

THE MILKY WAY AND OTHER GALAXIES

Galaxies are the largest building blocks of the universe. They are gravitationally bound systems of stars, remnant stars, interstellar gas and dark matter.

How many galaxies are there?

There are over 200 billion (1 billion = 1 000 million) galaxies in the universe. They range in size from dwarfs with just a few hundred million stars, to large galaxies that typically have a few hundred billion stars, and even giant galaxies with 100 trillion stars.

Which is our galaxy?

The galaxy in which we are located is called the Milky Way, which contains 300 to 400 billion stars. It takes its name from the irregular band of stars, dust and gas that is best seen for almost four months before or after June in the Southern Hemisphere as a beautiful band across the night sky. It is interesting that the term 'galaxy' is derived from the Greek word *galaxias**, which means 'milky'.

How do galaxies form?

Galaxies begin as small clouds of stars and dust that swirl through space. When other clouds approach closely, gravity drags them together into larger spinning clouds. Internal collisions then sling material outwards to form the galaxy's spiral arms.

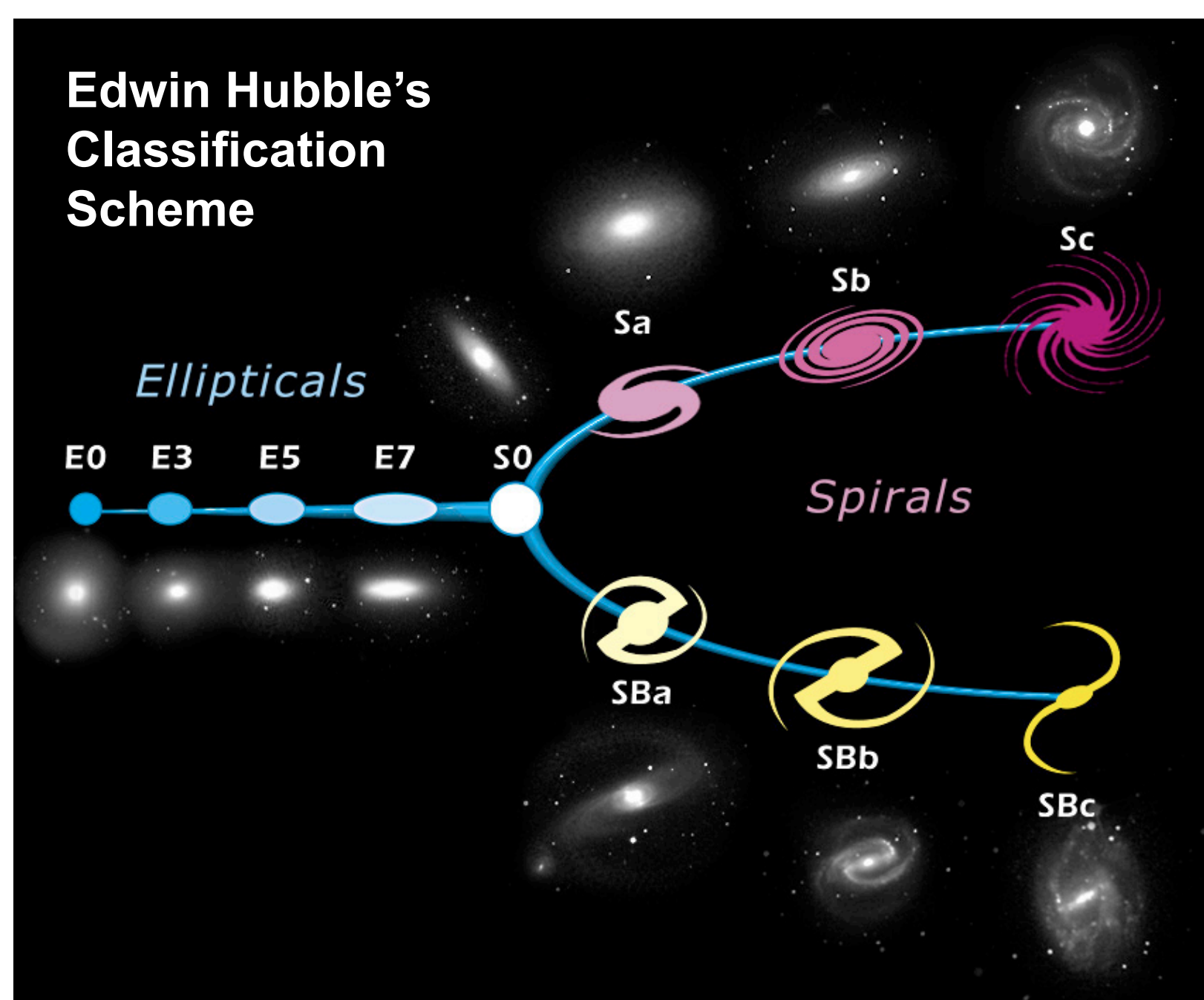
Types of galaxies

Galaxies are classified according to their shape, as illustrated in the diagram. There are four types of galaxies: spiral, elliptical, irregular and peculiar.

The closest galaxies to Earth are the irregular Large and Small Magellanic Clouds, which are 160 000 and 200 000 light-years from Earth. The latter contains several hundred million stars, while the former has about 10 billion solar masses.

The closest large (spiral) galaxy is the well-known Andromeda Galaxy (M31), which is 2.5 million light-years away from us. M31 is roughly double the size of our Milky Way and its one trillion stars contain twice as much mass as our galaxy. M31 and the Milky Way are being gravitationally attracted to one another and are expected to merge in 4 to 5 billion years' time into an elliptical galaxy or 'lenticular', which is an intermediate between a spiral and an elliptical galaxy. The Andromeda Galaxy is best viewed from Hermanus on a low northern horizon in November and December.

(See the diagram of the Andromeda Galaxy on the 'Sundials' plinth)



Elliptical galaxies form when two spiral galaxies collide.

They then lose their familiar shape and morph into less-structured elliptical galaxies.

Galaxies and black holes

Most galaxies contain super-massive black holes at their cores, varying from a few thousand solar masses (4 000 in our Milky Way), to M87's 6.5 billion solar masses, to the largest known supermassive black hole of TN180 at 66 billion solar masses.

Galaxy clusters and superclusters

Clusters are groups of galaxies that are gravitationally bound. Our 'Local Group' of galaxies comprises 80+ galaxies, most of which are dwarf galaxies (satellites to larger galaxies that gravitationally strip them of mass). The best-known members of the Local Group are M31, the Milky Way and the Magellanic Clouds. This group has a total diameter of about 10 million light-years and a mass of two trillion solar masses.

The Local Group itself forms part of the larger Virgo Supercluster, which contains at least 100 galaxies in its 110 million light-year diameter and is one of about 10 million superclusters in the universe. Recent research has revealed that the Virgo Supercluster is actually a lobe of the larger Laniakea Supercluster.

Large scale structure of the universe

The large scale structure of the universe resembles foam (or a collection of soap bubbles) with galaxies, clusters and superclusters in the filaments (or bubble walls) enclosing huge voids (see the 'cosmic web' diagram on the Cosmic Pie tablet).