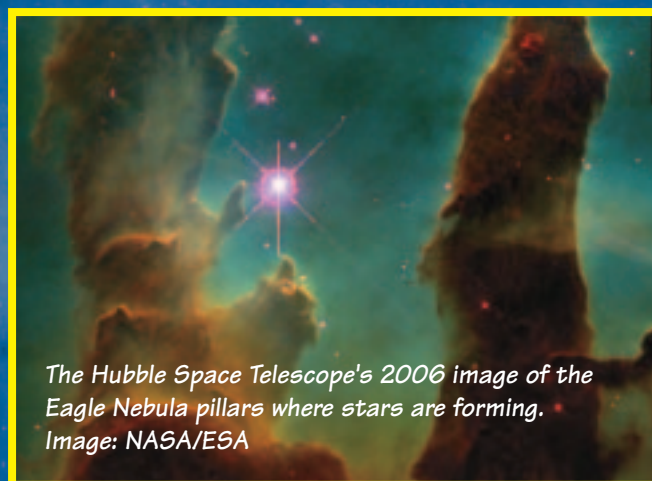


# EASY SCIENCE

## 50 Years in Space



The Hubble Space Telescope's 2006 image of the Eagle Nebula pillars where stars are forming.  
Image: NASA/ESA

The Space Age began on 4 October 1957 with the launch of a satellite somewhat bigger than a soccer ball, called Sputnik 1. World Space Week 2007 marks the 50th anniversary of the beginning of the Space Age. It was also the start of the space race between the United States of America and the old Soviet Union (Russia) – see right.

**T**he launch of Sputnik 1 made people all over the world look at space differently. Fifty years later, European and American scientists are working towards establishing a colony on Mars!

South Africa joined more than 50 countries worldwide to celebrate World Space Week from 4 - 10 October and the celebrations are continuing! The theme for World Space Week 2007 is "50 Years in Space." This theme encourages participants to reflect on the last 50 years in space and also to look forward to the next 50 years in space.

The Department of Science and Technology (DST) and the Department of Communications (DOC) joined forces to organise space science events for young and old and to make people more aware of the many exciting developments in space science and astronomy in southern Africa.

### Spin-offs from Space

There have been tremendous spin-offs for everyday life from space science. These include products such as aluminium foil; radioactive smoke detectors; cordless drills; cheap electronic calculators; fire-retardant clothing for fire-fighters; bar codes and bar code scanners; digital displays on watches; nickel-titanium alloys, called nitinol, that are widely used in dental braces and dental drills; thermal clothing; desiccated and freeze-dried foods; and rechargeable heart pacemakers... but not, apparently, the teflon-coated, non-stick frying pan, as widely rumoured!



### Sputnik and the dawn of the Space Age

History changed on 4 October 1957, when the Soviet Union successfully launched Sputnik 1. The world's first artificial satellite was about the size of a soccer ball, weighed only 83 kg, and took about 98 minutes to orbit the Earth on its elliptical path.

That launch was the start of new political, military, technological, and scientific developments. The Sputnik launch marked the start of the space age and the US - USSR (Russian) space race.

The Sputnik launch changed everything. As a technical achievement, Sputnik caught the world's attention and the American public off-guard. Then the Soviets struck again; on November 3, Sputnik II was launched, carrying a much heavier payload, including a dog named Laika.

Immediately after the Sputnik I launch in October, the US Defense Department approved funding for another US satellite project: Wernher von Braun and his team's Explorer project.

On 31 January 1958 the United States successfully launched Explorer I. This satellite carried a small scientific payload that eventually discovered the magnetic radiation belts around the Earth, named after principal investigator James Van Allen. The Explorer program continued as a successful ongoing series of lightweight, scientifically useful spacecraft.

The Sputnik launch led directly to the creation of the US's National Aeronautics and Space Administration (NASA). In July 1958, the US Congress passed their "space act", which created NASA as of 1 October 1958.

### What is a satellite?

A satellite is any smaller object travelling around a larger object. The Moon, therefore, is a natural satellite of the Earth and the Earth is a satellite of the Sun. For the purpose of this article, when we talk about a satellite, we refer to human-made spacecraft placed in space for a specific function.

Satellites have many different designs, depending on the type of information they need to communicate.

South Africa's satellite, SumbandilaSat, which will be launched in the near future, is a Low Earth Orbit satellite. This type of satellite orbits the Earth at 300 to 600km above the surface. Because it is close to the Earth, it must travel very fast to avoid being pulled out of orbit by gravity. These satellites circle the whole Earth in about an hour and a half.

SumbandilaSat is also a remote sensing satellite. This means it will carry a "camera". As it travels in its orbit, it will take pictures of the Earth. Mapmakers can use these pictures to make more accurate maps; the pictures can tell decision makers about changes that are going on in the world and about crops, water supplies, and urban development. The information that we can get from such pictures can also help to monitor and manage disasters like oil spills, floods and fires. These are only a few of the many uses of a remote sensing satellite.



Ofentse Khutswane of Pretoria and Benedict Ngidi of Durban, two of the three winners of the Name the Satellite Challenge, with SumbandilaSat being assembled in the background. The photo was taken in the Western Cape in September 2006.

EasyScience is produced by the South African Agency for Science and Technology Advancement (SAASTA), an operational unit of the National Research Foundation. SAASTA's mission is to promote the public understanding, appreciation and engagement with science and technology among all South Africans. Visit the website: [www.saasta.ac.za](http://www.saasta.ac.za) for more information.



## Space Exploration fact file

- ★ Rocket-propelled spacecraft were first seriously studied by a Russian, Konstantin Tsiolkovsky (1857 – 1935)
- ★ Herman Oberth (1894 – 1989) experimented in Germany with small solid-fuel rockets.
- ★ The first rocket to use liquid fuel was built in 1926 by the American, Robert H. Goddard.
- ★ 4 October 1957 – the Soviet Union (USSR, or Russia) began the age of space exploration with the launch of Sputnik 1, the first artificial satellite. Sputnik orbited the Earth in 90 minutes and stayed in space for six months.
- ★ 1957 – Sputnik 2 (USSR) is launched the first living creature into space – a dog called Laika, who spent a week in orbit.
- ★ 1958 – Explorer 1 (USA) was the USA's first successful satellite.
- ★ 12 April 1961 – Yuri Gagarin (USSR) became the first man in space. He orbits the Earth once in the spacecraft Vostok 1.
- ★ 5 May 1961 – Alan Shepard becomes the first American to travel in space.
- ★ 10 July 1962 – Telstar 1 was the first communications satellite launched. It carried one television channel. Live television images could be sent to Europe from the USA for the first time.
- ★ 14 December 1962 – Mariner 2 (USA) became the first successful probe to visit a planet. It flew past Venus on and made temperature measurements. It then entered a solar orbit.
- ★ 16 June 1963 – Valentina Tereshkova (USSR) became the first woman in space and orbited the Earth 48 times in the spacecraft Vostok 6.
- ★ 8 March 1965 – The first spacewalk was made by the Soviet cosmonaut Alexei Leonov. It lasted for 12 minutes.
- ★ 3 February 1966 – Luna 9 (USSR) became the first spacecraft to make a soft landing on the Moon and return pictures of the Moon's surface.
- ★ December 1968 – The first manned flight around the Moon takes place in Apollo 8 (USA).
- ★ 20 July, 1969 – Neil Armstrong and Edwin Aldrin make the first manned landing on the Moon. Armstrong becomes the first man to walk on the Moon (Apollo 11, USA).
- ★ 11 April 1970 – Apollo 13 was launched but suffered an explosion in the oxygen tanks of its Service Module. Its Moon landing was cancelled and the crew returned safely to Earth.
- ★ 19 April 1971 – The Russian Salyut 1 became the first space station when it was put in orbit on this day.
- ★ 20 July 1976 – The US probe, Viking 1, became the first to land successfully on Mars.
- ★ 1977 – A space probe called Voyager II was launched. Its mission was to reach Jupiter, Saturn, Uranus and Neptune and send back pictures to Earth. Voyager II has performed much better than scientists had expected. Voyager II is now more than 12,5 billion kilometres away from the Sun.

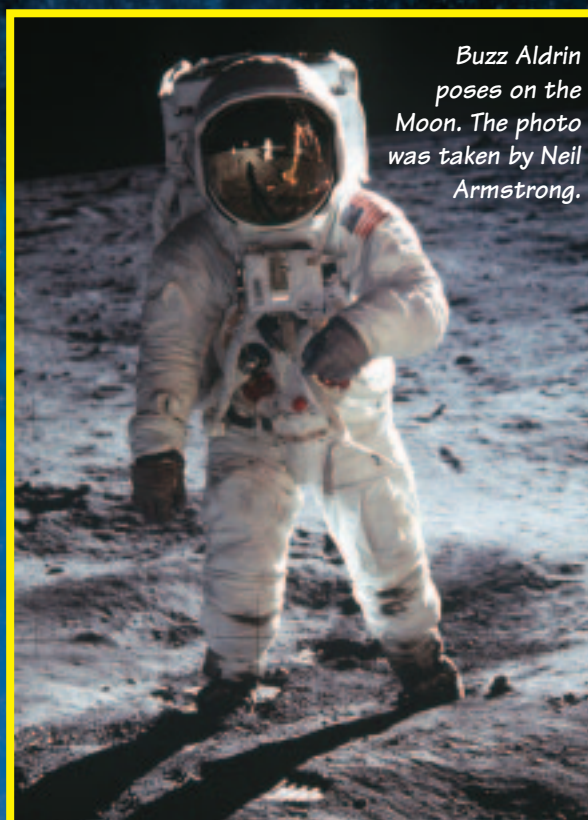
- ★ 12 April 1981 – The first reusable spacecraft, Space Shuttle, was launched (Columbia, USA).
- ★ February 1986 – the first section of the first permanent space station, Mir, was launched and the first of its four "laboratories" was launched a year later. Mir was abandoned in 2001 and made way for the International Space Station.
- ★ 24 April 1990 – The Hubble Space Telescope (USA) was launched on board the space shuttle Discovery. It still orbits the Earth at a distance of 600 kms and remains a very valuable tool for astronomers all over the world.
- ★ 15 October 1997 – The space probe Cassini was launched to start its journey to Saturn. It reached Saturn... and also dropped the first probe, Huygens, to land softly on the moon (Titan) of another planet.
- ★ 2 November 2000 – The first crew to stay aboard the International Space Station arrived. Expedition 16 will depart for this project later this year (2007).
- ★ May/June 2001 – Two Mars Rovers (USA) explored the surface of Mars for the first time. They are still on Mars, continuing to explore the planet very successfully.
- ★ April 2002 – Mark Shuttleworth becomes the first South African in space. He joined a team of cosmonauts on the Russian Soyuz capsule on a journey to the International Space Station. Shuttleworth conducted several experiments during his 10-day space flight.

## Currently

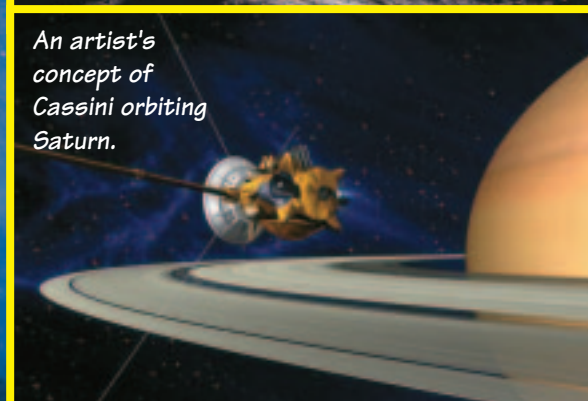
- ★ The spacecraft Dawn has just departed on its way to investigate the asteroid Vesta and the dwarf planet Ceres in the asteroid belt between Mars and Jupiter.
- ★ The spacecraft Phoenix is on its way to Mars with the specific purpose of investigating the water under the planet's surface, whether the planet has an inhabitable area.
- ★ New Horizons, the fastest spacecraft yet, will in 2015 be the first to visit the distant dwarf planet Pluto.

Sources: Nasa; Wikipedia;  
[www.spaceweek.org](http://www.spaceweek.org); CSIR SAC

Bottom Right: The International Space Station after separation from the Space Shuttle Endeavour, August 2007.



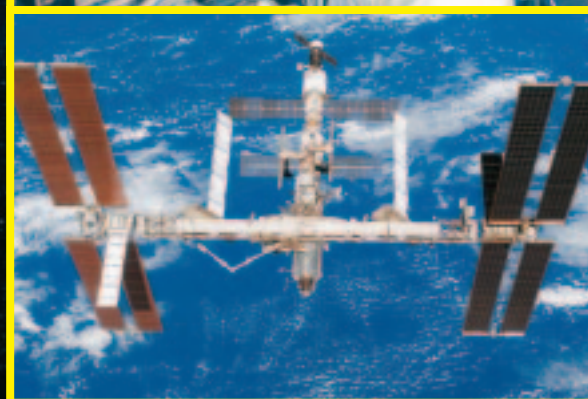
Buzz Aldrin poses on the Moon. The photo was taken by Neil Armstrong.



An artist's concept of Cassini orbiting Saturn.



Mark Shuttleworth, the first South African in space



# Heroes of Science

## Carl Linnaeus (1707 - 1778)

The science community is this year celebrating the birth of Carl Linnaeus, who was born in Sweden 300 years ago. He was the first person to classify plants and animals into groups which are alike in some ways. Scientists are still basing the way they group living things into different categories on Linnaeus' system.

Linnaeus was also an inspiring teacher who sent his students on voyages of scientific discovery all over the world.

He spent much of his childhood collecting plants and animals. He studied to become a doctor at the University of Uppsala in Sweden. In 1741 he was appointed Professor of Medicine and Botany, and spent more time studying ecology and the distribution of plants.

He described nearly 8 000 plant species and about 4 000 animal species (almost everything known to Europeans at that time) and he gave each a scientific name in two parts. The first name is the animal or plant's genus and the second, the species. For example, he called the wolf *Canis lupus* and the jackal *Canis aureus*. *Canis* is the genus to which the animals belong and so the scientific name shows that the animals are related. *Homo sapiens* is the scientific name for humans.

Linnaeus also used his two-word naming system to name many common plants.

## How many living things are on Earth?

No one knows how many living things there are. About two million species have been named. But some scientists think there may be four times as many species that we don't know about. Of the species we know about, 75% are animals (mostly insects), 18% are plants and 7% are "in between" that can not be classified easily into either of these groups.

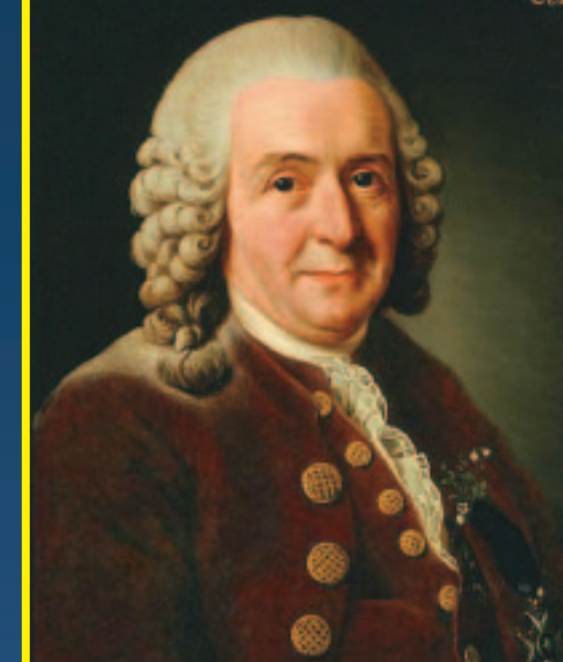
## Classification

Why is it necessary to have scientific names which are difficult to learn and say? Why aren't common names, like dog or rose good enough?

Scientific names are essential for communication between scientists so that they can be sure they are all talking about the same thing, and for naming organisms which have no common name. And sorting living things into groups makes the task of studying them far easier.

Living things are first sorted into huge groups, called kingdoms. These are then split into smaller and smaller groups, called a phylum, a class, an order, a family, a genus and a species. A species, the smallest group of living things, is a group which have so many features in common that they can mate together and produce young which are fertile.

Alexander Roslin's painting of Linnaeus.



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