The Foundations of Adobe Photoshop

Image Technology
The term image technology is used to define any method used to produce pictures. Since the first images were painted on the walls of caves with pigment extracted from natural materials, new image technologies have been invented that visually express ideas and experiences. The process of technical evolution was slow in preindustrial societies. For thousands of years, images were created entirely by hand. Gradually, techniques evolved that enabled artisans to duplicate and transfer images. Eventually the pace of change accelerated to the point that, today, we see new innovations almost daily.

Images at one time were rare and precious but today they are ubiquitous in our culture and affect what we experience, how we communicate and how we think. This article explores how image technology has changed the culture and how the culture has changed image technology. Furthermore, Photoshop’s emergence as the legacy of image technology is also addressed.

A cave painting from Laxcaux, France 15,000-10,000BC
The evolution of the visual image is due, in part, to the methods available to the artist. Artistic styles are an expression of the periods that produce them. As technology evolves, new ideas and visual idioms emerge that reflect the spirit of the times.

This idea was quite apparent in the twentieth century from the speed in which new technologies emerged. The obvious changes in aesthetic values can be observed decade by decade as cultural, political, and technological influences affected visual expression. Each decade of the twentieth century can be associated with distinct aesthetic styles that are part of the ongoing development of our culture.

**Mosaics**

One significant milestone in the history of visual art was the ability to portray tonality. Tonality is the effect of changing light or color on an image. In the real world, we see a seamless continuum of blended color that defines our visual world in light and shadow, and produces a tangible, three-dimensional reality of color and form. Primitive artists made no attempt to express tonal differences, in part because the technology was unavailable to them.

If you think that tonal variations in digital images is a new phenomenon, think again. One of the first methods of simulating the effect of tonal variation was to place tiny individual units of slightly varied color next to each other. We see this technique commonly employed in mosaics from classical Greece and imperial Rome. Each element of color is a separate glass or ceramic tile. The tiles, placed next to each other in a graduated sequence, produce the effect of varied tonality.

**Photoshop and Mosaics**

The mosaics of two thousand years ago are the predecessors of today’s Photoshop images. Instead of tiles of glass, the digital artist uses squares of colored light called *pixels*. Today’s scanners can “see” and interpret color information from a continuous-tone image into these tiny units. When the image has been captured, we can select and change the color of pixels individually or in groups.
Creating images by applying color to a surface is one of the most basic forms of artistic expression; indeed, the history of the world can be viewed in the legacy of paintings that have been left behind by our talented predecessors. Throughout history, the technical and aesthetic qualities of painting have changed, various styles have emerged, and pictorial content has evolved. Representational painting dominated the world for centuries. Paintings contained content that could be easily recognized, whether the subject matter
Leonardo da Vinci, *Mona Lisa* (La Gioconda), Oil on Canvas, 1503

was religious, historical, or descriptive. Then in the late nineteenth century, artists began to abstract the tangible realities that they observed to produce art filtered through their personal experiences. Within 50 years, abstraction led to the creation of a totally nonobjective idiom in styles such as the Abstract Expressionism of the 1950s and the Minimalism of the 1960s. Still, the tradition of representation coexisted with abstract painterly forms, but it was reinvented time and again reflecting the time in which it was created.
Pop Art of the 1960s, for example, introduced us to the idea that the objects and icons of popular culture could be assimilated and even elevated into the realm of “pure art.” This concept was revolutionary because it changed the way we viewed the common elements of our culture.

Though the imagery has changed, the painter’s tools have remained pretty much the same over the centuries. Paint, palette, knife, brushes, solvent, paper, canvas, panel, and easel have been around for quite some time, having seen few refinements throughout history. Even the airbrush evolved from an air-driven breath atomizer that has been in use since the eighteenth century. The concept remains the same: mix colors on the palette, adding solvent if desired, and apply them to the painting surface with a brush, knife, airbrush or bucket.
Photoshop and Painting
The painting process has been revolutionized by Photoshop. Of course one doesn’t actually “paint” on a computer. The act of painting is simulated by the software’s graphical user interface. Color can be mixed and applied as if painting but instead of pigment, the artist is painting with light. Photoshop has numerous tools, operations and filters that enable you to make a photographic image appear as if it had been painted in virtually any style and with any paint medium. You have 16,777,216 colors to choose from and brushes of almost any size or shape with which to apply color.

Impressionism
In the 19th century, in an attempt to revive what was perceived to be the glories of the classical civilization of the Greeks and Romans, much of what was being produced in the art world consisted of the representational, idealized images of the Neoclassic style. In the latter part of the century, the nature of European art shifted. The Impressionist movement emerged with a fresh new approach to painting. Artists such as Claude Monet, Paul Cézanne, and Mary Cassatt produced paintings that were explorations of the quality and nature of light and color. The importance of the Impressionists’ contribution to the way we perceive color cannot be overstated. One particular group of Impressionists, the Pointillists—and particularly Georges Seurat and Paul Signac—most influenced the digital art we practice today.
The Pointillists worked extensively with color theory and how one color affects the colors around it. They applied paint to the canvas in units, or little dots, not unlike the pixels on a Photoshop document or the halftone dots on a color separation. They experimented with how the eye mixes adjacent colors. Placing dots of two opposite colors—red and green, for example—next to each other will produce gray when seen from a distance. The relative density of the dots affects the darkness and lightness of the perceived color and its tint. Pointillism influenced the development of process printing, which uses four colors to produce full-color images.

In four color process printing, each color plate contains tiny dots of color, either cyan, magenta, yellow, or black (CMYK). Like Pointillist painting, the densities of the colored dots on each plate influence the surrounding colors when the eye mixes them together.
George Surrat, Parade de Cirque (detail) 1889

Detail of a four-color process image showing the dot configuration of the CMYK halftone screens.
Photoshop and Four Color Process
Photoshop is the ultimate color separator. It configures and generates process-color separations from the red green and blue numerical values in each pixel and converts the values to CMYK dot densities. Furthermore, Photoshop has a huge variety of filters that can simulate Impressionist and other painterly effects to transform an ordinary photograph into a work of art.

Printing
Another significant change in the ability to produce images came about a thousand years ago with the emergence of woodcuts, which were used to print textiles. In the early fifteenth century, the use of woodcuts and wood engraving began to take hold in Europe as a method of producing pictures.

A woodcut from a Venetian edition of the Fables of Aesop, published in 1491

At about the same time, Johannes Gutenberg introduced the concept of movable type technology. Printing gave us the capability to produce multiples of the same image which was the first big step towards of mass communication. No longer would scribes have the laborious task of copying manuscripts. Movable type lead to wide spread literacy and ultimately an more educated population.
Moveable Lead Type

Of course, the printed image has evolved over the past five hundred years; we’ve invented numerous methods of imprinting ink on paper, monochromatically or in full color. In the case of traditional offset lithography printing, the process involves separating colors into their ink components and transferring the information to a piece of film and then to a metal plate. The plate is mounted on a printing press where ink is applied to it. The image is transferred (offset) to a rubber blanket mounted on a cylinder which in turn contacts the paper and imprints the image. The process is repeated for each color.

Photoshop and Printing
Photoshop is used to prepare images for almost any commercial printing technique, including offset lithography, silk screen, and digital press. Artists even use Photoshop to create and transfer images for traditional copper or zinc intaglio printing. The most direct method of printing a Photoshop image is to a laser or ink-jet printer, but Photoshop files can also be output to film recorders to generate color slides, RGB printers to print photo continuous tone photo quality prints, to imagesetters to produce high-resolution color separations on film, or directly to printing plates. Images can be printed to large format ink-jet printers to produce Giclee prints.
Photography

When you think of how many centuries passed in which images were created exclusively by hand, you can appreciate how revolutionary the photograph was. A crude type of camera called a camera obscura, which was invented in the beginning of the fourteenth century, captured and projected light on a surface. However, it wasn’t until 1826 that the first true photograph was taken. Early photographers needed special equipment and a broad knowledge of chemistry to produce photographs. As a result of the scientific and technical discoveries of the 19th and 20th centuries, cameras became more efficient and easier to operate. Now, millions of still photographs are taken and processed every day.

A camera is very much like the human eye. Light rays enter a camera and are focused on a surface into an image. Film rests on the surface and is exposed, causing a chemical reaction. The exposed film is then bathed in certain chemicals in a process called developing. If the film is a negative, light passes through it onto a piece of photosensitive paper. The paper is developed, stopped, and fixed, producing a positive photographic image.

Photoshop and Photography

As a result of the popularity of computer programs such as Adobe Photoshop, over the past ten years, digital cameras have all but replaced film cameras and become the state-of-the-art photo technology. The digital camera’s lens focuses light on a light-sensitive mechanism called a charge-coupled device (CCD) or a Cadmium Metal Oxide Semiconductor (CMOS), which changes the light into electrical signals. The electronic pictures can then be stored on disks and directly opened and manipulated in Photoshop.
Several features are specially designed to make the photographer feel right at home in the Photoshop workspace. In fact, Photoshop is a virtual darkroom that includes tools to dodge, burn, saturate, enlarge, crop, mask, and, of course, correct and adjust color.

**Collage and Photomontage**

In the early part of the twentieth century, the artistic revolution in Europe was shocking the world with images that had never before been seen. Instead of representational content, the pictorial sources came from an abstraction of physical reality or the realization of a personal, inner reality. Cubists, Dadaists, and Surrealists changed the face and meaning of art.

Before World War I, the Dada movement produced works of anti-art that deliberately defied reason. Growing principally out of Dada, Surrealism flourished in Europe between the world wars as a visual art and literary movement. Surrealist images had a dreamlike quality—time, space, and matter were completely malleable. Compelled by the idea that rational thought and behavior had brought the world close to the brink of annihilation, the Surrealists created images that were anti-rational and anti-bourgeois. Surrealist painters such as Jean Arp, Max Ernst, Salvador Dalí, Paul Delvaux, René Magritte, André Masson, Joan Miró, and Yves Tanguy created new worlds where the nature of reality depended only on the artist’s unlimited imagination.

Hand in hand with this new aesthetic freedom came new image technologies. For artists concerned with the free association of images and the meaningful relation of unrelated objects, collage was the technique of choice. The recycling of printed graphics and text in the form of collage was developed to accommodate the Surrealists’ need to create the visual non sequitur. For the first time, printed images from multiple sources were combined to produce a new pictorial reality. The Surrealist Max Ernst created a book called *Une Semaine de Bonté (A Week of Kindness)*, a pictorial novel consisting entirely of recycled engravings from newspapers, magazines, and catalogs (see Figure 1.8). This novel was a technical and aesthetic tour de force when it was published in 1933. It epitomized and refined the absurdist viewpoint of the Surrealists and the freedom and creativity in which they pursued their artistic vision.

New innovations in commercial art and graphic design blossomed along side surrealism in Europe in the 1920s and 1930s as a result of the instability brought about by the aftermath of World War I, the Great Depression, and the Russian Revolution. Movements like Constructivism, New Typography, and Dada recycled photographic images, typography, and graphics as collage elements in a new form called photomontage.
German political magazines and newspapers from the period, such as Simplicicimus, Der Knuppel (The Truncheon), and Arbeiter-Illustrierte Zeitung (AIZ, or Worker’s Illustrated Times), published photomontage images as biting satire to promote a socialist or anti-fascist political agenda. In the Soviet Union new forms of political and commercial art were emerging that were dedicated to proselytizing the communist agenda.

Photomontage is a collage of photographs from multiple sources that are carefully cut and pasted together to create a new visual reality. Often, type and other graphic elements are incorporated into the composition.
Cut-and-paste photomontage was an art form derived from the Cubist, Dadaist, and Surrealist movements, but was displayed in the commercial venue of magazine publications and posters. It was the predecessor of the digital composite images we see in many of today’s advertisements.

**Photoshop, Collage and Photomontage**

The ability to combine photographs, text, and graphics from multiple sources is one of Photoshop’s strongest features. Images can be collected from a scanner, digital camera, or Photo CD, and be composited, superimposed, positioned, scaled, flipped, rotated, and distorted.
Sculpture

3D art forms have also been with us since prehistoric times. Carved stone objects have been dated to as early as 24,000 and 22,000 BC. The urge to create in-the-round images certainly has motivated our species to develop methods to immortalize the reality and especially the human form. Like painting and other art forms, sculpture reflects the style of the time in which it was created. Images in stone, terracotta and bronze are found in public outdoor spaces and in museums and galleries of all the major cities of the world, and new innovative materials and forms are constantly emerging as technology evolves.
Photoshop and Sculpture

Here again, Photoshop never ceases to amaze. A very sophisticated set of 3D features enables the virtual sculptor to design in the round objects and scenes. A file can be rendered as a wireframe in a 3D rendering program and imported into Photoshop. Then in a special 3D workspace, it can be surfaced with a material skin, lit with multiple light sources and ultimately rotated in space to be viewed from all sides. Furthermore Photoshop has features that generate shapes from a menu and an extrusion feature that can twist and bevel 3D objects. Ultimately the file can be saved to a 3D format and incorporated into a video, carved with a robotic 3D carving machine or even printed on a 3D printer.
The Web

Within the past ten years, the world has been transformed by a powerful new invention. This new communication technology is as revolutionary as the telephone was and as ubiquitous as the automobile. Within a few years, it has embedded itself deeply in our culture and has affected how we communicate and how we conduct business. The World Wide Web is by far the most accessible communication medium. As a research tool, the Web gives us instant access to every conceivable form of information. The Web is the ultimate technical manifestation of democracy in that it embodies the essence of free speech and freedom of the press. Being the most unregulated of all publishing mediums, anyone can publish anything at any time.

The Web has changed the nature of how we handle pictures. Images can be transmitted electronically and downloaded, making access to them almost instantaneous, even at a distance.

An Adobe Creative Suite Web page
Photoshop and the Web
Many features in Photoshop are devoted to Web publishing. Methods for choosing, optimizing, and saving files in the appropriate format have been seamlessly integrated into the program, eliminating all guesswork. The Color Picker offers the choice of Web-compatible hexadecimal colors. The slicing feature enables users to reduce load times and isolate specific types of files. Photoshop also has a frame animation feature that can quickly and easily create motion graphics for the Web.

Images are Everywhere
The introduction of new visual idioms and technology into our culture not only affects the world of art galleries and museums, it influences advertising, architecture, industrial design, fashion and commerce. As new styles appear through commercial vehicles, they become an integral part of our culture. The same is true of new image technologies. As new ones are introduced, they become embedded into the production cycle of our economy.

In our contemporary culture, images are everywhere. Pick up a book, magazine, or newspaper, and images dominate the layout. Take a walk or drive, and you’ll see images on billboards, signs, and the sides of buildings. These pictures are the result of the work performed by artists, designers, illustrators, and photographers. The long history of humans making images is the culmination of the images we make today. The evolution of image technology has given us the foundation to create and manipulate images to visually communicate ideas in personal, commercial, or artistic venues.

Adobe Photoshop
Never in the history of image technology have we seen anything quite like Adobe Photoshop. Never has one single tool, studio, or machine combined so many powerful methods of working with images. And the tools for this purpose are in a single convenient location – in your computer and at your fingertips! Photoshop presents these possibilities in a most elegant, user-friendly environment; the virtual workspace.

Photoshop is the culmination of the evolution of image technology over thousands of years. It is a revolutionary new way of visually communicating ideas. It unites the vision of the artist with the technology of the moment. Since its first release in 1991, it has been the world’s most popular image making software because it endows its users with extraordinary capabilities. Photoshop endows its users with infinite possibilities for the creation and development of images for any form of publication. With Photoshop anything you can imagine you can create.