Patterns and science

I will discuss patterns in very general terms, with the intention of demonstrating their inevitability. A pattern is a discovered solution that has been tested for some time, and under varying conditions. For architectural and urban patterns, the time-frame can be several millennia. A pattern is not usually invented, so creativity is subordinated here to scientific inquiry and observation. Although you can find novel ways to combine and relate patterns, creativity is reserved for the products arising from an application of the pattern language, not the process. Since patterns are derived empirically from observations, they differ from scientific theory, which derives solutions starting from first principles. Nevertheless, discovered patterns provide a phenomenological foundation out of which scientific theories can grow. Once established, those theories explain why some patterns work.

Sometimes, a pattern may arise as an informed conjecture. It has to survive the intense criticism and scrutiny that are part of the scientific method of validation. Although patterns are pre-scientific, they are in fact much broader than science. A pattern may be the intersection of separate scientific mechanisms. Many patterns do not yet have a scientific explanation; for others that do, the explanations may be bulky and convoluted compared to the simplicity of the pattern itself. Medicine, pharmacology, and psychology are based at least partially on pattern languages, while their phenomenological foundation is slowly being replaced by a biological/chemical basis. Morphological and scaling rules that apply broadly across many different disciplines are patterns that are useful independently of the particular mechanisms that generate the observed phenomena.

Unfortunately, architecture as a discipline currently has no means of validating an architectural pattern, so the basic mechanism for pattern formation doesn’t exist. Architects who are not also trained in the scientific method will not distinguish between a design method or procedure that gives successful results and one that
fails; the validation process that should follow any proposed solution does not form part of architectural education. The reasons why some buildings fail — in the sense of being unpleasant and difficult to use — are never seriously examined. Consequently, design mistakes tend to be repeated indefinitely.

A philosophical reversal presents an even more serious impediment to the use of architectural patterns. Architecture has changed in this century from being a trade serving humanity with comfortable and useful structures, to an art that serves primarily as a vehicle for self-expression for the architect. In the current architectural paradigm, the emotional and physical comfort of the user are of only minor importance. Architects resist using the Pattern Language because they erroneously believe it hinders artistic freedom. Declaring that they wish to express their creativity freely, they nevertheless force themselves to work within irrelevant stylistic constraints. Contemporary architecture has become self-referential, validated only by how well it conforms to some currently accepted style, and not by any objective external or scientific criteria.

The importance of detail

A language requires patterns on as many levels as it takes to connect to natural processes. Every level is important by itself. In any complex system, detail is part of the lower scales in a hierarchy. If these are unconnected, or missing, then the system is not coherent, and cannot work. Neglecting a pattern because it is on a lower level handicaps the entire structure. It is not always obvious what the lowest level of a system is upon which all the higher levels depend. Detail that is part of a scaling hierarchy will be connected to all higher levels of complexity, and is not just “added on”. Physical forms have structural features on different scales as a result of internal and external forces. From the microscopic to the macroscopic through all intermediate scales, different levels of scale cooperate.

In the design of buildings, there are several scales — corresponding to the human range of scales, 1cm to 1m — that are difficult to justify purely on structural grounds. Yet, in order to define a connected hierarchy of scales, those scales have to be present in the structure. Therefore, either the design should allow the emergence of structure and subdivisions on those scales, or substructure has to be intentionally generated on those scales. This need creates traditional “ornament” and all the patterns that generate it. The appropriate ornament is essential for a large form to be coherent. An analysis of structural coherence arising from a linked hierarchy of scales reveals the necessity for ornament, though nowadays, ornament is discordant because it is unrelated to the larger form.

Detail is a separate question. The smallest perceivable detail at arm’s length goes down to 0.25mm, which relates to a visual system such as a textile or a computer display. While such detail is available in richly-textured materials, it is usually the scales between texture and ornament (1mm–1cm) that are missing from contemporary buildings. Our minimalist design tradition removes the intermediate and smaller scales from built form. After half a century of training in this idiom, we
tend to forget that the best-loved architecture (Modernist included) works especially well on these scales. People need to connect to structure on every scale.