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Examining the Creative Process; Electronic technology in art and design

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Examining the Creative Process;
Electronic Technology in Art and Design

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The possibilities inherent in the computer
as a creative tool will do little to change those idioms of art
which rely primarily on the dialogue between the artist, his ideas,
and the canvas. It will, however, increase the scope of art
and contribute to its diversity.

Jasia Reichardt, The Computer in Art

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The purpose of this thesis is to examine the impact that electronic technology has had in reshaping the artists' approach to the creative process. As computers become a vital resource and creative tool for the art community, it is important for the artist, and public alike, to understand the significance of electronic technology in facilitating the creative process.

Without question computers are making extraordinary aesthetic experiences possible, and revolutionizing the way art can be conceived, created and perceived. At the forefront of technical and social change, the computer provides a new medium and a new way to look at art. But a computer should not be looked at as a replacement for the creative process. We tend to assume that a new technology leads to a new form of art, instead of asking if perhaps the arrival of a new technology is the result of new forms of thinking.

Artists have traditionally had a reputation of being at the forefront of experimentation; searching for a new tool, technique or idea. Some artists have embraced the computer and see it as a tool for both the fine and applied arts. Before being accepted as a legitimate artistic medium, some of the challenging aesthetic and philosophical issues raised by computer-generated art must be addressed. The most significant questions concern the impact of the technology on the artist, the creative process, and the nature of art. More specifically; to what extent do the available systems and software determine the results? The real question may be not so much, "What is computer art?" but "What will art become in the computer age?"

As part of my examination, I have tried to address the impact of electronic technology on fine and applied arts education, and how these issues influence a students' creative development, as well as, their ability to succeed in a professional environment. While electronic technology has provided the artist with new ways to approach ideas, there is a dangerous temptation to become enamored with clever technical solutions instead of intelligent design solutions. The result of which may be a less-than-positive impact on both the quality of students coming out of America's design schools, and the quality of work coming out of America's design firms.

Historically, such debates have followed the collision of virtually every new technology with well-entrenched ways of thinking about and doing work. There is a tension that exists between art and technology, and a fear that the computer will replace the creative process; diminishing the chances for diversity and human expression in design. And while computers have become the answer to the dreams of some designers, and the purveyor of nightmares for others, it is inarguable that the computer is becoming an integral part of the design environment. The principal challenge now for this new technology is to manifest itself in the creation of effective and appropriate design that contributes positively to our culture.

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Research of selected literature was conducted in the content areas of computers in the fine arts, design education and technological implications. Research material was selected to encompass current, as well as, future perspectives regarding the impact of electronic technology on the fine and applied arts.

accepting electronic technology as a fine art medium

The field of computer art represents an extraordinarily broad body of work that consistently generates a wide spectrum of opinion and interpretation. Resistant to fully embrace works created on the computer, the fine art world, and public alike, have yet to fully accept the unique qualities of the creative process in computer art. Confronted by this lack of understanding, computer artists continue to struggle for acceptance in many traditional avenues of success and recognition: the art gallery and museum.

Exposing the myth that art and computers are mutually exclusive concepts, "The Digital Canvas" looks at how some of today's artists have found ways to use the computer as an intermediary in almost any medium or style. It is not uncommon for artists to combine work on the computer with traditional art methods; although computer artists are careful not to say that their work is superior to traditional mediums: "If there is a disadvantage to computer art, it is that the basic aesthetics are missing." [1] The "basic aesthetics" refer to the tactile relationship that artists traditionally have had with their art. With most computer art, there is no modeling of clay with hands or touching of brush to canvas. As a result, questions plague the fine arts world as to the legitimacy of this new art form.

Those critical of computer art are fearful that it somehow detracts from the artist's creativity, while the perception among established museums is that computer art has not yet come of age and that there is not enough in the field to warrant taking it seriously in comparison to the other arts.

This is not the first time the art community has reacted so strongly towards an emerging art form. Published in 1892, Naturalistic Photography for Students of the Art, by Dr. Peter H. Emerson, became the first major aesthetic statement on photography as fine art.[2] The book created a furor among art critics and photographers by insisting that the independent medium of photography could be used to express unique creative visions and be the vehicle for great art. Influenced by these issues, artists such as Alfred Stieglitz went on to become major contributors in developing views on photography and art in the first half of this century.

Arielle Emmett, author of the article "Computers and Fine Arts," emphasizes the need to recognize the aesthetic qualities in computer art, pointing out that; "Computer art today still means anything that is visual with computers, as opposed to things that are strictly aesthetic."[3] Identifying these qualities may be as simple as looking to the basic elements of traditional design; organizational composition, technique and content. In general, though, the public and the art world may continue to focus on an unresolved fascination with the computer as a tool, rather than the aesthetic or formal values of the work produced. In order to define the legitimate role computers can play in the creative process, artists must fight the notion that the computer, not the artist, creates the work.

Confident that galleries will embrace the medium in the future, Gary Pfitzer, author of the article "State of the Arts," recognizes the recent emergence of more galleries and museums willing to acknowledge the digital medium.[4] The current trend for most venues is to not go completely digital, but to offer both computer works and those derived from more established fine art mediums. As more commercial galleries begin to actively promote computer-generated art, artists seeking to present their work, and galleries looking to sell it, will be forced to tackle such pressing issues as artistic value, originality, and the archivability of digital art.

For the most part, artists, and galleries alike, are working hard to make the computer medium work successfully. But the future success and, ultimately, the acceptance of computer art, will rely on several contributing factors: "the embracing of the computer by established artists from traditional mediums, increased sophistication and maturity on the part of fine artists now using the computer, ... and the successful generation of a market by the galleries, so that more collectors will want to buy computer art." [5]

Finding ways to use the computer in art may be a very individual process with a multitude of creative solutions. In order for the medium to be accepted, artists must remind the art viewing public that, as with any other traditional medium, computer art is not created by the computer, but by the artist. In addition, the art world must work harder to recognize those works that express both artistic and technological excellence, while being critical of those works that don't expand cultural and visual perception.

The following articles examine the role of electronic technology in fine and applied art education, and its ability to make learning experiences more effective.

determining the role of electronic technology in design education

"Design Education: Creating Effective Courses in Computer Graphics Takes Careful Planning," by H. Lind Babcock, examines the issues facing design departments attempting to integrate computers into their design curricula.[6] Chief among these concerns is the cost of equipment and a lack of specific guidelines for course content. Although the technology may be readily available to many institutions, learning curves for using sophisticated software are still steep, leaving little time to learn about the conceptual and creative processes involved, and some educators remain reluctant to embrace the new technology.

In a survey conducted in 1990 during an annual meeting of the ACM SIGGRAPH (the computer graphics "special interest group" of the Association for Computing Machinery), a conference devoted to the discussion of topics relevant to the scientific community, design educators participated in a workshop to determine the role of technology in university curricula. The study concluded that "most interdisciplinary and many fine arts programs tend to favor the artist-as-programmer approach, while most graphic design-oriented programs favor the artist-as-user approach." Defining specific guidelines for computer graphics in the education structure, some argue that it is necessary to teach the basics first, leaving computers for more advanced work. Others believe that "As computers are becoming a ubiquitous tool in the visual arts, computer graphics deserves a place in the general foundation courses for all art students ... "[7]

It is noted, however, in the accompanying article "Wanted: Computer-Savvy Artists," that, first and foremost, artists and designers must have creative talent, and that computer adeptness should not necessarily replace the creative process.[8]

Expanding on these issues, "Artistic Challenge; Establishing Aesthetic Standards in Computer Art" underlines the growing movement among educators to create undergraduate and MFA programs in computer art that facilitates a traditionalist's understanding of typography, mechanicals and page layout, while guarding against a facility where the only agenda is the student's mastery of software. Teaching disciplines should utilize methodology which involves adapting the traditional artistic process to the computer as a visual problem-solving tool– students should be "encouraged to make decisions about how to best use the computer's capabilities for a particular project and even to determine if the computer is appropriate." [9]

In the article "Graphic Design Education," D.K. Holland attributes the current state of graphic design education to the inability of educational institutions to adapt to the changing role of design professionals.[10] Studio courses must evolve to better address the effect of electronic technology on the creative process. Flexibility, speed, and rapid innovation are all outgrowths of the presence of computers in the studio courses of all art students. It should be noted, however, that an education that focuses almost exclusively on studio courses fails to adequately prepare the student to compete in a changing work environment. Today's designers are being challenged to define and defend their position in the business environment, especially when working in collaboration with other professionals.

Therefore, it is essential to introduce students to new ways of thinking, in addition to liberal arts and business related courses, in order to provide them with the mental discipline and information framework necessary to realize their full potential.

Revealing and provocative, "The Computer Debate" features opposing viewpoints concerning the effects of electronic technology on the design environment. Michael Manwaring, one of the co-authors of the article, attributes the increased proliferation of design material to; "an increasing sophistication of software and, more importantly, the increasing number of, and characteristics of, the people using it." When the first Macintosh computer systems were made available to the public in 1983, they created as much excitement within the design community as they did contempt. Using a limited number of available type styles and "clip-art" (simple graphics) packages, many new practitioners, some of who were either under- or un-schooled in art and design, were able to produce work that had the appearance of professional competence. As a result, the sheer volume of work being produced, coupled with a limited software selection, diminished the potential for unique creative expression. In the past 10 years, Manwaring explains; "I have seen increased formal complexity, but without regard to meaning or craft ... the abdication of personal style for the orthodoxy of technical style." [11]

Co-author Duncan B. Sutherland Jr. points to the invention of the telephone, by Alexander Graham Bell in 1876, as evidence of how society evaluates a new tool based upon preconceived paradigms: "seldom can the ultimate impact of a new tool be anticipated in advance of its extended use." [12] Although we have not yet realized the full implications of computers in

design, in today's electronic business environment, computer technology offers design firms significant competitive advantage over businesses who elect to maintain traditional design environments.

In a series of articles written for *Communication Arts*, a magazine catering to design professionals, author Wendy Richmond addresses the effect of technology on the design profession. She describes the current language of technology as "being removed from physical reality, ... its terms and processes obscure. There is no representation of process, of how something works; no correlation between an action and what it causes." [13] The success of electronic technology may depend upon its ability to become enabling, rather than getting in our way. New technology offers the user a chance to be a participant in the communication, thereby gaining greater understanding of the information being delivered.

Electronic technology in education should provide the tools necessary to motivate, as well as empower the student to learn. The flexibility and speed of many computer graphics programs should allow emphasis to be placed upon the creative process, rather than on the mechanics of the program itself, in addition to positively influencing the perception of design and principles of composition.

3

The thesis project evolved to encompass two distinct areas of thought: the changing role of electronic technology in design education, and the impact of electronic technology on the artists' approach to the creative process in fine and applied art. Topics were selected on the basis of their relationship to issues in which I was an immediate participant, enabling me to draw upon personal experience, in addition to information acquired prior to, and during research.

Because electronic technology in fine and applied art education plays an important role in the creative development of the art student, part of the research section of this project was used to examine the effective use of electronic technology in educational curricula. From this foundation, the remaining research, and procedure results, study the effect of electronic technology on the creative process. In addition to this information, an evaluation of each phase of the creative process was conducted using several illustrations that were created specifically for this purpose, as well as work created prior to this project. Each composition, as it appears in the appendix, is meant to serve as a visual reference for the creative processes referenced throughout this section, and not as a basis for presentation.

In determining the content for each illustration, I decided to evaluate fine art and design separately due to the fact that fine artists and designers approach the creative process with different objectives and requirements. While the creative process in fine art may be that of inward problem-solving, used by the artist as a vehicle for self-expression; the

creative process in design is one of outward problem-solving through public participation. Therefore, how and why technology is used by each group of artists to facilitate the creative process, became an important part of the final evaluation.

The technical parameters of the project, used during the production phase, were to employ the use of a Macintosh IIci computer with a 16" color monitor, keyboard, mouse, 24 bit color flatbed scanner, removable media drive, and several different color output devices. The final presentation would not require any of the aforementioned devices, as a hard copy presentation was planned.

As the first of two compositions created to evaluate the creative process in fine art, *Bright Lights ...* made use of geometric forms, layering and color to emphasize both depth and compositional balance. To enhance the geometric nature of the composition, each element was layered within a square frame. Within that frame, the layout was positioned diagonally, extending specific elements beyond the frame of reference, to make the composition more dynamic. Using the strength of the computer to create, duplicate, arrange and modify individual shapes, I was able to experiment with several different potential layouts, all within a single workspace, and dynamically view any changes before selecting one solution over another (appendix).

After sketching an initial concept on paper, the pencil rendering was scanned into the computer using an Epson color flatbed scanner and saved as a 1 bit TIFF (Tagged Image File Format) file. The Tiff file was then imported into Aldus

Freehand (a Macintosh illustration program), where it was used as a template to create the initial wire frame outline of the illustration. The TIFF file was then deleted from the composition (Fig. 1).

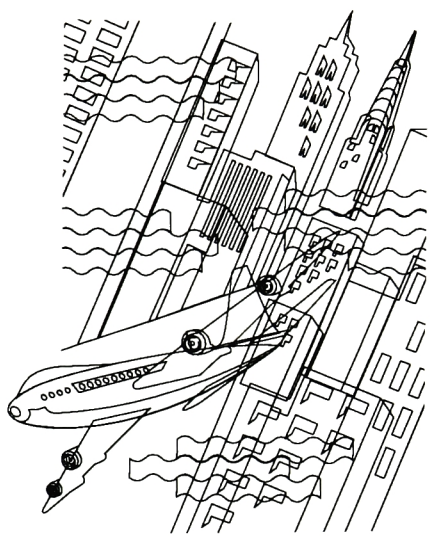


Fig. 1. Detail of wire frame from *Bright Lights ...* illustration

Each of the remaining steps were approached from a traditional artists' understanding of how color and style effect perception. Applying these principles to the computer, a color palette consisting of two colors, including screen percentages, was chosen to provide subtle contrast, and emphasize balance and depth.

Each element in the composition was made up of an individual outline, or closed path, which was then given a set of attributes. An attribute refers to the style, width, and color of the line, as well as, the style of fill applied to an element. Attributes were then applied to each element, including solid

and blended fills. A blended fill is achieved either manually or through designated program parameters. Beginning and ending colors are specified, as well as, the direction of progression. The program then calculates the number of intermediate steps required to create a smooth transition between the two colors (Fig. 2 a, b).

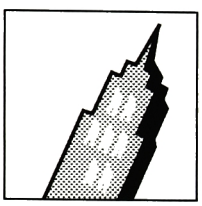
(a)  (b) 

Fig. 2. Element attributes;
(a) 1 point line, solid fill
(b) No line, blended fill

The final step was to layer each element according to its designated position in the original composition. This was accomplished by using commands built into the program to either send an element forward or backward in relationship to other elements within the layout.

Emphasizing both form and motion through free-form shapes and abstract imagery, *The Analogue* became the second composition to evaluate the creative process in fine art. Using electronic technology to compensate for a lack of traditional drawing skills, I was able to use the computer to create detailed forms that show fluid motion. In contrast to traditional methods, each illustration was created in separate documents, allowing me to work on foreground and background elements simultaneously, before assembling the final composition (appendix).

Creating a rough sketch of each figure on separate pieces of paper, the images were then scanned into the computer and saved as 1 bit TIFF files. The TIFF files were imported into separate Aldus Freehand documents, where they were used as templates to create wire frame outlines. After deleting the TIFF file from each Freehand document, the outlines were cut and pasted into a single Freehand document (Fig. 3).

Fig. 3. Detail of wire frame from *The Analogue* illustration

Appearing in the foreground, the dogs became the first elements created, and the initial focal point of the composition. To compliment the dynamic nature of a dog in full stride, each muscle group was rendered as a fluid shape. Several additional foreground elements were experimented with, but none proved interesting enough to maintain the continuity of shape or motion that had been established earlier with the dogs. Ultimately, a human figure was decided

upon. Its muscularity and position, relative to that of the dogs, was emphasized in order to maintain the appearance of motion that later became a dominate characteristic of the final composition.

Creating a background image capable of bringing the entire composition together, without interfering with the foreground elements, proved to be the most challenging aspect of the entire illustration. After experimenting with several different backgrounds, I decided to create an image that would enhance the overall feeling of motion, without competing with the foreground elements as the focal point of the illustration. The resulting background provides visual contrast between the foreground and background through abstract imagery, using indistinguishable shapes and colors to create the appearance of motion (Fig. 4 a, b).

(a)  (b) 

Fig. 4. Detail of background
(a) Original image
(b) Crystallize filter applied

The original photograph of autumn foliage was scanned into the computer and opened within Adobe Photoshop (a Macintosh image editing program), where it was saved as a 24 bit EPS (Encapsulated PostScript) file. Within Photoshop, a custom filter called "crystallize" was applied to achieve the resulting image. The image was then imported into Aldus Freehand, where it was placed in the background of the

existing composition. To further emphasize form and motion throughout the composition, several small stylized female figures were added to the background.

Experimenting with different color solutions on the computer, individual elements were given a metallic feel to emphasize a surreal quality. Colors for the remaining elements were then selected, applying line and fill attributes to emphasize form and structure. Working with several different layers, I was able to view, edit and apply colors to each element separately. During the final phase of production, each layer was combined and assembled in the final composition.

The first of two compositions created to examine the impact of electronic technology on the creative process in examples of graphic design, the *Untitled* series featured four reproductions of late nineteenth century french soap and perfume labels (appendix). Appearing in an issue of Upper and Lower Case magazine, the original labels provided an excellent opportunity for comparison between the techniques used to create the original labels and those used to create the computer generated illustrations (Fig. 5).[14]

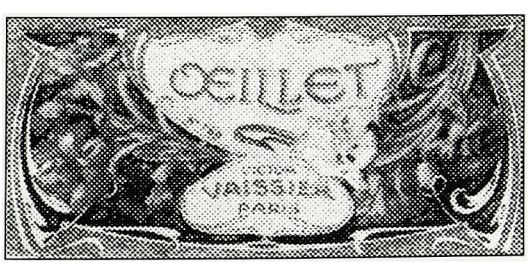


Fig. 5. Original label as it appeared in Upper and Lower Case magazine

Even though the original labels were used as drawing templates, recreating each label on the computer proved to be a somewhat slow process. Whereas a traditional designer might use a single brush stroke to define a design element in a layout; that same element, drawn on the computer, would require several points which define the element as an outline. The outline would then require line and fill attributes. While time may be a legitimate concern for design professionals, having the flexibility to edit layouts on the computer may result in less time required during subsequent iterations.

After the general outline of each label was traced on paper, the tracings were scanned into the computer and saved as 1 bit TIFF files. The TIFF files were then imported into separate Adobe Illustrator (a Macintosh illustration program) files, and used as templates to create wire frame outlines. The TIFF files were then deleted from each composition (Fig. 6).

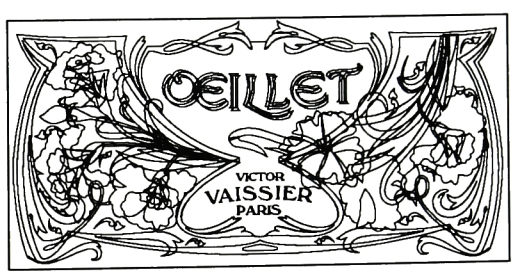


Fig. 6. Detail of wire frame from *Untitled*, 1 of 4 illustrations

A color palette was then selected for each illustration based upon the colors appearing in the original labels. During this phase of production, the computer offered a significant advantage over traditional methods, allowing me to experiment with different color solutions on a single layout, until

the proper combination of blended fills could be achieved. The traditional artist might have had to create a series of comprehensive layouts, experimenting with different color combinations and painting techniques, before applying those techniques to the final composition. After using the computer to create matching patterned and blended fills, each element in the composition was given a set of line and fill attributes, and layered accordingly. Upon completion, the illustrations were cut from their original documents and pasted into a single layout.

Whereas the illustrations created for the series *Untitled* demonstrated artistic elegance through detailed ornamentation and color, the final composition examined the capabilities of the computer as a tool for technical illustration. The resulting image of a *5775 Color Copier* combines complexity, detail, perspective and color, in an illustration that became a technical challenge to execute (appendix).

Using a traditionally developed technical illustration of a color copier as reference, the reflective image was scanned into the computer and saved as an 8 bit color TIFF file. The TIFF file was then imported into Aldus Freehand, where it was used as a template to create a wire frame outline of the copier body and internal components. Enlarging complex areas of the TIFF file on the computer, I was able to create detailed component outlines, without being restricted to the size of the original image. These "component" illustrations were then scaled down and placed in their corresponding locations within the copier body. The TIFF file was then deleted from the composition (Fig. 7).

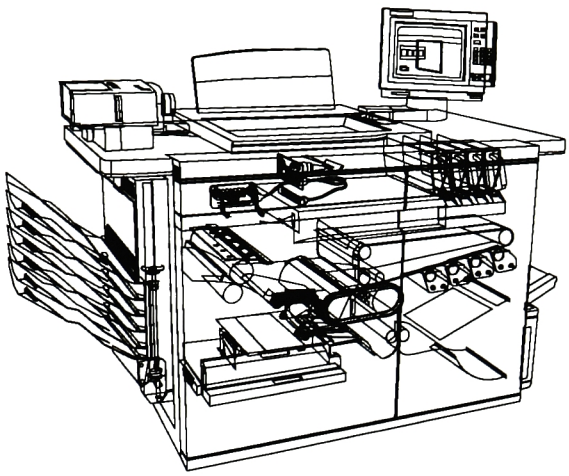


Fig. 7. Detail of wire frame from *5775* color copier illustration

The printed copier page, appearing in three separate locations along the paper path within the copier framework, was created in Photoshop from an actual printed layout. The page was scanned into the computer and saved as an 8 bit EPS file. With its capacity for holding and manipulating images, I was able to use the computer to duplicate, scale and distort the original image. Within Photoshop, three images were created and saved as separate EPS files. The images were then imported into the color copier layout and placed in their corresponding locations.

After each element in the illustration had been created, colors were selected, and fill and line attributes were applied. Working with several different layers, I was able to view, edit and apply colors to each element separately. During the final phase of production, each element was layered according to its corresponding location within the composition. Labels were then placed on major component parts to facilitate identification.

4

The final project was completed as anticipated, fulfilling the objectives set forth in the thesis proposal. An evaluation of the integrity of aesthetic principles in works created on the computer, and the impact of electronic technology on the creative process, was conducted using several illustrations that were created specifically for this purpose, as well as work created prior to this project. Even though several illustrations were created prior to, and in conjunction with, those created specifically for this project, they provided valuable information that not only addressed the impact of electronic technology on the creative process, but the adaptation of traditional methods to the computer as well.

The fact that I had had prior experience using drawing software on the computer may have biased the eventual results, enabling me to avoid many of the operational pitfalls encountered by someone approaching this project as an inexperienced "User." Even so, many of the problems that were encountered during the project reflect the impact that electronic technology has had on the artists' approach to the creative process. As each project began to unfold, several considerations were made to account for the use of the computer as opposed to traditional methods. As with traditional processes, there are certain limitations that accompany the decision to use one tool over another. Although some of these decisions were based upon the limitations of the computer to achieve specific results, this may be attributed to a lack of understanding on the part of the artist, than on the medium itself.

The strength of the computer as an artist's tool may lie in its ability to manipulate images in terms of color, resolution, size and form. For several projects, there was a need to view several different solutions before deciding upon the final composition. Using the computer to view variations in color, content and arrangement, I was able to retrieve and develop a promising intermediate stage, without starting a new layout. Having this flexibility allowed me to plan my expressions more fully prior to the actual execution of the final composition. And while the time it takes to complete a project may be a legitimate concern for design professionals, both artists, and designers alike, will ultimately benefit by having the flexibility to experiment with different concepts on the computer.

Because production is an important part of the creative process, the following information illustrates some of the technical challenges that accompany the decision to produce work electronically, as opposed to traditional methods.

Determining the method of output for each illustration presented the first real technical challenge. Using a color copier controlled by an interface that allowed for the direct downloading of computer files via a Macintosh computer, I was able to receive immediate feedback in the form of a printed hard copy. Probably the single most significant drawback to computers being fully accepted by the art community, is the inability of the computer to accurately match colors displayed on-screen with that of the printed output. Using the color copier for output during the intermediate stages of development, I was able to edit colors until the desired palette used for presentation was achieved.

Because several of the illustrations contained EPS images, it was necessary to account for the resolution of the output device when specifying the optimum resolution of each image. Printing at an effective resolution of 400 spi (spots per inch), the color copier was capable of accurately reproducing a photographic image scanned into the computer at a resolution of 100 spi, without significant degradation in image quality. To ensure that each EPS image would print correctly, a resolution of 150 spi was chosen. Images that have been scanned into the computer at a resolution comparable to that of the output device may print sharper, but the increase is often minimal, and the chances of an error occurring during file downloading is significantly greater.

The final considerations that were made, prior to printing, were that of compression and transportability. Since the illustrations were created at an alternate location from printing, a method of transportation was required. Although some individual files were small enough to fit on high density floppy disks through the use of compression, repeated compression and expansion of a file may yield unexpected results during printing. Ultimately, it was decided to copy the files onto a Syquest Media Cartridge (a removable storage media with an effective storage capacity of either 44 or 88 megabytes), and transport them to the printing location where they could be copied onto a "Host" computer for printing.

5

The profound impact of electronic technology on the arts, and what it predicts for the future is only beginning to be fully realized. Although the first computer-aided artistic experiments took place over twenty-five years ago, computers have since been applied to every facet of the artmaking process. Future applications of this new technology will in no doubt transform the way art is created and perceived within our environment.

Suffering from both a lack of visibility and understanding on the part of the public, the mere mention of computer art usually conjures up images of "Algorithmic" or "Fractal" art, rather than the less publicized fine arts applications. Although it would be implausible to dismiss the influence that computer-aided research has had on computer art, it becomes ironic that the rejection of computer art was initially based as much on the dubious aesthetic quality of early computer graphics accomplishments by scientists, who were mislabeled as artists, as on a fear of the machine itself.

Today's dynamic computer programs have the ability to positively influence the perception of design and increase the comprehension of compositional principles. Due to the flexible nature of many software packages, artists are free to apply the principles of composition on an experimental basis. At the same time, they receive immediate feedback on their work, making for an effective learning experience based upon an understanding of the basic technology, as well as, traditional creative principles.

Artists and designers come to the computer with different abilities and objectives. They like using the computer because images and information can be easily and quickly recalled, allowing them to experiment and interact with the system. For some artists, the computer is merely a tool that facilitates design decisions; for others, the artwork itself assumes the form of direct computer output; still others think of computer output as the point of departure for further elaboration and execution in an entirely different medium. Access to more power at less expense has enabled artists to exploit the computer's full potential. In the past, in order to use computers, artists had to gain access to research facilities containing highly expensive scientific equipment. Now, with the advent of inexpensive and readily available personal computers and software, artists can develop their expressions with the ease that had once been associated with many traditional mediums. For a growing number of artists who have chosen to develop their images with computers, the challenge now is to reintroduce the tactile sense and immediacy that has become the signature of many traditional mediums.

Recent artistic accomplishments have clearly demonstrated the ability of an individual working with computer technology to assert a distinctive form of personal expression. Computer art may contain any or all aspects of a tool, a medium, or even a subject. Many artists who had previously focused on the computer exclusively as a tool, have reevaluated and transformed their total approach to the artmaking process, reflecting an evolving commitment towards legitimate artistic expression.

Art created on the computer provides an alternate form of learning, leading to the development of valuable skills and an understanding of the basic technology. Unlike traditional forms of learning, electronic technology has enabled the educational institution to prepare students for the information age by building on the home experience. After all, many students have already had access to the latest technology, in one form or another, prior to enrollment. With the increasing accessibility and affordability of computers, a growing understanding of the potential applications, the development of new software tailored to artistic requirements, and a greater commitment from museums and galleries alike, computers will not only change the way artists create art, but how it is defined as well.

6


SAVON AU
GOUDRON DE NORWEGE
DU
DOCTEUR LAURENT
EX-MEDECIN EN CHEF DES HOPITAUX DE ROUEN
PARIS


PARFUMERIE DU LEVANT
PARIS
SAVON MARTHA
Nº 292


SAVONNERIE
P. TRANOY
SAVON NOVIALA
AU SANTAL
No 359
PARIS
TOURCOING


OEILLET
N° 789
VICTOR
VAISSIER
PARIS

1 *Processor*

2 *User Interface*

3 *Tray 3 and Paper Tray Bypass*

4 *Film Projector*

5 *Sorter*

7

[1]Hank Nuwer, "The Digital Canvas." Compuserve Magazine, April 1992, 19.

[2]P.H. Emerson, Naturalistic Photography for Students of the Art (New York: Arno Press, 1973).

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