



Graphix F/X on the Mac

There are many ways to look at the subject of graphics.

Types of Macintosh Graphics Programs

There are three kinds of Macintosh graphics programs: *painting*, *drawing*, and *PostScript*. The three different program types have to do with how the computer thinks of your art. Each graphics program is designed to create exactly one of these types of art. Normally, you can copy and paste pieces of art between the different kinds of programs, although you may sacrifice flexibility.

Painting

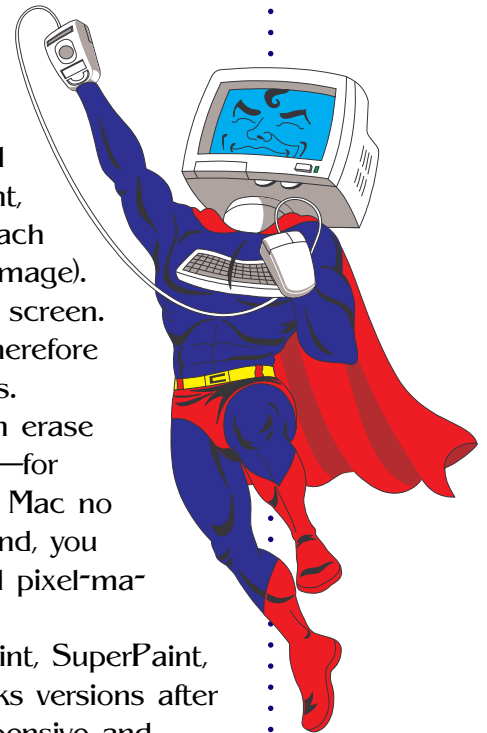
In painting programs, the Mac thinks in one-pixel units. (A pixel is one screen dot.) Therefore, to display a zebra in MacPaint, the Mac memorizes the exact status—black or white—of each of 414,720 pixels (that's how many are in an eight-by-ten image). In other words, the Mac stores what amounts to a map of your screen. It remembers the precise locations of all the black dots. Therefore we say that painting programs generate *bitmapped* graphics. When you lay down "paint," you turn white pixels black. You can erase them, but you can't change the original *shape* you painted—for example, a circle or a letter of the alphabet—because the Mac no longer thinks of them as a circle or letter. On the other hand, you have control over each individual dot. You also have special pixel-manipulation tools like the Spray Can and the Lasso.

Most painting programs have the word paint in the title: MacPaint, SuperPaint, etc. HyperCard's art tools are also painting tools. ClarisWorks versions after 2.0 have a painting module. Believe it or not, the most expensive and powerful graphics program of all, Adobe Photoshop, is a painting program too—actually a very, very sophisticated version of MacPaint.

Drawing

Drawing programs create what are called object-oriented graphics. When you draw a in circle a drawing program, the Mac doesn't store it as a map of dots. It remembers that you drew a circle of a certain shading and size. That means that you can never speckle over it, and you can never erase (or remove) just a chunk of it.

There are two powerful advantages to drawing programs. First, objects remain objects. After you draw a circle, you can return to it later and move it by picking it up and dragging it. You can overlap another object on top of it—and later change your mind. You can change a circle's color and shading long after you drew it. Or you can pull a shape's handles to make it larger, smaller or to stretch it.





The identical graphic, done as a bitmap (top) and as object-oriented art (bottom).

The other advantage of drawing programs over painting programs is in printing. As you probably know, the resolution (number of dots per inch, and therefore clarity) of every Mac printer sold today is greater than what you see on the screen (72 dpi). So every printout looks smoother and sharper than its on-screen counterpart, except bitmapped artwork. A printout from a painting program can look just as jagged on paper as it did on the screen. But when the Mac prints from a drawing program, it doesn't tell the printer "three black dots, then a white one...". Instead, it says: "A circle, one inch tall." The printer can now put on the page a circle, one inch tall, at the printer's much higher image quality. The Graphix example shows the identical artwork, one was drawn in ClarisWorks' painting window, and the other in its drawing program.

PostScript Drawing Programs

PostScript drawing programs, like Macromedia FreeHand and Adobe Illustrator, are high-end, expensive, and really tough to learn. But their amazing output shows some of the most striking work the Mac can do. This is the kind of work you see in package designs, album covers, and technical drawings.

In these programs, you work with lines on the screen called paths. As in object-oriented drawing programs, you manipulate objects in a PostScript drawing program after they are drawn. But unlike in a drawing program, you do most of your work in a wireframe mode, where none of your objects are opaque, and lines have neither thickness nor color. You see only their outlines. An editable Preview mode (available in both Freehand and Illustrator) shows you what your objects and text will look like when printed—with opacity and color—but it's slower than working in wireframe mode.

Because PostScript line drawings of this type are so striking when printed on laser printers and (in particular) imagesetters (professional publishing equipment), other kinds of graphics programs have begun adopting features from PostScript programs. ClarisWorks, Photoshop, Canvas, and other drawing programs now include a "freehand tool" of some kind (one that works like the pen tool in FreeHand or Illustrator).



Vector Images

Vector images are comprised of lines and curves and, therefore, print crisp and clear no matter what the size. These are created with the PostScript (EPS) and drawing programs we discussed.

Raster Images

Raster images are bitmapped images discussed in the Painting mode. These images are not scalable to the same degree but can be edited in programs like Photoshop and ClarisWorks. TIFF, PICT, GIF, and JPEG formats are raster images.



File Formats

In the Mac universe, the most common graphics formats are TIFF, PICT, and EPS. And for the World Wide Web, the graphics formats are GIF and JPEG. These are not the only formats you will ever have to deal with, but they are the most general. As you'll see, each file type came into being for a reason, and each has its limitations. Fortunately, most graphics programs can open and save most of the common and even the less-common graphics formats.

PICT files

A PICT file is the one you're probably the most accustomed to using. They're everywhere and have been since the beginning. Mac file icons are little PICT files. So are the snapshots you take by pressing COMMAND-SHIFT-3 in System 7. At one time, PICT was also the native format for most drawing programs, because a PICT file stores all the relationships between grouped objects. (The original PICT format was black-and-white, like the Mac itself. When Macs went color, the color images were called PICT2. Today, programs generally don't make a distinction. PICT is PICT, no matter what color it is.)

The only significant problem with PICT files is that their precision isn't great. A PICT file may know that a line is supposed to be very thin, for example. But it will round that line off to its nearest approximation of its original width value—half a point, for instance. As a result of the PICT format's lack of precision, you may find slight misalignments and changed line thicknesses when you transfer a PICT file to another program.

PICT is the Clipboard's natural graphics mode. If you draw a nice precise diagram and then copy it, your fine hairlines and careful alignments are already gone before they're even pasted into the Scrapbook! The Mac's Drag-and-Drop abilities help bypass this problem.

If your work requires the kind of accuracy that the PICT format can't deliver, there's only one way out: save the graphic as another format.



Black/white bitmapped graphic (6K)



Color PICT graphic (50K)

TIFF files



Color scan TIFF graphic, (546K)

The TIFF file format is something like a very high-density bitmap (painting). (TIFF stands for *tagged-image file format*; the "tags" are encoded "hints" that accompany the graphic data to enhance its appearance.) Most TIFF files start out life as the product of a scanner. It's like the scanner's camera takes "picture" of a photograph and converts it to pixels. TIFF files take up a lot of disk space. Some



graphics software was endowed with various TIFF compression (LZW) schemes in an effort to reduce the size of files. As a result, today's TIFF files can occasionally be troublesome to exchange between programs. This problem is getting better as LZW becomes the compression standard, and upgrades to programs include better TIFF filters. As a note, Photoshop will open almost anything.

EPS files

The Encapsulated PostScript file format, developed by Adobe, contains PostScript-language image-description codes. PostScript is the language your Mac speaks to PostScript laser printers (and high-end Linotronic printers).

In other words, when your Mac prints an EPS file, it's speaking your printer's language. The program containing the EPS file doesn't say to the printer: "Pixel number 1 is dark. Pixel number 2 is white." Instead, it sends a stream of mathematical descriptions: "Draw a .33-inch thick line starting halfway across the page" and so on. EPS printouts, therefore, are among the highest quality the Mac can produce.



Black/white EPS graphic (20K)

Because printing EPS files involves this transmission of computer code, the potential for foul-ups is much greater. Documents that contain EPS files are among the most likely to give you printing problems. An EPS file may contain references to fonts that are no longer in the Mac. An EPS file's instructions may fill up (and overwhelm) the printer's memory. This is also a reason that PostScript printers cost more — besides the licensing fee they have to pay Adobe, PostScript printers generally come with more memory and are upgradable for really big graphics print jobs. Remember that EPS files look great when printed — if they print.

EPS files come in two parts. The critical part, actually, is invisible to you. It's that stream of PostScript instructions. These are for the printer's benefit. For your benefit, most EPS files include a second component: a PICT file. This is the on-screen stand-in for the printer instructions and may make you think that the image isn't as wonderful as advertised. The PICT-file portion of an EPS file is actually optional. You may run across an EPS file that's represented on-screen simply by a big X in a box with the name of the file — but which prints out beautifully.

GIF files



Color GIF "button" (1K)

GIF (pronounced giff or jiff) stands for *graphics interchange format*. It began on CompuServe as a means of making graphics available to users of any computer model. It is now the standard graphics format used on the World Wide Web. A GIF file can have a *maximum* of 256 colors (and often use less) — no photorealism. GIF files are low resolution, but the file size is very small. Size is critical on the Web since it directly affects the amount of time a page takes to load on a browser. Remember, GIF files were never meant to be manipulated or printed, just viewed on 72-dpi monitors.



JPEG files

A bunch of computer-graphics experts, known as the Joint Photographic Experts Group, came up with a formula for compressing graphics files, especially scanned photos, so they took less disk space and take less time to send over the modem. This scheme, named JPEG compression, succeeded impressively at reducing the size of graphics files. When your computer stores a file this way, it actually discards much of the color information (making the file smaller). It turns out you can throw out more than half of the color information from a typical photo and, upon reopening it, not notice that anything is different.

This makes the JPEG compression format different from any other Mac file format. They call this "lossy" compression because there's some data loss; thus you can't run a file through JPEG compression more than once.

JPEG files have more than 256 colors, and so look better than GIF files, but they are larger as a result. They are still generally only 72-dpi. JPEG has become the standard for displaying photographs on the World Wide Web.



Color JPEG graphic (46K)

PNG file format

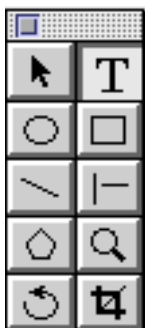
There is a new format you may have heard about, called PNG (portable network graphics). Pronounced "ping," it was developed in direct response to legal problems from CompuServe demanding licensing and royalty fees from developers who use GIFs in their products.

PNGs can be 256 indexed color or RGB (millions) color and they use a lossless compression. They also apparently have the ability to correct their brightness depending on the monitor on which they are viewed.

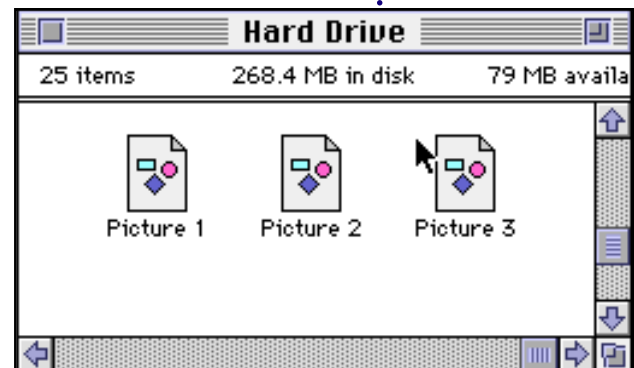
Only newer browsers and graphics software recognize it. So, we'll worry about that one later if it really does end up becoming a standard.

Because JPEG, GIF and especially PNG files are a fairly recent addition to graphics formats, some programs still don't recognize and import them. PageMaker and Photoshop will recognize them. GraphicConverter, JPEGView, GIFConverter and GIF Watcher are JPEG and GIF-opening shareware programs.

Screen Captures



On a Macintosh you may capture a copy of the image of your screen. Really! This is great for documentation on how to use a program. Command-Shift-3 will make a camera shutter sound and Picture 1 (or 2 or 3, etc.) will show up on your hard drive. (Screen captures are also a great way to document those cryptic error messages for technical support.)



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