Editing Camera Images: Using GIMP

Virtually every camera generates images using rectangular arrays of square 8-bit RGB pixels. Once you have that info, there is some manipulation that can be done easily, and some that is virtually impossible to do.

Photoshop is a large, well-known program that is commonly used to edit and manipulate photographs, or, more specifically, raster images. GIMP is the same thing, but free. I am far from an expert user of either of these programs, and I really only use the same couple of features over and over. Most PC's also come with a free raster editor called "paint". I feel that there has never been any reason for any human being to use "Paint" for any purpose.

Since this is class is a scientific graphics class and not an art class, I just want to go over a few of the most important features of working with bitmaps that will affect your job as scientists.

First of all, it is never acceptable for adults to use any bitmap-style format to create a **drawing**. Raster formats are for photographs, period. If you need to *sketch* something, use PowerPoint, Word, InkScape, or Adobe Illustrator to create a "vector graphics" image in the ways we've already learned. Depending on where it's going, you can convert this image to a raster image *after* it's been created, not before.

By default, the units in GIMP are pixels, which makes sense. You should see a pixel "ruler" on the top and left edge already.

Here are a small fraction of the main tools that come with GIMP:

1. Create From Clipboard (used with screen dump or copy-and-paste)
2. Save: Is completely useless. In versions 2.6 or older, you could "save as". But in newer versions, "saving" just creates a proprietary file that only GIMP can use. To get a useful saved image, use "export" to convert it into a jpg, bitmap, or GIF. Before exporting as a GIF, you have to use "Image/Mode/Indexed" to turn this image into a paletted image (or a grayscale image).
3. Zoom: At the bottom, you can set the magnification while working on-screen. You can use a pre-selected value, or type in any number you want. There's also a magnifying glass tool. Clicking zooms in, and CTRL-click zooms out.
4. Rectangle Select (and lasso, and Magic Wand, etc.)
   Once selected, you can copy-and-paste this region of the image to a new image or even to another application. If you select a portion of your onscreen image, then new steps you perform will only be performed on this portion, not the entire image. The un-selected regions are temporarily "protected". Submenu options are available if you see a triangle in the lower-right corner, and are "activated" by right-clicking.

   Note that once drawn, you can move the selection box, or resize it by dragging, or clicking and dragging. While creating the selector box, you can use the SHIFT key to select a perfect square or circle instead of a rectangle or ellipse. Moving or changing the selection region does not change the image itself!

While creating a selection region, if the "feather edges" is unchecked (i.e., the default), it means that there is a sharp boundary between the selected and unselected portions of the image. If you check "feather", then it means that there is a little bleed through from the selected region onto the supposedly protected unselected region. The "feather radius" tells you how far into the unselected region you can bleed into.

You can build complex or "concatenated" selection regions (rectangles, ellipses, whatever) by holding down the SHIFT key while selecting. Similarly, you can deselect a portion of a selection by using the CTRL key while you select.
With a rectangle selector chosen, if you single-click on any currently unselected region, it clears all selections.

The lasso is a kind of free-hand selector for choosing irregular shapes.

The "magic wand" or "fuzzy select tool" lets you click on a single point, and GIMP will attempt to select an enclosed area such that all the selected pixels are of similar color and brightness. The meaning of "similar" here is defined by the "threshold" setting. When the threshold is zero, then all selected pixels are EXACTLY the same color (in terms of R, G, and B values). As the threshold gets larger, then more and more pixels are included, even if the color match isn't perfect.

In terms of selections, sometimes you want to select everything EXCEPT a small rectangle or other region of interest. In this case, you first select the small rectangle, and then go to "Selection/Invert". You would do this if you want to erase a lot of background image, but protect some smaller portion of the image while you do so.

You can also use Shift- ("add") and Control- ("subtract")to add or subtract regions from an existing selected region.

5. Cropping (percentage size display at bottom)
   Cropping of photos is almost always needed when you take scientific images. If, as we suggested last week, you stand really far away when you take the picture, then it is likely that the important part of the picture only occupies a small region near the middle of the image. "cropping" means deleting portions of the image from the edges. To crop, you select a rectangle, and then go to "Image/Crop to Selection".

6. Image/Mode/Indexed: Use this to convert a full color image into a paletted/GIF image if you are putting a vector graphics drawing onto the internet. I use this a lot!

7. Text: You this to annotate a photograph with text. Text is added as a separately editable object, so once it is drawn, you can come back to it to fix a typo, or whatever. You can also change the font, font size, etc. However, you probably should annotate in PowerPoint by overlaying vector text, rather than doing it in GIMP.

If you're sure that you've finalized everything, you can go to the "Image/Flatten Image" tool. This will remove all layers, groups, and objects, and adding them to the base image so that it is just a grid of pixels again. If you flatten an image, you can no longer edit the text properties. Sometimes when you copy-and-paste images from other applications directly into GIMP, the result is by default a layered image that ought to be flattened! Saved JPG and GIF images can't contain layers… they must be flattened before saving.

8. Move/Rotate/Scale: If you want to move the text to a new place, use the "move" tool (the 4-arrow icon). You can move other objects, too. Or, you can rotate any object. Or, you can "rescale" it to make it larger or smaller. Click the broken chain link to toggle it from proportional scaling to separate *x* and *y* scaling. So, with a broken link, you can make your selection wider but not taller, for example.

9. Colors/Brightness: I use this a lot when a photo is too dark. I slide the upper slider to the right. But, when I do this, the contrast becomes poor, so I typically *also* slide the lower slider to the right about 75% as far as the upper slider.

10. Copy and paste sub-objects: You can add other photos or parts of photos to the current image by copy-and-paste. These will remain as separate layers until the image is flattened.

11. Pencil/Eraser/Paintbrush/Paintbucket: First, look at the two large colored boxes. The lower box is the current "background or paper color"; the upper box is the current "ink color". Pencils and paintbrushes add the upper color to the drawing. The erase replaces any color with the lower color, which is not necessarily "white". If a region is selected, then you can only change pixels in the selected region. The paintbucket has a threshold value that you can set to help define what the "edge" of your region to be painted should be. With a small threshold, you'll only spill paint into regions that are very similar to your initial spill point. If you have a larger threshold, the spilled paint will also cover regions that are quite different than your starting pixel.

12. Color Picker: (eyedropper) to choose a specific color value in "active color". Use this if you're trying to match a specific color that's already present somewhere in the image. Underneath, in the options for the color picker, you might check the "info box". If you do, then **clicking on the image** will bring up a little window telling you the exact RGB values there.
    Or, you can use "Windows/Dockables/Pointer" to see info about individual RGB values on the fly.

13. Filters/Enhance/Blur: Generally, most of the filters are used by artists rather than scientists. However, you sometimes need to enhance an image if it's blurry. Also, sometimes when you are creating a practice image (like my star map from last week), it's useful to use one of the "blur" or "noise" tools to add error to an image to make it more realistic. To make the star map, I first drew a bunch of nice perfect circles using

a brush, then I added a ton of noise, then I blurred it to remove the smallest noise again. I use the "spread" or "HSV" noise. For blurring, I usually use the "Gaussian".

14. Colors/Levels: I use this when a grayscale image has some noise, but not too much. You can set all dark shades less than some number to become *perfectly* black, while also setting any pixel brighter than some cutoff to become perfectly white, and then rescale all the other grays across the remaining range. When you use this multiple times in sequence, you'll see that all your pixels end up bunching together into a smaller total number of unique colors.

15. Adding Transparency to a drawing:

a. Make sure that the parts you want to be transparent are all of the same color, and that this color **doesn't** appear elsewhere in the image. Commonly, the color is white, but if your actual image to be saved also has some white pixels in it, then you should change the to-be-transparent parts to some other unique color using the paint bucket. Select this color, and make it the background color for your "paper".
b. Right Click on the image: Layer/Transparency/Add Alpha Channel.
c. Then use Layer/Transparency/Color-to-Alpha to choose which color is supposed to be changed into "transparent". By default, it chooses whichever color is currently the "background" color.
d. Now, the eraser tool will actually erase the paper, not just the "ink"! That is, it will replace pixels with "transparent" instead of with "background color". These invisible pixels show up as little gray boxes, which can be confusing if your image has a bunch of gray in it already.
e. Right Click on the image: Select/By Color

f. Or, instead of step c., click on a color that you want to become transparent. This will select a region of space in your image.
g. Right Click on the image: Edit/Clear. The part that has become transparent will be filled with a checker pattern so that you can distinguish it from white.
h. But if you want to *save* an image that has transparency, you have to save it as an indexed image (GIF/PNG/BMP, but not JPG). Then, if you insert this saved image into other documents (Word, Powerpoint), and it won't be surrounded by an annoying white box that covers up the background image or any other object.
In Word or PowerPoint, you can "Insert/Picture" to paste this image in. You might need to change the "Text Wrapping" of the imported image to "in front of text".

If an image possesses an alpha channel, then you can select a region and delete it (i.e., with the delete key!), and the deleted region becomes "transparent". Image/Flatten will remove the alpha channel, and replace all the transparent sections with the chosen "paper" color.