

A Personal Art/Science Connection: From the Explicatory to the Evocative

Dennis Summers

At 8 years of age I decided to become a veterinarian. For two years in college I dutifully pursued the pre-vet curriculum. I was doing quite well grade-wise, but by the winter of my second year I started having doubts. I couldn't put my finger on the problem at the time but later realized that what was missing was the creative challenge.

Having decided not to become a veterinarian, the question arose: What should I do now? The only other thing that had ever interested me was art, so for the least-considered reason I decided to major in fine art. However, as this was the late 1970s and one could still hitchhike through Europe on very little money, I decided to spend a few months exploring different countries and more importantly giving myself an art education at extraordinary museums. Much of what I saw at the time I did not fully understand, but some of it had powerful, if unarticulated, effects on me. I remember seeing a Richard Long walk path drawing on a map [1] and thinking "I don't know if this is art, but this is an awesome idea."

Returning to college, I realized that I still loved science, particularly chemistry and physics, and decided also to get a degree in chemistry, as I already had two-thirds of the necessary credits. Many people questioned why I would want to study science and assumed that this would be my "fall-back" when I failed as an artist. The fact that both of these endeavors are creative and can often be driven by similar goals will certainly come as no surprise to *Leonardo* readers, but it did to many of my peers.

I began to take art classes and to learn that creating artworks was more than just making pretty pictures—that there was supposed to be some sort of content. As I simultaneously learned about the contemporary challenges within science, I realized that the personal struggle I was having making sense of the universe was an appropriate theme for art. My early paintings were like abstract, colorful Big Bangs. It seemed to me originally that the answers to my questions could be found

in the sciences, but that I needed to capture and re-present them visually in order to create a context for my own understanding. This would change over time as I began to recognize the inherent limitations of science.

I *did* end up falling back on science, taking a year off after graduation to work in a research lab at the New York State Health Department, studying double-stranded plant RNA (and for a few years after graduate school I worked in a biochemistry research lab in Michigan). Upon returning to graduate school (at Ohio State University, in "New Genres") I continued to develop my thinking and attitude toward art-making. As a good chunk of the beauty, mystery and complexity of the world seemed to be found within quantum physics, that subject became an important initial influence on my work. (An article by Isaac Asimov on neutrinos initially sparked this interest [2].) A new and significant influence that opened me up to alternative worldviews was found within linguistic anthropology, which offered me the cultural traditions of many different people throughout the world and the fascinating approaches they had taken in creating systems of rational representations of *their* universes. What would it be like, I wondered, to create physical environments that could contain some of the most interesting parts of quantum physics (for me: neutrinos, entanglement, particle/wave duality) and somehow frame them in a ritual space that contained the poetry and coherence of primal cultural traditions? In primal cultures, the cosmological, the theological and the sociological are fused in ceremonial activities that incorporate symbols and metaphors within subtly negotiated experiences. My goal for at least 15 years was to re-create that experience using symbols and metaphors taken from science. (I discuss this in great detail in my first article in *Leonardo* [3].)

I began creating multimedia installations, which I continued until about 2001, along with other media, including artist's books and performance art. Often my working method will begin with an artist's book wherein I combine "hard facts," via excerpted texts from my research, with visual elements in an effort to create an essay in which I figure out what I'm dealing with, before I abstract those facts into a less explicit and more formally visual experience. These books are generally a kind of collage in which conceptual connections are made through proximity, conflict and parallel structure. As shown below, my

ABSTRACT

The author provides a personal description of how he became an artist and the role of science within his work of the past 25 years. He describes several artworks and their relationship to the science that informs them, addresses how he uses different media toward different ends and traces changes in his representation of certain physical concepts over time, drawing attention to how and why it happened. The emphasis is on his aesthetic development rather than on the conceptual framework for the artwork, which has been covered in previous articles.

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See <www.mitpressjournals.org/toc/leon/46/3> for supplemental files associated with this issue.

Article Frontispiece. *Thoughts on Ray Vibrations*, multimedia installation, detail, Ann Arbor Art Center, Ann Arbor, Michigan. 2000. (© Dennis Summers)

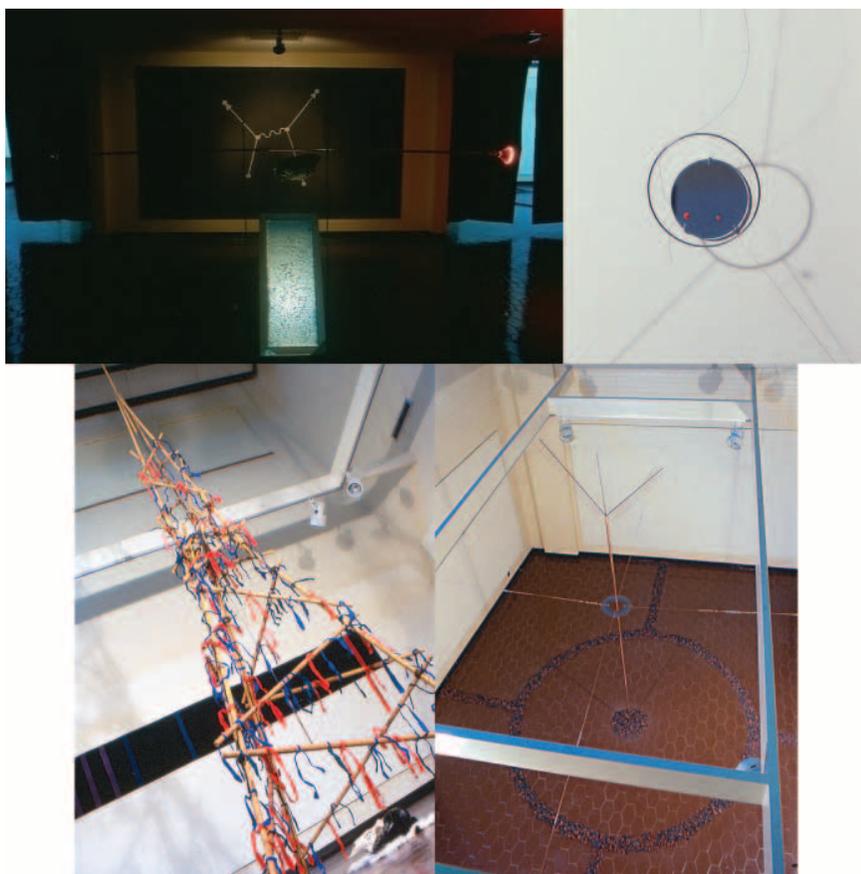


Fig. 1. *Bell's Theorem/Research into Communication*, multimedia installation, Alma College, Alma, Michigan, 1995. (© Dennis Summers)

work over 25 years has gone from having a clear connection to specific scientific concepts to a state of ambiguity; from the explicatory to the evocative. My approach too has changed to one in which I've learned to trust my intuition and not to feel the need to rationalize every aesthetic decision. For reasons of space I carry through below only a couple of specific ideas as they have developed over time. The pieces I have chosen are only a small representative sample of the artwork created during this time; they're not necessarily the best, but they are useful for my purpose here.

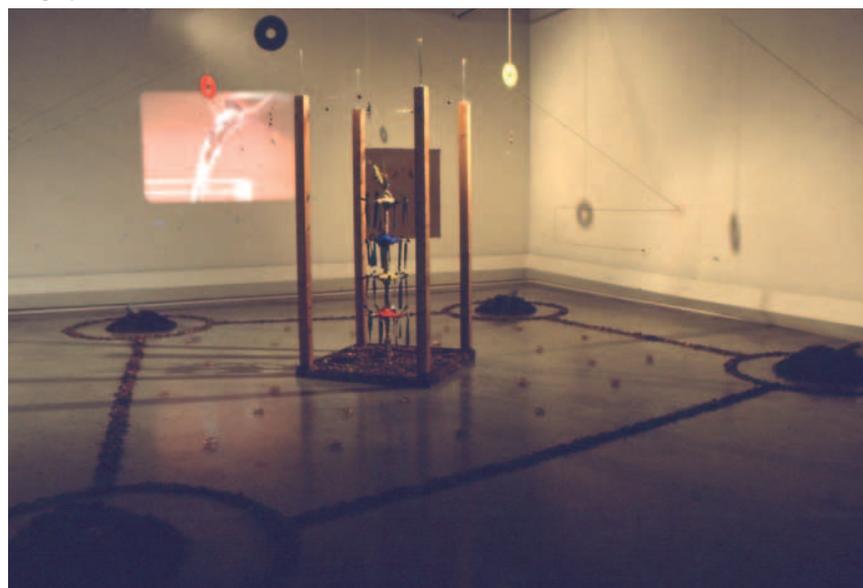
Figure 1 shows several images from an installation (*Bell's Theorem/Research into Communication*, Alma College, Alma, MI [1995]) that I created in a uniquely laid-out gallery space. One first entered a room, as seen in the top left image, and then had a choice to enter one of the two connected rooms to the right or left. Those rooms in turn were not connected to each another. The first time I saw this configuration I immediately thought of a Bell-type experiment [4], where two particles are sent in opposite directions but retain a kind of connection called entanglement. When a visitor entered the

first room, an electric eye toggled one light bulb on and the other off within the structure seen in the middle of the top left (the "on" bulb here is the right-hand

one). In the room to the left (seen at bottom left), there was a ritualistic, "cargo-cult"-type radio tower, the emission spectrum of hydrogen and a star map; and on the right side was an "antenna" within a stone pattern that appeared to be the result of a shamanic ceremony. In addition (see top right), there was a small round mirror in the same location on parallel walls in each of the non-connected galleries that had a small bead suspended by wire in front of the mirror. Thus the viewer, looking into the mirror, would see the mirror bead but by extension would connect that bead to the bead in the other room. I also included images such as a Feynman diagram; not seen are images of an electromagnetic field and the double helix, along with objects such as a telephone, included in order to tie in ideas related to forces, interconnectedness, information and communication. In addition, I must point out that I am not alone in finding scientific drawings, diagrams and symbols to be inherently beautiful.

In 1997 I was invited to spend two weeks creating an installation at the Alberta College of Art and Design in Calgary, Alberta, Canada (Fig. 2). For practical reasons and to challenge myself, I decided that I wouldn't bring my usual bag of tricks out with me but would create the artwork with whatever items I could find in Alberta. I was lucky to find a good junkyard with many electrical and industrial items, along with an old-fashioned film on science from the college library. Although I wouldn't go

Fig. 2. *Someone Else's Space*, multimedia installation, Alberta College of Art and Design, Calgary, Alberta, 1997. (© Dennis Summers)



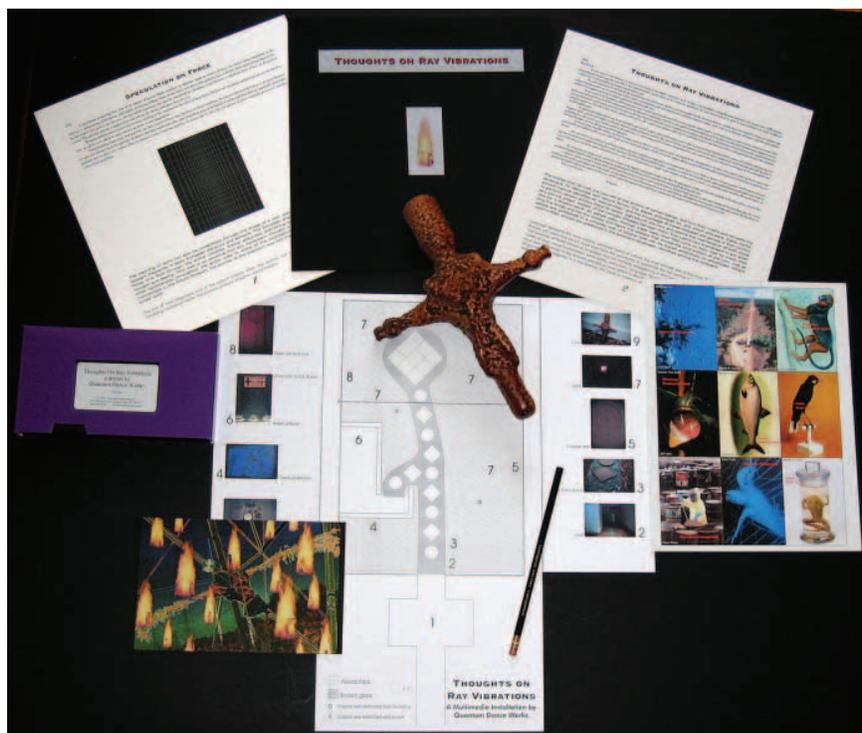


Fig. 3. *Thoughts on Ray Vibrations*—the box, book, videotape, other media, edition of 100, 2000. (© Dennis Summers)

so far as to say that I had been “illustrating” specific scientific concepts in my earlier work, this challenge helped me to work toward creating spaces wherein the symbols of science were perhaps less obvious and the aesthetic relationships were more interesting. This was furthered by a unique experience. About halfway into the construction of the installation, a man got into the room early one morning and messed around with what I had done. For example, he took some long lengths of copper wire and crumpled them into balls (they can be seen scattered on the floor). I shortly found out that he was a schizophrenic who hung out at the college and wasn’t necessarily trying to be destructive. But I was so struck by the aptness of some of what he had done (such as with the wire) that I incorporated those things into the final piece, hence the title: *Someone Else’s Space*. This experience, and the fact that I had absorbed my science interests into my general mental framework, led me toward creating installations wherein the imagery, objects and layouts were created more intuitively. The floor pattern suggests a diagram for a molecule; the crumpled wire, energetic electrons; the suspended disks and interconnected wire, lines of force. The visual form this took also refers to the ritualistic spaces of primal cultures, although without any specific resemblance. Thus, although the

science, anthropology and other conceptual references in subsequent works may not have been as obvious as they had been in my previous works, I believe the art still carried and communicated these ideas but perhaps in a more mysterious and interesting way.

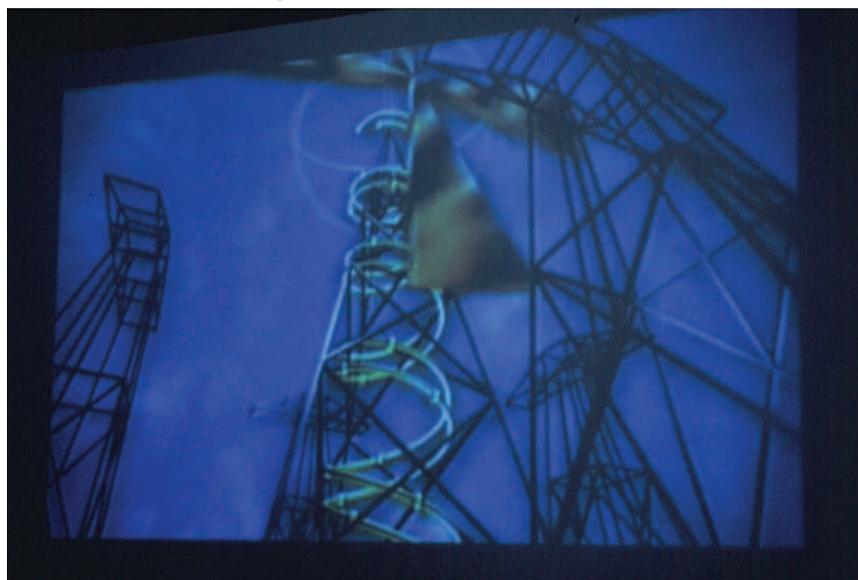
This type of work kept me busy for a good 15 years or so. Other inspirations over this time included information

theory, electromagnetic field theory and, quite strongly, the world-organizing principles of the native Australian people [5]. However, by the end of the 1990s I was beginning to feel that I was repeating myself—that I had made all the connections I could, created all the multimedia spaces I could—that I had finally resolved my initial search.

The challenge was gone. So I stopped making artwork for a couple of years, deciding that, if I had nothing to say, then there was nothing to do. That’s not to say that I disengaged from my intellectual pursuits; in fact I branched out into new and related areas. These included the study of language extinction and mapping theory. And for no good reason other than that he was a fascinating man, I read everything, and I mean everything, about Michael Faraday. It was Faraday who helped me to find a way out of my artistic cul-de-sac.

I had long been actively interested in environmental issues, but having seen too many examples of obvious and pedantic political art, I initially resisted including this topic in my work. Faraday, who was acutely sensitive to both language and visual experience, once wrote a letter to *The Times of London* decrying the pollution of the Thames River and recounting his experiment measuring this pollution [6]. Near the end of his life he also wrote an all-but-forgotten article called “Thoughts on Ray-Vibrations” [7], where he suggested that the idea of the luminiferous aether was entirely unnecessary (a good 60 or more years before anyone—OK, Einstein—considered the

Fig. 4. *Thoughts on Ray Vibrations*, multimedia installation, video projection detail, Ann Arbor Art Center, Ann Arbor, Michigan, 2000. (© Dennis Summers)



same thing). That letter and his article somehow gave me the insight and inspiration to tie all of my new interests, especially that of the environment, into an artist's book, new multimedia installations, and then into the development of the Crying Post Project (an ongoing artwork I have written about in *Leonardo* [8]). I say "somehow" because, by this point, I no longer felt the need to create a point-to-point correspondence between the ideas from one realm (science, ecology) and those of another (anthropology, linguistics). I felt that if I allowed myself to create the objects that were coming to mind, then the final product would still communicate these interests.

But first a digression. When I was in graduate school, because of my background in science and art, everyone said I should look into computer graphics. At that time OSU was a hotbed of innovation, owing to the presence of Chuck Csuri, a pioneer in digital animation. Initially I was reticent, owing to previous unpleasant experiences with punch cards in a physics course. I finally took a class in my final semester that I thoroughly enjoyed and that led to a parallel career in computer graph-

ics, specifically 3D animation. However, it was not until the early 2000s that I finally began to incorporate my "commercial" skills into my fine arts. I included two 3D-animated video projections in my next installation: *Thoughts On Ray Vibrations* (2000).

Figure 3 shows the artist's book I created for this project. As mentioned above, the books are where I include specific details of research. Thus each page contains quotes from Faraday articles, along with quotes from texts on language extinction and from various anthropological or mythological sources. Additionally, I created a set of "Animal Extinction" trading cards with images of or related to extinct species, with relevant texts on the reverse. Also included was a videotape of a 3D digital animation that was a combination of the two videos that played in the installation but was designed to stand alone (and indeed it went on to play numerous film festivals around the world). Figure 4 shows a frame from one of the projected videos within the installation. In it one can see electric power towers, along with a radio tower and the double helix. Obviously, this imagery resembles that from my earlier

work. However, given the context of the installation as a whole, this now took on a much darker meaning. We are well aware of the toll that human beings have taken on the planet in our rapacious need for energy, and this is reflected here. The Article Frontispiece shows a detail from the "quiet" room, where participants would escape the noise and visual cacophony in the rest of the installation. Within this dark, meditative space was an altar with three water lettuce plants, each growing in a bowl of water, each bowl resting atop a pile of white chalk. Above were three ceramic "fetish" figures, vaguely human but also clearly cast from objects including a test tube, and perhaps not so clearly, a radio tube (the "head"). The first was coated in coal; the second, in gold; and the third, in human blood. The metaphoric relationship to the environmental issues mentioned above seems obvious to me now, but at the time of creation, I really hadn't explicitly rationalized it as such. There were numerous other elements within this multimedia installation, but space does not permit describing all the details [9].

By the following year, when I created what I think is my best (and perhaps my

Fig. 5. *Coordinate Transform: A Crying Post Project*, multimedia installation, Robbins Gallery, University of Michigan, Ann Arbor, Michigan, 2001. (© Dennis Summers)





Fig. 6. *Coordinate Transform: A Crying Post Project* (detail), multimedia installation, Robbins Gallery, University of Michigan, Ann Arbor, Michigan, 2001. (© Dennis Summers)

last) installation (Fig. 5 shows a portion of the installation, which continued into two other rooms), *Coordinate Transform: A Crying Post Project*. I was working entirely intuitively, so it can be difficult to parse specific science connections, but let me draw out one possibility. This artwork was a continuation of my interests in the Crying Post Project (one can just make out a long narrow pole—a crying post—suspended horizontally near the center-top of the image) but transformed them into a very different kind of space. There were four square plaques (two can be seen in Fig. 5 high on each wall; a detail is shown in Fig. 6) that are covered with lead. There is a small gold “egg” mounted on each, along with a spray of lengths of copper wire protruding outward. It’s plausible that these objects might be related to Bell-type experiments and the transmission of force in general [10]. There is an additional conceptual overlay of alchemy, owing to the material choices. However, and I only recognize this in retrospect, in some ways it resembles the wire, bead and mirror referred to in *Bell’s Theorem/Research into Communication*. The larger point is that, assuming my interpretation is correct, unlike the earlier artwork, nothing here can be construed as an accurate scientific diagram or drawing.

At this point, perhaps I can return to the issue raised earlier in this article. My work throughout has been informed by my interest in science and other more analytical disciplines. However, the reader can now see how in my earlier pieces I was

explicitly using imagery taken from these disciplines and creating spaces that were designed to refer explicitly to scientific ideas such as a Bell-type experiment. As my work progressed, these images went away, to be replaced by imagery that is enfolded within other references (alchemy, for example). It is certainly possible that, for some viewers, the specific details of the scientific concept are now lost. However, I believe (and anecdotally this has been supported) that the later art still communicates these ideas, although more generally and through inference. What has been lost is specificity; what has been gained is an indeterminacy that is richer with implication. We could say that the work is now more “abstract,” as the term is commonly used in painting [11]. Abstract paintings can do things that representational paintings cannot do, and vice versa. All I can say is that this evolution occurred; I can’t say why. However, in addition to these changes, I also believe that, for example, *Coordinate Transform* was the most *beautiful*. Which brings us to the present.

A more recent and exciting new direction can be seen in a series of digitally produced nonrepresentational color field video projections I’ve been working on for the past several years. Perhaps this work is coming from a desire to escape the frankly depressing environmental research that I had been doing. Perhaps it comes from a desire, during a period of general global ugliness at so many levels, to simply create something beautiful (yes, I know it sounds like a cli-

ché). In some ways this is a return to my earliest work as a young painting student. However, this time around, I believe that these works are now informed at a much subtler level by my years of research (and increased visual sensitivity). This time the work is more successful in containing all the beauty, mystery and complexity of our scientifically understood universe, in a ritualized space of poetry and coherence.

These videos as a group are called Phase Shift videos <www.phase-shift.org>. Their generative structure was initially inspired by the early music of Steve Reich [12], in which repeated motifs slowly went out of phase. The first video I made was created by setting two color shapes (a disk within a solid square)—each of which cycles through all the colors in the spectrum—against each other as they slowly go out of phase. After roughly 15 minutes, the colors come back into phase and the piece seamlessly loops. In other videos, the shapes, arrangements of shapes and color patterns become more complex, but the generative system remains the same. They are always displayed as projections within a black gallery space and are at least 8 ft tall, in order that they might become a physiological, interactive and, for many, a meditative experience. Some of their titles specifically reference a scientific idea, such as “2p” (a type of electron configuration). Figure 7 shows two still images from *Filament*: the colors start out as they appear on the left side of the image; after about 7 minutes they transform via subtle color-cycling to resemble the right.

I have also begun research for a series of short digital animated videos. There will be 12 chapters to this project, the whole of which is called *Slow Light Shadow Matter*. Each chapter is inspired by both a scientist and an artist. I recently presented a paper on the relationship between the work of the scientist John S. Bell (originator of Bell’s Theorem) and that of the painter Jasper Johns, which emerged from this research. I argued that both men could be considered skeptical realists concerned with measurement and language problems and ambiguity versus precision. The reader should be able to see why I would be attracted to the work of these men. Additionally, there is a cross-chapter structure determined by systems such as alchemy and biology. Finally, a narrative of sorts will be represented by stories from the life of the Greek god Hermes. The connections that I draw between the artists, scientists, etc. are idiosyncratic, based on

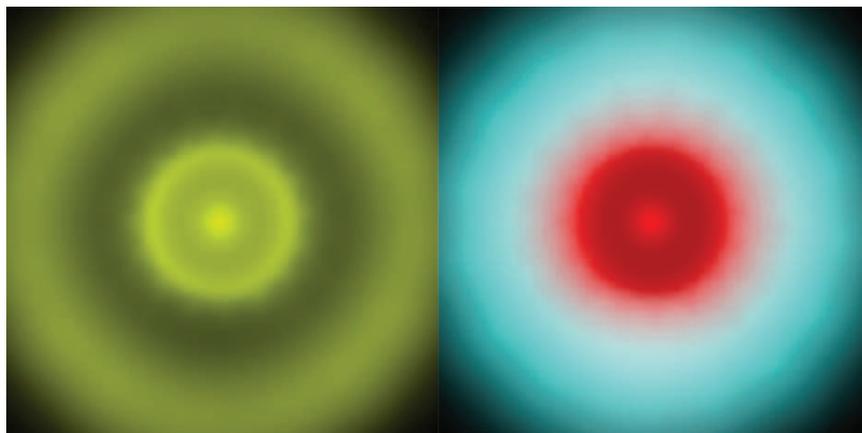


Fig. 7. Phase Shift Video Series: Filament, two frames from 15-minute video, 2006.
(© Dennis Summers)

instinct, and similar to the methodology of the artist books. With this project I hope to achieve both the specificity of my early work and the allusiveness of my later work. I anticipate that this may take the rest of my life to complete.

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Dennis Summers is an artist living in New Mexico and a former associate professor of digital media. He is a member of the Society for Literature, Science and Art, which holds a fascinating annual conference.

References and Notes

Unedited references as provided by the author:

1. For a link to an example, see <<http://beta.tate.org.uk/art/artworks/long-cerne-abbas-walk-t02066>>.
2. Isaac Asimov, "Detecting Neutrinos from the Sun," *The Magazine of Fantasy and Science Fiction*, Vol. 57, No. 5 (1979).
3. Dennis Summers, "Presenting Scientific Concepts with Methods and Forms from Primal Cultures: Mixed Media and Installation Artworks," *Leonardo*, Volume 29, No. 4, 283–290 (1996); a paraphrase of the article can be found in online supplemental Note 2.
4. There have been many throughout the past 40 years, but Alain Aspect did early and significant work. See Alain Aspect et al., "Experimental Tests of Realistic Local Theories via Bell's Theorem," *Physical*

Review Letters Vol. 47, p. 460 (1981); Alain Aspect et al., "Experimental Realization of Einstein-Podolsky-Rosen-Bohm Gedankenexperiment: A New Violation of Bell's Inequalities," *Physical Review Letters* Vol. 49, p. 91 (1982); Alain Aspect et al., "Experimental Test of Bell's Inequalities Using Time-Varying Analyzers," *Physical Review Letters* Vol. 49, p. 1804 (1982).

5. See, again, online supplemental Note 1.

6. Michael Faraday, letter to *The Times of London*, 7 July 1855. A portion reads, "The whole of the river was an opaque pale brown fluid. In order to test the degree of opacity, I tore up some white cards into pieces, moistened them so as to make them sink easily below the surface, and then dropped some of these pieces into the water at every pier the boat came to; before they had sunk an inch below the surface they were indistinguishable, though the sun shone brightly at the time; and when the pieces fell edgewise the lower part was hidden from sight before the upper part was under water." There was something inspiring in both the simplicity and visual beauty of this experiment.

7. Michael Faraday, "Thoughts on Ray-Vibrations," *Philosophical Magazine* Vol. 28, p. 345 (1846).

8. Dennis Summers, "The Crying Post Project: A Multi-Part, Multi-Media Artwork to Memorialize Global Sites of Pain," *Leonardo* Volume 36, No. 5, 381–388 (2003); see also <www.thecryingpostproject.org> for related images and texts. See also online supplemental Note 2.

9. For more detail go to online supplemental Note 3.

10. For more figures and details about this installation, see online supplemental Note 4.

11. Here I use *abstract* to refer to paintings that include generally recognizable imagery that has been altered to aesthetic ends. The best example would be that of cubism. This is contrasted to nonrepresentational painting, where there is no recognizable imagery. An example would be minimalism.

12. Steve Reich's website is found at <www.steverreich.com/>; an example of a particularly relevant composition, *Piano Phase*, can be found at <www.youtube.com/watch?v=JW4_8KjnzZk>.

