

# Guiding Patterns of Naturally Occurring Design: Elements

## A Pattern Language Approach

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*Reader Notes:* The “starter kit” is introduced in sections 2 and 3. The frequent mention of examples and applications is to help suggest viewpoints from which one can recognize the frameworks of nature that need to be worked with. - Rough draft sections are shown in: *green italic* – Resource site for reference and presentation materials [http://synapse9.com/ PLref](http://synapse9.com/PLref)

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## ABSTRACT<sup>1</sup>

Why pattern language can be so effective for describing simplifying ways to balance complex relationships, has to do with people first looking for those kinds of solutions. Then a structured practice of recording the essence of the relationship pattern from every view , fits together the parts for an understanding of the whole. For describing patterns of wholeness in nature, that develop without anyone's observation or intent, and may have interiors hidden from view, you need universal principles or "science" to get a start, like first locating the subject with a search pattern, a piece of boundary or a behavior. Then learning to recognize natural language and other sources as great repositories of natural design patterns we already know, you move your attention back and forth between our explanatory world of ideas and nature's behavioral world of independently organized relationships. It allows a "dual paradigm" view of causation, for translating between complex behaviors and explanations, building meaning and richness of understanding grounded in nature, to record using a slightly expanded pattern language template. The idea is to provide some sort of "starter kit" for experimenting with this method, to see what works. The easiest place to start seems to be with a word like "home", thinking about what it means as a place where things find their fit in the world, as the fulfillment of a journey, a place to be and to work from.

*Key Words:* pattern language, natural design, knowledge repositories, living quality dual paradigm,

Draft Reviewing note:

- *Paragraphs in development are indicated with this color and line spacing.*
- *The paper is for the PURPLSOC meeting, July 2015. A companion paper the PLoP meeting in October, is "Guiding Patterns of Natural Design: Mining Living Quality" available in draft form like this, [here](#) .*

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## MAIN BODY

### 1. INTRODUCTION

#### 1.1 Origins

Alexander's motivation for developing pattern language seems to first appear in "A city is not a tree" (1965), teaching architectural theory at Berkley, with recognizing that "there is some essential ingredient missing from artificial cities" compared with thriving natural cities. He linked it with a pattern of design that was missing, one of complex overlapping natural opportunities for making connections, what he called "a semi-lattice" form of design. My own early motivation for studying the natural language of design patterns was similar, coming to study architectural and environmental design<sup>2</sup> in 1971 with an interest in understanding what amounts to the "wholeness" of all individual natural events and their unique individual differences, not having come from studying physics<sup>3</sup> and being troubled that those subjects were undefined. It took time to understand, but I later found it was the great success of theoretical physics in describing nature with abstract concepts of controlled relationships, that for physics results in excluding questions of 'wholeness' and 'individuality' from the designs of nature being discussed, whereas architectural design is principally about creating systems for providing good 'service', not control, the individually whole things and their differences the main subject.

My actual first hints of how the architectural approach to system design could apply to natural systems, as wholes, and as providing services (not controls), came from noticing the patterns of how individual designs developed in architectural design studio. Studio projects always developed from scratch with everyone working on the same problem, looking for how to start, then building up in complexity and effort with focusing on the project as a whole, to end up having gone in very different directions. I recall some of my observations being inspired by hearing of Alexander's ideas too, before he developed pattern language. It was something about how environments build up layers of pattern memory of past designs, that remain even when things are removed. I could see it in how the piles of drawings that always built up during a project tended to constantly reflect all the problems studied and the shapes experimented with.

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<sup>2</sup> GSFA MFA in Archt. & Environmental Design, 1974

<sup>3</sup> St. Lawrence Univ., Physics, 1968. See also JLH CV (2015)

The direction I took that interest in where the wholeness of individual final designs came from combining that with research I did first in school and then shortly after, on the micro-climates of passive solar and other homes. The organization of air currents as the sun moves around during a day prompts numerous whole redesigns of the organization of how the energy flows (Henshaw 1979a). That lead to recognizing a general pattern, that all energy uses take place by means of emerging systems of organization, prompting my first attempt to describe its design patterns, as “An Unhidden Pattern of Events” (Henshaw 1979b). It implies a very concrete need for science to turn to study how individual systems are organized as wholes, simply because that’s how nature’s working parts are arranged. That the modern world developed without that is somewhat miraculous, not learning how to align our categories of information with nature’s units of operation, but it certainly hides the living quality of our home from view in many ways and leaves us handicapped for understanding how to respond to our upsetting most of nature.

So, ending up going in such a different direction I traveled in other circles and didn’t really follow Alexander’s later work. My guiding interest was studying the natural designs of systems as whole individuals, coming from first asking “what makes life lively”.

Alexander’s interest is in a search for “wholeness” as a source of “living quality” . . . What led me to it later was a combination of how it had grown and changed as a language, a connection through my interest in some of the rigorous systems thinking coming from the commons movement (Finidori 2014, 2015) (Bollier, Helfrich Eds. 2014)(Roy, Trudel 2011). The modern approach to pattern language caught my attention for extending architectural concepts for use in other fields, to define and convey complex practical patterns of relationships, that a science of naturally occurring whole systems could maybe use. I’ve have a problem defining terms, not unlike the problem programmers previously had, of having no good way to define for others various sets of functional relationships that needed to be understood as a whole. So this paper, and a companion paper for PLoP later this year (Henshaw 2015c), are my initial attempts to use a pattern language approach to present patterns of how naturally occurring whole systems form, that might be useful to learn from. A few other mentions of sources for the work are listed in Acknowledgements.

### **1.2 Natural design patterns**

In the terminology of Alexander’s pattern language a “design pattern” is both a “simplifying ideal” of design relationships, as a completed whole, and what identifies “objects” of design as wholes. They can be used as patterns for providing whole solutions to problems in

similar ways in other situations, and as an “object” of design both as an end purpose and as an individual organized whole in its environment. As such, a “design pattern” is then also something like reference to how it is used in a wide variety of situations, and a way to identify those situations to study them.

So, design patterns are not really ‘*solutions*’ as much as ‘*guides*’, containing information about the various contexts in which they are found. As such they are then also keys to unlocking some of the secrets of the other circumstances in which they are found. In the end it’s literally always nature that completes any design or transformation, so in functional terms natural pattern language includes that understanding, that what constitutes “solution patterns” is not the whole solution, but a set of frameworks designed for nature to grow into and so make the whole solution.

Those are the features that seem to have been important to making “object oriented software” such a useful tool for computer programming, giving program elements holistic purposes that are relatively easy to define. It also do the same in other fields, even, as the groundwork is aimed at here, opening a field of “object oriented science”, briefly discussed in the last section.

You might use a design pattern to look into the living cultures in the contexts where the solution applies, maybe just to know what makes them tick. You might also use it to help you see what it is that attracted them, or to anticipate the disturbances that might result and need to be responded to when applying the pattern. Perhaps more often you’d just be looking for ideas, to broaden your understanding of a design pattern by looking at how it applies in other places. To do that you think of the subject pattern as a “search pattern” used for finding instances of it in various kinds of environments looking for ideas of features to add or to do without.

For a general example, you might search for more meanings for a pattern called “home” and its complex meaning of both “enclosure” and “connector” and look at how those and other aspects are accomplished in various circumstances. You’d find it associated with how things in nature that develop by growth tend develop homes for themselves as they mature, as a kind of external body of services for and security for what takes place inside, raising those questions for things in your design that you can’t do without but are not yet finding their homes in the design. That process brings appreciation for the living qualities of the natural organization you find, like where the individuality of things is used to let them work smoothly together. Different qualities are found where theories are applied in

which every part is treated as identical, creating endless friction and incapable of becoming whole in a natural way.

As you learn from natural patterns you generally look for their variations and their opposites. As you do the essential features come clear, and easy to recognize, a design pattern, used to orient your view when seeing how it is used differently in different contexts, and when applying it to suggest ideas for how it might be used in any particular context. Say the model pattern is called “vehicle”, and you are working on a design that needs one... Nature has several meanings for that idea, you might think about which would apply in your situation, whether it is as “a conveyance”, for moving on something, or as a “channel” for moving along something, or as a “medium”, for moving immersed in something. These kinds of questions stop sounding abstract when you have a real purpose in mind.

That need to first translate design patterns as found in nature into an simplifying concept, and then reintegrate within some living context to work in nature, is less focused on in other descriptions of pattern language, like the nice quote from Jan Borchers (2001) “a pattern is a proven solution to a recurring design problem”, one that “pays special attention to the context in which it is applicable, to the competing forces it needs to balance and to the positive and negative consequences of its application”. Jennifer Tidwell (1999) touches on how framing them as simplifying patterns of design makes it possible: “They are not abstract principles that require you to rediscover how to apply them successfully, nor are they overly specific to one particular situation or culture. Instead, they are somewhere in-between: a pattern describes possible good solutions to a common design problem within a certain context, by describing the invariant qualities of all those solutions.” So those are some of the forces at play, between invariant qualities and their great variety of variations.

### **1.3 The dual paradigm**

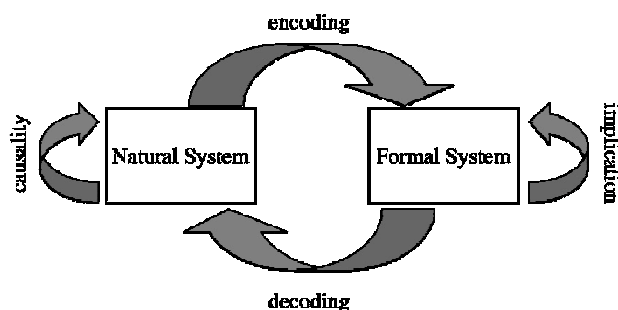
One difference between “design patterns” and “natural patterns” is the presence or absence of “the designer”. Natural science describes nature as following the pre-designs of the equations that can be used to predict them, using mathematical rules as metaphor for the designs of the behaviors nature displays. Where nature produces highly organized complex designs as if following a design, all you have to actually talk about are the observable patterns by which a design develops as the designer, describing the natural process. Quite often natural design are traceable to some point of beginning, and we can

see enough to tell there's a continuity from that starting point to the end, to have to assume that at the start there was some elemental pattern of design, that served as the seed for how things developed into their final form.

When studying complex designs, the need to turn your attention back and forth between explanations of cause and effect as following the observers rules of prediction, or having to consider how the designs of nature developed by themselves, is what I call the “dual paradigm view”. It's really a learning process, recognizing new patterns in how the uncontrolled world works around us to expand our thinking about what to expect or predict. Our usual human centric view has the observer in the picture, but thinking subjectively.

The nature centric view has the observer considering the natural patterns inquisitively, like an artist or a child would. The practice of going back and forth between them, as they inform each other, has the big advantage of letting each remain independent, and aware of the imperfection in the translations. The imperfections give you further questions and a way to go back to the source to check or expand on you observations if needed, as you compare your own interpretation with the patterns observed as arising by their own independent natural processes.

## • Rosen Model Relating Theory & Things •



The great biologist Robert Rosen (1991). described a model relationship of this kind, a diagram of the phenomenology of science (Figure 1), showing science engaging in a conversation with nature, going back and forth between its natural subjects and formal theory, using the theory to raise more questions, as how science relates to nature It helps define design using “pattern language” as a science too, only with a

## 1. Back and Forth Between Nature and Science

“formal language” where the “formality” is not mathematics, but a way of drawing out and defining useful natural patterns of complex working relationships, for designing with the elements of naturally occurring contexts.

As far as perceptual “technique” it's a matter of expanding one's natural ability to hold undivided attention and be purely inquisitive for long enough to notice truly objective

impressions, essentially just “imprinting”, to then ask pattern language kinds of questions. It’s the learning process of collecting naïve observations and asking good questions that connects the two views, turning one’s attention back and forth, translating and testing, learning as if fitting a glove on the hand of nature, to be comfortable and responsive, not to replace nature with an artificial hand, but to be aware and responsive.

You don’t need to make a research project of it, but just notice when you learn that way naturally, to make it available when needed. One always has various undigested raw impressions of things you can find in your thoughts, so when a new question arises about a subject of natural design you can just sort through your own scattered raw impressions, the ones you have not reshaped by explanations yet. We often do that casually, like when something turns up “out of place” we’re thrown into searching our memory for anything related that will help us piece together what happened. About the same thing can be organized as a workshop, for scanning what’s going on in environments people are familiar with for what is going on related to some particular concern (Henshaw 2014a).

If you are in study group, learning to recognize natural patterns, it’s likely that someone would present enough of a pattern for people in the group to use for finding other examples. To cement the learning, though, you could try being the teacher, with someone else in the group, 1) write a simple clear description of one or more of the examples you find for them to read, 2) exchange descriptions to see what they understood from how you described it, and share other observations.

You’re doing it right if you learn more about the pattern as part of nature each time you revisit it. That test also seems to be the main way one can validate descriptions, by seeing whether using them help you learn more about the original subject.

## **2. TWO PRIMARY PATTERNS**

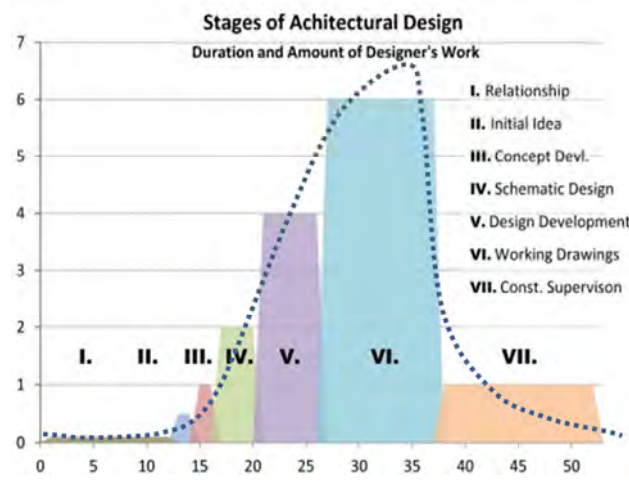
### **2.1 The Natural Process of Design**

Perhaps the most universal pattern of natural design is one I first noticed as a recurrent pattern of swelling and declining effort for every project in design studio classes. Design takes time, requiring you start making small tentative steps, searching for where to start and then unavoidably follows with a pattern escalating to intense effort, only to reverse course again. Designs end with small finishing touches, as the work approaches completion... if you have left yourself enough time to do so. As a phrase what one would



say is simply that “*designs develop*”. More particularly design generally proceeds by a ladder of stages of rethinking the all the parts over and over, each stage emerging from and built upon the one before, with the whole organization of the design changing form several times, and following completion the work is taken up by a builder and the designer’s work tapers off (Figure 2).

• Stages of Design and Degrees of Effort •



In architectural design the design process is largely finished before construction starts, as in (Figure 2). In nature, lacking any preconception to follow, of course, the same pattern of small then larger scale stages of redesign, all emerging from a common origin, to produce a new finished form of organization, is found as the general pattern of growth processes. Growth is nature’s equivalent of ‘*design*’, though actually our form of design is a special case of hers. In natural growth the design of the new form doesn’t occur

2. The general pattern of design

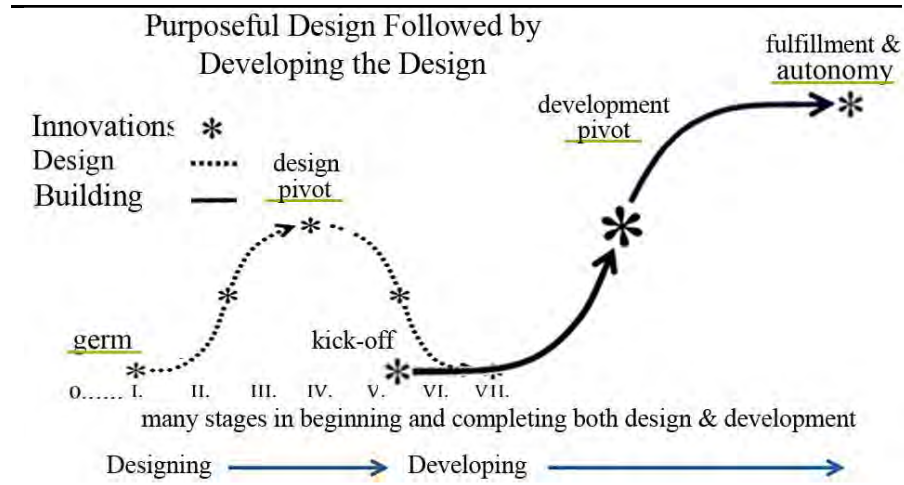
before it develops, but at the same time, as the process of its development (Figure 3).

In architectural design practice the stages of design follow a fairly standard sequence, I. The Client Relationship, II. Conceptual Design III. Schematic design, IV. Design Development, V. Contract Documents, and VII Construction Observation. They also correspond to changes in the organization of the team, the deliverables and payments, the legal work, etc, progressing from a very tentative and immature state to robust and refined complex product. Considered from beginning to end like that, the same pattern is found in all kinds of organizational processes, a similar series of changes in the character and content of emerging designs as the go to completion.

The sense of urgency that develops as the work swells is not really because someone asks for it, though as the team devotes more and more time and effort the need to just “get it out of the office” becomes a central motivation. I think it really comes from the naturally multiplying demands of following through on the simple idea the whole project is an extension of, the “elemental pattern” that all the stages are built upon. That pattern emerges in the earliest phase of conceptual design, somewhere during the search for how

to make a dream idea come true. In natural growth processes that phase corresponds to what biologists call “*individuation*”, when an developing organism changes from a lump of cells into a body with all its rudimentary parts .

## • Design Completes Before Construction •

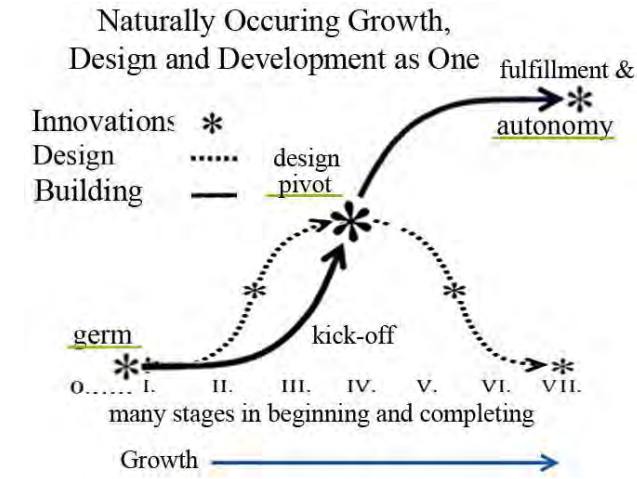


Once those cautious and tentative early steps get started in the right direction it's the demand of the expanding diversity of needs it creates that propel the big hurried steps to complete it and get it out the door. You can see those same stages in similar form wherever you find designs

## 3. Design and building as separate processes

developing following something like a growth process. You see it in getting ready for both a regular family dinner, or a large party for guests. It's there in sending a man to the moon, and in establishing a career. It always takes a bit of inspired invention and small tentative steps to find the elemental pattern needed to get going, and on which the larger steps builds up toward the finishing steps of completion. During each stage a different kind of organization for the process develops, posing and requiring answers to different kinds of questions, and setting the stage for the next. Of course you also see it process of getting an education, starting with early childhood reading and the long ladder of ascending forms, as a series of “*graduations*” that build on each other.

## • Design Begins and Ends During Growth •



## 4. Design and building in one

The physical science that ties these many kinds of similar patterns together is the common pattern of scales of energy use that correspond to the successive scales of organization and complexity that occur in design. It's just another way to identify the same pattern, one that doesn't require recognizing as much detail in the developing process. Thinking of design as swelling and then shrinking energy use also give it a "peak" to mark the most important point in a the design process other than getting

started, the point at which the work of design "pivots" from responding to internal needs of individuation to the external needs of connection with the world around, you might say moving from the issues of "take-off" to those of "landing".

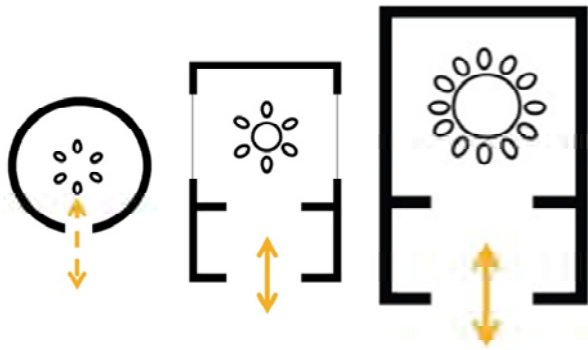
It's in the nature of growth to seek a fulfillment of growth, with nature's secret being to upset the growth process and release its structures for other things as the process as a whole approaches or crosses it's natural threshold of diminishing returns.

## 2.2 Elemental forms of "Homes"

Homes are enclosures where good access to the world around them, but where the users can define their own ways of living, free of outside interference, so "places for autonomous systems of relationships.

A biological cell is also an autonomous organism, with its internal operations largely sheltered from outside exposure, except for selectively controlled exchanges. It would be hard to count the differences between the autonomous relationships a cell develops to let it work smoothly, and that a family does, or a community, of course . There are distinct similarities though, like that at the center of the biological cell is its nucleus, and the work of the cell is organized around that somehow, the nucleus might even serve as a kind of map of the common culture of all the cells of the body.

• Circle Family Community •



Shelters for Equitable Gatherings

Serving as the center for a family home is usually the kitchen or dining room table, not a central repository of information, but an open space, across which family members share a common culture. Each person maintains their own mental image of the culture the family lives in and in the family circle each person has the attention of all the others, and witnesses all the communication between the others, for a self-reinforcing

commonality of experience. That's not really possible except when gathered around an opening that both separates and holds a group of people together collectively. Much the same relationship exists when sitting around a camp fire, that the fire brings people together and holds them apart, giving each person an equal audience with every other.

How strong an unique a bond that naturally creates is not appreciated until you experience how the complete privacy of homes allows families to organized themselves in very different ways. What becomes the general rule to expect is that homes are made to contain internal worlds of relationships that are most often quite complex and uniquely individual. Even though it's family cultures are literally invisible to others who don't participate in them somehow, we come to expect that any home contains an inner world we know very little about whenever approaching from outside. As outside observers all we initially recognize is the signs of the enclosure, that tells us little of what's inside. Unexpectedly often we'll find we cross a boundary not even realizing there was an inside, only finding we have entered someone else's domain by realizing we don't quite know how to act.

It might be only after considerable study after recognizing some boundary and discover what it hides from view is some very different kind of organization than we're familiar with. It may look familiar on the outside, only to be found very different from what we'd expect on the inside. We recognize a boundary as our information, a house or a group of friends that keeps to itself, a consistent shape that separates something inside from outside. Conveying no hint of why there are also openings in the boundary, it may only be much later that we recognize them as allowing things inside to connect, their internal and external relationships. We may be walking down a street and see through a window some family having dinner, but have no way to understand it. Think about it physiologically. Those relationships you're watching are between the people relating to each other. They

are not between the bits of information you can observe. So the two information contexts remain entirely disconnected even open to view.

As children we first find other people's homes deeply mysterious, the homes of neighbors and relatives, full of special things that wouldn't make sense in our own, surprising us in how they live. As adults we frequently have new employees, new roommates, new partners, and of course new children who all surprise us by having such original lives and minds of their own. The first impression we get from the outside takes a long time to reshape for both the amazing talents as well as the upsetting complaints they often have hidden inside. Every culture is a "cult" in that way too, a way of life deeply embedded with ancient manners and practices, the subtle character of which may be hugely important internally, but to any outside observer would have too little context to even be recognized as meaningful at all.

As a result many of us if not most, find ourselves living somewhat "invisible lives", as what makes private lives so private in many ways is rather universal. We may also have grown up in one of the many more or less unnamed and so unknown "invisible cultures", that outsiders never seem to understand. So it's in the nature of homes to be private, for cultures to be initially at least invisible too, the complex of working internal relationships not to be understood except to participants, private both physically and organizationally. It keeps outsiders from understanding the meaning of even what is easily observed, until we take an interest in the why we all live such hidden lives and build a deep compost pile of observations about it to call up in new situations.

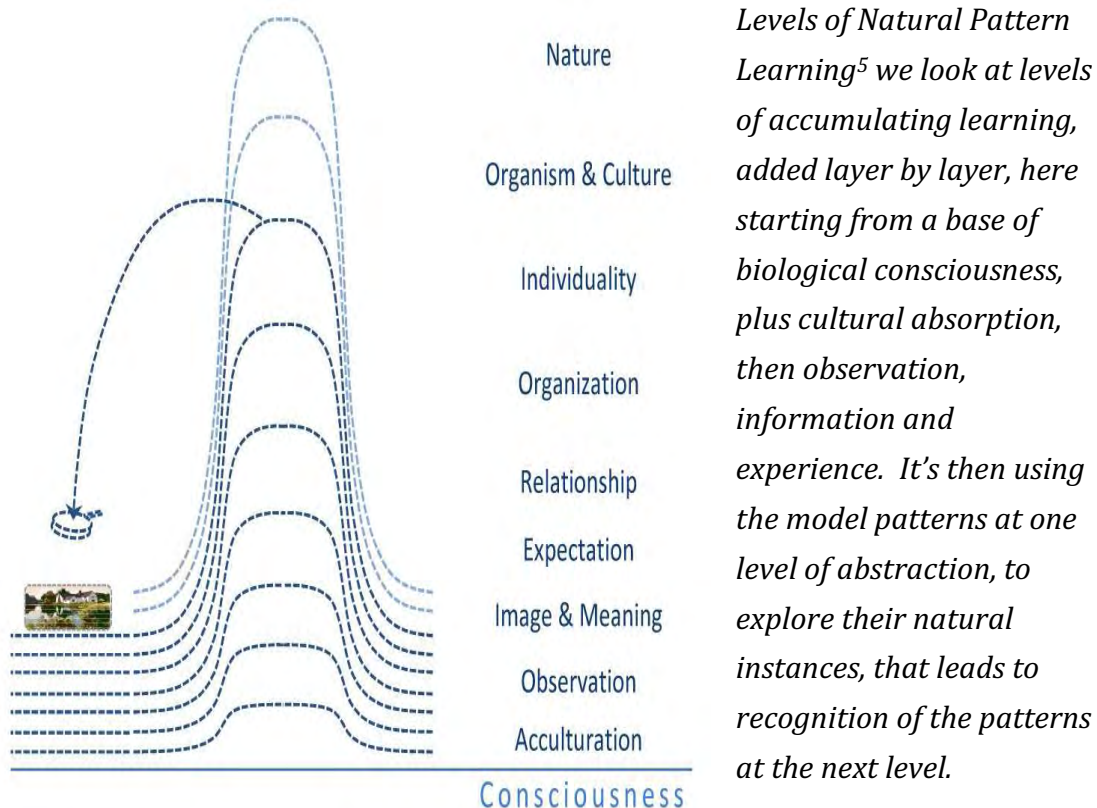
### **3. A STARTER KIT FOR USING NATURAL PATTERNS**

The idea of offering a "starter kit" of techniques is to offer a simpler and more easily used introduction to real understanding and use of a complicated subject. It takes the "core" approach, offering a few ways to take deeper dives into a broad subject, rather than a survey of everything. It's for giving people a real idea of what to experiment with on their own. It also offers that opportunity to the author, offering a chance to experiment with a combined language for work with purposeful and naturally occurring designs.

References that have been helpful to my working with pattern language include the work of the Hillside Group (2014), Christopher Alexander's formative and most popular later writings (1965, 1977, 1987, 2001-6), Jane Jacob's books (1961, 1970), application papers by Schuler (2008), Denf (2012), Bochers (2001), Naranda (2013), Tidwell (1999), and slide

sets by Iba (2013) and Leitner (2014). For developing a natural systems perspective its harder to make a list. That's both because the subject is really "all of life", but also because the most way to describe how natural systems work is as following someone's rules, rather than behaving on their own and exhibiting a variety or recurrent patterns. So you need to look in the fields of your own interest for writings that take that approach. They're more often obscure but not always. Systems theory may be the most valuable field, but also the least likely to take a naturalist perspective, for example. Developmental and feminist history, anthropology, evolutionary biology, narrative ecology, micro-economics, competitive strategy and realist fiction, are fields where you might find more. I have a personal list of influences and authors I learned from<sup>4</sup>, though a bit out of date at this point.

Key concept:



## 5. The General Idea of Natural Pattern Learning

<sup>4</sup> JLH Influences, Correspondents, Reading, Fields - <http://synapse9.com/others.htm>

<sup>5</sup> - As with Argyris' "Ladder of Inference" (1982), or Maslow's "Hierarchy of Needs" (1943), natural pattern learning can also correspond to levels of self-awareness, confidence, and higher consciousness



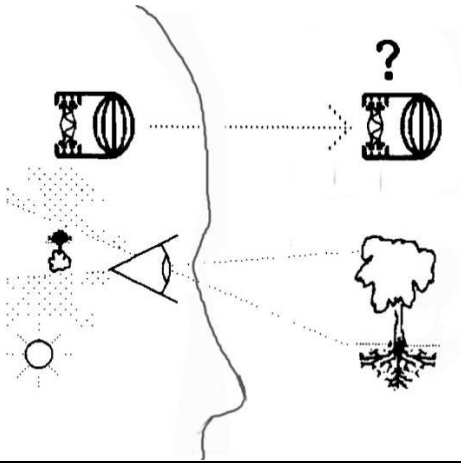
Natural patterns of design become guides when using a “model pattern” (a mental picture of working relationships) to search the environment for living examples. The living examples are usually many and varied, and what you learn from. It lets the simple image in the mind connect you with the rich patterns of the natural thing, to see how the real subject works and serves the things both within and around it. If your pattern idea is ‘tree’, understood as part of a larger system (Figure 5), you can use the design pattern in your mind to look for other things in which you can see similar patterns, to learn from. When you find them you’ll both more fully understand the natural subject and the natural limits of understanding them. You’ll also develop a capacity to imagine variations needed to get things to fit well when using them. It teaches you to understand how and why that set of relationships works and is found in its environment. It also helps eliminate the ironic habit of many people of seeing nature in their own image, converting the patterns they see into beliefs. Using the patterns we see in nature to find others that differ from it, to learn more from avoids that, as you’re learning from rather than fighting the differences.

For example, you might be working with a community that needs a center to call their own, and discuss a pattern to use with them. Then you might use that pattern to find living examples so everyone can understand what gets put together and how it gets done.

For another example, a community might have the idea of ‘growth’ as a pattern of increasing wealth for relieving strains, discuss the patterns they’d look for, to then use to find natural instances. That would let them see more clearly how the natural pattern of design developed and what became of it. They’d certainly need both practical advice and guiding original observation to really understand 1) how to get a chain reaction of compounding change started, and 2) how it ends with the growth strategy changing to being goal directed rather than process driven.

• Mental patterns for finding natural ones •

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#### 6. Searching a pattern to find examples

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It is also important to remember that Alexander's pattern language is modeled on the ideals of architectural design, balancing the forces of a particular environment to provide places with inviting living quality. The use of patterns of design he developed makes that kind of design approach well beyond architecture, creating an art and science of holistic design, potentially applicable to any field. What pulls it all together is its "motive to serve" living things,

providing frameworks in which they can find their good fit. Being organized around a motive to serve is a way to understand the meaning of another of Lou Kahn's curious notions, telling designer to "ask what does it wants to be", as "what needs to be invited to be at home here". Understanding design as service, just means you start from asking what it's role to serve, and everything you control follows from that.

### 3.1 Steps of Natural Design Pattern Study

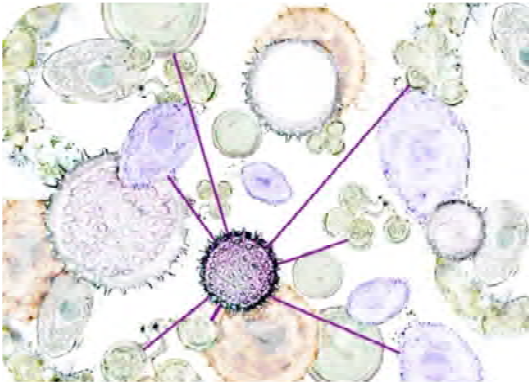
In any field, the general starting point for working with naturally occurring design patterns, is to first look for ones to study. You might look for centers where many things connect, and notice how different their reciprocal relationships are internally and externally. You might start from looking at the textures of surrounding parts, where very few things connect, working up to looking at the centers. You might start from noticing boundaries, not knowing what they belong to, and following them to see where they go. Any place you find signs of one of Alexander's 15 qualities of wholeness could either be a starting place, or expose another level of organization, giving you fresh insight into what you'd noticed before.

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#### • The General Pattern •

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7. Cultures making homes in semi-lattices,

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I think the patterns of centers that will be easiest to find and learn from will be ones you can recognize as housing “cultures”, with their own identifiable internal designs. Those are the active parts of the environment that create the artifacts we find easiest to trace, like links and boundaries and textures. They will also be more likely to have left traces of their own perhaps eventful history and processes of development, and how they grew from some common origin.

You might also start from recognizing the design processes taking place, or by tracing the histories of how recognizable patterns developed, looking for common origin.

As you begin to identify these working parts and relationships the character of the ecosystem surrounding your own interest and concern comes to look like a loose organization of separate individuals, a population with lots of independent relationships. It’s one of nature’s most illogical patterns of design, that so often it seems organization is composed of separate parts, that mysteriously maintain complex relationships. It’s at that point where you begin to really understand what would strengthen or weaken those seemingly reliable but illogical connections. It’s also a place where you distinctly feel the “quality without a name” and a sense of “oneness” in nature. The mystery partly comes from nature’s mysterious logic not really being in the designs we see themselves. It’s in the processes we tend not to see, that produce and use the patterns we find. In nature’s logic, finding new uses for cast off remains of other things, that nothing else has a use for, creates free resources for which there is no competition. It creates an advantage for things that discover good uses for things others find useless, tending to result in every part of an environment being used differently.

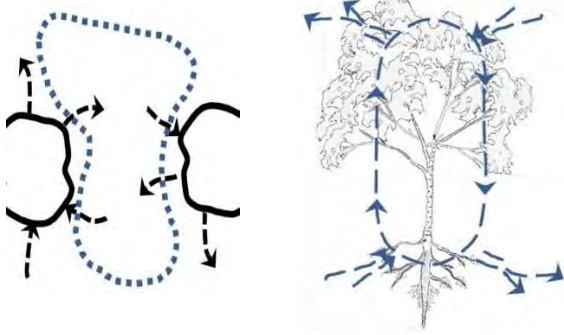
The subject you start to study this way could be anything of interest, but much better if something you know quite well, has varieties of different parts and changes enough to notice and slowly enough for you to follow. Your home town or city will generally let you study hints of a variety of different local cultures and the niches they create for themselves. You can often find local cultures on virtually every street corner too, for example, as well as seeing different neighborhoods with complex boundaries and histories, various demographics and separate communication networks for each age group, each profession

and each social group. So you just follow your curiosity, and budget the time you have, depending on your interest. I tend to find that a combination of broad and detail views produces the best follow-up questions for the next time, to build on what I learned before.

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• Open and Circulating Resource Pools •

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As you study a variety of similar patterns of these living relationships you get better at recognizing their variations. One can then use them to help find solutions in other situations, by extending the general pattern to fit the local situation, using the variations from other circumstances creatively. To balance the forces in a target context you work with or create a framework that provided important services, often learned about elsewhere. Since designers really

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8. Mediums of Exchange

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don't design the living things that inhabit designs, which design themselves, they mostly design the frameworks of services available. So you might think of design using natural patterns as for attracting living things, to occupy and make use of an environment in its own way, as a kind of ecological service or caretaking, perhaps.

What anchors the process is still the work of accumulating reliable observations of patterns of relationships, developing a technique for finding clear signs of the working relationships of centers defined by their patterns of "internal" and "external" organization, and its way of developing from a common origin, a "three point perspective" on it's

- 1) individuality,
- 2) inside and outside relationships, and
- 3) stages of change,

are the firm foothold for both checking what you found for some individual center of organization, sharing it with others in a way they can check and add to, and letting you return again to find out more.

Productive study also generally involves having multiple examples to think about of the same general kind though your main focus may be on just one. It helps generate fresh ideas and keep your mind open, and avoid getting stuck, as in thinking that nature works by your own theory. Since every example will work by a somewhat different theory, if you

study multiple examples you'll notice that and find those differences are one of the things you actively look for to better understand any individual.

So to then describe them a naturally occurring design pattern you follow much the same approach as for describing an intentional design pattern, in a simplified way that tries to express the unifying way the individual responds to its own place. Sometimes one issue will take precedence, sometimes another. I tend to find tracing the succession of growth stages, much like identifying the distinct design phases of a studio project, in the developmental life of the individual culture I'm studying, to be the most revealing. For me it reveals the history of how they changed, displays the milestones of transformation they went through, becoming a map of how their designs and relationships came to be. Other's might find other ways of exploring the nature of the individual as a whole to be more productive for them. As for any experimental approach, how to do it is mainly to find what works. Often the inquiry will start from looking for the right way to intervene in some established environment, to change something or prevent it from changing, and you need to know how it parts work naturally to find how they might fit together another way.

Possible examples:

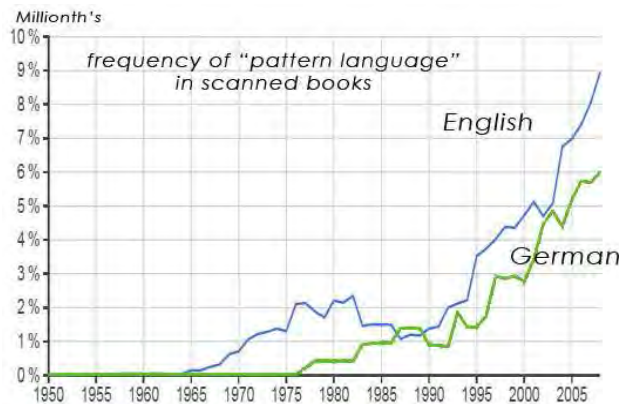
- 1) A community adapting to climate change,
- 2) A business that changed culture unexpectedly and no longer knows itself.
- 3) A disorganized start-up that wants to become well organized
- 4) Software platforms that became monopolies and don't profit from offering services
- 5) Community that needs to resolve cultural conflicts,
- 6) News organizations trying to get the story straight about how the world is changing.
- 7) Town meetings on shifting resources and unexpected crime or drug use cultures.

These are all importantly "healing problems", of one or another kind, and you need a long view of the established relationships and what they are struggling with, along with some fresh thinking to be of help. Generally you'd be looking around in hopes of finding what it is that will let the existing sets of relationships and the new ones all pull together, to generate a fresh living quality for the place and to share with others.

### 3.2 Locating Centers From Signs of Change

One good example of a found “proxy” for transformation in whole cultural patterns is the shape of increasing use of “pattern language” as a term found in books scanned by Google<sup>6</sup> (Figure 7). It’s the appearance of “progressive proportional change” from ~1985 on that has more physical science implication. It’s very likely to be direct evidence of systems of relationships building on themselves, as evidence of a locally emergent new whole culture in the process of defining its individuality, expanding its use of its environment, and making its home. It’s a kind of evidence that gives you a lot of pattern language kinds of questions to talk about.

#### • 1965-2008 Emerging Pattern Language •



Here it lets us see something of how the discussion of pattern language developed, with differences between the English and German language communities. The curves for English and German end up following about the same explosive growth trend, the English trend starting with a passing wave that peaked in ~1980. In the German trend there’s a smaller wave too, that peaked a little later, ~1987. The overall appearance is that the early wave of interest might have

#### 9. Growth Patterns as Signs of Emergence<sup>5</sup>

reflected the original architectural discussion which did not lead to widespread adoption, and the later rapid growth curve reflected the wider spread of pattern language use to other professions, principally for computer programming at first.

It’s a quite remarkable record of transformational change, really, that teaches us things we just would not have known about, except by seeing the two records of change as separate shapes side by side. In this case, this kind of ‘map of change’ displaying shapes in the design phases of an emerging natural system, as it develops its own language of relationships, represents a chance discovery of “found data”. It was picked out from the recognizable shape, and is presented as a potentially quite authentic and useful form of narrative regarding the relationships being developed.

<sup>6</sup> Google Ngram for “pattern language” in books in English or German

[https://books.google.com/ngrams/graph?content=pattern+language&year\\_start=1960&year\\_end=2008](https://books.google.com/ngrams/graph?content=pattern+language&year_start=1960&year_end=2008)

Found data can expose the continuities of natural design processes like this, and so also the centers of organization in which they take place, in lots of ways, opening up how they work internally and interact. They let you quickly identify where to look and what kind of information to look for, letting one study how things are organized from tracing how they developed, and lots of other things. Most any growth curve turns out to be a “proxy” for the energy being invested in a natural process of design, and can potentially lead you to discover how its process of development operates what it is building a new place in the world for.

Word usage can be tricky, with the design of something either referring to the process of creating something or what was created in the end. That semantic duality is so frequent in English, at least, it appears specifically for allowing words to be used both as nouns and verbs, both to the process and its endpoint. So when looking at growth curves, tentatively identifying a naturally occurring design process, the design seen in the curve ( using design as a noun), is not really what’s important. It’s design apparently taking place that matters (using design as a verb), and how to use the information in the curve to locate and understand it. That shift in perspective is part of the “dual paradigm” view, going back and forth looking at patterns in our information, and the natural phenomena the information gives us hints about. That’s the step that lets you recognize a growth curve (a shape) as information possibly about something designing its own new home (a process) in your environment, and more evidence of how pattern language can materially change perception.

Starting from evidence of change to discover centers of organization of interest can start with any good evidence of change (not just clear growth curves). It’s great usefulness comes from then providing a blank explanatory framework and a schedule of design phases to fill in (Figures 1, 2, 3, 4, 5, 6), for how some living thing made or is making its own new home. It’s not a guarantee you’ll find anything useful. It’s just a good general assumption in the case that an indication of change that seems worth exploring will then allow you to fill in the details of the changing relationships implied. It’s “a whole system map” as a general pattern of missing information, with a lot of gaps to fill in.

The most fruitful way of finding good proxies for what happens in your own environment is to first look at the data you already have, to see what the patterns in it might tell you. The mountains of “big data” now available now are potentially a giant pattern mine in that way, and could be sifting through as a great natural pattern repository. You shouldn’t ignore the

obvious things, of course, like talking to strangers who may know more than you, or just sifting through your own raw impressions looking for patterns or details you had not noticed before, that expose how things work, how a particular design makes a good home for something. Whether the patterns you seem to discover also help you learn even more about the subject, offering new questions leading to new findings you can check by other means, is the main test of validity.

When mining patterns from data one needs to not forget that people with more direct experience in any environments will tend to have much more balanced and complete understanding of what the data really means. It also helps to consider diverse viewpoints, and sometimes opposing cultural views too. The shapes in the data just tell you \*where\* to look, not what to see. Someday there might be online resources that analyze “big data” to locate centers of ecological, cultural and economic organization, and there will be more examples of using available resources, and workshop methods for drawing out people’s awareness of what’s happening in the environments they are aware (Henshaw 2013 2014b). There are a variety of analytical methods that can be advanced, for recognizing and extracting organic progressions in time series data, as profiles of transformation in natural cultures (Henshaw 1995-9, 1999).

Cities are collecting more and more kinds of “community indicators” of sustainability, to map their own quality of life, including detailed financial data too. Business sustainability plans are doing much the same, looking for patterns in the data to tell them how they are affecting the world. Libraries, research institutions and central governments are actively looking for new ways to use the tremendous data resources becoming available too. The UN has a worldwide sustainable development effort that includes a major focus on collecting and creatively using broad spectrums of information in what is increasingly called “ESG factors”, for monitoring environmental, social and governance conditions. It needs a pattern language to organize it, though. It might be used to identify interesting patterns of change, like that show for the emergence of pattern language, and generate articles on “what’s really happening” locally and globally, to base discussions and news articles on, and help people better understand the balance of real forces that need to be addressed.

### 3.3 Locating Centers by Their Boundaries

We all become expert in recognizing boundaries. We notice approaching them or crossing them, and when to change behavior. A felt sense of caution or anticipation about needing to act differently is often the first thing to make us aware of what we're approaching, too, as an environmental awareness causing us to sharpen our senses and look closely for signs of how to react. It may be to open up and become engaging, or to be more cautious. They're signs of entering or leaving some organization's home territory, its 'niche' or "private space", "near environment", the peripheral boundary, mediating interior and exterior.

#### • Pattern of Boundary Transition •



#### 10. Interiors, environments and boundary space

elements, city neighborhood preservation plans, or environmental policy spaces, as transition zones between internal designs and their environments, as where differing design solutions are connected.

Having come across a boundary, and if curious, you'd look for where it goes and signs of how the relationships differ in what it separates from those exterior. At that stage of approaching something unknown, we're often using all our senses, looking for design patterns we're familiar with from anywhere else, as we try to size up an unfamiliar subject. We might look at the boundary areas between "objects" of object oriented designs, whether computer program

You can think of the general pattern in terms of walking through the woods and coming across someone's home (Figure 10), unaware of people or animals but seeing it a well maintained place. You probably wouldn't approach to say hello, not unless you needed to. The same general encounter is experienced when approaching a strange vendor's stall, at a green market or in an ancient sook, perhaps. Though you are encouraged to enter the negotiating space around the stall, you still need to size up how to interact with its interior culture from the outside. These are emotional signals relating to evidence of boundaries.

One might approach a pile of children's toys, noticing the pile might be a home for a precious game, if there are signs of a real boundary defining it as private space, and not just



clutter to clean up. If so, the pattern tells you to prepare to negotiate as if approaching someone's home. You might do the same in an office work group, if differences of approach expose boundary issues for domains of working relationships important to find an inventive solution for, you might otherwise not have found would add to the whole.

The boundaries between domains are indicated by lots of other things too, the trails others have left behind, as "desire lines", that like pheromone trails or other evidence left behind as stigmergy, trails to follow where others have gone. When you notice them you might first be curious about the larger patterns, though, exposing frequent destinations and relationships between them, like where things are putting their energy.

Traces of energy use provide lots of good evidence about natural systems, their boundaries, centers, designs and behaviors. They expose what and how natural systems design and build, what their built capital is used for, what resources are taken in and what discarded, and the side effects. Only a small amount of the energy becomes incorporated into system artifacts. Most ends up being lost as low grade heat. In total it's the "entropy" of the system, leaving trails all over, if you can recognize them. The energy flows of a system, are essentially the "desire lines" of its internal operations, their trails of activity, relationships with the environment, exposing the system's energy is invested.

It's hardly necessary to go to basic principles to recognize boundaries, when we know so much from experience about the signs. There is a deep pattern to know, too, though. Most boundaries display an easily recognized energy use profile. As when approaching a home in the woods (Figure 9), if crossing its boundary space the energy use transition has a distinctive shape we both see and respond to emotionally, feeling ourselves with each step crossing someone's boundary space. As you cross the energy use swells from nothing toward a maximum at the house. That "S" curve in the evidence of energy use also indicates your proximity to important behavior change when intruding on private space. It's probably what we feel as a sense of "crossing a line" when crossing boundary spaces in general, the distinctive energy footprint shape. It's a functional awareness of a systematic transition, like the swelling rates of change distinguishing design and building processes, from slow to fast to slow, indicating their systematic nature too (Figures 3 & 4).

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### • Patterned Boundary Succession •





11. The Edges and Layers of Domains

Ecological boundary patterns have a lot to do with cultural boundary patterns, reminding us of the complexity and overlapping yet distinctive designs. Figure 11 shows various shapes of boundaries between cultures, shown as geometric shapes representing abstract “patterns” of ecological transition. They’re interesting shapes, but what seems missing from all but one are the boundary zones between them, you see clearly in the photo intended to exemplify the pattern of micro-ecology partitions. The actual organic transitions

are really too complex to draw, but the simplified drawings do help some, if you think of looking for the living examples to learn from too.

### 3.5 Design Pattern Templates

*A more or less standard pattern language template for describing design patterns, based on the model design of Iba (2014)*

Table 1. A Template for Design Pattern Writing



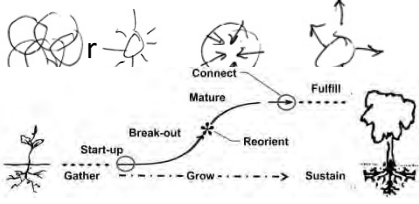
Name	Context	Forces
Image 	Problem	
	Solution	
Subject	Actions	Results

Table 2. Template for Natural Pattern Writing

Name	Problem	Forces
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<b>Image</b> 	<b>Context</b> <ul style="list-style-type: none"> <li>• Moving</li> <li>• Roles &amp;</li> <li>• Stages</li> <li>• Mover</li> </ul> 	
Simplifying Relationships	Object	Solution
Links	Anticipated Results and Open questions	

”. It’s basically a way to clearly describe familiar elements of complex designs, like gems of expert knowledge. They’d be described in familiar terms as 1) where they apply, 2) the problems ( ‘forces’) to be dealt with, 3) the service to be provided and 4) a simplifying concept for how, with the objective being to bring the forces into balance with a solution releasing all the tension. So... that would be “a design pattern” or “object”

#### 4. REPOSITORIES FOR NATURAL PATTERNS

One of the more surprising aspects of using Alexander’s model for design patterns is how very many existing repositories of natural design patterns there really are. Its more or less inherent in nature to leave traces of both the simple and intricate patterns that develop naturally, as echoes of the past, as foundations on which to build, as endlessly repeated common solutions for common natural problems. Human culture, as a whole, is a kind of interface between the internal relationships of people and the external world in which we operate. One could even define a new meaning for ‘culture’ that way, as a constantly evolving interface between natural systems that need to work together, composed of inherited information and organization.

Every person knows a great deal about their own culture, making it a great resource of the recorded natural patterns they are familiar with. Of course, maybe more than anything else we all tend to take our own culturally inherited knowledge for granted, to “be” the “firmament and stars” of our personal worlds, as we should, as it is our own mind’s main source of understanding. Natural patterns one notices in your own cultural inheritance are hard to reduce to abstraction, they are so deeply tied into our feelings. So I think if one just allows one’s whole response to them, finding them naturally just deepens and enriches our cultures.

#### 4.1 Cultures as Stores of Natural Patterns

How deeply hidden the natural patterns in our cultures seems to depend on how deeply ancient they are, and the converse, the things easiest to notice are the features of our cultures that are fairly superficial. Exceptions to that are beliefs that different cultures hold that come into conflict, and so have attention drawn to them. One can start with a “culture” itself being a “natural design pattern”, as an accumulation of regular relationships between people sharing it and collectively for relating to their environment. Maybe the most notable thing one finds is how very extensive and multi-layered that “interface” really is, a really remarkable “artifact” of lives lived and shared over time, acting on patterns left by others and adding their variations.

Figure 12 combines a list of various kinds of layers of human culture that are easier and harder to notice, until some exploratory question or experience brings them out. One great way to get a sudden surprise of entering a world of cultural differences just different enough to be confusing is to walk into a friend’s home. Generally “everything seems to work differently”.

##### • Cultures as deep patterns of how to live •



12. Visible & Hidden; patterns of living

Family homes develop their own quite independent versions the common culture partly because of the complete privacy that homes allow a family, to organized themselves in what every way succeeds in combining the individuals and the individual differences in their roles in the world. So the general rule is to expect that in every home there are internal worlds of relationships that are most often both complex and fairly unique. It means that family cultures develop so independently that they are literally invisible to others who don’t participate in them somehow, so we develop habits of respecting the privacy of homes, as containing an “inner world” we know very little about. We anticipate that whenever noticing the typical signs of occupancy, the various kinds of boundaries one naturally crosses to enter, or avoids crossing to leave undisturbed.

To turn that into a more general pattern of natural design one connects that experience with the related experiences of crossing other kinds of boundaries that separate cultural differences. You might enjoy in a group making lists of different kinds of boundaries between cultures, that give them privacy and caution against intrusion. Some a living culture will make for themselves, others a living culture will be attracted to as a “found shelter” and center of operation. Then there are others we find so unexpectedly when crossing them finding you’ve stepped into “another world”, not even realizing it, and suddenly don’t quite know how to act.

#### **4.2 Natural Language as a Store of Patterns**

If you think about where natural language came from, it becomes obvious that what words are for is connection our cultural meanings with the natural design patterns of the world we live in. Nouns, verbs and adjectives may have many related meanings, but generally as aspects of the natural design patterns we use them to refer to. We only need to explore their “contexts”, “problems”, and the “forces” their meanings bring into balance, to represent a “whole solution” for, to expand their familiar pattern language format for defining versatile whole patterns of design. It take searching for how to do it at first, of course, we start from being accustomed to using words for the intuitive meanings that come to us automatically, not thought of as conveying a balance of natural forces in an environment.

It helps to have a way to take families of related words out of their normal context, so one can stop and look at what natural designs their meanings refer to. In English there are fairly simple and surprisingly productive ways to do that, seeming to correspond to the actual accumulating layers of expanded meaning that our language today developed with. They are somewhat more visible as radiating patterns of meaning when from seeing lists of words with related structures and meanings, out of verbal context, so their related meanings can be looked at as a common pattern of thought that once developed. As you look at word roots, and how that root meaning is modified, it seems implied that the wonderful deep meanings of many of our words are emergent properties of putting together two very simple ideas to make a particularly powerful combined meaning. So as you look at the wonderful way the simple parts of compound words combine to express the more powerful words of English, you see them also as lists of the great “ah ha moments” of discovering deeply meaningful patterns of nature too.

### 4.3 Sifting for “Pattern words”

If we look closely, many common words are names for “centers” of natural design as Alexander might term them, as patterns of design that have strong living quality in terms of being inviting to life as in making places for lasting or temporary homes, of offering other design “services” that living things find meaningful. So “pattern words” would be the names for such designs that are in some sense pivotal in the context, as in the way that enabling “communication” or “community” are often central to the services to living things that a design provides. That might either be as a place of quiet or one connecting to places of commotion, for different purposes. Surprisingly perhaps, one seems to be able to find long lists of such “pattern words” by filtering natural language for words with the same prefix, or suffixes, complexly constructed word meanings. Figure 12 gives an example of how the structure of “community” can be looked at to recognize the natural design pattern it refers to.

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#### • Pattern words to identify natural centers •

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Community: [*comm*·*unity*]  
***combining a root for “together”***  
***modified by “unity”***

The structure turns our attention:

- to the common natural phenomenon,
  - to it being a property of natural design
  - to a great variety of examples we individually know of,
  - and to the many layered associations we are all familiar with.
- 

#### 13. Word structure a key to natural design

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think of that as collecting materials for pulling the word associations apart to find the pattern elements we can understand it with, the implied “simplifying ideal”, “problem”, “forces” and “way of bringing balance” to understand natural design patterns in pattern language terms.

To explore this aspect of natural language it helps to have a simple way to collect groups of related words taken out of context, so their individual meanings and structures are what you first see, rather than their roles in a sentence. I’m not sure about with other languages,

The word construction not only provides the name of a whole pattern of natural design. It also turns our attention to the natural design it names and all its roles in our lives. In normal use we don’t need to study the natural designs that our common words refer to. If you want to have the qualities of a word in a design, though, it’s very useful to learn more about the natural design pattern the word refers to. Looking at how the word is structured starts the process, of thinking over living examples looking for the common design pattern being referred to. I

but with English an easy way of sorting words a group of related meanings is to group them by prefix or suffix or root meaning. Below, for example, are a few of the 1,965 words in English that have the “-tion” suffix, obtained by using an online dictionary<sup>7</sup>.

It helps to turn your attention back and forth between the meaning of the word root<sup>8</sup> and how the modifier,<sup>9</sup> “-tion”, transforms the meaning of the root word to something greater. What these powerful terms of English have in common is this simple way of elevating a simple associative meaning in the root with quite broad generalization, an invention that came to English via Latin, and the Romans<sup>10</sup>

The most interesting thing these words mostly have in common is a *dual meaning*, relying on referring to both “the process of becoming” and the “the end state of being”, for some particular recurrent pattern of relationships. To understand any state of being you’d surely want to know both, but who would have guessed that need to express both was how we got the words for them! As for a couple examples:

- abbrev-iation: used for both shortening something and the shortened form of it.
- acclam-ation: used for the process of making and the end state of what was made
- dele-tion: used for both the process removing something and the end state of it having been removed.
- comm-uni-cation: as reaching a common understanding, both the process of reaching it and for the understanding reached.
- co.oper-ation: as jointly operating something, both the process of finding how and the way of doing it found.
- vocal.iz-ation: used to variously mean 1) using the voice for expression, 2)the collection of ways people do that and 3) a particular vocal expression

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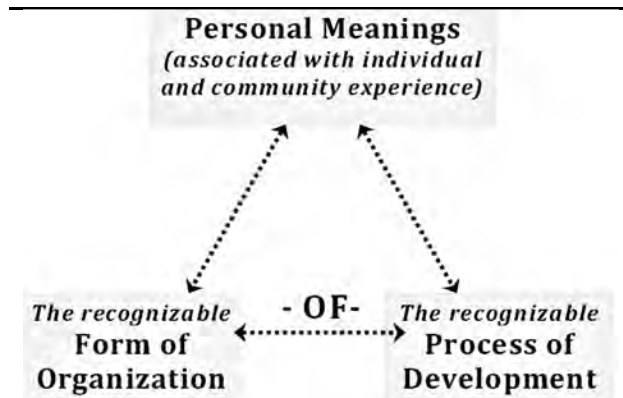
<sup>7</sup> OneLook dictionary search for “\*tion”: [http://www.onelook.com/?w=\\*tion&scwo=1&sswo=1](http://www.onelook.com/?w=*tion&scwo=1&sswo=1)

<sup>8</sup> ‘root’ <http://www.thefreedictionary.com/root> “The element that carries the main component of meaning in a word and provides the basis from which a word is derived by adding affixes or inflectional endings or by phonetic change.”

<sup>9</sup> ‘modifier’ [http://www.orbilat.com/General\\_References/Linguistic\\_Terms.html](http://www.orbilat.com/General_References/Linguistic_Terms.html) “a word or phrase that makes specific the meaning of another word or phrase.”

<sup>10</sup> - tion: suffix of Latin origin, to form abstract nouns from verbs or stems, to express actions, states or associated meanings - <http://dictionary.reference.com/browse/tion>

• Meanings from Perspectives on Nature •

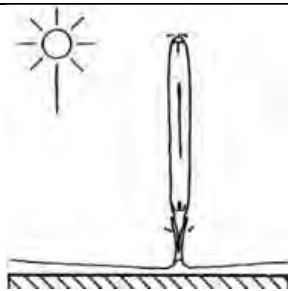


14. Dimensions of grounded word meanings

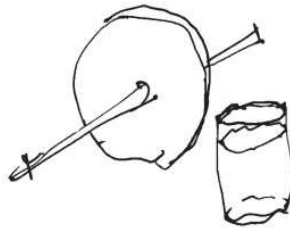
examples you are familiar with you try to recognize is the '*whole pattern*' of important experiences and relationships the word is relied for turning our attention to. The exercise might very casually done, but is likely to deepening your appreciation of the many living qualities that common language refers to, to give you more ready access to them as one works on other matters.

#### 4.4 Locating Centers by their Individuality – the Emergent Property

• Individuality as the Emergent Property •



*Separations & Birth  
a step to autonomy*



*Wheel & axel,  
glass and water*

15. Abrupt Changes of State

*You use the same approach to drawing out the details of the natural design patterns these words refer to as described for “comm·unity”(figure 14). You could understand it as a triangle of understanding, that develops from associating 1) the process of change, 2) the end pattern of relationships and 3) the personal and cultural values and circumstances associated with them. In thinking through them in relation to the*

I had a left over collection of elemental patterns that seemed to represent “individuality” and a sort of “un-pattern” of just being different from everything else. On thinking about it, perhaps that’s what’s so puzzling about the unique inventions of nature for which there are no equals, what many of the sciences call “emergence”. That the true individuality of things seems to come about very unexpectedly, and not in relation to anything else whatever.

Whatever the mystery is, “individuality” is clearly also another property like “wholeness” that can be recognized from a great many points of view, and as something that tends to pervade the forms of natural subjects that convey it.

Above are examples of individuality that emerge quite abruptly (Figure 15) A hot air current becomes an individual when it gains autonomy and separates from the source of heat it developed from. The birth of an organism is the event of it becoming an individual somewhat the same way, by a fairly abrupt separation. Abrupt changes in what things do and mean also happen very commonly when objects or roles are put together and are suddenly transformed into some new thing entirely, like the “wheel and axel” and “cup and water”. There are lots of other things that achieve their independence and individuality abruptly too, like people graduating from school, as their moment of being recognized for who they are themselves.

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• Eventful forms of Relationships •

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Relationships



Monuments of Art & Design

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Individuality is also a clearly recognizable emergent property of lots of things that may be suddenly recognized, but took extended periods and a long ladder of emergent stages to develop. Because that is also the usual pattern for either intentional or naturally occurring design processes, as discussed in Section 2.1, individuality can also be a good indicator of something having come from a long environmental process of accumulative

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16. Emerging Complex Individuales

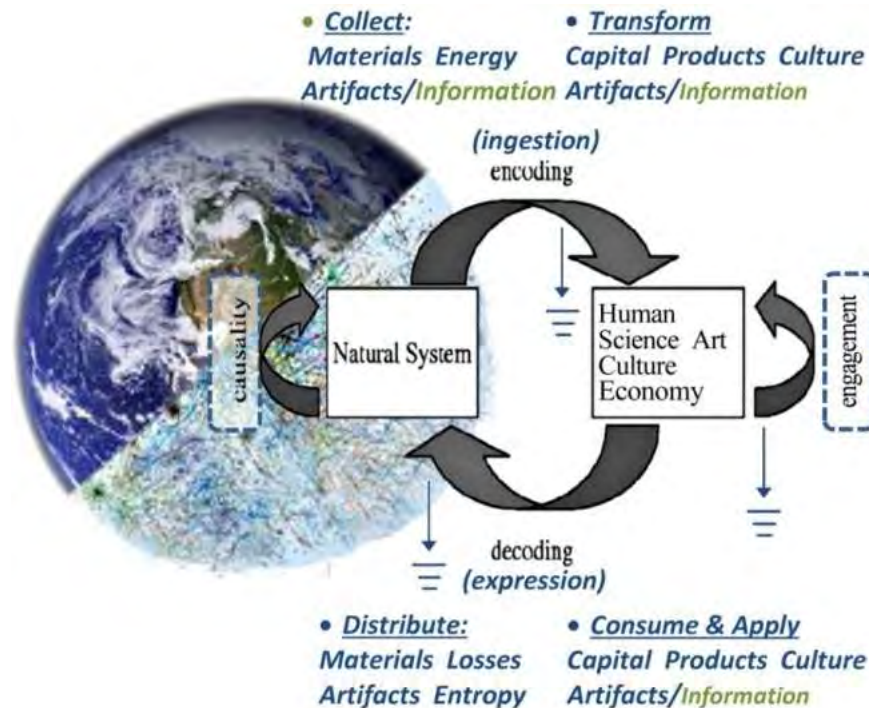
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design. That's the real story behind any happy couple, for example, or for fine moments in the history or art and architecture (Figure 16). You can perhaps see it more clearly in how very long it takes to prepare for the moment that something to be recognized in how a construction site is suddenly transformed into a home, when the builder hands over the key.

We also see individuality in mankind's process of growth and self-design in Figure 16, based on Robert Rosen's model (Figure 1), here sowing us in the midst of our very long and difficult work of making the earth our home. It shows human learning as one system of internal organization ( as it has many features of) interacting as a whole in learning how to relate to the external designs of its environment. Incoming and outgoing translations from one language to another, and the important losses in translation, are labeled in the diagram as '*ingestion*' and '*expression*', with the attention constantly going back and forth between interpreting and acting on it, attentive to the complexities of translation.



- Translation between natural system design patterns & human ones •



17. Relationships between independent worlds

## 5. ELEMENTAL CHARACTERISTICS OF WHOLENESS

### 5.1 Alexander's 15 Principles

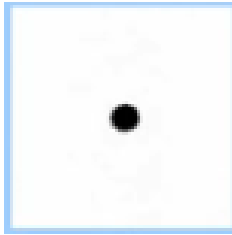
The table of Alexander's 15 Principles shows three ways of interpreting them, partly to make the case for including multiple viewpoints when describing design patterns. As mentioned above, looking at different views of the same thing 1) helps point out differences and hint at how they're all connected, 2) helps keep one's own thinking fresh and from becoming stuck on any one view. Here it's also, of course, to show the close relationships between Alexander's view of natural patterns and design with my own view, focusing more on the individuality of wholes as forms of complex organization, and the stages of developmental change they go through. One can use the 15 principles and their variations for either explaining the patterns you find, or as search patterns to use in exploring the living examples of patterns you find, as you're developing your understanding of them.

Table 3. Multiple views of Alexander's 15 characters of wholeness

Illustrations of Alexander characteristics of wholeness (Leitner 2013 & Reckard 2011)

Related characteristics of autonomous organization in nature (Henshaw 2015b)

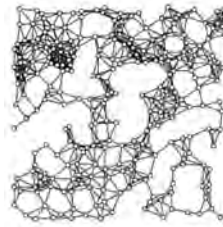
[01] Strong Center,



Focal points



Culture center

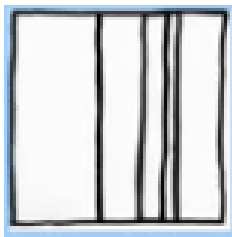


Clustering of Diversities "Scale free" distribution



Hives of Activity / Commons

[02] Level of Scales **proportion**



**Density**



**organization**



Ripples, waves, & swells



Successions of form

[03] Boundaries



geometry

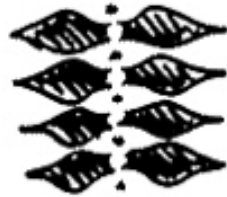
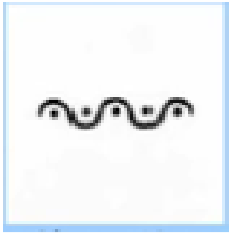


walls

Transitions and Limits

- paths of growth as natural bounds
- ranges of behavior as natural bounds
- Margins of ecologies -, trophic scales, neighborhood circles of relations
- Limits of Visibility, - of Reach, of Scale, of Change, of Versatility

## [04] Alternating Repetition



- Semi-lattice (as added complexity with added variety of opportunity)
- Stigmergy (trail reinforcement)

## Recurrence,

- Vitality, Resilience,
- Responsiveness, Independence
- Cycles and waves of change
- Practice & training, perfecting
- Looking back and forth, inside and out, forward and back, poking around
- Successive addition or subtraction, of layers of design, or branching from designs
- Hyserisis, Action learning, Exploration

## [05] Positive Space, complementarity



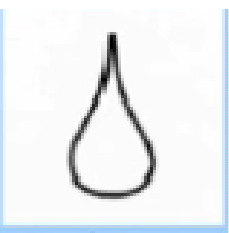
Openings



Permeability

- Open environments
- Spaces of free association and adaptation
- Proximity with separation
- “In-betweens” and freedoms of movement.

## [06] Good Shape & form



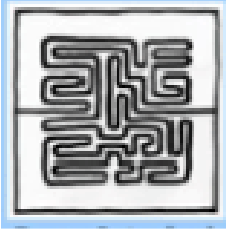
- Simplicity of design
- Comfortable and Complementary fit
- Serves intersecting needs
- Serves exclusive needs

## [07] Local Symmetries



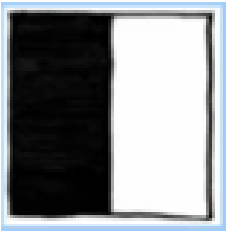
- Polarities: roots and branches
- Approaches and arrivals
- Interiors and exteriors

[08] Deep Interlock and Ambiguity



- The impossibly complex overlap of so many things working independently
- How nature can only organize separate things and our reason can only organize mutually defining things, looking for one world in a life of so very many worlds

[09] Contrast, difference



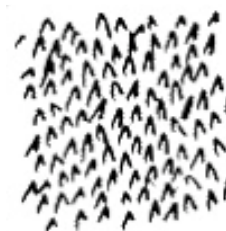
- A bridge between information and matter
- Revealing things hidden from view
- The potentials for complementary fit
- Signs of transition

[10] Gradients



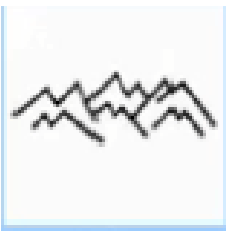
- Energy gradients to power organization
- Proximities, potentials, distance, values
- Margins, ranges, cushions, resilience, flexibility, continuity, versatility

[11] Roughness, individuality, diversity



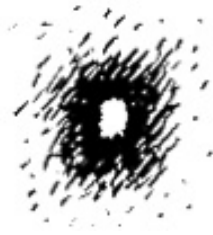
- Inconsistency, consistency, texture,
- Intermittance, irregularity, coarseness
- Surface, ground, skin,
- Fabric, aggregation, collection, granularity

[12] Echoes



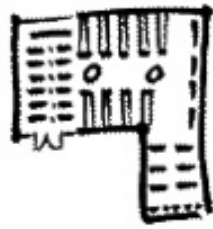
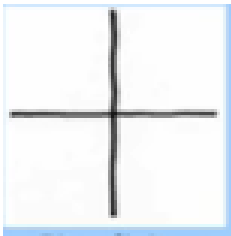
- Spreading and lingering reflections; elastic vibrations; memories of lost places, events; artifacts of periods of change
- Environments as repositories of fragments and footprints, a compost of discards,
- Traces of history as memory of all past learning and change, ornamenting things new

[13] The Void



- A lack of form, absence,
- 'Book zero', the potential of formlessness,
- The uncertain silence, the moments of stillness, pauses, suspense, immobility

[14] Simplicity and Inner Calm



- Freedom of direction
- Balance
- Observing, listening, receptiveness

[15] Alexander: not-separateness, "QWAN"

Emergent couplings/connections/units



connectedness

mutuality

*Homes*

*Flows*



- Homes, their receptive places and animating cultures
- Organization as a pairing of receptive places and active users, the material difference between parts and whole,

## 6. DISCUSSION

Introducing “guiding patterns” of natural design as an new approach to understanding and working with the natural eco systems of our everyday world, naturally raises many issues that might deserve a comment here. I’m both obligated by limited time and attention spans as well as by pedagogical principles to very largely “leave them for independent study”, having I hope presented an interesting problem. the basic relation between purposeful and naturally occurring design patterns, the stage of evolution of pattern language as an emerging science, the areas of work I leave undone here. What seems worth briefly addressing are 1) that ‘*design*’ is inherently a learning process, for either people or natural systems, and 2) in acknowledging that, requires a new approach to science, an “object oriented” approach, of going back and forth between the study of abstract concepts and things of the world that work by their own forms of organization.

### 6.1 Natural Patterns Of Learning

*What we discover when learning to identify systems of organization that behave as individual wholes, and to begin to understand their patterns of design, in part we find they are ever changing. For a while that might seem a ‘problem’ for understanding their arrangements of parts in the moment. Making sense of it from how their patterns of design developed, though, as a continuity of recognizable stages of transformation, developing from a common origin, is both a thrill to perceive and opens the possibility of imagining the life of any individual as a whole. Theory is good only at organizing concepts in fixed relation to each other, nature only good at organizing separate things to temporarily work together through a complex organizational process of learning.*

*So natural systems as autonomous individual forms of learning organization, ‘organisms’ of a sort, don’t appear to “have minds” as much as to “be minds” (of a sort) engaged in creative invention. They change organization by their own manner of pattern “learning”, a feat which is so common in nature but people are mostly only aware of as being what our own minds and lives do. So we need to learn to talk about them in some new way. It doesn’t change what they are, though, the we now find a need and new ways of talking about them.*



- 
- Design starting from an origin pattern •
- 



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18. Snowflake grown from its start

---

- 
- Design starting from an origin pattern •
- 



---

19. World Economy grown from its start

---

*What we get is a new way to talk about what anyone from their own point of view finds observable. Whether identified by patterns of organized relationships or the boundaries of their designs or artifacts, what an “object oriented science” provides is a view of natural organization that brings many previously hidden into view.*

*Whether it’s a snowflake or a world economy, having a way to identify them as individual forms of natural organization that had a common origin and went through stages of development to be what you observe, makes them much more tangible realities. We might still find them mystical or spiritual, but becoming able to confirm them as individually occurring, with observations repeatable by others, makes the discussion grounded in nature. So as slow or as fast as one makes discoveries about the natural patterns of design in the fields of your interest, it results in better understanding of natural forms people had only informal ways of understanding before.*

*It does of course implicitly suggest a change in our world of common beliefs, to observe that it’s quite likely that the things making*

*our world so “eventful”, in particular, are not largely composed of echoes of remote forces and decay products of a universe running down, as all science could find when describing nature with equations. What a pattern language approach to the study of natural designs identifies as the source of eventfulness in life is predominantly a collection of individually behaving naturally developing organizations, both great and small.*

*Given some study we can trace many of their individual developments, following the many trails of evidence that record their changes, that generally lead back to some common origin, a point of finite but minute beginning, and lead by recognizable stages of transformations to their forms in the present.*

*Sometimes it isn't possible or takes a great deal of effort, following the evidence of past energy use like counting tree rings, or sediment layers, or tracing patterns of improving design in artifacts as archeology does. The forms of natural organization we find all seem to be somewhat like snowflakes, having a common origin in some elemental pattern of design, which then develops independently, rather than pre-determined, in every case. So it appears quite likely our work with them will work a lot better if we learn to study them both our own way (of looking for deterministic patterns), and their own way (as individualistic learning processes), not focused only on how they are designed to work at present, but more really on an interest in how they developed, what they are experiencing learning, and how that is changing them .*

### **6.2 The Emerging "New Science"**

*PL does seem to be evolving toward a kind of object-oriented science, a way of conveying quite timeless and ancient principles of architectural design with a scientific method, a quite remarkable, almost magically wonderful feat of language transformation. It is also bound to change form as well, as bridges are made between design communities, between scientific methods, between philosophies, and world communities contribute, not the least of which is the change in view that results from embedding principles of purposeful design in a study of naturally occurring design I hope I am helping to get started.*

*.....often unclear what exactly is needed in the diversity of viewpoints that will produce transformative change, as demonstrated by it being programming with it's distinct lack of a design philosophy, purpose, or method, that welcomed the otherwise perhaps esoteric ramblings of Alexander, back in the mid-80's .....*  
*... how naturally occurring design is embedded but mostly unstudied in every step of both the plans of deterministic and control driven intentions as well as healing and patient ones... learning how to let nature work, to breathe life into things our intentions would never tell us quite how to do,.. and enjoy watching the independent lives of things take hold.*

*Helmut Leitner proposes a beautiful name for it, "Lebendigkeit Science" meaning a science of "liveliness" "vitality" "vividness". My own search for the new science of design in the study of patterns of natural organization was often concentrated on searching for "what makes life lively", which came with an answer in the end "emerging individuality". So I am quite pleased with that quality in the name of the new science. Then I wondered if maybe it should be more*



*inclusive, somehow, and whether it might be really the emergence of “true natural science”, or just “nature” as the study of the “nature” of things. Those transformations may occur but will take a while I think, with all the separate disciplines needing their separations and finding it slow going to discover connections.*

*So I began to think about what could actually move along at a reasonable speed at present, that we might imagine as an event of suitable magnitude instead, and thought of the task of investing some expertise in creating “pattern language starter kits” for various groups, with “natural design pattern extensions” for their domains. There are a number of grass roots communities that will need a version translated into their dialects, and of course quite a number of professions, government and business communities. If we want it to spread it needs to be made relevant in a way that is actively welcomed and useful for a great many domains. So we might choose a name for that hopefully accelerated process of advancing and spreading the method. One that came up is to call it a transformation to living design.*

## 7. CONCLUSIONS

*Pending – probably 22 summarizing points for the 22 sections.*

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Kahn's, and his way of thinking and searching for deep meaning in design. I'd also be remiss in omitting my dad, Clement L. Henshaw, a professor of physics at Colgate whose idea of teaching was giving students a way of observe and learn for themselves, and also his close faculty friend Ken Boulding who was around regularly when I was little. Their connection, and growing up in a science and engineering family would have been where I picked up the idea of life as a principled living system. I also had a variety of rather import personal friends. The one I really can't not mention being John A. Blackmore, who became a social scientist, and from high school on shared a wonderful appetite for exploring every subject we could possibly think of talking about.

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