Of the many optical devices we discuss in this Chapter, the magnifying glass is the simplest. Here it is magnifying page 705 of this Chapter, which describes how the magnifying glass works according to the ray model. In this Chapter we also discuss film and digital cameras, the human eye,

telescopes, and microscopes, as well as image resolution, X-rays, and CT scans.

Comparison of part (a) of Fig.

Ject is viewed at the near point with the the object subtends at the eye is much larger angular magnification or magnifying power, M, on the call that the angle of the angle subtended by an object when using the unaided eye, with the object at the (N = 25 cm) for a normal eye):

$$M = \frac{\theta'}{\theta},\tag{25-1}$$

s of the focal Fig. 25–16a),

small so  $\theta$  and

ye strain), the

ocal point; see

where  $\theta$  and  $\theta'$  are shown in Fig. 25–16. We can write length by noting that  $\theta = h/N$  (Fig. 25–16b) and  $\theta$  where h is the height of the object and we assume the  $\theta'$  equal their sines and tangents. If the eye is relaxed image will be at infinity and the object will be precising. 25–17. Then  $d_0 = f$  and  $\theta' = h/f$ . Thus

$$M = \frac{\theta'}{\theta} = \frac{h/f}{h/N} = \frac{N}{f}.$$
 [ eye | \text{eye} \text{ al eye} \text{ onification.} \text{ the lens}

see that the shorter the focal length of the magnification of a given lens cap ery ne.

$$d_0$$
  $j$   $a_i$   $f$   $N$ 

## CHAPTER 25

## **Optical Instruments**

In our discussion of the behavior of light in the two previous Chapters, we also described a few instruments such as the spectrometer and the Michelson interferometer. In this Chapter, we will discuss some other, more common, instruments, most of which use lenses, such as the camera, telescope, microscope, and the human eye. To describe their operation, we will use ray diagrams. However, we will see that understanding some aspects of their operation will require the wave nature of light.