

Nature as a Strategy for Pattern Formation in Art

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Abstract

We live in a world of structures and patterns that are determined by the interaction of natural forces and environmental factors. Understanding forms in nature provides answers to the molecular structure and how the use of minimal energy creates these patterns. Research by esteemed scientists such as D'Arcy Wentworth Thompson, Charles Darwin and Leonard da Vinci will be noted as evidence for the conclusion. Why is this an important topic? This knowledge can be and has been adapted to many of today's innovations and uses of technology in medicine and architecture. Applications in these fields will be cited. My creative work will show my strategy for structures and patterns. These are a sequence of numbers combined to stretch the space that show transition and change, that relate to forms in nature.

Introduction

Where do Structure and Patterns come from? Scientific research has provided the answer, that the molecular structure of a form is determined by intrinsic, natural forces, although random changes are governed by extrinsic, environmental factors of how living organisms evolve and adapt over time. D'Arcy Thompson in his monumental book *On Growth and Form* states: "Shape or form...is the resultant of a number of forces, which represent or symbolize the manifestations of various kinds of energy...Nature creates structures and patterns according to minimal use of energy". Other scientists such as Charles Darwin also concludes that functional efficiency is crucial and therefore of adaptive value. Adaptive behavior becomes function and form. Leonardo da Vinci's scientific manuscripts on view at the Pierpont Morgan Library analyze the nature of water with its eddies, whirlpools and flow and the patterns they exhibit. As Figure 1 shows, Leonardo adapted his study of the flow of water to his drawings of hair.



Figure 1: Adaptation of water flow to hair.

Scientists and mathematicians provide examples of patterns and of function. As Figure 2 shows, the pinecone's close packing and compression of the scales lead to a square or rhomboidal pattern instead of a hexagonal structure. Compression and adaptation are evident in the double spiral arrangement going in opposite directions. These spirals are also referred to as a Fibonacci sequence as well as having a tessellation pattern. The snowflake is an example of an inorganic form responding to adaptation. The crystalline structure of a snowflake starts by having a hexagonal structure. It has mathematical symmetry and regularity. Due to environmental factors such as temperature, humidity and wind, the resultant form will have different lengths of tentacle like extensions.

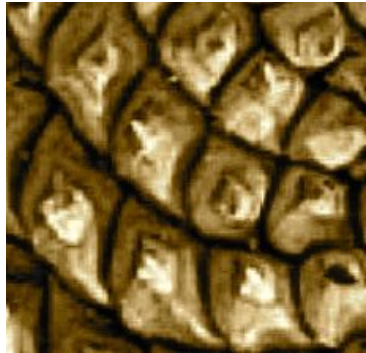


Figure 2: Adaptation of hexagons to a rhomboid pattern.

Applications of structures and patterns

Structural biochemistry has become a vital development of new medicines. The detailed three-dimensional folding and bending of structure of thousands of proteins have advanced drug discovery. In architecture, affordable housing and modern technology make shelters more efficient and economical to a greater number of people. The spherical structure of the geodesic dome uses the least surface area per unit volume and uses minimal energy to allow air to circulate without obstruction. The use of self-bracing triangles in a pattern gives maximum structural advantage.

Why am I interested in this?

My story began decades ago. I love the outdoors. In the early morning at the break of day, I walk in the Great Swamp near my home. The stillness allows me to observe nature and to listen to its sounds. Nature is for me a polyphonic symphony of rhythms, colors, patterns and sounds. This interest has developed into a passion for understanding structures and patterns in the seen and invisible world. The insights I have gained underlie the conceptual framework for the body of my work. My creative works bear a relation to the natural world and the mathematical patterns and structures found in natural forms. My paintings, drawings and sculptures are based on tessellation patterns and transition and change.

Irene Rousseau's work

Figure 3: *Stretching the Space-7*. This work begins with a square canvas to explore symmetry and a geometric conception on a two dimensional plane. It is based on a grid with linear extensions of bounded and unbounded spaces. The work is a sequence of numbers that are combined to stretch the space. The square unit module serves as a unifying element and consists of the sum of multiples of these units that become an interlocking pattern that is distributed over a field. The central core consists of rotated interlocking patterns, cutting across and overlapping contour lines, which gives an increase or decrease in measuring the crowding of lines in the direction. Overlapping of patterns result in subdivided spaces, color shifts and fragmentation, which disguise the geometry. My interest is to show a rhythmic pattern through repetition, transition, movement and change, which represents the ever-changing environment. The painting metaphorically represents the structures and patterns that are a result of forces in nature and environmental factors that we see and try to understand.



Figure 3: *Stretching the Space-7*. oil paint, pen & ink on canvas, 36"x36"x2". ©2014.

Figure 4. This painting explores the physiology of visual perception. Color and luminance are different. Light is a physical entity. But, color perception is a series of wavelength of light that our brain processes. Our perception of color depends on such factors as luminance and the detection of edges, shadows, and the resolution. It is based on the grid but fragmented pieces and broken color visually result in an uncertain form and shifting space. Luminance is perceived lightness. It allows us to perceive depth, three-dimensionality and optical movement. When there is an abrupt contrast of light and dark, we recognize the object or shape. The visual effect is a polyphonic symphony of multiple tessellation patterns and linear rhythms that result in a visual movement of transition and change. Nature is for me a strategy for pattern formation in art.



Figure 4: *Stretching the Space-8*. oil paint, pen & ink on canvas, 36"x36"x2".

Conclusion

What have we learned? We live in a world of structures and patterns that may be evident and observable or they may be hidden from view. Mathematicians and scientists have discovered that these patterns exist with repeating modular forms and may go on ad infinitum. Some patterns are said to have tessellation patterns others are said to have repeating patterns but on different scales. Artists, scientist and mathematicians have been interested in these patterns and have sought to understand them. They are different complimentary ways to visualize concrete abstract realities.