Color and Polarization

SECTION 4

SECTION OBJECTIVES

- Recognize how additive colors affect the color of light.
- Recognize how pigments affect the color of reflected light.
- Explain how linearly polarized light is formed and detected.

COLOR

You have probably noticed that the color of an object can appear different under different lighting conditions. These differences are due to differences in the reflecting and light-absorbing properties of the object being illuminated.

So far, we have assumed that objects are either like mirrors, which reflect almost all light uniformly, or like rough objects, which reflect light diffusely in several directions. But, as mentioned in Section 1, objects absorb certain wavelengths from the light striking them and reflect the rest. The color of an object depends on which wavelengths of light shine on the object and which wavelengths are reflected (see **Figure 17**).

If all wavelengths of incoming light are completely reflected by an object, that object appears to have the same color as the light illuminating it. This gives the object the same appearance as a white object illuminated by the light. An object of a particular color, such as the green leaf in **Figure 17,** absorbs light of all colors except the light whose color is the same as the object's color. By contrast, an object that reflects no light appears black. In truth, leaves appear green only when their primary pigment, chlorophyll, is present. In the autumn, when the green pigment is destroyed, other colors are reflected by the leaves.

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Additive primary colors produce white light when combined

Because white light can be dispersed into its elementary colors, it is reasonable to suppose that elementary colors can be combined to form white light. One way of doing this is to use a lens to recombine light that has been dispersed by a prism. Another way is to combine light that has been passed through red, green, and blue filters. These colors are called the *additive primary colors* because when they are added in varying proportions, they can form all of the colors of the spectrum.

extension

Integrating Biology

Visit go.hrw.com for the activity "How Does Sunscreen Work?"

Keyword HF6LGTX

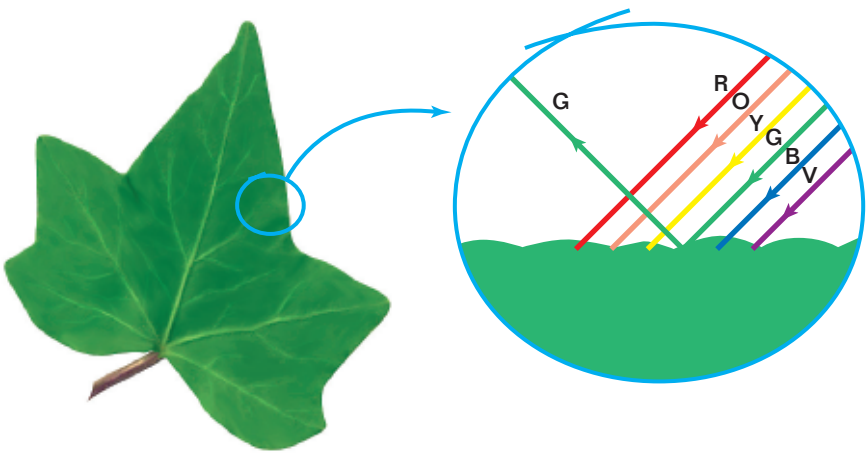

Figure 17
A leaf appears green under white light because the primary pigment in the leaf reflects only green light.