

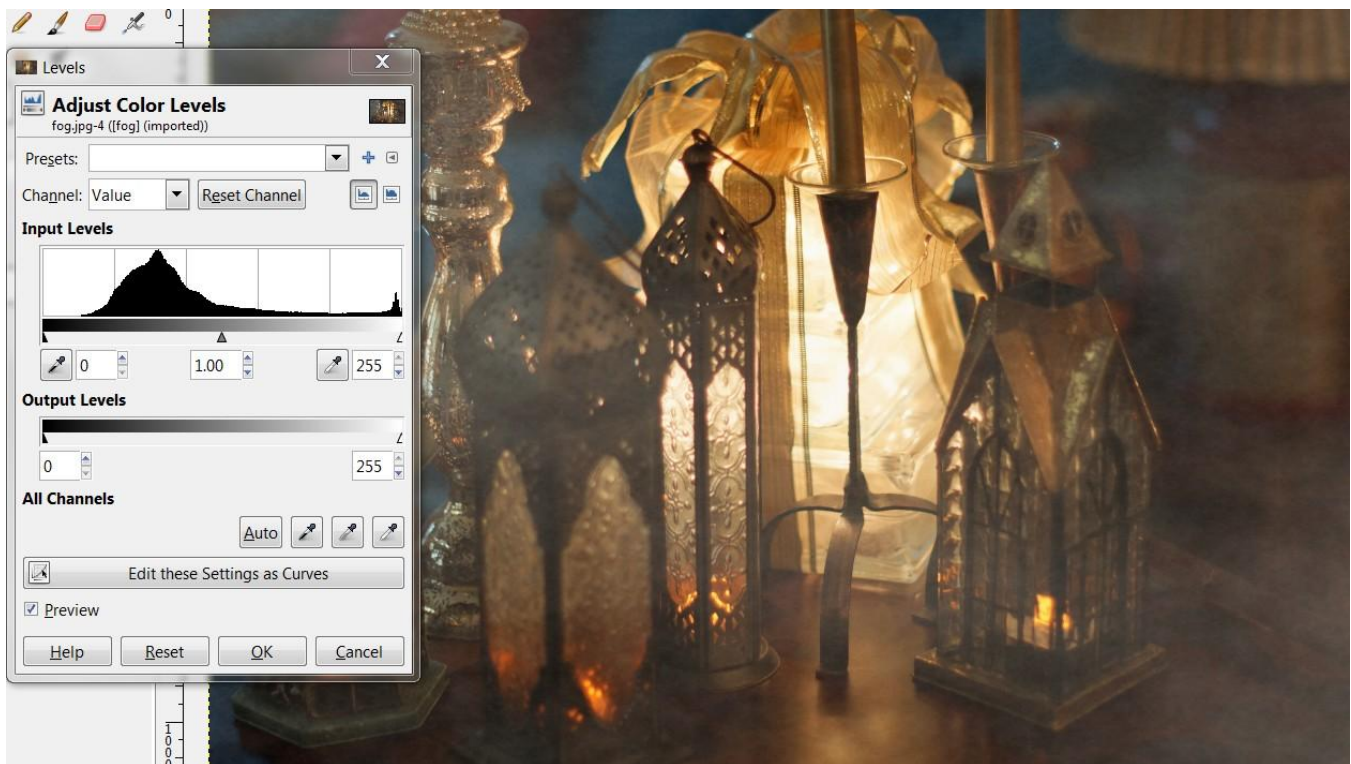
Thoughts on HDR – Gary White

HDR or high dynamic range is a recent process that has captured a lot of photographic interest.

Basically HDR uses multiple images of different exposure values (EVs) and then adds them to create an image that better approximates, or exceeds, what the human eye sees. This can be done in many cameras (including iPhone 4 or later) as well as by post processing multiple images in Photoshop, Gimp, Photomatrix , or any photo processing software that can stack multiple images into one

HDR to create better fidelity. The human eye has a static dynamic range of about 10 to 14 *f* stops and an adaptation range several times that so that we can see well beyond 10,000 levels of light. Sometimes when we take a photograph we are disappointed in the range of colors, brightness, and contrast. This is because the camera has less dynamic range than the eye.

Therefore, in general, we see a truer image in our mind. The camera, in a single image, may only have a range that accentuates the median values in a scene. One can look at a histogram of a photograph and see some of the immediate problems with a camera's dynamic range. For example, in the photograph below, the primary range of levels exist between say 40 to 150. Certainly, overall, a fairly flat image. However, that was by design since the background was used as a counterpoint to the very bright light, over in the range of 240-255. Therefore, not all flat images are necessarily bad and this photograph is just shown to illustrate how the dynamic range of this photograph is limited.



It is the power of HDR processing to remove this flat effect and enables one to capture an image that has a better approximation to what the eye-brain system sees.

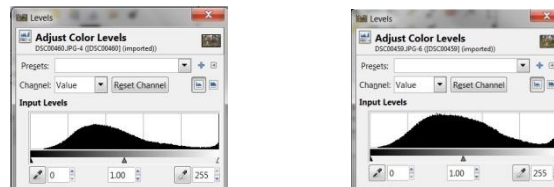
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For example, the below picture of the fireplug in a field (left), appeared bland and flat. I visually observed more vibrant red and contrast against the silver colored background. In addition, while the field was suffering from a drought, a recent rain had allowed some green foliage to develop which really seemed to stand out from the dead brown undergrowth.



Using my Sony DSLT A-77's built in high dynamic range (HDR) capability, and with the same light conditions as the image on the left, I re-captured the image on the right. It was a much better approximation of what I was seeing with my eye and, in my opinion, a more pleasing and interesting photograph.

It's fairly easy to examine the differences with the eye, but the histogram (color levels) of the two images (HDR on right) shows the increased dynamic range and intensities.



It should be noted, that all HDR processing for the above photo was accomplished in the camera; however, the results could have been obtained using Photomatrix, Photoshop, or Gimp. The advantages of post processing HDR is more control and an ability to extend or curtail the HDR processing effects.

One of the problems with digital photography and dynamic range is the fact that the analog to digital (A/D) conversion process has a finite number of bits. Most camera's employ a 12 bit A/D convertor. Therefore, in the HDR process, it is best to use the raw image instead of JPEG, which only employs 8 bits. In reality, one uses a process called tone mapping along with multiple images since most displays and printers are also bit limited.

Another limit is the noise introduced by the imaging sensor. For example, most cameras capturing an image are limited to a noise dynamic range, as measured in dB, not f stops, of about 40 at the lowest ISO setting. This is a precise measure of the camera's range against noise, since as the ISO, or image sensitivity, is increased, noise will further limit a camera's dynamic range.

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When one looks at all of this, we see that most digital cameras will have a dynamic range of perhaps only 5-8 *f* stops, at best.

HDR to create a surreal image. Some dramatic images can be created when the HDR process is carried out to an extreme level. Taking multiple images over a range of +/- 2 or 3 EV ranges and then combining them can yield stunning surreal results like the image below.



Most HDR enthusiasts seem to favor images like this that are beyond any degree of realism. However, I prefer to go for a slightly more subdued image unless there is a special theme or feeling I wish to communicate.

Creating a HDR image is very easy. Here is a link to a tutorial that uses Photomatrix - http://www.vanilladays.com/wp-content/uploads/2009/06/hdr_tutorial.pdf - it has some very nice images.

In summary, HDR if not used properly could easily ruin an image. But if properly applied, it can create realistic or artistic effects.