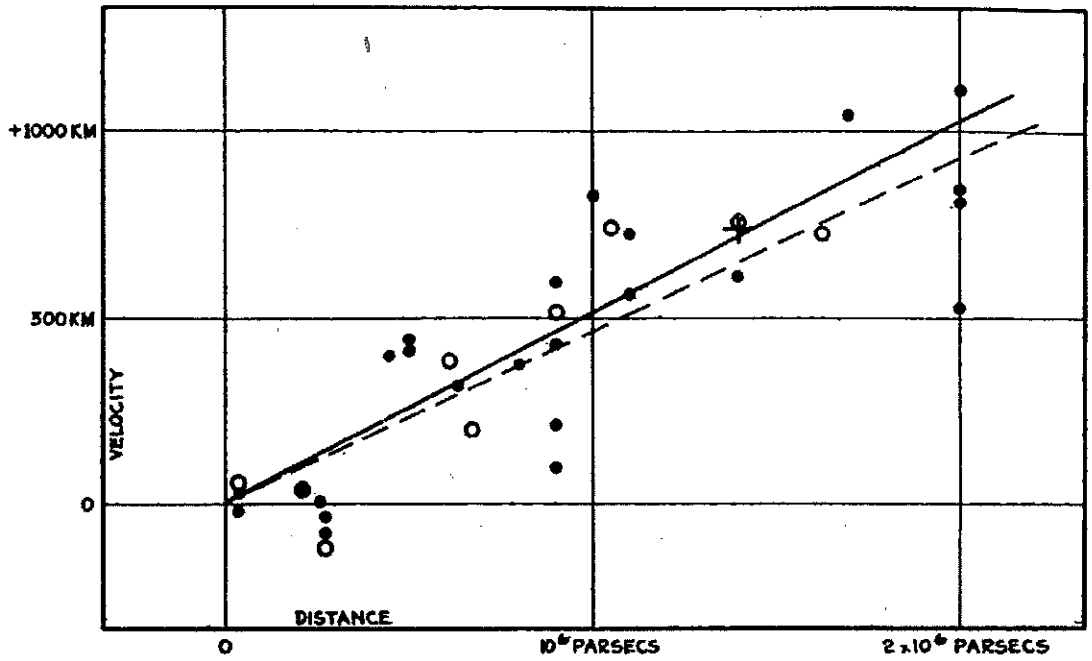

FIGURE 20.11 The Hubble diagram, according to Hubble.

or $100\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$. As a relic of that long debate, you sometimes see the Hubble constant written in the form

$$H_0 = 100h\ \mathrm{km\,s^{-1}\,Mpc^{-1}}, \tag{20.32}$$

where $0.5 < h < 1$. Since the value of the Hubble constant is pinned down more accurately now, feel free to substitute $h = 0.7$.

When cosmologically naïve individuals first encounter the Hubble law, they are likely to say, "Why are all the galaxies moving away from *us*? Was it something we said? Do we have the galactic equivalent of bad breath?" In fact, there is nothing particularly special about us. We are *not* the center of the expansion; in fact, there *is* no center of expansion. The Hubble law is the natural result of the homogeneous, isotropic expansion of the universe.

Saying that the expansion is **homogeneous** means that it is the same at all locations. Saying that it is **isotropic** means that it is the same in all directions. For homogeneous expansion, H_0 is the same at all positions; for isotropic expansion, H_0 is the same in all directions at a given location. The usual analogy compares the universe to a loaf of raisin bread expanding homogeneously and isotropically, so that its shape remains the same as the loaf expands. In such an expansion, each raisin sees every other raisin moving away with a velocity proportional to its distance. Note that the raisins themselves don't expand, since they are held firmly together by intermolecular forces. Similarly, in the globally expanding universe, galaxies themselves don't expand, since they are held firmly together by gravity. The Hubble expansion is not the result of some mysterious force that is prying apart the entire universe down to the tiniest scales; it's simply an empirical statement