Exposure

When you shoot a picture the lighting is not always ideal, so pictures sometimes may be under- or overexposed.

A well-exposed image will have a good spread of tones from light to dark with details in both the shadow and highlight areas.

An underexposed image has not received enough light. The shadow and midtone areas in an underexposed image are too dark.

An overexposed image has received too much light. An overexposed image will have little detail in highlight areas and the midtone areas will be too bright.

We can correct for exposure problems with Photoshop Elements. This will be the subject of this lesson.
Tonal Values

Digitized images actually are made up of tiny spots called picture elements or “pixels.” The color of each pixel in an image is a combination of three color channels: red, green, and blue (RGB). Photoshop Elements uses 256 levels of brightness, called tonal values, for each color channel.

- Tonal value = 0 = no color
- Tonal value = 126 = an intermediate shade
- Tonal value = 255 = the most intense color possible

The overall color of a pixel is determined by the tonal values of each color channel making up the pixel. Consider some examples:

<table>
<thead>
<tr>
<th>Pixel</th>
<th>Red</th>
<th>Green</th>
<th>Blue</th>
<th>Overall Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>255</td>
<td>0</td>
<td>0</td>
<td>Red</td>
</tr>
<tr>
<td>#2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Black</td>
</tr>
<tr>
<td>#3</td>
<td>255</td>
<td>255</td>
<td>255</td>
<td>White</td>
</tr>
<tr>
<td>#4</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>Gray</td>
</tr>
<tr>
<td>#5</td>
<td>255</td>
<td>255</td>
<td>0</td>
<td>Yellow</td>
</tr>
<tr>
<td>#6</td>
<td>255</td>
<td>255</td>
<td>175</td>
<td>Light Yellow1</td>
</tr>
</tbody>
</table>

The point of this is that each pixel has three tonal values associated with it, one for each of the three primary colors. The tonal value for each color expresses its brightness. The color and the brightness of each pixel is determined by its three tonal values.

RGB Histograms

A RGB histogram is a plot of all the tonal values (three per pixel) for all the pixels in an image.

The histogram of an image is useful for making changes that can improve the lighting of an image – its brightness and contrast in particular.

As an example, the majority of the tonal values in the histogram shown above are on the left-hand side of the graph. Because most of the pixels in the image are dark, this picture is underexposed and will appear too dark.

1 Blue is the complement of yellow. Red and green alone produce yellow. Adding some blue subtracts from the yellow, giving light yellow
Consider this picture and its RGB histogram from the Elements “Levels” command.

Note that almost all the tonal values are piled up to the left in the histogram. This picture is underexposed, leaving almost all the pixels with colors of low brightness.

This picture, on the other hand, has most of the tonal values on the right-hand side of the histogram. This picture is overexposed, leaving almost all the pixels with too much brightness.

This flat picture has all its tonal values piled up in the center – no really dark pixels and no really bright ones.
In this histogram, on the other hand, the bulk of the tonal values are either on the right or the left side. All the pixels are either dark or bright, with few in between. This is characteristic of a **contrasty** image.

There are two reasons why we care about histograms.

- A small change in viewing angle can have a major effect on the brightness of the thumbnail image shown on the LCD screen of a digital camera, so it frequently is difficult to judge whether a picture is properly exposed. Most digital cameras will display a histogram along with a picture, which will help you determine if the exposure was acceptable.
- The **Enhance, Adjust Lighting, Levels** menu choice in Elements allows you to adjust tonal values in an image. Adjusting their tonal values is the best way to adjust the overall brightness and contrast of an image.

**The Levels Control**

Open **Computers.jpg** and save it as **Computers_1.psd**.

In Elements, selecting **Enhance, Adjust Lighting, Levels** will display the RGB histogram of the image.
The small slider **Input controls** below the histogram allow you to adjust which pixels in the image have tonal values of 0 (pure black), 255 (very bright), or 127 (middle tone).

That the “Computers” image is flat is apparent from both its appearance and its histogram – all the tonal values are piled up in the center of the histogram.

First, move the right input control until it meets the right side of the set of pixels shown in the graph.

This sets the tonal values of the lightest pixels in the image to their brightest values and lightens the image in the process.

Now, move the left input control until it meets the left side of the set of pixels shown in the graph.

This sets the tonal values of the darkest pixels in the image to the pure black and darkens the entire image in the process.

Click on **OK**.
If you look at the histogram of the adjusted image, you will see that the tonal values now are spread over the entire range. A wide range of tonal values is characteristic of a well-exposed image.

You also may notice that the plot of tonal values is no longer solid, but is made up of dark and light bands. When Photoshop Elements stretches the plot of tonal values out so that its ends are at 0 and 255, it creates some “holes” – tonal values that no pixels in the image have. The “holes” are spread out evenly over the entire range, so they are not apparent to our eyes.

Levels Control – A Guide to Adjusting Tonal Values

1. Make a picture brighter

Open Austin.jpg. Rotate it.

Slide the right input control toward the center until it meets the right edge of group of pixels.
2. Make a picture darker

Open TracyArmsCliff.jpg.

Slide the left input control toward the center until it meets the left edge of the group of pixels.

3. Increase the contrast of a picture

We already did this one.

Slide both input controls toward the center until they reach the edges of the group of pixels.

4. Decrease the contrast of a picture

We will see how to handle high contrast pictures in the next section of this lesson on Shadows and Highlights.
Shadows and Highlights Control

Open *Church.jpg* and save it as *Church_1.psd*. This high contrast image obviously needs some lighting corrections – the sky and church steeple are fairly well exposed, but the trees in the foreground are way too dark.

Open the *Levels* window. The histogram is characteristic of a high contrast image, with tonal peaks on both ends, but not many tones in the center.

Adjusting the right or left input controls won’t do much to improve this picture, so changing the levels won’t help us. *We need to lighten the shadows without changing the highlights*. This can be done with the *Shadows/Highlights* control.

Choose *Enhance, Adjust Lighting, Shadows/Highlights* from the main menu.

In the Shadows/Highlights window, the *Lighten Shadows* slide will be set automatically to 25%, which will lighten the shadows in the image somewhat.

The *Preview* box must be checked for you to see the effect of the adjustment.

We need to move the Lighten Shadows slider to the right to lighten then more.
The shadows in the image still are fairly dark at 50%. Lightening the shadows at a higher percent improves the image even more.

Try lightening the shadows to around 95%. You should see that the trees and courtyard are lightened without the church and sky being affected much.

Save the file as Church_1.psd again. We will use it later.

Let’s try another. Open CIA.jpg and save it as CIA_1.psd. This picture suffers from the same problem as the picture of the church – a fairly well exposed sky, but shadowed portions that are way too dark.

Always check Levels first. You should find that we can slightly lighten the image by moving the right input control to the left a little. This will have a subtle effect on the clouds in the sky, but won’t change the fact that the trees in the image are too dark.
Choose **Enhance, Adjust Lighting, Shadows/Highlights** from the main menu to bring up the Shadows/Highlights window again. Lightening the shadows by 50% gives a fairly decent looking image. **DO NOT click on OK.**

You may notice that the changes have left the picture looking flat and lacking in contrast. This is a common problem when using the Shadows/Highlights control.

![Shadows/Highlights window](image1.png)

To add more contrast to the picture slide the Midtone Contrast slider to a positive value of your choice – I used 29%.

You now will have improved the picture considerably.

Save the picture as **CIA_2.psd**. We will return to this image in the next lesson.

![Midtone Contrast slider](image2.png)
The Brightness and Contrast Controls

Another way of changing the tonal values of an image is with the Brightness and Contrast control. This is not a substitute for the Levels and Shadows/Highlights controls which are the primary controls for adjusting tonal values. I mainly use the Brightness and Contrast control after I already have adjusted an image with Levels and it still needs more work.

Open the image Family_Dark.jpg and save it as Family_Dark_1.psd. This is an old photo that is in the process of restoration.

If you check out the Levels control you will see that the endpoints of the histogram already have been adjusted so that they are set to 1 and 255. The picture obviously still is too dark.

A good way to brighten this image up is with the Brightness and Contrast control

Choose Enhance, Adjust Lighting, Brightness/Contrast from the main menu.

A window will appear with two slider bars. Move the two bars so that the image appears to be better exposed. The Preview box must be checked in order to see the effect of the adjustment on the image.

This particular image is both dark and rather high contrast. I first raised the brightness and then decreased the contrast. It almost always is a good idea to adjust the brightness with this control before changing the contrast.
**The Burn Tool**

The Burn Tool is used to selectively darken a portion of an image. We will use it to darken the light church steeple in Church_1.psd. Open this file, which you saved earlier in the lesson.

Click on the **Burn Tool** icon on the toolbar.

If you do not see the Burn Tool on the toolbar, right-click on the small triangle in the lower left of the icon in the position shown in the picture at the right. This will show all three tools available, from which you can choose Burn.

The Burn Tool is a subtle tool, usually used to darken the midtones of a relatively small section of an image. Generally we use a low exposure (around 10% or less) for the tool so it does not darken an area too much at once. The church steeple isn’t very large so choose a small size around 20 pixels.

Use the **Zoom Tool** to zoom in on the image until it is displayed at **300%**. This will magnify the steeple so we can burn it in more precisely.

With the Burn Tool active, the cursor will look like a circle when moved over the image. Hold the left mouse button down and sweep the cursor over the steeple. You should see that the steeple becomes darker.

You also might darken the tops of the trees close to the steeple.

Save the image as **Church_2.psd**.
The Dodge Tool

The Dodge Tool works like the Burn Tool except it lightens sections of the image rather than darkening them. Open Santa.jpg and save it as Santa_1.psd.

Use the Dodge Tool to lighten Santa’s beard and robe.
Practice Problems

Before you move on to the next lesson, plan how you would improve the following images and then make the improvements. Use techniques from all the Photoshop Elements lessons you have worked with so far.

1. Open JoyceAustin.jpg and save it as JoyceAustin_1.psd.
   - Rotate the image
   - Look at the bricks, wood paneling and metal side of the fireplace. How could you improve the picture by changing its orientation and cropping it. Make these improvements.
   - Use the Levels control to improve the brightness and contrast of the image
   - Save the image as JoyceAustin_2.psd

2. Open Harbor.jpg and save it as Harbor_1.psd. Improve it with the Levels control.

3. Open Spires.jpg and save it as Spires_1.psd.
   - From the RGB histogram, is this picture under- or overexposed?
   - Try moving the midpoint slider to darken the midtones slightly.

4. NorthChurch.jpg

5. Ship.jpg

6. SteveDelena.jpg

7. Ketchikan.jpg

8. Appian.jpg

9. Calais.jpg