

Astronomy is the study of everything in the universe beyond Earth's atmosphere. That includes objects we can see with our naked eyes, like the Sun , the Moon , the planets, and the stars . It also includes objects we can only see with telescopes or other instruments, like faraway galaxies and tiny particles. And it even includes questions about things we can't see at all, like dark matter and dark energy .

Astronomy, science that encompasses the study of all extraterrestrial objects and phenomena. Until the invention of the telescope and the discovery of the laws of motion and gravity in the 17th century, astronomy was primarily concerned with noting and predicting the positions of the Sun, Moon, and planets, originally for calendrical and astrological purposes and later for navigational uses and scientific interest. The catalog of objects now studied is much broader and includes, in order of increasing distance, the solar system, the stars that make up the Milky Way Galaxy, and other, more distant galaxies. With the advent of scientific space probes, Earth also has come to be studied as one of the planets, though its more-detailed investigation remains the domain of the Earth sciences.

Since the late 19th century, astronomy has expanded to include astrophysics, the application of physical and chemical knowledge to an understanding of the nature of celestial objects and the physical processes that control their formation, evolution, and emission of radiation. In addition, the gases and dust particles around and between the stars have become the subjects of much research. Study of the nuclear reactions that provide the energy radiated by stars has shown how the diversity of atoms found in nature can be derived from a universe that, following the first few minutes of its existence, consisted only of hydrogen, helium, and a trace of lithium. Concerned with phenomena on the largest scale is cosmology, the study of the evolution of the universe. Astrophysics has transformed cosmology from a purely speculative activity to a modern science capable of predictions that can be tested.

Its great advances notwithstanding, astronomy is still subject to a major constraint: it is inherently an observational rather than an experimental science. Almost all measurements must be performed at great distances from the objects of interest, with no control over such quantities as their temperature, pressure, or chemical composition. There are a few exceptions to this limitation—namely, meteorites (most of which are from the asteroid belt, though some are from the Moon or Mars), rock and soil samples brought back from the Moon, samples of comet and asteroid dust returned by robotic spacecraft, and interplanetary dust particles collected in or above the stratosphere. These can be examined with laboratory techniques to provide information that cannot be obtained in any other way. In the future, space missions may return surface materials from Mars, or other objects, but much of astronomy appears otherwise confined to Earth-based observations augmented by observations from orbiting satellites and long-range space probes and supplemented by theory.