Reflections

Journal of the Northern Sydney Astronomical Society Inc.

Volume 21 Number 1 January 2010

Due to the length of the President's message, this will be a very short editorial.
So just let me wish you and your families a Happy New Year and, without further ado, I'll leave you the thrill of discovering and perusing all the interesting articles we've come up for this issue. Enjoy!

Cheerio,

Jean-Luc Gaubicher

In this issue

President's Message

October saw our Annual General Meeting, and for those of you not checking your emails, a new Committee was elected/appointed. I've put my hand up for another year as President, Bob Roeth is now Vice-president, Anna Koeneman is Secretary, Gordon Ogborne is Treasurer, and Peter Korber, Ron Washington and Roy Jordan are also on the Committee. I won't list the other positions, just to say that we have a really great bunch running NSAS for this year and lots of people doing the different things that are needed to make the Society a success. However, your help will still be needed at times, so please be ready to help out when it's needed.

Membership has pretty much stabilised, with Ray Ashton and Rod Hungerford resigning at the time of the AGM and one new member, Lydia Bell, signing up recently. There are a number of members who have not renewed their membership at the time this is being written (before Christmas) so, if you intend to continue as a member of NSAS, can I please remind you that the privilege comes with the responsibility to be financial.

Society activity in the last 3 months has been pretty much limited to General Meetings, the Christmas Party, with a good turnout of over 30 members, Observing (when possible), the NAG, and the Theory Group.
Observing has continued with difficulty since the last Reflections, although we were able to have some reasonable observing on the 11th and 12th of December but, for various reasons, the turnout was very poor.
In 2010 the Committee intends to try and build the interest back up for Observing (although we can't change the weather), and one of the means will be through dark-sky observing events.
The New Astronomers Group continues well and have progressed into the somewhat esoteric subject of astrophotography. Anyone who wishes to join the NAG will be accommodated with remedial education on the earlier subjects missed.
The new Theory Group that commenced in October has been going along very well with good attendances. The Group is concentrating on the "Understanding the Universe" DVD lecture series by Prof. Alex Filippenko, with two half-hour lectures per meeting followed by discussion. For those of you wanting to join, so far the lectures missed will not have any serious effect on your ability to follow the future ones and we will try and come up with some way for you to catch up with missed lectures.

I urge those of you in the Society, particularly members who joined last year with the enthusiasm of the IYA09, to try and make time for at least the General Meeting speakers as well as either the NAG or Theory Group. What you get out of your NSAS membership is pretty much in proportion to the time you spend taking advantage of its offered services.

As discussed by the Committee and during the AGM, due to the "outreach fatigue" experienced during 2009 and also as a mean of concentrating on a few important events, 2010 will see a reduction in Society outreach.
NSAS and St. Ignatius are in early discussions about a public Star Party at St. Ignatius next winter and there may be a few school opportunities during the year.
Another project that is in the early stage of discussions is the possibility of NSAS volunteers working with St. Ignatius to get the Cook Telescope facility back in operation as an observatory.

While 2010 won't have the media focus on astronomy that the IYA09 brought to it, there are plenty of interesting things happening nearly every week. This year will likely bring the first discovery of a "mirror Earth" from the various planet finding projects around the world and the recently launched WISE satellite may find some brown dwarf stars that are a lot closer than Proxima Centauri, the currently closest star known .
NSAS will try and keep you up to date via the new website.

If you haven't checked it out yet, and for up-to-date astronomical news, just go to the Sydney Starwatchers blog linked to our website front page. It was developed and is maintained by Roy Jordan, a Society member.

Please make an effort to get to the meetings, whatever your interest, and let the Committee know what you would like us to do with the Society, within the limits of our resources.
For those of you who like to write, Reflections is a great opportunity to practise your skills, so just contact the Editor.

Best Regards,

Bob Fuller

Calendar

General Meetings: February 16th Guest Speaker: TBA
March 16th Guest Speaker: TBA

NAG Meetings: February 23rd
March 23rd

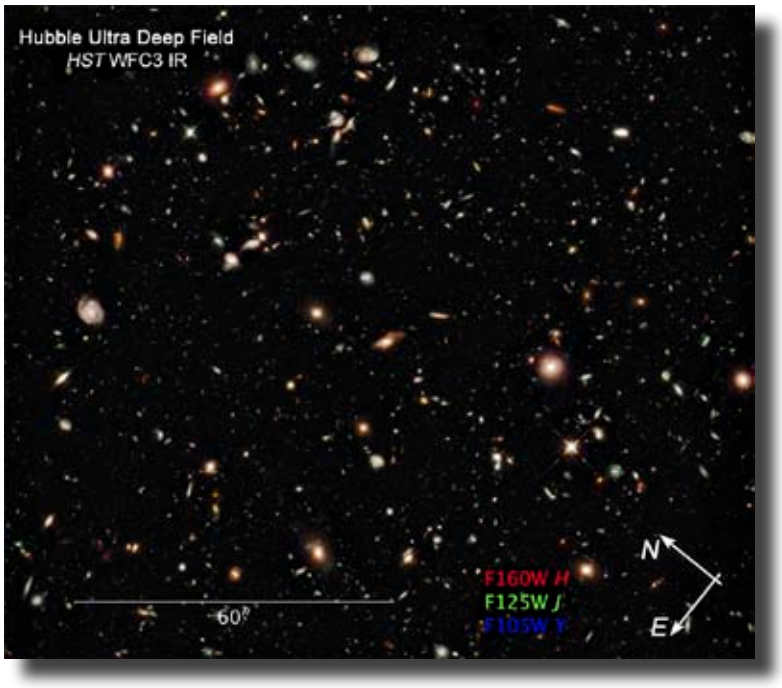
Theory Group Meetings: February 11th
March 11th

Observation Nights: February 12th / February 19th
March 12th / March 19th

Deadline: Please send your contributions to the April issue of Reflections in time to reach the editor **before March 15th**

Never-Before-Seen Galaxies

December 8, 2009
Hubble's deepest view of the Universe unveils never-before-seen galaxies.
NASA's Hubble Space Telescope has made the deepest image of the universe ever taken in near-infrared light.
The faintest and reddest objects in the image are galaxies that formed 600 million years after the Big Bang. No galaxies have been seen before at such early times.
The new deep view, taken in late August 2009, also provides insights into how galaxies grew in their formative years early in the universe's history.
The image was taken in the same region as the Hubble Ultra Deep Field (HUDF), which was taken in 2004 and is the deepest visible-light image of the universe. Hubble's newly installed Wide Field Camera 3 (WFC3) collects light from near-infrared wavelengths and therefore looks even deeper into the universe, because the light from very distant galaxies is stretched out by the expansion of the universe from the ultraviolet and visible regions of the spectrum into near-infrared wavelengths.



And for the technical-minded ones:

About the Object

Name: Hubble Ultra Deep Field Infrared WFC3/IR (HUDF WFC3/IR)
Description: Cosmological Survey
Position (J2000): R.A. 03h 32m 38s.5
Dec. -27° 47' 00".0
Constellation: Fornax
Dimensions: This image is roughly 2.4' wide.

About the Data

Instrument: WFC3/IR
Exposure Date(s): Aug 26, 2009 - Sep 6, 2009
Exposure Time: 48 hours
Filters: F105W (Y), F125W (J) & F160W (H)

About the Image

Colour: The image is a composite of separate exposures made by the WFC3 instrument on the Hubble Space Telescope. Three filters were used to sample broad wavelength ranges in the near infrared. The colour results from assigning different hues (colours) to each monochromatic image.
In this case, the assigned colours are:

F105W (Y)	blue
F125W (J)	green
F160W (H)	red

Image credit: NASA, ESA, G. Illingworth (UCO/Lick Observatory and the University of California, Santa Cruz), R. Bouwens (UCO/Lick Observatory and Leiden University), and the HUDF09 Team

Did you know?

The expansion rate of the universe is 74.2km per megaparsec.
This new value for the Hubble Constant has been determined by a team of American astronomers from observation of variables stars and supernovae done with the Hubble Space telescope.

Back to Basics: the inconstant Moon

Everybody notices the phases of the Moon, but to most people every full Moon is alike. Surely the full Moon high in the sky is always the same, right? Wrong.

One of the most spectacular phenomena in naked-eye astronomy escapes notice by the vast majority of people simply because the eye and brain can't compare the size and brightness of objects observed on separate occasions.
Let's have a look at this celestial phenomenon seen by everybody, yet observed by only a few individuals.

The Moon's orbit around the Earth is elliptical with a substantial eccentricity of 5.49%, which results in a substantial difference in distance and therefore in the apparent size of the Moon at perigee and apogee.

The image on the right shows how strikingly different the Moon appears at a full-Moon perigee and apogee. Most people don't notice the difference because they see the Moon in a sky that offers no reference by which angular extent may be judged. To observe the difference, you have to either make a scale to measure the Moon, or else photograph the Moon at perigee and apogee and compare the pictures, as done here.
A quick measurement of the diameters (vertical) of the original images gives 363 pixels for the Moon at perigee and 323 for the moon at apogee, yielding a ratio of 1.12384 that is pretty close to the 1.12807 ratio a calculation based on the actual distances gives.*

When the Moon is full near perigee, you'd expect it to be brighter than a full Moon near apogee and it is: lots brighter; let's figure out how much. Since the Moon shines by reflecting sunlight the following two factors determine the intensity of moonlight at the Earth:

1- The intensity of sunlight striking the Moon.

2. The distance the reflected light travels from the Moon to the Earth.

Since the 50,345 km difference between the minimum and maximum distance of the Moon is an insignificant fraction of the 149,597,870 km average distance from the Sun to the Earth and Moon, the intensity of sunlight at the Moon can be considered constant and ignored in this calculation.

The intensity of light varies as the inverse square of the distance between a light source and the observer, so taking the typical ratio between the perigee and apogee distances, the distance at apogee is 1.1363 times the perigee distance, and hence the Moon's intensity at perigee is the square of this quantity, 1.2912 times brighter—about 30%.

Like the variation in angular size, few people ever notice this substantial difference in the intensity of moonlight at perigee and apogee because there's no absolute reference against which to compare them. If you could flick a switch and move the Moon back and forth between apogee and perigee, the difference would be obvious, though not as evident as you might expect from a 30% change in illumination due to the logarithmic response of the human eye!

* By the way, this could be easily done to solve the age-old dispute: does the rising or setting Moon looks larger due to perspective playing tricks on the brain or is it a natural phenomenon due to some refraction effect in the atmosphere?

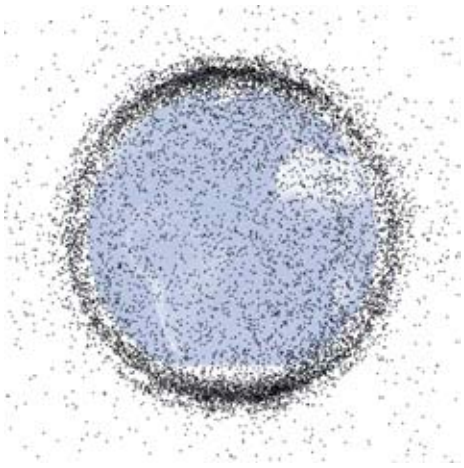
Jean-Luc Gaubicher
With thanks to John Walker
www.fourmilab.ch

Fiji 31/12/2009, the last sunset of the year.
Picture J-L Gaubicher

Collisions, collisions! Part 1

The Space Age has brought us an amazing array of new or improved devices not the least of which are in the area of communication. However, man's venturing into Space has added considerably to the possibilities of future collisions with the Earth's surface. We might well recite the aged adage: what goes up must come down. Luckily, the collisions attributable to the space age are more noticeable numerically than qualitatively.

Most people are aware of the term space junk. This name is used mostly for bits and pieces of various sizes that are associated



Space debris:
Low Earth orbit (above)
Hugh Eath orbit (right)
Image credit Nasa

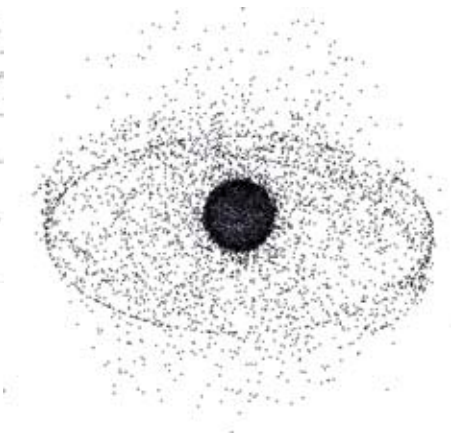
in some way with the lifting of spacecraft into Earth orbit and their later release from orbit. Dislodged heat shield tiles and tools dropped during space walks are well publicised but minor additions. Much of the space junk is still in orbit but every orbit is doomed to degrade. When a spacecraft of some kind is decommissioned, use can be made of its quite high velocity to lessen the effect of any collision with Earth's surface.

The craft can be put into an orbit where it is heated by the compression of the atmosphere on its leading parts. If you are old enough to have used a bicycle pump, you will know that air heats up when compressed.

The high velocity of a discarded object produces much air compression on the leading surface and hence much heat and the object can begin to burn up by oxidation and/or evaporation just as a meteor does. However, depending on the size and the velocity of the object, it may not burn up completely and, for deliberate discards, the orbit is chosen in the hope that any bits surviving the burn will land in safe drop zones, usually oceans.

As the Pacific Ocean allows more room for error than other oceans it is not surprising that it's the most favoured "drop-zone".

There are many deliberate additions to this incineration program from long-term manned missions like Mir, Sky Lab and the ISS. Shuttles have sufficient manoeuvring concerns and precious cargo without being loaded with rubbish and waste for their return trips. Miscellaneous rubbish from the International Space Station is occasionally released into space. This is sometimes packed into unwanted, unmanned cargo ships including the ATVs (Automated Transfer Vehicles). One such cargo ship was released from the ISS late in June 2009. If it burned up in the atmosphere in an area during night time, an observer there may have mistaken it for just another natural meteor burning up after arriving from outer space.



In mid-July 1979, pieces of Sky Lab, serenaded by a series of sonic booms, landed in and around the quiet West Australian fishing village of Esperance. Luckily, the pieces caused no human casualties.

The Laboratory had been operating successfully for six years before it was decommissioned.

Sky Lab
Image credit Nasa

The San Francisco Examiner offered $US10,000 for the first piece of Sky Lab space junk returned to them. A young man, 17 year old Stan Thornton, resident of the town, promptly delivered a scorched piece of metal, the size of a charcoal briquette, that hit his parents' storage shed and was paid the reward.

Readers may also remember the highly remunerative sale in USA of an automobile, a Malibu Chevy, the boot of which was struck by a natural meteorite.

The Town Council at Esperance, annoyed that they had no warning, sent NASA a $400 fine for littering the township. NASA ignored this but, eventually, a private US citizen, a radio host who visited Esperance for the unveiling in July 2009 of a memorial related to the event, paid the fine.

Of course, natural astronomical bodies have been arriving in the atmosphere or even on the Earth's surface, including the oceans, for untold millions of years. Such bodies are called meteoroids when in space, meteors while they are burning in our atmosphere and meteorites if they reach land or ocean. A discovered piece of a meteorite is called a find and if the meteor produces many bits with scattered landing site, the find is called a strewn field.

Henbury, Boxhole, Gosse's Bluff and Wolf Creek are amongst known Australian impact sites.

The diameters of recognisable meteorites, the ones that are not completely burned up, range down to grains smaller than fine beach sand (micrometeorites) but there is clear evidence that they range up to kilometre size as judged by the remains of their impact craters. An international project has been in operation for several years to locate and track any space bodies that might eventually threaten Earth. The hope is to locate and track at least 90% of those that might impact the Earth in future. An impressive list of these Near Earth Objects (NEOs) has already been produced.

Robert Mc Naught, the Aussie discoverer of the recent fancy-tailed comet-of-the-century and of the comet due to grace our skies in July 2010 is part of Australia's team working in this NEO Project. He is stationed at Siding Spring near Coonabarabran and has added a number of asteroids to the NEO list including one that passed closer than the Moon's distance

during 2009. It was discovered only two days before its near miss. Just as well it missed Earth, as two days is nowhere near enough time to present the intending visitor with the gift of a bomb or some deviation device. It is disturbing to know that the orbit of that body may have been altered by this close approach and that it might get even closer in a future lap around the Sun. Such gravitational changes to orbits are regularly used in the Space Age to alter the velocity of a spacecraft. The name Gravity Assist is used when any benefit in fuel is achieved.

Apophis - Image credit Nasa

Asteroids colliding with Earth have been blamed for the extinction of the dinosaurs and even for initiating ice ages. Similar effects would be possible in the future if enough dust is raised into the upper atmosphere to blot out the Sun. Eruptions of super volcanoes, like the one waiting beneath the Yellowstone area in USA, could certainly block out the Sun for considerable times measured in years.
Currently, scientists are testing a hypothesis that the collision with a huge comet or asteroid destroyed a racial group in North America and the megafauna they hunted for food. Some Sci-Fi novels and films have plots using asteroid collisions as the cause of destruction of major cities.

In 2007, the Planetary Society in USA promoted a global competition for the planning of a hypothetical space mission to send a spaceship to the vicinity of one NEOs, called Apophis, to monitor its path very accurately. The competition was in two parts, one for organisations and one for student groups with an academic supervisor.
An Australian team from Monash University won second prize in the student section. Their submission, called Oracle, included landing on Apophis a small craft equipped with accurate and automatic positional observing and communication devices.

With an estimated diameter of about 270metres, Apophis would certainly not burn up in our atmosphere.
Apophis takes approximately one earth year to complete its orbit but because its orbital plane is inclined at about 3° 20” to Earth’s plane, there is not a close approach every year,
The reason that Apophis sparked such interest is that, just after its discovery in June 2004, its first set of tentative orbital parameters predicted that there would be a very close miss at the asteroid’s close approach in April 2029. Subsequently, more accurate measurements indicated that Earth would probably be safe then. However, the measurements also showed that a near miss could be close enough to alter the orbit sufficiently to change the April 2036 visit into an actual collision. The calculated danger zone, called a keyhole, has an elliptical cross section, a bit like an ‘error ellipse’.
The Planetary Society wants the accuracy of the orbital information to be upgraded further to estimate much more accurately the likelihoodthatApophis will pass through the re-calculated keyhole. If it passes through the keyhole, we can expect a truly international partnership to be formed to plan an emergency mission to change the asteroid’s orbit. That would be a costly mission but the alternative could exceed the combined devastation by the explosion of Mt St Helens in the USA, the anihilation of the island of Krakatoa in Indonesia, the wide-reaching Tunguska Event in Siberia and the Hiroshima atomic bomb blast, not to mention the blotting out of the Sun for decades or longer.

June 2009 brought the 101st anniversary of the Tunguska Event in Siberia. Without any warning, a large astronomical body made a bright early morning, high velocity approach to land. However, no impact crater was found and no meteorite either. The un-heralded visitor is assumed to have been a comet probably largely composed of various ices but finds in the area suggest that certain metals were included. The ices may have exploded under the effect of heating by physical reaction with our atmosphere. The result was a fantastic blast which defoliated and felled an estimated 80 million trees in the forest over an area of 2500 square kilometres, knocked people off their feet and broke windows over a large area. The long, bright path of the object was seen in the pre-dawn sky as far away as England. Reports of hearing the explosions 500 km away were collected and, strangely, the witnesses said they heard 4 explosions. It has long been thought that some comets are close groups of separate similar pieces. If this was the case in the ‘Tunguska Event’, the explosion could easily have come as four separate blasts. Alternatively, the sounds may have included some sonic booms.

Bob Roeth

To be continued in our next issue

Site of the Tunguska event - Leonid Kulik 1927 expedition

James Cook's three voyages in the Pacific and the quest for an accurate means of determining longitude

The eighteenth century was significant for Cook's voyages of discovery and the mapping of same. Concurrently, there was activity in finding an accurate method of determining longitude. In respect to the latter, in the reign of Queen Anne, the British Parliament, in the Longitude Act of 1714, offered a prize of £20,000 for "practical and useful methods" to find longitude to an accuracy of half a degree.

A royal naval disaster on 22nd October 1707 was the forerunner of the Longitude Act.
Four warships out of a fleet of 21, under the command of Rear Admiral Sir Clowdisley Shovel, sank near the Scilly Isles close to Land's End on a foggy night.
About two thousand troops were drowned with the exception of two, the admiral and a lone sailor who had been keeping his own reckoning of the fleet's location during the whole cloudy passage. He was so concerned at such inaccuracies, that he notified his officers.
Such subversive navigation by an inferior was forbidden in the Royal Navy, as the unnamed seaman well knew. As soon as the admiral was advised of it, the man was hung for mutiny on the spot by some of the surviving officers from other ships. The exhausted admiral lay on the beach and a local woman, spying his valuable emerald ring, promptly murdered him and stole it. There had been previously hundreds of incidents involving errors in navigation by use of incorrect longitude coordinates resulting in the loss of many lives.

In order to calculate longitude by the use of clocks it is necessary to have one accurate clock showing Greenwich Mean Time and a second clock on "ship's time".
The difference in hours gives the longitude in that one hour is equivalent to 15° at the Equator, 1° equalling 60 nautical miles.

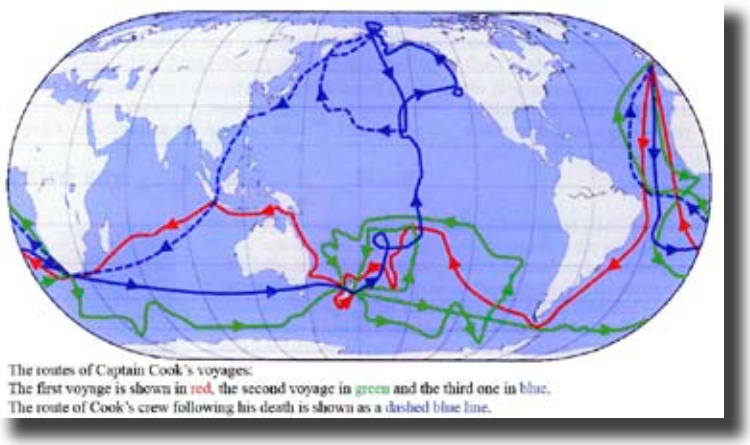
In 1736 the Royal Navy allowed the trial of a clock made by John Harrison (1693–1776) to confirm its "longitude capabilities".
HMS Centurion went on a voyage to Lisbon. On her return to London, John Harrison's clock indicated that the Centurion was sixty miles off course, as indeed she was. Unfortunately, although the trial was successful, when HMS Centurion sailed for the South Pacific under George Anson in 1740, the Harrison clock was not on board.
The Commodore did not believe in these new fangled things. Without the clock major errors in navigation were made and over half of the 500 crew was lost in the Cape Horn area.
Before the final adoption of the Harrison chronometer in 1773, the method of calculation of longitude was by use of lunar tables, based on measuring the motion of the Moon. The person supporting the use of lunar tables was Rev. Nevil Maskelyne, the Astronomer Royal, who had a vested interest as he was involved in the sale of such tables. This was the source of animosity between Harrison and Maskelyne until 1773 when Harrison was awarded the prize.

Kendall's K-1 chronometer
Image credit: National Maritime Museum (London)

Reverting to Cook's voyages of which there were three:
1- Lieutenant James Cook in command of Endeavour departed Plymouth on 26th August 1768 and arrived back in Dover on 13th July 1771.
Tahiti had been discovered by Commander Samuel Wallis on HMS Dolphin in 1767.
Precise astronomical calculations were made to determine its exact position using Dr. Maskelyne's method for longitude. The coordinates were 17°30'S and 150° W. It was there that Cook was sent to observe the transit of Venus on 3rd June 1769.
The king had also given him sealed orders to investigate the location of the "Great South Land". Subsequently, after circumnavigating and mapping New Zealand's north and south islands, he arrived at Point Hicks, now called Cape Everard in Victoria, on 20th April 1770. He then mapped the eastern coast of Australia and returned to England via Batavia (Jakarta) and South Africa.

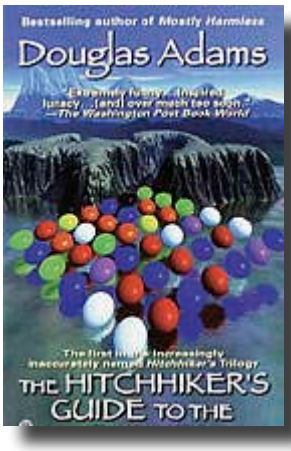
2- Cook was promoted to Captain after his first voyage achievements and was given command of H.M.S. Resolution. Accompanied by Tobias Furneaux in command of H.M.S. Adventure, they set out with the intention of finding Terra Australis. They departed Plymouth on 13th July 1772 and Cook arrived back at Spithead, near Portsmouth, on 30th July 1775 after what was an unsuccessful search. Furneaux was separated from Cook in an Antarctic fog and made his own way back to England. The Royal Navy having decided to disallow John Harrison's H-4 to be taken on any ship, H.M.S. Resolution carried a Larcum Kendall K-1 chronometer that was actually an exact copy of the H-4 watch. Three other inferior chronometers by John Arnold were given to Cook to test. The Kendall K-1 was the most accurate and was adopted with great enthusiasm by Cook. Its accumulated error of 19 minutes 31 seconds over almost a year was an excellent result.

Continued on page 8



The routes of Captain Cook's voyages.
The first voyage is shown in red, the second voyage in green and the third one in blue.
The route of Cook's crew following his death is shown as a dashed blue line.

Why did Adams used 42?



Consider "The Hitchhiker's Guide to the Galaxy". The question is often asked why did Adams use 42 as the meaning of it all?
I have seen many explanations but all seem somewhat contrived. I offer here a more plausible and possibly more probable explanation.
The answer could well lie in the BBC archives.
Here is an extract from the introduction by Paul Davies to the book *The Character of Physical Law* by Richard Feynman, originally published by the BBC in 1965:
"In the mid 1960's Feynman was invited to deliver a series of public lectures at Cornell University on the character of physical laws.
These lectures were recorded for BBC television and subsequently published by the BBC as a book. I acquired my copy as a young student in the late 1960's and found the lectures captivating".

The possibility is raised that Douglas Adams either acquired a copy of the book or maybe even saw the BBC series of lectures.
Herein could lie the answer why 42.
In the book (the later edition republished by Penguin in 1992) on page 31 you will see the following material:
"Question: What is the ratio of the gravitational force to the electrical force?
....
Between two electrons:
or 1/ 4,170,000,000,000,000,000,000,000,

$$\frac{\text{Gravitational Attraction}}{\text{Electrical repulsion}} = 1/(4.17 \times 10^{42})$$

000,000,000,000,000,000."
(Note that this is my direct copy of what is in the book)

The ratio of the gravitational attraction to the electrical repulsion is given by a number with 42 digits trailing off!
Now therein lies a very deep mystery. Where could such a tremendous number come?
If you ever had a theory from which both of these things are to come how could they come in such disproportion? What equation has a solution for two kinds of forces, an attraction and a repulsion, with that fantastic ratio?

People have looked for such a large ratio in other places in the hope that there is another large number somehow and, in fact, there is at least one such number: the diameter of the Universe to the diameter of a proton. Amazingly enough it is also a number with 42 digits.
And so an interesting proposal is that there is a hidden link between the ratio of the gravitational force to the electrical force and the ratio of the size of the Universe to the size of a proton!
But the Universe is expanding with time and that means the gravitational constant and the latter ratio are changing with time and, although that is a possibility, there is no evidence to indicate that it is a fact. Actually there are several indications that the gravitational constant has not changed in this way.
And the passage concludes:
"So this tremendous number remains a mystery"
The postulate is made that at some stage of his early life Adams either read the book or saw the series and then perhaps subconsciously of even consciously it inspired him to use 42 as the meaning of it all.

However, I have yet to find an answer to Feynman's original question of why such a disparate difference between the forces and would be interested to know if there is one somewhere out there who knows.
Or must I forever be satisfied with 42?

Ron Washington

Image credit: Martinultima/Wikipedia

Protect the right to darkness

Today's emphasis is on efficient energy usage and stricter controls applied to internal power and lighting use.
But is it not time for local councils to introduce controls on wasted outdoor light via their development approvals?

We have guidelines to protect the individual's right to sunlight but none to conserve our right to darkness. The intent is not to switch off lights but to give consideration to the use of smaller, more directional lights, without glare and spilled light.

We are faced with new evidence of a growing link between excessive exposure to light beyond the normal daily cycle and suspected reduced melatonin production in our bodies and its link with breast and other cancers.

Another concern is short wavelength blue light used in light sources such as compact fluorescent light bulbs and light emitting diodes (blue LEDs coated with phosphor). Short wavelength light is known to compromise human vision, increase sky glow and affect living organisms through disruption of their biological processes that rely upon natural cycles of daylight and darkness.

Given the Danish government has already acknowledged and met some 40 compensation claims in this area, is it not time we look to a reduction in wasteful outdoor lighting in the interest of public health and global warming?

Ken Petersen
Solis President

Glaring lights can actually reduce visibility.
Image credit: International Dark-Sky Association

James Cook's three voyages in the Pacific and the quest for an accurate means of determining longitude

Continued from page 3

On his return to England, Captain Cook was feted and accepted as a world-class seaman, scientist, cartographer, navigator and surveyor.

He should be recognised as one of the greatest explorers of all time because he displayed intelligence, perspicacity, dedication and aptitude to deal with the application of lunar tables as well as making good use of the new chronometer. His accurate maps are proof of this claim.

To this day, Captain Cook is also famous for the fanatical way he instilled into his crew the need to include sauerkraut, a major source of vitamin C, in their diet to avoid scurvy.

3- Cook retired from the Royal Navy after his second voyage but made himself available for any specific challenge.

With himself in command of H.M.S. Resolution and Captain Charles Clerke in command of H.M.S. Discovery, they embarked on a journey with the object of discovering the North West Passage. The expedition departed England with the K-1 on board on 12th July 1776 and returned to Stromness in The Orkney Islands, Scotland on 22nd August 1780 both captains having died during the journey.

Cook charted the majority of the North West coastline of Canada and U.S.A. and was subsequently murdered by the natives in Hawaii on 14th February 1779.

Captain Clerke took over command of H.M.S. Resolution but he died on 21st August 1779 and it is Lieutenant John Gore who took charge of the voyage back to Scotland.

It took the personal intervention of King George III (1738 – 1820) for John Harrison to receive his "Longitude Prize" in 1773, after 40 years of struggles against ignorance, academic backbiting and political intrigue.

From the lives of James Cook and John Harrison in the eighteenth century success was achieved by both, in the related fields of astronomy and navigation.

Arthur Boyd

Acknowledgements:
"Longitude" by D. Sobel and W. Andrews
"Captain Cook" by V. Collingridge
Wikipedia – Map of voyages

Photo Gallery

Our annual Christmas party was held on Tuesday December 15th. As usual this turned out to be a pretty popular event with approximately 30 members attending.

Bob Fuller introducing a captivated audience to astrophotography.

Reflections is published quarterly by the Northern Sydney Astronomical Society Inc
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