Portrait of the Computer Artist: Between Worlds

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Abstract

As a result of ignorance and misconceptions about the nature of computer artwork, the computer artist is misunderstood by practitioners in fine art, art education, science, and industry. This paper enters the world of the computer artist to look at some of the factors which contribute to misperceptions. It examines social issues ranging from the design and use of hardware and software to access issues, and problems with concrete and electronic exhibition venues. It also describes communication barriers in education and the media.

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Computers and software for art and design are relatively new art media. From the earliest line-art plotter drawings to recent 3D graphics (so-called because the objects in the picture are constructed in three dimensions and placed in "virtual" environments), the artistic history of computer graphics encompasses little more than thirty years. On one hand, it is astonishing that a medium could evolve so quickly. On the other, it is astonishing that we know almost nothing about a medium that is probably, after photography, the second most pervasive medium in contemporary image-making. We are impacted on a daily basis by imagery created or manipulated by computer hardware and software, yet few people can read its conventions or interpret the way computer art is situated within a postmodern context.

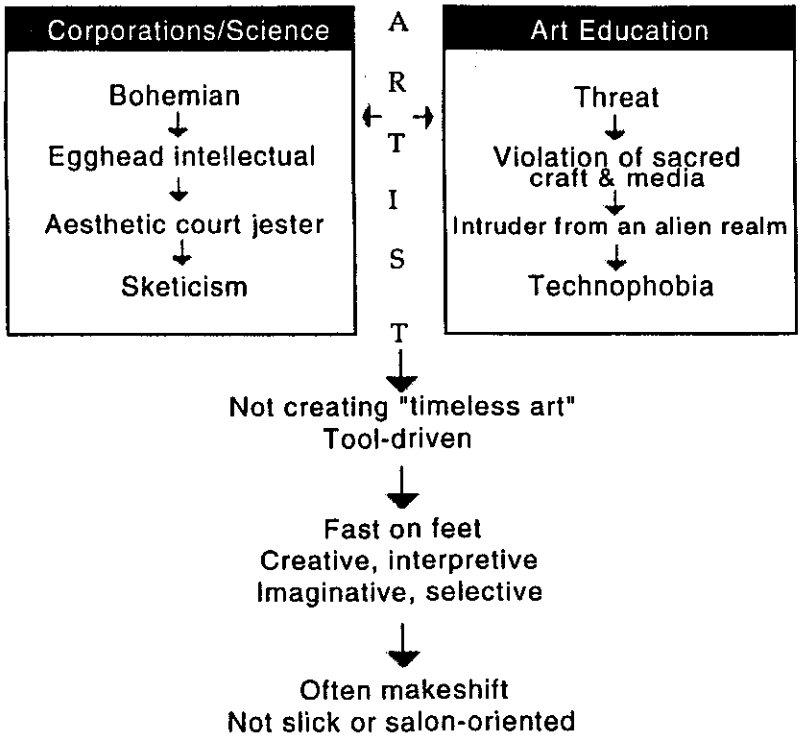
As a result of ignorance about computer art in the fields of science, industry, education, the media, and the fine art world, there are many misconceptions about the computer artist. The artist is perceived as rudderless and non-traditional by practitioners in science and industry. Members of the traditional art world of galleries and museums, as well as many in the field of art education, perceive the computer artist as scientific and thereby non-traditional in an art sense. Pomeroy (1991) provided a cogent description of the dilemma by contrasting the perspectives of corporations and the scientific community with those of traditional art worlds (see Table 1).

He notes that the scientific community perceives the artist skeptically as a bohemian or "egghead" intellectual. The traditional art community, with its generalized fear of technology that is quite particularized in the case of computers, perceives the computer artist as threatening. Neither group views computer art as something "timeless," grounded in traditions, or "pure." One group considers computer art as somewhat slipshod, the other as "too slick."

This paper enters the world of the computer artist in order to analyze some of the grounds on which these perceptions are

Table 1

Analysis of Pomeroy's Perceptions of the Computer Artist



based. It will examine some of the conventions and constraints under which computer artists operate. It will also delineate issues with which computer artists are currently grappling while constructing a new art world.

Entering the Computer Art World

One of the greatest challenges a computer artist faces is access to equipment, since there is no way of working without it. Unless the artist is affiliated with an institution or workplace which owns artistic software, private start-up costs will resemble those of a small business. At the very least, the computer artist

needs a computer, monitor, and keyboard plus one or more programs, for a baseline total of at least $3000. Fortunately, along with the advent of more powerful and less expensive home computers during the past five years, dozens of new low cost computer programs for art and design are now available. However, even the more expensive graphic software for personal use is still at the low-end of the industrial technological field. For example, a commercially available program for 3D graphics like *Autodesk 3D Studio* costs about $9000, while a high-end industry program like *Wavefront* or *Alias* is currently about $80,000. An additional access problem is that cultural integration of industry developments in technology can take many years, due to initial security restrictions and the high cost of prototypes. Also, new technology is generally first released publicly in such forms as video games and "power gloves" and may not be readily adaptable to art purposes.

Computer artists acknowledge the difficulty of access to technology with certain conventions. A painter may perceived Grumbacher paint as merely "oil paint" to be used in any manner. However, the computer artist and artwork remain closely affiliated with the production companies and support industry of the trade. Table 2 provides an overview model of a computer art world, from the production base level through the user support level to the output and exhibition levels.

Computer artwork is commonly identified by the names of programs, hardware, institutions, or corporations. The very act of making computer art requires collaboration between artists and technology professionals such as software engineers or interface designers. Even when artists do not collaborate directly through sponsorship, they collaborate indirectly with the programmers and engineers, whose "authorship" is embedded in both its constraints and possibilities. Acknowledgments accompanying published or exhibited computer artwork almost always credit the hardware (e.g., *Silicon Graphics IRIS 4D*) and software (e.g., *Alias 3.3* or *Xaos* proprietary—proprietary means that the developers have not yet released the program to the general public). Because different software programs offer different capabilities for performing artistic or technological tasks, artists often put together their own package of programs. Thus hardware or software credits may be broken down into

Table 2

Model of a Computer Art World

Base level 1

Hardware designers
Interface designers
Software designers
Programmers

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User support level 2

Technical institutes, art schools, universities
Technical assistants, graphics support, advisors, consultants
Program manuals, on-line help, program help lines
User groups, listservs, newsgroups
Trade shows, conferences, demonstrations, vendors
Corporate sponsorship, in-house workshops

↓

Output level 3

Technical assistance, facilitators
Printers, audio-visual labs, tech shops
Process labs, editors

↓

Exhibition level 4

Concrete: Traditional galleries, trade fairs, conventions
Electronic: FTP sites on the Internet

even finer detail. Artists might cite the makers of the modeling software, the rendering software, or the animation or motion control software that they utilized in creating their art work. These programs are developed at the base level of the computer art world (see Table 2). Artists my give further credit to computer facilitators, advisors, technical assistants, or graphics support at the user support level (see Table 2). Corporations are also commonly credited at the output level (see Table 2), such as "appreciation to Polaroid Corporation," or "donated by Sony." Research centers, institutions, and other lab sites are likewise noted, such as "The Electronic Visualization Laboratory of the University of Illinois at Chicago."

In this way, an image from the art world of computer artists leaves behind the creative equivalent of a paper trail. This makes it a highly *visible* art world in ways that traditional art worlds, such as those of painters or weavers, are not. However, due to these conventions members of traditional art worlds perceive the computer artist as making artistic, stylistic, and political concessions. A legacy of poor working conditions and low economic standards for traditional artists has perpetuated a suspicion of those who accept patronage, commissions, or commercial work. Artists may be suspected of "selling out" or of not being a "real" artist. The computer artist, by crediting sponsors and technology, in turn is affected by this legacy carried over from traditional art worlds. On the other hand, affiliations and credits do give the work some veracity and authority in the corporate and scientific world. But if the artist "hacks," "customizes," or "tweaks" the hardware or software according to creative needs, then the scientific community also will view the artist with suspicion. For credibility, the computer artist is tied to certain procedural behaviors in the scientific community.

Inside the Computer Art World

What do things look like from the artist's perspective? Assuming that the artist has gained access to some kind of hardware and software that will suit the artist's creative interest, the artist must become educated about the present state of this specific technology and transcend its present state to create an original work.

Computer art education can take many forms. As outlined in the user support level in Table 2, education may be formal or informal. Formal coursework may be available through institutions or in seminars sponsored by base level developers to promote their products. Trade shows and conferences offer the artist informal opportunities to try new products. User groups on the Internet are an extremely popular means of problem-solving. For example, an artist using a specialized program like *Autodesk 3D Studio* may join a user group organized by other users of the same software to discuss technical and artistic problems and solutions. One request for advice on a problem may bring dozens of suggestions from users all over the world. Program manuals and on-line help from program developers are also important educational sources for self-teaching.

The computer artist must quickly come to terms with the technology of the medium and at the same time explore its aesthetic potential. It is always impossible to separate "art" from the technology used in its creation, and computer art is no exception. Garofalo (1991) points out that, from the first cave drawings, art has been intimately connected to increasingly complex technologies. As the computer artist learns the technical aspects of programs, the artist identifies the aesthetic features and possibilities of the medium (as opposed to its number-crunching or spreadsheet capabilities—although these too have been grist for the creative mill).

Computer art is sometimes valued for utilizing the potentials of the computer. "In SIGGRAPH 91, the premier convention and showcase for computer artists internationally, the design jury focused on pieces where the computer played a part in the "look," style, or production of a piece" (Kerlow cited in Johnson, 1996). On the other hand, computer graphics are often criticized by traditional artists and educators for looking like they were made by a computer. This is like criticizing ceramics for looking like they are made of clay.

Whether well-received or not, graphic procedures such as mirroring (the flipping of an image to make a mirrored duplicate) or recursion (the repetition of a form in increasingly smaller or larger as well as more or less detailed ways) may be seen as computer art conventions. At the same time that the artist "learns" the program, the artist learns the conventions of the medium. As Becker (1982) stated, "When the equipment embodies the conventions, the way a conventional thirty-five-millimeter camera embodies the conventions of contemporary photography, you learn the conventions as you learn to work the machinery" (p. 57). Rosenblum (1978) wrote about the role of conventions in photography in a similar manner:

> Conventions specifying what a good photograph should look like embody not only an aesthetic more or less accepted among the people involved in the making of art photographs, but also the constraints built into the standardized equipment and materials made by major manufacturers. (Rosenblum, 1978, p. xx)

Conventions also apply to computers and computer graphics. For example, the scale of artwork is affected by conventions. Many computer artists think and work in a magazine-sized scale which is consistent with the monitor image size. The printer or "output" size may also determine the artwork's dimensions.

In his seminal text, *Art Worlds*, the sociologist Howard Becker (1982) defined the conventions of art worlds in some detail. He maintained that conventions dictate the materials that artist use. As previously mentioned, computer artists are concerned with the degree to which the computer itself is visible and invisible in the artwork. Computer art was originally created by programming code (i.e., based in mathematical instructions to the computer), and frequently looked programmed. Until recently, many computer artists continued to push the limits of "pure" computer graphics (i.e., art made only with hardware and software and displayed on a monitor). But in the art exhibit of SIGGRAPH 95 in Los Angeles, the integration of computer art with traditional media such as watercolor and hand-made rag papers was more prominent. According to Becker (1982), "conventions dictate the abstractions to be used to convey particular ideas or experiences, as when painters use the laws of perspective to convey the illusion of three dimensions" (p. 29). Some computer graphic artists stretch traditional art conventions. Working with 3D programs, they may, for example, decrease the field of view to increase the effects of perspective.

Computer graphics are full of symbolic, insider language which is often playful or tongue-in-cheek. Imagery such as a teapot or a lunar landscape, for example, provoke immediate identifications among computer practitioners, who were sometimes required to create these images as exercises during formal training.

After mastering the techniques of a program and learning the conventions, many computer artists strive to transcend the program and use it in original ways. An artist must understand the boundaries to go beyond the current forms and concepts in art. Georges Braque wrote: "In art, progress does not consist in extension, but in the knowledge of limits. Limitation of means determines style, engenders new form, and gives impulse to creation" (cited in Chipp, 1968, p. 260). In this respect, the computer artist has an advantage over peers working in traditional media. That is, individual computer programs generally operate dependably and consistently. For Becker, "the obverse of the constraint is the standardization and dependability of mass-produced materials . . . a roll of *Kodak Tri-X* film purchased anywhere in the world has approximately the same characteristics and will produce the same results as any other roll" (p. 33). Becker could have made the same argument for computer software. This kind of dependability is valuable. Computer artists may also take more creative chances with their work than their traditional peers, since earlier versions can be saved and recalled if subsequent experiments prove unfruitful.

Computer artists are motivated to engender new forms for at least three reasons. First, innovation is highly prized in the world of computer art. For example, the jurors for SIGGRAPH 91 selected works that were particularly innovative, in terms of being unlike works previously exhibited. The computer artist, therefore, is under pressure to push the medium in unexpected

directions, which, as discussed earlier, evokes certain perceptions of the artist among those in industry. Second, the predictability of specific computer programs may provoke the artist to transcend their conventions. Becker wrote, "Because equipment comes to embody one set of conventions in such a coercive way, artists frequently exercise their creativity by trying to make equipment and materials do things their makers never intended" (p. 58). A third reason for the rapid development and changing appearance of computer art is the accelerated development of computer technologies in the past ten years. Today, the continual introduction of new products and upgrades makes it impossible for individuals to learn them all. Conversely, this flood of technology—which particularly affects those artists who are inspired by the medium itself—creates the impression in traditional art worlds that the computer artist may be "flighty" or "tool-driven."

After grappling with numerous variables that include mastering technical knowledge, learning creative techniques, and acquiring an awareness of the unique conventions of the media, the computer artist must consider issues that have received little critical attention from art historians, theorists, or aestheticians. The most important issues involve the chameleon-like nature of computer art. As Malina (1990) notes, computer art is situated within the larger context of the study and development of artificial life. "The unique computer tools available to the artists, such as those of image-processing, visualization, simulation, and network communication are tools for *changing*, *moving*, and *transforming*, not for *fixing*" (Malina, 1990, p. 33). These characteristics are conceptual as well as technological, and are typical of the postmodern paradigm within which computer art is situated. Modern art has focused on the visual appearance of static artworks. Modern science has sought to identify, characterize, and categorize. But both modernism in art and positivism in science are currently confronted with an interpretive, pluralistic aesthetic. Beyond the technological aspects, computer art involves a melt-down of art, culture, politics, science, text, and images.

Computer artists also engage in issues ranging from appropriation and ownership to cultural colonization. Because computer graphics are more truthfully presented in their original digital form than as analog print-outs or hardcopy, many artists exhibit their work on-line at electronic sites via File Transfer Protocols (FTP). Therefore, anyone with access to the Internet can view their work and usually download a copy from these sites. Unlike analog, "real-world" paintings, images appropriated in this way also contain the digital code that constructs them. An artist who downloads an image possesses the entire artwork including its binary code. Imagine if we could undo each step of Van Gogh's *Starry Night* and replicate the paint strokes dab by dab on his original canvas.

It is often difficult to determine where one computer artist left off and another began. It is also difficult to trace the original image to an owner. Some computer artists embrace these unique aspects of the medium. Computer artist Esther Parada refers to her work as "the ongoing process of challenging received material" (Kirchman, 1990, p. 31). She "captures" or "copies" the work of other artists and photographers in order to re-work it, and properly credits the appropriated images as "embezzlements" rather than as simple thefts. "They seize not just images but systems of belief," she maintains, since the codes, conventions, and schematas of the other artists are embedded in her work (Kirchman, 1990, p. 32).

Female computer artists are concerned with gender issues. As Lyons (1994) points out, the "personal" of personal computers means "men": men who invent the computers, design the systems, and author the software. Constructs based on male-only research permeate the entire system, from decisions about software characteristics to communication issues in user groups and exhibition sites (p. 72). One provocative panel discussion at SIGGRAPH 95 considered the problem of the Cartesian Coordinate System itself, which one participant described as a "male-biased edifice of the dominant white male patriarchy" (personal communication, August 11, 1995). As Danto (1980) wrote, "A system of conventions gets embodied in equipment, materials, training, available facilities and sites, systems of notation, and the like, all of which must be changed if any one component is" (p. 186). Like the issue of appropriation, gender construction is an important issue for education today.

Unfortunately, for many reasons sketched in this paper, the computer art world is still highly private. Many art educators did not have access to computer images, practice, and theory in their own education. The general public is beginning to have some hands-on access to artistic technology, but "Paint" components like that included with *Microsoft's Word* for *Windows* are very simple forms of art technology. Most exhibition sites and venues are electronic and require access to the Internet, but the Internet itself is a new concept for most people. In the traditional art community, concrete computer art is still generally exhibited as "technoculture" in science centers like San Francisco's *Exploratorium* or in media centers like Santa Fe's *Center for Contemporary Art*. Thus computer art continues to carry associations of the scientific, technical, or "alternate."

Exiting the Computer Art World: The Place of Education

Communication and education are the two greatest challenges for integrating computer art into the field of art. Although both the popular media and public education have served as powerful disseminators in other areas of art, computer artworks are rarely reviewed by the media or discussed in art classrooms. Teachers and reviewers who are requested to describe computer artworks are often at a loss. Not only are the medium and conventions unfamiliar, but the terminology for describing the appearance and construction of computer art images is different. In a recent study (Johnson, 1993), 112 art terms commonly used to describe visual structure had different correlative terms in computer graphics. Further, 57 of the computer graphic correlatives represent concepts which expand or radically alter the meaning of traditional elements and principles of art. Table 3 compares differences in terminology. It is difficult, if not impossible, for clear communication or effective education to occur without a grasp of the differences in terms.

Without education, experience, or dissemination of issues and practices in the field of computer art, neither members of traditional art worlds nor those of science and industry can easily understand it. It may be useful to look at the kinds of

Table 3

Design Vocabulary: Elements

Traditional Art	Computer Art
element	primitive
mark, point	pixel; dot-per-inch
line, path, continuous mark, moving point	row; segment; vector
contour line	silhouette line
cross-contour, interior contour line	contour line
connecting line	segment; vector
corner	vertex; node, handle
edge	bounding side
pattern	default, selected, created patterns; area fills; hatch patterns
allover, continuous pattern (local)	fill, opacity map, texture map
surfaces	materials
plane	bitmap; polygon
two-dimensional shape	polygon
three-dimensional shape, 2D projection	solid object; polyhedral
illusion	simulation
projection	extrusion; loft
plastic shapes	extruded polygons
area	region
positive shape	region; polygon; polyhedral
negative shape, space	bitmap; void
soft-edge shadow	penumbra, fall-off
highlight	specular highlight
value	contrast

Note: Black boxes indicate conceptual differences in meaning, which are explained on the following page.

Table 3

Conceptual Differences in Terminology for Design Elements

mark, point ≠ pixel; dot-per-inch

In computer graphics, marks take two different forms—neither of which are the same as points. "Pixels" are marks on the screen and "dots-per-inch" (dpi) are corresponding marks in the printed image. "Points" are the locations where invisible gridlines cross on the monitor screen.

line, path, continuous mark, moving point ≠ row; segment; vector

While different terms for line have similar meanings in traditional art, "row," "segment," and "vector" are computer terms for lines created in three different spatial environments: pixel graphics, 2D graphics, or 3D graphics. Both marks and points are also contiguous, not continuous, in computer graphics.

corner ≠ vertex; node, handle

The computer graphic terms "vertex," "node," and "handle" indicate the generative potential of shapes. Computer shapes do not have "fixed" corners.

pattern ≠ default, selected, or created patterns; area fills; texture maps

In computer graphics, patterns are usually selected and then "assigned" (or transferred) to fit areas.

surface ≠ material

In traditional analog media, the surface of an object in a picture is the same thing as its side or "face." In computer graphics, the surface is called a "material." It can be manipulated independently of faces (called "facets").

plane ≠ bitmap; polygon

The computer terms "bitmap" and "polygon" distinguish the idea of a plane as either a surface or a shape, and indicate the program is pixel-based (Paint) or 2D (Draw).

3D shape, 2D projection ≠ 3D solid object, polyhedral

In computer graphics, 3D shapes are 360° forms in a geometric environment. They are called "solid objects" or polyhedrals.

knowledge that Becker once described as characteristic of an art "expert," since similar characteristics form the basis of discipline-based art education objectives. Becker's list includes knowledge of:

> the history of attempts to make similar works in that medium or genre; characteristic features of different styles or periods in the history of the art; the merits of different positions on key issues in the history, development, and practice of the art; an acquaintance with various versions of the same work; and the ability to respond emotionally and cognitively to the manipulation of standard elements in the vocabulary of the medium. (Becker, 1982, p. 48)

Although most teachers and students do not seek to become experts on computer art, only with some modicum of understanding about each of these areas can we take part in the conventions between artist and audience.

Computer art is evolving simultaneously with our lives and the lives of our students. As art educators, we have a responsibility to teach students how to understand and critique images that they would otherwise take for granted. We can do this in many ways. We can bring our understanding of art history as an evolutionary, culturally-bound perspective to the forefront of our computer art teaching. We can help students examine how symbols, metaphors and schemata are used by computer artists to "manipulate" response, just as we do with images and objects produced by artists in other media. We can help them separate the use of abstractions, stylistic mannerisms, and altered data from face-value reality. Art education includes the dissemination of terms and vocabulary, learning about studio and technical practices, studying the history of artistic conventions, and engaging in critical dialogue. Computer art integrates many disciplines including math, science, fine art, cultural studies; and frequently, language arts, architecture, and engineering. Thus the computer artworld offers a whole new sphere of interdisciplinary opportunities for art educators.

Perhaps the problem for the computer artist is not one of being "between" worlds, but that these worlds are still perceived to be separate by art and science. As art educators, we must address our fear of territorial threats to our subject area with the potential "invasion" of science and machines. Instead our art expertise depends on an interdisciplinary knowledge base.

References

Becker, H. (1982). *Art worlds*. Berkeley: University of California Press.

Chipp, H. B. (1968). Theories of modern art. Berkeley: University of California Press.

Danto, A. C. (1980). Munakata in New York: A memory of the 50's. *The Print Collector's Newsletter, 10*, 184-189.

Garofalo, R. (1991). Understanding mega-events: If we are the world, then how do we change it? In C. Penley & A. Ross (Eds.), *Technoculture: Cultural politics: Vol. 3* (pp. 247-270). Minneapolis: University of Minnesota Press.

Johnson, M. (1993). *A comparative study of the elements and principles of design in computer graphics and traditional art education.* Unpublished thesis, Univeristy of British Columbia.

Johnson, M. (1996). Made by hand. *Art Education, 49* (3), 37-43.

Kirchman, S. (1990). Digital image - digital photography. *Leonardo: Digital Image - Digital Cinema* (supplemental issue). 31-32.

Lyons, B. (1994). Cyberspace: A male preserve. *The Computer Paper, B. C. Edition., March.* 72-74.

Malina, R. F. (1990). The work of art in the age of post-mechanical reproduction. *Leonardo: Digital Image - Digital Cinema* (supplemental issue). 33-38.

Pomeroy, J. (1991). Black box S-Thetix: Labor, research and survival in the He[Art] of the beast. In C. Penley & A. Ross (Eds.), *Technoculture: Cultural politics:Vol. 3* (pp. 271-294). Minneapolis: University of Minnesota Press.

Rosenblum, B. (1978). *Photographs at work.* New York: Holmes and Meiers.