 137, 139, 140, 141
22 interacts with 8, 15, 19, 31, 32, 33, 36, 42, 44, 47, 49, 60, 61, 64, 69, 71, 74, 97, 98, 104, 107, 110, 127, 140
23 interacts with 4, 17, 31, 34, 62, 63, 71, 76, 78, 79, 82, 83, 93, 95, 100, 101, 105, 115, 116, 119, 126, 132, 137
24 interacts with 5, 10, 20, 21, 38, 82, 93, 100, 101, 102, 108, 115, 130, 133, 135, 140, 141
25 interacts with 8, 12, 13, 26, 27, 36, 62, 81, 90, 92, 111, 114, 116, 120
26 interacts with 2, 3, 10, 12, 18, 19, 25, 29, 31, 33, 34, 41, 53, 56, 58, 62, 67, 68, 76, 85, 90, 91, 92, 93, 108, 113, 122, 123, 124, 130
27 interacts with 8, 16, 17, 25, 29, 62, 68, 81, 86, 88, 90, 92, 113, 114, 122, 130
28 interacts with 1, 9, 12, 13, 14, 18, 19, 29, 31, 33, 34, 35, 36, 37, 38, 42, 45, 49, 50, 54, 55, 56, 62, 74, 92, 103, 106, 107, 108, 109, 110, 118, 127, 129, 131
29 interacts with 1, 2, 4, 9, 16, 20, 26, 27, 28, 41, 67, 71, 81, 85, 88, 92, 101, 119, 122, 124
30 interacts with 7, 14, 20, 31, 33, 35, 40, 47, 63, 95, 97, 98, 107, 126, 127, 129, 130, 131, 132, 133, 139
31 interacts with 7, 18, 22, 23, 26, 28, 30, 33, 34, 35, 37, 40, 43, 44, 49, 50, 52, 54, 59, 60, 80, 89, 94, 98, 106, 107, 109, 128, 131, 132
32 interacts with 2, 4, 19, 22, 34, 42, 43, 46, 48, 52, 54, 60, 61, 63, 65, 69, 70, 71, 73, 74, 75, 104, 105, 107, 109, 110, 122, 129
33 interacts with 13, 18, 19, 22, 26, 28, 30, 31, 34, 35, 36, 41, 54, 56, 59, 74, 78, 80, 90, 91, 92, 94, 105, 107, 118, 122, 123, 124, 136
34 interacts with 7, 12, 13, 16, 23, 26, 28, 31, 32, 33, 41, 54, 56, 59, 74, 78, 80, 90, 91, 92, 94, 105, 107, 118, 122, 123, 124, 136
35 interacts with 28, 30, 31, 33, 39, 42, 43, 46, 61, 79, 104, 118, 137
36 interacts with 9, 12, 13, 19, 20, 22, 25, 28, 33, 38, 40, 41, 43, 45, 52, 54, 61, 68, 80, 81, 86, 94, 106, 110, 136
37 interacts with 13, 15, 17, 19, 20, 28, 31, 38, 43, 44, 49, 50, 72, 76, 97, 103, 128, 133, 140
38 interacts with 17, 19, 24, 28, 36, 37, 40, 42, 43, 44, 50, 52, 58, 61, 68, 76, 78, 79, 94, 97, 106, 128
39 interacts with 15, 33, 35, 44, 48, 62, 69, 70, 72, 75, 97, 104, 118, 127, 134, 137, 138
40 interacts with 14, 30, 31, 33, 36, 38, 42, 44, 48, 69, 70, 97, 104, 107, 118, 125, 127, 134, 137, 138
41 interacts with 12, 13, 15, 19, 26, 29, 33, 34, 36, 44, 48, 51, 65, 69, 70, 71, 72, 92, 98, 104, 107, 118, 122, 125, 127, 138





A deals with cattle, bullock carts, and fuel
B deals with agricultural production, irrigation, and distribution
C deals with the communal life of the village
D deals with the private life of the villagers

A1: 7, 53, 57, 59, 60, 72, 125, 126, 128
A2: 31, 34, 36, 52, 54, 80, 94, 106, 136
A3: 37, 38, 50, 55, 77, 91, 103

B1: 39, 40, 41, 44, 51, 118, 127, 131, 138
B2: 30, 35, 46, 47, 61, 97, 98
B3: 18, 19, 22, 28, 33, 42, 43, 49, 69, 74, 107, 110
B4: 32, 45, 48, 70, 71, 73, 75, 104, 105, 108, 109

C1: 8, 10, 11, 14, 15, 58, 63, 64, 65, 66, 93, 95, 96, 99,
100, 112, 121, 130, 132, 133, 134, 139, 141
C2: 5, 6, 20, 21, 24, 84, 89, 102, 111, 115, 116, 117,
120, 129, 135, 137, 140

D1: 26, 29, 56, 67, 76, 85, 87, 90, 92, 122, 123, 124
D2: 1, 9, 12, 13, 25, 27, 62, 68, 81, 86, 113, 114
D3: 2, 3, 4, 16, 17, 23, 78, 79, 82, 83, 88, 101, 119

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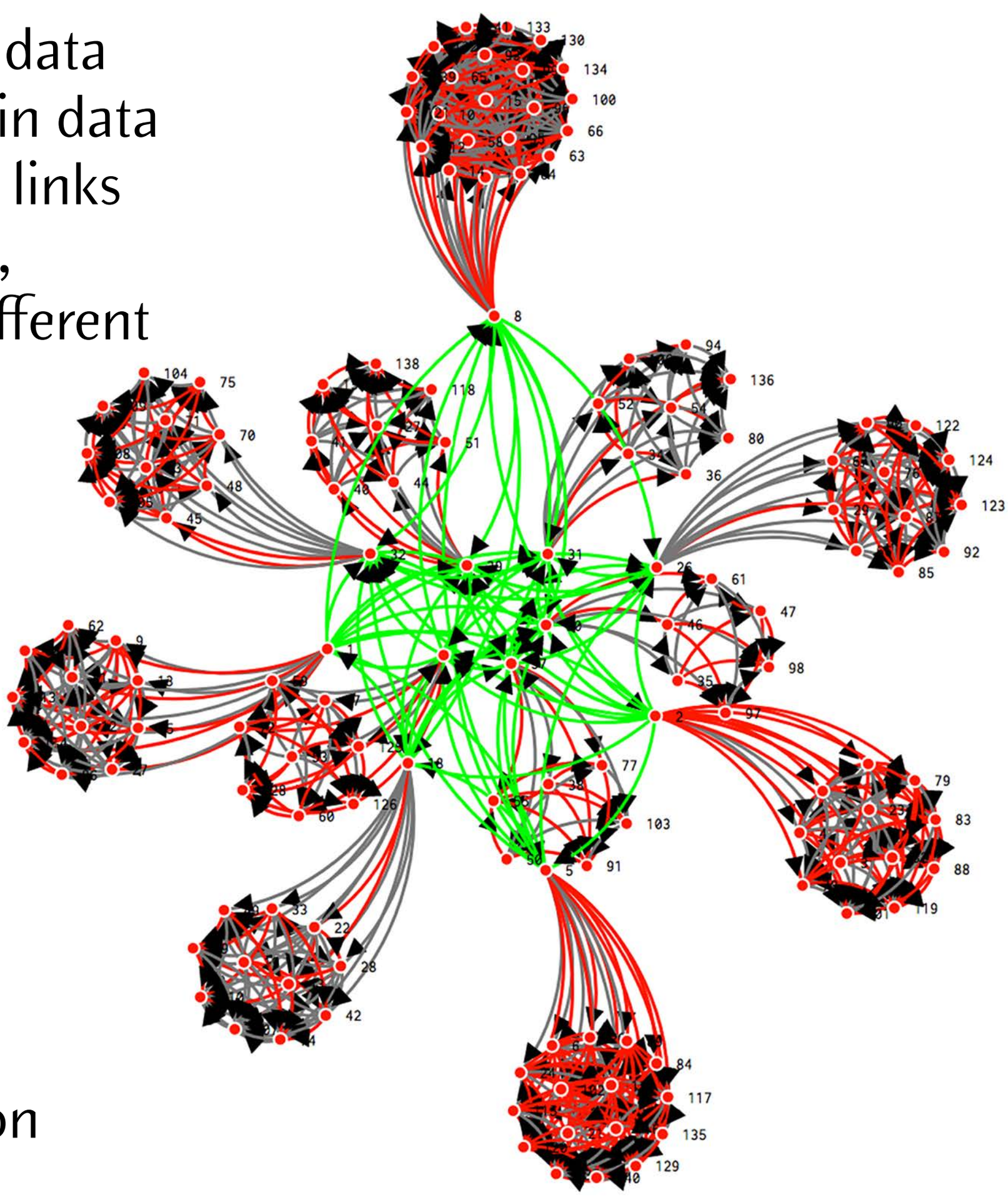
red: no link in data
green: cross links
(link in data,
 nodes in different
 partitions)



CA's Solution

$$R(\pi) = \frac{\frac{1}{2}m(m-1)\sum_{\pi} v_{ij} - l\sum_{\pi} s_\alpha s_\beta}{\left[\left(\sum_{\pi} s_\alpha s_\beta\right)\left(\frac{1}{2}m(m-1) - \sum_{\pi} s_\alpha s_\beta\right)\right]^{\frac{1}{2}}}$$

To find the best partition of a set S, we use a hill-climbing procedure which consists essentially of taking the partition into one-element subsets, computing the value of R(π) for this partition, and then comparing with it all those partitions which can be obtained from it by combining two of its sets. Whichever of these partitions has the lowest value of R(π) is then substituted for the original partition; and the procedure continues. It continues until it comes to a partition whose value of R(π) is lower than that of any partition which can be obtained from it by combining two sets.

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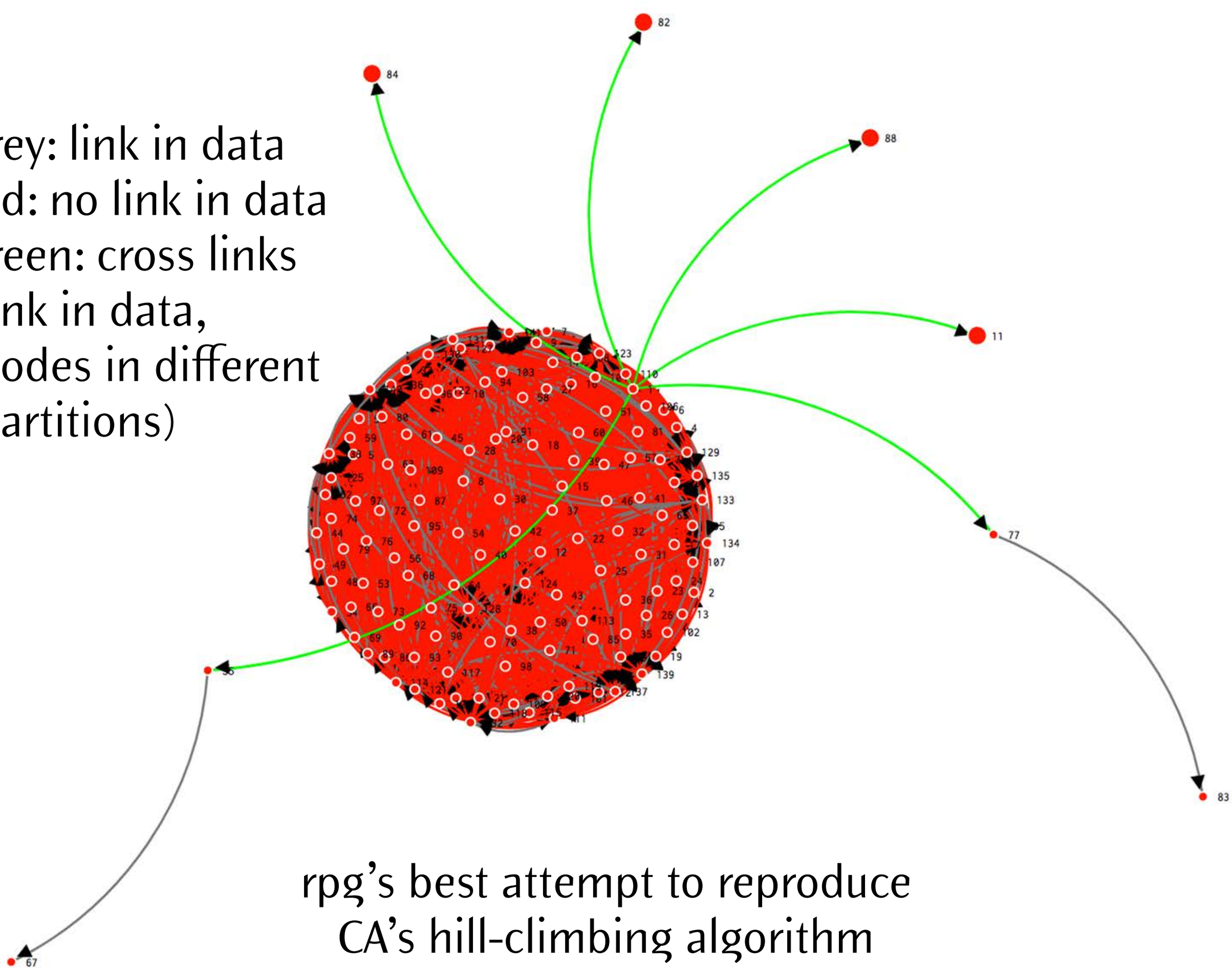
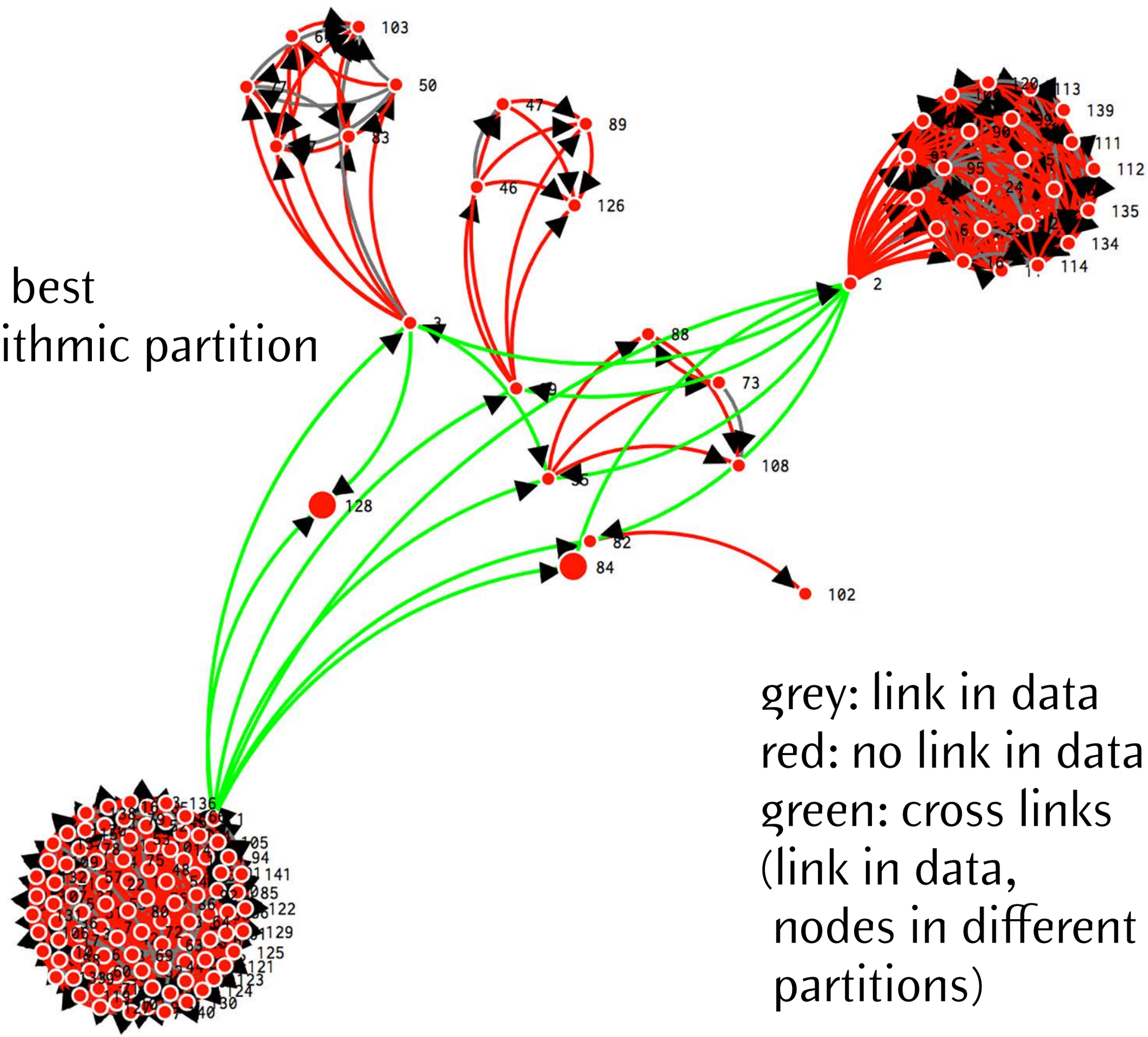
(link in data,
nodes in different
partitions)



rpg's best attempt to reproduce
CA's hill-climbing algorithm

rpg's best
algorithmic partition



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CA's Homeostatic Lights

- *n* lights with connections between some
- start off with lights all on
- on each cycle, for each light:
  - 50% probability a turned on light will turn off
  - 50% probability a turned off light connected to a turned on light will turn on
- if all lights turn off, they never turn on again
- W. Ross Ashby

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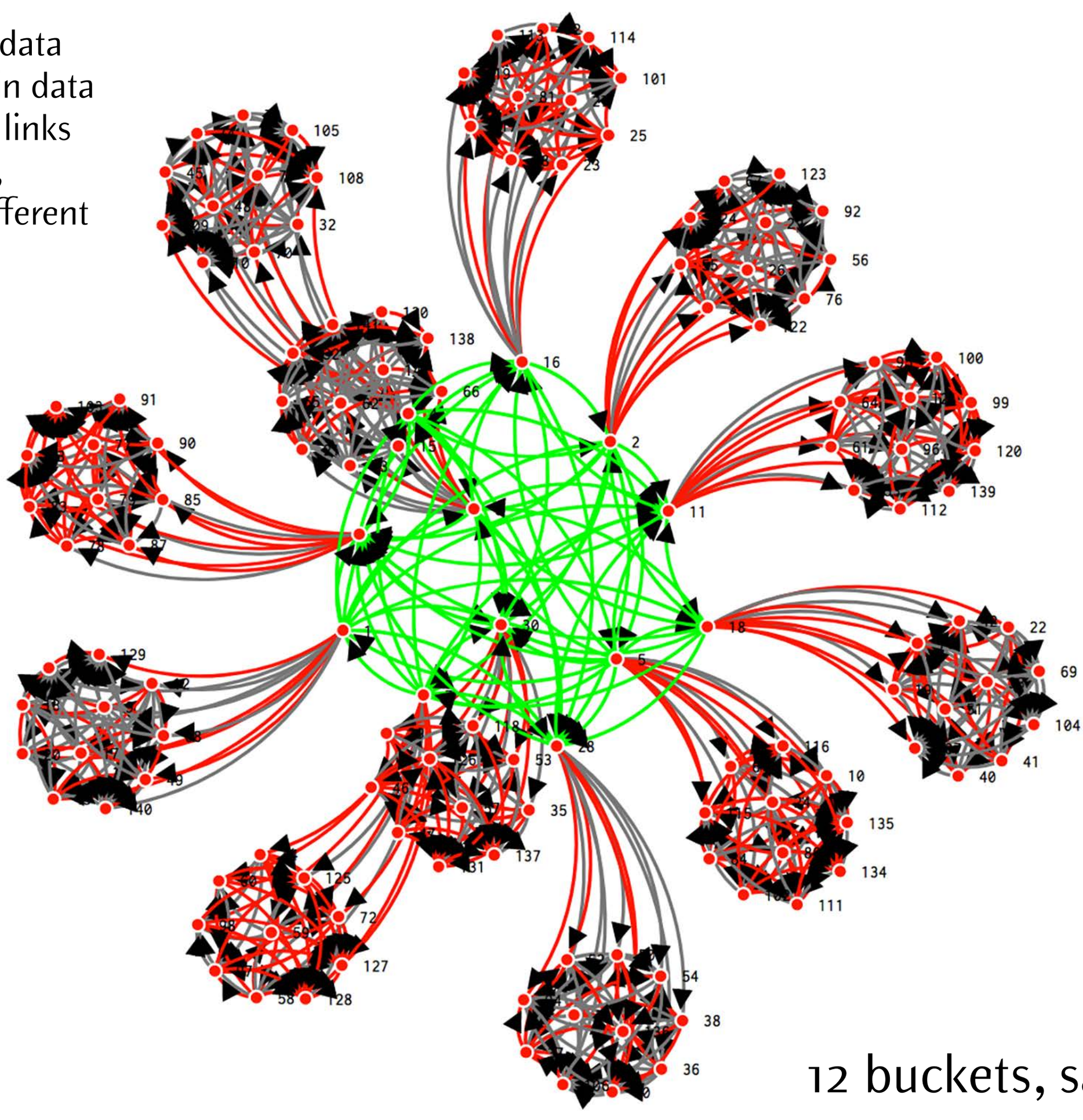
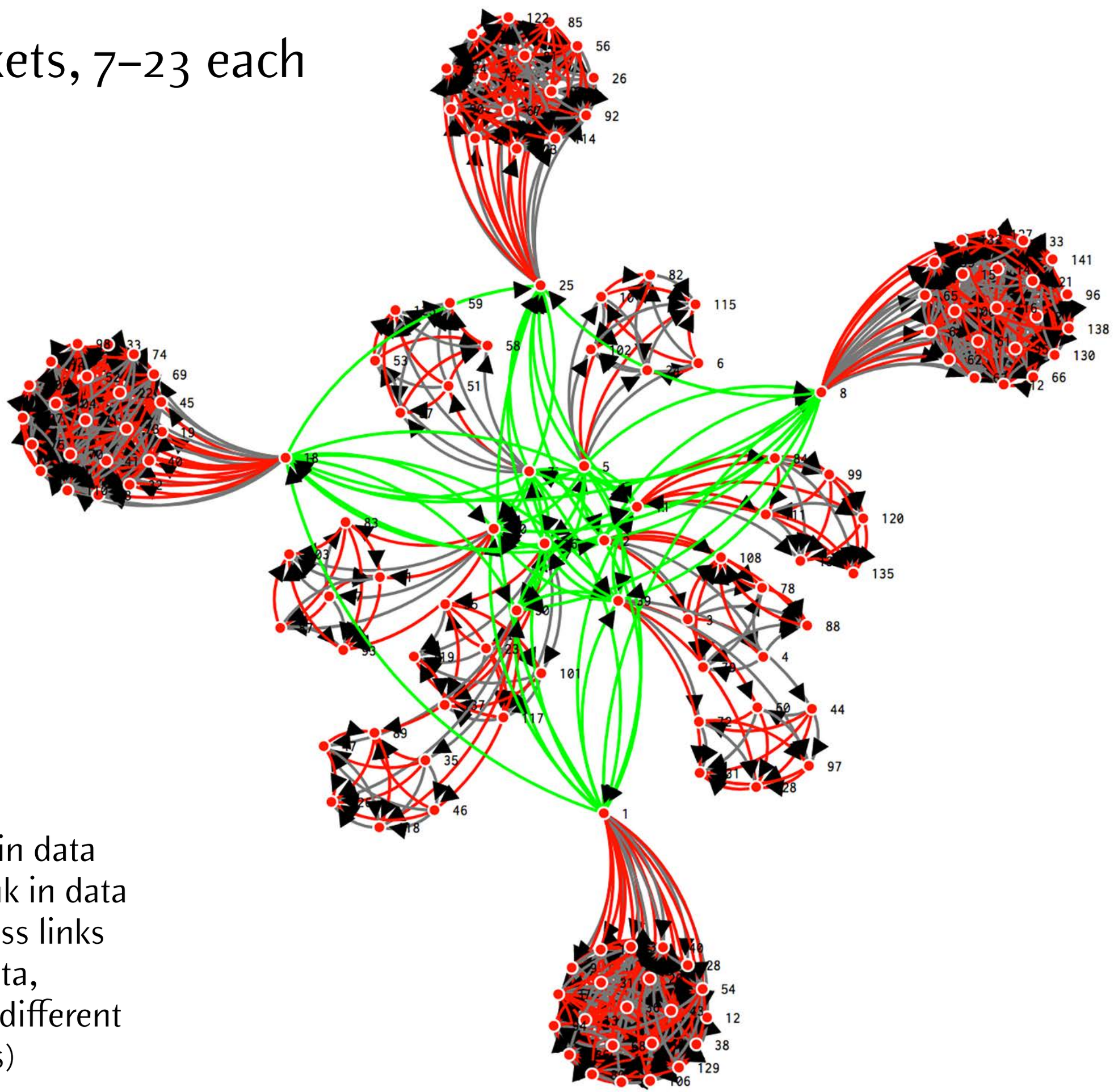


12 buckets, same size

12 buckets, 7–23 each



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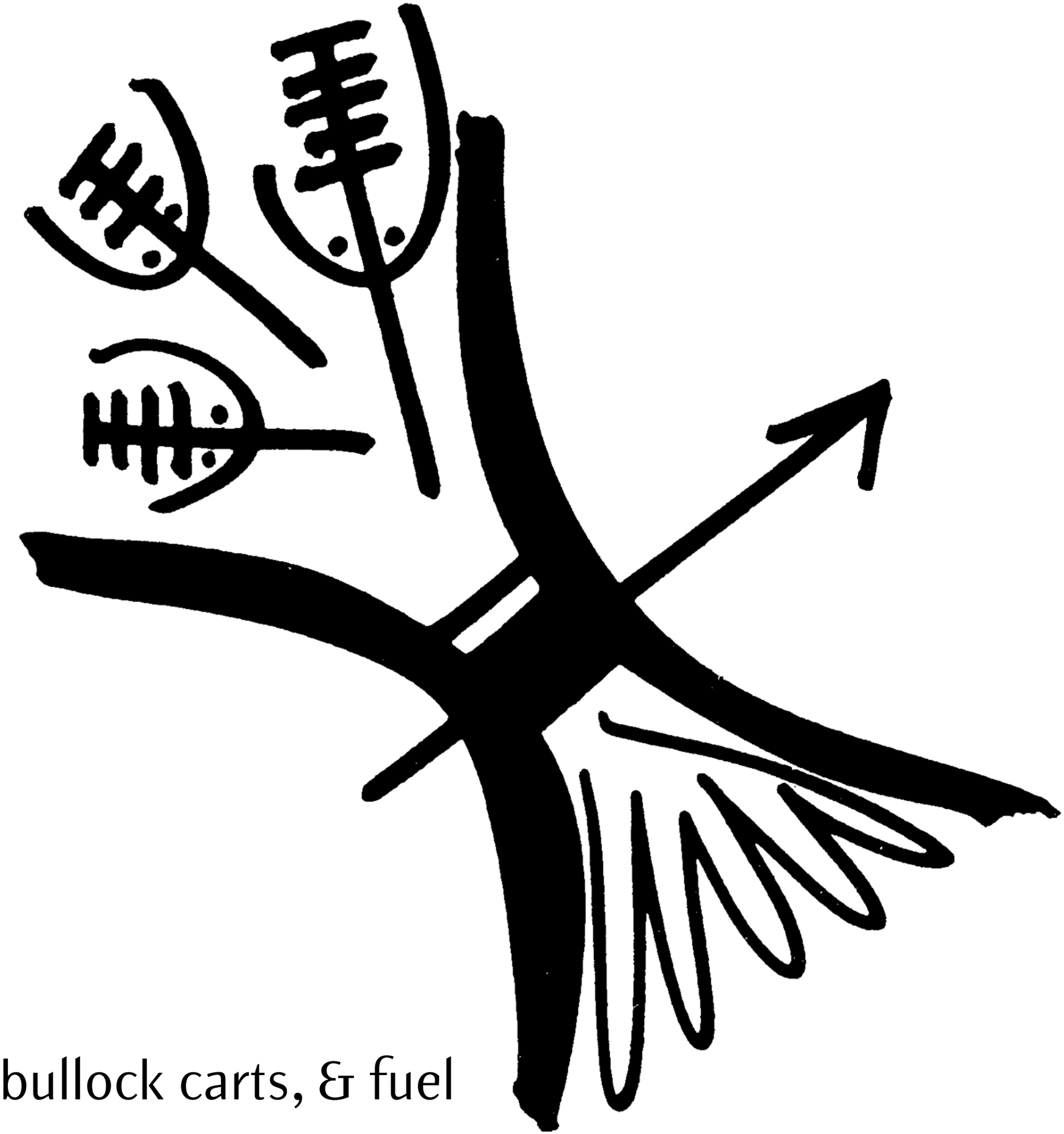
Diagrams = Patterns

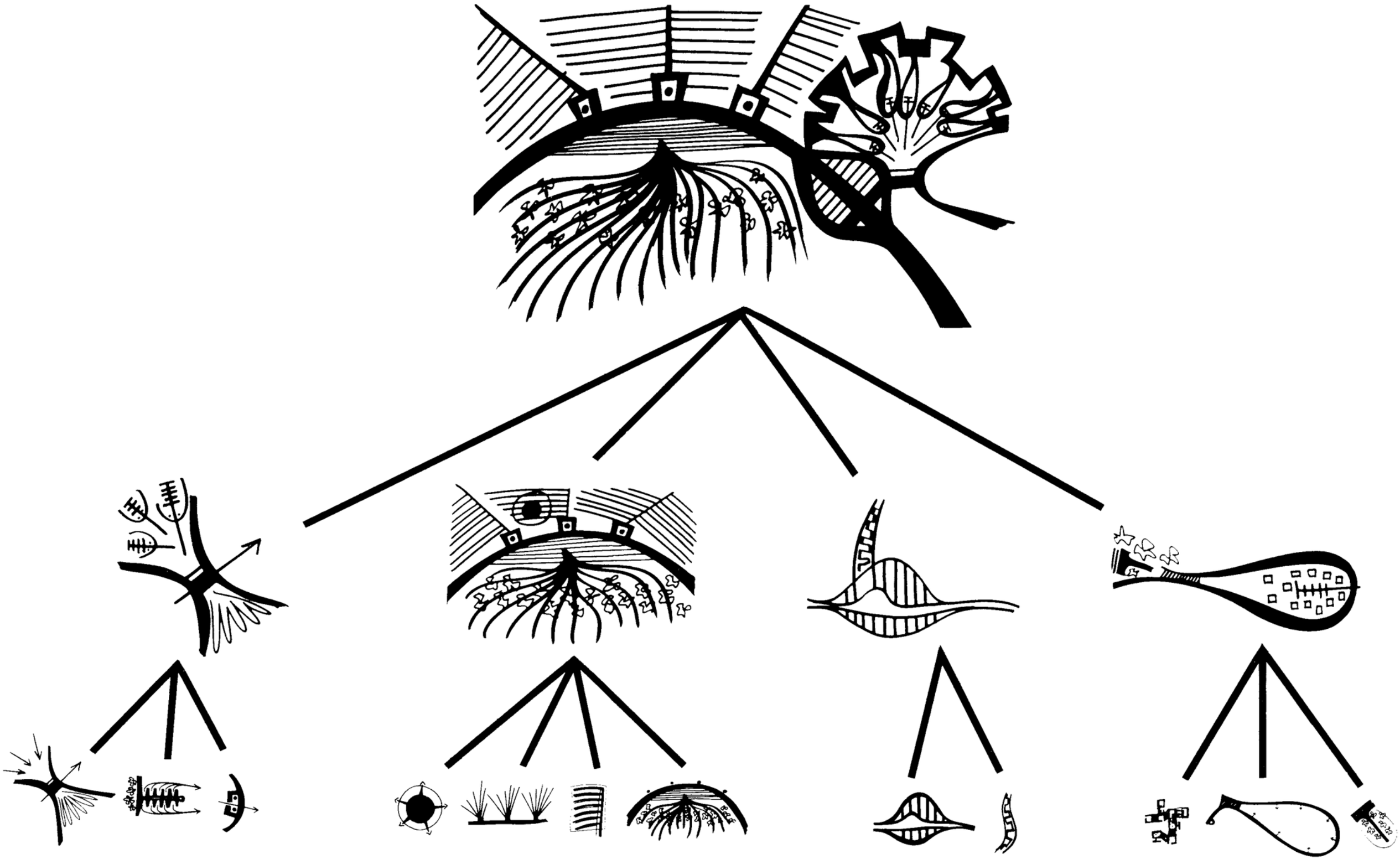
Notes Diagrams = Patterns

Today, almost ten years after I wrote this book, one idea stands out clearly for me as the most important in the book: the idea of the diagrams. These diagrams, which, in my more recent work, I have been calling patterns, are the key to the process of creating form.

–Preface to 1974 edition of Notes



Pattern for cattle, bullock carts, & fuel



Freely combined, entire village

Where Did This Strangeness Come From?

The Design of Highway Interchanges: An Example of a General Method for Analyzing Engineering Design Problems

CHRISTOPHER ALEXANDER, Society of Fellows, Harvard University, and
MARVIN L. MANHEIM, Department of Civil Engineering, Massachusetts Institute of Technology

a region of I-91 between Northampton and Holyoke

Diagram B: Requirements 25, 46, 47, 86, 87, 89, 94, 100.

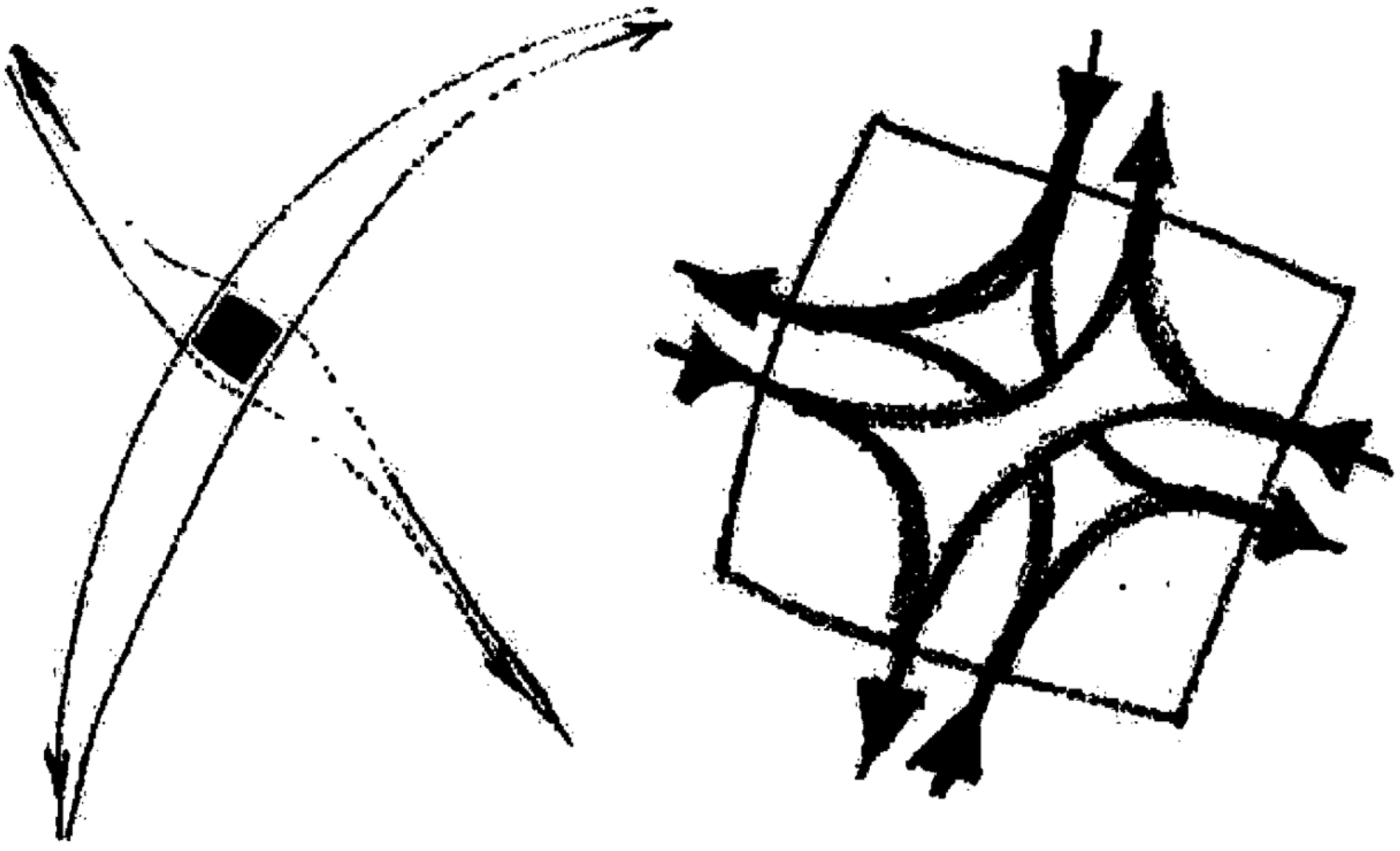
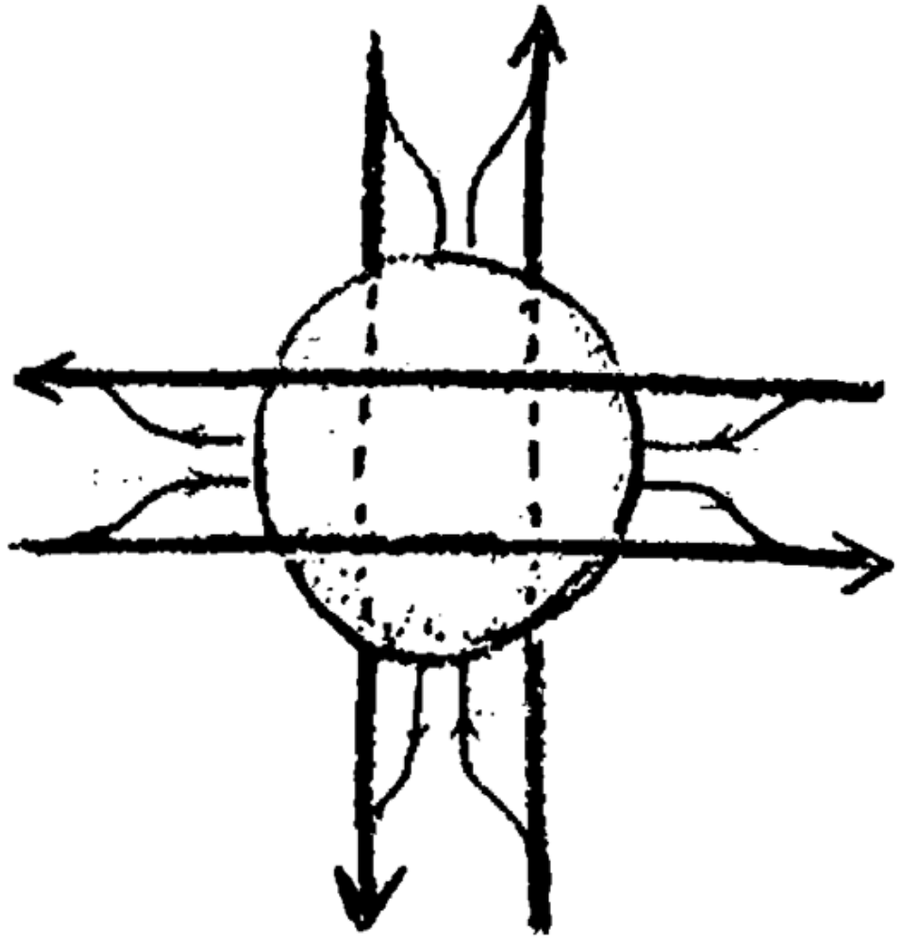
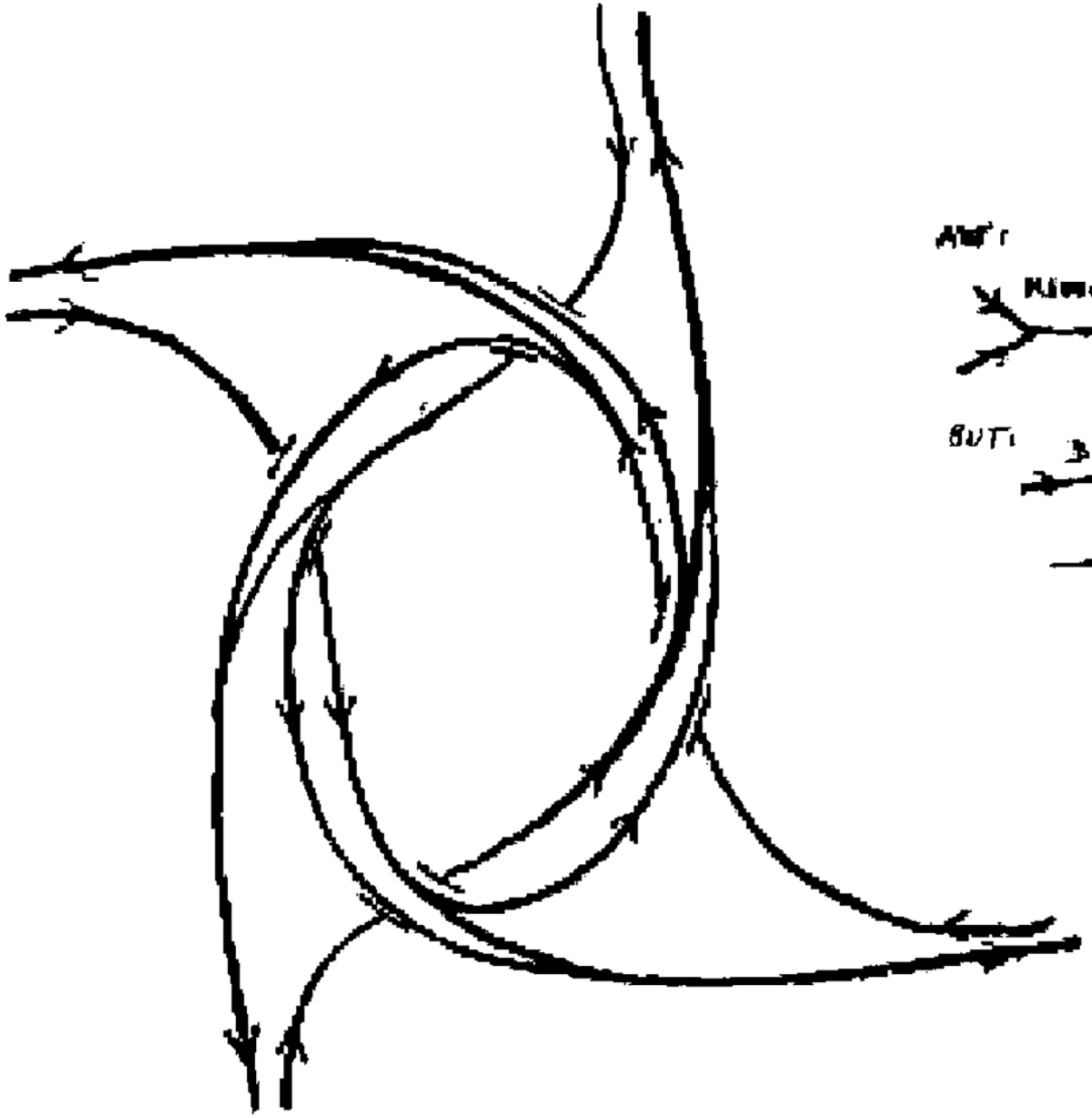
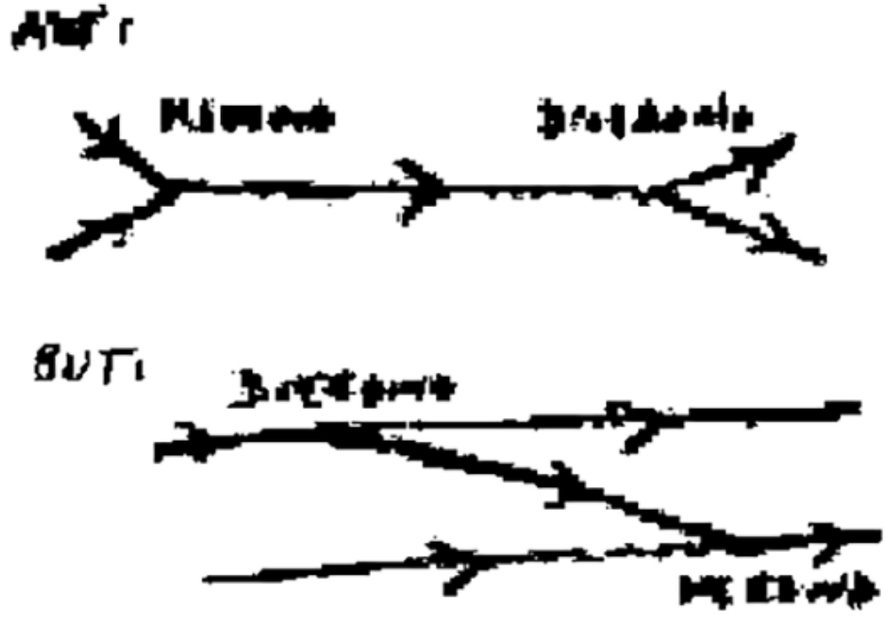


Diagram E: Requirements 1, 2, 5, 7, 12, 35, 37, 50, 95.







Modern professionals with no choice but a selfconscious process which divorces them from such rich reality and limits them to arbitrary simplifications (often made far from the actual building site and inhabitants) are condemned to failure.

Generated vs Fabricated

In “Nature of Order”

- selfconscious: *fabricated* structures
- unselfconscious: *generated* structures

...all the well-ordered complex systems we know in the world, all those...that we view as highly successful are GENERATED structures, not fabricated structures.”

Mistakes in a House

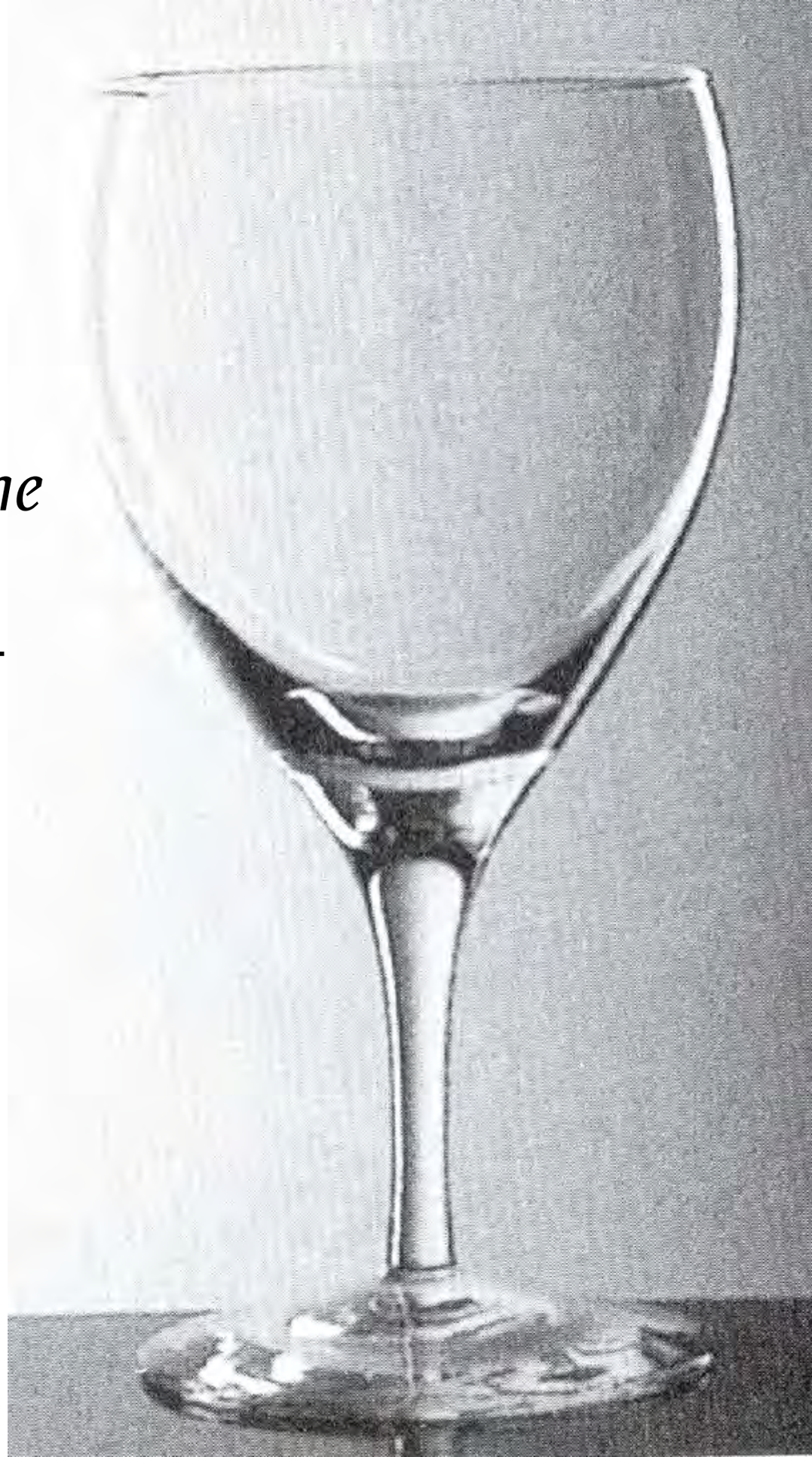
- 2,000 carpenter hours
- several decisions of dimension and placement per hour
- a remote architect at the drawing board makes those decisions
- about 5,000 mistakes per house

When a choice can be made in the context of the real world, where that thing will exist and where people are able to see and feel how they will interact with it, the choice can be made purposefully. When the choice is made at the drawing table by a designer, it is likely to be based on irrelevant ideas (such as a pre-existing image the designer has) or to be random, and, therefore, unlikely to contribute meaningfully to the whole.

A famous Japanese tea bowl which, in spite of its appearance of having been "designed," is actually a generated structure—hence its beauty.

A "fabricated" object—a glass made by the Royal Dutch Glassworks, well-designed (perhaps), but utterly dead as an object—because it has no generated structure.

–Nature of Order, V2



Japan's national treasure: Korean ido pottery tea bowl KIZAEMON IDO

This single Tea-bowl is considered to be the finest in the world.

There are twenty-six bowls registered as meibutsu, *but the finest of them all..., is known as Kizaemon* Ido. *This bowl is said to contain the essence of Tea.*

When I saw it, my heart fell. A good Tea-bowl, yes, but how ordinary! So simple, no more ordinary thing could be imagined. There is not a trace of ornament, not a trace of calculation. It is just a Korean food bowl, a bowl, moreover, that a poor man would use every day—commonest crockery.

–The Unknown Craftsman: A Japanese Insight into Beauty, Soetsu Yanagi

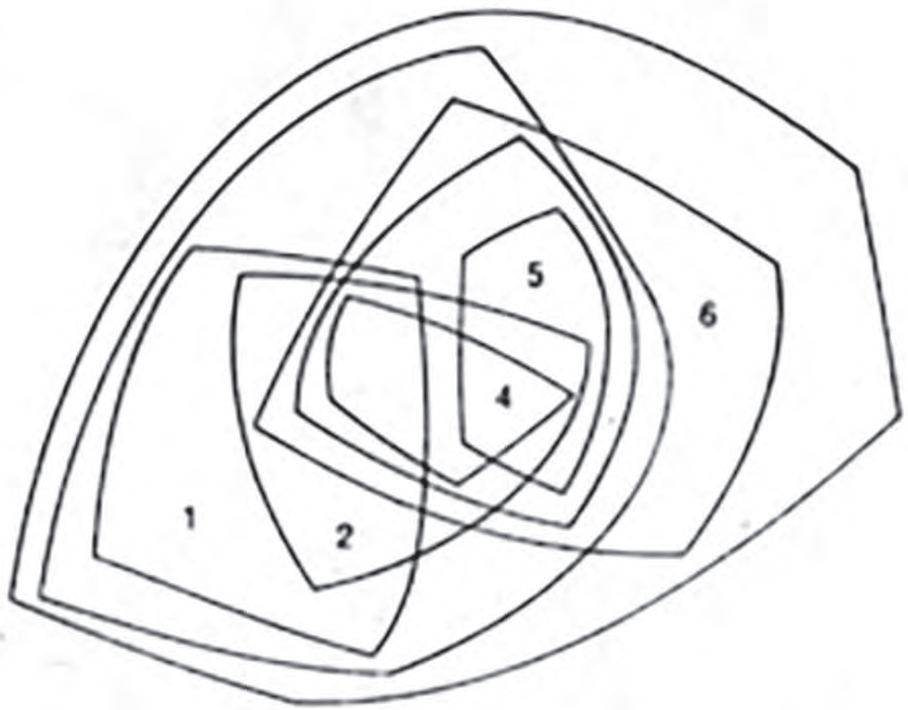
A City is Not a Tree

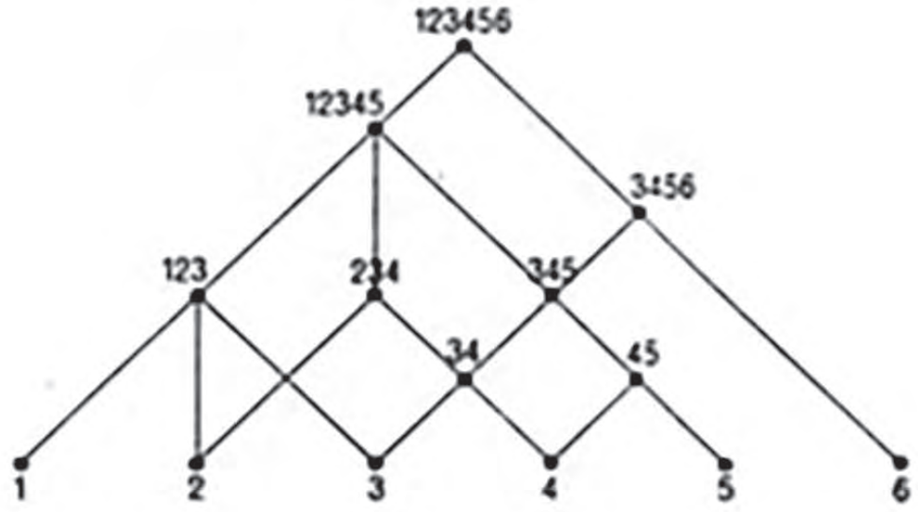
- ...our cognitive handicap trap of preferring models we can fathom over more difficult ones
- ‘Designed’ towns are set up as trees, but semilattices are a better model for natural cities

Alexander uses these definitions:

A collection of sets is a tree if and only if for any two sets that belong to the collection, either one is fully contained in the other or else they are disjoint

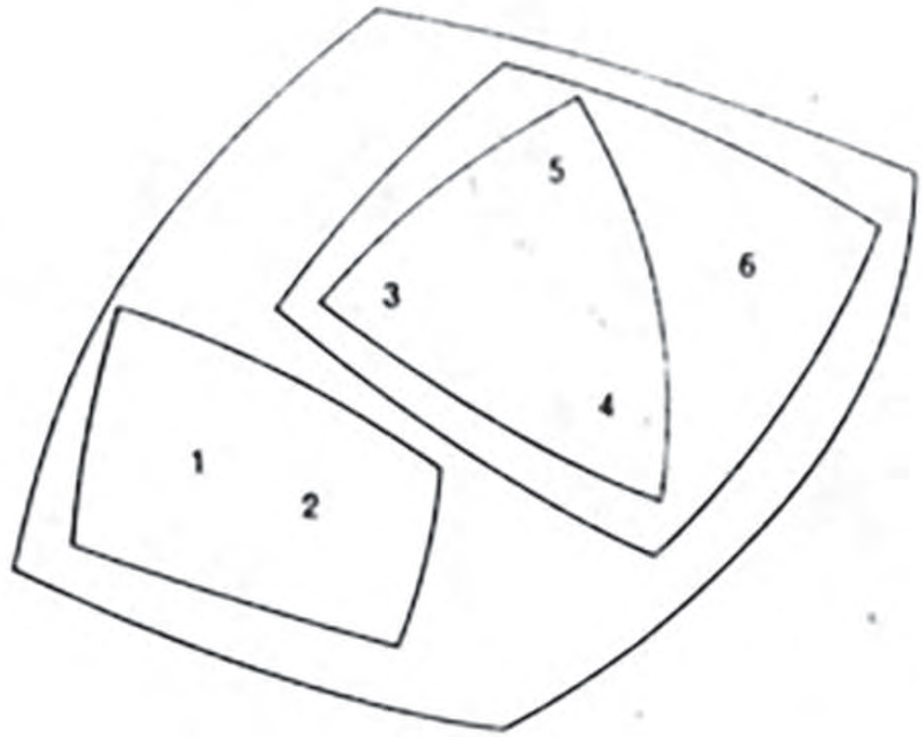
A collection of sets is a semilattice if and only if whenever two overlapping sets belong to the collection, then the intersection of those sets also belongs.





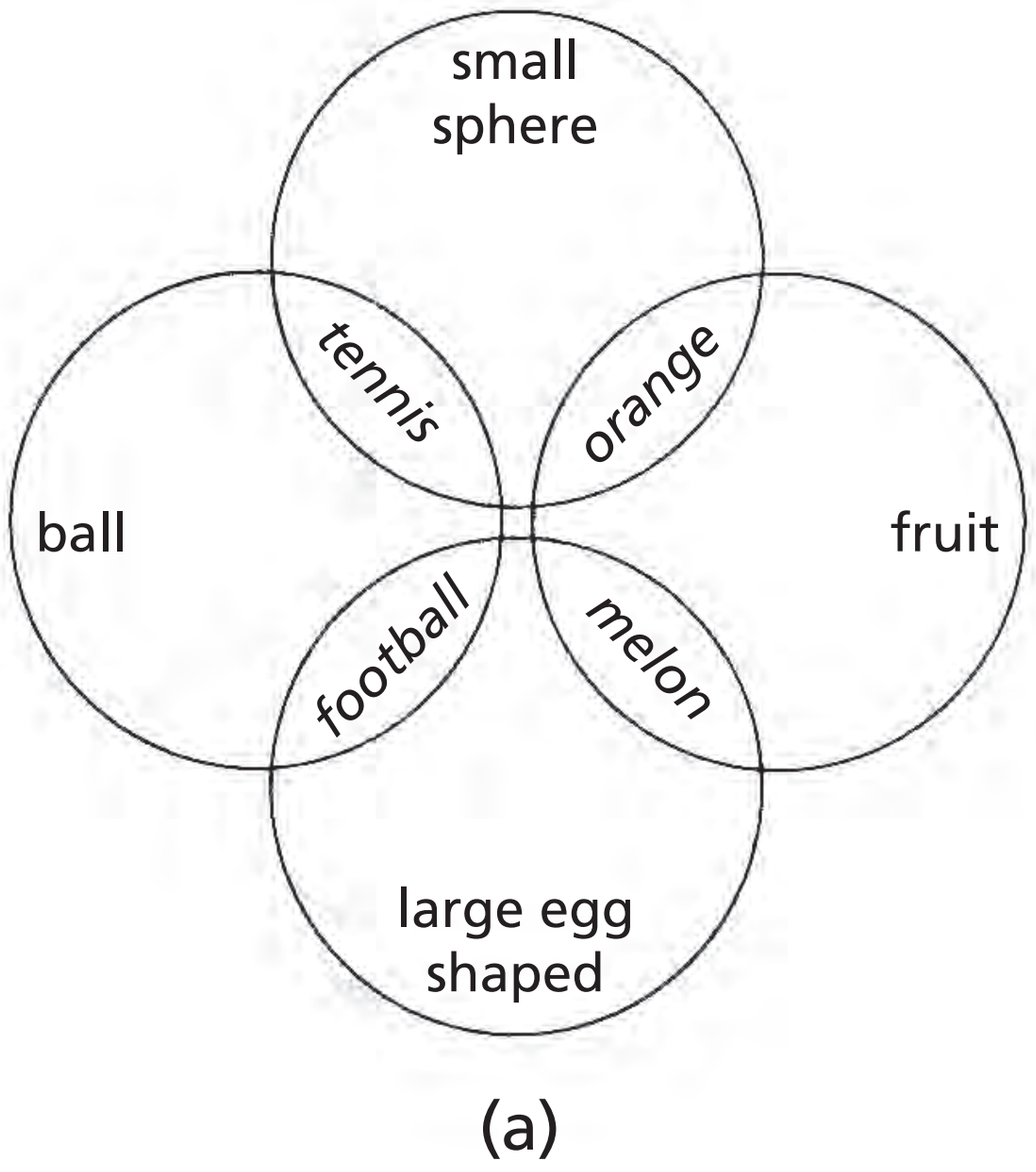
(a)

semilattice



(b)

tree



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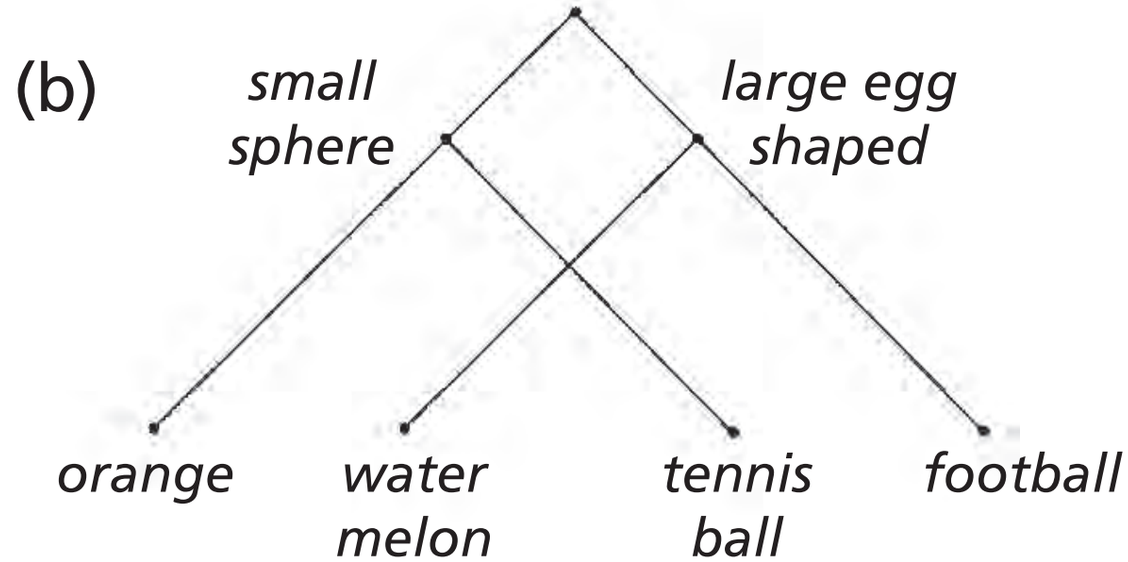
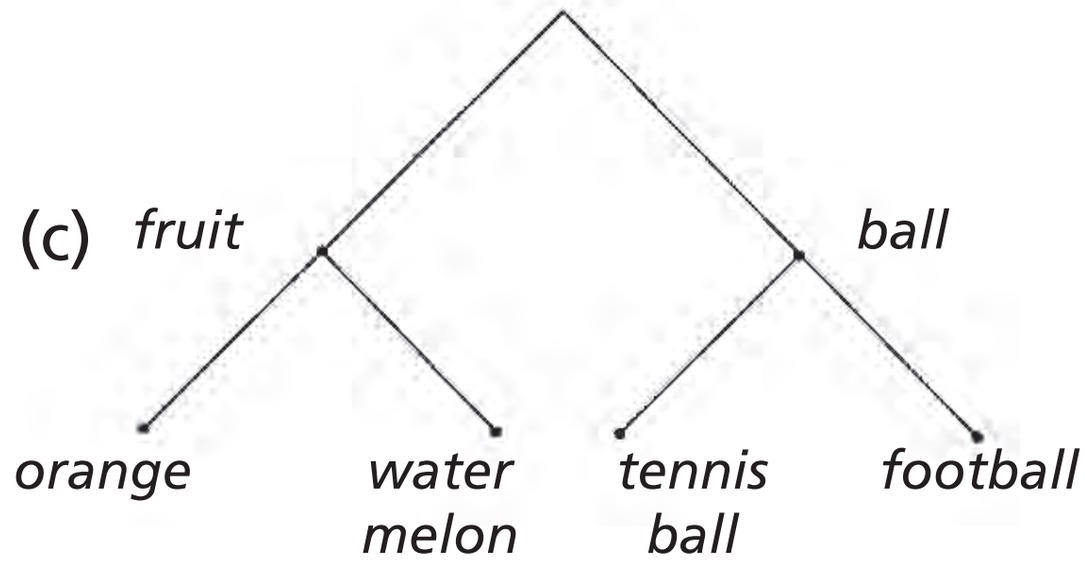




semilattice

Optimizing a tree is relatively simple—just optimize each node; the nodes are guaranteed to be independent. Optimizing a semilattice might require a metaheuristic approach because the search space is too big or too ill-structured.

Because the diagrams are independent of one another, you can study them and improve them one at a time...you can use them to create not just one design, but an infinite variety of designs, all of them free combinations of the same set of patterns

Beauty is part and parcel of all this. Overlapping subsets gives us ambiguity, multiple possibilities, slowly revealing meanings, and complexity in an urban environment. It is this complexity which enlivens us. The experience of Beauty lies partly in the half-hidden or deeply hidden relationships we can only dimly perceive or intuit.

Overlap and ambiguity would remain in Alexander's conceptual arsenal until the end of his career. ...later... Alexander will argue that DEEP INTERLOCK AND AMBIGUITY must be one of the fifteen essential geometric properties creating wholeness—and therefore Beauty.

The principal features of a complex configuration are always created by overlap. Although this overlap may seem trivial, when we examine the overall design of [a] *Persian carpet, you will see that this kind of overlap, and ambiguity, is essential and pervasive.... This is the glue in any system of wholes. Wholeness itself is directly created by this apparent overlap, or ambiguity. The greater the number of overlapping wholes, the more tightly bound the configuration is, and the more deeply the wholeness of the object shows itself to be.*

–Battle

Overlap & Ambiguity
Not Exclusively Geometrical

Ahab: *bleached bone*, *ribbed and dented brow*, *wrinkled brow*, *snow-white ivory leg*, wrinkling his *brow*

Moby Dick: *wrinkled brow* and a crooked *jaw*, his *wrinkled brow*, the *peculiar snow-white brow* of Moby Dick.

These form a descriptive overlap and hence gives rise to an existential ambiguity between Ahab and his obsession, Moby Dick, the white whale.

Emergence

BART

- San Francisco Bay Area Rapid Transit system
- Alexander: system analysis, system requirements, misfits, hierarchical decomposition of parts
- forces around a ticket booth lists 390 requirements
  - get tickets
  - get change
  - limit waiting time
  - don’t interfere with other traffic flows

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....

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.

a first inkling of *emergent properties* of a complex system
—a property lying somewhere just beyond reach

Alexander got his first hint that some emergent properties surprise. Complexity has a mind of her own.

Seventies to Mid-Eighties
A Prolific Period

- Modularity with strong and weak links, formulated as patterns, is explored as a possible way to regain unselfconscious building
- The subtle ineffability of Beauty warrants an entire book (*Timeless Way*), and yet Beauty is also pegged as an exacting discipline of reckoning with each and every design constraint
- Standard practices in urban development are seen as hopelessly wrong-headed
- Fact and humanistic values must both figure in our decision-making
- Major projects include Mexicali, which fails, and the Eishin campus in Japan, which succeeds

A Pattern Language

- RfP from National Institute of Mental Health (NIMH)
- relationship between the built environment and human well-being
- walkabouts
- the team formulated the concept of *pattern* and catalogued 253 instances of spatial configurations that supported well-being in everyday, ordinary life

SIX-FOOT BALCONY (#167)

- a narrow ledge on the side of a building feels precarious
- the most that people do with it is put out laundry
- A SIX-FOOT BALCONY
  - affords a sense of ease and safety
  - room for a small table and chairs
  - an invitation to connect life inside the building with life on the street, integrating the urban fabric both socially and physically

The Timeless Way of Building

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 Timeless Way of Building

Sigh—Jenny says it was ghostwritten

The Quality Without a Name

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.

It [QWAN] *is a subtle kind of freedom from inner contradictions.*

The Quality Without a Name

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.

Exactness

- Beauty requires exquisite exactness
- adaption to *all the forces* and a solution which allows all those forces freedom to flow through

Birdwatching from your House

- birdfeeder near the house
- blackbirds don’t like to swoop down low to the ground
- too high and the wind bothers them
- too close to objects frightens them
- too out in the open and they fear predators
- you want to see them from a comfortable place in your house
- almost every configuration is wrong
- none of the forces is negotiable

People

- Beauty requires human experience in the equation
- Alexander was increasingly phenomenological
- increasingly aware of the boundary between him and not him

Subject & Object

- for Alexander, Beauty contained sadness
- ...the power to remind him of his own fleeting existence

It has a slightly bitter quality

Subject & Object

The I, that blazing one, is something which I reach only to the extent that I experience, and make manifest, my feeling. What feeling, exactly? What exactly am I aiming for in a building, in a column, in a room? How do I define it for myself, so that I can feel it clearly, so that it stands as a beacon to steer me in what I do every day?

What I aim for is, most concretely, sadness. I try to make the volume of the building so that it carries in it all feeling. To reach this feeling, I try to make the building so that it carries my eternal sadness. It comes, as nearly as I can in a building, to the point of tears.

Process

- Large-lump development: NO
- Piecemeal growth: YES

Our only prayer for coping with change is via incremental, *in situ* growth where we stringently limit decision-making to a stage-by-stage process—where we need to keep things in a semi-stable equilibrium, always whole, always livable, always learning. With piecemeal growth—and especially when the growth and learning take place after initial construction—there is time to get the decisions right.

Grassroots Housing Process

Nineties: Perceived Failure and Begin Again

Mexicali Failure

The almost naïve, childish, rudimentary outward character of the houses disturbed them [the Mexican government] *extremely.*

...The buildings...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 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....

Simplicity

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.

Failure

Bootleg copies of the pattern language were floating up and down the West Coast....

...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...the first three books are essentially complete and...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.

Geometry

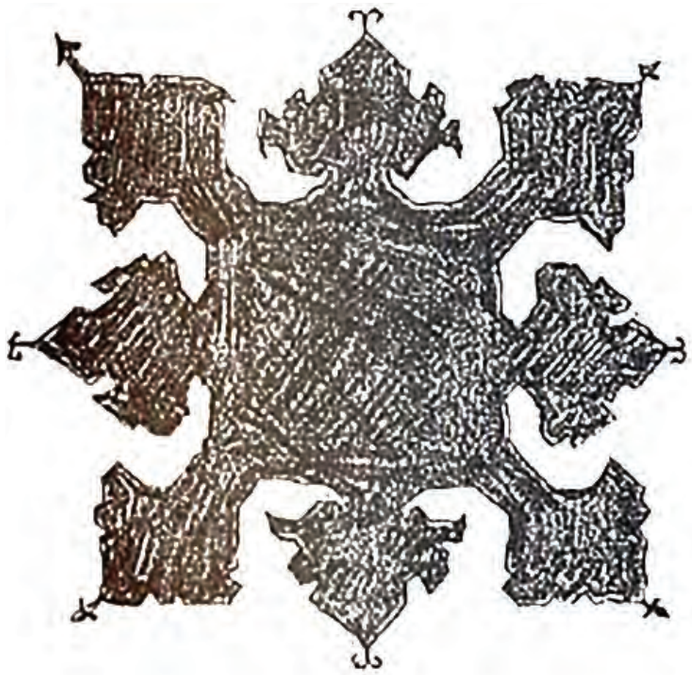
. . . the majority of people who read the work, or tried to use it, did not realize that the conception of geometry had to undergo a fundamental change in order to come to terms with all of this. They thought they could essentially graft all the ideas about life, and patterns, and functions on to their 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.

Turkish Carpets

When people started telling me this (that my rugs had a special something) 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.

Turkish Carpets

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 shortcut, 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.



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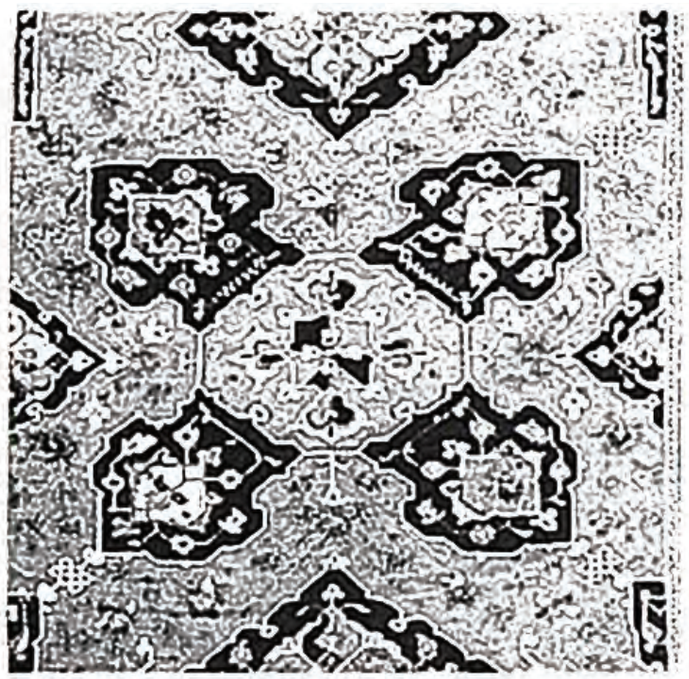
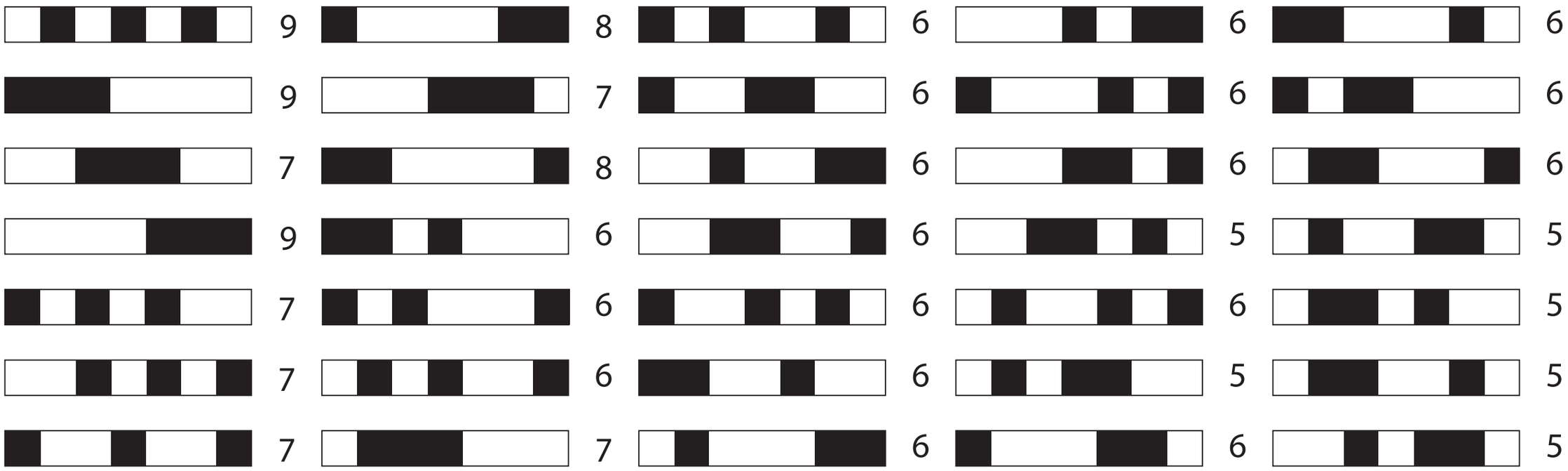


(b)

(c)

Subsymmetries



CA & Bill Huggins (1964) asked subjects to rank-order
a set of strips from most- to least coherent and simple

Subsymmetries Experiment

...Huggins and I established that the relative coherence of the different patterns—operationally defined as ease of perception—was an objective quality, that varied little from person to person. In other words, the perceived coherence is not an idiosyncratic subjective thing, seen differently by different people. It is seen roughly the same by everyone.

subsegments of length 3

Subsymmetries Experiment

"it took me three or four years to find the right answer"

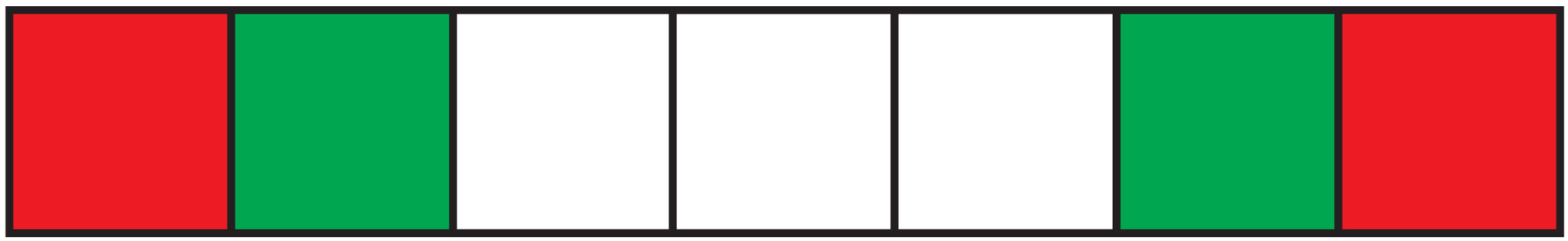
Thus, apparently, the perceived coherence of the different patterns depends almost entirely on the number of symmetrical segments which they contain. Since each of the segments which is symmetrical is a local symmetry I summarize this whole result, by saying that the most coherent patterns are the ones which contain the largest number of local symmetries or "sub-symmetries."

Can Do Better

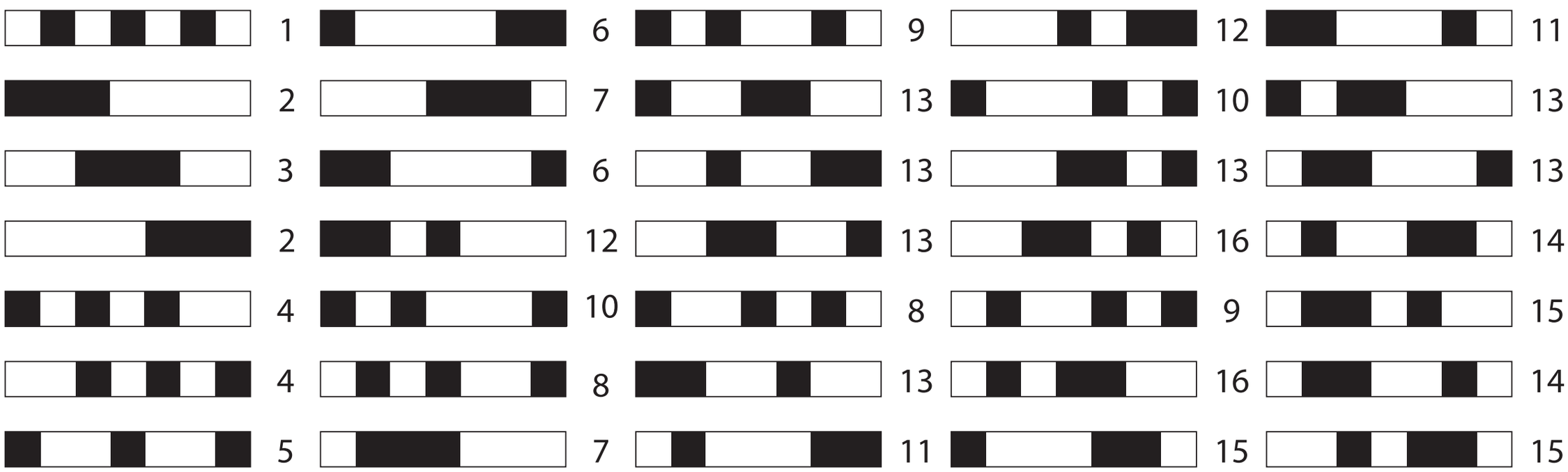
- use more factors
- weight the sub-symmetry counts

More Factors

- sub-symmetries as described
- doubled outer boundaries
- transitions
- fundamental complexity = information content
- machine-learn weights



doubled outer boundary

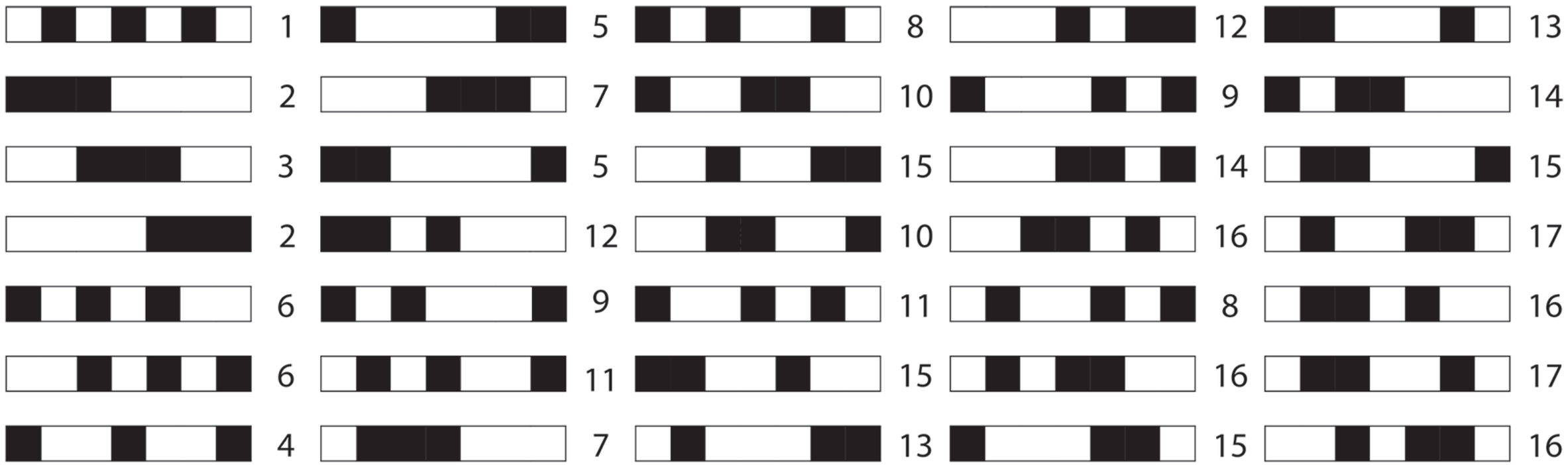


CA subsymmetry counter: 5 buckets, misfit score: 4.06
rpg factor scoring: 15 buckets; misfit score: 3.86

Score: 0.0–17.5 (best–worst)

Same Factors, Different Weights

- sub-symmetries as described
- machine-learn weights for different subsegment lengths



CA subsymmetry counter: 5 buckets, misfit score: 4.06
rpg factor scoring: 15 buckets; misfit score: 3.86
rpg re-weighting: 17 buckets; misfit score: 3.49

Score: 0.0–17.5

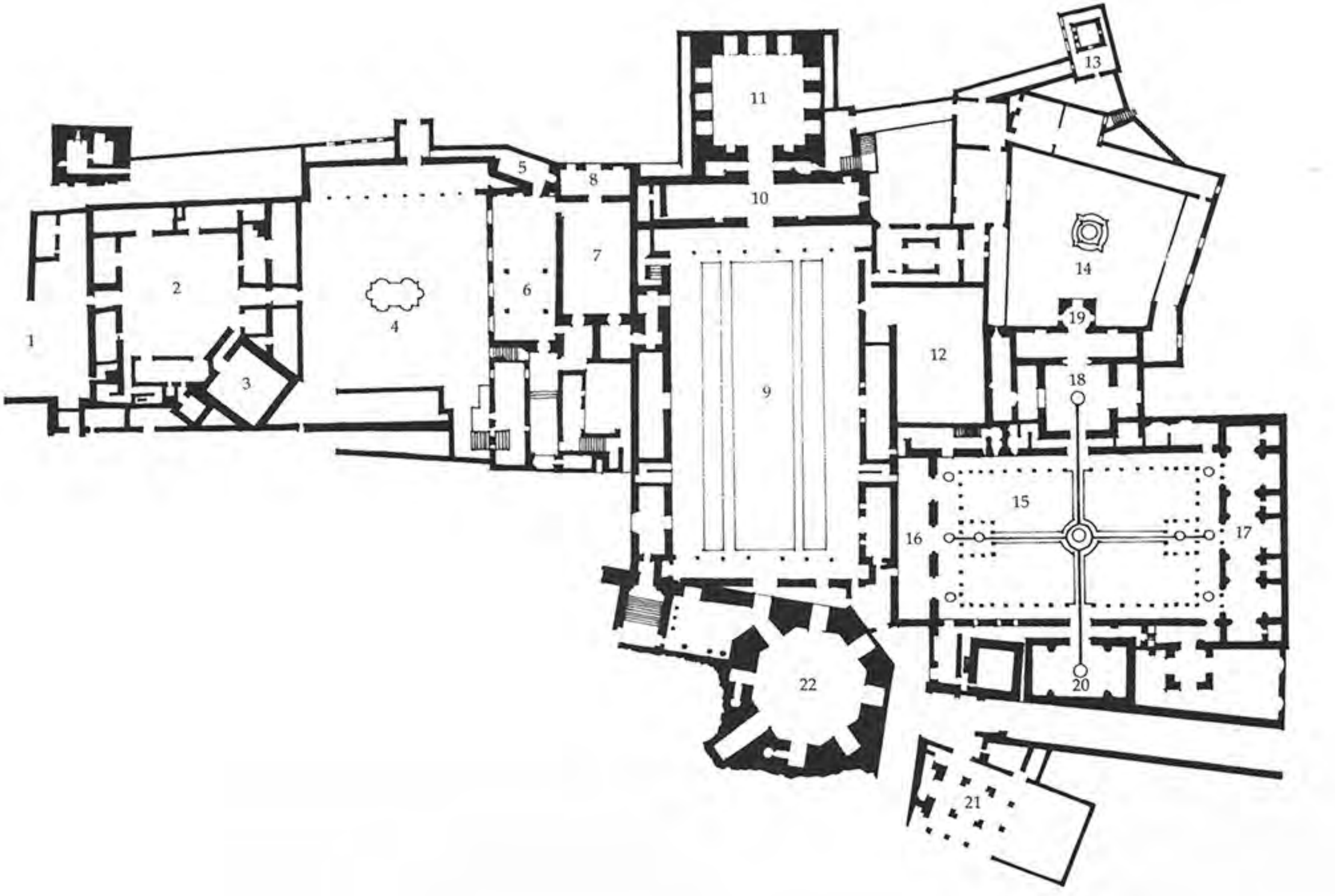
...complexity was taken as chaos and near-total disorder, and simplicity was taken as pure order. The place in the middle was left out: an interesting locale in complex systems—the border between order and chaos.

Chaos is unpredictability: combinations that might have lasting value or interest don't last because the energy pushing change is too high

Order is total predictability: the only combinations that exist are the ones that always have because the energy maintaining stability is too high. And organized complexity is in the border of order and chaos

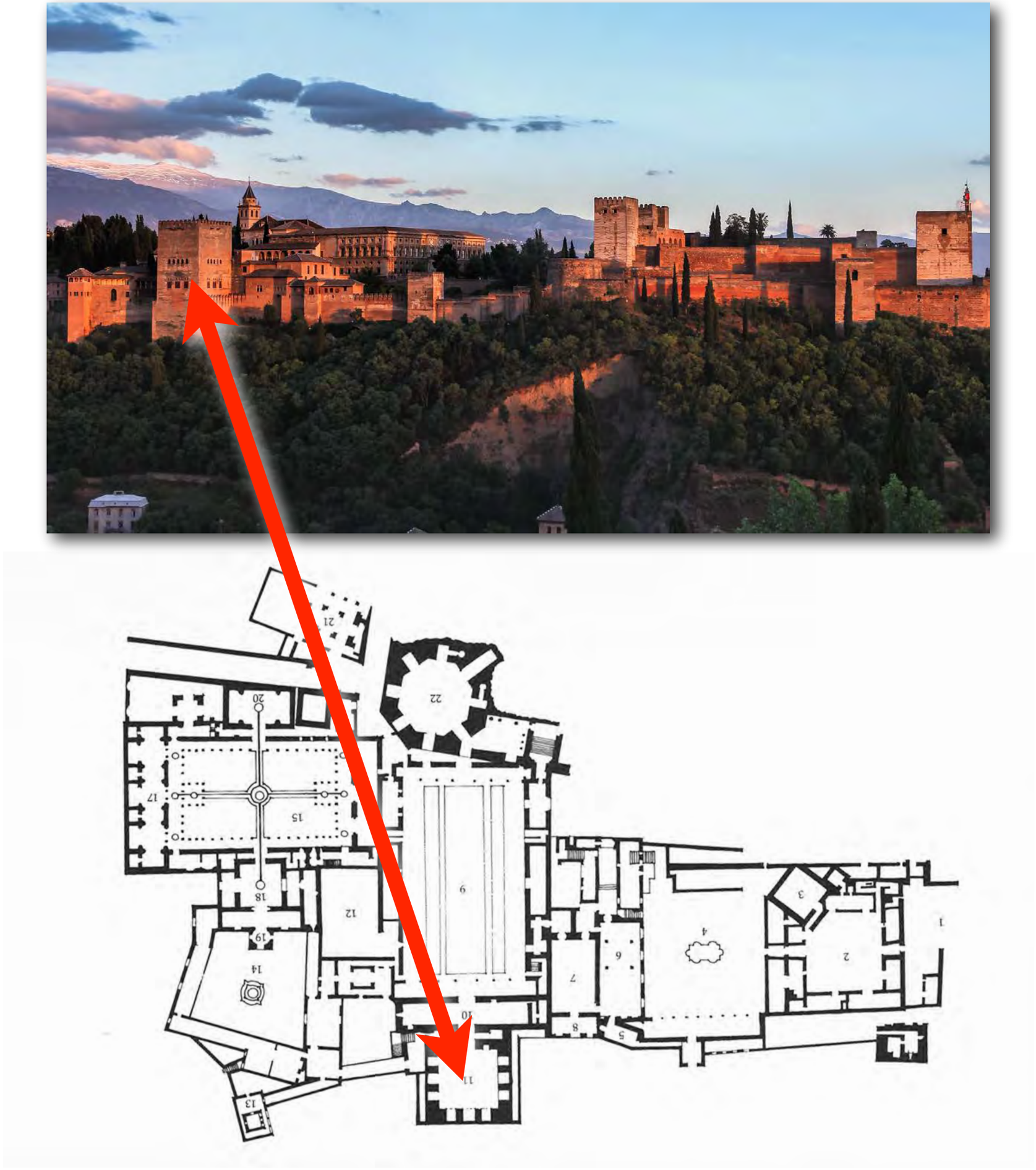
the paradoxical interplay between symmetry and asymmetry

or between simplicity and complexity



Alhambra

In the case of the Alhambra, the overall asymmetry comes from it spilling over an uneven hilltop, but its inner parts contain a tremendous concentration of symmetries. That is, the Alhambra is symmetrical where it could be, and asymmetrical where it needed to be; the places where it is rough are the places where the nature of the hilltop spoke loudly.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...build where the site seems to be striving to create something itself. A harmonious structure is one whose internal similarities and differences reflect the ones that exist in its conditions. Good structure arises because the living process creates the right symmetries asymmetrically on the backs of other symmetries.

Everything in nature is symmetrical unless there is a reason for it not to be.... Within the living cases, we know there is always a balance of symmetry and asymmetry. But we do not know a way to formulate this balance.... For the moment, we must just declare [it] *an enigma*.

Mirror of Self

(a)

(b)

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?

(a)

(b)

...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

(a)

(b)

I believe that almost everyone, after careful thought, will choose the left-hand example [a]. *...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.*

Disorganized Complexity

(a)

(b)

75% Randomized

Alexander was beginning to see that...the Mirror of Self is really just a way for people to be able to discern the degree of order in organized complexity

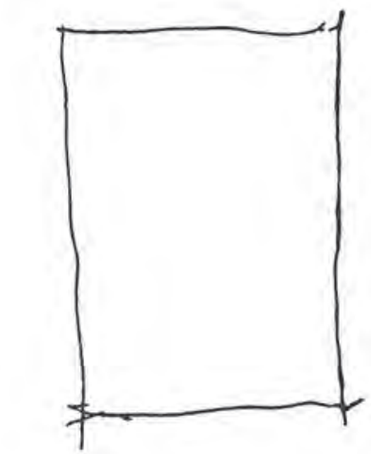
Turn of the Century the Nature of Reality

“Life”

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.

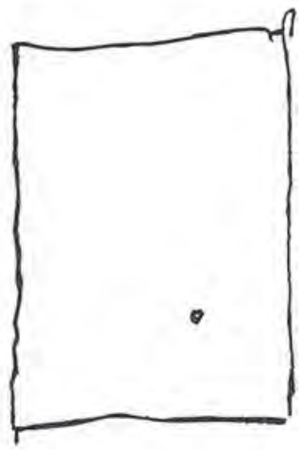
Centers
The Fifteen Properties

...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.



A blank sheet of paper

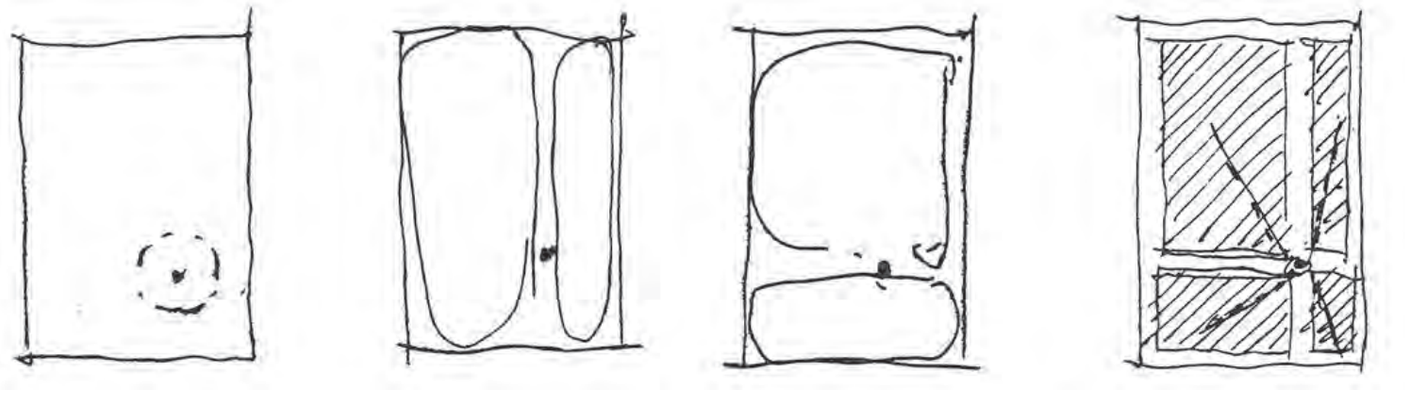
(a)



Blank sheet with a single dot

(b)

Then I place one dot on [the blank sheet]. Although the dot is tiny, its impact on the sheet of paper is very great. The blank sheet of paper is one whole, one kind of wholeness. With the introduction of the tiny dot, the wholeness changes dramatically. Its gestalt changes. We begin to experience a subtle and pervasive shift in the whole. The space changes throughout the sheet of paper (and not only where the dot is), vectors are created, differentiations reaching far beyond the dot itself occur within the space. As a whole, an entirely new configuration has come into being, and this configuration extends across the sheet of paper as a whole.



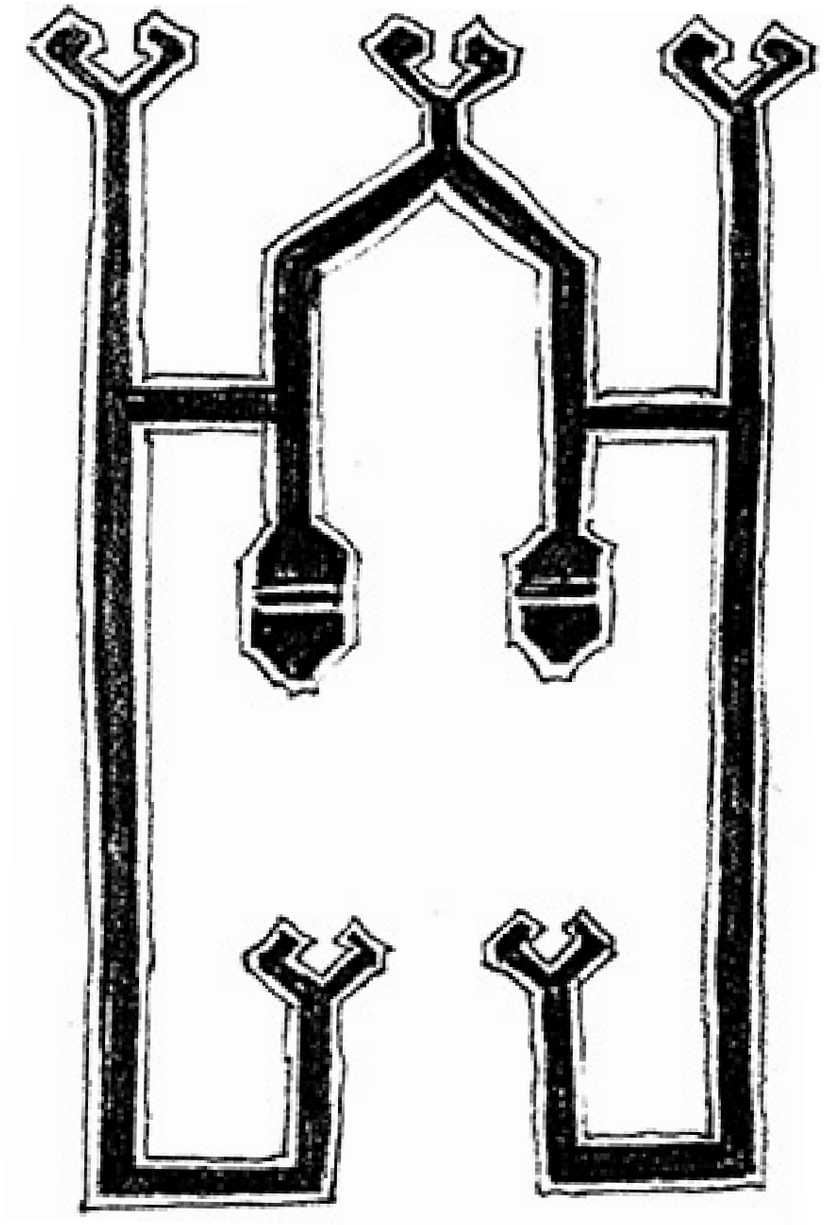
Halo around the dot

Four largest rectangles, creating four other rectangles in the corner, by their overlap. These are seen on the right

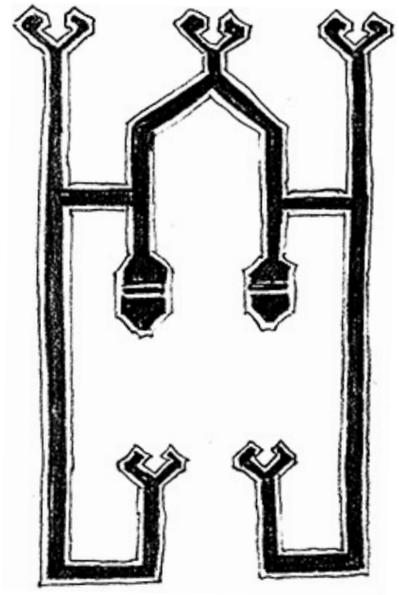
System of rays

(c) (d) (e)

1. The sheet itself. 2. The dot. 3. The halo around the dot. 4. Bottom rectangle trapped by dot. 5. Left-hand rectangle trapped by dot. 6. Right-hand rectangle trapped by dot. 7. Top rectangle trapped by dot. 8. Top left corner. 9. Top right corner. 10. Bottom left corner. 11. Bottom right corner. 12. The ray going up from the dot. 13. Ray going down from the dot. 14. Ray going left from the dot. 15. Ray going right from the dot. 16. The white cross formed by these four rays. 17. Diagonal ray from dot to nearest corner. 18. Diagonal ray from dot to next corner. 19. Ray from dot to third corner. 20. Ray from dot to furthest corner.



In the carpets, sometimes a being appears



This being arises from the configuration of the centers, geometrically, but recognizing it as a being requires more than geometry—it takes a being that is alive to notice a being that is alive. This is the mystery of complexity in the vicinity of order.

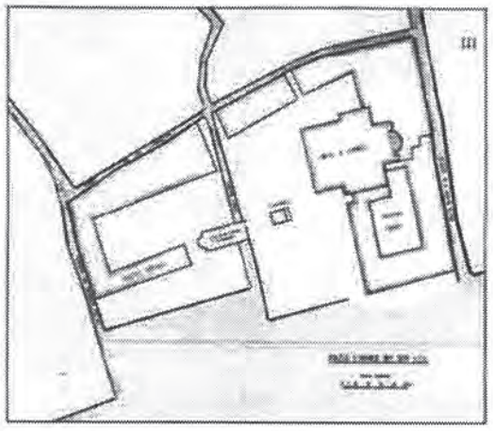
The Fifteen Properties / Transformations

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

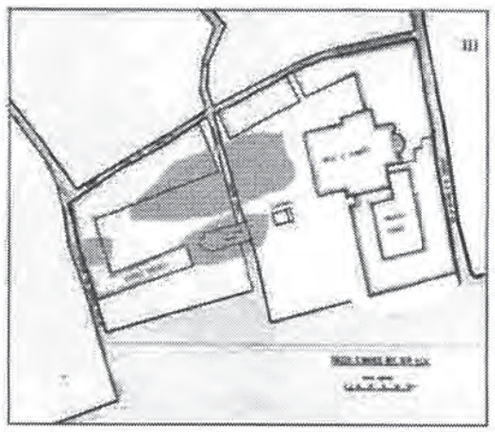
*These transformations delete centers

Unfolding

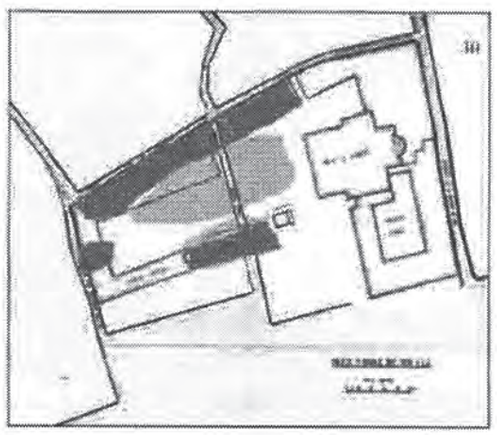
- adding new centers that reinforce existing ones
- strengthening or developing one or several existing centers
- removing weak or dysfunctional centers



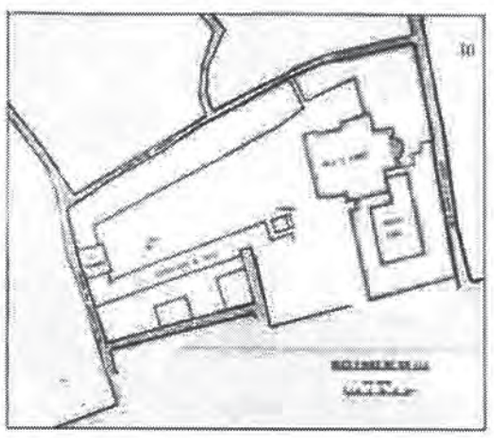
About 1400 A.D.



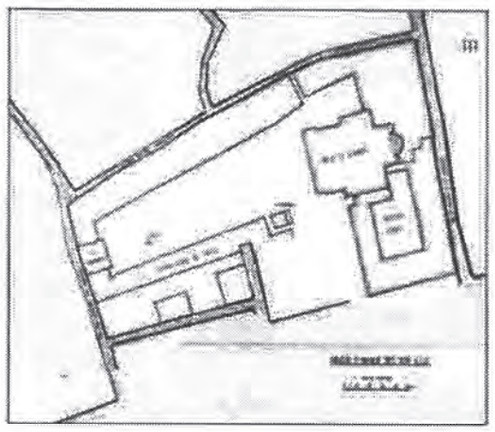
Latent centers



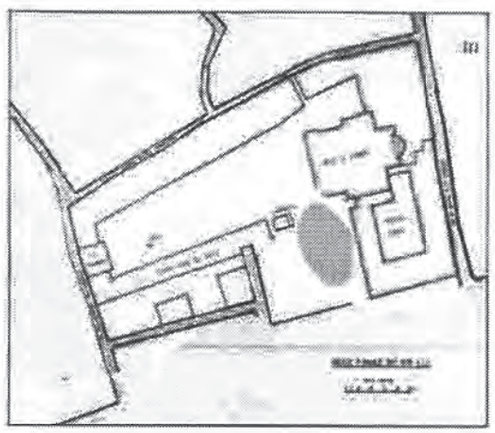
New building position



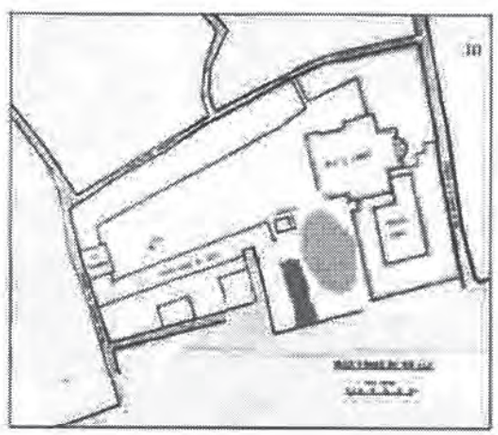
Old Procuria built 1532



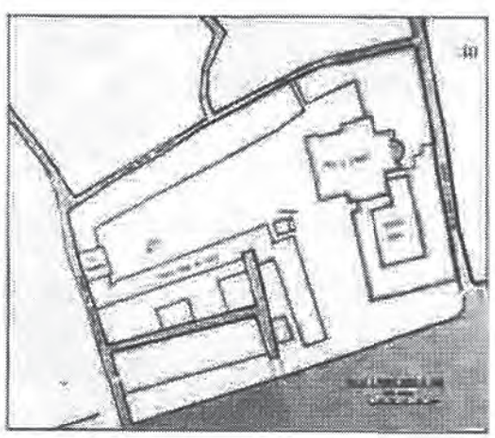
About 1532 A.D.



Latent centers



New building position



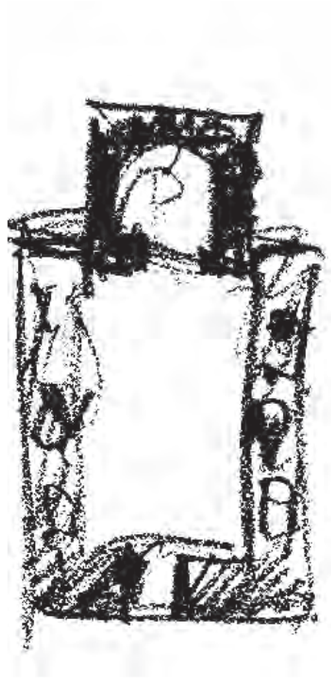
New Procuria c. 1600

St Mark’s Square

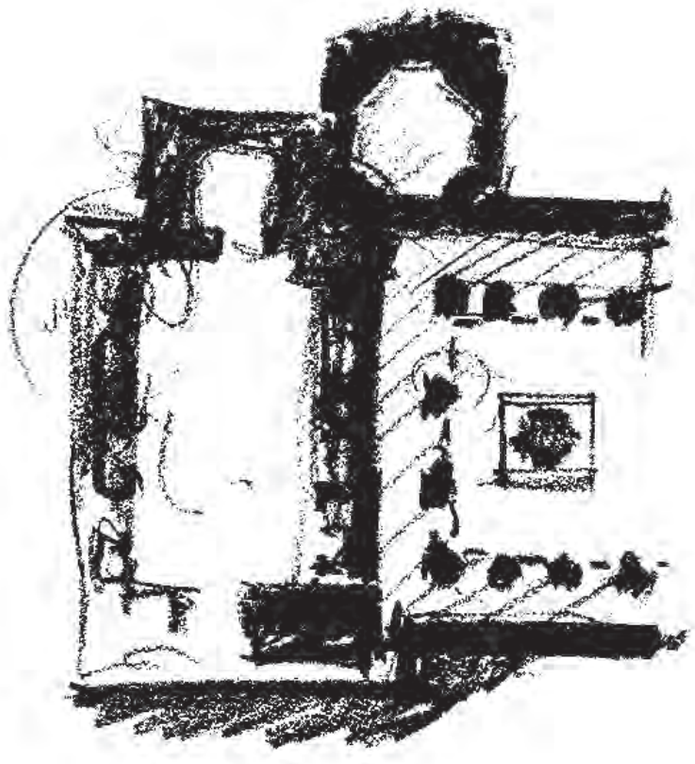
Step 1: A simple thing, bi-axially symmetrical

Step 2: The simple thing gets a second center which intensifies the first

Step 3: At the same time I can hardly stop myself: I start sketching in minor centers at the tail end, and along the sides, anticipations of further centers to come—and ways of intensifying the original body



Step 4: Now both major centers get a boundary which includes the minor centers from step 3. The boundaries are thick and themselves made of centers, which appear as shadows still. Are they niches, storage, alcoves, statues, places where something might grow.



Step 5: Not-separateness. The powerful center is now surrounded and embedded in a field of other centers: it disappears, and gets its life, most strongly, in the end, because it disappears.

Unfolding / Differentiation

- pattern languages (customized for the project)
- sequences (the ordering of an unfolding)
- form languages

Form Languages

a form language...is a box of tricks, the elements, rules, ways of making roofs, edges, windows, steps, the ceiling of a room. The way to make a wall, the way to make a column. The shape of the edge where the building meets the sky. The ways which will not only make a coherent and beautiful work, but one which can be built, in our time, by means we understand, control, and can execute for not impossible amounts of money.

The Crux:
Organized Complexity

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 Bulldozer

If we are trying to build on a site which is irregular, and if we have only crude hand tools, we need to find the place on the site where the house we want to build can be built using those tools. Therefore, we look for places where the adaptations we are *able* to make to the site meshes with the adaptations we are able to make to the house we have in mind. Nothing is modular.

The Bulldozer

...tools enabled us to put all the adaptations on the shoulders of the site. If the site's local forces present difficulties, we simply bulldoze those forces away. The house becomes the modular part. A modular part (generally) is not made to be adapted. It is fabricated.


PRIVATE LAND
Please do not
feed the
horses

Instead of a lovely stone croft nestled in the most serene and still part of the rocky, steep hill close by the voe—it's a double-wide on a flat spot bulldozed halfway up.

The icing on the cake is that...modern modular parts and structures created are hardened and immutable—steel and glass instead of brick and wood, which can be repaired locally as needed.

Simplicity

Mechanical Simplicity

mechanical idea of simplicity as the geometrically banal

Alexandrian Simplicity

...living process...may, in a certain special sense, be called deeply simple—that it may be characterized by the idea that it is the simplest process which exists in any given set of circumstances. What has appeared all along, the idea that complexity is a manifestation of a deeper, more intricate structure created by structure-preserving unfolding, may be understood better yet when we appreciate that it is always the simplest step which governs: And that the drive provided by the SIMPLICITY AND INNER CALM transformation is, necessarily, at the very root of living process.

Alexandrian Simplicity

The appearance of symmetry in nature comes about because there is a symmetry of the conditions where the thing in question exists. In most cases the symmetries occur because there is no good reason for asymmetries *to occur. That is why raindrops are symmetrical. That is why trees are roughly symmetrical.*

Alexandrian Simplicity

...in Alexander's world of making things, it is the artist Alexander who takes over. We don't have symmetry, but "rough symmetry." Alexander disdained harsh, geometric simplicity. And he said that it was of enormous importance that one needed "irregular variants of repeating centers, to make things work out."

...all the well-ordered complex systems we know in the world, all those...that we view as highly successful are GENERATED structures, not fabricated structures."

Border of Order and Chaos

Alexander's "well-ordered complexity" is what Weaver and Jacobs called "organized complexity." Alexander was describing the edge of chaos—a place balanced between order and chaos, or between simplicity and complexity. When we look too deeply into chaos, we find only disorder; when we look too deeply into order, we find only the botfly of boredom; when we look in between, we find Beauty, poetry, life.

A long sentence should feel like it is pushing at its edges while still keeping its shape. All along its length it will feel ever so slightly chaotic but still composed, never losing its underlying order.

–Joe Moran, *First You Write a Sentence*

Battle

So, You Think You Know About Alexandrian Patterns???

1.1 An outer Boundary surrounds the Campus. *A white, 60 cm wall serves as the base for a wooden fence. The fence varies in material and character. There are high, wooden, closed parts; at other places there are bamboo and climbing plants; and there are openings to look through. At other places a boundary will be formed by the landscape. The fence is punctured by gates at important points, perhaps with a darker concrete or stone foundation. Several buildings will be set into the outer boundary, connecting the school with the surrounding community.*

3.9 The center of the Homebase Street is the Large Gymnasium, which stands at one end of the street, and shapes the street. *This building is large, has a beautiful shape, and forms the head of the high school, in a very prominent position, at one end of the homebase street, all the time visible for everybody. The roof will be totally different from the standard modern gymnasium roof in Japan. Spectators will sit on bleachers, or in a gallery along one side of the building.*

5.5 In addition, every Sports Field is always attached to some building, which has nothing to do with the particular sports function. *Thus, for instance, the tennis courts, may be next to the art studio, and placed so that people entering the art studio, are just at that place where the tennis court is most enjoyable to watch.*

5.11 There are two Tennis Courts, preferably on grass. *Tennis games are both beautiful and exciting to watch; they are not noisy, the sound of tennis is pleasant. It seems like the courts for tennis games should be located in a very integral fashion with quiet or dignified outdoor activity. This kind of unusual adjacency of functions can give great vitality, and enhance both functions.*

5.23 Somewhere there is a Wild Garden. *There is a sort of a wild garden, a pure piece of nature, where nothing is added by the human hand, a wild forest.*

8.9 Inside, here and there throughout the Campus, there are surprising soft highlights of color, shining out among the subdued colors of the rest... A figure painted pale in kingfisher blue... In one place... A golden yellow iris in another. *For the most part, the school is composed of materials with beautiful, subdued, natural colors; wooden columns, plaster walls, wooden floors, stone paths. But occasionally, and only where necessary, highlights of lively colors are used. These places with bright color are not harsh or garish, but give the campus the same sort of life that wild flowers give to a meadow in the spring.*

7.7 ***There is also one garden, so secret, that it does not appear on any map.*** *The importance of the pattern is that it must never be publicly announced, must not be in* [the] *site plan; except for a few, nobody should be able to find it.*

Judo Hall Fiasco

From the time we had created the site plan, it was already clear where the Judo Hall would be placed.... Its position also made it very clear that the building must have a long narrow format, and be relatively high, on a plinth. This shape was created by its relation to the cliff, which put limits on its position to the south, and by the space of the Tanoji center, which required that the front of the building be narrow, so that it could form an effective end to the space.

Its length was thus partly a function of its position and its narrowness. It was also a function of its relation to the formal entrance path which approached the Judo Hall from the entrance street.

First, they pressed us for a building which was more square in shape. We explained the facts about shape and layout mentioned above—because of the building's crucial relationship to the surroundings. They were deaf to these issues, and cared only for the interior shape they wanted.

Here we come to the crux of the struggle. Our intention, from the beginning, had been to express the Judo Hall as a place of spirituality. Budo halls have, in Japanese history, always been place where the spiritual aspects of budo and kendo are emphasized, and we wanted to be sure that these qualities would be safeguarded, preserved and extended, in a building of an appropriately spiritual dimension of its own.

However, the further we got into the dispute, the more it became clear that the judo instructors viewed the Judo Hall as a kind of gymnasium, whose emphasis was mainly on the springiness of the floor, the padding, and the excellence of the lights.

We on our side, were quite unwilling to make any sacrifice which would disturb the spiritual dimension of the building, as long as practical requirements were modestly satisfied.

Drunk In 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.

...we're trying to do something that no one else has ever tried to do in the 20th century...make God appear in the middle of a field.

...Richard Gabriel must take enormous credit for his courage in writing such a crazy and inspiring book, based on the work of a visionary drunk in God....

It has taken me almost fifty years to understand fully that there is a necessary connection between God and architecture, and that this connection is, in part, empirically verifiable. Further, I have come to the view that the sacredness of the physical world—and the potential of the physical world for sacredness—provides a powerful and surprising path towards understanding the existence of God, whatever God may be, as a necessary part of the reality of the universe. If we approach certain empirical questions about architecture in a proper manner, we will come to see God.

The capacity to make each brick, each path, each baluster, each windowsill a reflection of God lies in the heart of every man and every woman. It is stark in its simplicity. A world so shaped will lead us back to a sense of right and wrong and a feeling of well-being. This vision of the world—a real, solid physical world—will restore a vision of God. Future generations will be grateful to us if we do this work properly.


PILOT US
LK.271.
LK.271.
LK.36

Mystery, Beauty, Complexity

Alexander considered design to be more like resolving a mystery than solving a puzzle, the experience is more like slowly dawning insights than aha! moments and the process can take a long time. That mystery kept him alive, pulling him ever forward in his search. Something with QWAN (or wholeness or life or "beings") needs some other thing—a tension, a strangeness, a stillness, a sadness, a complexity leaning against order—to make it special. After we find such a thing, we can explain it maybe with centers, patterns, sequences, and form languages—explain why. But not how. That's important: why but not how. The mystery always eludes us.

The Beautiful is not trivially simple or ‘pretty,’ but attracts our attention in an almost obsessive way; that much seems clear. We are drawn to it, we come back to it over and over, we notice new things each time or notice them differently. All good art has this quality. Alexander strove to attain it and occasionally came close.

When I first visited the campus, I found it rather strange and uncomfortable; I left soon after seeing it. The next day, I kept on thinking about what I had seen, and went back to see the campus again. A few days later, still having the picture of the campus in my mind, I could not let it go, and went back to see it once again.

During the next months, I found myself drawn back to it, again and again and again. The place and the buildings have a hidden depth, not present in contemporary, 20th-century works of architecture.

–Hiroshi Ichikawa, professor of philosophy and aesthetic

Where is the Gate?

A Search for Beauty
A Struggle with Complexity

Richard P. Gabriel

Jenny Quillien