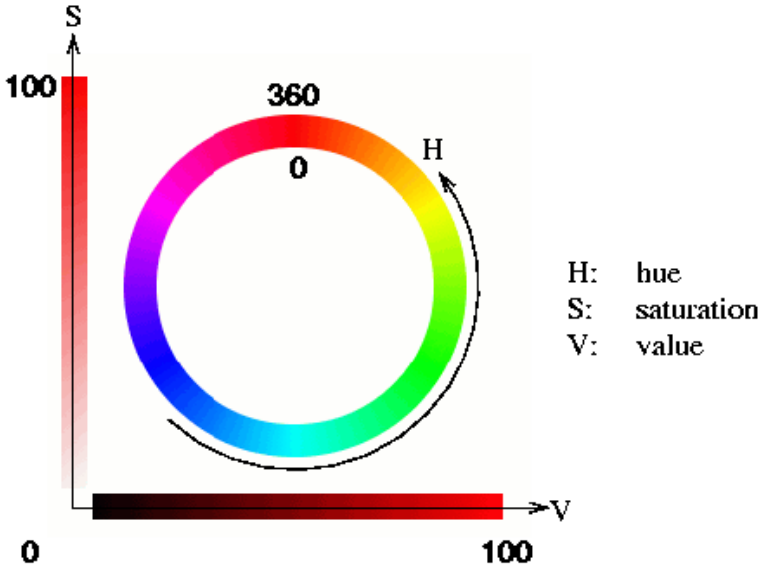
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5.2 The HSV Colorspace

The perception of color and our way of talking about it in everyday life is not well served by the RGB colorspace. If we're thinking of repainting the walls of the living room, for example, we usually think about what shade of color it should be, how bright we want it, and whether it should be pastel or vivid.

Typically, the first thing we usually notice about a color is its hue. Hue describes the shade of color and where that color it is found in the color spectrum. Red, yellow, and purple are words that describe hue. Figure 5.3

Figure 5.3: Hue, Saturation, and Value



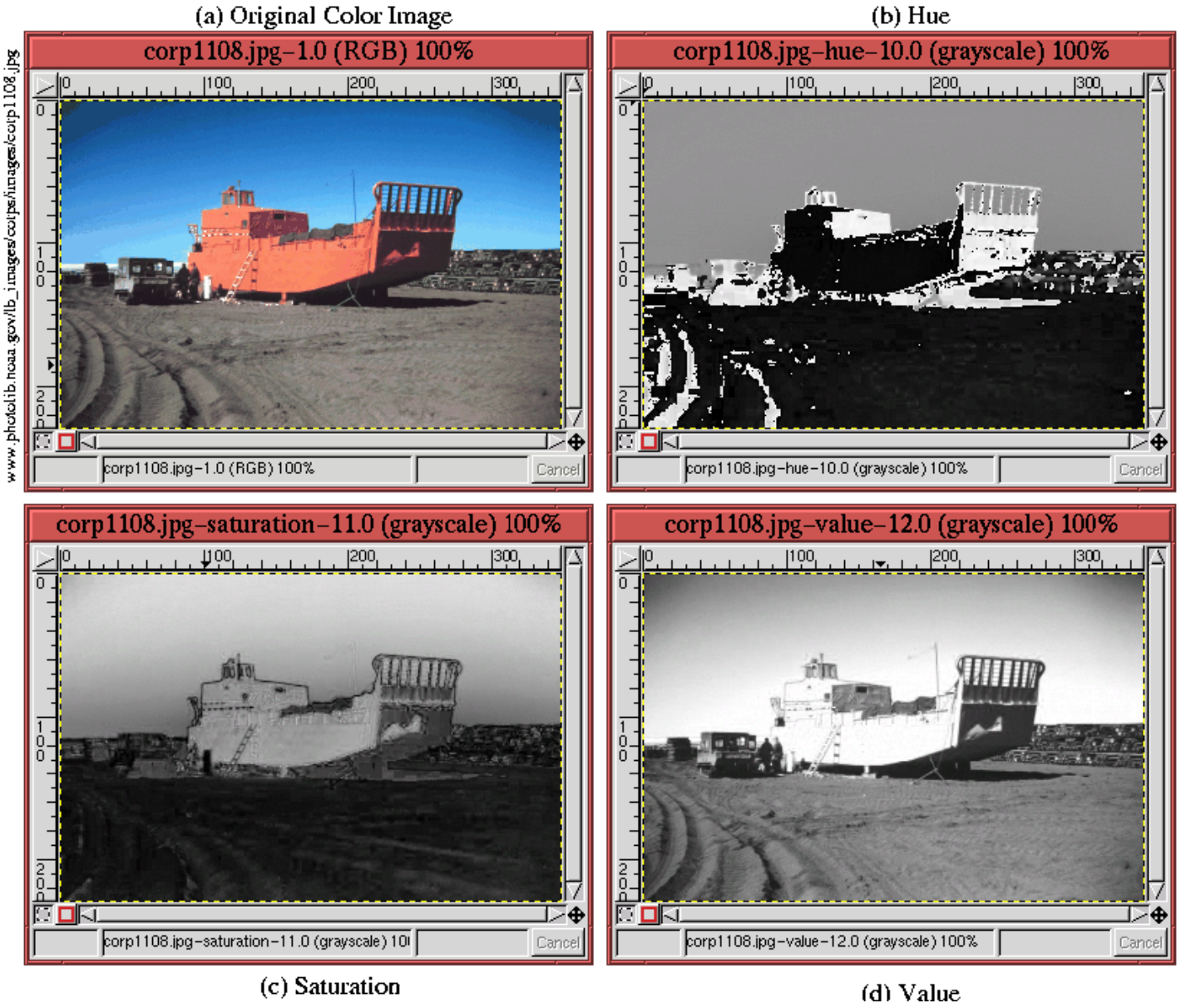
illustrates the range of hues, H, as a circle represented by values from 0 to 360. The reasons for this will become clear shortly.

The next most significant aspect of color is typically the saturation, S. The saturation describes how pure the hue is with respect to a white reference. For example, a color that is all red and no white is fully saturated. If we add some white to the red, the result becomes more pastel, and the color shifts from red to pink. The hue is still red but it has become less saturated. This is illustrated in the vertical bar of Figure 5.3. Saturation is a percentage that ranges from 0 to 100. A pure red that has no white is 100% saturated.

Finally, a color also has a brightness. This is a relative description of how much light is coming from the color. If the color reflects a lot of light, we would say that it is bright. Imagine seeing a red sportscar during the day. Its color looks bright. Compare this with the perception of the car as night is falling. We can see that the car is red but it looks duller because ambient illumination is reflecting less light into the eye. Less light means the color looks darker. In the GIMP, the most important measure of brightness is measured by a quantity called value. However, there are also other measures of brightness that will be introduced shortly. For the moment, though, the horizontal bar in Figure 5.3 illustrates a range of red values. Value, like saturation, is a percentage that goes from 0 to 100. This range can be thought of as the amount of light illuminating a color. For example, when the hue is red and the value is high the color looks bright. When the value is low it looks dark.

Thus, hue, saturation, and value are like an alternative colorspace. Any color can be decomposed into these three components and, like for RGB, it is possible to represent this space as a cube. Figure 5.4

Figure 5.4: Decomposing a Color Image into its HSV Components



illustrates the result of using `Image:Image/Mode/Decompose` on the color image in Figure 5.4(a). Choosing the HSV option in the `Decompose` dialog produces the hue, saturation, and value decomposition shown in Figures 5.4(b), (c), and (d). It is interesting to note that hue really doesn't change much. It is almost constant over broad regions of the image. For, example, although there is significant detail in the saturation and value components of the sky, the hue is quite uniform there. Of the three, it is the value component that is the most detailed.

Because colors are created on the monitor using mixes of red, green, and blue, it is useful and instructive to see how the HSV colorspace lives inside of the RGB cube.

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