# Understanding a Histogram

A digital image presents a gradation in brightness of 256 steps from 0 (darkest) to 255 (brightest). The image histogram is a bar graph with this gradation as the horizontal axis and the frequency of each brightness value in the image as a whole shown on the vertical axis. While it depends on the image, in cases of correct exposure and contrast this distribution will extend from one end to the other, with a shape in between appearing as a high mountain as in Photo 1.

When an image is revised with processing or editing software, the histogram changes accordingly. For example, if the brightness is increased so that the image appears overexposed, the histogram shifts to the highlight (right) side and shows a disrupted distribution as in Photo 2. In contrast, if the image is made darker, the histogram shifts to the shadow (left) side and shows a broken distribution as in Photo 3. Thus a histogram with disrupted distribution in either direction indicates inappropriate processing of the image.

A histogram that does not spread from one end to the other indicates a low contrast, dull (sleepy) image as shown in Photo 4. To the contrary, if the contrast is too high as in Photo 5, the histogram shows disruption at both the highlight and shadow ends, with a generally low distribution and poor gradation.



A histogram with suitable gradation displays a wide distribution from the highlights (A) to the shadows (B), forming the shape of a high mountain.
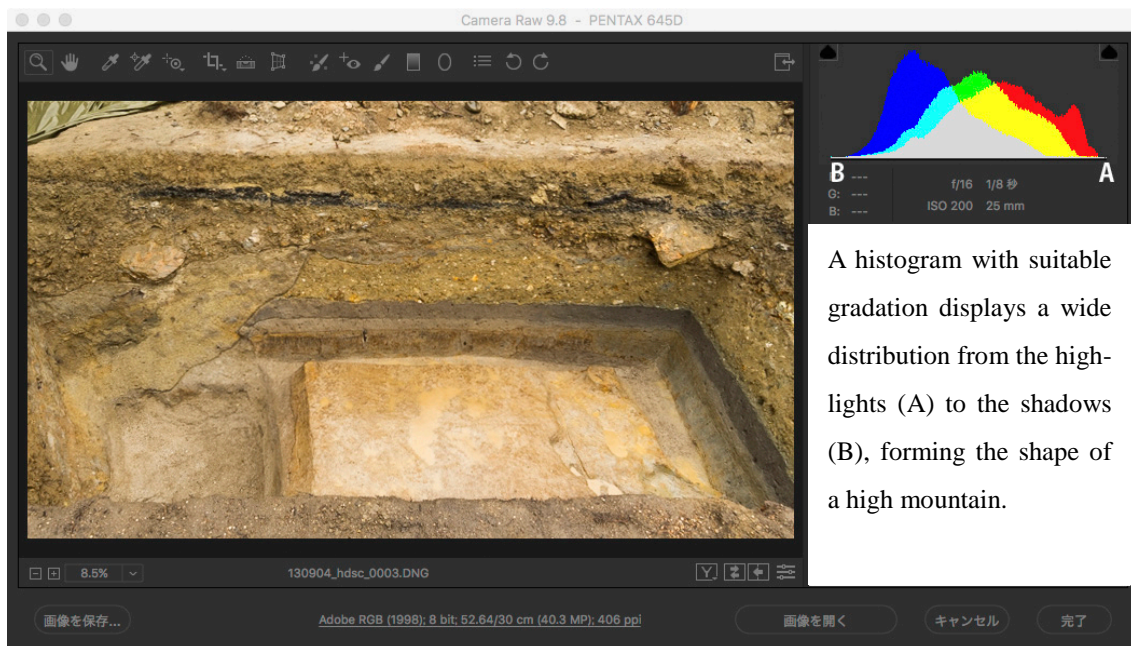
Photo 1. An image with correct exposure and gradation. The histogram is also well balanced.
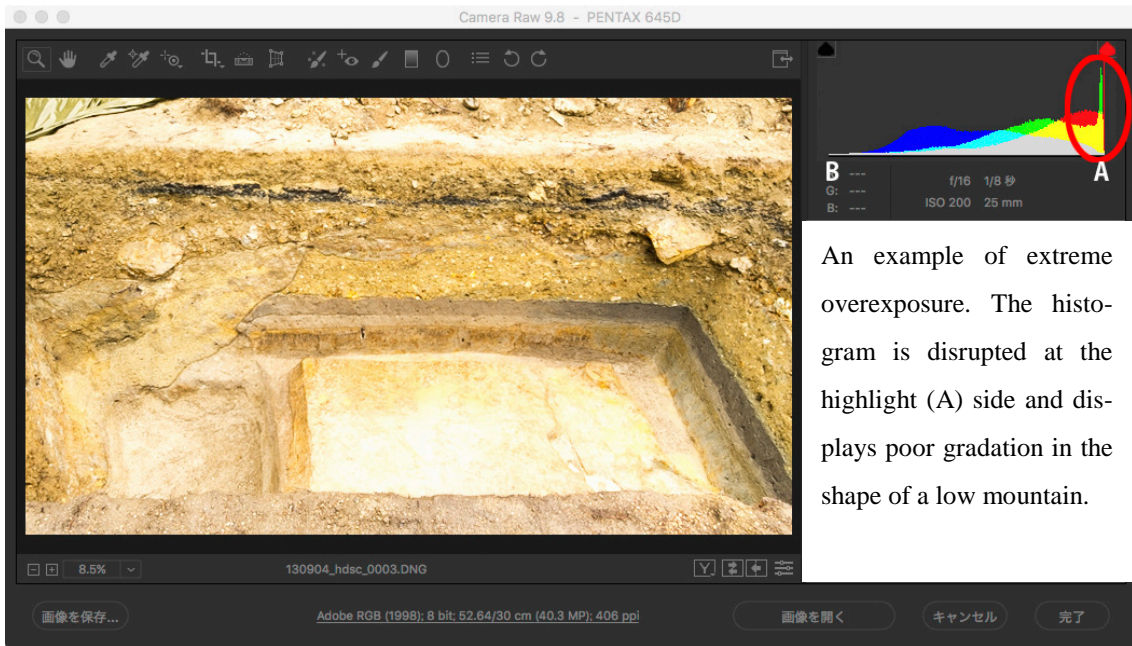
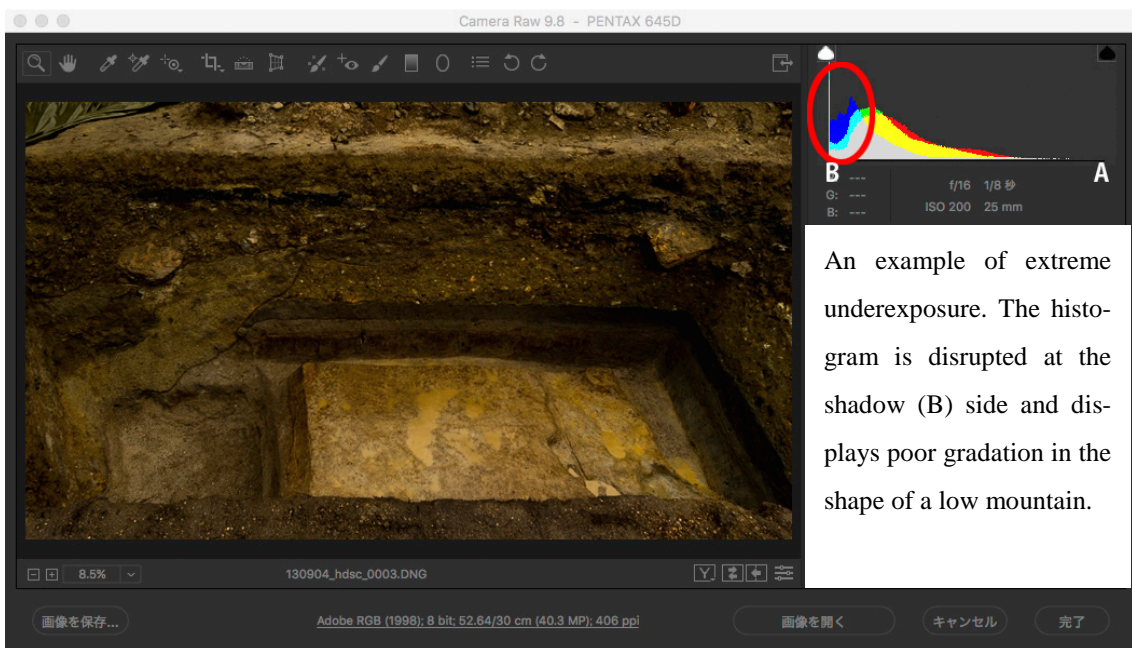Photo 2. An example of extremely overexposed processing. The histogram is disrupted at the right side.



Photo 3. An example of extremely underexposed processing. The histogram is disrupted at the left side.
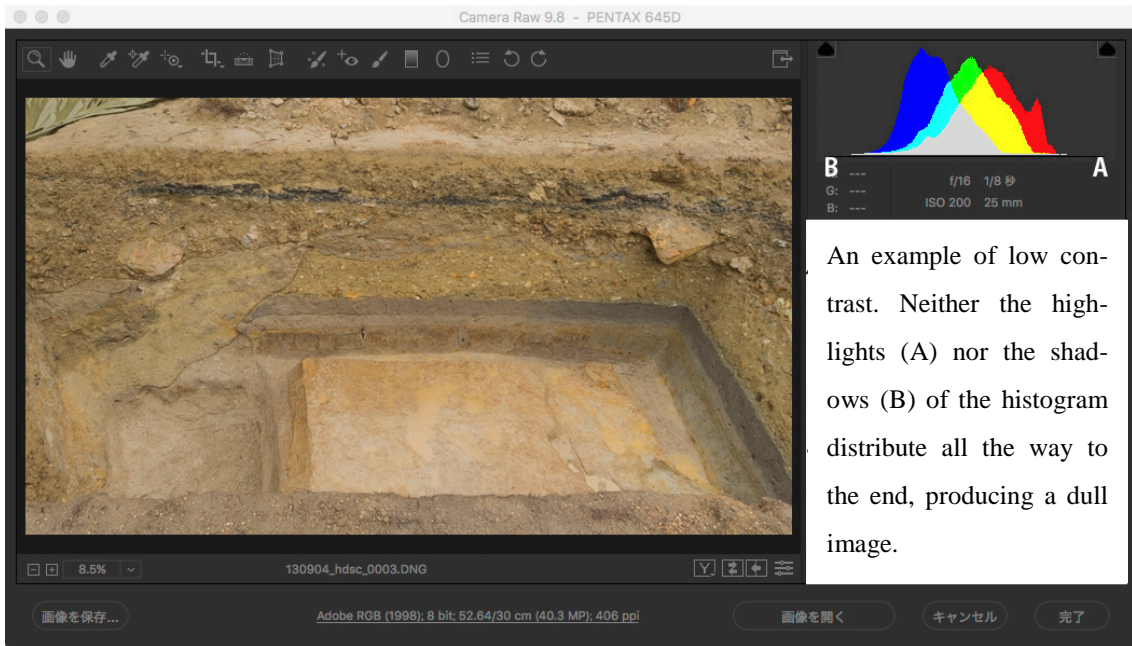
An example of low contrast. Neither the highlights (A) nor the shadows (B) of the histogram distribute all the way to the end, producing a dull image.

Photo 4. An example of a low contrast image. The histogram is not distributed from one end to the other.



An example of high contrast. The histogram is disrupted at both the highlight (A) and shadow (B) side, and displays poor gradation in the shape of a low mountain.
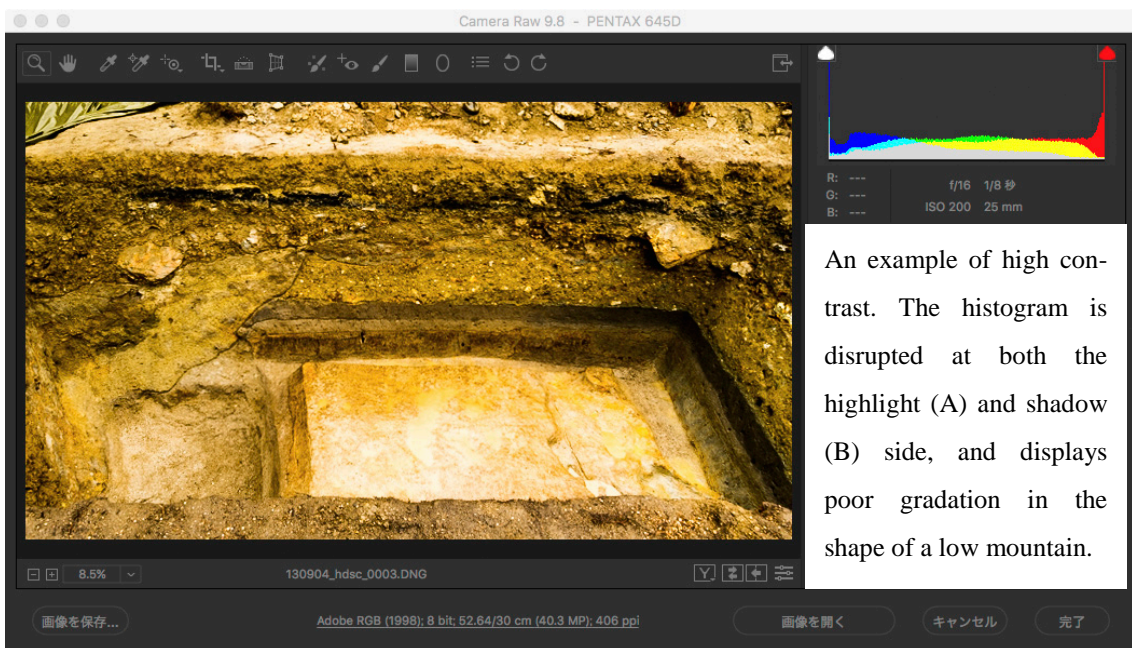
Photo 5. An example of a high contrast image. The histogram is disrupted and displays poor gradation.