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GREAT DISCOVERIES

Last year – the *International Year of Astronomy* – much attention was paid – to the fact that 400 years ago Galileo was the first person to use a telescope to watch the sky.

It appears, however, that the English scientist Thomas Harriot (1560-1621) beat him in this respect by using a telescope for astronomical purposes some four months earlier.

But it was Galileo who, while doing so, made a really great discovery that changed astronomy completely: He saw four moons orbiting Jupiter, the definitive proof that not everything orbits the Earth, in other words, that Earth is not the centre of the Universe.

That discovery was of about the same importance as the one we are anxiously awaiting at the moment, that of extra-terrestrial life. Both discoveries are of great importance, as both drastically reduce the uniqueness of Earth: centre of the Universe - or the only place with life.

The idea that not Earth, but the Sun was the centre of the Universe had been published almost a hundred years earlier – in 1514 - by the Polish astronomer Nicolas Copernicus. And he wasn't the first person to launch the idea of a *heliocentric* universe either, as the Greek scientist Aristarchus developed a model in the 3rd century BC already, with the Sun in the centre of a much larger Universe than was assumed until then. But nobody believed him.

Ptolemaeus (or Ptolemy; Egyptian astronomer, who lived some 400 years later) developed a model in which the Moon, the Sun and 5 planets orbit the Earth, with beyond this the sphere of the fixed stars. This model remained the basis for astronomy for almost 1500 years.

Around the year 1500 things started to change.

Copernicus (1473-1543) stated that the Earth rotates around its axis and orbits the Sun – just like the other planets. With this model it was much easier than with Ptolemy's ideas to explain certain movements in the sky. But Copernicus did not receive much recognition for his important work. It lasted until well into the 17th century before his ideas began to take root, mainly thanks to Galileo's discoveries. Gradually the idea of a Sun-centred Universe took hold.

For further great discoveries the astronomers' world had to wait until around the year 1800, when it started to become clear that the Sun is nothing very special, but just one of many stars, and that these stars together form a sort of cloud, a galaxy, the *Milky Way*.

One of the astronomers who did important work during this period was William Herschel (German/British; 1738-1822), who discovered over 2000 clouds and nebulae in the sky, and suggested that these were galaxies like the Milky Way.

So by this time it was becoming clear that the Universe was much bigger than ever imagined before.

Then, again about two centuries later, in the early 20th century, Edwin Hubble (American; 1889-1953) discovered many more galaxies and found that they are all moving away from us: the Universe appeared not to be stable and constant, but moving and growing.

A logical conclusion of the expansion was that the Universe must have been much smaller in the distant past and perhaps started from 'nothing', the first steps towards another big discovery – or theory: that of the 'Big Bang', which happened almost 14 billion years ago.

But we still do not know what happened in the first second after the Big Bang.

Hopefully, the *Large Hadron Collider* is soon going to change that.

So, resuming, we can say that the place of Earth and its inhabitants in the Universe has, within five centuries, been reduced to almost nothing, that is, when we talk about what we, the people on Earth, imagined it to be. Of course the place, or the role of Earth, has not really changed, but what we imagined it to be has changed at an unimaginable scale: from the centre of the whole Universe, with everything orbiting us, to a minuscule planet orbiting one of some 500 million stars in the *Milky Way*, which is just one of some 125 billion galaxies in the Universe!

And would this minuscule planet be the only place in the whole Universe where life exists? Probably not...

NEWS

Endeavour mission to ISS

On Monday 8/2 the shuttle *Endeavour* was launched towards the ISS and on Sunday 21/2 it returned safely to Florida. Most important jobs: installation of a new habitation module and of an observation deck in the form of a cupola with seven windows. The station is more than 98% complete now.

Now just four more flights remain before the shuttle will be retired this coming autumn.

Obama's Moon decision

Early this month President Obama decided to withdraw the subsidy to NASA for completing its *Constellation* programme to return man to the Moon. Understandably, NASA finds this a very disappointing development, also in the light of its labour market, which already receives heavy blows with the retirement of the ISS-shuttle.

However, the decision – which still has to be ratified by Congress - does not mean that NASA would not continue to receive huge amounts of government money: the budget for 2011 is \$ 19bn, and \$ 100 bn for the five years after that. And the cancellation of future manned Moon-missions does not mean that NASA will not continue to work on plans to go to Mars!

For the moment the road to the Moon is of course wide open for China and/or India and/or Japan. So it looks as if, for the near future, the West is going to be overshadowed by the Asian big three, which is, of course, not a good development for the development of science and industry in America and Europe.

Cassini mission extended

NASA recently announced that the mission of the *Cassini* spacecraft to Saturn has been extended until 2017. *Cassini* is one of the great spaceflight success stories. The spacecraft, at the size of a double-decker bus, weighing 6 tons, was launched in 1997 and arrived around Saturn in 2004. Since then it has been orbiting the planet, sending back a wealth of information about the planet, its rings and its 49 moons.

It even managed, in 2005, to send a smaller probe, called *Huygens*, to Saturn's biggest moon Titan (1.5 x our Moon). The probe landed in a muddy area on Titan and sent pictures and information for about 2 hours (the first spacecraft landing in the outer SS).

According to the original plans, the *Cassini* project would last four years, until 2008. Then it was extended until 2010, in order to watch the famous equinox, and now until 2017. In the coming 7 years it will continue to study not only Saturn and its rings, but especially also the largest moons – *Titan* and *Enceladus*. It has been discovered that *Enceladus* has geysers of water and organic material, probably fed by an underground ocean, which could point in the direction of the possibility of life!

Cassini's mission can not be extended any further than 2017, because by that time it will have used all its propellant (and it is too far from the Sun for solar energy).

Spirit stuck for ever on Mars

NASA has given up hope to free the Mars rover *Spirit* from the sand pit in which it got stuck last year. Efforts to get it moving again resulted only in some of the wheels digging deeper into the soil. But the rover can look back on a successful life, that started when it landed after a 7-month long journey, together with its twin *Opportunity* in January 2004. They were supposed to work on Mars for 90 days, so nobody can be disappointed that the first one has now stopped working after almost six years. And even when immobile, it can still do useful observations (supposing it survives the harsh Martian winter which has just started in the region where it is located).

Its brother *Opportunity*, at the other side of Mars, is still going strong and continues its slow journey from the famous Victoria crater, which it studied a couple of years ago, descending into it and climbing out of it again, towards another, even bigger crater.

