

Subtle Technologies  
Toronto, ON

## **Patterns**

by Jim Ruxton

### **Introduction**

Historically artists and scientists worked side by side and often their roles were indistinguishable from each other. As science became increasingly specialized not only did artists and scientists diverge from their working relationship, but science and art has split off into many camps of highly specialized disciplines. This increasing division has made it difficult for artists to find their way into the scientist's world, to get a first hand impression of the methods, tools and techniques, motivations and aspirations of a research scientist. Likewise for many scientists, the only window on the world of the artist is the art gallery where they may be exposed to an artist's work.

For the past eight years, Subtle Technologies, a Canadian non-profit arts organization, has organized an annual international festival in Toronto that provides a unique opportunity for artists and scientists to learn from each other about the way they approach their particular fields of practice. During the festival, the blurring of boundaries between art and science is investigated through presentations, performances, exhibitions and workshops.

The support of the "Off the Radar Program" from the Inter-Arts office of the Canada Council for the Arts presented Subtle Technologies with the opportunity to bring artists even closer to the world of the scientist. On November 6 and 7 2004, nine artists from various disciplines were invited by Subtle Technologies into a University of Toronto science lab to discuss their work and the work of Professor Stephen Morris who runs a nonlinear physics research group primarily concerned with the investigation of non-equilibrium pattern formation.

### **The Artists**

Arlene Stamp: textile and surface design artist, Calgary AB  
Michael Alstad : installation and .net artist, Toronto ON  
Gordon Hicks : electronic media artist, Toronto ON  
Steve Irvine : ceramic artist and photographer, Warton ON  
Willy LeMaitre: installation, video and sound artist, Toronto ON  
Paulette Phillips: video artist, Toronto ON  
Lydia Sharman: industrial design artist, Montreal PQ

Sally McKay: writer and performance artist, Toronto ON  
Leslie Partridge: painter and software artist, Toronto ON

## **The Event**

The workshop began with Stephen and the artists introducing themselves. In his introduction, Stephen stated that it was a luxury that he could present a workshop to artists, indicating that earlier in his career he would have been ostracized for such a radical act. Stephen went on to give a lecture about his research. Specifically this work involves the investigation of patterns which occur under non-equilibrium conditions. These patterns occur when a nonlinear system (output not proportional to input), which includes friction, is driven to a point of instability. The patterns which Stephen studies are those self-organizing patterns that emerge out of a non-equilibrium state. Unlike much of the physics today such as string theory, particle and high-energy physics, Stephen's work is very hands on. He works directly with the materials he studies such as: mud, sand, fluid, ice and air. Since many artists have a passion for materials, I think this hands-on approach offers a point of connection for many artists into Stephen's world.

Stephen showed many examples of patterns in nature that emerge out of non-equilibrium states. These examples include very large structures such as the formation of galaxies, the rings of Saturn and cloud streets (streaks of clouds that create periodic lines across the sky). Medium scale patterns include meandering rivers, cracks in mud on playas, sand dunes. Smaller scale patterns include stripes on animals, such as the zebra, and periodic ripples which appear on icicles as they freeze. Although we see these patterns and others all the time, we rarely reflect on why they seem to spontaneously appear. In fact, much is still unknown about why these patterns appear in nature and what the underlying mechanisms that drive them are. It's mysteries like this that we confront every day that often motivate the artist and scientist to carry out their work and pursue their methods of understanding.

Since the above-mentioned systems are difficult to study in their own environment, research is carried out in the laboratory to simulate conditions that occur in nature and accelerate many processes that normally would take long periods of time to manifest. Stephen discussed equipment he uses that vibrates, shakes or rotates sand and other particles of different densities as well as magnetic and electric fields which are used to manipulate and drive materials into the states necessary for patterns to self-organize and emerge.

We spent the rest of the first day in Stephen's laboratory where we were introduced to the materials and equipment he uses. One of the first experiments we looked at was an experiment called Taylor Vortices, pattern that emerges when one cylinder rotates within a second cylinder and the two cylinders are separated by a fluid. Since this was something that Stephen didn't currently have in his laboratory, I built the apparatus for the workshop.

We then investigated Faraday waves created by setting into oscillation, a fluid in the vertical direction. Depending on the vibration parameters, different patterns emerge.

Another experiment involves segregation of granular media. When placing particles of two

different sizes in a rotating drum, something counter-intuitive occurs. One would expect the particles to mix, however, they actually separate out into bands. A well-known experiment was used to create Chladni patterns. We placed sand on a large thin vibrating plate and used a violin bow to set the plate into a vibrating motion. By holding the plate at different points, the nodal lines can be adjusted.

We also investigated a pattern driven by a chemical reaction. The Belousov-Zhabotinsky (BZ) reaction is an active chemical medium that maintains self-oscillations and propagating waves.

On Day 2 we discussed what we saw in the lab and spent the day discussing a variety of approaches and ways of looking at patterns relative to each artist's work.

Arlene Stamp, for example, described her work by saying that whereas Stephen's work focuses on emerging patterns, her interest lies in patterns that evolve. She has discovered and adapted numerous algorithms that generate patterns some of which mimic growth and form in nature. As these patterns evolve in a two dimensional plane, interesting non-repeating patterns are formed. The patterns are then output as tapestries, tiles or wallpaper. Stephen was able to point out a number of examples in the scientific realm that related to Arlene's work. It was an interesting opportunity for her and the other artists to hear ways in which an artist's work unknowingly can relate to work in a different discipline.

Steve Irvine spoke about patterns from the point of view of both ceramics and photography. One of Steve's famous photographs is a multiple exposure he did over a year's time revealing the pattern the sun makes as it traverses the sky when a photo is taken at the same time and place each day. It was an interesting way to reveal a pattern that we all have seen but are not cognizant of.

Willy LeMaitre made an interesting point during his presentation. He noted that our entire basis for cognition is based on pattern recognition. In that sense, we can say that all our experiences of interpreting the world including art are based on learned or instinctual patterns. These patterns exist as many forms of familiar stimuli including the five senses. He characterizes the pattern aspect of his work as the ways in which our cognition recognizes patterns and creates narratives from mere suggestions presented by the artist. Willy and long time collaborator, audio composer Eric Rosenszweig in New York recently created "The Appearance Machine" an installation they describe as "an autonomous system for generating cinema". The machine has a rotating stage with mechanical devices and lights that manipulate pieces of refuse placed on it. As the objects are moved, cameras analyze the motion and a computer generates an accompanying soundtrack. The movement information is also used to control the lights and mechanical devices that manipulate the objects, creating a complex feedback system. What is very interesting about this piece is the way simple objects come together to form complex narratives. Of course it isn't the objects so much as our minds that recognize familiar movements and patterns to create a story. A very common reaction is to anthropomorphize the objects, something our pattern recognition system is so adept at doing.

This weekend workshop provided an excellent opportunity for the artists and facilitators to reflect on the various ways we look at patterns. This theme provided a bridge to bring together

people from very different disciplines. Since this was our first time staging an event of this kind, time went far too quickly. By all accounts, however, I think it was a resounding success and moved forward interdisciplinary arts into new areas of investigation.

As a result of this workshop, Stephen Morris and Lydia Sharman are collaborating and have applied to present a joint paper at Subtle Technologies 2005, Stephen Morris and video artist Paulette Phillips are talking about collaborating on some video work, Arlene Stamp and Leslie Partridge are in discussions about creating an automated loom.

Quotes from lab participants:

Steve Irvine: “The workshop organized by Subtle Technologies on Pattern Development and held at the University of Toronto Non Linear Physics Lab came at a key time for me. I am in the final stages of preparing an exhibition called Collaborations with Chaos which is an examination of the parallels between Chaos Theory and the creative process.”

Paulette Phillips: “Being included in the workshop was invaluable. I got to network with physicists and other artists and we were able to elaborate on our shared and divergent interests. We have identified our commitment to sharing resources and I look forward to continuing the opportunity for discourse and research.”

Arlene Stamp: “I think these symposiums that you are organizing are a wonderful contribution to the cultural scene from parallel disciplines so that we might all better understand the approaches and ways of thinking that we all share”

### **Acknowledgments**

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