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A View of the Intersection of Art and Technology

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In 1988, as the most junior faculty member of my department who happened to be teaching "printmaking" or "graphics," I was asked to investigate computer "graphics." Fortunately, my forays into this new field were not only successful, but also gratifying—it was as if I had finally found my métier! At that time, SuperPaint only worked in a black-and-white mode, and Adobe Photoshop was barely cutting its teeth in a beta version form. The options available to artists who began to explore the world of digital imagery at this time were limited to very pixilated and bitmapped files, very few tools with which to manipulate them, and little ability to convert a given file to another software application, let alone output it. So, what drew our attention to the digital world and then held our interest? I remember learning somewhere along the way of my many years in art school that if it didn't take a certain amount of time to create a work, then that work was somehow less valuable or meaningful or important than one that did. But how many times did we make work that, two-thirds of the way through, we knew wasn't "right" and started over? The computer seemed to provide speed and ease, and frankly, it was a relief finally to work with a medium that could keep up with me in real rather than glacial time.

I think the insidious thing about computers is their intrinsic ability to emulate metaphors. Ironic? Not really. People often use metaphor and analogy when speaking of or about the computer. (For example, "The information didn't have enough time to get to the hard drive" was how my friend Bev described her sister-in-law Sandy's lack of any memory of her hang-gliding accident in which she fell 900 feet with no parachute after I'd been foolish enough to ask if she remembered anything.) We even name them. All the computers in the art lab at Scripps are named after goddesses, both ancient and contemporary; we have Sappho, Red Sonya, Vidietta, Medusa (she makes you want to pull your hair out), Techne (this one's mine; she's the goddess of art and science or craft and technology), Chimera, Hekuba, Electronica, and Madonna.

Do we think like the computer or does the computer think like us? I am writing these notes on an airplane to New York, and the man sitting behind me is explaining to the woman next to him that someone told him that our brains are just like the computer. Hello, isn't this backward? Who's the progeny here? Isn't the computer more like our offspring, designed to reflect the way our brains operate, and not the reverse? I once made a list of terms that are now part of our everyday usage—window, thumbnail, database, bitmap, download, point and click, icon, delete, on-line, noise, morph, snail mail, e-mail, dialogue box, plug-ins, wysiwyg (what you see is what you get). Technical terms have pervaded, invaded our everyday language on a scale equal only to their presence in our lives on an everyday basis.

And it isn't just the terms that are here to stay. The images—digitized, "videoized," animated—appear on book covers, billboards, buses, and signs we encounter in our daily movement; in innovative films—usually action or animation; and before our eyes in split-second hits as commercials on television. But with all this imagery, are we actually any smarter as a culture in interpreting the "meaning" or the symbolism inherent within many of these images? This is where education must play a vital role. Visual knowledge, visual competency, and visual information all draw on different skills.

Teaching computer art, I have observed how the learning curve for this technology delineates itself. First, developing hand-eye coordination (much less necessary now than five years ago, when you had to start students off with mouse training), then moving into desktops, menu bars, and submenus. Once the x and y of these are learned and memorized, we can begin to establish relationships between the mode choice and the adjustment to colors in Photoshop or the file size and resolution to image size and storage. Finally, the student realizes how all these parts relate to the whole, from the artwork in process on the screen to the means for output. Today we have choices between World Wide Web (WWW) or CD-ROM or interactive video or cibachrome photograph or inkjet printer, which is a giant leap from where we started. Previously, we had to photograph the image directly from the screen using a funnel-shaped device to block out the light with the camera at one end and the screen at the other.

The computer mirrors our ability to assimilate paradigm shifts by categorizing, synthesizing, and hybridizing. Multitasking led to hyperlinking but they both represent what began to happen when we were about eight years old: the cognitive ability to comprehend that an object was red *and* round, and not red *or* round, or what I refer to as both/and thinking rather than either/or thinking. This is the logic necessary to comprehend multiplication, a dynamic process resulting from the coordinates at the intersection of x and y rather than the static linear progression of $x+x+x$, $y+y+y$, or $x+y+x+y$. In liberal arts education, we call it the breadth and depth experience. The culmination of the intersection of x and y is often the senior thesis or senior project.

Metatasking—or multitasking at a higher level—is, I think, what keeps us coming back to the computer again and again. This is especially true in image making. I know I synthesize new pieces and parts in my dreams after twelve to fourteen hours of making images on the computer as well as when I've been away from it for two to three weeks. It's a rather amazing phenomenon—learning, while not learning. All of a sudden you understand things you couldn't quite grasp a few days ago. It's a learning curve with a very complex topography demanding that you stay current and keep up. With technology in our blood from the music of the 1960s, the Moog synthesizer, television, Nam June Paik's introduction of the video camera into art in 1965, and armed with a modicum of computer programming skills slightly beyond Keypunch 101, we set off to explore this new landscape. This same process is indicative of technology in general. Just look at the difference in the last eight years: software we relied on no longer exists if it hasn't kept up with changes through upgrades, machines with ten times the RAM and storage, and software that requires both for optimal performance. We now have programs that "talk to" and interact with each other. Last year's

practical marriage of Mac and PC for cross-platform usage certainly ended the debate about a two-party system. A five-year life cycle is now three, with the upgradable RISC chip promising to keep future expenses at a minimum, but peripherals and software also have to be upgraded regularly. It's an exercise in constant maintenance. The real questions are: Can you sustain it? Is it efficient? Well, it's certainly not efficient. Technology has created more work, not less. The endless pixel fix proves this: as in editing text, there's always a dangling pixel, an unindented pixel, a series of pixels unseparated by a comma, and an uncrossed and undotted pixel. Visual editing brings new meaning to "just one more thing."

What does making digital art mean? That you are using a tool that electronically digitizes images into computer bytes for the electronic transfer of information. What does this mean for the artist? That basically she can show her work anywhere that an electronic impulse/signal can be received/transmitted. For what purpose? Well, believe it or not, it is actually generating sales for some artists. People are buying work from a thumbnail image. But commerce is not the only, nor the greatest motivation. Does one adjust one's work to accommodate this procedure? Digital art was and is a natural outgrowth of video and photography. Yet it is more powerful than any other combination of video, radio, TV, film, text, and images. Now that one can create art that works only in an electronic field, this will certainly influence choices and decisions about the work itself. Let's say you prefer to think of yourself as a painter, or photographer, or sculptor who also engages in the digital construction/manipulation of your work as well as the transfer of images for information/communication purposes. How do you straddle both worlds? Right now the technology is in such a fluid state that if you make a commitment to some form of digital communication you can be assured the form and possibly the content will change in perhaps six months and no more than a year. Working back and forth will influence your thinking in both spheres and, undoubtedly, cause you to ask new questions of your work in the traditional medium as well as to look for ways to do new things with technology.

As a painter, as a photographer, as a sculptor, you can enter this medium with all your skill sets and achieve what you were after; in that process, you may also discover that which you didn't realize you'd imagined. Bits, bytes, pixels, sampled color, color tables, levels, modes—digital imagery is a microcosmic world with phenomenal attraction. The possibilities are endless, the manipulations remarkable: sizing, small to large to small again, cut and paste, blend, layers, image and text, collage, brightness, contrast. Like a good consumerist society, it goes on and on, packaged to give us the greatest number of choices and selections. The image itself exists in a space where you can make a virtual world. Whether it's two- or three-dimensional, abstract, hyperreal, collaged, montaged, static, dynamic, still, moving, or interactive, it can be viewed at a speed impossible with any other medium. Image access via databases, which provide speed in relationship to visualization or conceptualization or comprehension of knowledge, is creating visual culture, visual knowledge, and visual information.

Who sets industry standards: .gov? .com? .org? .edu? .net? I have a real fear that in the not too distant future the Internet will become one big infomercial to watch on your TV screen like an eternal home-shopping network. Artists are concerned that their needs and uses of the Internet will be entirely ignored in this process, especially if they do not represent some sort of commercial enterprise. It is critical that there be a place at the Internet table for the artist.

Although new software and hardware become available on a regular, almost annual basis, they are not necessarily affordable. When it comes to making their work using computer technology, artists are still controlled by outside economic forces. The example below of "trickle-down" access is only one of the many factors that actually create limits rather than freedom. Software and hardware development is a megamillion-dollar industry geared to attracting the general public. Artists are not working in the research and development departments of industry or government, and their vision and input are not part of the process that invents the original. We are not at the helm of authoring the new products, nor do we have access to them until much later.

Let's examine the relationship between the movie *Terminator 2* and new versions of related software applications produced for consumer use. In the early 1990s, Industrial Light and Magic (ILM) was hired by Carolco Pictures to create the special effects (aka fx) for *Terminator 2: Judgment Day.* Working with high-end Silicon Graphics IRIS 4D/340VGX RISC processor workstations, PIXAR, one of ILM's subsidiaries, developed new plug-ins for Renderman and Alias Studio 3.0 to create a morphing creature that was fluid and capable of multiple transformations.[1] The result was the T-1000, the "Cyberdyne Systems Model 101 v.2.4" or "mercury" creature in the film. After the film was released in 1991, this special effect eventually became a new feature in a number of software application upgrades, thus making it available to the general public.[2]

Is this just another case of "science becomes art"? Or, like a food chain, is it the economics of technology at work? A software program is developed as a tool for a commercial, albeit an artistic fx (special effects) use, which then becomes available to the general population. In most cases, artists have access to or are using the same software as the average person. What they do with it, the techniques that they employ, is a result of their training or background in art. The combination of training and education helps, but it also perpetuates a certain "art" mentality applied to a new medium. Obviously, in an academic environment like an undergraduate or graduate art department or an art school, this seems plausible. But what about the "art" put on the Internet by people who might be called untrained or unschooled? There is a difference. Is

1. *The Terminator Movies Home Page,* FAQ, v.2.3, http://www.geocities.com/Hollywood/6601/q7–8.html.

2. Prior to the release of the film, PIXAR shared some of its technical wizardry with those attending Special Interest Groups in Computer Graphics (SIGGRAPH) '91 in Las Vegas at an educator's panel on special effects.

this a "high/low" class attitude? Are we being "art" snobs? Or is the margin pressing in on the center in such a way as to cause new hybrids of visual work in which design plays a stronger role than before, when it was relegated to a separate field, and in which the untrained image maker has enough technical expertise to create visual work? How was it informed by the "art world" or an "art school" mentality? The very nature of the medium is cause for both celebration and concern for the "state" of visual art as we have known it. The beauty of this technology is the opportunity it offers to artists to expand the field, and artists must be part of the guiding body that regulates its use. Artists want greater freedom of access and expression to images than anyone else and, at the same time, equal protection of their images. We must advocate and represent a freer and more open use.

The field of technology sets up an attraction that is at once seductive and compelling yet restrictive and elite, establishing limits that are at best difficult to deal with and, at worst, impossible to overcome. Cost is one factor. Access is another. Being part of the fuller enterprise is a third. If this is my field, how can I adequately compete with the 1 percent of the artists (such as Nam June Paik, Jenny Holzer, Bill Viola) who have complete access to computer technology? If you're still painting, you can more readily afford paint and canvas, which gives you the freedom to express yourself and equal opportunity with established artists. If you are committed to working with technology, you can see the wide-ranging possibilities for working with this medium demonstrated all around you in the media, the industry (as we, in Los Angeles, refer to Hollywood), and science. The system that makes these opportunities appear available also prevents you from having real access through cost and pricing. You cannot, literally, afford to make critical statements about the very system you might be challenging. Grants are drying up. Everyone is competing for what's left. This becomes almost a moral dilemma in which the very soul and substance of being an artist is not only challenged but crushed in the economic process. One cannot reasonably afford to stay in the game without putting one's family and personal finances in jeopardy or debt.

Once again the artist's voice is eclipsed by factors totally unrelated to any kind of real aesthetic base—factors that inevitably affect the aesthetics of the work. The economics at play have a direct effect on the outcome, on self-expression and on the work itself. If we lower our standards and accept this situation, we are doing a disservice to ourselves as artists as well as to the students we are teaching.[3] I believe we have a responsibility to teach our students the most current material to prepare them for their lives ahead and for entering the work force. This becomes an impossible goal if one does not have input early in the development of new technologies, access to the most advanced technology, and a voice in establishing appropriate standards.

Contemporary art has long played a critical role in meaning making, relying not only on the intellect but also on personal meaning, the senses, imagination, and physical interaction to communicate ideas and form valuable cultural connections. The Internet, via the World Wide Web, has provided artists with global access to culture and visual information beyond anyone's past expectations or predictions. What we do with that is critical if we are to make sense of our world.

At Breakaway Technologies a "webraising" is taking place. Much like an old-fashioned barn raising, here the goal is to enable people from a variety of cultural organizations to put up their own home page on a Web site during a two-day workshop sponsored by the Getty Information Institute as part of the Los Angeles Culture Net project. Breakaway itself is a phenomenon. Located in the heart of south central Los Angeles and nestled in the interior of the African-American community, it is the soup-to-nuts of technology—from hands-on building of computers to workshops and classes teaching members of the community how to use software and access the Internet. It is an extraordinary effort by Joseph and Paula Loeb, the founders, to give the opportunity of access to everyone in this community. Based on the concept that technology is a neutral zone in which anyone can participate, they are providing a service to their community in the hope that the next generation will have it easier economically and can make valuable contributions to our society. Who attended this inaugural webraising? One or two staff members from each of twenty-two different organizations that range from museums (Autry Museum of Western Heritage, Los Angeles County Museum of Art, Korean American Museum) to arts organizations (Rachel Rosenthal Company, Highways Performance Space, LACE, Watts Towers), community organizations (LA Cultural Affairs, Plaza de la Raza, Watts Community Housing Corporation), AIDS service centers (Asian Pacific AIDS Intervention Team), and even a religious bookstore (the Word of Life Christian Bookstore). All were there to learn how to access the Web and create their own home page. The Getty will house the pages on its server for the first two months until each organization has found its own Internet service provider.

Why is this important and what does it have to do with artists? Its primary link is that it is about culture and, in this case, the diverse culture of Los Angeles. The culture of Los Angeles has long been a rich source of interest and controversy for artists—politically, ethnically, historically, philosophically. Some of us are also there to act as facilitators to help the participants learn to use the Web. Since the Web is so visually dependent, we are also there to guide and advise on the graphic components in relation to the textual information. Everyone is learning that a page with no images is one no one will read because it is too "text heavy." The visual elements are necessary to break up the page, provide related information, and keep the viewer-reader engaged.

Despite the notion that the computer will do all the work for you, working with the computer often causes changes in reverse. Individuals may have started out as painters, printmakers, photographers, or sculptors and applied those schools of thought to the work done using the computer, but eventually they become aware of thinking about their work as a result of what the computer can do or provide. Where once their imagination might have been limited by funding, access, or actualizing ideas in physical reality, the virtual world basically removes those obstacles, and artists begin to believe that they can do whatever can be imagined. Somehow there is a way, a software that can accomplish our wildest ideas.

All over the country, technology is causing faculty members in many disciplines to reexamine and retool their curricula. In the arts, the advent of computer technology in general and the digital image in particular has been the source of, and the cause for, curriculum transformation that would do away with media-based majors in order to focus more on process and content. Technology is insidious. It has or will permeate every venue and field. Why do we not just realize that now and begin to build a well-defined department with curricula that more accurately reflect the next stage in studio art practice?

Should you have a computer lab? If so, what do you need to know about building it? It could be integrated in any way that works in your school. The primary considerations are always going to be: money, money, money and support, maintenance, and a workable life-cycle replacement plan. A small endowment is a good idea for the last. Your lab needs to reflect a flexible design that can change and grow with the medium, the student demands, the curriculum, and the ever-changing software and hardware. Where we once began with static image making using funny little drawing programs like CricketDraw and PixelPaint Professional, now we are faced with installing enough storage and RAM to accommodate MacroMind Director to make small interactive pieces for CD-ROM and the World Wide Web. What was once static is now dynamic: from Photoshop we grew to Premiere for video compilation and editing, from e-mail to writing our own HTML and programming. (And you thought if you owned a Mac you'd never have to!) Well, programming has come full circle. Those few logic and statistics classes some of us took—even a little Basic C programming—make a reentry as HTML now in the packaged version of Web design tools and programs like Internet Assistant, WebWeaver, PageMill, Shock Wave, Front Page, and Java. It is also important to consider how you want to link your lab. Do you want to have it be part of another medium, perhaps photography or graphic design, or should it be a stand-alone lab that the other areas can link into? You may wish to refer to the "Guidelines for Faculty Teaching in Computer-based Media in Fine Art and Design"[4] as you begin to discuss and develop these issues.

How will art historians represent the images and the other phenomena created by the technical revolution in the arts and in the art world? Merely presenting digital slide shows, or even interactive slide presentations, barely scratches the surface of what is really occurring, which is truly revolutionary. As my colleague in the Department of Architecture at the Massachusetts Institute of Technology, Professor Leila Kinney, points out:

> There is an overall social significance to creating a situation in which artists feel comfortable making their work widely available for teaching and commentary. Art history has been notoriously poor at dealing with contemporary art, partly, I believe, because the visual material is hard to track down, and most slide curators would rather pick up the Saskia catalogue than call dealers or write to artists themselves. This impoverishes the critical discourse and hampers our ability to comment on contemporary culture. It would be wonderful to see artists, museums, and educators collaborate in changing this situation.[5]

How will contemporary artists' work on the Web be represented by art historians teaching contemporary art and art criticism? What pedagogy will they employ to discuss these changes? What changes need to occur in art history to include aspects of and theories about digital technology? It's a multimedia world—at home, at school, and on the Internet. How will you introduce this technology in your classes? This is how the future of teaching with multimedia looks to me: students will be using multimedia for their projects. We will all be designing and writing multimedia presentations. How we choose to interact now with this media will shape and determine its value and role in the future. At the end of *Terminator 2,* Sarah Connor carves the words "no fate." Remembering her friend Kyle Reese's words to her that "there is no fate but what we make for ourselves,"[6] she realizes that the future is not predetermined. I would like to believe that we, too, have the capacity to determine the shape of things to come and that the future is not set "in stone."

An associate professor of art, Nancy Macko is secretary of the board of directors of CAA and co-chair of the Committee for Electronic Information. She is presently at work on a new installation entitled Re:Envisioning the Melissae, *which will include* Telling the Bees, *a computer-assisted video [Art Department, Scripps College, Claremont, Calif. 91711, nmacko@scrippscol.edu].*

3. In many ways this is similar to the copyright dilemma for text-based researchers, who may soon be experiencing a lack of access to original archival material if the new Conference on Fair Use (CONFU) copyright recommendations are accepted as legislation.

4. Available from the College Art Association, this is the first document of its kind to provide direction and guidance for faculty and administrators working and teaching in this field. In development for more than three years, this document was circulated internationally via the Internet for contributions from artist teachers around the globe. It was unanimously endorsed by the CAA board of directors in October 1995.

5. Leila W. Kinney, personal correspondence, August 1996.

6. *The Terminator Movies Home Page,* FAQ, v.2.3, http://www.geocities.com/Hollywood/6601/q6–8.html.