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ARMAGH PLANETARIUM

# ASTRONOTES

Incorporating **FRIENDS' NEWSLETTER**

Uranus and Neptune: identical twins?

Hitler's space program

The sky this month

Sunspots and climate change

Happy birthday Hubble!

# Identical twins?

By Martina Redpath, Education Support Officer

Unbeknownst to the ancients Uranus and Neptune are two ice giant planets discovered in modern times. Often paired together, both have a diameter around four times the size of the Earth, are bluish in colour and made up of a similar collection of gases. However, a few hundred years later with improvements in technology and better understanding of our Solar System, how much do we actually know about these distant members of our Solar System? Are they really twin planets?

Uranus, which often induces a little giggle from teenagers and a variation of pronunciation, is the seventh planet in our Solar System located on average 19.84 AU (1 785 million miles or 2 872 million km) from the Sun. Uranus is a ball of gas and liquid and that looks pretty much featureless. Although visible with the naked eye under clear very dark conditions, it was not discovered and identified a planet until 1781. There have been reports of sightings as early as 1690; however it was originally thought to have been just another star.

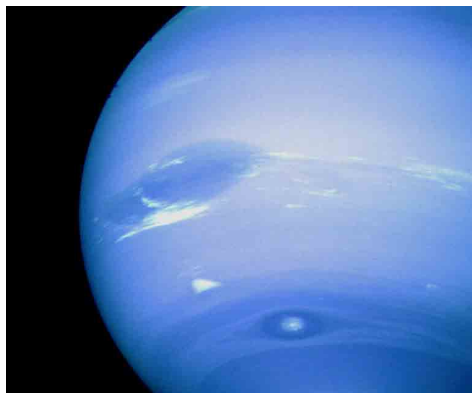


Image Credit: NASA

**Blue planet** An image taken from Voyager 2 spacecraft showing the stormy area known as the 'Great Dark Spot' on Neptune.

British astronomer William Herschel (1738 – 1822) was using his telescope to survey stars down to magnitude eight. Magnitudes rate the brightness of a star or object, the larger the number the dimmer the object is. The Sun has a magnitude of -26 and a full moon -13, the planet Uranus has a magnitude of +6. Herschel discovered this "star" and originally believed it to be a comet. However, as it moved too slowly in the sky to be a comet, he concluded that his finding must have been a new planet. Initially Herschel planned to name it after the king of England, George III, 'Georgium Sidus', translated to George's Star. However eventually it was named Uranus after Saturn's father in mythology.

## "Uranus is a ball of gas and liquid and looks pretty much featureless"

Neptune was discovered by mathematical prediction in 1846 before being observed through a telescope. Neptune is not visible with the naked eye. Astronomers noticed that Uranus was not always in the expected position; therefore they assumed that the gravity of an unknown planet must have been influencing Uranus. John C. Adams (1819-1892) an English astronomer and French mathematician Urbain J.J. Le Verrier (1811-1877) are both credited with the discovery of Neptune by predicting where this new planet should be, although they completed their work independently unknown to one another. Johann G. Galle (1812-1910) director of Urania Observatory in Berlin confirmed their findings. Neptune takes its name from the Roman god of the sea and orbits at an average of 30 AU (2 793 million miles, 4 495 million km) from the Sun.

Jupiter, Saturn, Uranus and Neptune make up the planets in our outer Solar System. Jupiter is the largest, followed by Saturn with Uranus and Neptune the next largest planets. Although sometimes thought to be twins, Uranus and

Neptune are very different. Uranus is sometimes known as the sideways planet, as it has an axial tilt of  $98^\circ$  (compared to  $23\frac{1}{2}^\circ$  for the Earth); therefore its poles directly face the Sun or point away from it. It is thought that an impact with another body knocked it over on its side. Its blue colour is caused by presence of methane in its atmosphere. However, the majority of the atmosphere is made of hydrogen and helium. Neptune's blue colour is also due to methane, but it is present in higher concentrations than on Uranus. Uranus also has a ring system, 13 in total, formed of small, dusty, dark particles. After the surprising discovery of rings around Uranus, astronomers began searching for Neptune's rings. They discovered full but thin rings, which were a little lumpy and twisted, that are thought to be much younger than their planet.

## “Neptune was discovered by mathematical prediction in 1846”

Neptune, rather unlike Uranus, has some very prominent features on its surface, dark spots showed Neptune to be a very stormy planet with wind speeds of more than 2000 km/h (1200 mph). These features appear and vanish frequently, unlike Jupiter's Great Red Spot which has been prominent for a few hundred years. As well as being a windy planet, Neptune is also unusually quite warm. In 2007, astronomers using the Very Large Telescope (VLT) in Chile found that the South Pole was  $10^\circ\text{C}$  ( $18^\circ\text{F}$ ) warmer than anywhere else on the planet probably due to heat during the course of a prolonged summer.

Both of these planets have multiple moons;

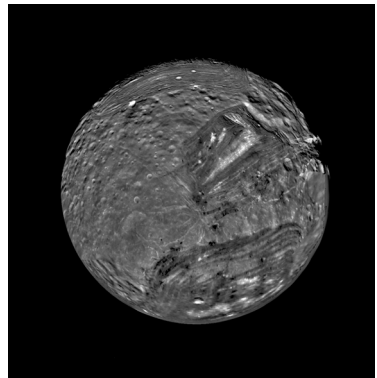


Image Credit: NASA

**Miranda** The moon's multi-textured surface suggests it experienced a violent past .

Uranus' 27 moons are named after characters from the works of Shakespeare and Alexander Pope. The biggest moons, Titania and Oberon, are icy, and much cratered worlds. The moon Miranda is gouged and also very cratered. Of Neptune's 13 moons, the six closest are lumpy and irregular. Neptune's largest moon Triton travels around the planet backwards, it is also the coldest large body in the Solar System with a temperature of  $38\text{K}$  ( $-200^\circ\text{C}$  /  $-391^\circ\text{F}$ ). Tidal interactions between Neptune and Triton mean that in 100 million years these two bodies may come too close to one another causing Triton to be torn apart leaving Neptune with a ring system more spectacular than Saturn's.

Uranus and Neptune are fairly recent additions to our Solar System. Both of these worlds are fascinating and different. As our technology improves, and further probes are sent to this region of space, we will learn more about our ice giant neighbours proving that they are two very different worlds.

# Hitler's space program

By Colin Johnston, Science Communicator

This month marks 65 years since Adolf Hitler's 'Thousand Year' Third Reich was utterly defeated. Ever since, this awful regime has held a hor-

rid fascination in the popular imagination. One aspect that interests many is Nazi Germany's frightening array of military hardware. Despite an astonishingly corrupt and incompetent procurement bureaucracy, the Nazis fielded some very

technologically advanced weapons (and less often-mentioned, many disastrous flops too). Among the successes were the heavy Tiger tanks, assault rifles, IR nightsights, the excellent Focke Wulf fighter 'planes, the Me262 jetfighter and the V-2 ballistic missile.

In the past few years stories of other, more amazing schemes from the Third Reich have appeared, stories of intercontinental missiles and orbiting spaceplanes (all adorned with swastikas). These started on the internet (for example, until recently Wikipedia used have to an article stating that several Luftwaffe pilots made space flights in 1945) and since have spread to books and TV documentaries. Are there the slightest grains of truth in these tales of Nazis in space?

Of course, Germany was the first nation to field a ballistic missile in the sleek shape of Wernher von Braun's V-2. The name V-2, for Vergeltungswaffe 2 (Vengeance Weapon 2), was an invention of Nazi propagandists, more correctly, this missile was designated A4, one of the A-series rockets developed by von Braun (1912-77) and his colleagues since the 1930s. The German army had begun sponsoring von Braun's research even before Hitler came to power, seeing missile weapons as an alternative to the long-range artillery forbidden to post-WW1 Germany. Built by a workforce of slaves labouring in hideous underground factories managed by sadistic murdering thugs (as many as 20 000 people died building A4s, and about 7250 more people were killed by the missiles, never forget this), the A4 was a staggeringly futuristic rocket. Rising from



Image Credit: US Army

**The Reich Stuff?** This German pilot models not a spacesuit, but a pressure suit for high altitude flight in the Go 229 jet fighter.

its launch pad under 25 tonnes of thrust from its alcohol and liquid oxygen-fuelled engine, it could carry a 975 kg (2150 lb) warhead at supersonic speed up to 314 km (195 miles) from its launching site. First successfully launched in 1942, it was fired against Allied cities, including London, Antwerp and Paris from 1944. Sometime in 1944, an A4 reached an altitude of 189 km (117 miles) making it the first man-made object to reach space. This would have been a propaganda triumph for the Third Reich, but the Kármán line, the boundary 100 km (62 miles) above our heads where space officially begins was not yet defined at that time.

“the A4 was a staggeringly futuristic rocket”

Yet impressive though it was, the A4 was not (except in Hitler's dreams) a war-winning weapon, its range and destructiveness were adequate for a European war, but not for a global conflagration. Aware of this, von Braun and his team had investigated longer ranged A4 derivatives. One result was the A9, a winged A4, which was intended to glide up to 800km (497 miles) from its launch site, but von Braun was thinking on a yet more grandiose scale.

The A10 design was started in 1936, and resembled a giant A4 with a unique 100 tonne thrust engine formed from six of the A4's engines feeding a single exhaust. Originally the aim was



Image Credit: Deutsches Bundesarchiv

**Dedicated followers of fascism** According to von Braun (centre), he spent his time designing space rockets which other people turned into weapons.

to carry a 4 tonne warhead 500km (310 miles). By 1941 the A10 had evolved into the lower stage of an intercontinental missile. Mounted on top of the A10 would be an A9, launched from western France this combination was hoped to be capable of launching 1 tonne warheads at New York city. Just like today's shuttle SRBs, the A10 was meant to descend under a parachute into the ocean for recovery and reuse. The combined A9/10 would have been comparable in size to the 1950s US Atlas missile, later used to launch Mercury project astronauts into orbit. This concept sounds impressive but it was a fantasy. The whole configuration of the A9/10 is primitive and would not have worked. No A10 component was ever built and the project was officially abandoned in 1943 (anything you may read to the contrary is a modern invention).

## “Sänger’s Silverbird was a fully-fledged spaceplane”

The Germans planned a piloted craft based on this research. Among the engineering drawings of the A9 discovered after the war were a set showing the rocket modified with a pressurised cockpit and a tricycle undercarriage. Capable of a maximum speed of Mach 3.4 at an altitude of 20km, its performance would have been astonishing for the 1940s. The purpose of this vehicle is unclear; many sources claim that this was a suicide bomber, imagining a fanatical Nazi pilot steering his craft into the Empire State Building or the White House. Ignoring the infeasibility of this scenario, the craft had no space for a warhead and was meant to land on a runway for reuse, presumably it was for high speed research or possibly reconnaissance missions. Combined with an A10 booster, this manned craft could cross the Atlantic in 40 minutes, or fly above the Kármán line (assuming it all worked, an unlikely prospect). This never happened and this vehicle was never built. No Nazi astronauts flew into space on it and no CGI images, however pretty, will ever make this true. Yuri Gagarin was the first man in space.

Further decrying the modern myths, the combined A9/10 vehicles were not meant to launch payloads into orbit. However von Braun did claim that during the war that he had designed

a reusable orbital space vehicle to assemble and service a wheel-shaped space station. This seems to have been a fib for his US Army captors perhaps to sell his services to them. He called the spacecraft and its launch vehicle the A11/12 and they appear to have actually been designed when he was in detention in 1946. Again this was never built and was far beyond 1940s technology, designed without later knowledge of high-speed aerodynamics and atmospheric heating, the craft as planned would have disintegrated in flight had it been launched.

The other great Nazi “space project” was Eugene Sänger’s Silbervogel (Silverbird) or “Antipodal Bomber”, a fully-fledged spaceplane. Sänger (1905-64) was a gifted engineer who had been investigating supersonic flight and rocket engines since the early 1930s. At this time he sketched plans for a rocket-powered supersonic passenger aircraft (note that contemporary airliners were mainly biplanes which cruised at 160 km/h or so). Offered a post by the Luftwaffe (the Nazi armed forces jealously guarded their pet projects from each other; von Braun was employed by the army and later the SS, he and Sänger were kept ignorant of each other’s work), Sänger remodeled this civilian vehicle into an

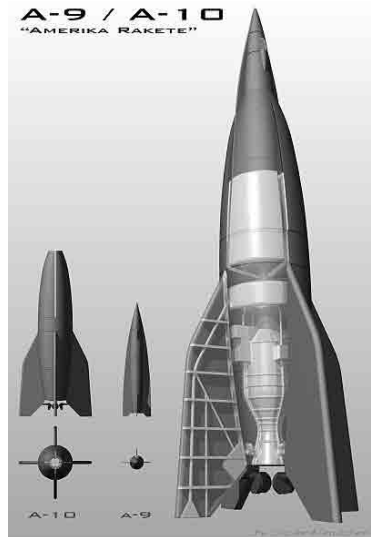


Image Credit: created by "Spike" via Wikipedia.org

**Two stage terror** A modern impression of the A9/10 rockets. The term Amerika Rakete is a recent invention.

extraordinary bomber.

A flattened metal cigar 28m long with stubby wings, a Silverbird would have begun its mission pushed along a 3 km (2 mile) long monorail track by a large rocket-powered sled somewhere in Germany. Once airborne, the craft's pilot would ignite its large rocket motor accelerating it to ten times the speed of sound. Gliding over the Atlantic, the Silverbird would drop up to eight tonnes of bombs (claims that it was meant to carry a nuclear device are again modern inventions) on targets in the eastern US, before traversing the whole American continent. As it flew it would make a series of hops, soaring out of the atmosphere, then diving back. Each time it skipped into space it would lose velocity and radiate the heat generated by its hypersonic flight, avoiding the need for a heatshield. Finally it would land on a runway somewhere in the Pacific (presumably on some Japanese-occupied island) where a second track would launch it back to the Fatherland.

## “A Silverbird would turn into a shower of aluminium meteors.”

It is an amazing scheme but completely unworkable with WW2-era technology and the Luftwaffe agreed, closing the project down in 1942 and putting Sänger to work on more conventional projects. Even today we would have difficulty building such a vehicle, only the space shuttle has higher performance. The planned craft contained many elegant technical solutions, the self-cooling engine for example, but despite all the modern computer-generated movies and images of the Silverbird in flight, it would never have worked as designed. The proposed ‘hopping’ flight path to shed heat was hopelessly inefficient; at high speed a Silverbird would catastrophically turn itself into a shower of aluminium meteors. Although Sänger tested windtunnel models of this project, it never came anywhere near construction. Some websites feature indistinct photographs claimed to be of a partly assembled Silverbird but these are not correct.

In reality, Nazi Germany never had a space program in the sense of a plan to explore and ex-

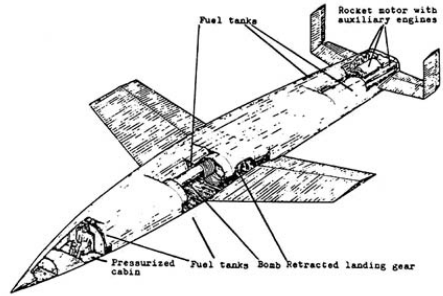


Image Credit: US Army

### Fascist folly A contemporary diagram of the Silverbird space bomber.

plot Earth orbit and beyond. I would argue that it is a pity that it didn't. The world today might be a better place if Hitler had taken a personal interest in these proposals. An ignoramus on technical matters, the Führer often overruled his less fantasy-prone advisors, deciding to throw resources at projects that appealed to him, no matter how ludicrous such as the impressive-looking, hugely expensive yet militarily pointless 188 tonne Maus tank and Dora superguns. As a result millions of Reichmarks were squandered and Allied victory crept a little nearer. According to historian Steven J Zaloga, the A4 missile project “achieved nothing of significant military value” but cost Germany the equivalent of \$2 billion (1945 values). That was \$2 billion not spent on the tens of thousands of tanks or fighter planes which could have slowed the Allies' advances. Just think, if Germany in 1940 had started to seriously develop von Braun and Sänger's creations, how much more money would have been wasted? The war might have ended in Allied victory years earlier, millions of innocent lives could have been spared and any prototypes would be popular exhibits at the Smithsonian and Imperial War Museums.

#### Further reading

Lowther, Scott, “Raumwaffe 1946”, Aerospace Projects Review, September-October 2003, p3-57

Parsons, Zack, My tank is fight: deranged inventions of WWII, Citadel Press, New York, 2006

Zaloga, Steven, J, V-2 ballistic missile 1942-52, Osprey, Oxford, 2003

# The May night sky

By Mary Bulman, Education Support Officer

Clear and warmer nights provide an invitation to turn off the TV, go outside and turn on to the night sky. You don't even need a sky licence.



Image Credit: NASA

**Crescent Moon** photographed over the Baikonur Cosmodrome (aka Tyuratam) in Kazakhstan. Due to the failure of the N-1 rocket, no cosmonaut ever left for the Moon, but numerous lunar probes blasted off from here.

Stargazing is one of the few delights available to us that is still free of charge. There are lots to see just using the naked eye, no need for binoculars or a telescope.

What are the wandering stars (as the ancients called them) up to this month?

In spite of the short spring nights ...for your pleasure you can see Venus, Mars and Saturn in the evening sky while if you are an early riser you will be greeted with Jupiter, Uranus and Neptune. Venus can be seen as a beautiful bright star in the western sky and does not set until 11pm by the end of the month. At a magnitude of 1.1 by the end of May, Mars moves into Leo around the middle of the month. Moving close to the bright star Regulus, which is the bottom star in a pattern that looks like a backwards question mark. Saturn can be found in Virgo but the rings

are not at their best for observing. They are at their minimum tilt for the year by the end of the month. It is still an amazing experience to see Saturn through a telescope especially if you are lucky enough to also see Titan, its largest moon. If you are returning after a night out Jupiter is an easy object to see in the early morning, two hours before sunrise.

The Plough is high overhead this month. This asterism forms part of the much larger constellation of Ursa Major or Great Bear. This distinctive saucer-shaped pattern formed of seven bright stars can guide us to other stars and patterns in the sky. Following the two stars at the end of the pan-shape if you move down the sky in a westward direction you will come to a bright star called Regulus. This star forms the bottom star of the pattern looking like a backwards question mark mentioned earlier. You are now in the beautiful constellation of Leo the Lion. Just ahead of Regulus you will find Mars still strutting his stuff. To the right of Leo you can still see Gemini with the bright stars Pollux and Castor. To the left of the Lion you will see the constellation of Virgo with the bright star Spica. Virgo which is the 2nd largest of the 88 constellations is visible throughout May. Though not the most prominent constellation, containing only the one bright star, Spica, it is particularly rich in fascinating galaxies.

“Vega, Altair and Deneb are rising in the east...”

In the NW and you will see Capella in the constellation of Auriga still lighting up our sky. Face north and the vain queen Cassiopeia with her distinctive M shape is clear to be seen. The three bright stars Vega, Altair and Deneb are clearly visible rising in the east getting ready to shine all summer.

The Moon is the brightest and biggest object in the night sky and can help you find the planets if you are a newcomer to the 'joy of the sky'. Many people are surprised to learn that Venus, Mars and Saturn are visible to the naked eye. Here's how you can locate them. On 16 May the very bright star beside the new crescent Moon in the NW is in fact Venus. Looking west on 19 May the bright reddish star to the left of the Moon is Mars. Turning to the stars, the bright blue star to the left of Mars is Regulus, brightest star in the constellation of Leo (see above). On 22 May the

Full Moon will be sitting below Saturn. To its right will be Spica, brightest star in the constellation of Virgo. Enjoy your stargazing!

## Moon Phases May 2010

Thursday 6 May	Last Quarter
Friday 14 May	NEW MOON
Thursday 20 May	First Quarter
Thursday 27 May	FULL MOON

# Climate change: us or sunspots?

by Sinead McNicholl, Education Support Officer

The Sun is Earth's closest star and has a diameter of approximately 865 000 miles (1.39 million km) and is composed primarily of hydrogen. There are two main reasons why the Sun is so important for us on Earth; it provides us with light and it gives us heat. During ancient times it was worshipped as a god by some cultures for these reasons. But it contains many mysteries, such as sunspots, coronal temperatures and hemispheric discrepancies that even today, with our robot spacecraft observing its activity such as the SoHO (Solar and Heliospheric Observatory) project, we have yet to answer.

The Earth is located in what is known as the Solar System's "Goldilocks Zone" where it's not too hot and it's not too cold, it's just right for life to exist. Mercury and Venus are located too close to the Sun and are extremely hot whilst Mars and the outer planets are further away and thus are too cold for life to be present. As our planet is in this zone we have liquid water, a breathable atmosphere and a suitable amount of sunshine, but can the Sun itself affect our climate and ultimately our future? One controversial line of thinking is that the amount of sunspots can determine our weather and temperature.

The idea that sunspots affect Earth's climate is

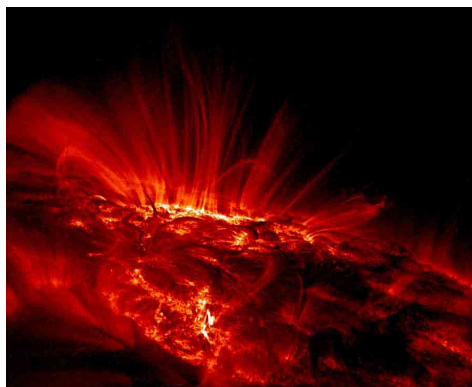


Image Credit: NASA/TRACE

**Sunspot close-up** Image taken by the TRACE spacecraft show a group of sunspots on the Sun's surface.

vigorously debated with some believing that an increase of sunspots on the surface of the Sun can reduce the amount of energy and light distributed to Earth. Most within the scientific community believe that climate change is purely down to human behaviour with emissions from man-made objects such as cars and industry the main cause. Although few dispute that we are contributing to a global warming effect on Earth, the fact remains that as far back as two hundred years ago, before cars and all our modern technology were invented, the theory of sunspots and climate was being debated. In 1801 the Brit-

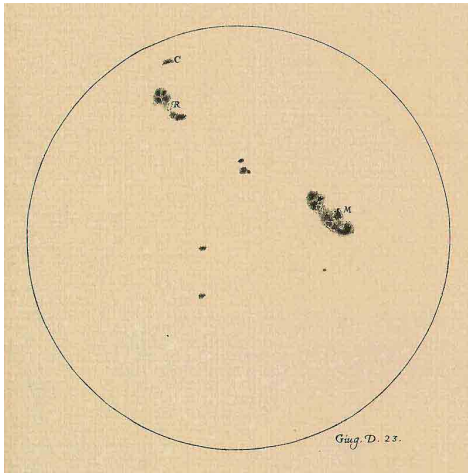


Image Credit: via wikimedia.org

### Sunspots then... One of Galileo's early sunspot sketches

ish astronomer William Herschel (1738 – 1822) published two papers that effectively launched the subject of solar influences effect on Earth's weather. He noted a relationship between the price of wheat and sunspots. He discovered that the more sunspots there were, the lower the price of wheat, fewer sunspots meant that the price rose, suggesting that more sunspots meant better harvests.

“The Earth is located in what is known as the “Goldilocks Zone” where it’s not too hot and it’s not too cold, it’s just right for life to exist”

So what exactly are sunspots? Sunspots are areas of the Sun's surface or photosphere which are cooler than its surroundings by approximately 1500° Celsius and thus appear darker. They have a distinct structure with a central dark area called the umbra whilst the surrounding lighter region is known as the penumbra. The magnetic field surrounding the umbra is about 2500 times stronger than Earth's. Sunspots tend to occur in pairs that have magnetic fields pointing in opposite directions and are quite large by human standards with an average size sunspot about the same size as the Earth. They also provide the longest-

running direct measurement of our star's activity. Records of naked-eye sunspot observations go back to at least 28 B.C. in China whilst the first known European sketches were made by Galileo Galilei (1564 – 1642) as he looked through his telescope in the early 17th century. To make the sketches Galileo actually looked directly up at the Sun through his telescope, something that we know today is very dangerous as the rays can damage our eyes. Although he was able to accurately map out the sunspots on the surface he did indeed in later life go blind!

Through research we have found that sunspots increase and decrease through an average cycle of 11 years. Dating back to 1749, we have experienced 23 full solar cycles where the number of sunspots have gone from a minimum, to a maximum and back to the next minimum. In 1848 Johann Rudolf Wolf (1816 – 1893) devised a method of counting sunspots on the solar disk called the Wolf number. This Wolf number is still used today to keep track of the solar cycle. Periods where sunspot figures remain quite low are known as minimums and they have coincided with much cooler temperatures worldwide. In fact several times over the last 500 years low sunspot numbers have coincided with much cooler global temperatures leading some to believe that this is not just a coincidence.

“Sunspots are areas of the Sun's surface or photosphere which are cooler than their surroundings”

During the Maunder Minimum between 1645 and 1715 very few sunspots were seen on the Sun's surface. It corresponded with a spell of prolonged cold weather often referred to as the “Little Ice Age”. Some solar scientists strongly suspect a link between the two events. Over the past few thousand years there is evidence of earlier Maunder-like cooling's in the Earth's climate using tree-ring measurements that show slow growth in trees due to prolonged cold. During sunspot maximums, solar radiation increases a small percentage. However, ultraviolet radiation increases significantly, and solar flare activity,

Image Credit: NASA



**...and now** The sunspot group know as 1045 on the Sun's surface.

which is generated in the regions between spots, increases greatly. Flares are extremely hot ejections of plasma.

We are currently in the minimum part of the cycle and according to ABC News reports China has experienced the coldest winter in 40 years, Florida the coldest in 30 years and Europe has suffered the coldest winter in 25 years. Note, though that regional cold weather does not necessarily contradict global warming. In 2009 we had a particularly quiet Sun, in fact February 2010 was the first month since 2007 that had sunspots every day. So far there have been only

two spot-free days in 2010. By comparison there were 260 spot-free days in 2009, and there have been 772 spot-free days since 2004. What this means is that one of the quietest periods of solar activity in recent history may be coming to an end! NASA has predicted that the next sunspot maximum (cycle 24) will occur in 2014, but that it will be considerably weaker than 23.

## “our planet wobbles on its axis”

We have to remember that there is no overwhelming evidence to suggest that sunspots are affecting Earth's climate. Many other factors enter the equation also. For example, our planet wobbles on its axis. Its average tilt is 23.5 °, but over a period of 18.6 years that varies from 22° to 24.5 °. That changes the amount of solar radiation that each hemisphere receives! Over the next number of years as we enter a maximum period again scientists will continue to collate data. If sunspots increase, and other factors such as prevalence of greenhouse gases, volcanic activity, and known cycles such as the Pacific Decadal Oscillation continue in their recent patterns and temperature increases, then we may conclude that sunspots do indeed affect Earth's climate. If not, then we can eliminate sunspots as a significant contributor to climate change!

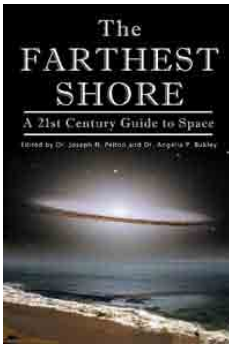
# The Farthest Shore

Reviewed by Colin Johnston, Science Communicator

This is something different. Briefly it's a very nice and eclectic collection of essays on space by numerous authors from all around the world. It appeared to be aimed at a diverse audience beyond the usual narrow band of space enthusiasts. Among the contents are chapters on satellite technology, spacecraft systems and other “nuts and bolts” topics. These are pretty

useful with a lot of important material collected together in one handy place and I imagine I'll refer back to these often. The details on spacecraft design I'm not so sure I'll need to reread the chapters on “Space policy, law and security” and the economics of space businesses but some of the intended readership will find these very valuable.

The chapter of firsthand accounts from astronauts, engineers and space entrepreneurs is



interesting and gives the book more of a human face. Unlike most books on space which tend to concentrate on the hardware and space environment, this book also features a chapter on how space travel has permeated popular culture and

arts world-wide. Some of the information on western science fiction is a little out of date but on the other hand there is information on SF in non-western cultures.

Summing up this is a handy reference book which will see a lot of use. (Thank you to Apogee for the review copy.)

Pelton, Joseph N and Buckley, Angelia P (eds), *The farthest shore: a 21st century guide to space*, Apogee, Burlington, Ontario, 2010

# Happy birthday Hubble!

by Colin Johnston, Science Communicator

That amazing instrument, the Hubble Space Telescope (HST), has just celebrated its twentieth anniversary since it was placed in orbit. Since then, (after a rocky start) it has revolutionised not only what we know about cosmology, star formation, exoplanets and so on, but also how we see the Universe. If you don't believe me, look at the pictures in a glossy astronomy book from the 1980s; the cosmos was fuzzier, duller and somehow less three dimensional back then!

To celebrate, the anniversary, NASA, ESA and the Space Telescope Science Institute have issued an especially striking image (opposite). It is a close-up of part of the Carina Nebula, a huge cloud of gas, mainly hydrogen, and dust some 7500 light years (2400 parsecs) from Earth. The Carina Nebula cannot be seen from Earth's northern hemisphere but is a naked eye object in the southern hemisphere. This is a false-colour image coded so that oxygen appears blue, nitrogen and hydrogen as green and sulphur as red. This helps astronomers understand the dynamic processes inside the nebula which is a star-forming region.

The image shows a spectral column of gas molecules and dust, three light years (less than a parsec) tall. This pillar is being sculpted into a phantasmagorical shape by the fierce starlight and winds of particles from its newborn stellar



companions and the super hot hatchling stars within. The Hubble team have named this image 'Mystic Mountain'. To me it is an image suggestive of boiling, turbulent motion. If we could observe the nebula as closely as this for millennia I imagine we would see it pulse and writhe like some huge cosmic living creature, eventually vaporising under the onslaught of starlight.

The HST is reaching the end of its planned life, being last serviced by astronauts in May 2009. All being well the HST will be superseded by the much larger James Webb Space Telescope in three years time. I wonder what marvels this gigantic observatory will reveal?

# Image of the Month

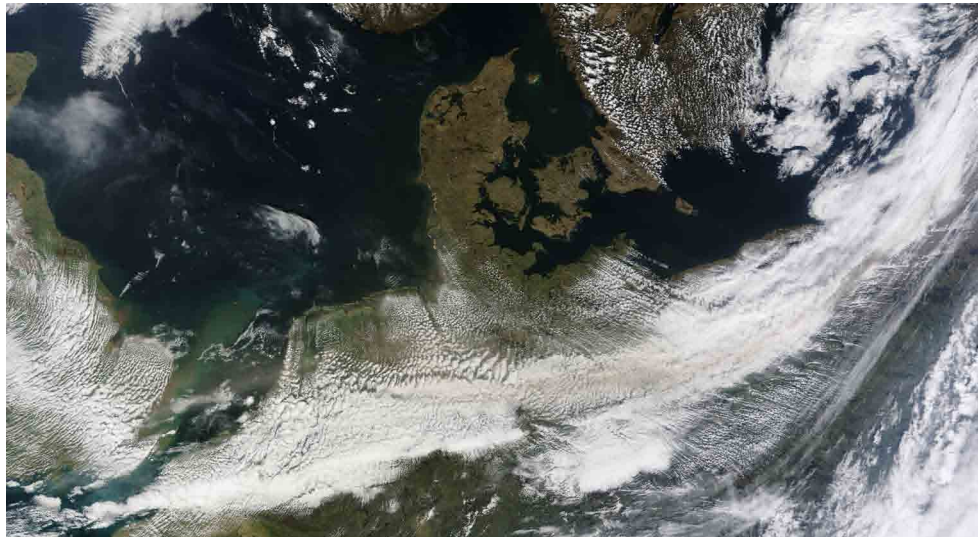


Image Credit: NASA (courtesy Jeff Schmaltz, MODIS Rapid Response Team at NASA GSFC)

The eruption of the Eyjafjallajökull volcano in Iceland has been one of the main stories in the news recently, with thousands of people's travel plans disrupted. This satellite image taken on 16 April shows the clouds of ash over England, Northern Europe reaching as far as Russia. The volcano located beneath a glacier, began erupting on 20 March after lying dormant for 187 years with plumes of ash billowing across the planet a few weeks later.

The last eruption from this volcano lasted 14 months. In the months before the eruptions at Eyjafjallajökull, small earthquakes could be felt, a sign that magma was building up. In the past the

eruptions at this volcano have triggered an eruption at the larger volcano Katla. Should it erupt, the global effects will be even more drastic, however earthquake activity at Katla has not yet been felt but it is being carefully monitored.

While thousands of airline passengers remain unable to reach destinations, and many homes in Iceland evacuated from risks of floods as I write these words, we are left wondering the outcome of this eruption over the coming weeks and months. It is a reminder of how indifferent a planet, never mind the cosmos, is to human affairs. (Caption by Martina Redpath, Education Support Officer)



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