

2.3: Real and Virtual

Most people have no trouble understanding what a real object is or the distinction between a real image and a virtual image. A virtual *object*, however, may take one by surprise – so let's look at all of them here

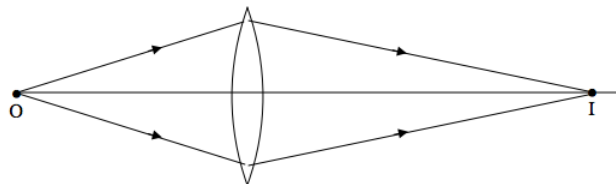


FIGURE II.2

Figure II.2 shows a lens forming a real image of a real object, and I think it requires little explanation. Light diverges from a real object and it converges to a real image. Real photons of light depart from a real object, and real photons of light arrive at a real image.

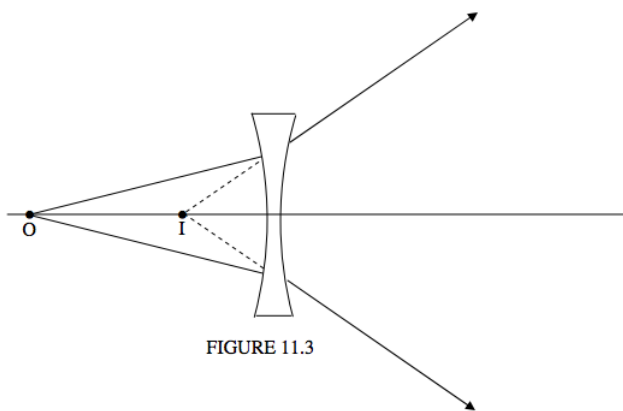


FIGURE II.3

Figure II.3 shows a lens forming a virtual image of a real object. As before, light diverges from the real object, but no light converges to a real image. After refraction through the lens, the light is diverging from a point where the photons have never visited. The light is diverging from a virtual image.

Whereas you can project a real image on to a piece of card or a photographic film, you cannot do this with a virtual image. The reason that you can see a real image with your eye is that the additional optics of your eye bends the diverging light from the virtual image and makes it converge on to a real image on your retina.

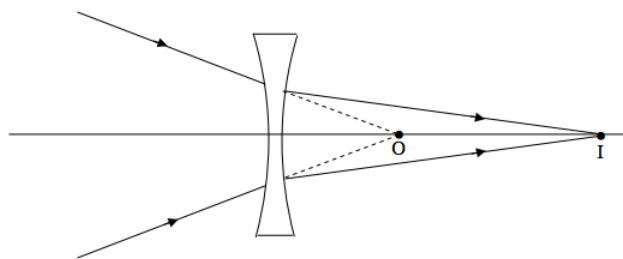


FIGURE II.4

Figure II.4 illustrates what is meant by a virtual object. Light is coming from the left – perhaps from a big lens beyond the left hand edge of the paper (or your computer screen). It is converging to the point O, and, if the concave lens had not got in the way, it would have formed a real image at O. However, as far as the concave lens of Figure II.3 is concerned, the point O to which the light was converging before it reached the lens is a *virtual object*. No photons reach that point. The lens bends the light, which eventually comes to a focus at a real image, I.

You will see that light *converges to a real image or to a virtual object*, and light *diverges from a real object or from a virtual image*.

This is not a sign “convention”; it is just a statement of fact, or an explanation of what are meant by “real object”, virtual object”, “real image” or “virtual image”.

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