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ARMAGH PLANETARIUM

ASTRONOTES

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Who mourns for Apollo?

By Colin Johnston, Science Communicator

Nearly thirty five years after the final Apollo mission, the Apollo Program is still probably NASA's best-known project. Although it also encompassed the almost forgotten Skylab and Apollo-Soyuz Test Project, the programme is remembered for the hugely successful moon landings. This article, one of several Apollo-related articles planned for this anniversary year, will describe the spacecraft, the scientific results and deeper cultural impact will be covered later in the year.

When it began in 1960, Apollo was a project to develop a versatile three seat spacecraft to succeed the single seat Mercury spacecraft (NASA's first manned spacecraft which itself was under development at the time). It was to be capable of missions in Earth and lunar orbit, possibly including landing on the Moon. This was very challenging, at that time no human had even flown in space. The requirement that the craft be able to operate in cislunar space would dominate the design as this meant it could be entering Earth's atmosphere at about 11 km/s on its return, enduring savage heating. Entirely new materials would have to be used in its construction. Several of the US's aviation companies proposed designs, many of which were completely unlike the spacecraft that was eventually built: General Electric suggested a vehicle strangely like the Soyuz craft then being developed in secret in the USSR. Other designs featured winged and aerodynamically-shaped re-entry vehicles which would land on a runway like the Shuttle decades later. Most unusual of all, but favoured by many in NASA was the Martin Corporation's lenticular design, a true flying saucer.

On May 25, 1961, President John F. Kennedy committed the US to the goal of landing Americans on the Moon before 1970. Apollo then became entirely a no expense crash spared, project to do just that (strictly speaking the Skylab and Apollo-Soyuz missions were not part

of the Apollo project). By July 1961, the exotic layouts for the spacecraft's re-entry vehicle had been rejected in favour of a squat conical design. In December that year, North American Aviation was selected for the coveted contract to build Apollo which then comprised the Command Module and a "second component", later called the Service Module, which would house the spacecraft's fuel, electrical power supply, propulsion system and lunar take-off gear (at this time it was still expected that the whole vehicle would touch down on the Moon, a third component, the "lunar landing module" would be attached to soft land all three components). North American had produced many successful and advanced military aircraft and anticipated building dozens or more Apollo spacecraft in the following decades but their Apollo experiences would not be happy. North American later became known as Rockwell and created the Space Shuttle Orbiter before being taken over by Boeing in the 1990s.

To send three men in an Apollo spacecraft to land on the Moon then take off for return to Earth required a huge launch vehicle. This would have been a titanic three stage rocket called Nova, there were several planned variants of this, the

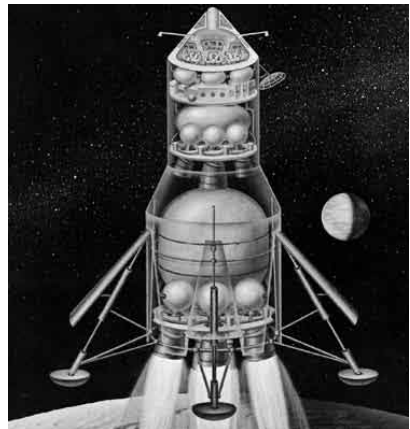


Image Credit: NASA

How it might have been 1: A painting of an early Apollo configuration which the whole spacecraft would have landed on the Moon.

'direct to the Moon and back again' model, the Nova C8, would have weighed about 4500 tonnes on the launch pad. Nova was still on the drawing board and would not be ready to test until the late 1960s at best. However, some NASA engineers were pushing a much simpler approach called Lunar Orbit Rendezvous (LOR), where only the landing module touched down (with one or two astronauts on board), leaving the Command and Service Module (the CSM) in lunar orbit. Since the heavy fuel load and engine for returning to Earth no longer needed to be transported to and from the Moon's surface, LOR had many advantages, in particular a (relatively) smaller rocket could be used, in the form of the Saturn 5 (3000 tonnes at launch) which was already in development. This revised mission plan rapidly gained support inside NASA. In July 1962 NASA invited tenders to design and build a "Lunar Excursion Module". The winning competitor was naval aircraft specialist Grumman who created the third component of the Apollo spacecraft, the Lunar Module. A spaceship in its own right (perhaps the only true spaceship to date), the LM will be covered in a later issue of Astronotes.

“the Martin Corporation’s lenticular Apollo design was a true flying saucer ”

The Apollo Command Module was 10.4 ft (3.18 m) high and measured 12.8 ft (3.9m). At the top was the vital docking adaptor encircled by the parachutes for descent to the splashdown in the ocean (the Command Module had to function as an acceptable boat too!) The rounded base was covered by a heatshield which during re-entry burned and disintegrated at a known rate, carrying heat away from the craft. The three crew, commander, CM pilot and LM pilot, sat in a pressurised cabin facing panels studded with 506 switches, 71 indicator lights and 40 dials and read outs. Five small windows allowed the crew to see outside. In diagrams the CM's interior seems horribly cramped, but the freedom to move all around it in micro-gravity made it seem relatively spacious to the crew. At launch, the CM was enclosed by the Boost Protective Cover surmounted by the Launch Escape System. A

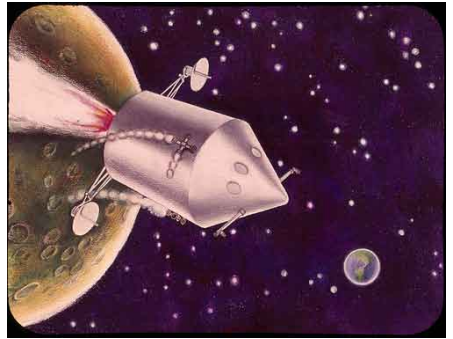


Image Credit: NASA

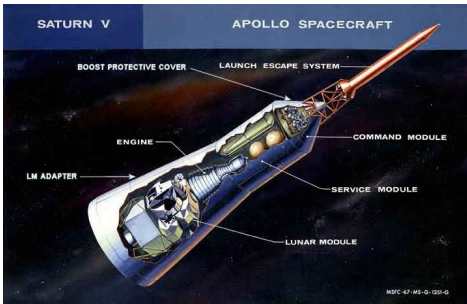
How it might have been 2: An early concept of the Apollo CSM rounding the Moon.

hefty rocket in its own right, the LES would have pulled the CM to safety should the Saturn rocket fail on ascent. Thankfully no Apollo crew ever had to rely on this device. Both the Boost Protective Cover and the LES were discarded once the spacecraft was clear of the atmosphere.

“the Command Module had to function as an ac- ceptable boat ”

Throughout the flight the CM's base was attached to the Service Module (SM), a 24 feet 7 inches (7.5 m) long cylinder which contained an AJ10 rocket engine and its propellants, fuel cells to generate power for the mission, tanks of water and air and the spacecraft's S-band antenna for communications with Earth. Later missions also carried scientific instruments in the SM including a deployable sub-satellite and a mapping camera (based on a camera developed for spy satellites although no one mentioned this at the time). The crew could not access the SM, so a spacewalk was needed to retrieve the mapping camera's film cartridges. Every SM was discarded shortly before the CM reentered the Earth's atmosphere.

Developing the Apollo spacecraft was far from straightforward (although to today's eyes it seems to have been remarkably fast), but at the start of 1967, Apollo 1 was being prepared for a test flight in Earth orbit. But hope turned to horror when astronauts Grissom, White and Chaffee were killed by a fire during a ground test of the capsule. The project was halted by



Apollo cutaway The Apollo modules are shown in launch configuration in this 1960s NASA artwork. this tragedy. A review board was unable to find the exact cause of the fire which spread faster and burned more intensely than it should have been thanks to the extensive use of flammable materials and the 100% oxygen atmosphere in the cabin. The board compiled a shockingly long list of design flaws and poor workmanship on the spacecraft and lambasted North America for its poor quality control.

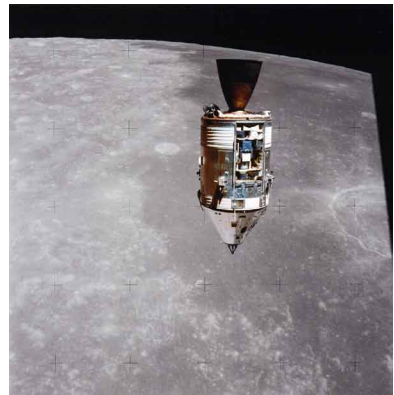
“the Apollo project ... successfully enabled the first phase of human exploration of the Moon”

By the Autumn of 1968, an enormously improved version of the CSM (the Block II) was ready for flight. Thousands of technical defects had been eliminated in the redesign and the crew breathed air rather than pure oxygen. The first crewed flight was Apollo 7 in October 1968, and this successfully demonstrated the vehicle was spaceworthy. In the next four years the Apollo project made history as it successfully enabled the first phase of human exploration of the Moon, ending with Apollo 17 in December 1972 (individual missions will be discussed in future Astronotes). Three further moon landings, Apollos 18, 19 and 20 were cancelled. Shrinking budgets and a sharp decline in public and political interest in space exploration were among the reasons for the project's waning.

It was not, however, meant to be like this. In the mid-60s NASA foresaw increasingly ambitious Apollo Moon missions throughout the 1970s. Ideas such as simultaneous landings by pairs

of Lunar Modules and astronauts establishing lunar bases were planned for. There were more grandiose plans still including manned flybys of Mars and even Venus using Apollo Spacecraft. The Venus flight was considered in detail in 1967 and would have been launched in 1973. At the very least there was the Apollo Applications Program, which foresaw thirty or more missions for Apollo CSMs including visits to a series of space stations based on modified Saturn 5 upper stages. These space stations were to be placed in orbit around the Earth and Moon, but only one, Skylab, was actually launched to become the first American space station in Earth orbit. The last Apollo CSM carried three astronauts to a docking with a Soviet Soyuz spacecraft in 1975. Apollo was retired in favour of the Shuttle as America's manned space vehicle. Now in 2009, the Shuttle is soon to be retired itself, to be replaced by the Orion CEV, a sort of “Apollo on Steroids”.

The Apollo project cost the US \$25.5 billion by 1969 (more than \$145 billion in today's money). It developed a flexible space transportation system that enabled twelve men to walk on the Moon, returning thousands of photographs and scientific measurements and 382 kg (842 lb) of lunar rocks and soil. Further missions would have been feasible but were not performed and the spacecraft could have been developed further still. Even today many wonder why it at this loss of vision.



How it was Apollo 15's CSM Endeavour as seen by from the Lunar Module Falcon. Note a section of the Service Module's skin has been jettisoned to expose the scientific instruments.

The Reign of Saturn



Image Credits: NASA

Saturn Rising Apollo 11 leaves for the Moon. Just think how big that plume of flame is.

By Orla O' Donnell, Education Support Officer

(Editor's note: Here is the second of our Apollo Anniversary articles. There will be another next month.)

This year is a memorable year in many ways. Notably, for the people of the United States of America, it is a time of great hope as President Barack Obama takes over the leadership of the most powerful country in the world during a very troubled time. Astronotes readers will be well aware that 2009 is also a special year for astronomy and space sciences as this is the International Year of Astronomy, a whole year devoted to the promotion of astronomical sciences. 2009 is also the anniversary of another exciting astronomical achievement, as it is the 40th anniversary of the first Moon landing.

The Apollo Moon landings were a momentous occasion not only in the history of science but

also the history of mankind as a whole. The Moon landings demonstrated what human beings were capable of and were a beacon of hope during the turbulent 1960's. Indeed, the president who made the historic speech on 25 May 1961 announcing the ambition to reach the moon before the end of the decade, John F Kennedy, had been assassinated just two and half years later. The effort and expense it took to land on the Moon in July 1969 was predicted by Kennedy when he told the United States Congress "No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish. "

“A Saturn V was 363 ft tall... the Statue of Liberty stands at 305 ft... ”

As part of our series of commemorative articles to celebrate this historic event I will review the Saturn V rocket, so central to the Apollo project.

Back in 1957 German scientist Wernher von Braun had proposed the design for a large rocket called the Juno-5 for his then employers the Department of Defence (bizarre as it may seem in the 1950s the US Army briefly considered a hugely ambitious military space programme including the establishment of bases full of GI's on the Moon). The Army no longer needed the rocket so the design was passed to a still relatively new organisation called NASA. The rocket was altered and renamed Saturn, Saturn 1 would become the first in a family of three rockets; Saturn 1, Saturn 1B and Saturn 5.

The Saturn 1 rocket was not powerful enough to complete a mission to the Moon producing a thrust of 836K Newtons (188 000 lbf) at launch. This rocket was however a useful starting point and the Saturn 1 rockets completed 10 suc-

Image Credit: NASA



Little brother A Saturn 1B stands ready to send a crew to Skylab.

Successful missions. Three of the Saturn 1 missions launched Pegasus satellites which were meteoroid detection probes. Following on from Saturn 1 was the slightly bigger Saturn 1B. This rocket was commissioned in 1962, at this time the Saturn V was already under development. Saturn 1B produced 1000k Newtons of thrust at launch and was used as a means to speed up the space programme while the Saturn V was in production. Saturn 1B was a much larger and powerful rocket than its predecessor and was a mixture of components from Saturn 1 and Saturn V. The first flight of a Saturn 1B took place on 26 February 1966 and was followed by unmanned missions which were used to test the Apollo Command Module, to launch unmanned lunar missions and generally to test the safety of the rocket. A Saturn 1B launched Apollo 7, the first manned mission in the series on 11 October 1968. The crew of Apollo 7 were Walter M. Schirra, Donn F. Eisele and R. Walter Cunningham, this crew were the original back up team for the ill-fated Apollo 1 mission. The Saturn 1B rocket would not be used again after Apollo 7 until 1973, when it was used to send crews to the Skylab space station. The last Saturn 1B flew in 1975, launching the American half of the Apollo-Soyuz Test Project.

Often overlooked today, the Saturn 1 and 1B were not toy rockets by any stretch of the imagination. However despite their colossal dimen-

Image Credit: NASA



Big Brother a Saturn V (there were no Saturns 2-4) on the launch pad. The prominent black markings made the rocket easier to track against a bright sky.

sions they seemed miniature beside the Saturn V. This behemoth was 10.1 m (33 ft) in diameter and 110.6 m (363 ft) high, to put that in perspective the Statue of Liberty stands at 93 m (305 ft). A Saturn V consisted of three stages. Saturn V's first stage (S-IC) was powered by five F1 engines each able to produce an earth trembling 6819kN (1.5 million lbf) of thrust.

“Saturn V was the largest rocket ever built in the US...”

The Saturn V was not just a bigger version of the Saturn 1B, it had undergone many improvements, for example, the four outer engines swivelled to keep the rocket on course. The S-IC stage may have been powerful but it was designed to work for only two minutes until the next stage, the S-II, took over. Each S-II stage operated for six minutes and was powered by 5 liquid hydrogen-fuelled J2 engines. The third and final stage was called the S-IVB and contained scientific instruments and the guidance system. Just above them was positioned the Apollo spacecraft's Lunar Module. En route to the moon the Lunar Module would be detached from the S-IVB stage of the rocket, after this the S-IVB was sent into orbit around the Sun or crashing

into the Moon.

The Saturn V was the largest rocket ever built (its slightly smaller Russian counterpart, the N1, will be discussed in a future Astronotes) but it was not the largest rocket ever conceived there, in 1959 the Nova rocket was proposed. The Nova would have incorporated a staggering eighteen F1 engines and three M-1 engines which were to be more powerful still. This rocket was never actually built, as it was considered too expensive (even for the generous space budgets

“Saturn V missions would have an unblemished safety record”

of the time) and the planned process of landing the whole Apollo spacecraft on the Moon was too complicated. Even though the Saturn was much smaller than the proposed Nova it could produce a combined thrust of 33 million Newtons (7.4 million lbf) at lift off, this sound and fury meant the Saturn V was a considerable health and safety risk. NASA not only had to consider the life of the astronauts and other personnel but also to any people in the locality. NASA had to



Biggest Brother? A 1960s NASA artwork compares the Saturn 1 (C-1), Saturn V (C-5) and Nova rockets. The Saturn V was just small enough to be constructed in an existing factory. A new purpose-built building would have been needed to assemble Nova components; this helped seal Nova's fate. NASA considered plans for enlarged and improved Saturn Vs for the 1970s but these were never built as the projects they were needed to support were cancelled.

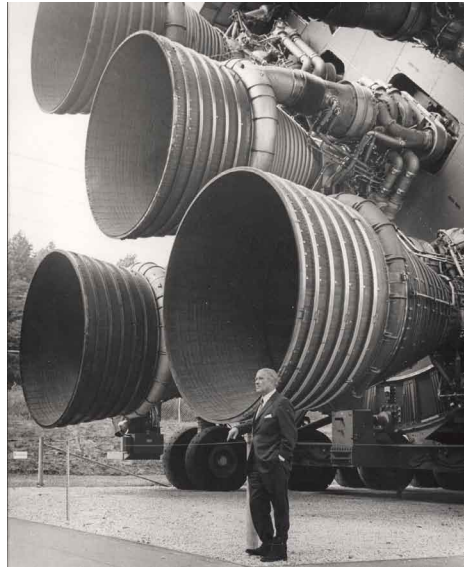


Image Credit: NASA

Look on my works, ye mighty, and despair! A contemplative Werner von Braun is dwarfed by the cluster of F1 engines at the base of one of the two Saturn V rockets preserved for posterity.

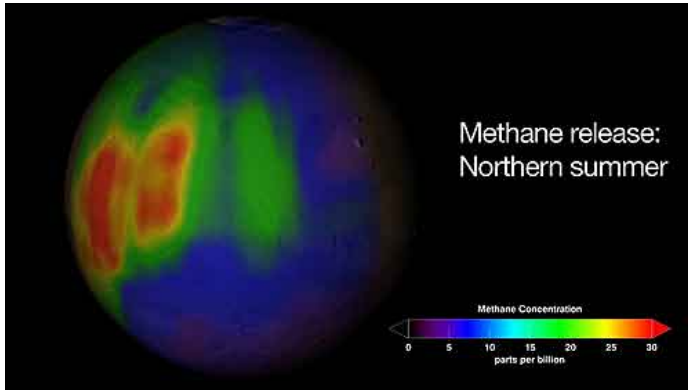
conduct an intensive study into the risk factors before the first rocket was launched. The Saturn V missions would thankfully go on to have an unblemished flight record with no lives lost. In all 15 rockets were built, the first was launched on the 7 November 1967 and was an unmanned test mission. The first manned mission, Apollo 8, was launched on December 1968. Saturn V rockets would complete thirteen more successful missions, the last placing the Skylab Space Station in orbit around the Earth.

“A Saturn V allowed Neil Armstrong to take one of the most historic steps of all time ”

There is one mission however that is responsible for the eternal fame of the Saturn V rocket, that is, of course Apollo 11. A Saturn V successfully launched the Apollo 11 spacecraft safely to the surface of the Moon and allowed Neil Armstrong to take one of the most historic steps of all time.

Mars Methane Mystery

Image Credit: NASA



Concentrations of Methane discovered on Mars. Another compound which can be of biological origin, ammonia has also been found in the planet's atmosphere.

By Nigel Farrell Education Support Officer

For decades it has been widely accepted that Mars is essentially a dead desert planet. However, scientists have recently announced the discovery of large quantities of methane in the Martian atmosphere, indicating that the planet could still be alive. Methane was discovered in the atmosphere of Mars as far back as 2003 and now scientists have revealed that it appears to be abundant over many parts of the Red Planet signifying that Mars is quite likely to be biologically or geologically active.

“the methane must be made by an ongoing process ”

On Earth, the ‘natural gas’ which many people use to heat their homes is mostly methane and virtually all of the methane released into our atmosphere (about 90%) is produced by biological processes, including rotting vegetation and bovine emissions, to name but a few. In real terms methane on Earth is a waste product, released into the atmosphere by microbes. However,

teams of curious scientists are still unsure about the source of the methane plumes which they have discovered on our neighbouring planet.

The NASA and university scientists found the methane by studying the atmosphere of the planet over several Mars years (each equivalent to about 1.88 Earth years) and through all the Martian seasons. Using spectrometers on NASA's Infra-

red Telescope Facility run by the University of Hawaii, and the W. M. Keck telescope, based at Mauna Kea; Hawaii the team was able to monitor about 90% of the planet's surface. They split the light into its component colours revealing its chemical make up, much like splitting white light into a rainbow using a prism.

By doing so the team were able to look for dark areas in specific localities along the light spectrum where methane was absorbing light from the Martian surface. During the research the scientists found three such areas, referred to as absorption lines, which together, according to the team, are a definitive sign of methane. One plume of methane among the multiple areas observed actually released about 19 000 tonnes of the gas.

According to the researchers, the plumes of methane were emitted during the warmest Martian seasons, spring and summer, and the plumes were seen over areas that show evidence of ancient ground ice or flowing water, for example, northern hemisphere regions such as Syrtis Major, an ancient volcano about 1200 km (745 miles) across.



Image Credit: NASA

Six wheels on my wagon Mars Science Laboratory will carry the biggest, most advanced suite of instruments for scientific studies ever sent to the Martian surface.

Methane is quickly destroyed in the Martian atmosphere by a variety of natural processes so the discovery of such large amounts is evidence that the gas is somehow being replenished. It follows therefore, that the methane must be made by an ongoing process. However, scientists cannot say as yet whether this process is an ancient or modern one. "The fact that we have found three discrete regions where Mars is releasing methane at this time means we have a window into processes occurring under the surface of the planet," said Michael Mumma, a senior planetary scientist at Nasa's Goddard Spaceflight Center in Maryland, US. Mumma added, "The production of methane is likely due to only one of two possibilities. The first is geochemistry, the second is biology. That raises much interest on which one is the dominant production mechanism."

If methane is being produced by a geological process then it is possible that it is coming from active volcanoes or possibly from a process known as serpentinisation. This is a chemical reaction which occurs at low temperature. Rocks rich in the minerals olivine and pyroxene react chemically with water, releasing methane. Though there is no evidence of active volcanism on Mars today, this process could cause ancient methane trapped in ice cages called clathrates to be released now (a large, but unknown, quantity of methane is trapped under Earth's oceans in methane clathrates in the ocean floors).

"Some scientists believe that life arose when Mars was more hospitable"

Alternatively the process could be biological, occurring near the surface or deep beneath the permafrost layer. Some scientists believe that it is possible that life arose when Mars was more hospitable and microbes could have survived below the permafrost layer where water changes from ice into liquid. It is possible ice could block pores or fissures connecting to the planet's atmosphere. This ice could evaporate during spring and summer releasing the methane. It is likely that the key to solving the scientists' questions about the origin of the methane lies with future missions to Mars such as the Mars Science Laboratory. Due for launch in 2011 the rover will carry instruments which have the potential to distinguish between carbon in gases produced by biological activity and those with a geochemical origin. This should enable scientists to analyse the methane in-situ on the Martian surface.

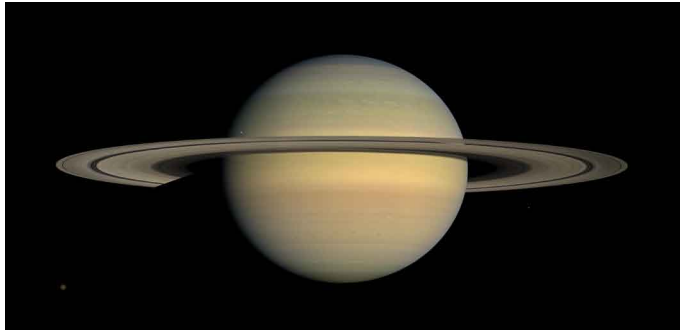
The Sky in February

By Tracy McConnell, Education Support Officer

Welcome back to the "Night Sky Guide" for February 2009. The sky is working in our favour at this time of year with long dark nights, although the clear nights tend to be bitterly cold so, please remember to wrap up warmly and have

a hot drink handy to fend off the cold. Please consider that the general guide presented here is based on the stellar positions at 11:00pm on 15th February, and while the stars don't change much from day to day, their relative positions will move across the sky throughout the night.

The sun will be setting around 7pm and by 8pm our beautiful ringed planet Saturn will have risen in the east. Saturn was the Roman god of corn and agriculture. He's considered to be the equivalent of the Greek god Cronos, father of Zeus and ruler of the world during the Golden Age.



Saturn is the second largest planet in the Solar System and is a gas giant world composed primarily of hydrogen and helium. The atmospheric winds reach up to 1800km/h, but despite this Saturn appears bland and relatively

uninspiring. What captures the most interest are Saturn's rings and moons. So far over 60 moons have been discovered, the largest being Titan. Saturn's rings are mostly made up of chunks of ice with smaller amounts of rocky dust and debris. Saturn is a spectacular sight, well worth looking out for. However, without binoculars or a telescope it just looks like a brightish star.

From sunset onwards, towards the west there should be the now familiar sight of the stunningly bright wandering star, or planet, Venus. Venus was the Roman equivalent of Aphrodite, the goddess of love. This planet is often considered to be the "sister" planet of Earth, as both planets have similar size, gravity and composition. The major difference is that of Venus' atmosphere. It is composed of a toxic concentration of carbon dioxide due to an extreme "greenhouse effect". Venus' atmosphere is also the densest in the Solar System, leading to a surface pressure 92 times that of Earth's. Although Venus has been in our skies for many months now, it's still a beautiful and uplifting sight.

As mentioned last month, the dominant constellation at this time of year is Orion. As well as being a stunning constellation in its own right due to the abundance of bright stars, Orion is also home to two of the most famous gas clouds in the sky. Next to Alnitak, the left-most star of Orion's belt, is the Horsehead Nebula. It got its name from the shape of the dark cloud in this

Saturn resplendent This mosaic combines 30 images—10 each of red, green and blue light—taken over the course of approximately two hours as the Cassini spacecraft panned its wide-angle camera across the entire planet and ring system on July 23, 2008. The spacecraft captured these images at a distance of approximately 1.1 million km (690 000 miles) from Saturn.

nebula which absorbs light from the surrounding stars. This is very difficult to see even with a powerful telescope. The other cloud however can often be seen with the naked eye. Approximately half way between Orion's belt and his



Stellar steed This beautiful image of the Horsehead Nebula was taken at the National Science Foundation's 0.9-metre telescope on Kitt Peak with the NOAO Mosaic CCD camera. Special filters have been applied to bring out the detail of the image. The dark cloud of the horse's head is actually absorbing light emitted by the surrounding gases.

knees is M42, the Great Orion Nebula. This is a huge stellar nursery, it is a brightly glowing cloud of gas and dust, where stars are being formed, some even have planetary systems.

“Orion was also quite a ladies’ man and one story does cover his stalking of the seven beautiful sisters known as the Pleiades”

There are many stories about Orion in Greek mythology. The son of the sea god Poseidon, he was considered to be a handsome man of tremendous build and strength, and was believed to be a great hunter. The great bull Taurus, one of the signs of the Zodiac whom we have mentioned in previous months, challenged Orion to a great battle, and you can find Taurus just to the right of Orion, he is represented by a long “V” of stars, the horns of the bull.

“Saturn’s rings are mostly made up of chunks of ice with smaller amounts of rocky dust and debris”

Orion was also quite a ladies’ man and one story does cover his stalking of the seven beautiful sisters known as the Pleiades. These sisters were placed in the heavens to keep them safe from Orion’s advances and they can be found as the small star cluster just behind Taurus. Each of these three patterns, Orion, Taurus and the Pleiades can be found directly south after sunset and in a southwest direction at around 11pm. The star on the end of Taurus’ upper horn is called Alnath, and whereas today it belongs to Taurus, it used to belong to the constellation above it. This constellation looks a bit like a hexagon with a triangle on its upper right side. The pattern is called Auriga, the charioteer. In Auriga there is a pair of stunning yellow giant stars called Capella. Without a telescope, these



Image Credit: NASA, ESA, M. Robberto (Space Telescope Science Institute/ESA) and the Hubble Space Telescope Orion Treasury Project Team

Alias M42 This image of the Orion Nebula was taken by the Advanced Camera for Surveys (ACS) aboard the NASA/ESA Hubble Space Telescope. The Orion Nebula is a place of stellar birth, more than 3000 stars of various sizes appear in this image.

appear as a single star, in fact the sixth brightest star in the sky. Each of these stars is about 80 times brighter than our Sun and 10 times as big.

Other constellations visible include the circumpolar constellations in the north, around the star Polaris; Ursa Major, Ursa Minor, Cassiopeia, Cepheus, Draco and Camelopardis. You can still see our line of Zodiac signs stretching from, the newly arisen Virgo in the east to Aries and one of the Pisces fish in the west. We covered these in detail in previous months. In the east, the bright star Arcturus marks the bottom of an ice-cream cone-shaped pattern of stars. This constellation is called Boötes, the herdsman. We can learn a bit more about this pattern and its story next month. So, this outlines some of the most recognisable objects visible this month. Enjoy your stargazing and I’ll see you next month.

Moon Phases, Feb 2009

Mon 2 Feb	First Quarter
Mon 9 Feb	FULL MOON
Mon 16 Feb	Last Quarter
Wed 25 Feb	NEW MOON

Image of the Month



Image Credit: NASA/ESA/STScI

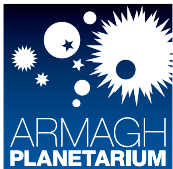
Considering the recent weather, this image of a celestial snow globe captured by the Hubble Space Telescope seems particularly appropriate. This is the globular cluster M13 located some 25 000 light years away in the constellation of Hercules. M13 is relatively easy to find in the summer sky and can even be viewed unaided under dark skies.

Globular clusters contain many hundreds of thousands of glittering jewel-like stars. M13 contains over 100 000 stars in a tightly packed sphere about 150 light years across. Within the cluster are some of the oldest stars in the Universe. It is possible that they formed even before the disc of our Milky Way, so they are older than nearly all

other stars in our galaxy.

The bright reddish stars are ancient red giants. The blue-white stars are the hottest in the cluster. At the core of this cluster the stars are so crowded that they can, at times, slam into each other and even form a new star, called a “blue straggler.”

Globular clusters can be found spread largely in a vast halo around our Milky Way Galaxy. M13 is one of nearly 150 known globular clusters which are contained within this celestial aura. This image is a composite of archival Hubble data taken with the Wide Field Planetary Camera 2 and the Advanced Camera for Surveys. (Caption by Nigel Farrell, Education Support Officer)



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