

Galaxies

What galaxies are

Have you been invited to an astronomical dinner, and you don't want to come hempty-handed? Here we have the perfect recipe for you!

Let's take at least 100 billions of stars and all the interstellar gas as much as you like. Then add enough interstellar dust and dark matter. Cook your mixture at least at 1032 K and do not forget the fundamental ingredient: the gravity! Let's make all cold for a billion of years and... voilà! You will have a new galaxy, ready to be waited on!

It seems easy to create a new galaxy, but really we did not know what a galaxy was, until a very few time ago. In the past, we didn't have powerful observation instruments as today, so galaxies seemed small regions, placed everywhere in the skies and featured by a bright vagueness, called, exactly, nebulas.

Until the Twenties of the last century, scientists supposed that these nebulas were parts of our galaxy, whose real dimensions were still misterious. In 1924, astronomer Edwin Hubble, thanks to one of the most powerful telescope of his time, had been able to see some regions of the nebula of Andromeda, confirming that it was a single galaxy, external to ours. Already around 1929, Hubble discovered 18 galaxies, each one containing billions of stars. But are all these galaxies equal?

Galactic morphology

We can see several types of galaxies, differring for example for their form, dimensions, brightness, mass, stellar contents and, in the end, for the energy emission distribution in the different bands of the electromagnetic spectrum.

The principal classification, called Hubble Sequency, is based on the form and it divides the galaxies between elliptical, spiral and irregular ones.

Elliptical Galaxies

They show regular systems, approximately with a spherical form, with just few dust and interstellar gas, fitted with a really dense nucleus, whose superficial brightness decreases from the centre towards the periphery. Their structure may change from the circular form, called E0, to the extremely crushed one, described like E7. The elliptical galaxies are made, above all, by red stars (or Population II) that, according to the theory of the stellar evolution, are very ancient. Stars are in fact used to change their color becoming old. In the first part of their life they show a blue color, becoming then more yellow-red.

Spiral Galaxies

They appear like systems full of interstellar gas and dusts, based on a central bulge surrounded by a disc, from where run bright spiral filaments, called arms, site of an intense stellar formation.

We can also divide these spiral galaxies into two classes: normal ones (S), with a central and at least perfectly spherical central nucleus and spiral arms, and barred spirals (SB), different from the normal ones because of a central structure placed through the nucleus, a so-called bar-shaped structure.

Irregular Galaxies

They appear like systems full of interstellar gas and dusts, usually being inferior, for their mass, to the spiral and elliptical galaxies. They are usually called "irregular" because their aspect has no simmetry. They typically host young stars, or stars from the population I.

The Milky Way

At night, glancing up to the sky, it is possible to admire a milky white stripe through the vault of heaven. It really seems made with milk, causing the ancient Greek definition "Galaxia", that exactly means "made with milk".

The Galaxy or Milky way is a large, barred spiral galaxy with arms surrounding its bulge, a central swelling with a depth of about 16.000 light years. This bulge is placed in the middle of a disc that, in turn, contains the spiral arms, the gas filaments and stars extended from the centre of the disc, wrapping themselves up it. The disc is surrounded by an almost spherical halo extended until a 150.000 light years diameter, hosting about 200 globular clusters. They are spherical

groups, extended for few hundreds of light years, able to contain a million of stars. In our galaxy, we found three arms: the Orion one, that contains the Sun (placed at about 28.000 light years from the centre), the Perseus and Sagittarius ones. In the middle of the bulge we have the nucleus, made of stars and stellar clusters, whose birth seems to date back to the formation of our galaxy.

The disc is largely composed by dust, interstellar gas and bright blue stars, recently born. These stars are placed, starting from the nucleus, along a spiral trajectory.

Our galaxy is not fixed in the Universe. Its spiral arms, in fact, orbit around the nucleus with different velocities. All the stars are trailed from this movement, like the Sun with all the Solar System, on an elliptical trajectory around the galactic centre, with a period of 250 millions of years and a speed of about 250 km/sec.