The Pattern That Connects

Paul Andersen
David Salomon
Indie architecture
University of Pennsylvania
United States

While patterns have a spotty history in architecture, their definitions and uses in other fields offer new possibilities for design. This paper examines those definitions and uses—including theories put forward by architectural theorist, Christopher Alexander; art educator, Gyorgy Kepes; chemist, Ilya Prigogine; and anthropologist, Gregory Bateson. Of particular interest is the shift from eternal, essential, universal, and fundamental patterns to fleeting, superficial, specific, and incidental versions. While endemic to many contemporary architectural practices, this multifaceted view of patterns was anticipated by Bateson, who saw them as agents of evolution and learning. His desire to combine redundancy and noise offers architects new ways to understand patterns and use them to link form and information, matter and thought.
1 Ubiquitous and Untheorized

Patterns are everywhere in architecture these days. Nearly all of the field's subcultures exploit their ability to promiscuously shift in scale, type, function, and structure to make synthetic connections between apparently unrelated territories of design. Enabling architects to do one of our central jobs—bridging aesthetic experience and operational logic—patterns are no longer limited to static motifs or stable systems. Today's varieties are imbued with elasticity, aperiodicity, opulence, variegation, and idiosyncrasy—geometric qualities that are born of recent computational advances, including algorithmic, parametric, scripted, and other morphogenetic practices. A synthetic approach to design is required to build on these technological innovations, to mobilize patterns to combine novel forms with corresponding organizational models and sensory environments.

Despite their ubiquity, patterns' recent resurgence remains un-theorized and their capabilities underused. No account of their proliferation has been given, nor have their increased morphological and functional capacities been thoroughly examined. There are many reasons why the relationship between patterns and architecture hasn't been addressed in almost thirty years: dissatisfaction with previous architectural conceptions of them; their everyday association with superficiality and planned obsolescence; the ambiguity of the term pattern; and a loose and one-dimensional use of them in design. With no clear conceptual definitions, they are deployed with little sense of what exactly constitutes a pattern or why one is more relevant, capable, or desirable than the next.

The tenuous theoretical and practical status of the pattern is enough to make any designer skeptical. Paradoxically rejected for being timeless and too timely, deterministic and promiscuous, patterns are all too easily marginalized. However, instead of dismissing them, we hope to give authority to a new generation of patterns, ones that extend the best features of their predecessors and add some new swerves. Temporally, patterns that never seem to go out of style can be hybridized with others that are momentarily brilliant. Procedurally, a pattern can be defined as both an original and a copy, as an ideal or generalized model to be followed and its repetitive materialization. To develop these protean definitions further, it is useful to examine past definitions, from architecture and other fields.
2 Alexander and Kepes

No one has taken the eternal associations of patterns more seriously than Christopher Alexander. With the publication of *A Pattern Language* in 1977 and *A Timeless Way of Building* in 1979, he and his partners initiated a 30-year monopoly on the topic. During the 1980s the logic developed in those books migrated to computer science (though not computation in architecture) and since that time has become increasingly influential in a number of fields. Despite this success, Alexander's stance also reveals the limitations of any theory of patterns that positions them as underlying and unchanging organizations. Specifically, it solidifies the status quo. Alexander's position is consistent with most scientific definitions of patterns in that he believes their fundamental order to be capable of explaining the seemingly random parts of the world we occupy.

A slightly less conservative understanding of patterns, but one that also directly addressed their ability to traffic between surface appearances and hidden structures, was proposed by the designer and educator Gyorgy Kepes. Kepes recognized that making use of this communication required a more synthetic design process—that is, a process that combined scientific and artistic methods of discovery. Patterns were central to this new approach, which allowed one to move beyond "thing seeing" and toward "pattern seeing." This active mode of perception would favor "interactions, not things." (Kepes 1956) According to Kepes, "although we see it as an entity—unified, distinct from its surroundings—a pattern in nature is a temporary boundary that both separates and connects the past and the future of the processes that trace it. Patterns are the meeting-points of action. Noun and verb must be seen as one: process in patterns, pattern in process." (Kepes 205)

However, far from creating progressive or extreme solutions, the processes in which Kepes was most interested were ones that maintained formal, social, and geopolitical homeostasis. His attempts "to unify art and science on the common ground of control and communication, with architecture represented as an agent of homeostatic regulation," were one way for postwar culture to maintain what Sigfried Giedion had dubbed "dynamic equilibrium." (Martin 2003)

Within this cybernetic formulation, stability had to be maintained via the use of negative feedback—a method of response found in natural systems that was increasingly being used to improve the performance of technological devices (namely, weapons systems), as well as to "improve" social relations between individuals and collectives. Following this line of reasoning, Kepes argued that while "most of the visual patterns of our man-created landscape lack such congruence between process and pattern," the natural patterns made visible by photography "clarify relations of order, continuity and direction in the emergence, growth and disappearance of nature's forms," and suggested a way of translating examples of "natural occurring equilibrium" into cultural systems. (Kepes 1956) In each case, a self-stabilizing system was dependent on its components' ability to adjust to environmental information.

3 Prigogine

As Ilya Prigogine's research proved, similarly active patterns are evident in chemical processes. Before his discoveries, most physicists, mathematicians, chemists, and biologists viewed behavioral and morphogenetic patterns as registrations of unchanging structural principles. He proposed a relationship between form and behavior that is much more capricious, challenging the predominantly indexical association of patterns and scientific laws.

In 1977, the same year in which Alexander published *A Pattern Language*, Prigogine won the Nobel Prize in Chemistry. Unlike Alexander's interest in stability, Prigogine's research focused on the behavior of systems far from equilibrium, ones that exchange energy with the environments around them (yet occasionally organize in patterns). (Dowling et al. 2005) Dissipative structures are one such patterned organization—for instance, Benard convection cells that momentarily appear as hexagonally shaped bubbles on the bottom of a container of boiling liquid. Prigogine argued that these complex patterns (which also include the Belousov-Zhabotinsky reaction and storms such as cyclones) form when the system develops an asymmetrical relationship with its surroundings and its uniform "thermodynamic branch" becomes unstable. In these cases, patterns are volatile and transitory.
Like the patterns documented by Kepes, the behavior described by Prigogine is produced through exchanges between an open system (or, in the case of Kepes, an organism) and its environment. But contrary to Kepes’s and Alexander’s use of patterns as mechanisms for maintaining identity in an entropic, chaotic world—supported by the isolationism of thermodynamics—Prigogine’s patterns are coincidental with high degrees of flux; they only appear under circumstances of dynamic instability. Feedback between a system’s agents, whether direct or through their local environments, sets off rapid, cascading changes to a dissipative structure.

Prigogine’s theories have been hotly contested, particularly the relationship between patterns and the laws that govern them. Philip W. Anderson, another Nobelist, places dissipative structures in the realm of transitory effects rather than stable patterns, and in doing so, sustains a conception of the pattern as a permanent and essential condition. Despite the visually repetitive nature of dissipative structures, Anderson is reluctant to call them patterns because he believes them to be uniquely formed in each case rather than governed by broad fundamental principles. Yet his dismissal contains a new definition of patterns, when he acknowledges “their ability to lead to the emergent property of spatial variation from a homogeneous background.” (Anderson and Stein 1987) He concedes an essential shift in the perceived capacity of patterns—no longer the harbingers of dynamic equilibrium, they are liberated to catalyze qualitative diversity.

For architecture, the ways in which this debate reformulates the notion of a pattern are more important than who is correct. From Prigogine we get an interpretation of the pattern as a condition of instability embedded in an entropic and unpredictable environment, rather than juxtaposed to it. In other words, a pattern is an organization that a system expands into rather than an underlying structure to which it can be reduced. Meanwhile, Anderson’s critique affirms that since no universal laws govern these types of patterns, each is provisional and local.

This suggests new possibilities for patterns in design: first, to incorporate any number of distinct forms within a continuum of time or space; second, to be multiple and changing in any one project; third, to be as much or more the outward appearance of a project as its deep structure; and fourth, to react mutually with their physical and social environments.
4 “Pattern That Connects”

Gregory Bateson suggested a more flexible view of patterns in his 1979 book, *Mind and Nature: A Necessary Unity*, in which he identified “the pattern that connects” as providing an epistemological link between the natural and the cultural. At first glance, this definition appears analogous to Christopher Alexander’s totalizing ideology. Similarly, it echoes Gyorgy Kepes’s argument that an aesthetic sensibility can better join things than segregate them. While related to these other thinkers, Bateson’s understanding and use of pattern contains important differences—differences that have distinct advantages for architecture.

For Bateson, patterns operate according to an aesthetic logic—one that is based on “recognition and empathy” rather than rationality. (Bateson 1979) But while he describes the general continuity between mind and nature as a “metapattern,” he proposes that patterns are neither teleological nor eternal but recursive. Thus, his definition of patterns is much more fluid than Alexander’s or Kepes’s: “We have been trained to think of patterns, with the exception of those of music, as fixed laws or fixed rules to prevent noise—any deviation from what’s expected. (Bateson 1979) For Bateson, such deviations are not a problem to be eradicated but are necessary for learning to occur. The emergence of “foreign” parts within seemingly fixed patterns is evidence of the pattern’s embedded nature and propels the evolution of stochastic processes. This insight enabled him to recognize the differences and relationships between epigenetic growth and processes of evolution and learning. (Bateson 1979) Bateson’s argument is self-consciously framed within the cybernetic discourse on communication, organization, thought, learning, and evolution. Unlike the laws that govern energy and mass, when the science of organization is applied to social relationships involving communication between people, there are no “natural” rules to prevent noise—any deviation from what’s expected. (Bateson 1979) For Bateson, such deviations are not a problem to be eradicated but are necessary for learning to occur. The emergence of “foreign” parts within seemingly fixed patterns is evidence of the pattern’s embedded nature and propels the evolution of stochastic processes. This insight enabled him to recognize the differences and relationships between epigenetic growth and processes of evolution and learning. (Bateson 1979)

Morphological development in epigenetic processes is an unfolding of an already complete whole, where parts are developed through a sequence of divisions or differentiations. This is precisely the analogy Alexander uses to describe his “Timeless Way,” (Alexander 1979) a method in which the architect nurses an embryo-building to maturity. The designer protects the embryo from external forces through the elimination of random
or superficial components. In cybernetic terms, his process is one in which negative feedback is aggressively administered to identify and eliminate noise—any element within an architectural pattern that is not essential—to maintain the pattern's homeostatic and therefore idealized status. In contrast, evolution and learning are acts of accretion, of making a complex whole from independent but related parts. Evolutionary design requires the coordination of programmatic information from internal and external sources.

While the unfolding of embryology deals with reason and replication, evolution is the domain of creativity, art, learning—practices that produce change. A combination of predictability and randomness generates new varieties of patterns without devolving into a chaotic state. In both language-based and biological systems, patterns are a form of repetition in which iterative components allow one to make educated guesses about what's not yet present. In Bateson's words, "To guess, in essence, is to face a cut or slash in the sequence of items and to predict across that slash what items might be on the other side. The slash may be spatial or temporal (or both), and the guessing may be either predictive or retrospective. A pattern, in fact, is definable as an aggregate of events or objects which will permit such guesses when the entire aggregate is not available for inspection." (Bateson 1979)

Because of their predictability, patterns prepare one to receive random input, helping to select what will be reintegrated as new information: information that can thrive in an unfamiliar context by adapting to, or modifying, the patterns that preceded it. Thus, far from maintaining homogeneity or encouraging pandemonium, patterns establish favorable conditions for creativity and learning to occur. Since their inherent repetition allows parts to be immediately recognized, the addition of new information can be registered against this known background, in turn producing new information and a new pattern. Legible deformations of a once-regular pattern are thus never simply an index of the forces acting on it. Because the original state is still present and somewhat recognizable, the base array's identity remains separate yet linked to these forces. The resultant pattern is similar to protocol; located on a continuum between constant and random, it is specifiable, flexible, and localized.
6 Plurality

Informed speculation is particularly important in such design problems, where there is more than one “correct” answer. This is especially true for architects, whose task is, in part, to imagine new alternatives to what already exists. Bateson makes explicit the relationship between what is and what could be when he argues, “With almost no exceptions, the behaviors called art or their products (also called art) have two characteristics: they require or exhibit skill, and they contain redundancy or pattern. But those two characteristics are not separate: the skill is first in maintaining and then in modulating the redundancies.” (Bateson 1972)

There are two levels of redundancy: the first is a perfect replication of a form, figure, or graphic, and the second is a differentiated version of the first. Together they account for the “linkage in aesthetics between skill and pattern” and register a development away from the original. The pure repetition of the first-level redundancy serves as a baseline against which the variation of the second-level redundancy can be read. This process produces “multileveled knowledge”: the proficiency required for the first level enables the innovation of the second. In such a scenario, design becomes the skillful manipulation of excess and repetition—patterns—such that they produce novel, if slightly familiar, outcomes. Ever stochastic, patterns enable the new to emerge out of the same, repeating the difference in them, not only the same we want to see.

For Alexander, patterns are the stable laws (the unfolding of epigenetic logic) that make sense of chaos; for Kepes, they are agents of homeostasis; and for Bateson, they are relatively stable but flexible original materials, what one might call a design primitives, on which outside agents act. They target what could be designed rather than what should be.

In both cultural and natural systems, patterns have the ability to adapt their internal, autonomous logics to external, heterogeneous forces without losing either their aesthetic or organizational identity. The combination of these typically independent systems does not produce overly smooth solutions that neutralize the specific traits of any one of them. Instead, it results in highly calibrated, particular, yet easily recognizable ad-mixtures; aggregations where both the gestalt of a primitive pattern and the individual events or distortions within it are alternatively highlighted or hidden according to the specific demands—formal and functional—it satisfies at any one moment.

The redundancies present in patterns—emphasized by Bateson and present in today’s “thick” and protean architectural patterns—are neither excessive or efficient; they neither optimize nor essentialize any one aspect of a design; instead, redundancies enable a pattern and the elements within it to act as a diagram that anticipates multiple informational and energy flows. A newly theorized understanding of patterns—focusing on the flexible and multifunctional capabilities made possible by their redundant characteristics—encourages patterns’ surplus repetition to function as a force for maximizing technical, sensory, and aesthetic capacities.
Acknowledgements

This text contains excerpts from The Architecture of Patterns, by Paul Andersen and David Salomon (WW Norton 2010).

References