

A New Art Form: Exploring Nature's Creativity with a Self-Organizing Medium

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Over a decade ago, while lamenting an ill-conceived brushstroke on a sheet of expensive, highly absorbent watercolor paper, I decided it was time to find a new painting surface, one more sympathetic to my needs. On a whim I chose a smooth, white, non-absorbent sheet of styrene, a selection with so different a surface from watercolor paper that it provided me with a major personal challenge: I had to find a new way to paint.

There was an upside to this choice. The act of painting suddenly became an interactive dance with patterns in motion, evolving over time. The occasional "Did I paint that?" I felt working with watercolor paper quickly turned into an "Oh my God" experience with the styrene. I had inadvertently unleashed a plethora of slowly forming, self-ordering, non-random natural structures that stimulated my mind, sending my thoughts in new directions. This discovery would turn into an opportunity for me, through nature and science, to gain a new perspective on art, one more suited to the 21st century.

INTERACTING WITH NATURE

I begin by brushing on several colors to create a pattern of interest. Then, through the addition of energy and matter to the styrene surface, I interact with patterns as they form. Adding energy and matter can be as simple as a fine spray of wetting agent and/or pigment (varying droplet size and height from surface), or using an infrared or ultraviolet light. Tilting the painting surface even one or two degrees also introduces the force of gravity. I quickly realized that under the right conditions, water-based pigments are capable of exhibiting a variety of structures of increasing complexity, like those found in nature, displaying patterns of growth, flow, erosion and symmetry.

In effect, the painting surface had become a generator of novelty and surprise, challenging my creativity in ways that I never would have imagined. Suddenly, my options for creating art seemed unlimited. I could explore nature's world of evolving patterns by controlling the flow of energy and matter interacting on my painting surface.

However, I could not add just any kind of matter. I had to use soft matter, a unique class of materials that are easily deformed by external stresses. They occupy a middle ground be-

tween two extremes: the fluid state and the ideal solid state. Typically, they have structures that are much larger than the molecular scale and can spontaneously form new structures that "move in unprecedented ways while exhibiting surprising flow properties" [1]. Most importantly, they also have the ability to self-organize. The best-known examples of soft matter are polymers, in which many repeating sub-units are connected to form flexible chains, such as those found in artist's pigments, wetting agents, emulsions and all forms of living tissue.

A NEW ART IN THE MAKING

What does all this have to do with art? The defining property of soft matter is the ease with which it responds to external forces, and so the key to maximizing its potential to form complex structures is to maintain the medium as an open system, far from equilibrium (matter and energy are added, reactions occur, structures form). The concept of an open system can be likened to a burning candle where the hot wax (matter and energy) is oxidized by the air (a chemical reaction), transforming it into an ionized gas (the flame). Also, adding energy and matter can keep the process of pattern formation active. By using a water-based pigment/wetting agent medium as an open system, maintained far from equilibrium on a smooth non-absorbent surface such as styrene, I unlocked a world of structures and forms that I had always associated with nature.

Suddenly, the act of painting took on the attributes of an experiment, providing a succession of unique visual experiences. My usual need to find a subject or to paint on location vanished. Here was an opportunity for the creative artist to explore nature's laws through direct interaction with her patterns and forms in real time, provoking the imagination and energizing the intellect in new and exciting ways.

Is this effect really due to the medium? What in the use of soft matter gives me that sense of oneness with nature that I have rarely, if ever, experienced before? Is there a psychological explanation? Recent studies in neuroscience have confirmed that a powerful brain mechanism [2] essential to the survival of the organism comes into play in the detection and

ABSTRACT

The author describes a new art form that uses the self-organizing potential of a water-based medium to provide an ever-changing environment for interpretation and elaboration. The medium allows for little separation between plan and execution. The artist, nature and science interact on the "canvas" to create an art rich in novelty and surprise.

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production of surprise and novelty (excluding the familiar). Clearly, images that can trigger such emotions are sought by many artists. I believe I have found a new tool for exploring our creative potential.

CREATING A PAINTING

Generally, as various structures begin to form, I selectively add energy and matter to create and enhance patterns. My brushes are 2-, 3- and 4-inch wide pieces of foam attached to wooden handles, with Winsor & Newton's numbers 4, 5 and 6 brushes occasionally used in a supporting role. Usually a number of novel structures begin to appear, inviting interaction; many are fractal. The whole surface becomes an open system, far from equilibrium, moving in slow motion. The manipulation of various shapes, forms and textures encourages further exploration and discovery. Typically patterns begin to form and coalesce into an image of a place I have never seen before, yet which often seems familiar on a deeper level. Most importantly, because the painting medium responds to nature's laws, random structures rarely seem to occur. Usually complex patterns find a resonance in my memory, as if I had seen them before. Perhaps there is a genetic connection. The images in Color Plate H are meant to provide a glimpse of the range and type of paintings that can be created with this new technique.

Whereas I used to paint what I saw before me, in the creation of *Inner Vision* (Color Plate H No. 1) I started to paint with no particular scene in mind. As I added energy and matter, patterns began to form. After a short time, I saw mountains and a host of familiar shapes and objects in those patterns. I added the sky last. For *Pacific Swell* (Color Plate H No. 2), I tried to imagine how a bird flying along the coast might view the Pacific Ocean. When I created *Southwest Land-*

scape (Color Plate H No. 3), I started with the idea of a canyon but had no scene in mind. I put pigment down close to the top and added energy and matter to create a wall. I repeated the process to create the rock structure in the foreground and followed the natural development of patterns, adding the sky last. *In the Beginning* (Color Plate H No. 4) arose from attempts to imagine how the early Earth looked when it was covered by water. Again, I followed the natural development of patterns created by the soft matter technique, then let my imagination take over.

Creating art has become a voyage of discovery within the medium and within myself. Painting with soft matter provides a rich variety of new and subtle methods of creation that continually challenge my intuition, imagination and intellect in unexpected ways. I now see art and nature as matter in motion based on universal laws—welcome to the 21st century [3].

ART IN THE NEW CENTURY

I believe that future advances in technology will offer artists new ways to create, ways that we can hardly imagine now. Materials that self-organize, because they reflect the laws of nature, will start a new trend by helping to provide the novelty and surprise intuitively sought by artists. The medium I use can take from many minutes to hours to self-organize. Artists will have choices with unpredictable implications. Rather than dealing with the formation of one pattern at a time, artists will be able to explore a network of relations and associations in real time. If they sense that something is missing, they can selectively add energy and/or matter, forming new patterns at will.

This way of creating art is new, and since the images are rarely random, it is easy for the mind to reflect, imagine and explore new possibilities in real

time. I call this new way to create art "Developmental Expressionism." Developmental Expressionism uses the self-ordering potential of the medium to provide an ever-changing environment for interpretation and elaboration. There is little separation between plan and execution. The artist, nature and science interact on the "canvas" to create an art rich in novelty and surprise.

Maximal pleasure from this unique painting experience requires a rudimentary understanding of the science involved. This understanding creates a heightened awareness and a sense of participation that also seems to act as an antidote to self-doubt, affording the artist even more freedom.

Where the art of soft matter will lead and what its ultimate effect on artists and viewers will be is uncertain, but there are fascinating possibilities. I humbly believe that we may be on the threshold of a new era, one based on a homegrown technology that can take art to a higher level in the creative process. Here is an art form that can merge intuition and intellect through a bonanza of natural patterns, providing a private place where artists can explore their deepest emotions.

References

1. T.A. Witten, *More Things in Heaven and Earth: A Celebration of Physics at the Millennium*, B. Bederson, ed. (New York: Springer, 1999) p. 617.
2. J.-P. Changeux, "Creation, Art, and the Brain," in Albert M. Galaburda, ed., *The Languages of the Brain* (Cambridge, MA: Harvard Univ. Press, 2002) pp. 141–142.
3. R. Steinberg, "Patterns That Connect: The Self-Organizing Landscape and the Brain," presented at the Third International Conference on Neuroesthetics, Berkeley Art Museum, Berkeley, CA, U.S.A., 10 January 2004.

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