TECHSIGHTING
SOFTWARE

Plugging in to Visual Data

Scientific data can be stored in several ways. A popular format used by NASA and other scientific groups worldwide is the Hierarchical Data Format (HDF). HDF provides a flexible file environment to store data in many ways, including database and image formats. HDF also supports superimposition of data onto maps or images, a popular method used by Earth scientists and others to display geographic and related information.

Several software products enable opening and viewing of HDF-formatted files, but until recently users have been unable to access and manipulate HDF data with common software applications. The recent availability of a mountain of NASA's Landsat 7 data in HDF format (http://edcwww.cr.usgs.gov/) has made this shortcoming apparent. Fortunately, Fortner Software, developers of Noesys, has released a tool for importing HDF data into Adobe Photoshop (www.adobe.com). The HDF Import Plug-in consists of two files that users install easily by dragging them into the import/export folder within the Adobe Photoshop plug-ins folder.

HDF Import Plug-in
Fortner Software, LLC
Sterling, VA
$149; upgrade, $79
703-478-0181
www.SciSpy.com

Upon starting Photoshop, HDF files can be brought into Photoshop easily by selecting HDF Import from the import submenu of the file menu. Visual HDF data formats (called data objects) supported by the plug-in include 8- or 24-bit raster images, two-dimensional (2D) datasets, and 2D projections (called slices) of data from a multidimensional dataset. Up to seven dimensions of data can be "sliced" by the HDF Plug-in and shown as a 2D image.

Figure 1 illustrates how Photoshop can be employed to display three-dimensional HDF data using the red, green, and blue (RGB) color channels. The gray-scale images in the figure represent intensities of light seen by a satellite sensor as it viewed Earth through three different ranges of wavelengths. The top left image depicts data taken at a wavelength at the blue end of the visual spectrum. The top right image is the same view in the middle of the visual spectrum (green). The bottom left image is at the red end of the spectrum. By assigning each of these views to a red, green, or blue channel in Photoshop, the three-colored image (lower right) can be easily created. Because the user controls which data are displayed in which channel, specific features can be colored as desired. For example, the water in the image could be shown as shades of red instead of blue. It is a distinct advantage to be able to open HDF images in Photoshop. Dozens of Photoshop options for manipulating and enhancing visual features give users the ability to present data in almost any way they choose.

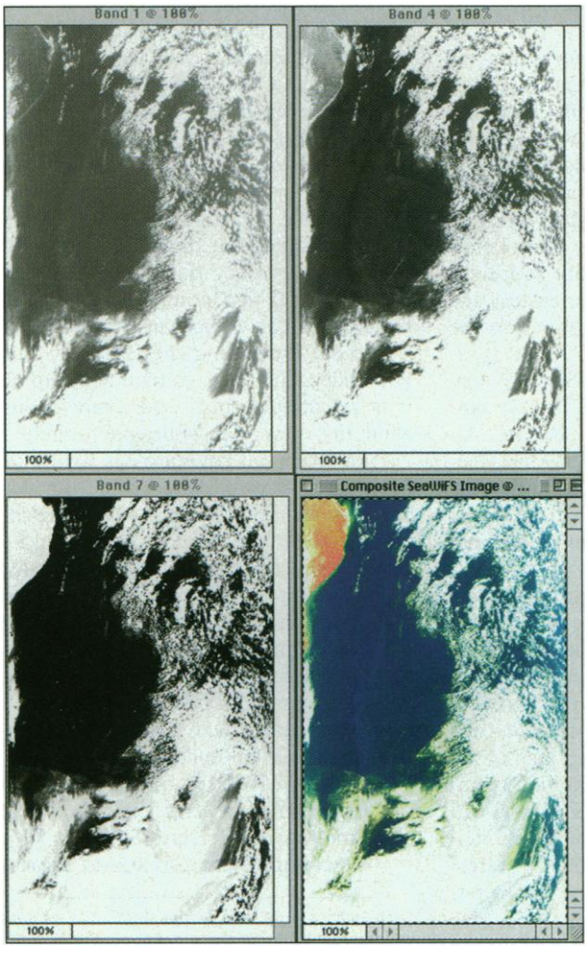

Fig. 1. Satellite views of Earth. The color image is a composite RGB image made by loading the other three images into the RGB channels of Adobe Photoshop.

The HDF Import Plug-in only works to visualize data; Photoshop contains no tools for analyzing data. Still, the HDF Import Plug-in will be welcomed by anyone trying to optimize presentation of visual data using Adobe Photoshop. The plug-in works well, installs easily, and showed no bugs in this testing with Photoshop 5.0 on a Macintosh.

—KEVIN AHERN

TECHSIGHTING
CELL BIOLOGY

Sorting on Silicon

One of the most useful technologies in a cell biologist's toolbox is flow cytometry, usually performed by a machine called a fluorescence-activated cell sorter (FACS). Flow cytometry assesses cellular properties (shape, stainability, and so forth) that can be used to distinguish among cells in mixed populations, which can then be sorted into different collection bins.

The core concept behind any cell sorting system is the ability to route cell types by physical characteristics. In a typical FACS machine, the input cell suspension moves through tubing that ends in a droplet, which is then ionized. An electrical field is then used to force the path of the droplet from this point forward. In a simple example, the collection bin may be to the left and a waste bin to the right. Sensors in the FACS are used to detect the size, fluorescence, or other property of the cell in question. Software interprets the signals from each cell and determines the direction of the electrical field, and hence, the left or right flow of the droplet.

While FACSs are quite useful, they are not without problems. First is cost. An average machine may run up to $250,000. Add to this figure the constant maintenance and repairs, and the scientist has a considerable drain on resources. Next, the mechanism by which modern FACS technology operates is prone to error. The droplet-generating orifice can become clogged or can carry-over contamination from a previous run can prevent effective sorting. Also, cell size can induce significant variation in the operation. And, finally, it is technically difficult to generate identically charged droplets; errors in deflecting a selected cell are common. Given these issues, a better way of sorting cells would be welcome.

A group of scientists from California Technical Institute (*1*) have constructed a microfabricated version of the FACS machine, which they call mFACS. The