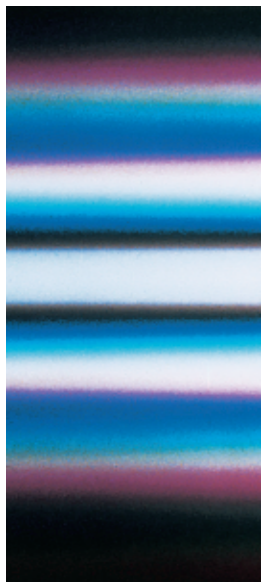

Figure 5
When waves of white light from two coherent sources interfere, the pattern is indistinct because different colors interfere constructively and destructively at different positions.

at that location. When the light from the two slits combines destructively at a point on the viewing screen, a dark fringe appears at that location.

When a white-light source is used to observe interference, the situation becomes more complicated. The reason is that white light includes waves of many wavelengths. An example of a white-light interference pattern is shown in **Figure 5.** The interference pattern is stable or well defined at positions where there is constructive interference between light waves of the same wavelength. This explains the color bands on either side of the center band of white light. This effect also accounts for the bands of color seen on soap bubbles.

Figure 6 shows some of the ways that two coherent waves leaving the slits can combine at the viewing screen. When the waves arrive at the central point of the screen, as in **Figure 6(a),** they have traveled equal distances. Thus, they arrive in phase at the center of the screen, constructive interference occurs, and a bright fringe forms at that location.

When the two light waves combine at a specific point off the center of the screen, as in **Figure 6(b),** the wave from the more distant slit must travel one wavelength farther than the wave from the nearer slit. Because the second wave has traveled exactly one wavelength farther than the first wave, the two waves are in phase when they combine at the screen. Constructive interference therefore occurs, and a second bright fringe appears on the screen.

If the waves meet midway between the locations of the two bright fringes, as in **Figure 6(c),** the first wave travels half a wavelength farther than the second wave. In this case, the trough of the first wave overlaps the crest of the second wave, giving rise to destructive interference. Consequently, a dark fringe appears on the viewing screen between the bright fringes.

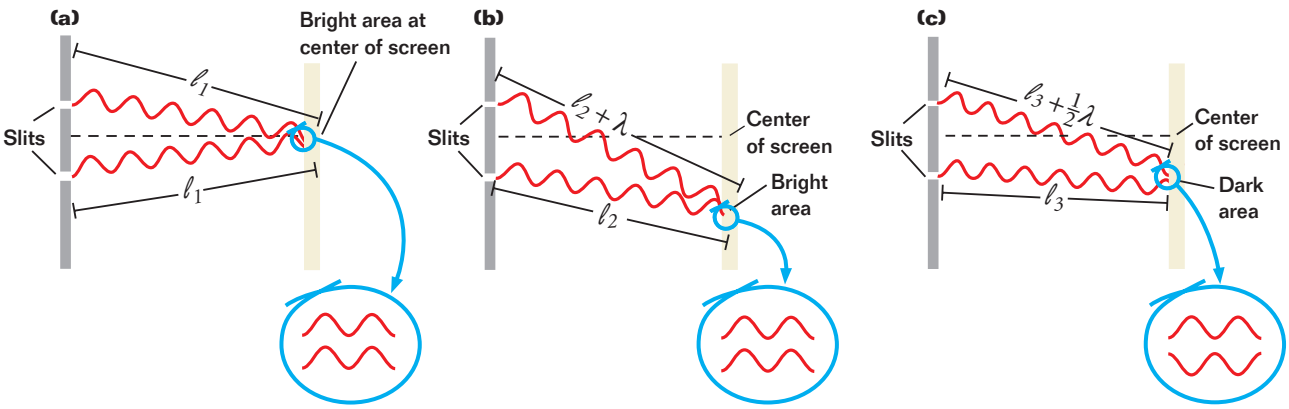

Figure 6
(a) When both waves of light travel the same distance (ℓ_1), they arrive at the screen in phase and interfere constructively. **(b)** If the difference between the distances traveled by the light from each source equals a whole wavelength (λ), the waves still interfere constructively. **(c)** If the distances traveled by the light differ by a half wavelength, the waves interfere destructively.