

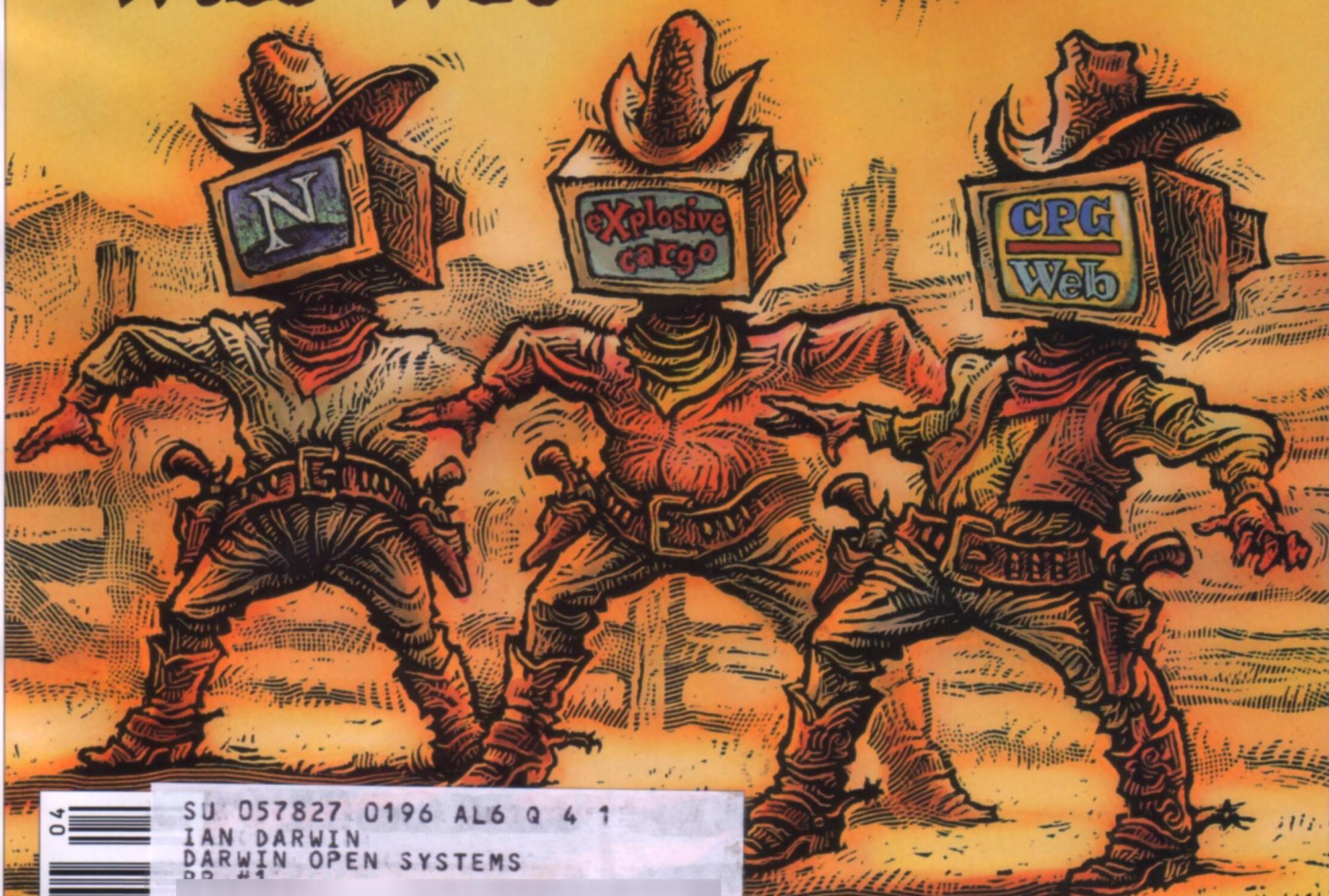
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UNIX-TO-PC SOLUTIONS

THE WILD, WILD WEB



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IAN DARWIN
DARWIN OPEN SYSTEMS

Threads: Advanced Techniques

Reviews: Photoshop 3.0, Qualstar TLS-4210



Fun with Graphics Programs and a Tape Library

This month Computer Publishing Group reviews a graphics program we couldn't tear ourselves away from and an automated tape library with impeccable mechanics.



Reading preferences...

Adobe Photoshop™ 3.0 for Sun™

Scott Byer, Marc Pawliger, Allen Chan, Jeff Chien, Paul Asente, Doug Tomm, David DiGiacomo
Jon Ferraiolo, Jerry Granucci, Vicki Shipkowitz, Kathy Foote, Jackie Lincoln-Owyang
Thomas Knoll, Mark Hamburg, Kevin Johnston, Douglas K. Olson, Sean Parent, Zalman Stern

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Adobe Photoshop 3.0 for Solaris 2

by IAN F. DARWIN

This is one of the hardest reviews I've had to write in a while. Not because the program is hard to use, nor because my hard disk crashed. None of the usual excuses apply. No, the problem is I'm having too much fun using the program to want to

bother writing the review. But I hear my editor calling from down the hall, so here goes...

Adobe Systems Inc. Photoshop is yet another in the series of major graphics applications being ported to UNIX by a major Macintosh/PC software house (see "An Illustrious Illustrator," August 1995, Page 64). Most graphics programs fall into one of two categories: object-oriented drawing programs like Adobe's Illustrator, Corel Corp.'s Corel

Draw and the Free Software program XFig; and bitmap or paint programs like Photoshop, Corel Paint and XPaint, also in the public domain.

In "draw" programs, each object (line, circle, square, text, freehand shape) is stored as an object and can be manipulated independently, even long after its creation. When you scale an object very large, it is redrawn with smooth lines or curves.

In "paint" programs, the canvas is essentially an array of pixels, and once something has been painted there, it becomes an irretrievable part of the canvas. When you scale the canvas larger, you see "jaggies," the jagged lines shown where the individual pixels are scaled upward.

Photoshop is a paint program but has several object-like features. And, as the name implies, Photoshop was originally designed to be used with scanned photographs, but it does much, much more than that.

Hey there, calm down! Mr. Protocol is whining about why that Darwin guy is going on again about some Mac-geek graphics software. Well, it's true that Photoshop had its genesis on the Mac, but it has since spread to Microsoft Corp. Windows and, most recently, to UNIX. UNIX in this context means Sun Microsystems Inc. Solaris and Silicon Graphics Inc. IRIX, the former for its volume leadership and the latter

for its slightly sprightlier graphics. And not only is Photoshop the best way to produce those neat pictures that you see on Web sites around the world, but it can also be a lot of fun, for the sheer pleasure of seeing graphical images appearing in front of your eyes. Throw Mr. Protocol some Big Stuf Ding-Dongs and he soon calms down.

Now where was I? Photoshop 3.0 has a very comprehensive selection of imaging tools, with many more available as "plug-ins" (see "Photoshop Plug-ins"). Most Photoshop "wannabes" implement some subset of this collection of imaging tools. For example, Mentalix Inc. Pixel!FX implements an image editor that is remarkably like Photoshop in layout, although the icons look quite different (to prevent look-and-feel suits?). The Pixel!FX icons are in color rather than gray scale, and are in a different order.

Photoshop has the advantage over most wannabes of being fully cross-platform, that is, it runs on Macintosh, where the serious graphic designers are, on Microsoft Windows 3.1 and Windows 95, where the mass market is, and on UNIX, where the good guys are. It also has the advantage of being a mature package, with most of the slick features you'd expect. It works pretty well under UNIX. And it's used widely enough that you can find textbooks on it and even a Usenet newsgroup.

File Formats, Color Models

Photoshop can read a variety of standard file formats, including GIF, TIFF, JPEG and Sun Raster, as well as its own format. It can even open PhotoCD files. Photoshop's own format is not only a raster file but can store quite a bit of additional information about a file. As we will see when we discuss plug-ins, additional file formats can be added to the package at any time.

Since it's designed for use by graphic arts professionals, Photoshop has to support a wide range of color models. The colors in an image can be stored as RGB (red, green, blue) as is used in computer monitors and World Wide Web images, in CMYK (cyan, magenta, yellow, black) as is largely used in the printing industry, in Indexed color (similar to what GIF uses), or another

scheme called Lab colors.

You can convert from one model to another by selecting from a menu. Note that some operations will only work in certain modes. During conversion, where no equivalent color exists, one will be substituted. You can have Photoshop warn you if colors will be lost or can't be stored in certain modes. You can also have gray-scale or even bitmap files.

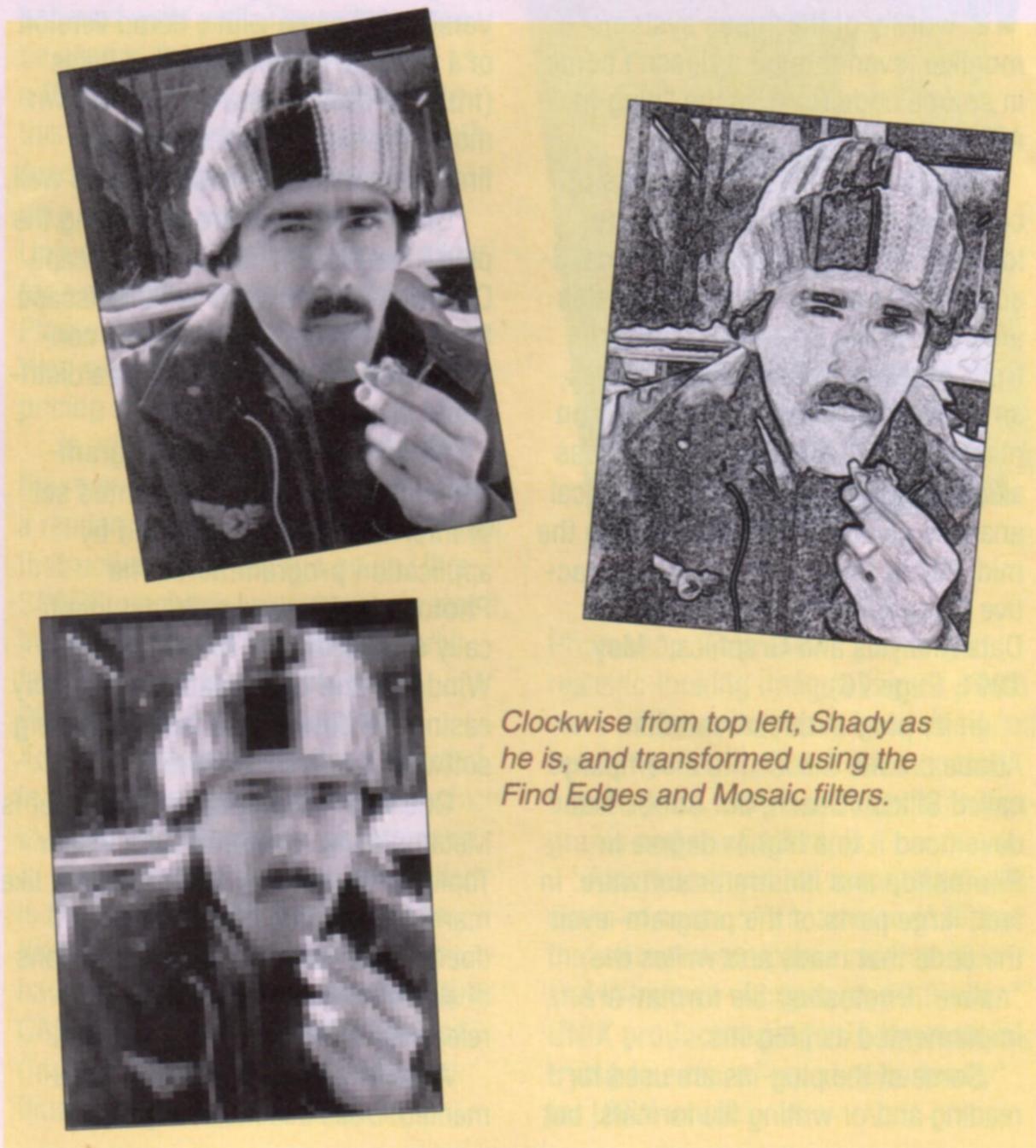
There are more filters than you can shake a light saber at. The displacement filter lets you displace the pixels of an image by using a second image, the "displacement map." Light regions on the map move pixels up or to the right, neutral tones cause no motion and dark regions move pixels down or to the left. Sound weird? It is, but look at some of the effects it can do. The map can be small (and therefore tiled), or large, possibly based on a modification of the image you're working on.

Here is a list of the filters bundled with the basic Photoshop 3.0:

- Blur: blur, Gaussian, motion, radial

- Distort: displace, pinch, polar, ripple, shear, spherize, twirl, wave, zigzag
- Noise: add noise, despeckle, dust & scratches (for retouching old photographs)
- Pixelate: color halftone, crystalize, facet, fragment, mezzotint, mosaic, pointillize
- Render: clouds, difference clouds lens flare, lighting effects (simulates lights shining on object)
- Sharpen: sharpen, sharpen edges, unsharp mask
- Stylize (painterly, impressionistic): diffuse, emboss, extrude, find edges, trace contour, solarize, wind
- Special-purpose: custom convolution, high-pass, maximum, minimum, offset

There's not enough room in this article to explain them all, let alone show them all. The images below show my pal Shady as he is, and as he looks when transfigured by the Find Edges and Mosaic filters. In addition, each filter has two or three adjustments, so you can get a phenomenal range of variations.



Clockwise from top left, Shady as he is, and transformed using the Find Edges and Mosaic filters.

And that's not to mention all the third-party filters. SoftImage Inc. has three volumes of a dozen Painterly Effects on UNIX. Aldus Corp. has about the same number of Gallery Effects, in two large volumes, for Macintosh and PC; this is part of the business that Aldus transferred to Adobe, so you can get Macintosh and Windows versions from Adobe.

Metatools Inc. makes Kai's Power Tools, which also run only on Mac and Windows. Fact is, if you're truly dedicated, you can write your own filters. The Software Developer's Kit is included on the CD-ROM, and gcc is free for the downloading, so anybody who knows C and has a bit of imagination can become a Photoshop developer.

In addition to the filters and conventional tools, there are some neat effects built into some of the other tools. The Rubber Stamp tool (yes, that's its official name) copies parts of

an image to elsewhere in the picture. It can be used to duplicate items or to cover up flaws in a photograph. The Smudge tool lets you smear digital ink, rather like the effect of smearing paint.

The Pencil, Paintbrush and Airbrush tools let you draw freehand. The Pencil tool makes hard-edged lines. The Paintbrush and Airbrush tools behave much like their traditional namesakes and have controls that allow you to vary the look you get.

More OO-ness is available with the Path tool, which lets you draw paths like those used in Illustrator. In fact, you can save a path and even export into Illustrator to have effects like Path Type applied to it, then import the Path Type back into Photoshop. Paths can also be used as "clipping paths" to merge a photograph with artwork drawn in Illustrator. This method allows you to accurately define the edges to which a photo is to be clipped.

The Selection Model

The area that you work on is called the selection. A selection can be part of an image, but can be much more complex—all the sections with an exact color tint, or the letters of some text you are adding to an image, for example. In fact, Photoshop's selection model is years ahead of simpler paint programs.

Of course you can select a simple area, such as a rectangle or ellipse. Once a region is selected, you can cut it, move it, paste other image data into it, color it, scale it, rotate it, distort it, stroke (shade) the outline of it as a line of a given width, filter it through any of the plug-in filters, or slice and dice it.

But there's more. Once you have a region selected, you can "feather" it. Feathering softens edges and is the quickest way to make an image fade to a background, or another image. Many of the cute overlays you see on the Web are done this way.

PHOTOSHOP PLUG-INS

What makes Photoshop doubly worthy of the "open systems" moniker, even though it doesn't come in source code form, is the "plug-in API" concept.

Plug-ins are separate portions of compiled executable code that are loaded into an application when needed. The first place I came across this idea was in the Speakeasy system from Argonne National Laboratories, an application framework that ran on mainframes in the mid-1970s. It was also used in the similar "S" statistical analysis package from Bell Labs in the mid-1970s (see "S-PLUS: An interactive Programming Environment for Data Analysis and Graphics," May 1991, Page 76).

In its plug-in documentation, Adobe credits the idea to a company called Silicon Beach, but Adobe has developed it to a higher degree in Photoshop and Illustrator software. In fact, large parts of the program—even the code that reads and writes the "native" Photoshop file format—are implemented as plug-ins.

Some of the plug-ins are used for reading and/or writing file formats, but

many are used for graphical effects. Version 2.5 came with a demo version of a package called Painterly Effects (from SoftImage Inc., the well-known movie production effects software firm). It works with Version 3.0 as well.

Other companies are now using the plug-in approach, including Netscape Communications Corp. in its Netscape Navigator 2. Sun's Java applets concept can even be thought of as a distributed plug-in API.

An API, or application programmer's interface, is a documented set of interfaces that can be used by application programmers. The Photoshop API works almost identically on Macintosh, Microsoft Corp. Windows and UNIX platforms, greatly easing the developer's task of moving software between platforms.

One well-known plug-in developer is Metatools Inc., maker of Kai's Power Tools for Photoshop. Unfortunately, like many Mac-centric developers, it doesn't plan on making UNIX versions of all the tools. Metatools recently released a Windows 95/NT version.

Adobe's plug-in interface is documented. Does this mean any C pro-

grammer with half a brain and some patience can write a Photoshop plug-in?

To test this thesis, I wrote a plug-in to import a file format that I needed. A friend of mine has a Silicon Graphics Inc. IRIX with a video camera and occasionally sends me pictures from it. But I run Photoshop on a Sun SPARC system (surprise, surprise). There is an SGI-format import filter, but it was provided directly by SGI and for some strange reason SGI didn't produce a Sun version. So as an exercise, I wrote a "file format filter." There were few surprises (other than that it now works!). It was based on the plug-in documentation from Adobe and the SGI format document obtained from SGI's FTP site (thanks to Paul Haeberl of SGI for some test images). If you would like this plug-in, it's available from CPG's Web site (see "Photoshop Resources").

Adobe also has a GIF89 plug-in, which is available free from the company's Web site. It is primarily used for writing GIF files for use on the Web. BoxTop Software's shareware GIF89 plug-in, PhotoGif, is a slightly fancier way, but is not yet available

But there's more yet. You can also select regions in more complex ways. You can trace a shape freehand, such as the outline of a person's head and shoulders. Having done so, you will probably never want to do it again, so you'll be glad to know that you can save it into a "channel"—about which more later—so you never have to repeat a complex tracing.

An even more powerful selection tool is the "magic wand" feature that lets you select entire objects as long as the color is relatively homogeneous and distinct from the background, giving it a sort of object-oriented draw program flavor. Of course, you can control how similar the colors have to be to match. And you can select multiple "object" areas this way, one at a time, each of which can be of a different color range. Then you can cut them, move them, paste into other selections, color them and so on. Get the picture?

While you're working on it, the selection "floats" above the image. The selection is indicated on screen by a very thin outline that appears as a rotating thread, like an old-fashioned barber's pole. Some people refer to it as "the marching ants." Whatever you call it, it makes it easy to see which pixels are included in the selection. Those pixels are merged into the image once you indicate that you're done with them, or "defloat" the selection. A particularly troublesome aspect of Photoshop 2.5 and earlier versions was that once you defloated a selection, it became part of the image, replacing what was there before. If you did anything at all, and then realized that the positioning was off by a little bit, you were sunk.

Because Photoshop is a paint program, not a draw program, it only has one level of undo per file. You can save your file, then try a series of changes, and "Revert" if it's not what

you want; alternately, you can "Save a snapshot," which saves a copy of your current image in a temporary holding buffer. But you don't have "infinite undo" as in draw programs like Illustrator, and in modern text editors.

Beneath Yonder Layer...

Some of these drawbacks have been eliminated by a technique called Layering. Previous versions of Photoshop had a feature called "channels." Channels, still used in Version 3.0, are like scratch files—they hold transformations and images, and selections and "masks."

Masks are images that mask off parts of your main image to, for example, show a person's head but not their body, or their head but not the background. Channels can also be used for powerful transformations on images, using combinations of the "Image->Calculate" menu. Some people swear that this is

for UNIX.

Another major use of plug-ins by the graphics arts industry is to drive SCSI scanners. These could be platform-independent, but tend not to be due to the intricacies of driving SCSI devices. Several plug-ins are available for UNIX.

I chose to try out Mentalix Pixel!SCAN scanning software, because it ran on my ancient HP ScanJet II, a gray scale-only scanner. The software is part of Pixel!FX, a full-blown image editing tool that can almost compete with Photoshop, but unfortunately we don't have space for a fair comparison. Mentalix' software, like that from Apunix Computer Services and Pictronics Corp., includes among other things:

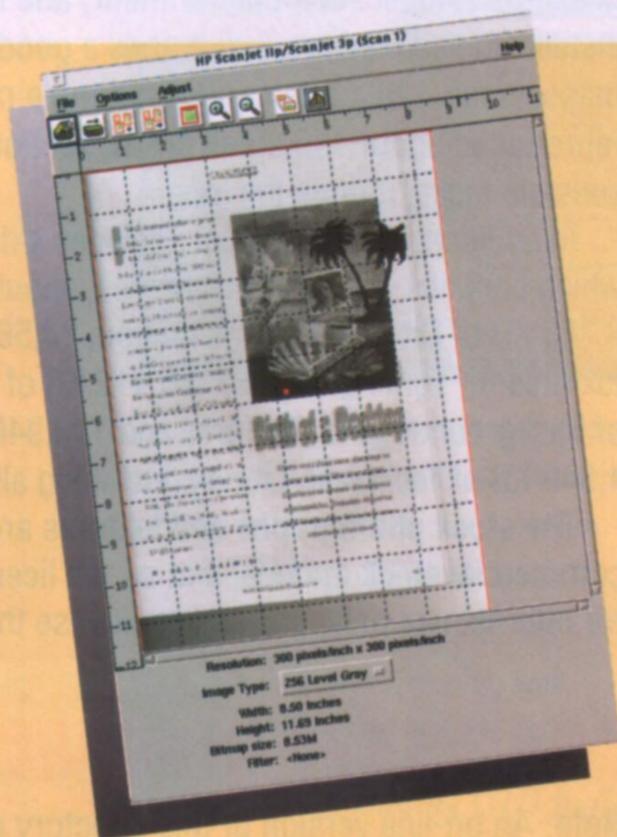
- Scanning, either stand-alone, under Pixel!FX, or Photoshop
- Image Database, for storing and retrieving images
- Optical character recognition (OCR) capabilities
- File format conversion
- Batch mode (using Tcl as a scripting language)

We only had time to check out the

scanning feature and the OCR. Both behaved quite well. The scanner can be used in three modes, including as a Photoshop plug-in, PFX-Plugin. In this mode it worked quite nicely. Both Apunix and Pictronics were willing to ship software and even hardware. Unfortunately, deadlines did not allow for a comparison of their products. Please do so yourself. Check out their Web sites for product information, pricing and so on.

In addition to the filters described in the main article, Adobe has just put out a rendering filter that uses Sun's Visual Instruction Set when run on an Ultra-SPARC machine. I was unable to test it, but Adobe claims it is spectacularly fast. This filter is available free to Photoshop 3.0 customers from Adobe's Web site and will be included in a forthcoming update release (which is going into beta as we go to press).

Another filter, this one unbundled, is the CAD Import Filter for Adobe Illustrator (not Photoshop). If you have bought both tools and have this CAD disk, you can import CAD files (in common formats like DXF) into Illustrator, then render them in



Pixel!SCAN worked well.

Photoshop. This allows you to get realistic-looking images in your photo work of items that have been designed but not yet built. Watch for a special bundle price, which includes both programs and the CAD tools.

Also watch out for more UNIX versions of some of the advanced filters that sometimes appear only on Mac and Windows versions—the current UNIX product manager is aggressively trying to ensure "equal opportunity" for UNIX users.

ADJUNCT PROGRAMS

Photoshop comes with many of the same adjunct applications as Illustrator:

- dpsNX for running on X servers that lack Display PostScript
- TypeInstaller for adding Type 1 fonts to your server
- PostScript viewer, like Sun's Pageview

Adobe TypeInstaller adds Type 1 fonts to your X server. Through various promotions, you may get a copy of Adobe's Type on Call CD-ROM. This CD features hundreds of quality Type 1 typefaces from Adobe and Berthold, which are encrypted. For a small fee, you get a password that unlocks and installs them on your system. You get four free passwords to start, and others can be had by calling Adobe. Type on Call does give you many font options to choose from. Any of the other Type 1 fonts available from font foundries or on the Internet can also be used.

One related but unbundled tool that still doesn't run on UNIX is Adobe's Streamline, a tool for converting "in the other direction," such as logos. Streamline converts raster images that have been scanned (or even pictures produced by Photoshop) back into object-oriented PostScript files for editing by Adobe Illustrator or another drawing program. On Mac and Wintel platforms, it even uses Photoshop plug-ins so you can scan directly into Streamline instead of scanning to disk first. And it does a good job of converting raster files into editable artwork.

I've had a chance to play with Streamline (running on Solaris under Apple's Macintosh Application Environment) and it looks pretty good, though hard to install. On scanned artwork it does a good job and has settings galore. To be masochistic, I told it to convert a simple raster picture of yours truly, and it reproduced about 150 small drawn sections that looked rather silly. But for sensible tasks, it does the job.

In addition, the distribution includes a directory called PhotoshopExtras_3.0 which contains, as the name implies, about 150 MB of extra stuff, including: 8,705 KB of On-line_Documentation; 20,565 KB of Other_Goodies, mostly textures for lighting effects; 125,412 KB of Stock_Art, comprising 24,464 KB of Backgrounds_and_Textures and 100,946 KB of Stock_Photography; and 1,548 KB of Technical_Library, including all the Adobe technical notes.

The stock photography and textures are wonderful, but they are samples of commercial stock material and so the licensing on them is restrictive—they are for internal use only, unless you license them from the original suppliers.

PHOTOSHOP RESOURCES

Note: An on-line version of this directory can be found at our Web site, <http://www.cpg.com>

Adobe Systems Inc. makes Photoshop, Illustrator and many of the other tools described in this article. See the Photoshop What's New Page, [Apps/Photoshop/](http://www.adobe.com/Apps/Photoshop/). Adobe sells numerous other Mac- and PC-only packages, such as Streamline. Why not check out the Photoshop Books Web Site, at <http://www.aa.net/~davidh/PSBooks/PhotoBooks.html>.

Kai's Power Tools and Convolver, from **Metatools Inc.**, formerly HSC, are for Mac and Wintel, but not UNIX, see <http://www.metatools.com/>.

SoftImage Inc., a Microsoft Corp. subsidiary, is best known for 3D animation software. SoftImage used to make "Painterly Effects" for Sun and SGI, but these are no longer listed on its Web site, <http://www.microsoft.com/SoftImage>.

Finally, the Usenet newsgroup comp.graphics.apps.photoshop is where fans, newbies and heavyweights meet to discuss Photoshop, regardless of the desktop operating system.

the heart of *really* using Photoshop. But channels have had a reputation for being a bit tricky.

Layers to the rescue! In Photoshop 3.0, a document can consist of a number of layers that behave, to paraphrase Adobe's manual, like sheets of clear acetate on which you can draw. Each layer is independent of those above or below it, so you can make fabulous composite images and still have each layer separate. Want to move the text a little to the left? No problem, as long as you put it in its own layer. Just move that layer to the left.

Photoshop 3.0 uses a "modernized" GUI in which "tab divider" icons are used to select views for a window.

Layers (or even selections) can be combined using various paint options, such as normal mode, colorize, lighten, darken and so on, for a variety of effects. You can also specify the degree of opacity, to allow two layers or selections to blend together.

Reviewer's Issues

Every time Solaris Photoshop starts up, it runs a long (1,245 lines) shell script that checks the OS patch level—this should be done at install time—which type of SPARC chip your system uses (SPARC V7 or SPARC V8), runs `ps` to check if you're already running another copy of Photoshop and otherwise dallies around before starting the program. It would make more sense to create a `Photoshop.pid` file at start-up and use `kill(pid, 0)` inside the program to see if another copy is still running. All this start-up overhead makes it less convenient for the occasional user.

Also, when running `ps`, the script assumes that the environment variable `$USER` is set, but on Solaris this is only set by the default `.login` and `.profile` files, not by the login program itself. The script misbehaves (but still works) if a user has provided local start-up scripts that don't set `$USER`, so some lucky users see a screen full of errors each time they start the program. This is easy to fix in your `.profile` or `.login`, but is something that Adobe should fix.

A few idiosyncracies remain in the X11 implementation. For example, if

you open a new Photoshop window that is to be positioned over part of another window, such as xterm, Photoshop will religiously position the new window behind xterm while it's writing the image into it, even if you try to move it to the front. But once the image is in the window, you can move the Photoshop window to the front. No one ever said that X Window System programming was trivial!

Also, dialogs suddenly pop up over the window you're working in, when they could just as easily pop up beside it. This is a minor complaint but gets annoying after a while.

Conclusions

It's hard to compare Photoshop to the competition. I've mentioned some of the imitators. The major competition is Corel Paint, part of the Corel Draw product line. In fact, Corel has several lower-cost options, such as PhotoPaint software and the new Xara midrange graphics package. Alas, none of this runs on UNIX. Almost none: You can still get Corel Draw Version 3 for UNIX, but other Corel users are up to Version 6(!) on the Wintel platforms. Until Corel upgrades its UNIX offerings, we're not going to look at it.

Adobe notes 32 MB as the minimum memory requirement, and a SPARCstation 2, IPX or faster machine. However, if you're going to be using Photoshop full-time in a

graphics-intensive environment, you should consider having 64 or 96 MB.

Adobe suggests that for handling very large images and to get a fast response, you may need up to 200 MB. It may sound like a lot, but a high-end graphics professional working on a Macintosh PowerPC system might have that much today. Equal memory for equal work, I always say.

So we're out of time and space for talking about Adobe Photoshop. I have only been able to touch on some of the highlights in my hands-on exploration of the program. Even so, I've been able to do some useful work.

In summary, Photoshop is one very powerful bitmap graphics program, certainly the most powerful available for UNIX that is also on Mac and Wintel platforms. If you like graphics and like UNIX, try it out. If you've used Photoshop on a Mac, try it out on an UltraSPARC system. You'll like it.

Ian Darwin (ian@darwinsys.com) is the author of several courses and seminars, and over 50 magazine articles, on all aspects of UNIX. He is the author of the O'Reilly book *Checking C Programs With Lint* and the as yet unpublished O'Reilly book *X User's Guide: Volume 3 OPEN LOOK Edition*, which is included in Darwin Open Systems' (<http://www.uunet.ca/darwinsys>) XView and OPEN LOOK Source and Documentation CD-ROM.

Companies Mentioned in this Article

Apunix Computer Services

9555 Chesapeake Drive, Ste. 105
San Diego, CA 92123

Phone: 619-495-9229

Fax: 619-495-9230

URL: <http://www.apunix.com/>

Makers of TruePrint. Apunix also has a plug-in for the RasterOps video board, which lets you grab frames from a live video source and place them into Photoshop.

Mentalix Inc.

1700 Alma Drive, Ste. 110
Plano, TX 75075

Phone: 1-800-MENTALX

Fax: 214-423-1145

URL: <http://www.ptx.com/>

Pictronics Corp.

1475 Saratoga Ave., Ste. 160
San Jose, CA 95129

Phone: 408-867-3180

Fax: 408-446-5552

Email: info@pictronics.com

Makers of EasyScan, also has a Software Developer's Kit.