

CHAPTER 1

Galaxies

- Define galaxy, and describe types of galaxies.



What's happening with those galaxies?

Find a clear night sky and get out a good pair of binoculars or a telescope. You can see this feature (although not quite as well). The Whirlpool galaxy has an enhanced spiral structure due to its interactions with its companion galaxy NGC 5195.

Galaxies

Galaxies are the biggest groups of stars and can contain anywhere from a few million stars to many billions of stars. Every star that is visible in the night sky is part of the Milky Way Galaxy. To the naked eye, the closest major galaxy — the Andromeda Galaxy, shown in **Figure 1.1** — looks like only a dim, fuzzy spot. But that fuzzy spot contains one trillion — 1,000,000,000,000 — stars!

Galaxies are divided into three types according to shape: spiral galaxies, elliptical galaxies, and irregular galaxies.

Spiral Galaxies

Spiral galaxies spin, so they appear as a rotating disk of stars and dust, with a bulge in the middle, like the Sombrero Galaxy shown in **Figure 1.2**. Several arms spiral outward in the Pinwheel Galaxy (seen in **Figure 1.2**) and are appropriately called **spiral arms**. Spiral galaxies have lots of gas and dust and lots of young stars.

Elliptical Galaxies

Figure 1.3 shows a typical egg-shaped **elliptical galaxy**. The smallest elliptical galaxies are as small as some globular clusters. Giant elliptical galaxies, on the other hand, can contain over a trillion stars. Elliptical galaxies are reddish to yellowish in color because they contain mostly old stars.

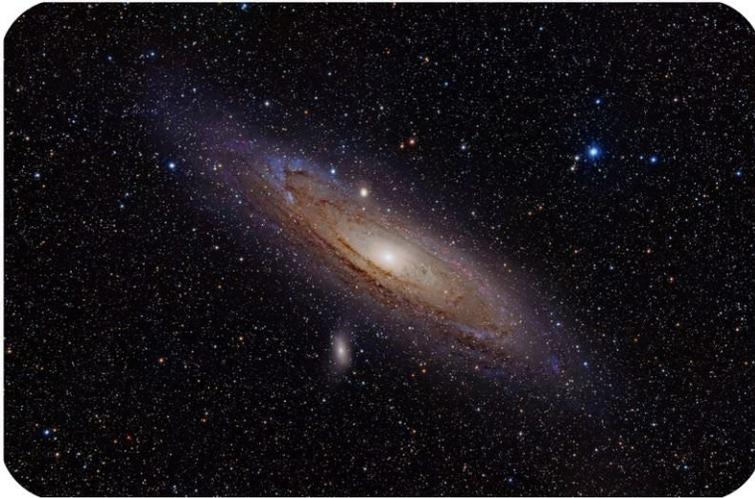


FIGURE 1.1

The Andromeda Galaxy is a large spiral galaxy similar to the Milky Way.



FIGURE 1.2

(a) The Sombrero Galaxy is a spiral galaxy that we see from the side so the disk and central bulge are visible. (b) The Pinwheel Galaxy is a spiral galaxy that we see face-on so we can see the spiral arms. Because they contain lots of young stars, spiral arms tend to be blue.

Most elliptical galaxies contain very little gas and dust because the gas and dust have already formed into stars. However, some elliptical galaxies, such as the one shown in **Figure 1.4**, contain lots of dust. Why might some elliptical galaxies contain dust?

Irregular Galaxies

Is the galaxy in **Figure 1.5** a spiral galaxy or an elliptical galaxy? It is neither one! Galaxies that are not clearly elliptical galaxies or spiral galaxies are **irregular galaxies**. How might an irregular galaxy form? Most irregular galaxies were once spiral or elliptical galaxies that were then deformed either by gravitational attraction to a larger galaxy or by a collision with another galaxy.

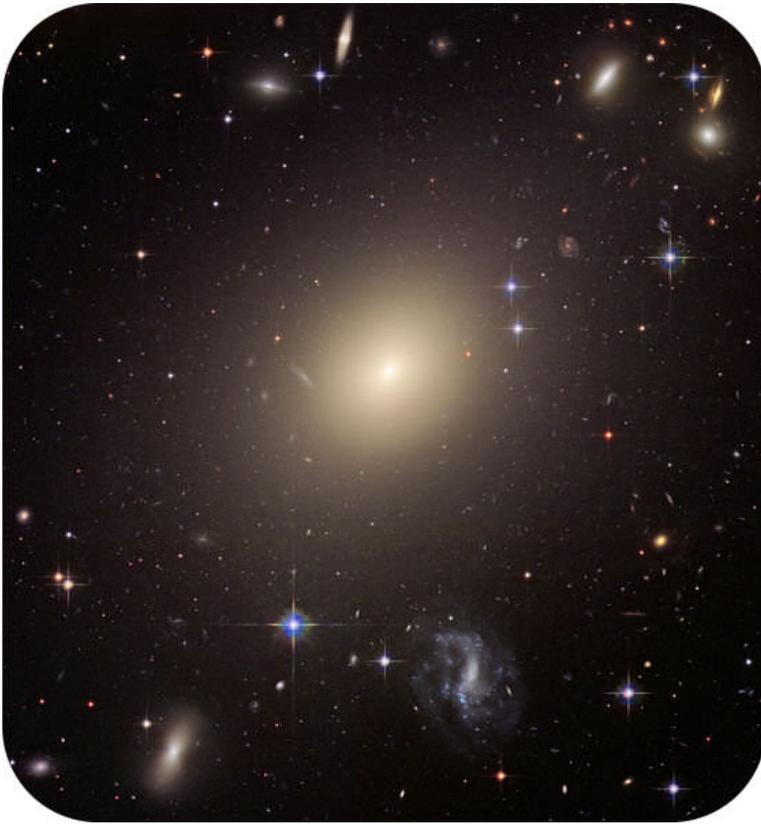


FIGURE 1.3

The large, reddish-yellow object in the middle of this figure is a typical elliptical galaxy. What other types of galaxies can you find in the figure?

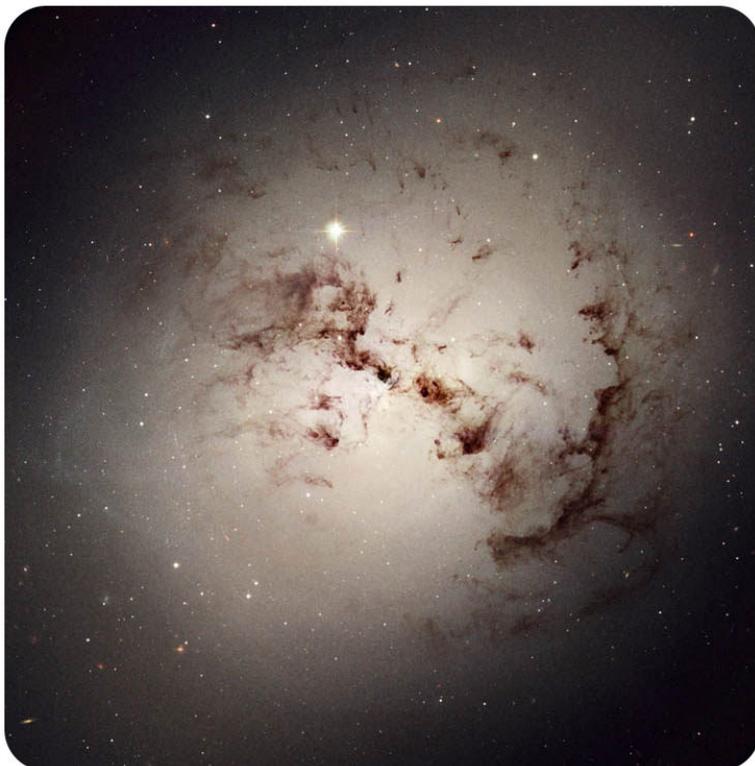


FIGURE 1.4

Astronomers believe that these dusty elliptical galaxies form when two galaxies of similar size collide.

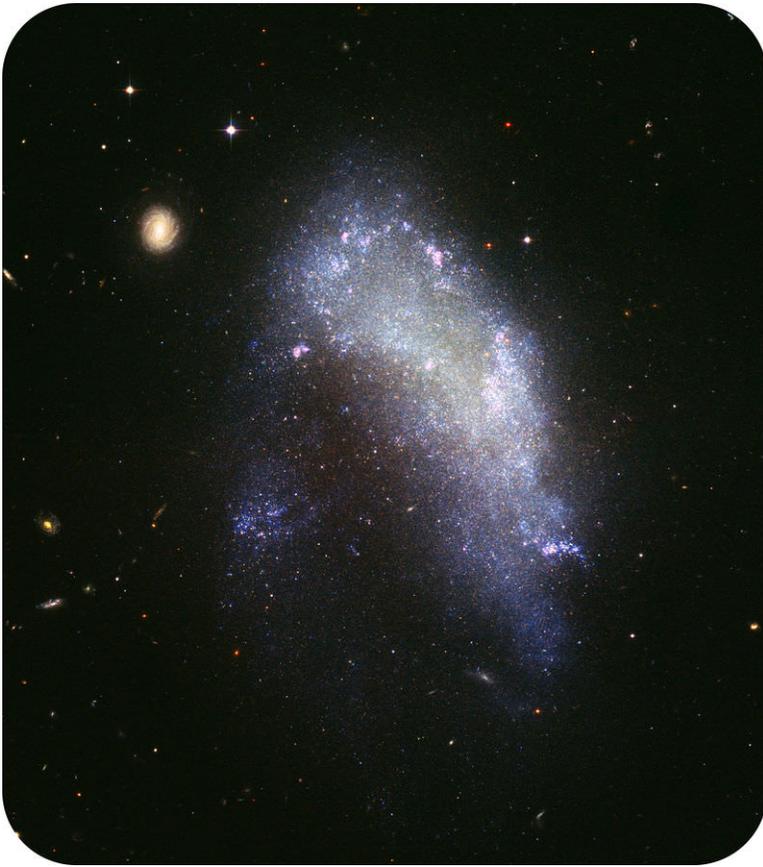


FIGURE 1.5

This galaxy, called NGC 1427A, has neither a spiral nor an elliptical shape.

Summary

- A galaxy is composed of millions to billions of stars.
- Galaxies can be spiral, elliptical or irregular. Dwarf galaxies are smaller, but are more common than other galaxies.
- Galaxies that have lots of dust and gas are locations where stars are forming.

References

1. Adam Evans. [The Andromeda Galaxy is a large spiral galaxy similar to the Milky Way](#) . CC BY 2.0
2. (a) Courtesy of NASA/ESA and The Hubble Heritage Team (STScI/AURA); (b) Courtesy of NASA and ESA. [Spiral galaxies are totating disks of stars and dust with several arms](#) . (a) Public Domain; (b) CC BY 3.0
3. Courtesy of NASA and J. Blakeslee (Washington State University). [The red-yellow galaxy at the center of t his image is an elliptical galaxy](#) . Public Domain
4. Courtesy of NASA, ESA, and The Hubble Heritage Team (STScI/AURA). [Dusty elliptical galaxies may have been formed when two galaxies of similar size collide](#) . Public Domain
5. Courtesy of NASA, ESA, and the Hubble Heritage Team (STScI/AURA). [This galaxy is an irregular galaxy t](#)