

Experimental Morphology: The Generative Dynamics of Form and Structure

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"Morphology is not only a study of material things and the forms of material things, but has its dynamical aspect, under which we deal with the interpretation, in terms of force, of the operations of energy."

D'Arcy Wentworth

Thompson, *On Growth and Form*

The morphological and integrative potential of fundamental processes existing throughout the natural environment is being systematically explored through an architectural work-in-progress titled the "*Phenomenological Garden*." As part of the overall objectives of this project and the Forms Studies Unit at Carleton University's School of Architecture, students in the *Crossings* workshop have also carried out this exploration through projects that incorporate hands-on procedures derived from the research. These projects inherently allow for an intuitive learning process to occur through the nature of the materials and processes involved in the exploration.

Nature's fundamental processes inherently generate regulatory systems and patterns that correlate with the rich realm of natural phenomena. These fertile processes inherently involve elemental geometric relationships that dynamically evolve into integrative systems with startling form and structure generating capabilities. Modern visualization and analysing techniques are providing us with deeper insights into the ways the "*operations of energy*" interweave into dynamic modular systems and structures that often recall the patterns and motifs found throughout the natural and man-made environment. When the generative potential and interrelated modular patterns of these systems are analyzed, they can yield more comprehensive insights into emergent complex morphology. The intrinsic nature of these process-patterns reveals highly coordinated modular relationships that are simultaneously stable and highly dynamic. These complex networks are fluently encoded patterns offering a multitude of possible alternative interpretations or "readings." They contain *information* and are themselves dynamic *processes-in-formation*. Inherently encoded within the modules or text-tiles of these morphogenetic tapestries are the intrinsic attributes of their generative processes. We are made of and, simultaneously, are surrounded by these encoded and event-filled tapestries. The probing of these tapestries and their associated modules can reveal new insights into the nature of the *reciprocal relationship* that exists between matter, developmental processes, growth and form.

Through systematic analysis of the dynamic potential of basic geometric relationships, a series of dynamic modules and hands-on experiential procedures have been developed that inherently allow for the intuitive discovery of the interrelationships between form, structure, and generative process. The modules consist of 12" bamboo dowels joined together with rubber bands, thus allowing for a high degree of flexibility. The form generating potential of these modules is explored by joining (or weaving) them together into membranes or fabrics. The flexibility of the

joints and their three-dimensional relationships, both within an individual module and throughout the modular fabric, generates a wealth of forms and structures through the emergent transformative and organizing properties of the integrated assembly. These properties recall and re-generate the inherent properties of the natural phenomena that inspired their conception. How the fabric is explored and segmented will determine the forms and structures that can be discovered and developed. The experience is that of a process whereby one feels, follows, flows with, and guides the versatile form generating properties of the dynamic relationships. The following figures show some of the forms, structures and installations produced through this process. As part of the evolving "*Phenomenological Garden*," the work seeks to explore how complex structures are generated from initially random processes that evolve into morphologically rich collective relationships.

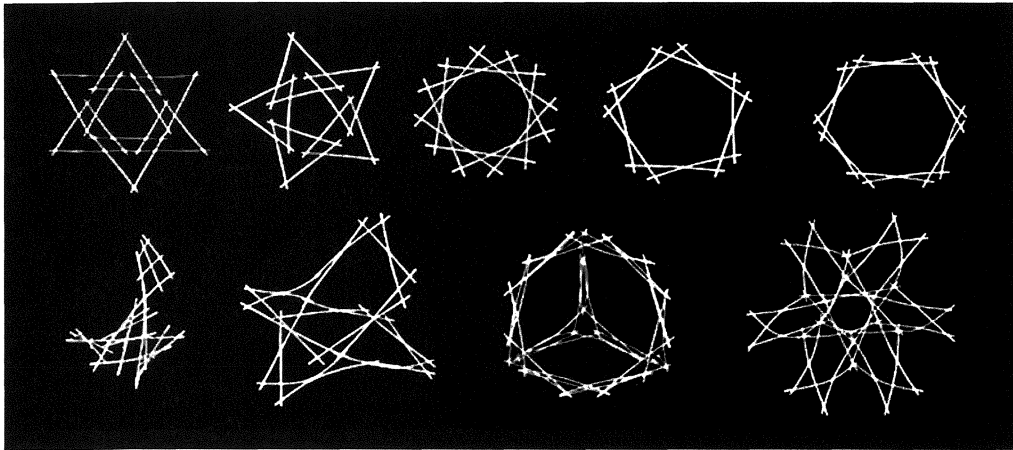


Figure 1: Modules and modular arrangements. 12" bamboo dowels joined together with rubber bands. These initial modules are woven together into flexible membranes or fabrics.

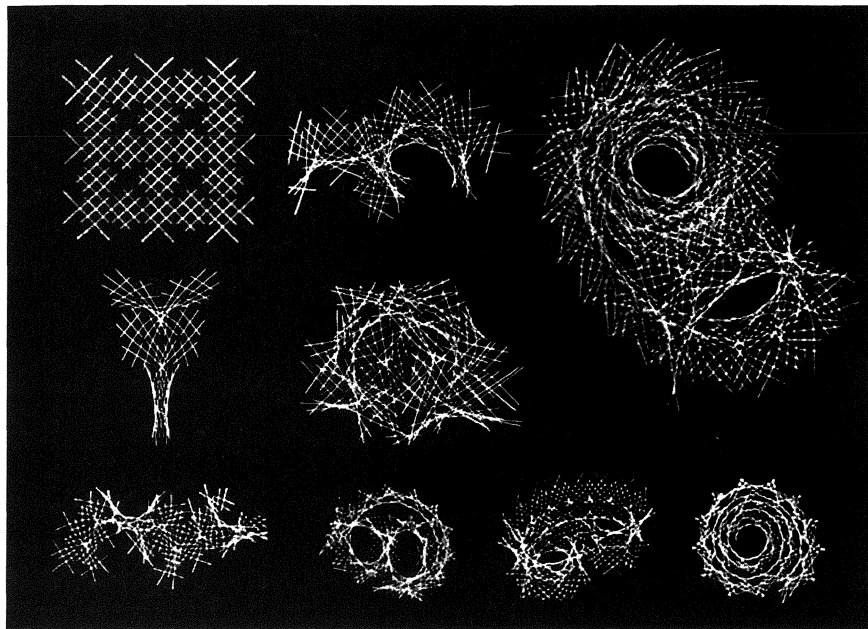


Figure 2

Figure 2: Manuel A. Báez, *Suspended Animations*, 1994-present. Form studies with square modules, 12" and 6" bamboo dowels joined together with rubber bands. The upper left-hand corner shows a portion of the fabric used throughout all fabrications shown here and in Fig. 3. The right-hand side shows an inherently coiling structure that is approximately 30' in length. It can be re-arranged into different inherent forms as shown here in the lower right and in the upper right-hand corner of figure 3.

Note: Figures 1, 2 and 3 are from: M. Báez, *Textiles of Information: Drawing Inspiration from the Nature of things*. *Design & Nature 2002* Conference Proceedings paper, Wessex Institute of Technology, UK and International Centre for Mechanical Sciences of Udine, Italy.

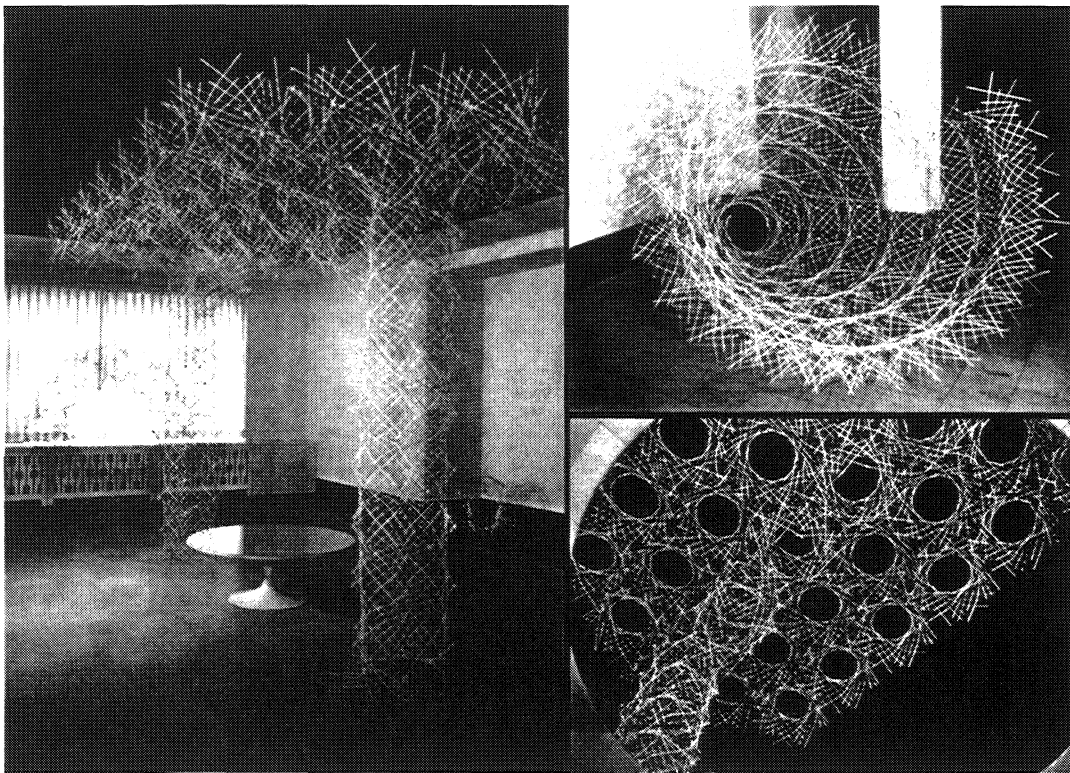


Figure 3: Manuel A. Báez, *Phenomenological Garden* Installation, Cranbrook Academy of Art, 1998. Two columns are transformed into an intricately patterned ceiling structure (left side). Emergent patterns were unconsciously assembled and a variety of them are revealed as one walks around the installation or looks into the mirrored central table (lower right). See notes on fig. 2 for upper right-hand structure.

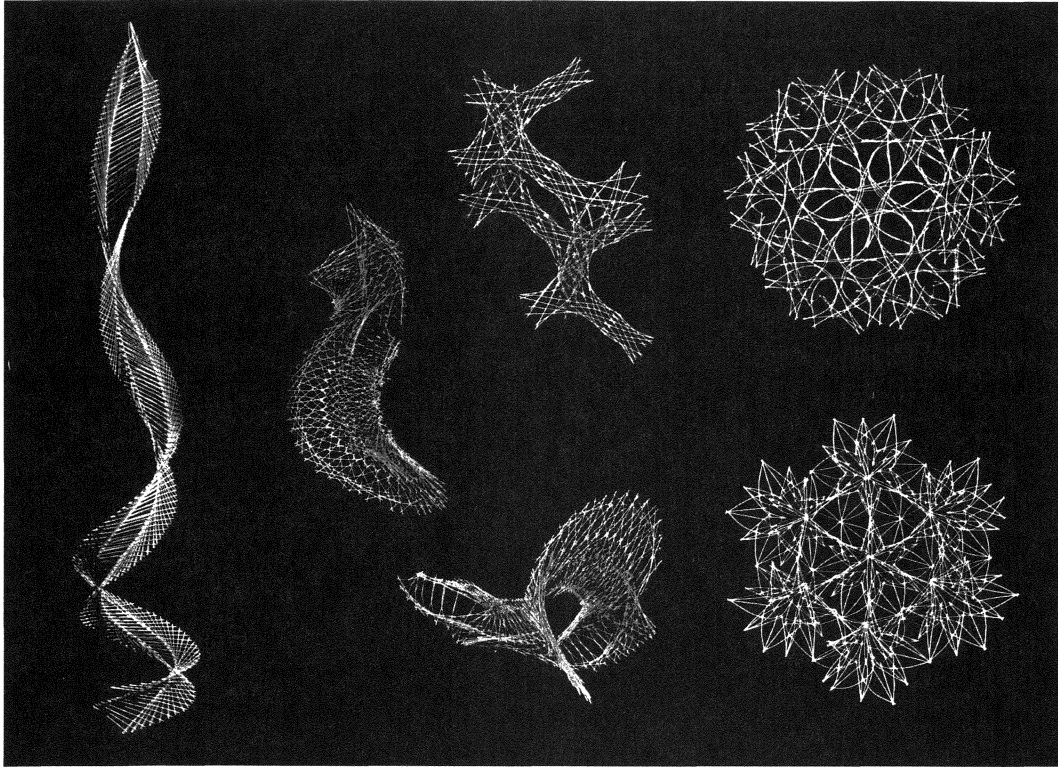


Figure 4: *Crossings* Workshop, Modular Forms Studies. Works by Mariam Shaker, Diana Park, Sherin Rizkallah, Daniel Cronin and Sharif Kahn. Two upper right-hand corner structures and left side: square modules; lower right: pentagonal modules; two remaining middle area structures are different arrangements of the same structure: heptagonal modules.