Chapter 1   **NCSA Image Tutorial**

Chapter Overview

This chapter introduces NCSA Image and provides a brief tutorial to get you started using the program. The tutorial describes the basic steps involved in using NCSA Image:

- installing and invoking the program
- loading images and palettes from files
- saving and printing images
- using online help
- exiting the program

Before reading this chapter, review the information presented in the Introduction to ensure that you have the necessary hardware to run the program. Refer to the Glossary at the end of this manual for formal definitions of the terms that are introduced in the chapter.

This chapter assumes that you are familiar with the Macintosh user's interface. Specifically, to use NCSA Image successfully, you should know how to use the mouse, choose commands from the pull-down menus, make entries in dialog boxes, and activate and resize windows. If you need further information regarding these subjects, refer to your Macintosh user's guide.

NOTE: The tutorial in this chapter is only a preliminary introduction to familiarize you with the basic structure of NCSA Image. The advanced features for complex imaging, analysis, and manipulation of your images are described fully in Chapter 3, "Windows and Palette Manipulations" and Chapter 4, "Imaging Options for Data Analysis." A brief overview of the program's menu commands and tools is contained in Chapter 5, "Tools and Menus."

Installing NCSA Image

NCSA Image does not require any unusual installation procedures. As you would for any new Macintosh software, create a new folder and copy the contents of the NCSA Image disk to your hard disk. The application may also be used from a floppy disk; however, image data may exceed the capacity of floppy disks.
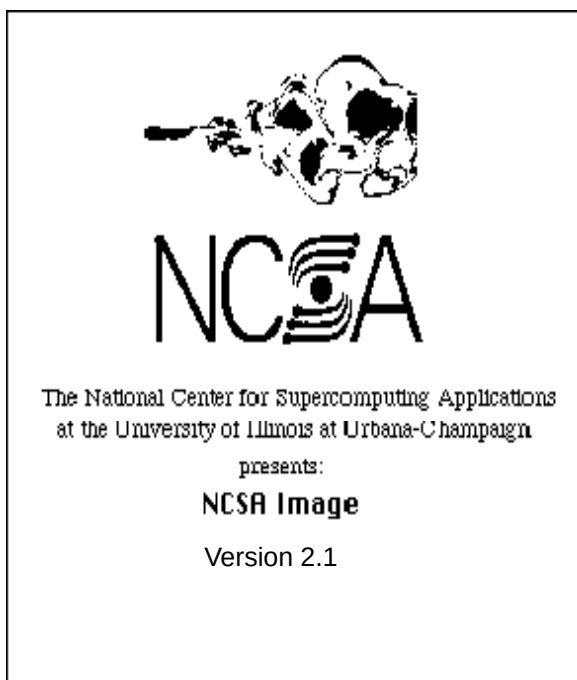
Getting Started with NCSA Image

Figure 1.1   NCSA Image Icon

NCSA Image V2.1

Invoke NCSA Image by double-clicking on the NCSA Image application or icon. The NCSA Image program icon is shown in Figure 1.1.

After you invoke the program, a palette window displaying the range of the current palette appears at the lower edge of the screen and a startup dialog box, shown in Figure 1.2, appears above it to introduce NCSA Image. Click on this box to remove it.

Figure 1.2   Startup Dialog Box

The National Center for Supercomputing Applications
at the University of Illinois at Urbana-Champaign
presents:
NCSA Image
Version 2.1

Loading an Image

To load a dataset that has been saved in either a raw raster or an HDF file into NCSA Image, select Open from the File menu, shown in Figure 1.3, or press ⌘-O. A standard directory dialog box appears, displaying the contents of your disk. In this dialog box, you may select a file from which to load the data. For the purposes of this tutorial, several images have been saved in a folder labeled Images on the NCSA Image disk.

Figure 1.3   File Menu
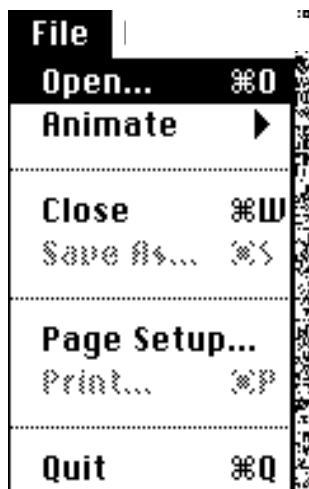
To view the contents of the Images folder, select the folder and click Open, or simply double-click on the folder. The new directory displays the contents of the Images folder.

Suppose you wish to display the data file labeled sincos.hdf. Select and open the file as you did the Images folder. A progress box labeled Interpolating appears on the screen to let you know what percentage of the interpolation process is completed. After the image has been loaded, the progress box closes and the image data is displayed as a color raster image in a window at the upper-left corner of the screen.

NOTE: NCSA Image has a minimum image window size requirement; consequently, if you load an image smaller than this minimum size, the remainder of the image window will be filled with white space.

Loading a Palette

You may wish to use a palette other than NCSA Image's default palette to yield the best perspective of your image. More detailed information about palette manipulation features is presented in Chapter 3 in the section entitled "Creating the Perfect Color Environment."

To load a palette, select Load Palette from the Palette menu, shown in Figure 1.4. A directory dialog box appears, displaying the contents of your disk. In this dialog box, you may select a file from which to load the palette. For the purposes of this tutorial, several palettes have been saved in a folder labeled Palettes on the program disk.

Figure 1.4   Palette Menu

To view the contents of the Palettes folder, select the folder and click Open. The directory that appears displays the contents of the Palettes folder.

To use the palette named evans.pal, for example, select and open the file as you did the Palettes folder. The color table is initialized and the individual values of your dataset are *mapped*, or displayed, according to the new palette. In other words, the palette you load replaces the palette associated with the current image, if any.

NOTE: NCSA Image never alters your actual datasets, only the visual representations of them. That your image data is *mapped according to a new palette* means only that the data is represented with colors from the new color palette. For example, because the 36th entry of the palette may be blue for one palette and green for another, the data values assigned to this entry are represented by blue when the former palette is used, and by green when the latter palette is used.

Visualizing Your Image Data

NCSA Image allows you to create contour plots, 3D plots, shaded data plots, and dither plots to visualize sets of data points. In addition, XY graphs, histograms, and animations may be generated from your dataset to allow advanced analysis of the image data.

In this tutorial, you will rotate the palette, make a selection on an image, and generate a histogram from that selection. You will also practice generating a contour plot from your dataset. By making a selection on the image and rotating the current palette, you will become familiar with the *tool chest*, which you can use to manipulate the current palette, view actual data values, and generate XY graphs.

Detailed information regarding the various palette manipulations you may make using tools from the tool chest is presented in Chapter 3, "Windows and Palette Manipulations." More detailed information regarding the various plots and instructions for

generating and using XY graphs, histograms, and animations is provided in Chapter 4, "Imaging Options for Data Analysis."

Rotating the Palette

To see what effects rotating the palette has upon the representation of your image data, choose Show Tool Chest from the Tools menu, shown in Figure 1.5, or press ⌘-T.

Figure 1.5 **Tools Menu**
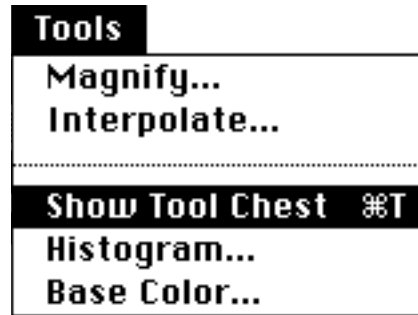
The *tool chest*, a special window containing icons for various tools, appears on the screen. Clicking these tools in the tool chest, shown in Figure 1.6, allows you to perform various manipulations of the palette and the image. The tool chest and its numerous uses are formally introduced in Chapter 3 in the section under "Creating the Perfect Color Environment."

Figure 1.6 **Tool Chest**
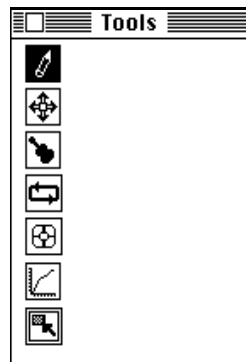
To rotate the current palette, choose the rotation tool from the tool chest by clicking on the tool. The rotation tool is shown in Figure 1.7.

Figure 1.7 **Rotation Tool**

Note that several new control buttons appear in the tool chest when you select the rotation tool (see Figure 1.8). These special buttons control the direction and speed of palette rotation. During rotation, each entry of the color palette is replaced by its neighboring color to the right or left, depending upon the direction of the rotation.

Figure 1.8 **Tool Chest Showing Rotation Buttons
and Accelerator Bar**
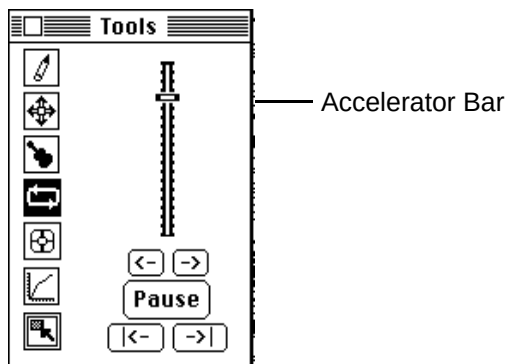
———— Accelerator Bar

To rotate the palette:

1. Click <- or -> to initiate continuous palette rotation to the left or right, respectively.

2. Drag the accelerator bar up or down along its ladder to increase or decrease the speed of rotation.

3. Click |<- or ->| to rotate the palette a single entry in either direction, left or right, respectively.

4. Click Pause to discontinue the rotation, or to switch from continuous to incremental rotation.

To restore the image to its original state, choose Restore Palette from the Palette menu or press ⌘-R.

Creating a Histogram

You can generate a histogram to represent the values in an image by choosing Histogram from the Tools menu. A histogram, such as that shown in Figure 1.9, is plotted in the Histogram dialog box.

The histogram in the dialog box represents the number of instances of each particular value in the selection along the y axis. The x axis denotes the values in ascending order from left to right. The numbers below the histogram—Top, Bottom, Left and Right—define the rectangle within the image data from which the values were extracted to calculate the histogram.

Figure 1.9   Histogram Dialog Box
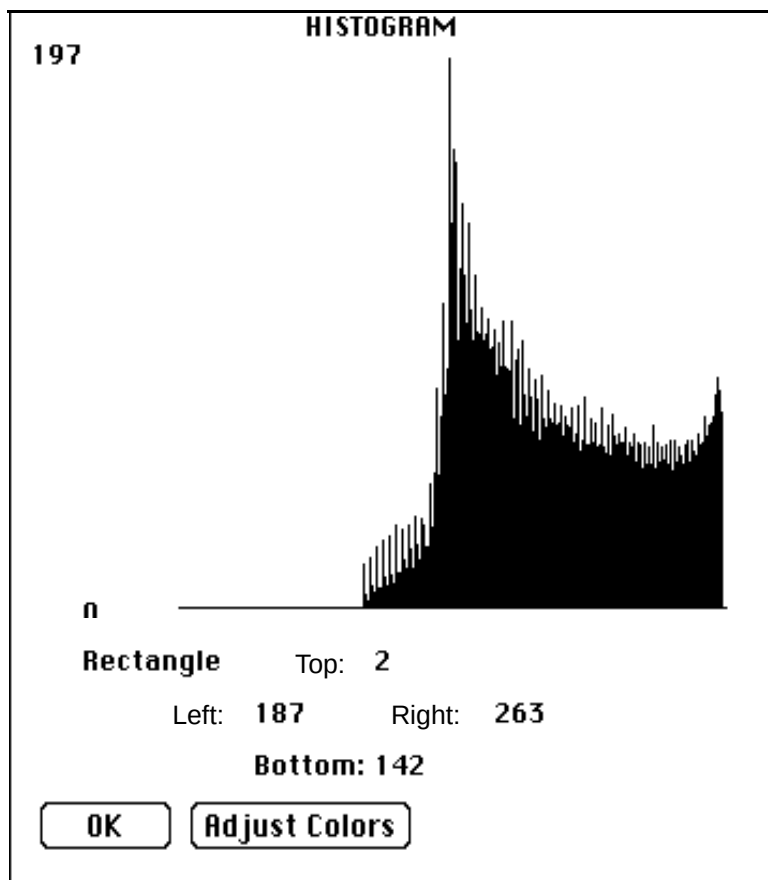
Histogram Color Adjustment

The button labeled Adjust Colors allows you to adjust the color table to increase contrast in the areas where the most data values are located; clicking this button when you are working with a black-and-white plot would have no effect. The histogram color adjustment is intended to be performed on a color raster image. After you have looked over the histogram, click Adjust Colors to perform a histogram color adjustment on your color raster image and return to your image window.

NOTE: If you will be selecting multiple areas from your image from which to create histograms, restore the color table to its original state by selecting Restore Palette from the Palette menu. Otherwise, the contrast reduces to just two colors with repeated Adjust Color operations.

Histogram of Subregion

To generate a histogram of a particular section of a color raster image, first select the region of interest; then:

Selection Tool

1. Choose Show Tool Chest from the Tools menu or press ⌘-T.

2. Choose the selection tool from the tool chest by clicking on the tool. The selection tool is presented in Figure 1.10.

3. Select any area of the image or the entire image by clicking, dragging out a rectangular region within the image window, and releasing the mouse button. Notice that the area of the selection is highlighted as you select it.

4. Select Histogram from the Tools menu.

Generating a Contour Plot

Suppose you wish to depict the differing levels of magnitude that occur in your image data. You can do so by displaying the data as a *contour plot*, which represents a matrix of data values by drawing contour lines between areas of differing contour levels. A contour plot is much like a topographical map, where lines are drawn between areas of differing altitude. Contour plots are discussed in more detail in Chapter 4, "Imaging Options for Data Analysis."
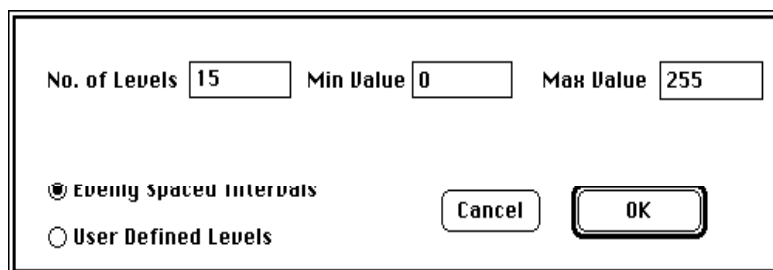
To generate a contour plot for your dataset, select Contour from the Plot menu, shown in Figure 1.11.

Figure 1.11 Plot Menu

```
Plot
Raster
Contour...
3D
Shade
Dither
```

The dialog box that appears is shown in Figure 1.12. In this dialog box, you may specify the number of contour levels and the maximum and minimum data values. Specify 15 contour levels for this example, and click OK or press RETURN to view the resultant contour plot.

Figure 1.12 Contour Plot Dialog Box

No. of Levels `15`   Min Value `0`   Max Value `255`

● Evenly Spaced Intervals   [Cancel]   [OK   ]
○ User Defined Levels

A contour plot for your image data is drawn in the image window. A sample contour plot is depicted in Figure 1.13.

**Figure 1.13 Sample Contour Plot**

sincos.hdf
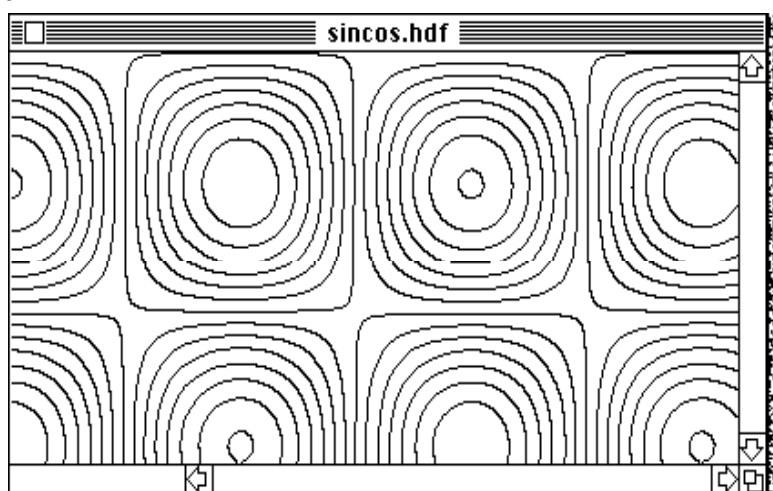
Saving Your Work

After generating several different images from your data and analyzing the results, you may wish to save an image, its dimensions, and the associated color table to a file. You must save this information before quitting the Image application; quitting the program causes all previously unsaved information to be purged.

To save the current color raster image with its associated evans.pal palette information, select Save As from the File menu or press ⌘-S. A standard directory dialog box appears and prompts you to name the file and specify the directory in which to store the data. The Save dialog box is presented in Figure 1.14.

Figure 1.14 Save Dialog Box
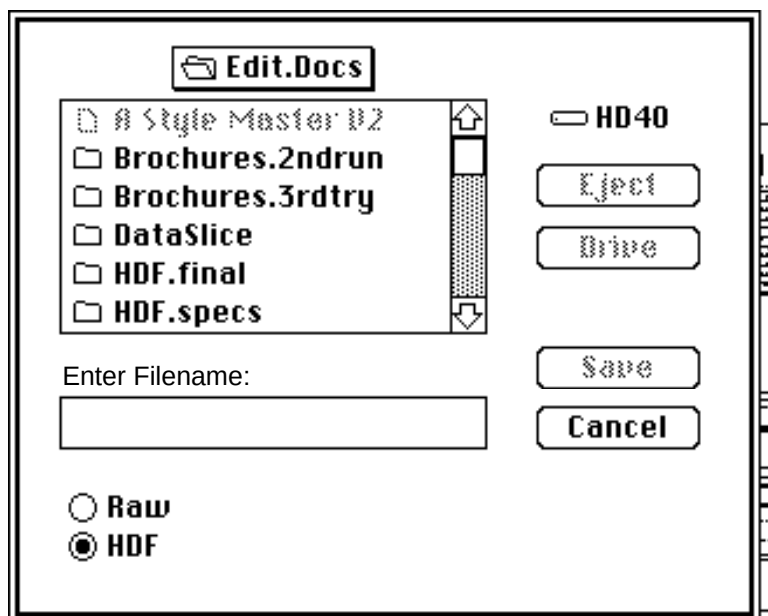
Note that there are two radio buttons in the lower-left corner of this dialog box. NCSA Image allows you to save your images in either raw raster or Hierarchical Data Format (HDF). The advantages and disadvantages of using each of these file formats are discussed in Chapter 2, "Formatting Your Data Files."

For example, to save your image data and palette data in an HDF file, click the radio button labeled HDF, and click Save.

NOTE: When you select HDF format, your data is saved in compressed form in a Hierarchical Data Format (HDF) file, unless you specify that it be saved in uncompressed form. Instructions regarding saving information in HDF files in uncompressed form is presented in Chapter 2 in the section entitled "Preferences."

Printing an Image

NCSA Image allows you to print any of the black-and-white plots, including the XY graph.

To specify the page characteristics for printing, select Page Setup from the File menu. In the dialog box that appears, you may specify the characteristics of the printed page. A sample page setup dialog box created specifically for the ImageWriter is shown in Figure 1.15. The appearance of the dialog box may vary from system to system depending on your printing device, but most print dialog boxes allow you to specify the page size, the orientation of the printing, and some special effects. The setup depicted in Figure 1.15, for example, has options that allow you to adjust the height of

the page, reduce the printed image by 50 percent, and print without gaps between pages. Typically, you will not need to use such options when printing from NCSA Image.

Refer to your Macintosh user's guide for the specific settings to select for your printing device.

Figure 1.15 Sample Page Setup Dialog Box
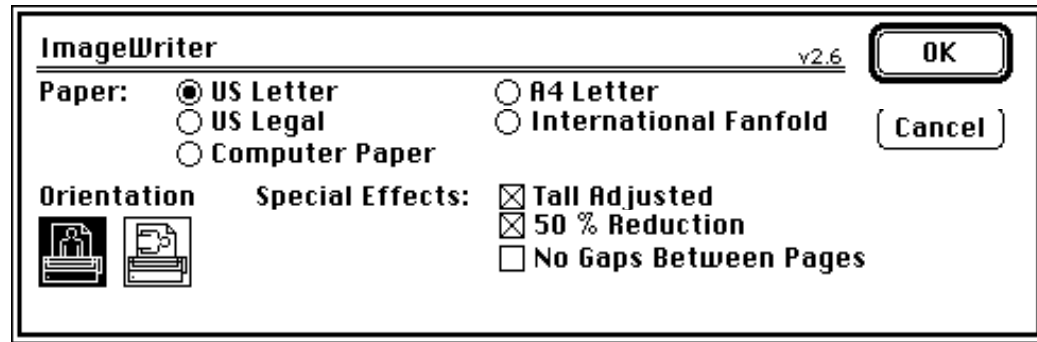
After determining the desired characteristics for your printout, click OK or press RETURN.

To print your image, activate the image window that you wish to print and select Print from the File menu or press ⌘-P.

While NCSA Image creates an image for printing, the cursor becomes a spinning beach ball. When the image is ready to print, a print dialog box appears. This dialog box allows you to specify the format for this particular printing session. A sample print dialog box, tailored specifically for the ImageWriter, is presented in Figure 1.16. Though the print dialog box that actually appears on your screen may differ from this example depending upon your printing device, it generally includes the following parameters: page range (which is not applicable in NCSA Image), number of copies, and automatic or hand feed.

After you have specified the desired page characteristics, click OK or press RETURN to print your image. The image is sized to fill the page.
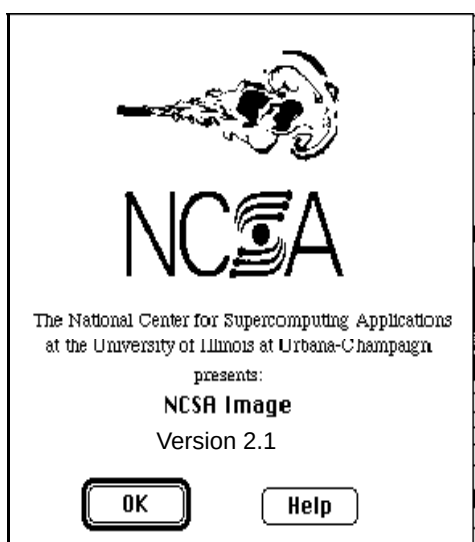
Figure 1.16   Sample Print Dialog Box
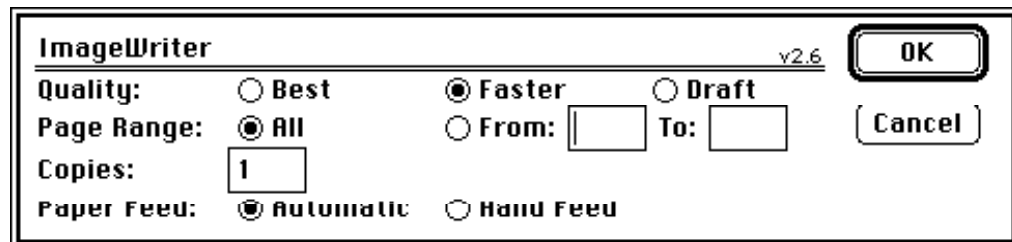
Using Online Help

NCSA Image provides online help that you may access at any time while using the application. To access online help, choose About NCSA Image from the Apple menu. In the dialog box that appears, shown in Figure 1.17, click the Help button.

**Figure 1.17**   **About NCSA Image**

The Help menu appears, shown in Figure 1.18. To select a topic from this menu, click on the subject heading and click Help or press RETURN; or simply double-click on the heading. For example, double-click on the heading *Animate*.

Figure 1.18   **Help Menu**
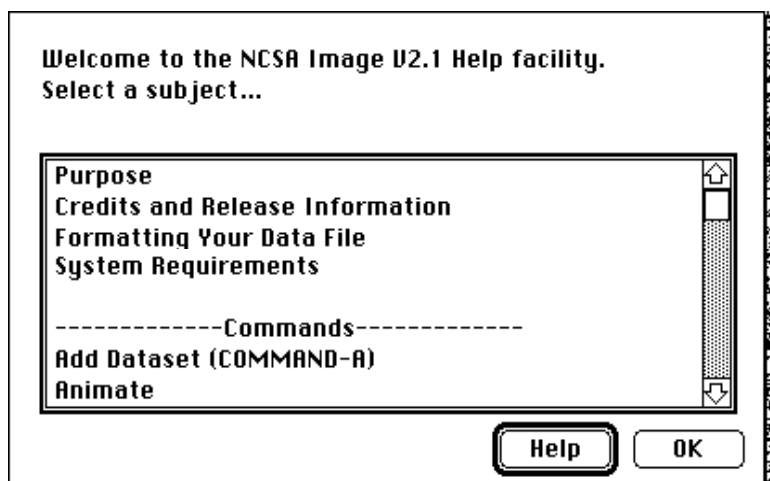
The corresponding help screen appears, shown in Figure 1.19. From the help screen, you may proceed to the next or preceding topic, or to the *top*—the main menu. To exit Help and return to the main application, click Done.

Figure 1.19   **Sample Help Screen**
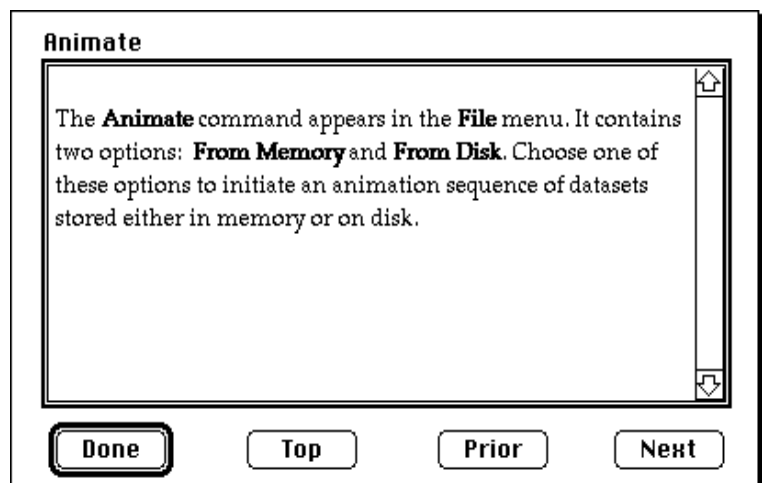
Exiting NCSA Image

If you have saved all of the palettes and images you intend to use again, you may safely exit NCSA Image without losing your work.

To exit NCSA Image, choose Quit from the File menu or press ⌘-Q.