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www.stirlingastronomicalsociety.org.uk

Thanks to all contributors. Please think about pieces, articles and images for the next July issue. Items describing events or the activities of the Society, or of individual members or groups of members, are especially welcome. Advanced notification of future events and activities can be included, particularly as *The Mercury* can now be accessed on the web.

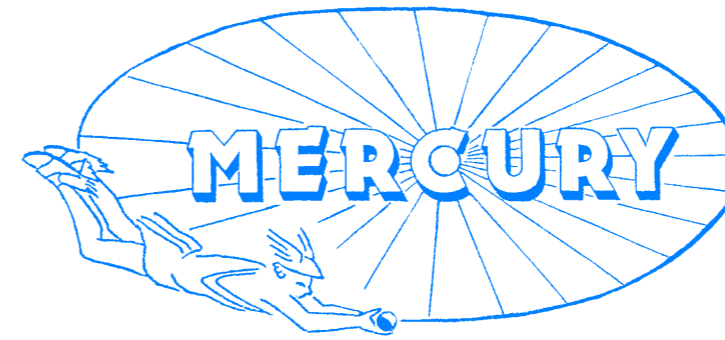
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(Please note that this has changed)

Copy can be in clear handwriting, typescript, images for scanning, e-mail attachments, or on floppy disk or CD. Contributions should normally not be more than about 750 to 1000 words in length. Please try to have material ready by the beginning of June for the July 2011 issue of *The Mercury*.

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EDITORIAL

Sadly, this issue of *The Mercury* begins with two obituaries. Dr Brian Marsden had associations with our Society through his involvement in the renaming of a minor planet in honour of Sir Robert Ball and Mark Butterworth provides an obituary on page 2. Dr Mike Culpin, who was an active member of our Society for many years, died in January aged 82 and Derek Allen provides an obituary on page 4.

On a happier note, Bert Mackenzie contributes his thoughts - and one superb photograph - on observing at 61 degrees north in December on page 5; while Sandi Cayless commences a short series on astronomy-ish quotes on page 6. Chris Davies provides write-ups of two Smith lectures, "Animals in Space" by Mark Butterworth on page 15 and "The Solar Dynamics Observatory" by Lyndsay Fletcher on page 17. The AAVSO Writer's Bureau has been an excellent help in providing us with guest lectures and, as a kind of tribute, this issue's guest lecture on page 19 is called "Happy 100th birthday AAVSO" and is by Kurtis Williams. Following my own first attempt at lunar webcam photography on page 20, Sandi Cayless provides a book review for "Starlight Nights: The Adventures of a Star-Gazer" by Leslie C. Peltier on page 21. The usual features "Forthcoming Meetings" (page 22) and "The Night Sky" (page 23), again courtesy of Martin Palmer-Smith and his Astronomical Calendar website, complete this issue.

I should not have to re-state it but we are still looking for an editor for *The Mercury* to take us into 2012. After twenty-six volumes it would be a pity to see this publication close and that, I am afraid, is what is likely to happen unless a volunteer can be found in the next few months. Go for it! I am sure that you will find it just as rewarding as I have.

Alex Houston

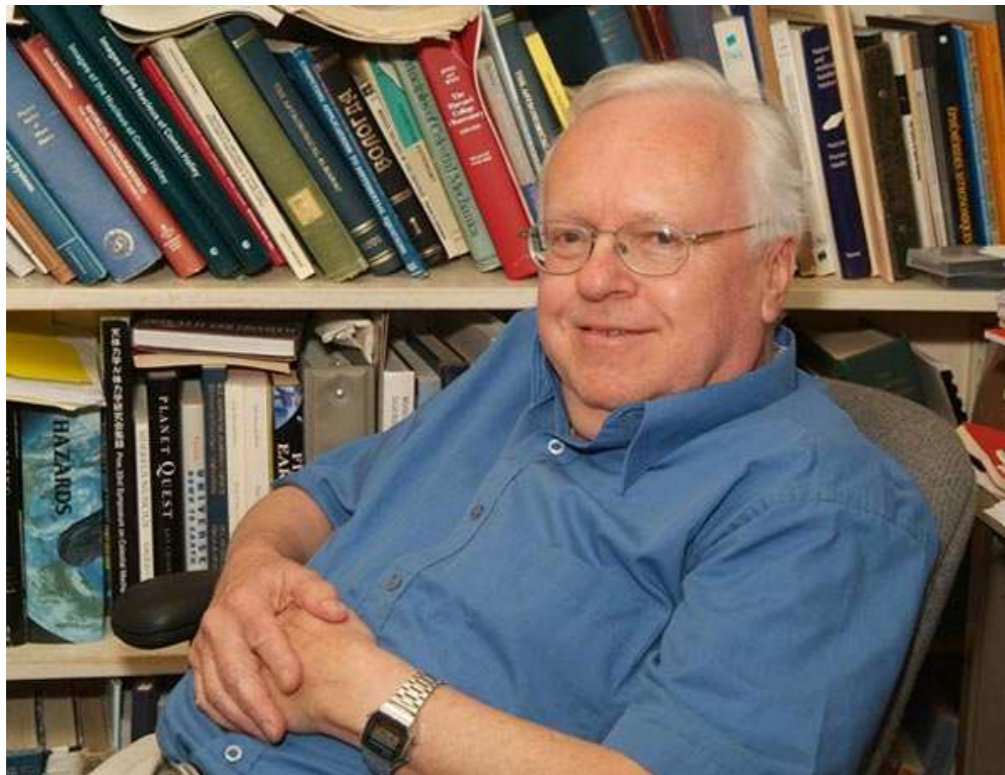
BRIAN MARSDEN

Back in late 2003 I gave a lecture to the Stirling Astronomical Society about Sir Robert Ball:

At the end of the lecture, John Moffat asked why Ball had never been celebrated by naming a crater on the moon or asteroid after him. Taking John's lead I contacted the International Astronomical Union and they put me in touch with Brian Marsden, director of the Minor Planet Centre (MPC) at the Harvard-Smithsonian Centre for Astrophysics. Dr Marsden was responsible for the management of names assigned to asteroids and minor planets. After a few months of emails flying back and forward Brian Marsden wrote to me in August 2004 to advise that the proposal had been accepted by the IAU and that Minor Planet 4809 had been renamed Robertball to honour the Irish astronomer. The citation reads:

“Mathematician and astronomer Robert Stawell Ball (1840-1913) was one of the most successful scientific popularisers of his time. For a while tutor to the children of the fourth Earl of Rosse and observer at Birr Castle, he moved to Dublin in 1867 and was Royal Astronomer of Ireland until becoming Lowndean professor at Cambridge in 1893.”

Sadly, Dr Brian Marsden passed away on the 18th of November, 2010. Through his brief involvement with the Stirling Astronomical Society and his significant contribution to astronomy, I thought he was worthy of an obituary.



THE NIGHT SKY

- Apr 3 *New Moon (14:32)*
- Apr 3 *Saturn at opposition*
- Apr 6 *Jupiter at conjunction*
- Apr 9 *Mercury at inferior conjunction*
- Apr 9 *Pluto stationary (morning object)*
- Apr 11 *First quarter Moon (12:05)*
- Apr 18 *Full Moon (02:44)*
- Apr 18 *International Space Station visible in the evening until 4th May, for details use Heavens Above*
- Apr 19 *Morning conjunction of Mars and Mercury (0.8°)*
- Apr 19 *Algol at minimum (20:31)*
- Apr 21 *Lyrid meteor shower maximum (20/hr)*
- Apr 25 *Last quarter Moon (02:47)*
- May 1 *Morning conjunction of Jupiter and Mars (0.4°)*
- May 3 *New Moon (06:51)*
- May 5 + *Eta Aquarid meteor shower maximum (10/hr)*
- May 7 *Mercury (morning object) at greatest elongation, 27° W.*
- May 10 *First quarter Moon (20:33)*
- May 11 *Conjunction of Jupiter and Venus (0.7°), low down before sunrise.*
- May 11 *Conjunction of Jupiter and Mercury (2°), low down before sunrise.*
- May 17 *Full Moon (11:09)*
- May 23 *Morning conjunction of Mars and Venus (1.0°)*
- May 24 *Last quarter Moon (18:52)*
- May 29 *International Space Station visible in the morning until 23rd Jun, for details use Heavens Above*
- Jun 1 *Partial solar eclipse, visible from East Asia, Northern N. America and Iceland*
- Jun 1 *New Moon (21:03)*
- Jun 3 *Neptune stationary (morning object)*
- Jun 9 *First quarter Moon (02:11)*
- Jun 11 *International Space Station visible in the evening until 28th, for details use Heavens Above*
- Jun 12 *Mercury at superior conjunction.*
- Jun 14 *Saturn stationary (evening object)*
- Jun 15 *Total lunar eclipse, visible in South America, Europe, Africa, Asia, and Australia.*
- Jun 15 *Full Moon (20:13)*
- Jun 21 *Northern summer solstice (17:16) and shortest night*
- Jun 23 *Last quarter Moon (11:48)*
- Jun 28 *Pluto at opposition*

Courtesy of Martin Palmer-Smith and his website “Astronomical Calendar” at: <http://astronomical-calendar.org.uk> . Times are UT.

with downward pointing cusps... At mid-eclipse I turned away and looked about. Everything I saw, the nearby fields, the distant vistas, all seemed wrapped in some unearthly early twilight. The sky seemed darker - shadows faint and indistinct. A cool wind, almost chilly, had sprung up from the west. The grass beneath the nearby maple now was appliquéd with scores of crescent suns, projected there from each small aperture between the leaves above... I watched, fascinated, as the moon, now in full retreat, slowly relinquished all the solar spoils which it had won. From behind the low serrations of the profiled mountains of the moon, one by one the sunspots now emerged from occultation... Like a moving finger of darkness the cone-shaped shadow of the moon had dipped down, scrawled its brief two-minute mark of night across the land and then moved on, still writing, but now with invisible ink upon the empty page of space."

This solar eclipse was, however, eclipsed itself the same evening, as the young Leslie forgot eclipses and variables as he looked up and saw 'a bright and blazing star' squarely in the centre of the Milky Way – Nova Aquila, his first nova – he was later to discover six novae of his own. A new edition of *Starlight Nights: The Adventures of a Star-Gazer* (Sky Publishing, 2007, ISBN 0933346948, 256 pages, with an introduction by David H. Levy) was issued on the 100th anniversary of Leslie Peltier's birth. David Levy explains in his foreword to this edition why it was reissued: many books will tell you how to observe the night sky; this book explains why. Amateur astronomers will relish and treasure *Starlight Nights*. Professional astronomers will recall the reasons why astronomy captured their imaginations in the first place.

Sandi Cayless

FORTHCOMING MEETINGS

Meetings at the Smith (7.30pm—9.30pm) - open to all

8th April 2011

Speaker - Dr Derek Banks, Stirling Astronomical Society

Title - "Classification of Images in Astronomy and Science"

13th May 2011

Speaker - Dr. James Biggs, Dept of Mechanical Engineering, Strathclyde University

Title - "Solar Sailing"

Meetings at the Mayfield (7.30pm—9.30pm) - members only

29th April 2011; 27th May 2011

Born in 1937 in Cambridge, his father Thomas was a maths teacher at the local high school. In 1942 his interest in astronomy began when he came home from primary school and found his mother in the backyard watching an eclipse of the sun through a candle-smoked glass. What most impressed him and shaped his future direction was that the eclipse had been predicted.

At the age of 11, Marsden went to the Perse School, Cambridge, and began making calculations of the orbits of the planets and their moons, using seven-place logarithm tables. He always maintained that making such computations by primitive means significantly increased his understanding of the underlying science. At the age of 16, he joined and began regularly attending the monthly London meetings of the British Astronomical Association.

He soon became involved with the Association's Computing Section, which specialised in making astronomical predictions for amateur observers to use as opposed to the information published in almanacs aimed at professional astronomers. While an undergraduate at New College, University of Oxford, Marsden convinced the BAA to lend him a mechanical calculating machine, which significantly increased his productivity. By the time he received his undergraduate degree he had already developed somewhat of an international reputation for the computation of comets' orbits, especially new discoveries. He particularly enjoyed computing orbits from minimal observational data.

Graduating from Oxford in 1959 with a mathematics degree he went on to Yale and was awarded his PhD on "The Motions of the Galilean Satellites of Jupiter" in 1965. From there he went on to the Smithsonian Astrophysical Observatory, Cambridge, Massachusetts, and in 1968 became head of the Central Bureau for Astronomical Telegrams, with responsibility for circulating information about the discoveries of comets, novae, supernovae and other objects of astronomical interest. He took up the post of director of the Minor Planet Centre in 1978, and became the longest-serving Associate Director of the Harvard-Smithsonian Centre for Astrophysics, from 1987 to 2003.

He played a major role in the "demotion" of Pluto from full-planet to dwarf-planet status. He was interested in the discovery of what he called trans-Neptune objects, although colleagues referred to them as objects in the Kuiper Belt, the region extending from the orbit of Neptune to edge of the solar system. When what seemed the first of these trans-Neptune objects was discovered in 1992, Marsden argued that they were not the first, because Pluto, discovered in 1930 and somewhat larger, had to be the first. He also suggested that three further trans-Neptune objects discovered in 1993 were exactly like Pluto, in the sense that for every two of their solar orbits Neptune orbits the sun three times. So he became a firm advocate of "demoting" Pluto. With the discovery of Eris, another object comparable to Pluto, in 2005, the 2006 International Astronomi-

cal Union (IAU) created a new category of "dwarf planets". This now includes both Pluto and Eris, together with two further trans-Neptune objects known as Makemake and Haumea, as well as the largest asteroid, Ceres. Pluto was designated minor planet 134340, though this decision remains the subject of great debate.

It was also at the IAU meeting in Prague that he stood down as the Minor Planet Centre director after 28 years; he was amused by the thought that both he and Pluto had been retired on the same day.

He was particularly proud of his prediction of the return of Comet Swift-Tuttle, the comet associated with the Perseid meteor shower in August. Swift-Tuttle was discovered in 1862, and predicted to return around 1981. Marsden had a strong suspicion that the 1862 comet was identical with one seen in 1737, and detailed calculations led him to predict that Swift-Tuttle would not return until late 1992. He was proved to be correct; Swift-Tuttle has the longest orbital period of all the comets whose returns have been successfully predicted.

He also once famously, and incorrectly, warned of an asteroid collision with Earth. It caused a public stir and gave him a degree of notoriety. He explained that he did this as a "last-ditch" effort to encourage further observations, including searches for data from previous years to refine calculations of the object's orbit. Observations from 1990 emerged soon after, and new calculations demonstrated that the object was highly unlikely to collide with Earth in the foreseeable future.

Critics suspected that Marsden had made the announcement in an effort to secure more funding for the search for interplanetary objects that could potentially strike Earth and this is now a routine process with a much higher public profile than ever before. The tracking of near earth objects has become his lasting legacy.

Mark Butterworth

DR MICHAEL CULPIN

Many Members will remember Mike Culpin who died in January aged 82 years. He was a long standing Member of the Society right from its early days, and he regretted the fact that his failing eyesight and declining health had prevented him from participating in Society activities in recent years.

Mike was a physicist who moved to Stirling University from industry in the 1970s. He had a wide and expert knowledge of astronomy and he contributed much in various ways to the Society over the years. He possessed an astute and

BOOK REVIEW:

***Starlight Nights: The Adventures of a Star-Gazer*, by Leslie C. Peltier, Mac-Millan 1967 (First published in the United States in 1965); illustrations by the author.**

This is a book about the love that one man, born on January 2, 1900, has for Astronomy and why it captured his attention. It is a short, eminently readable, appealingly illustrated and almost faultless piece of writing, in places closer to poetry than prose in its beauty and sensitivity, by an author who has been described as the world's greatest amateur astronomer. *Starlight Nights* is the story of a young man, who began with a two inch telescope and the dark night skies of the family farm in rural Ohio early in the 20th century, and the growth of his passion for meticulously observing and understanding the universe about him (including under his feet). The book charts his first introduction to the stars as his mother pointed out the Pleiades to the five-year old through the kitchen window (the reason for the visit to the kitchen in the dark is charmingly told); two years later, his father pointed out a lantern in the sky – Jupiter. He had known the Big Dipper for years, as an indicator of the weather in his region of Ohio. Leslie Peltier describes his sight of Comet 1910a in the company of his entire family, which stayed mentally vivid to him all his life, but this was a mere harbinger of the May morning later that year that brought Halley's Comet so close that Earth passed through its tail. Leslie was to discover twelve comets over his lifetime, ten of which are named for him. His introduction to variable stars was life changing – this 'addiction' (he was a lifelong member of the American Association of Variable Star Observers and never once missed sending in his monthly report) led through the course of his life to more than 130,000 variable star observations. His first eclipse of the sun was observed at his small country school courtesy of the far-seeing and progressive teacher using small pieces of glass carbon-coated above the flame of one of the school oil lamps as filters. His descriptions of life, astronomical events, his telescopes and observatories fill a book that has the power to transport the reader to the dark night skies of his world and the wonders they hold. His sensitive, almost poetic attention to detail can be seen in this account of his second solar eclipse (pp93-4 of the above edition):

“...a moment later, I was staring spellbound as the moon, right on time, took its first little nibble from the red-hot cookie of the sun. Slowly, inexorably, the moon moved eastward as it ate its way into the sun with the nicked and broken teeth of its mountained leading edge. Sunspot after sunspot was swallowed by the black invader until at mid-eclipse they all had disappeared, leaving nothing but a crimson-colored crescent sun

You do not need to have a degree in astrophysics to participate in the AAVSO. You don't even need to have thousands of dollars worth of equipment. You just need an interest in astronomy, a willingness to learn how to make astronomical measurements, and dedication to looking up at the sky. Why not stop by the AAVSO website, read about their centennial celebration and their history, and see if any of their ongoing projects tickles your fancy. There's no reason you can't discover a supernova or a planet yourself!

Kurtis Williams

Kurtis Williams's blog *Professor Astronomy* is at <http://blog.professorastronomy.com/>

This content distributed by the AAVSO Writer's Bureau.

N.B. The AAVSO website is at <http://www.aavso.org/>

WEBCAM MOON PHOTOGRAPH



Photo by Alex Houston (taken on 18.03.2011: the day before Super Moon)

analytical brain with an independent approach to problems, and his contributions to discussions on astronomical matters were always stimulating and often thought provoking.

Despite his recent physical disabilities his mind remained as keen as ever. He kept in touch with the Society through his copy of the Mercury Newsletter, lately with help. In fact he discussed a point which interested him with me when I visited him at home only three weeks before he died.

Rest in peace, Mike, you are sadly missed.

Derek Allen

OBSERVING AT 61 DEGREES NORTH - IN DECEMBER.



A sequel to my Autumn article. Our scattered family (daughter and partner from Calgary; son from Oslo) met up near Geilo, Norway, for Christmas. Our 'hutte' situated at 1000m in a Southern Highlands ski resort was looking just like Bo'nness with lots of snow but there were no city lights to spoil the view of the night sky - just a glimmer from the other hut windows. Although we arrived in a blizzard, we were blessed with three cloudless days and nights but

the temperature stayed constant at minus 25 Centigrade! Naturally, the only astronomer ventured out to view the heavens and reported sparkling skies, with Jupiter, Orion and the Moon prominent. "Can you see the Milky Way?" was answered with the excuse that the Moon's light was interfering. Nevertheless, everyone donned several layers of outdoor gear and moved outside for 10 minutes or so. Having established that the Moon would set an hour earlier each night, they resolved to repeat the excursion the next night - Christmas Day.

In fact, to my surprise, on the following two nights - between courses of substantial meals and glasses of wine, they all left the comfort of 30 - 35 degrees around a log fire several times to look at the sky. On the last night four cameras were used to capture the moment with variable success. Trial and error, on small tripods or snow covered rocks, cold batteries and frozen fingers eventually produced some satisfactory images. My son's effort, using a nearby chalet for scale, gives some idea of the wonder of this Universe that we seldom see properly.

Bert Mackenzie

ASTRONOMY-ISH QUOTES (PART 1: A—J)

Adams, Douglas (1952-2001)

There is a theory which states that if ever anybody discovers exactly what the Universe is for and why it is here, it will instantly disappear and be replaced by something even more bizarre and inexplicable. There is another theory which states that this has already happened.

In the beginning the Universe was created. This has made a lot of people very angry and been widely regarded as a bad move.

Space is big. You just won't believe how vastly, hugely, mind-bogglingly big it is. I mean, you may think it's a long way down the road to the drug store, but that's just peanuts to space.

I don't believe it. Prove it to me and I still won't believe it.

Aligheri, Dante (1265-1321)

If thou follow thy star, thou canst not fail of a glorious heaven.

GUEST ARTICLE: HAPPY 100TH BIRTHDAY AAVSO

Welcome back to a new year (and technically a new decade, though I celebrated that a year early)! All of us on this celestial ball have just started a new revolution about the Sun (technically the centre of mass of the Solar System, which is close to the Sun, but that's not important for most people), so we tend to look forward to a new year full of possibilities and discoveries yet unwritten (or half-written, in my case, but that's another column).

I've blogged many times about the important contributions that non-career astronomers have made and continue to make to the science of astronomy. Just earlier this week a 10-year old Canadian student, Kathryn Gray, became the youngest known person to help discover a supernova (exploding star).

One of the largest organizations of citizen astronomers is the American Association of Variable Star Observers, or AAVSO. The AAVSO was organized in 1911, which makes this year their (*let's see, subtract 1911 from 2011, borrow 1 from the thousands column...*) centennial! 100 years! That's no small accomplishment, and the organization is only continuing to grow in membership and impact.

Members of the AAVSO participate in science by monitoring the brightnesses of stars. Many stars change their brightness, hence the term "variable". The reasons for these variations are many. Some stars are really close pairs of stars that periodically eclipse each other. Some stars grow and shrink in radius due to an unstable structure. Some stars are pulling material off their companions. And some stars have planets that occasionally block a tiny amount of light of their parent star.

The most important tool needed to study variable stars is time. While many variable stars change their brightnesses in predictable fashion, many others are unpredictable. And professional telescopes have too many varied research projects to sit and stare at a star that may do nothing for months, years, or even decades before it does something interesting. The total membership of the AAVSO does have the time and telescope power to watch these stars and notify the big telescopes when something unexpected happens.

But the AAVSO does much, much more than simply act as night watchmen for professional astronomers. Their measurements of star brightness are often just as accurate, and in some cases better, than those obtained by professional astronomers. AAVSO members and their data regularly appear in scientific papers. They are discovering hitherto unknown planets around other stars. They are discovering changes in variable stars that professionals would never have noticed. This is all cutting edge science.

With the Sun being filmed at several critical wavelengths simultaneously, composite colour videos can be created revealing the Sun in astonishing and beautiful detail, with structures and events appearing that have never been seen before. We were all goggle-eyed at the solar videos Lyndsay played for us. Then she announced, and actually demonstrated in the lecture theatre, that these videos are available on the internet. You can almost get a live feed from space of our Sun, thanks to the enlightened generosity of ESA and NASA who have spent about a billion dollars to build, and then launch this amazing eye into space. They reason that by making the data available to the whole World, the greater will be the chance of findings beneficial to the human race.

In question time, Lyndsay was pressed on the subject of climate change and the Sun, since the whole of Earth's ocean-atmosphere-climate system is driven by the vast but steady hydrogen fusion reaction going on in our star. Importantly, Lyndsay was able to reassure us that the Sun varied in energy output by only a fraction of a percent over long periods of time. However, the Maunder minimum of sunspot activity coincided with a climatic cooling of several percent. Therefore it seems likely that variations in specific Solar emissions may have unexpectedly powerful effects on the Earth. The likely candidates are the protons, electrons and ions of the solar wind, but it has also been found the output of the far ultra-violet varies significantly during solar cycles and may be affecting climate by some yet to be understood mechanism. Even so the relentlessly rising global temperature does not correlate well with ultra-violet or any other of the Sun's observed activities. One aim of the SDO project is to clarify the situation.

(Personally, I cannot see how releasing increasingly huge quantities of heat-absorbing carbon dioxide into the atmosphere can possibly help global warming problem, no matter what other influences there might be. We have seen the atmospheric concentration of carbon dioxide rise with increasing rapidity to fifty percent over its "natural" concentration since the Industrial Revolution.)

The SDO has been up since last year and has settled in well. It is a very sophisticated instrument which includes the "EVE" spectrometer for observing the absorption and emission lines of solar phenomena as they occur. The SDO is going to improve our understanding of many solar phenomena including the chromosphere high temperature anomaly, solar magnetic fields, sun-spots, faculae, and even solar seismology. From all this may come the ability to predict potentially damaging coronal mass ejections and give the World time to protect its vulnerable communications and power grids.

Chris Davis

Heaven wheels above you, displaying to you her eternal glories, and still your eyes are on the ground.

Asimov, Isaac (1920-1992)

The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' (I found it!) but: 'That's funny...'

Humanity has the stars in its future, and that future is too important to be lost under the burden of juvenile folly and ignorant superstition.

Barnard, Edward E. (1857-1923)

I have been watching and drawing the surface of Mars. It is wonderfully full of detail. There is certainly no question about there being mountains and large greatly elevated plateaus.

Barrow, John D. (1952-)

We are just strings of quarks living in a suburb of the local density maximum of the universe.

The universe is full of magical things patiently waiting for our wits to grow sharper.

There was no "before" the beginning of our universe, because once upon a time there was no time.

Bohr, Niels (1885-1962)

A physicist is just an atom's way of looking at itself.

Einstein, stop telling God what to do!

Bradbury, Ray (1920-)

We are the miracle of force and matter making itself over into imagination and will. Incredible. The Life Force experimenting with forms. You for one. Me for another. The Universe has shouted itself alive. We are one of the shouts.

Brahe, Tycho (1546-1601)

Now it is quite clear to me that there are no solid spheres in the heavens, and those that have been devised by the authors to save the appearances, exist only in the imagination.

Bruno, Giordano (1548-1600)

Innumerable suns exist; innumerable earths revolve around these suns.... Living beings inhabit these worlds.

The physical world of things is embedded in the infinite, embedded in a space filled with all the other possible worlds...

An atom, beyond which we cannot in fact go, although to thought it may be still further divisible; so there is in every figure, in every kind of thing, a definite number of atoms.

This entire globe, this star, not being subject to death - dissolution and annihilation being impossible anywhere in Nature - from time to time renews itself by changing and altering all its parts. There is no absolute up or down, as Aristotle taught; no absolute position in space; but the position of a body is relative to that of other bodies. Everywhere there is incessant relative change in position throughout the universe, and the observer is always at the centre of things.

Burroughs: William S. (1914-1997)

After one look at this planet any visitor from outer space would say 'I want to see the manager.'

Man is an artefact designed for space travel. He is not designed to remain in his present biologic state any more than a tadpole is designed to remain a tadpole.

Language is a virus from outer space.

Byron, Lord (1788-1824)

Ye stars! Which are the poetry of heaven!

Churchill, Winston (1874-1965)

Do not let spacious plans for a new world divert your energies from saving

then the fish would turn itself the same way up as the viewer and lock onto their movements outside the tank.

As far as people are concerned thinning is also a problem, apparently bone thinning and muscle wastage start the day people arrive in the ISS. No amount of animal experiments has revealed solutions for these problems. Exercise helps but nothing substitutes for the pull of the one G gravitational field back on dear old Earth.

So far, over 530 people have been into space and none of that would have been possible without the early use of animals. History really belongs to Laika, the mongrel dog from the streets of Moscow. During her flight the UK popular press called her "Laika – the Mutt-nick". Laika is the Russian for barker. The US popular press called her "Laika – the dog whose bark was heard around the world".

Chris Davis

THE SOLAR DYNAMICS OBSERVATORY

Smith lecture, 14th January 2011

Dr. Lyndsay Fletcher.

Dept of Physics and Astronomy, University of Glasgow.

Lyndsay stated the Sun is the engine that drives our planet's environment and all its life. She engagingly described SDO, the latest technology launched to watch over our own star.

SDO is a great advance on the two previously launched Solar observers, Tracker and Soho. Like Soho, SDO is lodged at the Lagrangian point of zero gravity between the Sun and the Earth where it has an unobstructed view of the Sun at all times. It has four very high resolution cameras (about 4000x4000) watching the whole disc of the Sun in detail far exceeding that seen by Soho. They are all snapping and transmitting pictures every ten seconds, generating a video data stream from SDO to Earth equivalent to ten High Definition TV channels. One and a half terabytes of data arrive on Earth every day from SDO. Lyndsay showed us some of it as time-lapse films: because of the extremely high resolution it was possible to zoom in on parts of the Sun with no apparent loss of definition, and this revealed a spectacular three dimensional, active star-scape of prominences, erupting Sun spots and roiling ropes of glowing plasma extending many Earth-diameters above the Sun's photosphere. The cameras are able to pick out these relatively tenuous structures against the fierce glare of the photosphere by using carefully selected narrow bandwidth filters.

than attempt to recover her. Actually they were probably not capable of performing a live recovery from orbit at that time. Nevertheless, politically for Khrushchev, the Laika flight was a huge success; beating the Americans to putting the first living creature into orbit round the Earth.

In 1958, the Russians launched a pair of dogs together into space and brought them back alive, without putting them into orbit but demonstrating they could at least now launch and recover live animals.

Meanwhile the Americans were suffering a barrage of setbacks in their schedule of animal trials on their way to getting a man into space. They tried using mice but the experiments failed. On one flight it was found the mice had chewed through vital wires. On another they chewed holes in their containers and mouse urine ran out the holes into the electronics. But with national pride at stake the Americans kept at it and eventually got Ham the chimpanzee into space *and* recovered him alive. This was no thanks to the launch vehicle which consumed its fuel too fast subjecting Ham to greater G forces than planned, and lobbing him into the Atlantic a two hour helicopter round trip away from the Naval capsule-recovery vessel. The ship's medics announced he was well, if a bit dehydrated, and extremely irritated. Happily he was none the worse for his adventures and after only one flight he was retired and lived as a national celebrity to the grand old age of twenty seven. The Americans were now convinced that space travel was safe for humans.

In April 1961, the Russians launched Yuri Gagarin into space and he made several orbits before successfully landing in Kazakhstan. This was followed by the American's making their first manned sub-orbital flight with Alan Shepard in May 1961 and then John Glenn orbiting the earth in February 1962.

Having beaten the Americans with a man into space the Russians throttled back their efforts to man in orbit experiments, while appearing to aim to get to the Moon first. America took the bait and spent billions continuing the development of the manned spaceflight with President Kennedy's ambition to put a man on the Moon within 10 years. Detailed animal experiments continued to back up the manned space program expertise, some sadly flouted animal rights rather badly, but the Americans did successfully get to the Moon in the end.

Subsequent animal experiments on the space stations continued with a view to assessing the feasibility of much longer manned space flights; to Mars for example. Some probably not very helpful but interesting discoveries have been made. For instance spiders still spin webs in zero gravity but they are not very tidy and they use unusually thin thread. Bees still make honeycombs but the wax walls are unusually thin. A blenny type fish would swim around in all attitudes in its enclosed zero gravity tank until someone looked into the tank,

what is left of the old.

Clarke, Arthur C. (1917-2008)

Perhaps, as some wit remarked, the best proof that there is Intelligent Life in Outer Space is the fact it hasn't come here. Well, it can't hide forever - one day we will overhear it.

Coleridge, Samuel Taylor (1772-1834)

The stars hang bright above, silent, as if they watched the sleeping earth.

Columbus, Christopher (1451-1506)

Following the light of the sun, we left the Old World.

Copernicus, Nicolaus (1473-1543)

So far as hypotheses are concerned, let no one expect anything certain from astronomy, which cannot furnish it, lest he accept as the truth ideas conceived for another purpose, and depart from this study a greater fool than when he entered it.

Crisp, Quentin (1908-1999)

In an expanding universe, time is on the side of the outcast. Those who once inhabited the suburbs of human contempt find that without changing their address they eventually live in the metropolis.

Curtis, Helena (1924-2005)

You and I are flesh and blood, but we are also stardust.

Democritus (460-370 BC)

Nothing exists except atoms and empty space; everything else is opinion.

Dirac, Paul (1902-1984)

God used beautiful mathematics in creating the world.

Pick a flower on Earth and you move the farthest star.

Donne, John (1572-1631)

Man hath weaved out a net, and this net throwne upon the Heavens, and now they are his own.

Dyson, Freeman (1923-)

The question that will decide our destiny is not whether we shall expand into space. It is: shall we be one species or a million? A million species will not exhaust the ecological niches that are awaiting the arrival of intelligence.

Eddington, Sir Arthur (1882-1944)

Something unknown is doing we don't know what. (Comment on the Uncertainty Principle in quantum physics, 1927)

It is sound judgment to hope that in the not too distant future we shall be competent to understand so simple a thing as a star.

Every body continues in its state of rest or uniform motion in a straight line, except insofar as it doesn't.

Einstein, Albert (1879-1955)

The most incomprehensible thing about the universe is that it is comprehensible.

Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius - and a lot of courage - to move in the opposite direction.

Politics is for the present, but an equation is for eternity.

The ideals that have lighted my way and time after time have given me new courage to face life cheerfully, have been Kindness, Beauty and Truth.

Imagination is more important than knowledge. Knowledge is limited, imagination encircles the world.

Put three grains of sand inside a vast cathedral, and the cathedral will be more closely packed with sand than space is with stars.

Sandi Cayless

Editor's Note: Part 2 of Sandi's "Astronomy-ish Quotes" will appear in the next issue of *The Mercury*.

ANIMALS IN SPACE

Smith lecture, 10th December 2010

Mark Butterworth

After a brief reminder of the pioneers and history of rocketry, Mark described how the Americans and Russians vied with each other to be first to get a man into space. One definition of space is the height above which aerodynamic flight does not work anymore. In fact at about 100 Kilometres (62 miles) the speed a plane has to go to maintain lift in the vanishingly thin air is greater than Earth orbit velocity. So at this height, called the "Karman line", an aircraft becomes an orbiting space craft in zero gravity.

The Americans decided they needed to know if a human body could survive in zero gravity. The first experiment was to send an animal up above the Karman line in an air-pressurised capsule fitted with life signs monitoring equipment, and to bring it down again. They successfully launched a squirrel monkey on a sub-orbital flight and got it back to Earth alive, unfortunately, the capsule sank in the Atlantic Ocean before recovery and the monkey was lost.

The Russians, who knew about the American's secret tests with monkeys, decided to do their own thing and use stray dogs instead; claiming dogs were easier to train and did not "monkey" with the space-craft controls. The World's first pressurised space suits were made by the Russians for their space dogs. Unfortunately the 40th anniversary of the communist Russian revolution came along before the space suit's environmental controls had been perfected. Laika was selected from a collection of stray street dogs undergoing training for space, and got launched into orbit to celebrate the communist anniversary. The Russians claimed she was happily orbiting the Earth for ten days before announcing she had sadly died. (It later transpired she had actually died only a couple of hours after the launch, probably of heat exhaustion.) The Russians explained that since she was no longer alive Laika would be left in orbit rather

The universe never did make sense; I suspect it was built on government contract.

When a place gets crowded enough to require IDs, social collapse is not far away. It is time to go elsewhere. The best thing about space travel is that it made it possible to go elsewhere.

Herschel, William (1738-1822)

The undevout astronomer must be mad.

Herzen, Aleksandr Ivanovich (1812-1870)

Man and science are two concave mirrors continually reflecting each other...

Hoffer, Eric (1902-1983)

Our passionate preoccupation with the sky, the stars, and a God somewhere in outer space is a homing impulse. We are drawn back to where we came from.

Hoyle, Sir Fred (1915-2001)

Space isn't remote at all. It's only an hour's drive away if your car could go straight upwards.

There is a coherent plan in the universe, though I don't know what it's a plan for.

Hubble, Edwin (1889-1953)

The history of astronomy is a history of receding horizons.

The explorations of space end on a note of uncertainty... we measure shadows... we search among ghostly errors of measurement.

Jeans, Sir James (1877-1946)

The universe begins to look more like a great thought than a machine.

Life exists in the universe only because the carbon atom possesses certain exceptional properties.

There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle.

The most beautiful thing we can experience is the mysterious. It is the source of all true art and science.

Only two things are infinite, the universe and human stupidity, and I'm not sure about the former.

Eliot, T. S. (1888-1965)

We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time.

Ellison, Harlan (1934-)

The two most abundant things in the universe are hydrogen and stupidity.

Emerson, Ralph Waldo (1803-1882)

Every spirit builds itself a house; and beyond its house a world; and beyond its world, a heaven... Build, therefore, your own world.

Ennius, Quintus (239-169 BC)

No one regards what is before his feet; we all gaze at the stars.

Euler, Leonhard (1707-1783)

For since the fabric of the universe is most perfect and the work of a most wise Creator, nothing at all takes place in the universe in which some rule of maximum or minimum does not appear.

Faraday, Michael (1791-1867)

Nothing is too wonderful to be true.

Fermi, Enrico (1901-1954)

If I could remember the names of all these particles, I'd be a botanist.

Feynman, Richard (1918-1988)

I believe that a scientist looking at non-scientific problems is just as dumb as the next guy.

You can know the name of a bird in all the languages of the world, but when you're finished, you'll know absolutely nothing whatever about the bird... So let's look at the bird and see what it's doing -- that's what counts. I learned very early the difference between knowing the name of something and knowing something.

Poets say science takes away from the beauty of the stars - mere globs of gas atoms. I, too, can see the stars on a desert night, and feel them. But do I see less or more?

Fulghum, Robert (1937-)

Sirius, the brightest star in the heavens.... My grandfather would say we're part of something incredibly wonderful - more marvellous than we imagine. My grandfather would say we ought to go out and look at it once in a while so we don't lose our place in it.

G'Kar of Narn, Babylon 5

The universe is run by the complex interweaving of three elements: energy, matter, and enlightened self interest.

Gagarin, Yuri (1934-1968)

I see Earth! It is so beautiful!

Galileo, Galilei (1564-1642)

The sun, with all those planets revolving around it and dependent on it, can still ripen a bunch of grapes as if it had nothing else in the universe to do.

The Milky Way is nothing else but a mass of innumerable stars planted together in clusters.

Gell-Mann, Murray (1929-)

Our planet doesn't seem to be the result of anything very special.

Glenn, John (1921-)

The most important thing we can do is inspire young minds and to advance the kind of science, math and technology education that will help youngsters take us to the next phase of space travel.

Haldane, John B. S. (1892-1964)

If one could conclude as to the nature of the Creator from a study of his creation it would appear that God has a special fondness for stars and beetles.

It is my supposition that the Universe is not only queerer than we imagine, is queerer than we can imagine.

Halley, Edmond (1656-1742)

Scarce any problem will appear more hard and difficult, than that of determining the distance of the Sun from the Earth very near the truth: but even this... will without much labour be effected.

This sight... is by far the noblest astronomy affords.

Hanks, Tom (1956-)

From now on we live in a world where man has walked on the Moon. It's not a miracle; we just decided to go.

Hawking, Stephen (1942-)

The usual approach of science of constructing a mathematical model cannot answer the questions of why there should be a universe for the model to describe. Why does the universe go to all the bother of existing?

We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe. That makes us something very special.

Heinlein, Robert A. (1907-1988)