TRANSIT

The October 2013 Newsletter of

NEXT TWO MEETINGS, each at 7.15 pm

Friday 11 October 2013 at Grindon Parish Hall, Thorpe Thewles

Thomas Wright Trophy quiz contest

CaDAS (*holders*) vs Durham A.S. vs U. of Durham A.S.

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Friday 8 November 2013 at Wynyard Planetarium

Title to be announced

Prof. René Oudmaijer, *Astrophysics Group, University of Leeds*

Content

Editorial

Rod Cuff

I fondly hope that usually everyone finds at least something of interest in each issue of *Transit*, but surely that must be particularly true this month, unless you're primarily an observer – alas, there are no observation reports or images this month (please help remedy that in November's issue).

But otherwise: for readers interested in physics, there's the first in a multi-part series by Ray Brown on gravity, tides, relativity … If you're interested in the history of science, Peter Hanna introduces us to a museum dedicated to it in Cambridge (to my eternal shame, I never visited it when I was an undergraduate there). Is gardening one of your things? Then start planning your astro-themed flower beds with the plant list that Barry Hetherington supplies. Would you like a run-through of planetary and lunar space missions so far? Michael Roe not only informs you, but sets down a lament for the future that may well get several of you writing letters for publication next month (I can but hope …).

But, unless you know something about the saga already, you may join me in being rather open-mouthed at Ray Worthy's article triggered by his encounter some years ago with a Hartlepool hairdresser called Maurice Ward, and the astonishing story (still continuing) of Starlite. I wondered if there was a hoax of some kind lurking at the bottom of this, but a brief internet search shows that it's absolutely as Ray states it. Wow.

Many thanks to all contributors, as ever. Don't forget to go to Grindon Parish Hall in Thorpe Thewles (*not* the planetarium) for our meeting on 11 October, to support CaDAS's team hacking their way through the thicket of tricky-to-fiendish questions that Neil Haggath has no doubt lined up again for this year's competition.

Please let me have articles for November's *Transit* by 28 October if possible.

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Letter

The change of Aquarius

from John Crowther

New to me from the reproduction of the old Brooke Bond Tea card of the constellation Aquarius was the fact that the Venerable Bede tried to change the names of the Zodiac signs to those of saints. So Aquarius the Water Carrier with its horn of plenty would then have sprinkled new believers, although, as it was changed into St John the Baptist, total immersion would have been more likely!

The astronomical link is that St John's birthday is celebrated on 24 June, six months before Christmas. So after his anniversary, the days begin to shorten. The symbolism of the date relates to St John being the forerunner to Christ – he represents a morning star that will fade when the Sun/Son rises.

Best wishes – John

OBSERVATION REPORTS AND PLANNING

Websites – October 2013

Here are some suggestions for websites that will highlight some of what to look out for in the night sky in October. Some of these addresses may discuss September's sky until the end of the month, but then should update themselves to October.

- **HubbleSite**: a **video** of things to see each month:

  http://hubblesite.org/explore_astronomy/tonights_sky

- **Night Sky Info's** comprehensive coverage of the current night sky:

  www.nightskyinfo.com

- **Jodrell Bank Centre for Astrophysics** – The night sky:

  www.jodrellbank.manchester.ac.uk/astronomy/nightsky

- **Telescope House** monthly sky guide:

  http://tinyurl.com/pzzpmsx

- **Orion's** What's in the Sky – October:

  http://www.telescope.com/Whats-In-the-Sky-October/p/103353.uts

- **Society for Popular Astronomy's monthly Sky Diary** – download from the link at:

  http://www.popastro.com/skydiary

GENERAL ARTICLES

Some thoughts on gravity and tides
Part 1: The gravitational force

Ray Brown

Tycho Brahe acquired the astronomical data that allowed Johannes Kepler brilliantly to recognise the patterns of planetary motion, but it was left to Isaac Newton, born some twelve years after the death of Kepler, to produce a theory of gravity. Newton was the first to realise that the forces of attraction that dictate the orbits of planets around the Sun, and of satellites about their parent planets, have the same basic nature as the force that causes an apple to fall to Earth – and Earth to rise up, albeit to an immeasurably small extent, towards the apple.

In short, the magnitude of the force of attraction that exists between any pair of objects is in proportion to the product of the individual masses of the two objects. The gravitational force also obeys the same *inverse square law*, which, incidentally, applies to two other important natural forces: the electrostatic force between electrical charges and the magnetic force between two (hypothetical) single magnetic poles. The inverse square law

arises in each case because the strength of a force field created by a point mass (in the case of Newton's law), or a point charge (in the case of Coulomb's law) or a point magnetic pole decreases with distance from the point, varying with the inverse square of distance. We can imagine the force fields being 'diluted' as a result of spherical symmetry about any point source.

So Newton's law for the force of gravitational attraction between two masses m_1 and m_2 separated by a distance r is expressed in simple mathematical form: the force of attraction F is given by

$$F = Gm_1m_2/r^2$$

Here G, the *universal gravitational constant*, is found to have the value 6.67×10^{-11} N m^2 kg^{-2}.

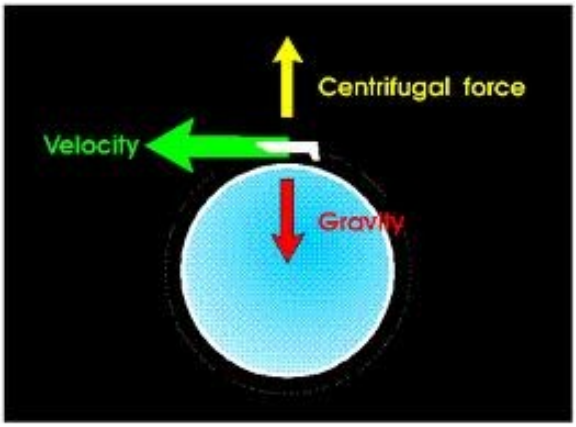
Many textbooks refer to gravity as being 'puny – by far the weakest of the known physical forces', the others being the electromagnetic and nuclear forces. However, without qualification such a statement is meaningless. Certainly, if we are comparing the electrostatic and gravitational forces acting between two protons then indeed the size of the electrostatic repulsion does exceed that of gravitational attraction by about 37 orders of magnitude: 10^{37}. On the other hand, electrostatic forces play no significant part in the interactions between astronomical bodies, or indeed between Earth and an apple! Perhaps authors who, unthinking, simply copy such bald statements from a textbook they are reading into one they are writing might care to imagine themselves at the event horizon of a black hole!

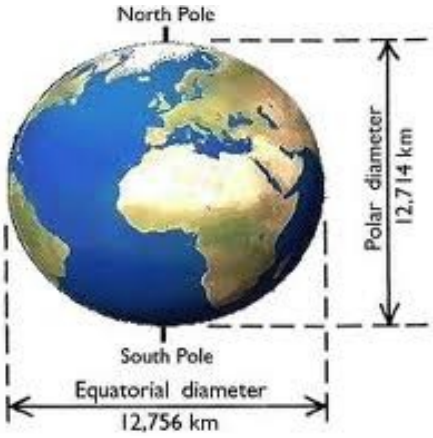
The point mass is an idealised concept that does not exist. Instead, astronomical bodies are huge and many are approximately spherical in shape. Only the smallest of the moons and asteroids have odd shapes like potatoes. Spherical shapes result from internal gravitation within bodies; just as a drop of liquid will assume a spherical shape in a zero-gravity environment (approximated by a free-falling raindrop), so too do solid bodies tend to form spheres as the most stable configuration (the minimum surface size for a given volume), but friction, much higher within solids than in liquids, prevents that perfect shape being attained in solids.

Other influences also cause astronomical bodies to be distorted from the perfect spherical shape:

1) The internal composition, the density and therefore the mass distribution of the body might lack spherical symmetry.

2) A body spinning in space will form an equatorial bulge (become an *oblate spheroid*) because centrifugal forces increase from zero at the poles to a maximum at the equator.





3) Gravitational attractions by other celestial bodies tend to produce elongation from a sphere to a *prolate ellipsoid* in the direction of the distorting influence. For example, the gravitational effects of Saturn on its synchronous moons Mimas, Enceladus and Tethys and of Uranus on its synchronous moon Miranda are responsible for the detectable rugby-ball shapes of the moons. No doubt the Earth (and the Sun) exert similar distorting forces on our Moon, which has synchronous rotation around Earth, but the effects are insignificant.

Newton's law explains this third form of distortion; as the gravitational force field decreases with increasing distance between the interacting bodies, the side of the satellite facing its host planet is subject to greater attraction than is the centre of the satellite, which in turn feels a stronger force than does the side of the satellite farthest from the planet. So the variation in gravitational force across the satellite amounts to a stretching force along the line of centres, thus turning a sphere into a prolate ellipsoid.

It is usual in simple considerations of gravitational attraction between spheres to assume that each can be treated as a point mass concentrated at the centre of the sphere. Yet we have just seen that different parts of each sphere are subjected to different forces from the second sphere. This is not the place to present a detailed justification of the assumption above, but for those who are interested I refer them to:

http://hyperphysics.phy-astr.gsu.edu/hbase/mechanics/sphshell.html#wtls

where it is proved that the assumption is correct. That is, for any non-rotating, spherically symmetrical object (including those whose density varies, provided it varies only with radius) it is valid in calculations of gravitational interactions with other bodies to treat the mass as a point mass located at the centre of the sphere.

Distortions caused by the variation in gravitational force with distance can have profound effects in certain cases. Perhaps most dramatic is when the intense gravitational fields (and hence the most intense variations in field strength with distance) associated with a black hole pull apart any object as it is drawn towards the abyss.

More generally, any body that relies on its internal gravity to hold it together will disintegrate as a result of the differential gravitation effect if it approaches a much larger body too closely. This event will occur within the *Roche limit*, *d*, where

$$d = 2.45\, R\, (\rho_M / \rho_m)^{\frac{1}{3}}$$

Here R is the radius of the larger body and ρ_M and ρ_m are respectively the densities of the larger and smaller bodies. The Roche limit if the Moon approached Earth is 2.9 × Earth's radius. Fortunately the Moon is some 61 Earth radii distant and is slowly moving further away, so the Moon is in no danger of disintegration!

Next month: Part 2 will discuss tidal effects.

The Whipple Museum, Cambridge

Peter Hanna

On a recent visit to Cambridge I came across the Whipple Museum of the History of Science. The entrance is down a narrow side street named Free School Lane and is hidden alongside the famous Cavendish Laboratory and behind the door of the Laboratory of Physical Chemistry.

Attached to the University of Cambridge, the museum houses an extensive collection of scientific instruments, apparatus, models and more recently a large collection of globes.

Of particular interest in the main hall is an early example (one of five) of a 10-foot reflecting telescope made for George III by William Herschel after he had discovered Uranus, which he originally named *Georgium Sidus* (George's Star).

Also of note was a grand orrery circa 1750, reflecting the then known planets and moons.

Figure 1: Herschel's telescope

Figure 2: Orrery

An orrery is a moving model of the motions of the Earth, Moon, and Sun, and can be used to demonstrate phenomena such as day and night, the seasons, lunar phases and eclipses. In the second hall a working model of the orrery is powered by a pound coin – I couldn't resist!

There are many other fascinating objects housed and sometimes hidden in this museum (including mementoes of Cook's journey to record the transit of Venus, one of which is a locked box, contents 'unknown!'), and I had just about run out of time when I realised there was another hall upstairs housing a large collection of globes.

This hall was accessed through the back of the second downstairs hall and is not really publicised at all, so that when I found it I was alone in the room, which contained some 50 globes of all sizes but all relating in some way to astronomy. Early examples of starry globes sat alongside modern globes of Mars and the Moon. One of the Moon globes, however, was produced before space flight and so lacked some detail on the 'far' side.

There were also photographs and illustrations of an early planetarium, which was a large globe inside which the audience sat as the globe rotated about them

All in all, a very interesting couple of hours – and if anyone else is interested in visiting the museum, note that it is open only between 12.30 and 4.30pm Monday to Friday and is closed on Bank Holidays.

Note: The Whipple Museum has also developed an Electronic History of Astronomy, based on its own exhibits and others from elsewhere in Cambridge, called *Starry Messenger* (cribbed from someone called Galileo, I think).[1]

The end of space exploration

Michael Roe

This article's title may sound grim, but I mean it. I honestly wish things were otherwise. By 'the end of space exploration', I mean the end of direct exploration of other worlds, mostly by automatic craft achieving either orbiting fly-bys or actual landings.

I used to be a great optimist about the future of space exploration. I saw all the Apollo Moon landings, and for me watching men walk on the Moon was the most amazing thing I had ever seen. By 1973 these journeys had ended. 'Never mind!' I thought, 'Just wait … in a few years, men will return for more Moon landings.' I waited years, then decades.

I did see photographs from automatic Mars probes, and then surface images of that planet from the Viking Landers. Later, the Voyager craft sent back images of Jupiter and Saturn, and years later of Uranus and Neptune, plus their numerous families of satellites.

In the 1980s fewer exploring craft were launched, but the Russian Venera landers on Venus and the European Giotto mission to Halley's Comet were the amazing exceptions. I must also mention Mariner 10, which first revealed the cratered surface of Mercury.

Manned spacecraft, sometimes with women as part of the crew, continued. Skylab, an Earth-orbiting space station launched in 1973, was followed by the Russian Salyut space stations in the 1980s. Later came the American Space Shuttle, an orbiting space plane; the Russian Mir space station serviced by Soyuz capsules; and finally the International Space Station, which took many years to build. A short

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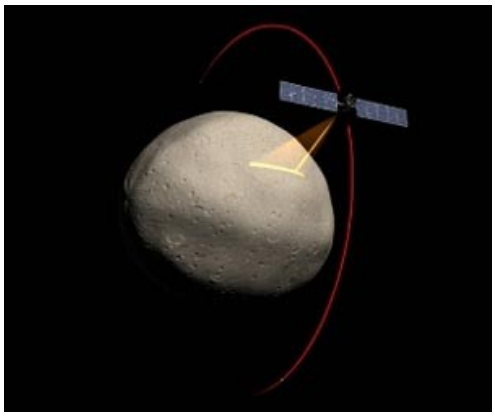
[1] *[You can find this at www.hps.cam.ac.uk/starry. It's an eclectic and rather clumsy-looking website, seemingly built by graduate students in 1999–2000 and no longer maintained, but it's well worth browsing through. It describes itself as follows:*

> *By drawing on the rich collection of instruments and books in the Whipple Collection, the University Library and the Wren Library, we have sought to produce a history of astronomy which focuses on the uses of astronomy and its instruments, as well as on the practitioners of astronomy. We hope that this project goes some way towards illustrating the variety of uses (astrology, weather prediction, calendar reform) and inspirations (e.g. poetry), people in past societies and cultures found in astronomy.*

– Ed.]

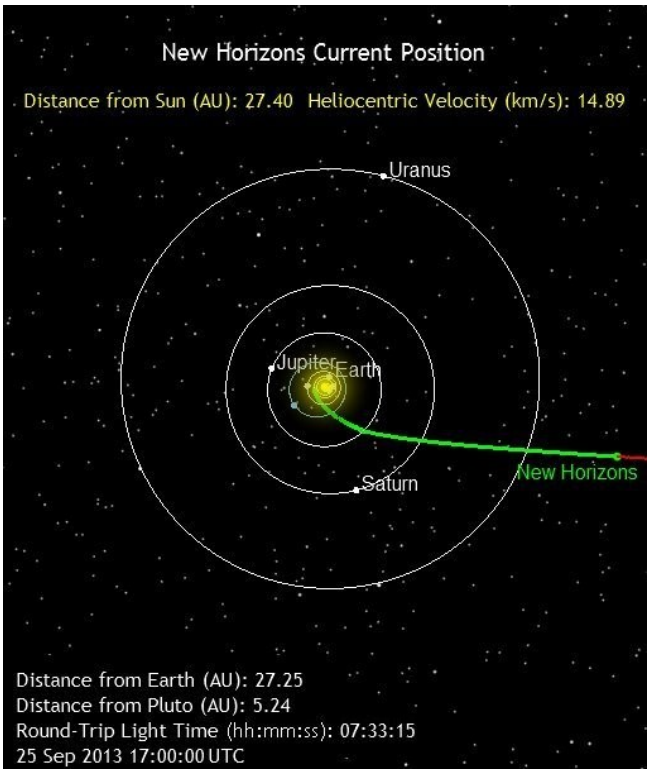
while ago the Space Shuttle was retired, and now the Americans pay the Russians to take their astronauts to the ISS! In addition the Chinese have sent their astronauts ('taikonauts') into orbit, but with only one flight every few years.

That sums up human space-flight in the last 40 years: very expensive to achieve, exploring a virtual vacuum, and doing a few experiments to prove that humans can survive long periods (as much as a year) in space.



Automatic spacecraft did much better. Since 1990 craft have been orbiting Jupiter (Galileo) and Saturn (Cassini, with the Huygens lander reaching the surface of Titan). Other craft have flown past comets and the asteroid Eros and have orbited Mars. In the 21st century, Messenger has orbited Mercury, Dawn has orbited Vesta (*see left*), and the two amazing rovers Spirit and the still-working Opportunity have spent years exploring Mars, joined last year by the larger Curiosity. And I mustn't forget the New Horizons probe launched in 2006 on its long journey to Pluto (*see below for where it is now*). Lastly, the Lunar Reconnaissance Orbiter has greatly improved our images of the Moon, the previous best ones being from the Lunar Orbiter and Apollo missions of 40 years ago.

But this impressive history of unmanned spacecraft is almost at its end. The Curiosity Mars rover in 2012 was the last of its kind; the only firm project now is a Mars orbiter, being built now and due for launch at the end of this year to investigate the planet's atmosphere. All other interplanetary missions are simply tentative plans to go ahead in many years' time, and could easily be cancelled. I do know of a spacecraft to Mercury being built (very slowly) in Britain, incredibly enough, but its launch is scheduled for many years into the future.

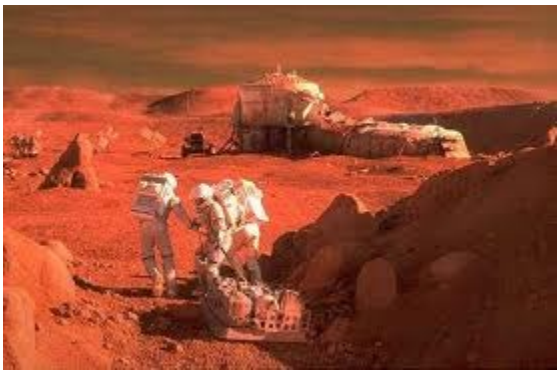


I really don't know how this collapse of space exploration came about. When I was a boy, many people were interested in space travel, and even the later Viking and Voyager missions were covered in TV news bulletins. Now there appears to be almost total news-report censorship about long-lasting missions, and not even much in astronomy magazines!

I suppose this sorry state of declining exploration of space began in 1969 just after the first lunar landing by men. Wernher von Braun, the rocket genius who got America to the Moon had further, more incredible plans to send men to Mars. Richard Nixon looked at them and said, 'No!'. He believed it was far too expensive while his country was involved in a costly war in Vietnam – which was subsequently lost, as was the American space programme. Von Braun had planned to send men

to Mars as early as 1981. However, Nixon cancelled Apollos 18, 19 and 20, which would have cost about $400 million each – not a lot for a rich country. Instead, the USA used an already-built Saturn V rocket for Skylab, its first space station. After that, the only option employed was the Space Shuttle, which took years to complete, and became far more expensive and made far fewer flights than originally planned. Furthermore, the Shuttle made space travel boring as far as the public were concerned, only coming to their notice when the two tragic explosions of Challenger and Columbia killed all the astronauts aboard.

In the last 20 years, two serious attempts have been made to send men and possibly women to the Moon again, and perhaps even to Mars. The first, around 1990, was during the presidency of the elder George Bush, but the project collapsed. In about 2003, his son tried again. This time the project got further, leading to a single launch of an Ares rocket – and then was cancelled. Unfortunately, new presidents seem to love cancelling projects begun by their predecessors (except of course wars, much more expensive than Moon landings).



Projected manned missions to Mars have had an interesting history. They have always been scheduled for 20 years' time – this was true of projects mooted in 1970, in the 1990s and in 2000. Some people still think such a mission may happen, but I don't! At first the Americans were believed to be sending men to Mars, then the Russians were; next, the Japanese were going to send men to the Moon, then the Chinese were, even the Indians; and now there are rumours that the private sector may fund a Moon landing.

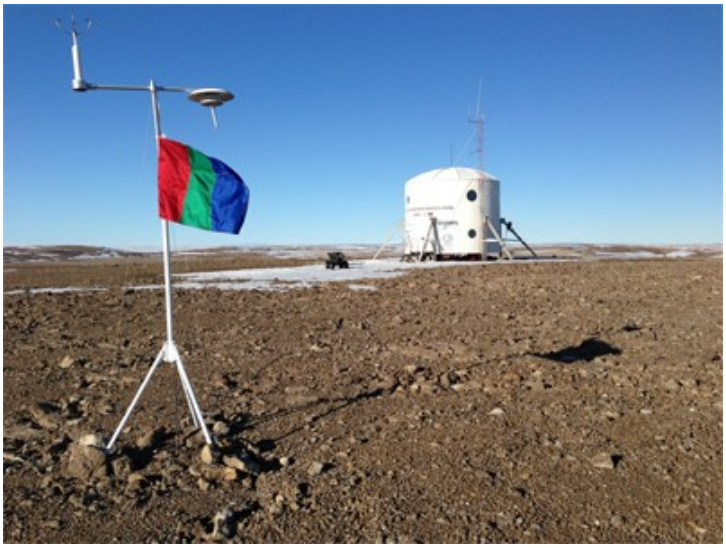
Actually, we hear a lot about private companies financing space travel, but these wealthy companies exist to make huge profits. In space, only communications and TV satellites have ever made profits, and any company trying for space exploration would soon see its vast wealth drain away and would swiftly abandon the idea. I have heard of projects to send people, for a fee, into the upper atmosphere, to an altitude of 62 miles – but that's not space (meteors disintegrate at about 80 miles up).

I've heard of two recent proposals. One was for ex-NASA employees to fly two people to a Moon landing – all the passengers have to do is pay £750 million each … The other, for much the same price, was a scheme to send a man and a woman round Mars without landing. Possibly rather pointless?! As with so many projects, this is the last you'll ever hear of these.

It all comes down to apathy and problems with funding. The people of, say, the USA could for a few dollars each per year for a few years easily afford to put a man or woman on the Moon. Once they did just this, but now the desire is not there and their leaders appear to have persuaded them that war and the economy are the important things – anything but a space programme.

There are people, of course, with fortunes so vast that they could fund a trip to the Moon, but none of these billionaires has ever proposed this, and they prefer investing their fortunes to make even more money. There are also organisations that promote interest in space travel. The British Interplanetary Society, which has few members, does little and is hardly known by the public. The Planetary Society is American-based and does try to fund aspects of space flight, but with a falling membership and a priority to use precious funds to find potential Earth-colliding asteroids and other

non-spaceflight programmes, it cannot do much (I was once a member, but left for this and other reasons).



One curious organisation is the Mars Society, run by Robert Zubrin, which uses all its cash to run a base to test space suits on Devon Island, a frozen wilderness (*see right*). They don't have a rocket to get to Mars, though, which is just as well, as Zubrin has fantasies of Mars colonisation and terraforming!

There might be a million people in the whole world interested in space, but the number is falling. The deaths of Carl Sagan and Patrick Moore took away the best popularisers of space science that we've had. What we really need is a great space-exploration charity to fund, say, an automatic Lunar Rover. Nothing has landed intact on the Moon for 37 years now, yet it's the easiest world to reach. There is so much more that should be done: more landers on Venus and Mercury and the icy world of Europa, investigation by orbiter of the Uranian and Neptunian systems, and much more.

Yet I fear it will never be done. Science fiction remains all fantasy. There is little research on building new and better rockets, so perhaps the Saturn V will never be beaten in performance. Once, over a million pounds a day was spent on planetary exploration, but it must be less than half that now, with the Cape Canaveral launch centres doing little and others around the world much the same. Television could educate people about space exploration, but little of that goes on.

I would be very happy if what I've written turns out to be wrong, but if you watch the news these days, space exploration is hardly mentioned. Perhaps our best hope is for all the former brilliant geniuses who worked to build spacecraft to turn instead to building a machine for making perfect paper money from old newspapers to finance space travel! Yes, I know that would be illegal, but betraying the future hopes of space exploration is surely a much greater crime!

The strange case of the Hartlepool hairdresser

Ray Worthy

In the past, there have been one or two hairdressers in the town who have caught my attention, mainly because they have adopted such names as 'Herr Dooz' or 'Curl Up and Dye', but this one was different – very different.

One particular Hartlepool hairdresser came unannounced into my life one evening when I had gone round the corner to pay for the papers at my local newsagent. This was before the World Wide Web had taken hold, and the cutting edge of communication was the Newsgroups facility. I had been using it to investigate the family history of a lady assistant in the shop, and the atmosphere there was very cordial.

A gentleman was standing by my side and awaiting his turn to pay his paper bill. The lady seemed to have a flash of inspiration.

'Hey!' she said. 'You two should get to know each other.'

We looked at each other and then at the lady behind the counter.

'Why's that?' we both said almost simultaneously.

'Well,' she answered, '*You* teach Astronomy with your planetariums, and *you* might work with NASA soon.'

She went on to introduce us properly. 'You're near neighbours and you should get to know each other. This is Ray Worthy of Queensberry Avenue and this is Maurice Ward of Northbrooke Court.'

We started talking then and were still talking as we came to our house, so I invited Maurice in for a cup of tea in our front room. After some time, Maurice invited me, in turn, round the corner to his house the following evening, where he wanted to show me a few practical demonstrations. But at that time I was busy, busy, busy and Maurice was even busier, so our paths did not cross again.

What is amazing is that I had put this meeting out of my mind and it was not until last November (2012), when I was examining the last of the space shuttles, recently placed in the museum at Cape Canaveral, that I began to unravel my memory.

My wife Josie and I, together with my son Christopher and his wife Fiona, were staying in New Smyrna Beach, a few miles north of the Cape Canaveral complex. On the local TV, we watched the space shuttle *Atlantis* being pulled through the streets on its way to its last resting place in the museum. Crowds thronged the sidewalks, waving their patriotic flags. The local High School Marching Band with its drums and sousaphones and cheerleaders was trying hard to keep its pace down to two miles per hour, which was all the tractor could manage. The band was in danger of leaving the shuttle behind.

When *Atlantis* was safely ensconced in its museum niche and the place was opened to the public, we paid our dues, got our tickets and 'did the tour'. It must have been the first day on which it was open

to the public, and the shuttle's surroundings were very temporary. The craft itself looked a little scruffy and when my wife remarked upon this, our son answered, ‘It's not surprising. It’s been shot into space at least thirty times.’

I had expected to see the underside all covered in white heat-resistant tiles, but all I saw was a kind of black paint. Perhaps the tiles had been removed. It was while I was speculating about this that something jumped into my memory. There was a connection here to do with a Hartlepool hairdresser. As we were being driven away back to our holiday flat, I told the others that I was thinking about this connection, but was having some difficulty conjuring up the details.

Josie laughed and said, ‘Don't you remember? You brought him into our front room when we lived in Queensberry Avenue and gave him a cup of tea.’

‘Of course!’ I exclaimed. ‘How stupid of me!’, and the details began to flood back. Upon our arrival home, I began to ask around and put together the following narrative.

Maurice Ward came from Yorkshire and settled in Hartlepool, opening a shop as a hairdresser. However, Maurice was no ordinary hairdresser. He was forever tinkering with solutions, hair dyes, lotions and so on, trying to improve upon what the market had to offer. This endeavour was fraught with potentially nasty consequences. There were stories of customers whose hair turned green and then fell out.

However, Maurice set up a special back room as a small laboratory. This project developed to such an extent that he opened a small factory somewhere along Brenda Road. As far as I know, he had no formal science education, but he became quite confident that he knew what he was doing.

There came an event that changed the direction of his thoughts. Over at Manchester Airport, there was a disaster in which 55 people died in 40 seconds when the cabin of an airliner became flooded with toxic fumes.

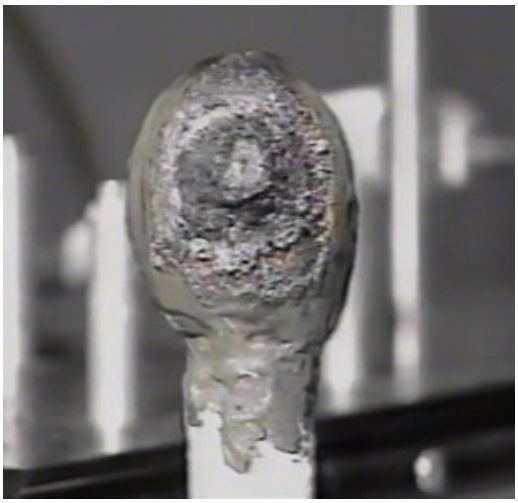
Maurice's thoughts turned to the making of substances that could resist the onset of great heat. As I have already mentioned, Maurice was not a trained scientist, but neither was Thomas Edison, one of the world's most famous inventors, who ended up owning thousands of patents and becoming a multi -millionaire. I do not know whether Maurice deliberately modelled himself on Edison, but I do know that he took the same path.

When Edison was seeking a substance with which to make an incandescent filament for his new light bulbs, he sent a team of men to search for and bring back thousands of fibres such as bamboo, grass and any other plant filaments they could find. Edison simply tried them all one by one until he found something that did the job. It was ironic that the filament he finally used was a simple cotton thread, carbonised in situ.

This was the method that Maurice used. There was one period when he tried as many as twenty different formulae in a day. Maurice kept his cards very close to his chest. He shared his results and methods with no one outside his family. The amazing fact is that he succeeded. When he realised that he was on to something, he went along to the bosses at ICI in Billingham and bought from them a plastic extruder so that he could mix his ‘gubbins’ and set it out into sheets. Keeping everything deliberately vague, Maurice described the substance as a melt of various plastics and ceramics.

Of course, if he wanted to become rich, he would have to show the world what he had achieved, and this he did. It was absolutely spectacular. As a demonstration, he would take a raw egg and coat it with the substance he now christened ‘Starlite’.

He allowed the Starlite to harden around a raw egg, then proceeded to heat the egg covering with the direct flame from a Bunsen burner or even an oxyacetylene torch. He did this for five minutes, showing that the outside of the cover was glowing red hot (*see right*). When the five minutes were up, Maurice cut open the egg and showed that the contents were still raw liquid and had not cooked at all.



At first, many people were very suspicious of his claims, and indeed I must confess my own scepticism when I first heard them. It was only when Maurice trotted out the list of organisations who had seen the demonstrations and subjected Starlite to tests of their own that I began to sit up and take notice. I think it was when Maurice told me that Starlite had been tested by the National Physics Laboratory in Teddington that my unspoken scepticism evaporated.

The 'egg test' was given an airing on the television programme *Tomorrow's World*. After this, Maurice was invited along to the Atomic Weapons Establishment at Foulness, where they subjected the sample of Starlite to a simulated atomic explosion. An especially intensive light-ray device tested the coating round the raw egg up to temperatures as high as 10,000 °C and still the egg remained raw. When I learned this, I began to realise that this Starlite was quite phenomenal.

Maurice was invited to cross the Atlantic and show off his invention over there. The organisations taking an interest included such illustrious folks as Boeing, NASA and even the atomic testing place at White Sands, New Mexico. One figure that was bandied about was that Starlite was two hundred and forty times more efficient than the ceramic tiles used on the space shuttles.

One would expect, with a reputation such as Starlite now enjoyed, that the world would beat a path to his door, and this it did; but Maurice was in a quandary. The product would be a source of income only if the formula could be kept secret. Each applicant naturally asked for samples, but Maurice would not comply. He knew that these large firms with their sophisticated laboratories could easily reverse-engineer the product and the secret would be out. He could not even take out a patent because it would necessarily have to disclose what the secret was.

Maurice claimed that there was a spate of break-ins at the factory and an attempted computer hacking incident. He and his family felt they were under siege, but the secret never got out. If the facts as presented in this narrative have any base in reality, and the internet is replete with videos of the spectacular demonstrations, then the potential, even in anything as mundane as the production of fire doors, would be incalculable. The only information I have been able to dig out is that the discussions with Boeing came nearest to fruition, but everyone seems to have been frightened off by Maurice's insistence that he should retain a 51% share in the controlling company and that the applicant should sign a legally binding agreement that there should be no reverse engineering.

Sadly, Maurice died in May 2011 leaving four daughters, and what the situation is at the moment with regard to the business, I have no idea.

To any normal person, it would seem that this remarkable hairdresser should have been home and dry. He would become a rich man as a matter of course. But this was not so. It did not happen. From this point on, I have to piece together what happened by referring to what Maurice told me when he came into our own front room, and later when I visited him in his home in Northbrooke Court. Contributions from the internet did not add substantially to what I had already gleaned.

Television viewers today are familiar with the programme called *Dragon's Den*. Inventors and entrepreneurs present themselves to a panel of financiers who have to assess the viability of a business idea. The criteria used in judging are not only the actual invention, but also the outline of a viable business plan. Maurice would have been an ideal candidate for the programme. Unfortunately, it did not exist then, more's the pity.

Maurice presented his ideas to many representatives of big business, but he made little progress because he was adamant that he should keep control by retaining 51% of the shares. Owing to this, his project failed.

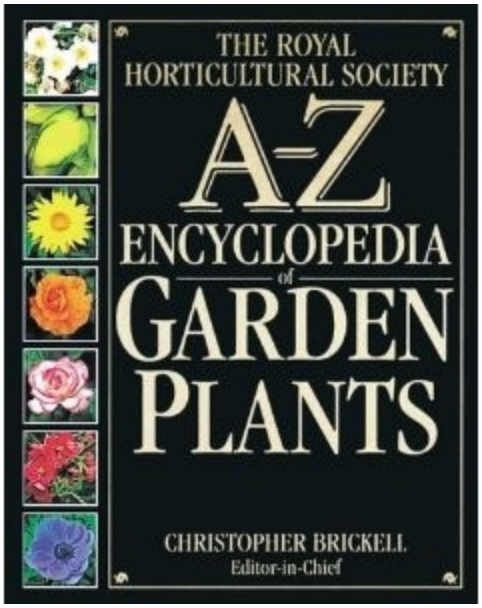
I remember him railing against the fees demanded by the patent lawyers, and in this respect I had great sympathy.

I hope that the story does not end there. At present, I am trying to summon up courage to trace and visit Maurice's daughters, but doorstepping is not my style. One never knows. There may be another chapter to this story yet.

Astroplants

Barry Hetherington

Although daylight significantly reduces our astronomical activities, especially in the summer, some of us might like to extend our interest into the daytime by cultivating an astronomically themed plot in our garden. Each plant in the following list carries an English name relating to astronomy, although this name may not have had an astronomical origin. The list does not include those trees (or rather their seeds) that went to the Moon and back on the Apollo 14 mission in 1971. Those species were loblolly pine, sycamore, sweetgum, redwood and Douglas fir – collectively known as Moon Trees. Today you can get secondary Moon Trees, i.e. offspring of the original trees.



The following list should not be regarded as complete and is mainly compiled from *The Royal Horticultural Society A–Z Encyclopedia of Garden Plants* – the remaining few come from the internet.

Acer Red Sunset; bright red colour
Agapanthus Blue Moon; pale blue flowers
Anemone Blue Star; pale blue flowers
Anemone Violet Star; amethyst flowers with white backs
Aquilegia Crimson Star; red sepals with creamy white petals
Aspidistra Milky Way; white-speckled foliage
Aster Asteroid; blue/scarlet/white flowers
Astilbe Venus; bright pink flowers
Begonia Bethlehem Star; light pink flowers
Begonia Midnight Sun; white flowers
Brachyglottis Sunshine; white hairy leaves
Callistemon Captain Cook; bright red flowers
Calluna Dark Star; crimson flowers
Calluna Red Star; deep lilac-pink flowers
Camellia Star above Star; white or lavender-pink petals
Campanula Miranda; grey-blue flowers
Canna Endeavour; bright soft-red flowers
Carpobrotus Summer Sun; yellow flowers
Caryopteris Heavenly Blue; dark blue flowers
Ceanothus Dark Star; dark purplish-blue flowers
Chamaecyparis Stardust; yellow foliage
Chrysanthemum Polar Star; pale yellow flowers
Chrysanthemum Eastern Star; primrose-yellow flower heads
Clematis Silver Moon; silver-mauve sepals
Clematis Sunset; bright red flowers
Codiaeum Sunrise; orange-red
Colchicum Rosy Dawn; pinkish violet flowers
Coleonema Golden Sunset; white flowers
Columnea Early Bird; yellow-throated orange flowers
Coreopsis Early Sunrise; deep yellow
Coreopsis Gold Star; golden yellow flowerheads
Cornus Gold Star; yellow, red and purple leaves
Cornus Milky Way;
Crocosmia Star of the East; orange flowers
Crowea Pink Starlight; red and green leaves
Cytisus Golden Sunlight; pale gold flowers
Cytisus Moonlight; pale sulphur-yellow flowers
Dahlia Comet; dark velvet-red blooms
Dahlia Pink Jupiter; deep pinkish-mauve blooms
Dahlia Rose Jupiter; rose-pink blooms
Dahlia Scarlet Comet; scarlet blooms
Dahlia White Moonlight; white blooms
Delphinium Blue Dawn; pale blue flowers
Delphinium Galileo; mid-blue flowers
Delphinium Giotto; violet blue and yellow flowers
Dianthus Telstar Crimson; deep blood-red flowers
Dianthus Telstar Picotee; red
Dianthus Telstar White; white flowers
Dierama Miranda; bright pink flowers
Dierama Titania; pale pinkish-red flowers
Dimorphotheca Tetra Polar Star; white flowers
Elaeagnus Titan; bright yellow flowers
Erica Challenger; bold magenta flowers
Erica Pink Star; lilac-pink flowers
Erysimum Moonlight; pale sulphur-yellow flowers
Freesia Oberon; yellow flowers
Galanthus Ophelia;
Gardenia Hadley; white to yellow flowers
Geranium Galactic; milk-white flowers
Gladiolus Comet; cherry-red flowers
Gladiolus Halley; pale yellow flowers
Gladiolus Purple Star; mid-purple flowers
Hamamelis Moonlight; pale-yellow flowers
Hedera Triton; dark green leaves
Helenium Bruno; brown disk florets
Helianthus Sunspot; large yellow flowerheads
Heliopsis Mars; yellow-orange flowerheads
Helleborus Pluto; purple flowers
Hemerocallis Europa; tawny-orange flowers

Hemerocallis Hyperion; lemon-yellow flowers
Hemerocallis Nova; lemon-yellow flowers
Heuchera Hyperion; deep pink flowers
Hibiscus Full Moon; lemon-yellow flowers
Hosta Blue Moon; pale mauve-grey flowers
Hosta Moonlight; lavender-blue flowers
Hydrangea Europa; dark-pink to purple-blue flowers
Impatiens Spectra; mid-green leaves
Iris Apollo; white and primrose-yellow flowers
Iris Sunrise; yellow flowers
Ixia Uranus; lemon-yellow flowers
Ixia Venus; magenta flowers
Juniperus Blue Star; silvery-blue leaves
Kalmia Shooting Star; white flowers
Lagerstroemia White Dwarf; white flowers
Leucospermum Eclipse; orange-yellow flowers
Lilium Maxwell; brilliant orange-red flowers
Lilium Star Gazer; red flowers
Lilium Sun Ray; yellow flowers
Limnocharis Stardust;
Linaria Northern Lights; yellow/pink/orange/white flowers
Liquidambar Moonbeam; yellow and red
Magnolia Galaxy; purple-pink flowers
Malope Vulcan; magenta-pink flowers
Mimulus Calypso; wide colour range
Mussaenda Aurorae; golden-yellow flowers
Narcissus Merlin; pale yellow cups
Narcissus Sundial; golden yellow flowers
Narcissus Sun Disc; mid-yellow flowers
Narcissus Vulcan; fiery orange-red cups
Nopalxochia Calypso; lilac-pink flowers
Nymania Aurora; yellow/orange/red
Nymphaea Sunrise; bright yellow flowers
Paeonia Sunshine; vermilion flowers
Pelargonium Pulsar Scarlet; deep red flowers
Pelargonium Super Nova; lilac-pink flowers
Peperomia Luna Red; dark crimson leaves
Phlox Ariane; white flowers
Phormium Aurora; red, pink and yellow
Populus Rocket;
Populus Aurora; white, cream and pink
Potentilla Moonlight; yellow flowers
Potentilla Sunset; dark orange flowers
Rhododendron Scintillation; pale-pink flowers
Rhododendron Seven Stars; pale pinkish-white flowers
Rhododendron Wren; yellow flowers
Rosa Blue Moon; lilac-mauve flowers
Rosa Celestial; light-pink flowers
Rosa Moonlight; lemon-white flowers
Rosa Ophelia; creamy pale-pink flowers
Rosa Polar Star; creamy white flowers
Saxifraga Tycho Brahe;
Sidalcea Oberon; rose-pink flowers
Sisyrinchium Pole Star; white flowers
Solanum Red Giant; orange-red fruit
Syringa Firmament; light blue flowers
Tulipa Corona; red and yellow flowers
Tulipa Viking; scarlet-red flowers
Verbena Polaris; silver-blue flowers
Viburnum Aurora; pink flowers

THE TRANSIT QUIZ

Answers to September's quiz

Every answer starts with the letter H.

1. Dark nebula seen in silhouette against the emission nebula IC 434. **Horsehead Nebula, in Orion.**
2. The second Astronomer Royal. **Edmond Halley (1656–1742).**
3. Discover of Saturn's largest moon, Titan. **Christiaan Huygens (1629–95).**

4. Discoverer of Mars's two moons, Phobos and Deimos. **Asaph Hall (1829–1907), in 1877.**
5. The first person to show that sunspots are cooler than the surrounding chromosphere. **My intended answer was George Ellery Hale (1868–1938), after whom the Mt Palomar 200" telescope is named. But it turns out (thank you, Neil!) that the encyclopaedia I took that from is in error; Hale it was who discovered in 1908 that sunspots were magnetic phenomena, but Joseph Henry (1797–1878) demonstrated their relative coolness 57 years earlier. His name still begins with an 'H', though!**
6. A bright reflection nebula produced by outbursts from Eta Carinae, beginning in 1843. **Homunculus Nebula.**
7. Irregular, brightly 'knotted' objects thought to be pre-main-sequence stars building mass via an accretion disk. **Herbig–Haro objects, after George Herbig (1920–) and Guillermo Haro (1900–90), who discovered them independently in the 1950s.**
8. The path on a Hertzsprung–Russell diagram followed by a pre-main-sequence star as it evolves onto the main sequence. **Hayashi track, after the Japanese astrophysicist Chushiro Hayashi (1920–2010).**
9. Alpha Arietis. **Hamal, magnitude 2.01. Its name comes from an Arabic word meaning 'the lamb'.**
10. The largest single meteorite known. **Hoba, lying where it was found in Namibia in 1920. It is about 3 × 3 m across, and at least 1 m deep, and is estimated to weigh about 60 tonnes.**

October's quiz

Every answer starts with the letter I. The questions are in very rough order of increasing difficulty.

1. A collective term for Mercury and Venus, as distinct from Mars and more distant planets.
2. The very bright but short-lived solar reflection off a panel of a particular kind of communications satellite, which can be predictably viewed along a thin strip on Earth.
3. The hypothesis, now part of the standard cosmological model, introduced by Alan Guth in 1981.
4. Saturn's 'yin-yang' satellite.
5. The most volcanically active body in the Solar System.
6. A catalogue of nebulae and clusters prepared over 100 years ago by John Dreyer as a sequel to his 1888 New General Catalogue (NGC).
7. The disappearance of a star or planet behind the Moon's leading limb at an occultation.
8. The total amount of radiant energy from the Sun falling on a body, per unit area perpendicular to the direction of the Sun, in unit time.
9. The second asteroid to be imaged in close-up by a passing spacecraft (Galileo).
10. The Lunar Module pilot on the Apollo 15 mission – and the first Moonwalker to die.