



Figure 1.3

Albert Einstein and Edwin Hubble at the Mount Wilson Telescope

Between 1913 and 1965, a startling series of discoveries was made in astronomy, physics, and chemistry. The first piece of key evidence that the Universe had a beginning came from astronomers.

The Universe Is Expanding. In 1914 Vesto Slipher presented slides to the American Astronomical Society that gave the first hint of an expanding universe. Like many great breakthroughs in science, Slipher's discovery was accidental. He was looking for something else when he found that nearby galaxies were moving away from the Milky Way Galaxy at enormous speeds.

Slipher missed the implications of his observations, but others did not. A great scientific partnership began at the Mount Wilson Observatory in California. Between 1925 and 1930, Edwin Hubble and Milton Humason trained their giant telescope on distant clusters of stars. They measured the speeds and distances of vast numbers of galaxies. Their careful observations and precise accumulations of data proved that other galaxies were moving away from our galaxy at increasingly rapid rates of speed in proportion to their distance from our galaxy.

The implications of these observations were profound. If all galaxies are moving away from each other, the universe is expanding! The picture that emerges is one of a gigantic inflating balloon with small coins stuck on the surface of the balloon to represent the galaxies. The inflating outer skin of the balloon represents the finite but expanding boundary of the universe.