

4 Our Solar System is in its turn part of a much bigger structure: our Milky Way Galaxy. Our Galaxy consists of huge curly arms coming out of a central region, and we lie in one of these arms. Apart from the Solar System, our Galaxy contains billions of stars, dust, planets, and pieces of rock. ★



★ The Earth, together with 8 other planets: Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto, revolve around a star, our Sun, forming what we call our Solar System. Stars and planets are very different: a star is just reflects the light from its nearby star. ★

There are huge numbers of other galaxies apart from our own. Along with the empty space and dust clouds in between, they all together form what we call the Universe. The size of the Universe is still unknown and we don't know if it will expand forever or if it will collapse far in the future. Neither do we know how or why the Universe started! ★



But measurements from ground telescopes and from satellites in space try to solve these unanswered questions. ★



3 Satellites are launched by a rocket. They can either be put in orbit around the Earth, or be directed to a special target like for example the Moon, Saturn or even a comet. Because constructing satellites is a difficult and expensive task, many European countries decided to get together and form the European Space Agency, where scientists from all over Europe work together to send new satellites to space that will reveal exciting mysteries about the Universe we live in. ★

### The Gaia satellite

Today, for example, we are very close to measuring the size of our Galaxy which some years ago still seemed like a dream. ★

One of the satellites that ESA plans to launch into space around 2011 is a satellite called **Gaia**. Its aim is to measure extremely accurate positions, distances and velocities of enormous numbers of stars in our Galaxy, the Milky Way. The measurements taken by the satellite will allow us all to have a clearer idea of how our Galaxy formed, what it contains, and what it will look like in the future. ★

In particular, **Gaia** will be able to detect many thousands of planets the size of Jupiter outside our Solar System. In fact, in recent years, more than 300 new planets outside our Solar System have been observed and scientists believe there must be millions of other planets out there waiting to be discovered! ★

Drawings by Julia Kostelnyk.

2 A telescope in space must include instruments that record the measurements, computers and transmitters to send the information back to Earth. It also requires a shield to protect against possible hits from meteorites and other small particles in space, and solar panels that power the instruments. This whole combination is called a satellite. ★



But a problem still remains for telescopes on Earth: our atmosphere absorbs part of the energy given out by stars and other objects in space. It also changes their images as seen from the ground in the same way as objects seem to have funny shapes when looking at them through a crystal glass. This is why astronomers decided to send telescopes to space, so that the Earth's atmosphere wouldn't be in the way.



### A UFO?

No, it's the **Gaia** satellite! **Gaia** will be 3 metres high, about 10 metres across, and it will weigh as much as a young elephant.

 More detailed information can be found on the Gaia web site: <http://sci.esa.int/Gaia>

1 With larger and larger telescopes many more stars could be seen. Their positions could also be measured with much higher accuracy. New planets were found in the Solar System, and increasingly distant objects became visible to us. ★

You would be surprised by how much information can be gathered from stars simply by looking at them! The precision of naked eye measurements improved slowly with the help of simple viewing instruments. But the invention of the telescope brought big changes to astronomy and made many new discoveries possible. ★

★ Since Ancient times, people have enjoyed looking at the sky and have wondered what is behind it, far far above the Earth. First, they just looked at the heavens with the naked eye. Hipparchus, an ancient Greek astronomer, was the first to create a catalogue giving the positions of one thousand stars across the sky. ★

### The Little Books of Gaia



### TALES OF THE UNIVERSE