

Top-Down Lighting Bias

A tendency to interpret shaded or dark areas of an object as shadows resulting from a light source above the object.¹

Humans are biased to interpret objects as being lit from a single light source from above. This bias is found across all age ranges and cultures, and likely results from humans evolving in an environment lit from above by the Sun. Had humans evolved in a solar system with more than one sun, the bias would be different.

As a result of the top-down lighting bias, dark or shaded areas are commonly interpreted as being farthest from the light source, and light areas are interpreted as being closest to the light source. Thus, objects that are light at the top and dark at the bottom are interpreted as convex, and objects that are dark at the top and light at the bottom are interpreted as concave. In each case, the apparent depth increases as the contrast between light and dark areas increases. When objects have ambiguous shading cues the brain switches back and forth between concave and convex interpretation.²

The top-down lighting bias can also influence the perception of the naturalness or unnaturalness of familiar objects. Objects that are depicted with top-down lighting look natural, whereas familiar objects that are depicted with bottom-up lighting look unnatural. Designers commonly exploit this effect in order to create scary or unnatural looking images. Interestingly, there is evidence that objects look most natural and are preferred when lit from the top-left, rather than from directly above. This effect is stronger for right-handed people than left-handed people, and is a common technique of artists and graphic designers. For example, in a survey of over two hundred paintings taken from the Louvre, the Prado, and the Norton Simon Museums, more than 75 percent were lit from the top left. Top-left lighting is also commonly used in the design of icons and controls in computer software interfaces.³

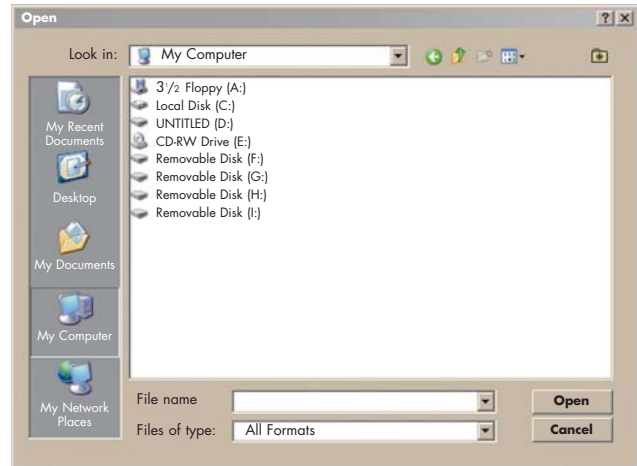
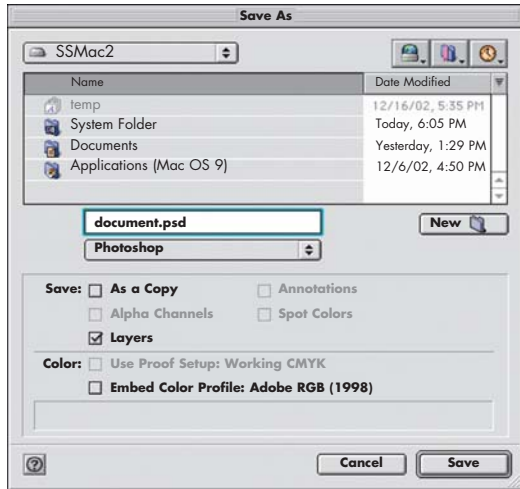
The top-down lighting bias plays a significant role in the interpretation of depth and naturalness, and can be manipulated in a variety of ways by designers. Use a single top-left light source when depicting natural-looking or functional objects or environments. Explore bottom-up light sources when depicting unnatural-looking or foreboding objects or environments. Use the level of contrast between light and dark areas to vary the appearance of depth.

See also Figure-Ground Relationship, Iconic Representation, Three-Dimensional Projection, and Uncanny Valley.

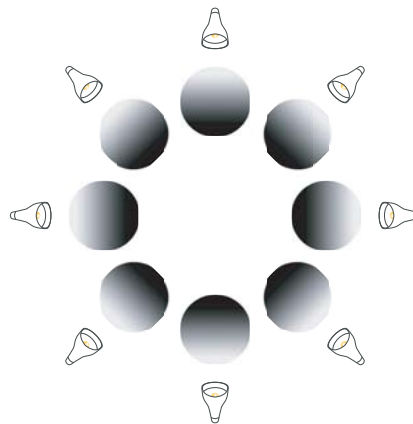
¹ Also known as *top-lighting preference* and *lit-from-above assumption*.

² See “Perception of Shape from Shading,” *Nature*, 1988, vol. 331, p. 163–166; and “Perceiving Shape from Shading,” *Scientific American*, vol. 256, p. 76–83, both by Vilayanur S. Ramachandran.

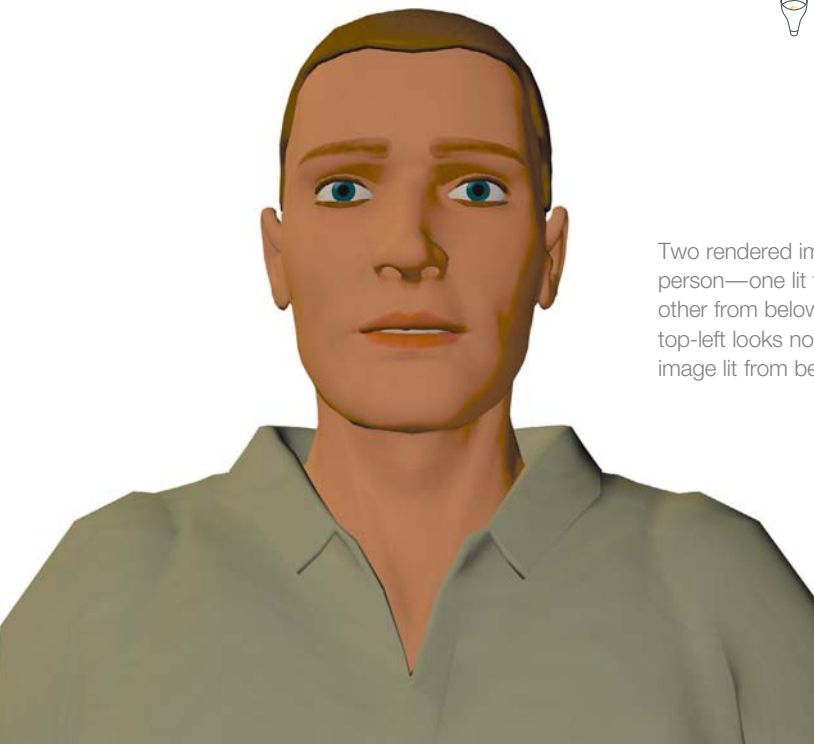
³ “Where Is the Sun?” by Jennifer Sun and Pietro Perona, *Nature Neuroscience*, 1998, vol. 1(3), p. 183–184.



Graphical user interfaces generally use top-left lighting to imply dimensionality of windows and controls.



The circles lit from above appear convex, whereas the circles lit from below appear concave. As the light source moves from these positions, the depth cues become increasingly ambiguous.



Two rendered images of the same person—one lit from top-left and other from below. The image lit from top-left looks normal, whereas the image lit from below looks scary.

