Uncovering history: Using Photoshop to Enhance Images for Research
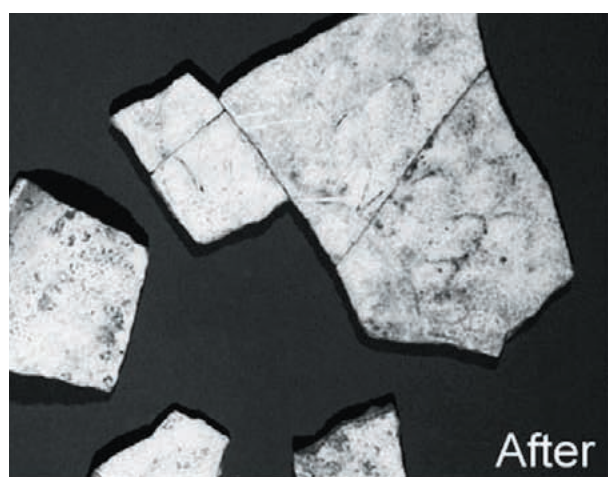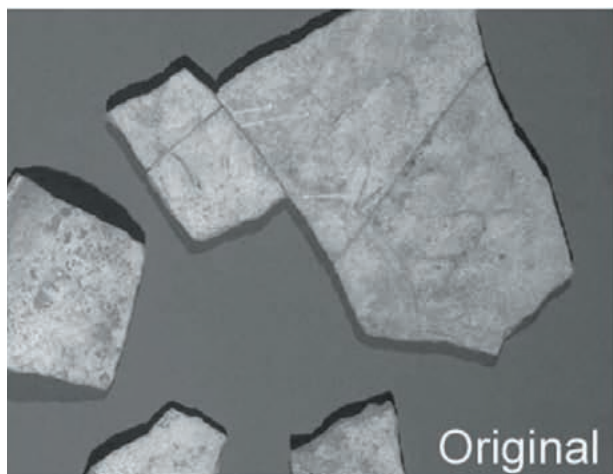
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Many methods are used to study art. We are familiar with using photographic techniques like X-ray, ultraviolet and infrared photography. But with the advent of digital technologies there are many new tools that may enhance these techniques and also create new techniques. I am going to discuss the use of Adobe Photoshop both to enhance existing techniques and to create new ways to look at an image. This is not about how to use Photoshop, as there are many resources available on that subject.

When we capture or scan an image to create a digital file, it has to be put into a format we can see on screen; this format is RGB. To create this file, filters are used to divide an image into a red channel, a green channel and a blue channel.

Using these channels, we can break down an image into its parts. In these individual channels, things may become evident that we do not see when looking at the actual image. Using the RGB channels and sometimes the CMYK channels (CMYK—cyan, magenta, yellow, and black—is the common format used for most printing) is what enables us to uncover hidden parts of images. Using tools in Photoshop, we will work on these channels and the overall image to enhance the image for research purposes.

First we will talk about enhancing what we see. One of the most useful tools is the Curves tool (fig. 1); this allows you to adjust the lightness, darkness and cast of an image. With this tool, we can add contrast to an image and also accentuate any differences in tonal range. To make a good contrast move, we use what is called an "S" curve. To do this, first click on the center of the line in the Curves tool; this will be an anchor to hold the mid-tones (values below the box should read 50%) in place, then click on the 1/4 tone (values below the box should read 25%) and move the line so the output numbers decrease—the more you move it, the lighter the light areas will become. Next click on the 3/4 tone (values below the box should read 75%) and move the line so the output numbers increase; this will darken the dark areas. Using this move allows us to accentuate differences between light and dark. We can also adjust this move to a particular image by moving the points on the line, i.e., we could make a move at 15% instead of 25%, or we could move the anchor in the mid-tone to lighten or darken the 50% areas. If there is a particular area in an image that you want to work on, you can click on it with the Curves tool open; when you do this, a circle will appear in the curves window to show where this point appears on the curve—you can then adjust that particular area.

We can also use Selective Color and Hue/Saturation tools to adjust what we see (figs. 2–3). Selective Color allows us to change the hue of particular colors, i.e. you can make all the reds more orange or all the blues more blue. Using this tool, we can accentuate the differences between colors. Using Hue/Saturation we can brighten, lighten and darken one particular global color range in an image. So you can adjust all the reds in an image or all the blues, etc. Changes you make will affect all the colors in the range you select. These tools are great for enhancing differences between different color ranges, such as the differences between yellow and red or blue and green. Using these tools, we can enhance what we
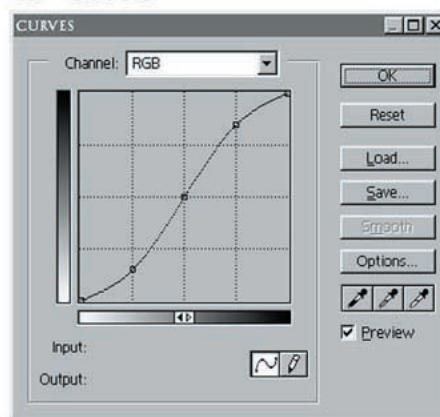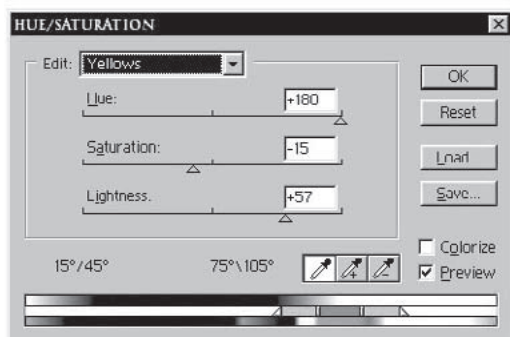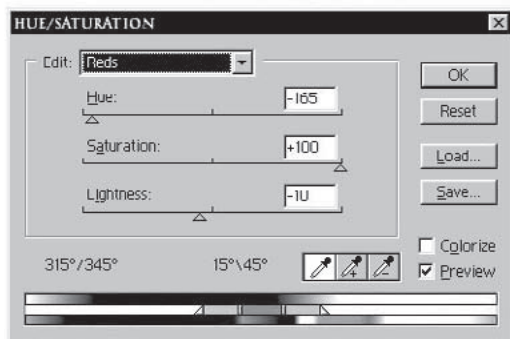
Original

After

"S" curve

To look for hidden parts of an image, the first thing we do is look at the Channels window. This window allows us to look at individual channels or groups of selected channels. If we can find something in a particular channel, then we can use the curves tool in that channel to enhance it. Another tool we can use with channels is the channel mixer (fig. 4); here we can choose the channel we want and enhance it or turn the other channels down. This is also the best way to create a grayscale (black and white) of an image, because it allows us to choose which channel or channels will create that image. So we could create the grayscale from the channel that shows what we want.

If we do not find what we want in the individual channels, it is time for some experimentation. We can start with things that make sense, i.e. if you are trying to find something hidden in wood, work on the reds and yellows—the most prominent colors. You could work in the Hue/Saturation tool and change the hue of the reds and yellows in different directions. You could also adjust the saturation and the lightness and darkness of each. If you start to see something, adjust it until you feel it is most obvious; then go back and look at the individual channels. Now you could work on the channel where it is most prominent and enhance it more. If you are not getting good results with Hue/Saturation, then try the other tools. You could adjust Selective Color; by bringing up the amount of cyan and black in reds, you should see more detail in woods. And again to enhance differences, you could correct yellows and reds in

see to make things more obvious and easier to look at. There are also other tools we could use and I highly recommend experimentation when using Photoshop. Just remember not to save over your original file. One thing I recommend is to do all your corrections in layers; that way you can turn them on and off. This also allows you to go back to them and re-adjust them. To do corrections in layers, open the layers window. At the bottom of the layers window is a button (a circle divided into black and white by a diagonal line); click on the button to get a pull-down window to choose your correction. Layer corrections are very important in research, because you can always see what you have done and it is repeatable. Layers are great for allowing you to document your procedure, because they show what you have done step by step. So I highly recommend you get used to working on images in layers; it will make everything you do easier to duplicate.

Hue saturation-Red and Yellow moves

HUE/SATURATION ✕

Edit: Reds ▾

Hue: -165
Saturation: +100
Lightness: -1U

OK
Reset
Load...
Save...

☐ Colorize
☑ Preview

315°/345°   15°\45°

HUE/SATURATION ✕

Edit: Yellows ▾

Hue: +180
Saturation: -15
Lightness: +57

OK
Reset
Lnad
Save...

☐ Colorize
☑ Preview

15°/45°   75°\105°

After

Original

FIGURE 2

different directions, i.e. you could take yellow out of red and take magenta out of yellow. Again if you do see results, adjust it to what you feel is best and work on the channels individually or in the channel mixer.

If you are not getting results with these tools working on color, the next step would be to experiment with the Curves tool. I have found by making moves with the Curves tool, you can get some very interesting results. I would start by moving the overall curve (RGB) and see if anything starts to show; try moving the curve up and down and in different areas and see what happens. Next, work on individual channels. Start with the channel that most corresponds to the area you are working on. The red channel shifts from red to light blue, the green channel shifts from green to magenta (pink), and the blue channel shifts from blue to yellow. So if you are working on a yellow area, start with the blue channel. When working with Curves, don't be afraid to make big moves—sometimes that is what it takes.

I have gotten my best results from using the tools together, so try each of the tools, and once you

get a result in one, go back to the others and see if you can enhance it. And if you make the corrections in layers, you can go back and forth between corrections and adjust them slightly to get the best result.

Another thing I am experimenting with is the way you can apply your tools. When you do your corrections in layers, you can change the way a layer is applied. In the layers window just below where it says "layers" is a pull-down menu. It defaults to normal, but has many options. By choosing different settings, you can select how the correction is applied, i.e. by choosing Hue, your correction will only effect the hue. I have found this to be a powerful tool and highly recommend you play with it. Open an image, make a layer adjustment, and change this setting just to see what it does.

Be willing to try things—that is how you learn to use the tools better, and sometimes you will stumble upon something. It is very important to keep track of what you do, so again I highly recommend
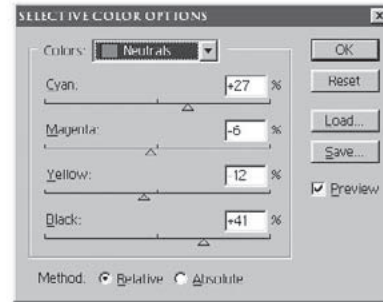
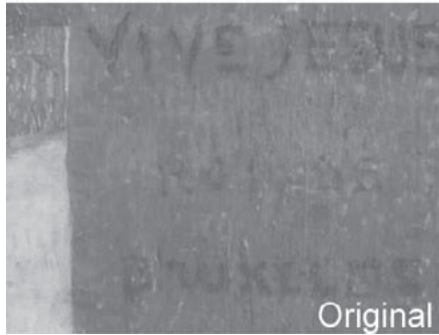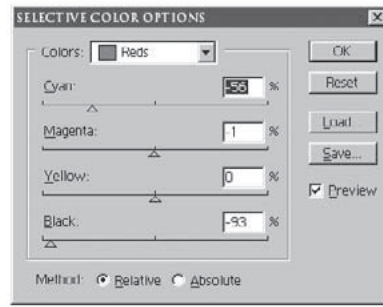Selective color-Red and Neutrals moves

After

Original

FIGURE 3

making all of your tool adjustments in layers; this will allow you to document each adjustment you make. Having your adjustments in layers will also allow you to use various adjustments together and apply them in different combinations by turning them on and off. When you are done, you should save the file as a layered Photoshop file; this will not only save the image but also all the adjustments you made. Most importantly, saving your adjustments allows anyone to see how you achieved your results and serves as documentation of the process.
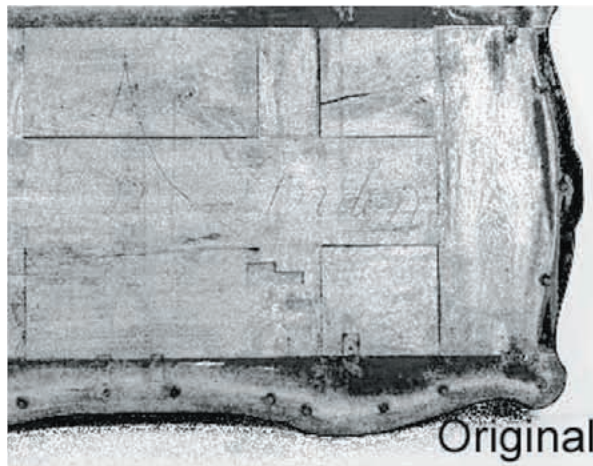
One more very important factor is the quality of the images. Always work on the largest files you can, because larger files have more detail and will show more subtle differences in an image. I encourage you to experiment with Photoshop and other digital tools to see how they can enhance the way you work.

Original

After

FIGURE 4

Channel mixer-changing to gra