Computers and Appropriation Art: The Transformation of a Work or Idea for a New Creation

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Ever since cave paintings, artists have adapted compositions or pictorial ideas from each other's creations. To the uninformed, these adaptations or appropriations have not been appreciated for their originality or understood for their importance in the history of art. In fact, artists themselves often hide or fail to recognize that the source of their inspiration is from nature, fantasy, their memories or other artists' works [1].

With each new advance in computer technology I have continued to search for different ways to appropriate ideas, compositions and palettes as sources for inspiration—to create new visual imagery or to study great works of art with the purpose of understanding the artists' intent.

The question of originality is a frequent issue in the appropriation of art. According to art scholar Norbert Lynton, "Romanticism's insistence on originality would seem to forbid this kind of borrowing." However, he points out, art has always thrived on art and artists have always used and abused ideas they got from other artists: "It is of course the use to which such borrowings are put that justifies them" [2].

In this paper, I discuss some samples of my computer-generated works and samples of appropriations of a few Masters' works:

- **Homage to Duchamp, Nude Ascending the Staircase**, based on the appropriation of Duchamp's idea that a specific placement of images in two dimensions can suggest motion
- **Homage to Van Gogh's Starry Night**, a work in which I used the computer to analyze and then create a new work of art by reshaping several paintings—Van Gogh's *Starry Night*, Picasso's *Demoiselles*, Leger's *Three Women* and Rousseau's *Sleeping Gypsy*—into trapezoids to use as "brushes"
- **Beyond Picasso**, a videotape I created with the aid of the computer to keep track of lists of shapes and colors in my new arrangement of these elements to simulate one of Picasso's stylistic treatment of images
- **The Plum Tree Teahouse at Kameido**—Hiroshige's woodcut, Van Gogh's oil rendition of the same composition and my computer-generated interpretation of the same subject illustrate the use of appropriation for study and transformation
- **Leonardo's Last Supper**, which I appropriated and reconstructed as a three-dimensional (3D) model to be viewed in virtual reality to permit spectators to view my solution to the 500-year-old controversy over the fresco's perspective construction

*Leonardo's grotesques, thought to be influenced by adaptations of Northern humor as the grotesque Morescas [3]; Jerome Bosch's exaggerated features [4]: my grotesques influenced by both of these Masters' works; and, finally, a method for authenticating Leonardo's grotesques.*

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**Abstract**

From ancient times, through the Middle Ages, to the Renaissance and into the modern world, artists have learned from each other, from books and from exhibitions, appropriating and building on other artists' works. Today, each new advance in computer technology has facilitated the appropriation and transformation of a work or idea into new creations. The author discusses different ways to appropriate ideas, compositions and palettes as sources for new imagery. She provides background relating to her computer-generated works based on well-known artworks, along with examples of some Masters' use of appropriation in their own art.

**Fig. 1. Lillian F. Schwartz, Homage to Van Gogh, computer-generated work, 1986. The artist recreated Van Gogh's cypress tree by using the painting 'Starry Night' as her palette. She created the foreground with trapezoid-shaped "brushes" from Rousseau's 'Sleeping Gypsy'; the hills were painted with the same method, using trapezoid-shaped brushes from Leger's 'Three Women' and Picasso's 'Demoiselles.' (Copyright © Lillian Schwartz, 1984–1990)**
APPROPRIATION METHODS AND RESULTING WORKS

Appropriation of an Idea Rather than an Image

My first computer-appropriation work, completed in early 1970, centers on the concept of motion in the static image of Duchamp’s Nude Descending a Staircase. However, I used abstract images, rather than Duchamp’s recognizable imagery, to explore this notion in my Homage to Duchamp, Nude Ascending the Staircase (Color Plate B No. 2). The basis for Duchamp’s work was a “desire to break up forms—to decompose them much along the lines the cubists had done. But I wanted to go further. . . .” [5] Duchamp’s statement epitomizes the notion of appropriation art—in his case, taking an idea from the cubists and building on the concept of breaking up forms. In addition, Duchamp stated that he aimed for a static representation of movement.

Since this method of appropriation stems from a concept rather than an image, I did not scan Duchamp’s Nude into the computer to create Homage, but constructed my work based on the overall idea of Duchamp’s original work. I adapted a program, intended for drawing integrated circuits, to draw triangles in explicit locations. The program also permits the selection of thick or thin lines that can be exposed accurately onto film through the use of a computer-controlled laser. For the final work, the developed film can then be used as a pattern of the image to etch into copper, aluminum or brass plates. Just as Duchamp shifted and overlaid a photographed figure to create movement in abstract shapes, I arranged the triangular shapes to represent motion in Homage to Duchamp [6].

I used the computer to eliminate a number of the lines in Nude Ascending the Staircase and then replaced them, one at a time. This technique provided me with a unique way to study Duchamp’s method for achieving motion in a two-dimensional (2D) work. Later, I returned to his work—along with Muybridge’s photos of a man running—to build on the idea of reducing a moving figure to mere lines for a cinematic effect. The resulting film shows a series of figures formed of octagons [7].

Appropriating Paintings to Create New Works of Art

In the mid-1980s, I appropriated Van Gogh’s Starry Night to study his composition and colors. Richard Voss and I had digitized and stored more than 50 works of art from the New York Museum of Modern Art (MOMA) collection to create a computer-generated graphic announcing the opening of the museum’s newly renovated building. Starry Night was one of the works I selected for the announcement, along with prints, sculptures and other paintings such as Picasso’s Demoiselles, Leger’s Three Women, and Rousseau’s Sleeping Gypsy.

After we scanned and digitized the work [8], I color-corrected the images to match the museum catalogue’s reproductions as closely as possible. (All the works were kept in storage during the renovation.) I had a good deal of trouble balancing Van Gogh’s work and decided to divest the work of all color and then replace each color, one at a time. When examining the work’s composition without color, I realized that Van Gogh did not paint this work in a state of emotional frenzy as is commonly suggested. Starry Night is a carefully constructed work of art. Without color, the cypress tree in the piece hints at the structural and compositional influence of a Japanese print.

It is well known that Van Gogh worked from Millet’s woodcuts and that he had translated Millet’s unique way of carving wood into his handling of oil paints [9]. I began my recreation of the cypress tree by reversing the method of chiseling out areas of the wood and laying in positive images instead. Since the computer programs Voss wrote allowed me to shape the paintings into trapezoids, I was able to use the painting itself as a “brush” to recreate the tree in Homage to Van Gogh (Fig. 1). The positioning of the “Starry Night brush” in different shapes and sizes allowed me to give an illusion of more depth and direction to the tree than appears in the original painting. As a result, my cypress tree appears more three-dimensional than Van Gogh’s.

This method caused more of a chiseled look than I desired. To soften this appearance, I mapped images from Picasso’s Demoiselles, Leger’s Three Women and Rousseau’s Sleeping Gypsy onto the hills as trapezoids to form the landscape around the tree. I chose these paintings as “brushes” for their unique patterns and diversified textures.

The emotional impact of Starry Night and the whirling atmosphere caused by the dynamism of Van Gogh’s brush strokes provoked me to insert other paintings into my palette and use the paintings themselves as brush strokes. This emphasized some parts of the work while reducing the emotional impact in other areas. The very act of examining the separate elements while positioning the insertion points for the trapezoid-shaped “image brushes” when creating Homage to Van Gogh gave me a better understanding of the overall structure.

Art students sit in museums and copy great works of art to study them. Such intense scrutiny teaches composition, use of palettes and handling of paint. Now, with computers, the artist can use a variety of techniques to analyze artworks—such as the elimination of color to aid the examination of composition alone, or the magnification of a work to allow the examination of the individual color elements that make up each brush stroke.

The computer proved to be an invaluable tool for the intimate study of Van Gogh’s Starry Night and allowed me to maintain the integrity of the original composition while rendering a new computer collage.

Studying Stylistic Extremes and Constructing New Images

During my work on the MOMA project and color-correcting Picasso’s Demoiselles, I took advantage of the potential of the computer as an excellent tool—it allowed me to concentrate on the composition by removing all color and extraneous detail. It appears to me that the creative power of Picasso’s works are found in the overwhelming strength of their composition [10]. After the MOMA project was completed, I continued my work devising methods for using the computer to understand Picasso’s creative decision-making process.

In 1991, Picasso said that Van Gogh exerted a greater influence on him than did any other artist, specifically in regards to his handling of the brush: Picasso replaced his angular, discontinuous contouring with the more curvilinear patterning of Van Gogh. Once I had studied Van Gogh’s brush strokes in Starry Night, I decided to examine Picasso’s brush strokes. Picasso was influenced by Van Gogh. What could be learned from Picasso?

The piercing black eyes in a photograph of one of Picasso’s Self-Portraits (painted in Paris, Spring 1907 [11]) provoked me to prop the picture next to my computer to study it. Rather than digitizing the picture, I chose to work directly from the self-portrait itself so that my interpretation would be radically different from a direct scan of the image.
I used a mouse to sketch and then "paint" Picasso. My intent was not to imitate his brush technique but to use the self-portrait as a model to examine brush strokes and the way in which he handled shapes and light. The self-portrait was so compelling that I made multiple sketches, always starting with the first sketch and building on it. I removed and repositioned elements, changed them in size and orientation and, finally, added color. After exhausting my interpretations of this work, I was attracted to one of Picasso’s paintings of the Jacqueline of Rauvenargues series. The computer made it easy for me to move a reduced and completed version of the self-portrait to the side of the computer screen to make room for another head. I kept the self-portrait on-screen to make comparisons between the works. And, after completing the second head, I rearranged the composition again to make room for another version of Jacqueline. Since the sources of the self-portrait and the two Jocquelines were from different periods of Picasso’s work, I decided to explore the notion that the analysis of Picasso’s stylistic extremes might provide insight into his creativity.

Picasso often used the appropriation of visual themes or even compositions to work his way out of impasses [12]. In turn, Picasso’s work serves as a source for many artists. For example, David Hockney photographed a number of Picasso’s works, which he later “painted” onto his own canvases or used to serve as ideas for new works [13]. Since it is known that African sculpture inspired Picasso’s work—specifically Les Demoiselles d’Avignon—I examined his collection of photographs of African sculpture as well as the New York Metropolitan Museum’s collection. What did Picasso assimilate? What did he add or change? His fluctuations in style seemed to follow his appropriation, not only from these primitive sculptures, but from the compositional arrangements of, for example, Velázquez, El Greco and Cézanne.

Like Cézanne, Picasso created his own light sources to shape the faces in his portraits instead of using natural light sources [14]. I relied on the invaluable ability of the computing environment to determine light sources, fictional or real [15], and imitated Picasso’s use of arbitrary light sources for each element to direct the viewer of my work to the subject matter itself.

Just as Picasso mirrored the style of El Greco, I incorporated Picasso’s handling of contours, broken planes and distorted proportions to create a hierarchical arrangement of images. The stylistic changes from image to image were profound. To properly display the combination of different elements from each stage in Picasso’s stylistic evolution (with hints from his own appropriations), I used video to capture the changes. The result is a 3-min, 15-sec videotape, Beyond Picasso. I started with a style reminiscent of the manner in which Picasso painted his men. Then I cut and dissolved to other styles or themes, dipping back and forth between computer-generated images, including Picasso-like line drawings, then moving on to my own interpretations, effecting a number of subtle changes and culminating in the final images (Fig. 2).

Appropriation for Analysis and Change
While living in Japan in the early 1950s, I had the opportunity to study and acquire a number of woodcuts by Hiroshige, Hokusai and Utamaro. Hiroshige’s One Hundred Famous Views of Edo—composed of 119 wood block landscape and genre scenes of mid-nineteenth-century Tokyo—particularly influenced my work and continues, more than 40 years later, to be the source for many of my current studies.

In the middle of the nineteenth century, the European market was inundated with Japanese woodcut prints. Van Gogh was one of the primary artists who collected these works and showed their influence in his paintings. Besides the use of prints in his Le Père Tanguy and Self-Portrait with a Bandaged Ear, he translated two of Hiroshige’s prints into oils.

When Van Gogh began appropriating Japanese woodcuts into his art, his style of painting changed. He began using large, flat areas of color and dispensed with 3D perspective. His work, like the woodcuts, became more symbolic. He was so taken with these linear arabesques that he not only changed his handling of color and perspective, but also adopted the use of reed pens to simulate the woodcut technique.

To study Hiroshige’s woodcut and Van Gogh’s copy of it, I positioned the works side by side on the computer screen. I then magnified areas of the two images, such as the tree trunks, to compare the differences in the two Masters’ handling of texture and space. Both artists painted the gnarled trunks in a way that evokes a sense of the tree’s great age. With greater magnification, I was able to examine new, small shoots in detail. When I compared the colors on a larger scale than the eye alone could perceive, I was surprised to find that the greens in Hiroshige’s print were more muted than in Van Gogh’s work. Hiroshige’s view offers greater depths than Van Gogh’s, who in copying this work emphasized the flat 2D surface of the woodcut (Figs 3–5).

The influence of Van Gogh and Hiroshige is apparent in my early oil
Fig. 3. Hiroshige, *The Plum Tree Teahouse of Kameido*, woodcut, 1857. (Van Gogh Museum, Amsterdam)

Fig. 5. Vincent Van Gogh, *Japonaiserie: The Flowering Plum Tree* (after Hiroshige), oil on canvas, 55 x 46 cm, 1887. (Van Gogh Museum, Amsterdam) Van Gogh enlarged and transferred Hiroshige’s woodcut to his own canvas. Since the woodcut was too vertical to conform to the standardized format of the canvas, Van Gogh painted calligraphy on the sides.

Fig. 4. Vincent Van Gogh, *Tracing of Hiroshige’s Flowering Plum Tree*, oil on canvas, 1887. (Van Gogh Museum, Amsterdam)

Van Gogh enlarged and transferred Hiroshige’s woodcut to his own canvas. Since the woodcut was too vertical to conform to the standardized format of the canvas, Van Gogh painted calligraphy on the sides.

Fig. 6. Lillian F. Schwartz, *Computer Plum Tree*, computer-generated work, 1990. To appropriate Hiroshige’s woodcut *The Plum Tree Teahouse of Kameido*, the artist first digitized the original. Her version was made possible through a combination of software and the use of the mouse to input the drawing and colors. The colors of the computer work are more muted, and the composition has been altered slightly. (Copyright © Lillian Schwartz, 1990)
paintings, created before I began working with computers, in which I tried to match the colors as printed in a woodcut or the texture of the oil paints in Van Gogh’s *Sunflowers*. When I had the opportunity to work with Symbolics’ advanced graphic hardware and software, I found that I could simulate these two techniques by shading or texture-mapping with pleasing results. And, I had the added advantage of being able to store combinations of colors or textures to use together or separately, in a multitude of ways.

After studying Hiroshige’s original and Van Gogh’s version of the same subject, I began my work. Rather than having to draw by hand and enlarge a copy of Hiroshige’s woodcut, as Van Gogh did, I digitized and scaled the artwork and positioned the image on just half of my computer screen to allow space for my interpretation. Special-purpose software allowed me to divest the work of its color so I could examine the drawing alone. Symbolics’ paint program permitted me to make a palette of up to 255 colors or shades of one color or to interpolate between two different colors [16].

In most Edo woodcuts, the two most dominant colors are blue (Prussian blue) and red, with yellow appearing occasionally. I kept the basic composition but diverged from Van Gogh’s heavy application of oil and Hiroshige’s bright colors by using delicate, shaded colors. I was able to bring out a full range of pigments with the use of gradient colors, easily selected through the computer program. By selecting pure colors from the electronic palette and interpolating between them, I eventually created a set of soft, pastel colors to work with. I kept a gradual shading of colors in the background, as in the woodcut, but used my selection of subdued hues to effectively balance the colors. This was a simple task with the computer as my medium (Fig. 6).

Computer analysis of the oil brush strokes in Van Gogh’s copy of Hiroshige’s *The Plum Tree Teahouse at Kameido* demonstrates that the same composition interpreted in different media can provide totally different but equally satisfying responses. Each work is original in its execution. Van Gogh’s appropriation gives us another way to experience the *The Plum Tree Teahouse at Kameido*, as does my interpretation, in which I used the computer as my medium.

**Appropriation with the Purpose of Studying an Artist’s Intent**

Figure 7 shows a computer-generated model of the Refectory at Santa Maria del Grazie in Milan, where a fresco of the *Last Supper* is painted on a wall, demonstrate another purpose for appropriating art. Works that are permanent parts of architectural settings can now be reconstructed far from their installation sites to allow the study of the artists’ intent. A spectator can also experience a work through virtual reality, which provides the general public and scholars with interactive space/time experiences. These techniques aid my study of the controversy of what perspective Leonardo used to construct the *Last Supper* and my determination of the best vantage spots for viewing the fresco so that it appears as an extension of the real room.

In the mid-1980s, Donna MacMillan and I built a 3D computer model that allowed me to explore the notion that Leonardo used the “trickery” of the theater when he constructed the non-traditional perspective of the *Last Supper*. I also used the computer to compare the true linear perspective of the 3D room at the refectory with the 2D painting for a direct comparison to help determine the perspective construction Leonardo used in the painting. The *Last Supper* was scanned and digitized and positioned on a wall as it appears in the refectory. The results demonstrate that Leonardo began his work with true linear perspective, which he then altered to create a painting as if setting a stage [17].

The analysis answered major issues that have provoked scholars for 500 years concerning Leonardo’s *Last Supper*: How was the painting meant to be viewed? Why did Leonardo position the true vantage point above the viewer? Is there a place from the floor of the refectory where the painting appears to be an integral, 3D part of the actual viewing space?

Once the questions were answered, Michael Potmesil translated the database for the model into virtual reality to allow viewers to “visit” the monastery and experience the work as Leonardo intended. Instead of walking into the refectory and standing directly center-front and looking up at the fresco as visitors have done since Leonardo’s death, the visitor can now find the positions along either side wall in the refectory that give the illusion that the fresco is an extension of the real room. The viewer’s eye is drawn along the painted tapestries in the fresco and out onto a design that Leonardo painted on the refectory wall—supporting the feeling the monks expressed that Christ was in the room with them (see Fig. 7).

The virtual-reality program transmits images of the fresco onto two small screens—one for each eye—that are encased in a helmet, providing the user with
a stereoscopic pair of images, which adds depth to the perception of the room. Wearing the helmet, one feels as if one is inside the room with the fresco. Once inside, one can "move" about, viewing the fresco from different angles and getting a close-up view of any portion by using a joystick to manipulate the image.

Virtual-reality technologies can provide the general public with an inexpensive way to view, enjoy and understand the great artworks of the world. For the artist, art historian or art restorer, virtual prototypes can be set up anywhere on earth to allow interactive study, shared analyses and a permanent reference in case of damage to a work.

**APPROPRIATIONS BY A MASTER**

A few years ago I was invited by art historian Patricia Truitt-Coohill to collaborate on a study of over 700 grotesques by Leonardo. The plan was to build a database of the heads, which would then be compared with each other and with Leonardo’s own rules of proportions to determine if Leonardo conjured up these images or based them on real life. At the time of this paper, preliminary findings indicate that Leonardo’s grotesque heads probably grew out of his exposure to Northern humans of the Moresca grotesques as well as ancient terracotta and Medieval drolleries [18]. He appropriated these ideas to spur his creativity [19].

I first digitized a picture of one of Leonardo’s drawings depicting a face, in which he drew lines to show proportions for the positions of the features. I then digitized a small sample of Leonardo’s grotesques to compare with a “normal” face. Once the pictures were scaled and aligned, I substituted features from the grotesques for the features on the well-proportioned face and vice versa. I found that the exaggerated chins, noses, foreheads and mouths were interchangeable with the “normal” face (Fig. 8). The proportions seemed to work for both distorted and non-distorted faces. If the proportions were distorted then the face did not appear to be drawn from life.

Following these tests, I used a number of Leonardo’s grotesque features as the basis for my own series of grotesques (Fig. 9) and, eventually, made my own vocabulary of irregular features. In addition, I scanned a number of grotesque heads painted by Bosch into the computer to test them against Leonardo’s proportion drawing as well as a few of his grotesques. There are strong similarities in some of the features. If the features are overly exaggerated, the faces appear more cartoon-like. Since Leonardo’s faces seem to be based on the proportions of real people, his grotesques tend to look as if they were painted from life, while Bosch’s more contrived faces do not.

An interesting note is that the study of Leonardo’s grotesques was somewhat complicated by the fact that so many copies or appropriations of his grotesques were made while he was still alive [20].

To ensure that my study was restricted to Leonardo’s grotesques, I used his canon of proportions and found that Leonardo’s own rules offered a way to rule out the copies and authenticate some of the drawings that were questionable.

**CONCLUSION**

Creation is a process that begins with the initial instinct to express oneself and finishes in the attainment of the end result. The need to create can be triggered from within oneself, from nature, cultural surroundings or from other works of art.

For me and my audience, knowledge about the age in which artists lived and what came before and after their time provides a better sense of the historical and cultural placement of works of art. The use of the computer—with sophisticated software—can aid both the analysis of a work of art and the decision-making steps in the creative act.
In addition to studying, building on and appropriating masterpieces, artists through the ages have looked to other artists’ works not only for inspiration, but also to avoid repeating themselves—a pitfall that Leonardo advised against. Today’s computer technology enables artists to choose from a variety of methods to appropriate compositions and palettes to create new visual imagery and come to a better understanding of great works of art.

References and Notes
4. Jerome Bosch was a relative of Hieronymous Bosch.
11. Picasso’s *Self-Portrait* (1907) is in the National Gallery, Prague.
12. Lynton [2].
13. Peter Webb, *Portrait of David Hockney* (New York: E. P. Dutton, 1988) p. 110. Hockney’s appropriations of sections of Picasso’s works ended up in the canvases themselves in *Three Chairs with a Section of a Picasso Mural and A Chair with a Horse Drawn by Picasso*.
15. There are a number of special-purpose picture-processing programs and computers that can be used to analyze art. For the work discussed in this article, I used Symbolics’ S-Paint and S-Geometry and the Pixel Machine TM, a high-performance image computer, which offers super-computer power dedicated to 3D graphics and image processing. Symbolics is a high-performance system in which the interpretation of the hue, brightness and saturation of a color is provided automatically, one pixel or picture element at a time, and stored for later reference.
16. A digitized picture can be displayed on a screen and used to select colors to “paint” with, which are stored in the computer, thereby creating a unique palette for that painting or separate palettes of literally hundreds of colors and infinite shades between them.
18. Gombrich [3].
19. One of Leonardo’s students appropriated one of his Master’s now-famous grotesques, which was appropriated once again before it eventually was used by John Tenniel as the basis for *The Duchess Holding the Baby, with Alice, the Cook and the Dachshund Cat*, an illustration in Lewis Carroll’s *Alice’s Adventures in Wonderland.* See Gombrich [3] p. 68.