

Representation, Visualization, Art and Science

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As basic science advances and new technologies become available, artists grapple with their meaning and impact. Some of these are:

- We are in the midst of a movement from virtual to embodied
- We are trying to understand the present using the paradigms of the past
- We live with an increasing mediation of the senses
- With enhanced knowledge of matter at the smallest scale, we can see that some patterns are universal
- Context and intention change our understanding of images
- To whom will technological advances belong?

Virtual to embodied

One issue facing us is that of simulation vs. embodiment. The past decade was centrally involved with creating experiences that resemble reality, or that create a new (virtual) reality. The present decade's concerns have shifted to manipulating reality itself and to understanding the impact that our powerful technologies and scientific advances have on the real world.

Eduardo Kac's fluorescent rabbit "Alba"¹ is a well-known example of commenting on genetic engineering by *engaging* in it rather than representing it. Created in 2000, GFP Bunny "comprises the creation of a green fluorescent rabbit, the public dialogue generated by the project, and the social integration of the rabbit. GFP stands for green fluorescent protein. Transgenic art ... is a new art form based on the use of genetic engineering to transfer natural or synthetic genes to an organism, to create unique living beings."

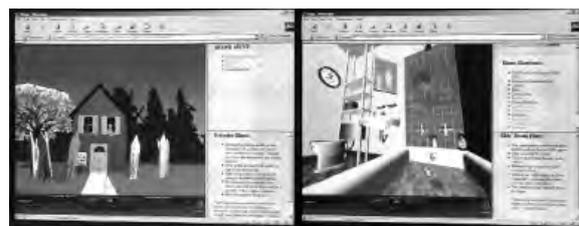
I would compare the work by Kac to The "Judgment" series by Daniel Lee.² Although the work wasn't created with genetic manipulation in mind, it has been included in group shows like "Gene(sis)" (organized by the Henry Art Gallery in 1997) along with work that is clearly genomic because of the powerful and disturbing references to the combination of human and animal characteristics.

We might also compare two other works from the realms of embodiment and virtuality.

Present vs past

Nano art may seem virtual because it cannot be directly seen or felt, but it participates in the physical world in a way that the great paradigm of the last decade, virtuality, does not.

Flw,³ Ken Goldberg's reproduction of Frank Lloyd Wright's architectural masterpiece "Falling Water," demonstrates the absurdity of considering the nanoscale with the paradigms and rules we perceive with our senses. The world not only ceases to be habitable at the nanoscale, the principles of gravity inherent in the cantilevered design are no longer applicable. Goldberg gives a powerful message about the nano-scale: we do not belong here.



A work later in time but participating in the conceptual framework of simulation is "Home"⁴ by Drew Browning and Annette Barbier. "Home" was both an on-line, navigable work in VRML⁵ that included a neighborhood and house whose interior could be explored, and a work re-created for the CAVE⁶ virtual reality environment. The house encompassed several rooms, each of which included links to the work of other artists as well as the voices of fictional characters who had inhabited the house, in addition to animated events triggered by the user in the course of navigation. Although the scale was in one instance miniature (on the computer screen) and in the other life-sized (in the CAVE), in both cases what was simulated was the secret life of each former

resident. Of course the argument could be made that by using viewer-centered perspective, an immersive, multi-screen environment, and stereoscopy, the CAVE version of the work acknowledged and participated in the creation of an embodied experience. Perhaps, in this sense, there are works that sit on the cusp of paradigms.

Mediation of the senses

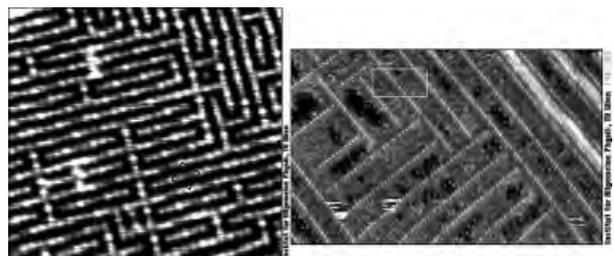
Previously distinct fields of study are converging, as are our senses. For decades we have known that we can no longer understand the world through the direct evidence of our senses, beginning with Einstein's Theory of Relativity. But now we must accept that the distinction between and among our methods of knowing the world may be artificial, and we are entering upon a time of technologically produced synaesthesia in which sight, hearing and touch are interchangeable.

Because reality at the nanoscale is too small to be viewed, it must be sensed using an instrument called the STM (scanning tunneling microscope)⁷ which uses capacitance (varying electric current) to gauge the distance between the STM tip and the surface of the substance being sensed.

Another new sensing device developed at Georgia Tech⁸ is FIRAT, (Force sensing Integrated Readout and Active Tip). Georgia Tech's website states: "FIRAT works a bit like a cross between a pogo stick and a microphone. Much like a microphone diaphragm picks up sound vibrations, the FIRAT membrane starts taking sensory readings well before it touches the sample." This conflation of touch and sound to deliver information usually thought of as visual is typical of our contemporary way of knowing the world.

Patterns are universal

Technologies that allow us to probe material at the nano scale reveal the organization of matter in a way we've never understood it before and allow us to compare this to other, created structures and patterns. There are striking resemblances between the morphology of



the growth of lead on copper,⁹ and a maze puzzle, and between the surface of a platinum/nickel alloy¹⁰ and patterns in fabric.¹¹

These images suggest that there are deep structures in the organization of matter which evidence themselves in higher order, human made structures.

Context and intention

The website Nanotechnology Now has an "art gallery" section which contains some stunning images vibrant with color, formally inventive, well composed.¹² The explanations are entirely technical, describing what phenomenon they represent and how they were measured.

Many artists (such as Jean Pierre Hebert, Roman Verostko, John Whitney, Sr.) create images that are strikingly similar to these scientific images, sometimes using algorithmic means.

This raises the question of the distinction between science and art. While there are increasing convergences among scientific fields as well as trans-disciplinarity in art, there are also artists using scientific methods to make art and scientists proposing scientific visualization as art.

Can images be considered art in the absence of context and intention? Is scientific visualization that is beautiful, art? Or perhaps the question should be, rather, why are there such interesting similarities among work coming from such different sources?

Ownership

In Richard Feynman's landmark 1959 address "There's Plenty of Room at the Bottom," he talks about the possibility of placing, through nanotechnological means, the Encyclopedia Britannica on the head of a pin. His measure of truly small scale, and his metaphor for important activity (ie, archiving information) both relate to the written word.

One of the first breakthroughs in nanoscience to receive widespread press coverage¹³ was the image created by Donald Eigler and Erhard Schweizer of IBM's Almaden Laboratory when, using the STM tip, they manipulated thirty-five xenon atoms to spell I-B-M.¹⁴

The issue of ownership is one that has been central to artists in the 20th century. This disturbing identification with corporate goals inherent in one of the very first nano-images raises the question of whether every advance, every new understanding of matter (living or not) will be privately branded and owned, and whether nothing will be shared collectively by humanity?

Many more questions suggest themselves in relation to the profound developments taking place in our understanding of matter. Our continued involvement in these fundamentally important questions will continue to expand our understanding of ourselves, our field, and our creative and human responsibilities.

1 <http://www.ekac.org/gfpbunny.html>

2 <http://www.daniellee.com/Judgemnt.htm>

3 <http://www.ieor.berkeley.edu/~goldberg/flw/>

4 <http://www.unreal-estates.com/>

5 Virtual Reality Modeling Language

6 <http://www.evl.uic.edu/core.php?mod=4&type=1&indi=161>

7 http://www.iap.tuwien.ac.at/www/surface/STM_Gallery/stm_schematic.html

8 <http://www.gatech.edu/news-room/release.php?id=858>

9 http://www.iap.tuwien.ac.at/www/surface/STM_Gallery/Pb_on_Cu.html

10 http://www.iap.tuwien.ac.at/www/surface/STM_Gallery/reconstructions.html

11 <http://www.answers.com/topic/herringbone?cat=technology>

12 http://www.nanotech-now.com/Art_Gallery/Cambridge.htm

13 as quoted by Hayles, N. Katherine. 2004. *Nanoculture: Implications of the New Technoscience*. Intellect Books.

14 <http://www.almaden.ibm.com/vis/stm/images/ibm.tif>