What is HP Adaptive Lighting Technology?

HP Adaptive Lighting technology is a breakthrough technology that permits HP digital cameras to produce photos that look more like what we see with our own eyes. The human visual system, our eyes and brains working together, have a marvelous ability to deal with very high contrast scenes without losing information in either shadows or bright areas. The photographic process, either digital or film based, is much more limited in this regard. Photographers have long used techniques such as fill flash, fill lighting and darkroom techniques such as dodging and burning to address this challenge. HP’s Adaptive Lighting technology uses advanced digital image processing to achieve the same effect, automatically and in the camera. HP Adaptive Lighting technology balances brightness relationships between bright and dark areas in a photo, preserving gentle contrasts but compressing harsh contrasts. In doing so, some local areas in a photo are lightened while other areas are left alone. Image scientists call this process “digital scene re-lighting.”

HP Adaptive Lighting technology was introduced in the HP Photosmart 945 digital camera in 2003 and included in a wide range of HP Photosmart cameras since then. In addition, HP adaptive lighting technology is now included in the Image Zone software as well as several HP Photosmart Photo Printers. In HP Photosmart digital cameras that have adaptive lighting, it can be turned on and off and in some cameras the level can be set to “low” or “high” based on the photographer’s desires. By default, this feature is turned off, however the camera can be set to power on with any of the three levels as the default.

Show me!

Here is an example showing a photo taken without adaptive lighting technology and the same scene with adaptive lighting tuned on. Notice how adaptive lighting has lightened the interior portions but preserved the bright details outside the windows. The scene on the right – taken with adaptive lighting turned on – is much more shows a much more realistic photographic rendition of what the photographer saw.
Has anything like this been done before?

The concept of scene re-lighting is not new. However, application of these advanced techniques has been quite limited. HP was the first to provide this type of technology inside the camera. HP adaptive lighting technology is also available in HP Image Zone software and in some HP Photo Printers so the adaptive lighting may be applied to images after capture. However, HP adaptive lighting, when applied inside the camera, takes advantage of the full raw image information as well as camera specific information such as camera model, exposure and light levels, camera mode, temperature, flash information, to optimally process the image. When adaptive lighting is applied outside the camera, some of that information is not available so the results will differ.

Can’t I just do this in an image editing package using tools like histograms, gamma curves and so on?

No. Tonal manipulation tools such as histograms and gamma curves are extremely useful and powerful tools. However, they operate globally over the entire image whereas HP adaptive lighting technology operates based upon an image dependent mask. In other words, adaptive lighting changes depend on where, in the image, it is operating. A sophisticated user may be able to achieve similar benefits in image editing packages by carefully making selections or masks then applying tonal correction using those masks. In addition, burning and dodging tools can selectively lighten or darken specific areas of an image much like the film photographer does in a darkroom. However, while these techniques are possible, they are very difficult, time consuming and beyond the ability of most users. HP adaptive lighting technology operates automatically, in the camera, with no user interaction required (other than turning it on!)
What types of photos benefit the most from HP adaptive lighting technology processing?

Photos of scenes that have a lot of contrast benefit the most from adaptive lighting. These include outdoor scenes in a mixture of sun and shade, cloudy days when there is a lot of “glare” from the sky, and indoor flash photography. A good time to use HP Adaptive Lighting technology on is when taking photos at a gathering of family or friends and you want to get pleasing photos without paying much attention to the act of taking photos. The algorithm improves photos taken under many difficult lighting conditions and results in more photos that are worth keeping and sharing.

It is especially difficult to get pleasing photos with flash photography, because light from the camera’s flash brightly shines on subjects close to the camera, but dimly lights subjects far from the camera. Professional photographers call this problem “inverse-square light falloff.” HP Adaptive Lighting technology processing balances much of these brightness differences to produce more natural and pleasing photos. The images on the next page illustrate the advantage of Adaptive Lighting technology in a flash scene where the background is better revealed. Another very common problem flash scene is a flash photograph of people where some of the people are close to the camera and others are farther away. In this case, the people close to the camera tend to be over exposed and those further away are dimly lit. Adaptive Lighting will help to balance the illumination and create a better photograph of both close and far subjects. Note, HP Adaptive Lighting technology does not replace the flash – it simply works to make flash photography better.

Will all photos look dramatically different?

HP’s Adaptive Lighting technology adjusts the strength of processing for each individual scene. Sometimes the effect will be very mild, particularly in scenes where extremes of contrast do not exist. In addition, adaptive lighting is custom tuned for each camera model so two camera models will provide slightly different results from the same scene.

When should I not use HP Adaptive Lighting Technology?

There are a few types of scenes for which HP Adaptive Lighting technology may not be desirable. These include times when you want dramatic contrasts in a photo, such as a silhouette. Low contrast scenes, such as delicate outlines of objects in a fog bank, do not benefit.

Also, when making 8x10 or larger prints, some parts of a photo may appear to have more noise. With digital photography, dark parts of the scene will contain more noise than light areas. Because HP Adaptive Lighting technology lightens some of these dark areas, you may notice more noise in these parts of the picture. In general, the improvement in overall photo quality using Adaptive Lighting technology will offset slight increase in noise.

Is adaptive lighting the same in every HP camera?

Not quite. The intent and effect on your image of adaptive lighting is the same in all HP cameras, but the results will vary from model to model. There are two reasons for this. First,
adaptive lighting is custom tuned for a particular camera model based upon the precise performance of the camera. Second, the specific adaptive lighting algorithms used inside a particular camera model differ. HP has two versions of adaptive lighting technology in HP cameras called adaptive lighting /r and adaptive lighting /s. These are described further below. HP Image Zone and HP Photo Printers have adaptive lighting /s.

**What is adaptive lighting /r?**

Adaptive lighting /r has some of its roots in a theory called “retinex” developed by Edwin Land of Polaroid many years ago. Retinex is a theory based upon the way people see high contrast scenes, but, while it has been an interesting area of research in digital imaging, it has never been particularly successful as it often damaged an image more than it improved it. HP researchers developed a modification and extension to this theory and created adaptive lighting /r, the first automatic digital re-lighting technique to be included in a digital camera or to be successful on a wide variety of photographs.

In HP cameras with adaptive lighting /r, you can select off, low and high settings for adaptive lighting. For most scenes the low setting would be preferred. In this setting, the algorithm balances lighting on a scene with a conservative touch. The high setting is most useful under conditions of extreme backlighting, or when you want a dramatic effect.

**What is adaptive lighting /s?**

Adaptive lighting /s achieves digital re-lighting but is based upon different class of image processing routines spatial varying contrast maps. Adaptive lighting /s adapts to the scene you are photographing but operates on different principals than adaptive lighting /r.

In HP cameras with adaptive lighting /s, you can select off or on for adaptive lighting. The ‘on’ setting will operate much like the ‘low’ setting in adaptive lighting /r. HP Image Zone and Photo Printers with adaptive lighting all currently use adaptive lighting /s.

**How do I know which my adaptive lighting my camera has?**

The version of adaptive lighting your camera has will be indicated in the data sheets for your camera with the exception of the HP Photosmart 945, R707, R607 and R507 cameras. These cameras all have adaptive lighting /r.

**Is one version of adaptive lighting better than the other?**

This question does not have a simple answer. In fact, the results you get from adaptive lighting /r or adaptive lighting /s will depend on the camera model being used and the scene being photographed, even if the camera models have the same version of adaptive lighting. The nature of these algorithms is that they adapt. In addition the adaptive lighting routines are customized for each camera model based upon the characteristics of that specific model. Adaptive lighting /r does have the added flexibility of both a low and high setting.
Reviewers need to know.

HP Adaptive lighting technology is a sophisticated image processing algorithm that extends the time needed by the camera to save a photo to the Secure Digital memory card. To provide a fair comparison, you may want to turn off Adaptive Lighting before comparing HP cameras with adaptive lighting to cameras that do not do this sophisticated level of image processing.

HP recommends you turn off Adaptive Lighting when measuring color accuracy, contrast or signal/noise ratio. While adaptive lighting will provide more pleasing image that better represents what the photographer saw, it is not intended to improve analytical accuracy measurements.

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