



What's Watt: Measuring Light

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When a professional photographer sets up a shoot, he or she will use a photometer to measure light levels on and around the subject being photographed. This is so the best lighting is used to capture the image of the subject. But what is really being measured when we measure light? The answer depends on what you are interested in. Light is quantified in different ways using different units. For example, if we are interested in knowing how bright the sun is, we might measure the brightness of its surface, its brightness as seen from the Earth, or how bright objects become under sunlight. In other words, we might try to measure the sun's intensity or its illumination.

The Lumen

The lumen is a measure of the quantity of light produced by a source such as a light bulb. For example, a standard 60-watt light bulb produces about 880 lumens.

Illuminance

When an architect designs the lighting for a building, the intensity of a light source is not as important as how much light falls on the surface of a wall, desktop, or floor. This is known as illuminance. Illuminance is measured in units called footcandles (using the Standard system of feet) or in lux (the metric form). One lumen is the amount of light it takes to illuminate a 1 square meter area to 1 lux. In the typical elementary school classroom, light is maintained at a level of about 40 lux. But if older adults were going to use the room, a level of about 80 lux would be appropriate, because older eyes typically need more light to see.

The Watt

Some people think that the watt is a measure of light, because light bulbs are labeled in terms of their wattage. In fact, a watt is not a measure of light intensity or illumination, but of energy use. For a 60-watt incandescent bulb, only 5% of the energy consumed (3 watts) actually results in the light we see. The remaining 57 watts ends up as heat instead of visible light! The sun is the biggest energy producer in the solar system. It continuously puts out about 4×10^{26} watts of power (that's the number 4 followed by 26 zeros!). To put it another way, the sun is 1024 times brighter than a 200-watt light bulb!

Whether measuring intensity of light or the illumination on a surface, the standard tool used in measuring light intensity is the photometer. Photometers are used in a great many devices, including cameras (to determine the proper exposure of film), security lighting, and even on astronomical telescopes. There is even a

special type of photometer that can measure the light intensity of specific wavelengths of light. These devices permit scientists to study the chemistry of the air and surface of different planets without having to be there. By applying photometers, we knew the moon was not made of green cheese long before the astronauts landed there.