



SciArt in America

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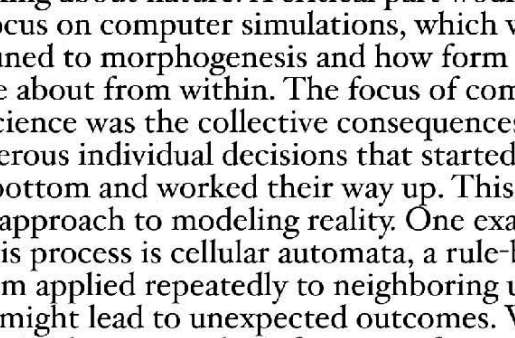
Table of Contents

- 4 Letter from the Editor
- 5 On Topic: Art Imitates Life—And Sometimes Creates It
- 13 Spotlight: BioScapes
- 16 SciArt Center: Jessica Parker
- 18 Spotlight: Art for the Age of the Anthropocene
- 21 International: The Neuroscience of Art
- 22 Straight Talk with Dhruva Deb
- 28 Straight Talk with Ellen K. Levy
- 34 Straight Talk with Elizabeth Demaray
- 40 Spotlight: Seeing the Art Through the Weeds
- 42 The Dish: Culturing Science



STRAIGHT TALK with Ellen K. Levy

Ellen Levy is a visual artist who uses art, science, and technology to stimulate conversations on cognition and perception. Her work, which is often expressed through mixed-media installations, places complex still representations and dynamic animations in dialogue side by side. Levy contextualizes her work through curatorial projects and essays on the connections between art, science, and technology. Levy has an extensive presence in the sci-art community hosting LASER (Leonardo Art Science Evening Rendezvous) talks in New York City and serving as the special advisor on the Arts and Sciences at the Institute for Doctoral Studies in the Visual Arts.



By Pamela Segura
Contributor

PS: In your work, you address many topics, including the complexities at the heart of attention and other perceptual phenomena, the brain's abilities for adaptation, and the ways in which biological systems are similar to technological and economic systems. What originally inspired you to pursue these interests, and how do they continue to change and evolve as you mix different media into your works?

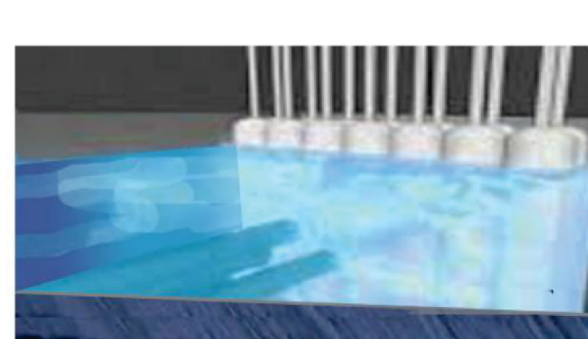
EL: Identifying complex systems as a source of inspiration for my various art pursuits will also answer some of your other questions. In 1984, I installed an exhibition called "Telescopical Vision." It was one of the first that The New York Academy of Sciences initiated in the wonderful William Ziegler building at 63rd Street off 5th Avenue. The exhibition space was literally 'wonder-full' in part because its regal architecture was seeded with major scientific historical treasures. One could see original excerpts from Darwin's *On the Origin of Species* and other books displayed in marble niches. During my exhibition, physicist Heinz Pagels, then director of the Academy, suggested that, given my interests, I check out the Santa Fe Institute that was under construction in New Mexico. He explained that the Institute's founder, Nobel Laureate Murray Gell-Mann, had conceived of a large interdisciplinary think tank that would embrace diverse approaches to the study of complex systems, essentially a new way of

thinking about nature. A critical part would be its focus on computer simulations, which would be tuned to morphogenesis and how form can come about from within. The focus of complexity science was the collective consequences of numerous individual decisions that started at the bottom and worked their way up. This was a new approach to modeling reality. One example of this process is cellular automata, a rule-based system applied repeatedly to neighboring units that might lead to unexpected outcomes. What galvanized me were the inferences of complex systems for art and the possibility of generating a system of my own invention that could develop a network of associations and devolve unpredictably along a path.

I later found the perfect location for an art project comparing memes and genes at the National Technical Museum in Prague. My solo show there in 2000-2001, "Shared premises: Innovation and Adaptation," was responsive to their transportation and aeronautical displays. It also incorporated depictions and transformations of objects from NASA from which I had received a commission in 1985. After first painting juxtapositions of animals and transport systems, I scanned and morphed them with a cellular automata program before printing. They provided virtual windows onto the actual museum displays that lay behind the walls and

28

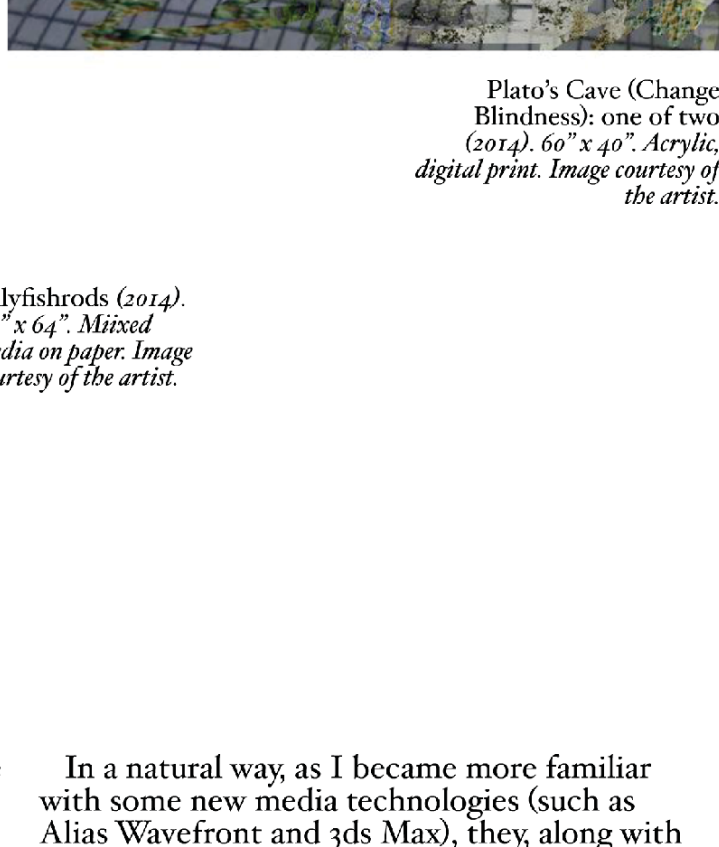
SciArt in America February 2015



Transporting Salmon (2014), 44" x 62". Mixed media on paper. Image courtesy of the artist.



Jellyfishrods (2014), 44" x 62". Mixed media on paper. Image courtesy of the artist.



Plato's Cave (Change Blindness), one of two (2014), 60" x 40". Acrylic, digital print. Image courtesy of the artist.

SciArt in America February 2015

29

even suggested the traffic under the floor of the Prague Museum.

The topic that subsequently captured me was the process of 'innovation', how new ideas come about. How could I best visualize this process? My basic rule was to find the present in the past and trace it over time like a genealogy. Natural history museums offered an intuitive starting point for this kind of content, and so, too, did the US Patent and Trademark Office (the USPTO) along with its set of evolved conventions for drawings. For example, an upgraded manual of the patenting procedure in 2005 explained how to make two-dimensional orthographic views readable as three-dimensional objects. The manual instructed the drafter of the patent design that "light should come from the upper left corner at an angle of forty-five degrees" to the surface of the paper. Edges to the bottom and right should thus be made graphically thicker, to indicate a shadow. It turns out that this convention is in keeping with our hard-wired expectations that light should come from above. Even the USPTO reflected some of the constraints of our perceptual system! I found that the USPTO shares many similarities with biological evolution. Adaptive improvements, diversification, and competition typify the history of innovation. The key difference is that with artifacts you have nongenetically transmitted behavior that occurs by learning—memes instead of genes. You have to take into account the variety of forms and environmental constraints.

Norbert Wiener, one of the founders of cybernetics, suggested that living organisms be viewed as systems governed by feedback control. The USPTO also embeds a feedback loop involving the interactions of environment, cognition, and behavior. To structure this visually, after I had compiled a database of inventions I tracked the originality of each invention on the basis of what was salvaged and remixed from a predecessor to form a new invention. I saw corroborating evidence for my approach. I learned that paleontologist Niles Eldridge had collected different species of corals. They ranged from when the instrument was first invented to modern examples. An article at the time noted that a period of expansion was like the musical equivalent of the Cambrian explosion for fossils. So I felt I was on a productive track.

In a natural way, as I became more familiar with some new media technologies (such as Alias Wavefront and 3ds Max), they along with scans from forms that I morphed with cellular automata or simulated in paint could be incorporated into my system.

PS: Your experience as a microbiology technologist has shaped many of your more recent works, including your stellar exhibition, *Colonizing Plato's Cave: Remembering the Future* (2013). Can you elaborate on how microbiology has inspired your work on both an aesthetic and conceptual level?

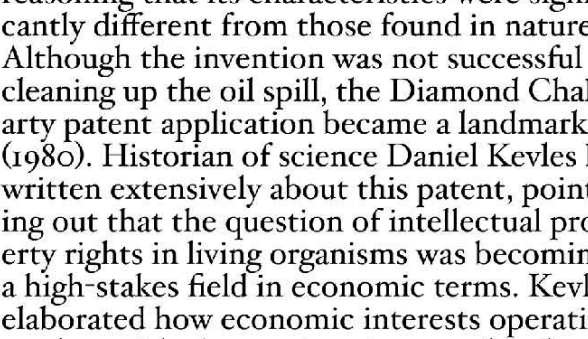
EL: My experience as a microbiology technologist shaped art work throughout much of my career. It provided me with a knowledge of microorganisms and recipes for feeding (thus growing) them. I became acquainted with how Alexander Fleming, discoverer of penicillin, fully made 'germ portraits' by growing bacterial cultures on Petri dishes to create pictures, and at times I approximated this process in the micro lab. After photographing and scanning bacterial cultures grown in the lab, I later applied cellular automata programs to morph them. I then incorporated the results and/or painted their fascimiles in art works as appropriate. What appealed to me aesthetically was how I could incorporate a biological process in my art and use it to animate the resultant forms in a visually expressionist-like way.

Evolutionary processes underlie fields apart from biology. Darwin made a critical link between evolution and economics when he referred Malthus's population studies. As a result, we now realize that nature tends to optimize outcomes, and adaptation occurs as the organism or product tests its environment, incorporates feedback, and demonstrates learning over the course of time. I found that my patent system could be used to visualize the evolutionary nature of industries like biotechnology that compete in a constantly changing economic landscape.

My art focused on some of the stakes involved in the Exxon-Valdez oil spill of 1989 in an exhibition at Wesleyan called *evolution*. Ananda Chakrabarty, a biochemist who was on the staff of the General Electric Research Center in Schenectady, New York, applied for a patent on a living bacterium that was genetically engi-

30

SciArt in America February 2015



evolution* (2005). From left to right: Surviving Extremes, Sea Currents, DNA + Oil, Production of Molecular Chimeras. 80" x 20" each. Enamel, acrylic, digital print. Images courtesy of the artist.

neered to eat crude oil. This patent on a genetically modified bacterium was granted with the reasoning that its characteristics were significantly different from those found in nature. Although the invention was not successful in cleaning up the oil spill, the Diamond Chakrabarty patent application became a landmark case (1980). Historian of science Daniel Kevles has written extensively about this patent, pointing out that the question of intellectual property rights in living organisms was becoming a high-stakes field in economic terms. Kevles elaborated how economic interests operating in tandem with changes in science and technology has shaped the patenting of life.

In *evolution**, I transformed images from registered patents that were pertinent to Arctic exploitation. In each case, the most recent invention has adapted some aspect of a past innovation for a different use. These processes internalize feedback. You can trace them backward in time, but you can't predict them going forward. The works deal with the Arctic from different vantage points, including econom-

ics, the individual within an environment, and biotechnology and energy industries. The patents and images included show that almost every inch of the permafrost and land above and below it has been claimed as intellectual property. On the left, *Surviving Extremes* shows the life of a hearty individual that I met at the Arctic Circle. To survive, he hunts wildlife for food. *Sea Currents* is second from the left; in it, I portray the impact of industries on the Arctic environment. Halburton, among them. To its right is *DNA + Oil*; it features text from the famed Chakrabarty patent. At the far right is *Production of Molecular Chimeras*, including forms morphed by cellular automata.

PS: In *Change Blindness*, a piece showcased in *Colonizing Plato's Cave*, you juxtapose two visualizations of urban settings that are colored over by algorithmic representations of microbes found during Hurricane Sandy. The piece invites viewers to compare the two images and regard both the personal and biological consequences of Sandy. What specific elements about *Change Blindness* imply interaction between the art and viewer?

SciArt in America February 2015

31

EL: In *Colonizing Plato's Cave*, I was dealing with the impact of Hurricane Sandy and our ways of adapting to environmental change. Microbes form an essential part of a healthy human body and biochemical cycles. My aim was to show how we have become more attuned to this previously invisible world, at times looking to microorganisms as a solution to man-made problems. I was intrigued by the writing of Manuel de Landa, and I included depictions of lichen in my installation along with microorganisms. I included a video, *The Perspective of Lichen*, which showed a brief history of the world from the lichen's standpoint and the pivotal role played by human artifacts in their transportation and replication. De Landa has pointed out that ancient states constitute environments in which one can "see ecological phenomena: competition, host-parasite and prey-predator relationships. It is also the substratum for the complex reactions of biogeochemical cycles..."

PS: Your work also rests on the notion that art can reconfigure standard ways of perceiving information, especially visual information. This is evidenced in your animation, *Stealing Attention* (2009). This video came about after collaborating with neurophysiologist Dr. Michael E. Goldberg, the director of the Mahoney Center for Brain and Behavior at Columbia University. What were some of the responses to the video? What new information did you glean about attention and the viewer's experience of art?

EL: My growing realization concerns the importance of attention; simply put, we don't see what we don't attend to. The construction of an installation and collaborative animation, *Stealing Attention*, (exhibited in NYC at Michael Steinberg Fine Art in a solo show in 2009 and at Ronald Feldman Fine Arts in a group exhibition) allowed viewers to experience first-hand the constraints on their own attentional systems, provoking awareness of our own 'normal' physiological limitations.

Neurophysiologist Michael Goldberg and I collaborated on the animation. Images of looted Iraqi antiquities were programmed to gradually disappear over the course of three minutes, and the distraction of flashing cards made them hard for viewers to discern. A directive was is-



This Image is Unavailable (A Little Red Paint Survives) (2012), 60" x 40". Acrylic, digital print. Image courtesy of the artist.

sued at the onset of the animation to "count the number of times the Queen of Hearts appears." The distractors were intended to symbolize a con game of Three-Card Monte. After one playing, a subset of viewers were questioned about what they had observed; those who did not see the targets disappearing (well over half) were invited to walk around the gallery and then re-view the animation. The aim was to assess whether the repetition of images of looted objects throughout the gallery in static displays of painting, collage, and an installation of the print-outs of looted objects from the Web could cause the targets to become more salient when viewers re-viewed the animation. I found that the art could redirect viewers' visual attention from the foreground to the background of the animation.

Our animation symbolically linked the Iraqi invasion and stolen antiquities with the Bush

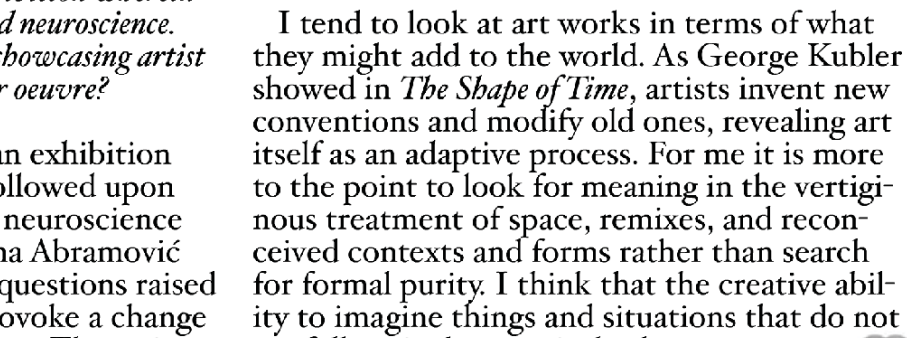
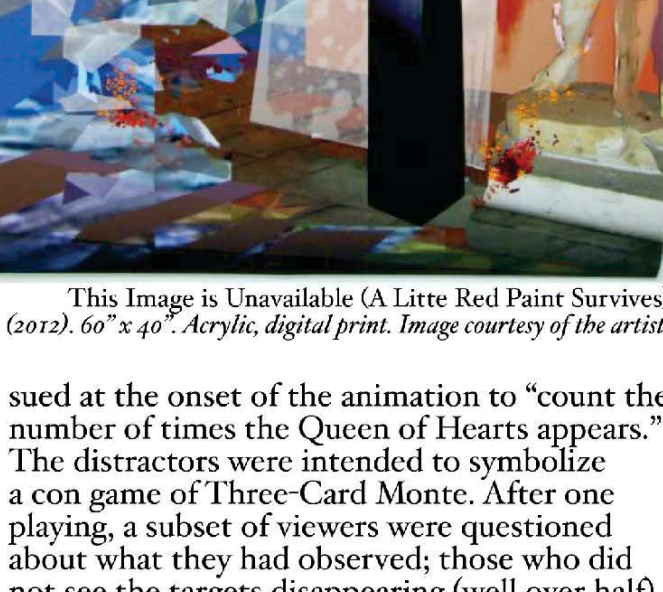
32

SciArt in America February 2015

administration's own hidden objectives. It deliberately referenced the well-known Simons and Chabris animation about inattention blindness, *Gorillas in our midst: sustained inattention blindness for dynamic events*, but with significant differences, involving politics and emotion. My experience has been that most viewers do not see the disappearing antiquities on first viewing. I found it instructive that a few people were able to perform accurate counting and also see the antiquities disappear. They attributed this ability to their training in art, and my take is that art can play a significant part in the process of informal learning.

PS: You were involved with the Pratt Institute's "Sleuthing the Mind" (2014), an exhibition wherein artists showcased works that engaged neuroscience. How did your work as curator and showcasing artist in "Sleuthing the Mind" fit into your oeuvre?

EL: Pratt invited me to curate an exhibition about art and neuroscience; it followed upon my being part of a small art and neuroscience workshop spearheaded by Marina Abramovic and Robert Wilson. One of the questions raised was whether and how art can provoke a change of behavior through self-reflection. The artists explored the mind's many facets through video, performance, human-computer interface, and virtual reality along with traditional approaches that offered an expanded field of artistic practice informed by current neuroscience. The artists constructed experiences, many disorienting, in which we might intuit what it means for minds to be divided, aroused, recalibrated, or rewired. The minimal criteria for inclusion was, since well over 90% of the processes that are in our brains are automatic, to locate art works that might raise them to conscious awareness. In this sense the exhibition functioned like an informal experiment, although no data was collected. Visitors interacted with a number of the works, and some became aware of processes normally taken for



Installation of "Sleuthing the Mind," Pratt Manhattan Gallery, NYC, September 16 - Nov. 5, 2014. Photo Credit: M. Alexander Weber. Left to right: works by Nene Humphrey, Hans Breder, Michael Metz, Patricia Olynk, and Nicole Origer. Image courtesy of the artist.

SciArt in America February 2015

33

View more of Levy's work at: <http://complexityart.com/>