

U3Astronomy meeting 23/11/2007

Shuttle *Discovery* and the ISS

Shuttle *Discovery* was launched on 23/10, carrying a 31,500 pounds (= over 14,000 kg) docking module – Italian built *Harmony* - to the International Space Station, to be attached to the ISS during 5 space walks. Within the coming months European and Japanese research laboratories will be attached to the *Harmony* module, which will also serve as living quarters for three additional astronauts. During the mission a new set of solar panels, needed for the new laboratories, appeared to be damaged. Repair was necessary which could only be done during a long and dangerous space walk. The work was done successfully, after which *Discovery* returned safely to Earth, one day later than planned, on 7/11.

Plans are in place now for the launch of the ESA laboratory *Columbus* on 6 December.

The ISS in general

Ideas about an orbiting station, in the first place to be used as a launching platform for more distant journeys, date already from the first half of the 20th century. Around 1970 plans began to be developed for a large station which eventually resulted into the present ISS. Shuttles indispensable; first flight in 1981. The size of the ISS was reduced several times, because of the costs. The idea of a launching platform was abandoned completely; the present ISS only has laboratories for (important) scientific research based on microgravity (medicines!) which can only be carried out in space.

In the early '90's the Russians got involved. Very important because of their experience with the MIR Space Station. In 1998 the construction of the ISS was started, and from the year 2000 crews – mostly of three - have been on board. Until now astronauts from 13 countries have participated. They usually work there for a period of 3-6 months.

Life on board

Very strict schedules. Each crew member has a small personal cabin, where he/she can lie/sit/stand/hang to sleep. Two hours of exercise per day on various fitness machines in order to keep in form. Everything is different in a weightless situation, even eating!

The Seven Wonders of the Universe

The magazine *Astronomy Now* (07/11) has an article with this title. We know *The Seven Wonders of the Ancient World*, but of course the Universe also has an impressive number of 'wonders'. The article describes six 'wonders', and invites the readers to choose nr.7 from a list of six options. The six 'wonders' as selected by the editors are:

1. Saturn

Most beautiful object in the SS with its rings. Second largest planet. We are lucky to be around at the same time as the rings, because they will not last forever.

2. The Pillars of Creation

Part of the *Eagle Nebula*, a relatively young cloud of gas – mostly hydrogen - in which large numbers of new stars are born ('*Stellar Maternity Wards*'). The nebula is only 5.5 mln years old. They were first seen by the Hubble telescope in 1996. They are 6500 ly away.

3. The Tarantula Nebula

Part of the Large Magellanic Cloud – the nearest galaxy to the Milky Way. TN is the largest star-forming region in the 'Local Group' of galaxies. It measures 1000 light years across and is about 170,000 ly away. It is home to some of the most massive (up to 50 times the Sun) and most luminous stars known to exist.

4. The Milky Way

Our own galaxy, over 100,000 light years across, containing some 500 billion stars. We can only see it as a faint band of stars across the sky (on a bright night without light pollution). We can never see it from outside, but we may assume that it looks more or less like most of the other spiral galaxies.

5. The Sloan Great Wall

Included in the list of 'wonders' as simply being the largest structure known in the Universe. Galaxies tend to be distributed in groups. The central part of this *Sloan* group is a string of galaxies which is almost 1.4 billion light years in length. It is located at around a billion light years from us.

6. The Cosmic Microwave Background

About 380,000 years after the Big Bang the Universe started to become transparent and to radiate waves (expansion and cooling down – *And there was light!*) . Around 1940 it was predicted that this radiation - a sort of echo of the BB – would still be observable. In 1964 two American astronomers discovered this *Cosmic Microwave Background radiation*.

So far the first six 'Wonders of the Universe'. Readers are invited to select nr. 7 from the following six options:

A – The Earth

Not difficult to suggest special reasons to include our home-planet in the list of Wonders.

B - The Antennae Galaxies

Two galaxies, around 60 mln light years away, which for 800 mln years have been merging into one bigger unit. It is a very slow process, going on for millions of years. Enormous numbers of new stars are born inside the merging clouds of hydrogen.

C – Mars

Our nearest neighbour after Venus: the *Red Planet*, with immense geological features: highest volcano and largest canyon of the SS, beautiful craters, etc. Most research with all sorts of instruments, possibly next place to be visited by astronauts (after the Moon), intensive search for past or present water and/or life.

NB – During the coming month Mars is easily visible, pretty high in the SE sky and rather 'big' as it will be 'in opposition' (= at its nearest to Earth) on Christmas Eve. Distance Earth-Mars varies per opposition as the orbits of Earth and Mars are not concentric: Longest distance Earth – Mars: 97 mln km, shortest distance Earth – Mars: 55 mln km.

D – The 'Red Rectangle'

One of countless nebulae formed by gas blown away from dying stars (this one 'only' 2,300 light years away). They take all sorts of different forms, some of which are quite spectacular – and mostly inexplicable.

E – The 'Whirlpool' galaxy

About one-third of all galaxies have a spiral form. They are especially spectacular when seen face-on, like this 'Whirlpool', about 25 mln light years away.

F – Super Pulsar

A *Pulsar* is the remnant of a collapsed star, a 'super nova'. It consists of highly magnetic neutrons. The strong magnetic field generates beams of radio waves (in two opposite directions), and as a consequence of the rotation you see these beams rapidly appear and disappear -somewhat like a lighthouse - but much quicker. On average a pulsar rotates once per second, but the *Super Pulsar* suggested as one of the Wonders of the Universe, rotates 716 times per second!

The group voted for The Earth to be added as 'Wonder of the Universe' nr 7.