

## U3ASTRO – January 2012

### 2011 AND 2012

#### Looking back at 2011

##### **Launches**

Over the past year there were several important astronomical launches:

- Various launches towards the ISS, three of them by shuttles, with the flight of *Atlantis* in July being the 135th and last one in a period of just over 30 years. Other flights taking astronauts to and from the SS in 2011 were carried out by Russian *Soyuz* spacecraft.
- In early August NASA launched the spacecraft *Juno* on its way to Jupiter, where it will arrive in 2016.
- Then on 10/9 NASA launched *GRAIL* towards the Moon – see the *NEWS page (PTO)*.
- On 29/9, the Chinese launched an 8.5 ton first part of an unmanned laboratory – called *Heavenly Palace*. The final goal is a 60-tonne space station by 2020.

##### **Discoveries**

- Early in the past year, the *Hubble Space Telescope* discovered the oldest object in the sky ever observed. It is a small galaxy, containing a collection of hot young stars, which is 13.2 bn light years away – or 13.2 bn years old, just half a billion or 500 million years after the Big Bang.
- On 29/1 last year the *Pan-STARRS Telescope* in Hawaii discovered no less than 19 near-Earth asteroids during one night. So we were reminded again of this ever present threat to Earth. For instance, a 400 metre wide asteroid safely passed Earth last November at a distance smaller than the distance Earth-Moon.
- Then there was a whole list of newly discovered *exoplanets*. The total number of exoplanets found so far grew over the past year from about 500 to circa 725.

##### **Fundamental developments / discoveries**

- In June scientists at the CERN *Large Hadron Collider* succeeded to trap 309 antihydrogen atoms and study them for about 16 minutes. This gave them the first glimpse of *antimatter*. The idea of antimatter dates already from c. 1930, but so far it had never been observed.
- Then, in September, came the very exciting news – also from CERN - that *neutrinos* had moved faster than light. Scientists all over the world are now checking the data, and if it is true, the whole book of science will have to be rewritten . . .
- This same conclusion may have to be made if, at the same CERN Centre, it will be concluded that the so-called *Higgs Boson* does not exist. Without it, nothing in the Universe would have mass.

#### Looking forward to 2012

##### **The International Space Station**

In the not too distant future we may expect the first flight to the SS of an American *private* freight spacecraft. The idea is that after the end of the shuttle-era, private companies should gradually take over the task from NASA to transport cargo and astronauts to and from the ISS.

##### **Further space flight**

On 6/8 the spacecraft *Curiosity* will – hopefully – land safely on Mars. Together with the work of several other spacecraft, already in orbit or on the surface of Mars, we'll undoubtedly learn a great deal more about the red planet.

##### **Exoplanets**

Without any doubt quite a number of new *Exoplanet* discoveries will be announced in the coming months. And, of course, it's not only the number that's important, but even more, the characteristics of the planets: water, climate and perhaps even the signs of past or present life.

##### **The night sky**

Some special sights during the months to come;

- On 3/3 *Mars* will be at opposition
- On 6/6 there will be a transit of *Venus* across the Sun
- On 13/11 there will be a full *solar eclipse* – unfortunately not in our part of the world.

## NEWS

### Curiosity-launch

On 26/11 the Mars Science Laboratory Rover named *Curiosity*, was successfully launched from Florida. It is the biggest planetary lander ever built, having the size of a Mini Cooper. One of the project's main goals is to look for possibilities for the existence of former or present life on Mars. It will land on Mars on the 6<sup>th</sup> of August.

### International Space Station

On 21/12 a Soyuz spacecraft was launched from Kazakhstan, taking three astronauts – American, Russian and Dutch - to the ISS for a 6-month stay. Two days later they docked successfully with the station, bringing the crew back to six again, after three of their colleagues had returned to Earth a month earlier after their almost half year-long stay.

### Phobus-Grunt

On the 8<sup>th</sup> of November a probe was launched by Russia, which should eventually land on Phobos – the largest moon of planet Mars, study the surface of this moon and gather some soil, put this in a capsule which would bring it back in 2014, to be studied on Earth.

But after the spacecraft got into orbit around Earth, it failed to fire its engines twice to get enough speed to leave Earth and head for Mars. It remained in orbit around Earth and after a few weeks it started falling back to Earth. On Sunday 15/1, the remains that had not burnt up in the atmosphere plunged into the Southern Pacific Ocean, some 800 miles W of Chili.

### GRAIL twins orbit the Moon

The two identical GRAIL satellites, launched by NASA on 10/9, got into orbit around the Moon, the first one on New Year's Eve, and the second on New Year's Day. The two identical satellites, each the size of a small refrigerator, orbit the Moon in formation – 200 km apart - at an altitude of only 50 km, and together they will tell us more about the structure of the Moon's crust and interior. NASA organised a contest among schools to name the two satellites. Some 900 schools in 45 states participated, and the winning names are *Ebb* and *Flow*.

### Spacecraft recycling (or re-use)

NASA is good at recycling. The spacecraft *Deep Impact* visited the comet Temple-1 in July 2005, flung a probe into its surface and studied the content of the dust cloud. Then *Deep Impact* went on and used its main camera to look for dips in the light of stars that might indicate the transit of exoplanets. It was then on its way to another comet – *Hartley* – which it flew by and pictured in November 2010. And now it has been sent on its way towards another asteroid - a half-mile wide - which now and then approaches Earth and could perhaps collide with us at some time in the future. *Deep Impact's* fly-by is planned for 2020.

### Voyager-1 about to leave the SS

In 1977 NASA launched space probes, called *Voyager-1 and -2* to study (= fly by) the outer planets – which they did in the years between 1979 and 1989. They then continued their journeys and now *Voyager-1* has reached the boundaries of the Solar System and is about to enter interstellar space. It is over 11 bn miles (16 bn km) away from Earth, and all the time (almost 35 years) has kept in contact with Earth (messages now take 16 hours to reach us!).

### Exoplanets

In the search for 'exoplanets' NASA announced two important new discoveries, both made by its space telescope *Kepler* in the course of December. The first one is a planet about 2.5 times as big as Earth, orbiting its star – 600 Ly's from Earth – in the so-called 'goldilocks-zone' (neither too hot nor too cold to harbour water, in other words with conditions that could support life). The other one is a star – 1000 Ly's away – with a sort of 'solar system' with at least five planets. And the very special thing was that one of these planets is just 3% larger than Earth, and another one even 13% smaller. That was the first time that exoplanets the size of Earth or even smaller had been detected, which increases the chances of ever finding a real 'Earth-like' planet. Then, in mid-January, *Kepler* discovered a 'solar system' around another star, with three planets being considerably smaller than Earth. But they are far too close to their star – and thus too hot – to have water or to have a habitable environment. And on 26/1 came the news that *Kepler* had discovered another 26 exoplanets, orbiting 11 stars (= 11 'solar systems')!