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Topic: Diffraction
Code: HF60405

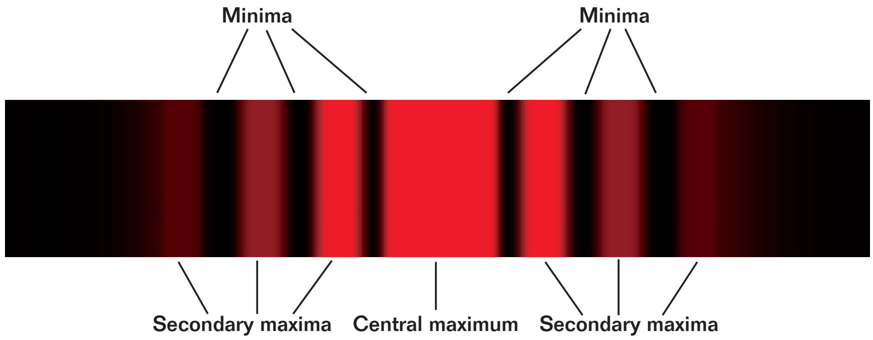

Figure 13
In a diffraction pattern, the central maximum is twice as wide as the secondary maxima.

Light diffracted by an obstacle also produces a pattern

The diffraction pattern that results from monochromatic light passing through a single slit consists of a broad, intense central band—the *central maximum*—flanked by a series of narrower, less intense secondary bands (called *secondary maxima*) and a series of dark bands, or *minima.* An example of such a pattern is shown in **Figure 13.** The points at which maximum constructive interference occurs lie approximately halfway between the dark fringes. Note that the central bright fringe is quite a bit brighter and about twice as wide as the next brightest maximum.

Diffraction occurs around the edges of all objects. **Figure 14** shows the diffraction pattern that appears in the shadow of a penny. The pattern consists of the shadow, with a bright spot at its center, and a series of bright and dark bands of light that continue to the shadow's edge. The penny is large compared with the wavelength of the light, and a magnifying glass is required to observe the pattern.

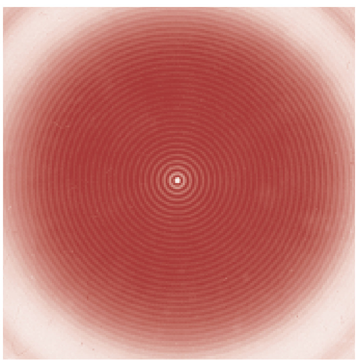

Figure 14
A diffraction pattern forms in the penny's shadow when light is diffracted at the penny's edge. Note the bright spot that is formed at the center of the shadow.

DIFFRACTION GRATINGS

You have probably noticed that if white light is incident on a compact disc, streaks of color are visible. These streaks appear because the digital information (alternating pits and smooth reflecting surfaces) on the disc forms closely spaced rows. These rows of data do not reflect nearly as much light as the thin portions of the disc that separate them. These areas consist entirely of reflecting material, so light reflected from them undergoes constructive interference in certain directions. This constructive interference depends on the direction of the incoming light, the orientation of the disc, and the light's wavelength. Each wavelength of light can be seen at a particular angle with respect to the disc's surface, causing you to see a "rainbow" of color, as shown in **Figure 15.**

Figure 15
Compact discs disperse light into its component colors in a manner similar to that of a diffraction grating.