

CHAPTER OVERVIEW

26: Galaxies

In the last chapter, we explored our own Galaxy. But is it the only one? If there are others, are they like the Milky Way? How far away are they? Can we see them? As we shall learn, some galaxies turn out to be so far away that it has taken billions of years for their light to reach us. These remote galaxies can tell us what the universe was like when it was young.

In this chapter, we start our exploration of the vast realm of galaxies. Like tourists from a small town making their first visit to the great cities of the world, we will be awed by the beauty and variety of the galaxies. And yet, we will recognize that much of what we see is not so different from our experiences at home, and we will be impressed by how much we can learn by looking at structures built long ago.

We begin our voyage with a guide to the properties of galaxies, much as a tourist begins with a guidebook to the main features of the cities on the itinerary. In later chapters, we will look more carefully at the past history of galaxies, how they have changed over time, and how they acquired their many different forms. First, we'll begin our voyage through the galaxies with the question: is our Galaxy the only one?

[26.1: The Discovery of Galaxies](#)

[26.2: Types of Galaxies](#)

[26.3: Properties of Galaxies](#)

[26.4: The Extragalactic Distance Scale](#)

[26.5: The Expanding Universe](#)

[26.E: Galaxies \(Exercises\)](#)

Thumbnail: Spiral Galaxy. NGC 6946 is a spiral galaxy also known as the “Fireworks galaxy.” It is at a distance of about 18 million light-years, in the direction of the constellations Cepheus and Cygnus. It was discovered by William Herschel in 1798. This galaxy is about one-third the size of the Milky Way. Note on the left how the colors of the galaxy change from the yellowish light of old stars in the center to the blue color of hot, young stars and the reddish glow of hydrogen clouds in the spiral arms. As the image shows, this galaxy is rich in dust and gas, and new stars are still being born here. In the right-hand image, the x-rays coming from this galaxy are shown in purple, which has been added to other colors showing visible light. (Credit left: modification of work by NASA, ESA, STScI, R. Gendler, and the Subaru Telescope (NAOJ); credit right: modification of work by X-ray: NASA/CXC/MSSL/R.Soria et al, Optical: AURA/Gemini OBs)

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