U3A-GROUP ASTRONOMY **(27-10-2006)**

RACE TO THE MOON

In 1903 Orville Wright managed to fly a distance of 36 metres in an aeroplane (in N.Carolina). Only 66 years later Neil Armstrong set foot on the Moon. So developments went very fast, mainly thanks to the big role flying played in military activities: fighter planes were already being used during WW I, the first jet planes during WW II. In 1947 an aircraft for the first time passed the sound-barrier (c.1000 km/h). Eventually speeds of well over 10 *Mach* were reached. Rockets were also developed during WW II (Wernher von Braun; V1, V2). The big issue was to surpass the Earth's gravitational force, for which an 'escape velocity' of 11.2 km/sec (= c. 40,000 km/h) was needed.
The first to succeed were the Russians: 1957 – *Sputnik*. They were also the first to bring an astronaut in orbit around the Earth (1961 – Juri Gagarin), the first to send probes to the Moon ('Luna'), to make pictures of the back of the Moon (1959), to make a soft landing on the Moon (1966), to collect Moon dust to be sent back to Earth and to make use of roving vehicles on the Moon (1970).
The American people felt very embarrassed by these developments, but in 1962 President Kennedy promised them that before the end of the decade Americans would walk on the Moon. After many initial failures, things began to take a favourable turn in the early sixties. In February 1962 John Glenn flew 3 times around the Earth, in June '65 the first *space walk* was made, March '66 saw the first successful docking of two spacecraft. In the same year two astronauts remained in space for two weeks in order to discover the effects of long-lasting weightlessness on the human body. Then some years were used to develop the necessary enormous, multi-stage rocket: *Saturn-5* and to decide on the technique to be used to bring astronauts to the Moon ánd back to Earth! Around Christmas1968 three astronauts flew around the Moon, and then, in July 1969, *Apollo-11* was launched, bringing Neil Armstrong and Buzz Aldrin to the Moon. They landed with their *lunar module* (only just avoiding a catastrophe), while Michael Collins orbited the Moon in the *Columbia* spacecraft. They remained on the Moon for 2½ hours, carrying out experiments, taking pictures and collecting 22 kg of lunar rock, before returning safely to Earth. So Kennedy's objective was fulfilled, with just 5 months to spare!
There followed six further Apollo-flights, bringing a further ten astronauts to the Moon (one flight went wrong, with the crew only just surviving by orbiting the Moon and returning to Earth on board the lunar module). The four last flights all made use of lunar rovers, enabling the astronauts to cover larger distances and to collect more material. In total the Apollo expeditions brought 382 kg of lunar material to Earth. After Apollo-17 (December '72) the project was ended prematurely, one of the reasons being the enormous cost of the Vietnam War.

Thereafter, the Moon received little attention for over 20 years. In 1994 the spacecraft *Clementine* flew around the Moon for 3 months in a polar orbit → more information was gathered about the polar regions, parts of which – in deep craters - never receive sunlight and are always cold (-190 º C). These areas contain large quantities of water ice (brought to the Moon by comets), which may be used by future astronauts visiting the Moon, or staying there for longer periods of time. A future permanent Moon-observatory could replace installations orbiting the Earth like the Hubble telescope and the International Space Station. In October 2008 NASA is going to launch the *Lunar Reconnaissance Orbiter,* which will map the whole of the Moon in great detail (showing objects of c. 50 cm!).