



TRANSIT

The July/August 2011 Newsletter of



NEXT MEETING: NEW SEASON

9 September 2011, 7.15 pm for a 7.30 pm start
Wynyard Planetarium

Galaxies in massive clusters

Dr John Stott, Durham University



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Editorial

Rod Cuff



As befits a summer publication, this issue includes a 'What I did on my holidays' article from Neil's trip to Ireland (page 7); and it has a timely astronomical link with a recent event captured photographically by Jürgen (page 4). Although the light summer nights don't lend themselves to easy observation of the night skies, several indefatigable photographers stayed awake and alert late into the night and early morning to record some excellent displays of noctilucent clouds at the end of June and the beginning of July, recorded in a gallery starting on page 5.

Congratulations and good wishes from us all, I'm sure, to Rob Peeling on getting himself and his family moved in to their new home in southern England. We shall and do miss him, but for now at least we're still benefitting from his welcome *Skylights* (page 2).

Armed with his 'baloney detection kit of scientific scepticism', Andy Fleming sounds off about spurious things in the sky on page 12.

Many thanks to all contributors. *Transit* is now taking a short summer break, reappearing with the September issue, the copy deadline for which is **Tuesday 30 August**.

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OBSERVATION REPORTS AND PLANNING

Skylights – July 2011

Rob Peeling



For the first time, I'm writing as a resident of South Oxfordshire rather than Teesside. We've bought a house in a lovely village on the road from Reading to Oxford. Whilst the sky is less than dark with Reading 6 miles away, my initial impression is that the light pollution is probably not much worse than our last home in Eaglescliffe and so I'm optimistic that good visual observations will still be feasible. I'll keep you posted.

The Sun

Have a look for some other effects as well as the obvious sunspots. Look for the **limb darkening** effect. The edge of the Sun should appear slightly less bright than the centre of the disk. This is because our line of sight penetrates deeper into cooler portions of the photosphere at the edges, and the effect is one of the lines of evidence that the Sun is gaseous, not solid. Also examine the solar disk carefully for signs of **granulation** (looking like a graininess over the disk) caused by small cells of circulating gas in the solar surface. Look, too, for signs of **filaments** – darker streaks and lines, which are prominences seen end-on.

As always: NEVER look at the Sun directly through any sort of camera, binoculars or telescope. Either use purpose-made objective filters or use projection.

The Moon

| 1 July | 8 July | 15 July | 23 July | 30 July |
|----------|---------------|-----------|--------------|----------|
| New Moon | First Quarter | Full Moon | Last Quarter | New Moon |

There are two stellar occultations (the Moon passing in front of a star) to watch out for this month. On 19 July, kappa (κ) Aquarii will re-appear from behind the dark limb of the Moon sometime between 01:12 and 01:17 BST. The following night, κ Piscium will also pop out from behind the dark limb between 04:32 and 04:34 BST. In both cases the star will re-appear about 30° south of the lunar equator.

The planets

It will be just about possible to catch a farewell glimpse of **Saturn** for this apparition, setting in the west as the sky darkens in July.

Across in the east, **Neptune** is just rising as twilight descends. It's a binocular object slightly to the south-west of epsilon (ε) Aquarii. It ought to be easy to pick out as the brightest 'star' in this area. Use medium to high power with your telescope to see the disk and confirm your observation.

Later in the night **Uranus** rises in Pisces, followed by **Jupiter** in Ares. Jupiter's rising time is gradually becoming earlier; by the end of July it is around midnight and almost convenient for casual, evening observation.

The asteroid **4 Vesta** is visible in the southern sky, lying in Capricorn – a topical target, with the [NASA Dawn mission](#) arriving there during the month. Late in the night the dwarf planet **Ceres** can be observed as the constellation of Cetus rises.

Meteors

Towards the end of the month two separate meteors showers are active: the [Southern Delta Aquarids](#) and the [Alpha Capricornids](#). Both are at maximum on 30 July. Some bright meteors are possible from these showers.

Noctilucent clouds¹

Between mid-May and mid-August is the best time for observing noctilucent clouds (NLCs). The reasons for and origins of these clouds are still mysterious. They are completely different from the tropospheric (weather) clouds found in the lower 10km of the Earth's atmosphere. NLCs exist at around 80km high in the atmosphere and seem to be ice crystals. They can be noticed only when the Sun is well below the horizon and therefore illuminates only these very high clouds, which is of course how they get their name. When they are visible, the lower, normal clouds are dark in appearance, which is how you tell the difference. NLCs can be quite bright and are white or an attractive bluey-white colour.

NLC forms are classified into four easily identified types:

Type I: Veil – A simple, structureless sheet, sometimes as background to other forms.

¹ [See the gallery on page 5. – Ed.]

Type II: Bands – Lines or streaks, parallel or crossing at small angles.

Type III: Waves – Fine herring-bone structures, like the sand ripples on a beach at low tide.

Type IV: Whirls – Large-scale looped or twisted structures.

www.kersland.plus.com, the Noctilucent Cloud Observers' homepage, contains plenty of information on how to record observations and the different types to be seen, together with photos to help you see what to look for.



A recent supernova in the Whirlpool Galaxy

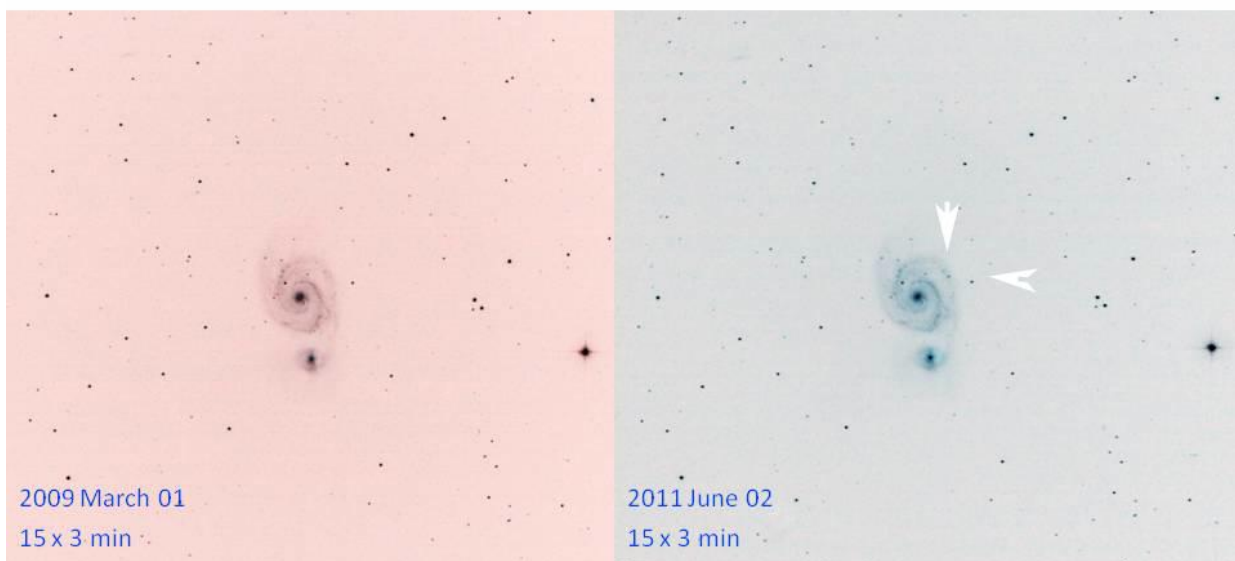
Jürgen Schmoll

A supernova, labelled SN 2011dh, was discovered in M51, the Whirlpool Galaxy, on 31 May. A couple of days later, just a few hours after reading news about it, I was able to image it – a lucky thing, given the light nights and generally poor weather.



[Jürgen supplied a pair of positive photos, but negatives often display better here, so I've taken the liberty of inverting the composite image. I've also added below it textual information (slightly edited) about the supernova, courtesy of [Wikipedia](http://en.wikipedia.org). – Ed.]

SN2011dh in M51



Canon EOS 40 D, 200/1000mm Skywatcher Newtonian unguided on EQ6 pro mount.
Jürgen Schmoll, West Cornforth, County Durham.

SN 2011dh is a supernova in the Whirlpool Galaxy (M51). On 31 May 2011 an apparent magnitude 13.5 type II supernova was detected at coordinates 13:30:05.08 +47:10:11.2. It was discovered by Amédée Riou and confirmed by several sources. A candidate progenitor has been detected in Hubble Space Telescope images and may have been a highly luminous yellow supergiant with an initial mass of 18–24 solar masses. The supernova appears to have peaked near apparent magnitude 12.1 on 19 June.

Emission spectra from the Keck Observatory indicate that this is a type II supernova. Its appearance is a unique event, because it has occurred in a galaxy that is imaged almost constantly. It is expected to be observable for northern hemisphere observers for several months.

This is the third supernova to be recorded in the Whirlpool Galaxy in 17 years (following SN 1994I and SN 2005cs), which is a lot for a single galaxy. The galactic supernova frequency is estimated to be around one event every 40 years.

In terms of visual observation with a large amateur telescope, this object may not jump out at the viewer. As of 25 June, it may be holding reasonably steady at magnitude 12.7. However, it is an easy target for an amateur telescope equipped with a modern CCD camera under a dark sky.



[A gallery of noctilucent clouds](#)

Peter Heath, Keith Johnson, Ed Restall & Jürgen Schmoll



Peter Heath: 3 July, from outside his bathroom window



Keith Johnson: 3 July, Canon 1000D, 18–55mm lens set at 18mm, ISO 800, 45s



Ed Restall: 3 July, Canon 1000D, 80–200mm lens set at 200mm, ISO 1600, f/5.6, 1.6s.



Jürgen Schmoll: 30 June, Canon EOS40D, 17mm, ISO 800, f/4.5, 5s

GENERAL ARTICLES

[Another trip into history: The Leviathan of Parsonstown](#)

Neil Haggath

I recently spent a long weekend in the Republic of Ireland. I spent a day and a half sightseeing in the fair city of Dublin – but the main purpose of my visit was related to astronomy. I hired a car and drove across country to the small town of Birr in County Offaly, to see an iconic piece of astronomical history – the famous 'Leviathan of Parsonstown'.

For those of you who don't have a clue what I'm talking about, and are now wondering what an obscure town in the middle of Ireland has to do with astronomy, allow me to present a little background and history.



In the nineteenth century, the work of professional astronomers and observatories was mostly limited to the frankly boring fields of cataloguing and precision astrometry. Most original research – such as the development of astrophotography and spectroscopy, and investigating the nature of the recently discovered nebulae – was done, particularly in the British Isles, by a class of men whom [Dr Allan Chapman](#) calls 'the Grand Amateurs of Victorian astronomy'. These were very wealthy individuals – some of them aristocrats, born into rich families, others from humbler origins who had made their own fortunes in business – who invested substantial amounts of money in their hobby, and often built private observatories and telescopes that far surpassed anything available to their professional counterparts.

Of all the Grand Amateurs, the grandest of all was Sir William Parsons, the third Earl of Rosse (1800–67) (*Figure 1*) whose family home was Birr Castle, in the aforementioned small Irish town – though the town was known as Parsonstown in those days. The Earl became a very accomplished amateur astronomer and engineer, and set himself a goal that would be inconceivable for an amateur today – to build the biggest telescope in the world!

The Earl was seriously wealthy in his own right, but he married a lady, Mary Field, who was even more wealthy; she was the heiress to a major landowning family in Yorkshire. (The Parsons family has always had strong connections with Yorkshire; Sir William himself was born in York, and [the present Countess of Rosse](#) is also a Yorkshirewoman.) Fortunately for him, his wife also supported his interests; financially, he was able to indulge his astronomy in a manner matched by very few amateurs before or since. The cost of building his 'great telescope' was around £10,000 in 1840s money – equivalent to roughly one million pounds today! (Indeed, the restoration work in the 1990s *did* cost around the latter figure.)



Figure 1

Prior to his time, the world's biggest telescope was the 48-inch reflector built by [Sir William Herschel](#) – which was not especially successful. The young Earl first built an 18-inch reflector, and then a 36-inch. The latter was fully steerable, and mounted on a turntable and gantry structure similar to that of Herschel's 48-inch. Sadly, it was later destroyed by a hurricane.

In about 1840, the Earl began his great project – to build a 72-inch reflector, which would be half as big again as Herschel's. At that time, the technology had not yet been developed to make large glass mirrors; telescope mirrors were made of speculum metal, an alloy of copper and tin, similar to bronze but with a higher proportion of tin, which made it more reflective and whiter in colour. The big problem with that – apart from its being difficult to cast and work with – was that it tarnished quickly, especially in a damp climate such as that of central Ireland, and had to be frequently repolished. So the Earl actually made *two* 72-inch mirrors, and used them in rotation, with one always in the telescope while the other was being repolished. (In fact, he cast *three* speculum blanks; his first attempt failed, as he allowed it to cool too quickly and it cracked.)

The telescope tube, built of wood and strengthened with iron rings, was 56 feet long and 7 feet in diameter. Each mirror weighed four tons, and the complete assembly 12 tons.

With the technology of the time, scaling up the mounting of his 36-inch to double the size would have been near impossible – so the Earl was wise enough not to try. He sacrificed mobility for robustness. The telescope was suspended between two huge masonry walls, each 72 feet long and 56 feet high, aligned north–south. This meant, of course, that it permanently faced south; while it could be raised almost from horizon to zenith, it could only move through about 15° in azimuth – so any given object could only be observed for about an hour each night as it crossed the meridian. Figure 2 shows how the restored telescope looks today.

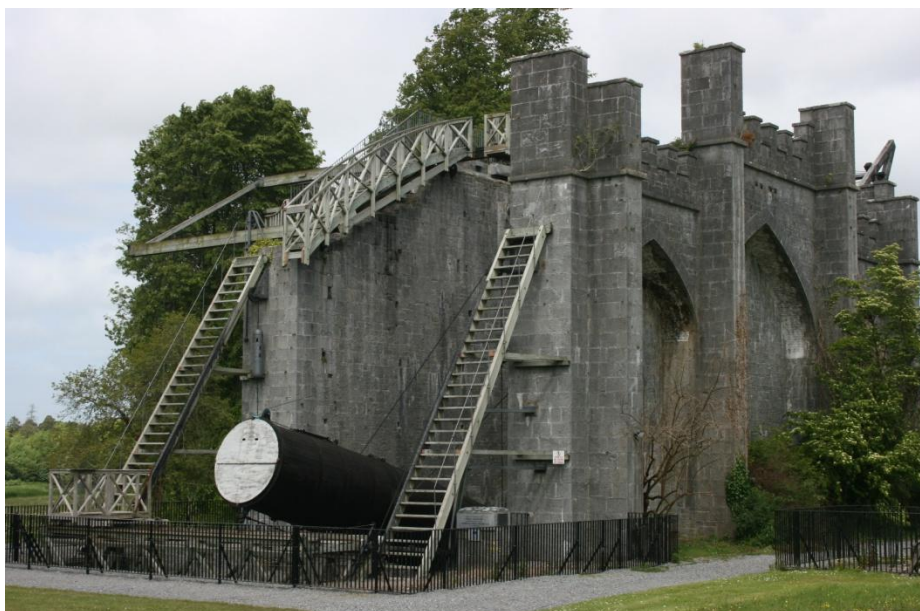


Figure 2

The telescope pivoted on a huge universal joint of the Earl's own invention, and was raised and lowered by means of pulleys, chains and massive counterweights, so that the whole 12 tons could be raised by two men operating a winch.

The 'Leviathan of Parsonstown', as it became known, was completed in 1845. However, for the next three years it was little used; that was the time of the [Irish Famine](#), and the Earl and his family concerned themselves with relief work. After that was over, he began using his masterwork in earnest.

Among the astronomical community, reactions were mixed. At least one prominent astronomer described the telescope as 'a joke' – but others were more impressed. Many of Europe's leading astronomers visited Birr Castle and observed with the Earl, including [J.L.E. Dreyer](#), who would later compile the New General Catalogue. And [Sir Robert Ball](#), who would later become the foremost astronomy populariser of the age, worked as the Earl's assistant in his youth.

Despite its limitations – not to mention the lousy climate of its location – the Leviathan proved a remarkably successful instrument, and the Earl did a lot of important research with it. Most notably, he was the first to discover that some of the fuzzy 'nebulae' had a spiral shape – he discovered what we now call spiral galaxies.

The first galaxy in which he discerned the spiral form was the one we now call the Whirlpool Galaxy, or Messier 51. Figure 3 shows his original sketch of M51, which is quite recognisable to us today, including its small companion galaxy, NGC5195.

After the Earl's death in 1867, his son the fourth Earl continued his work with the Leviathan. But after *his* death, the telescope fell into disuse, and by the turn of the twentieth century it had sadly fallen into ruin. It remained the world's biggest telescope for 72 years; it wasn't beaten until 1917, when the 100-inch [Hooker reflector](#) was built at Mt Wilson in California.

You may have surmised that the Earl's family name, Parsons, has another strong connection with the history of astronomy – and if so, you're quite right. The third Earl's younger son, Sir Charles Parsons (1854–1931), also became a highly accomplished engineer. In 1925, he took over the optical company of Sir Howard Grubb, to form the world-renowned company of Sir Howard Grubb, Parsons and Co., more commonly known as [Grubb-Parsons](#). The company remained in business until 1985, and most notably made the 158-inch mirror for the [Anglo-Australian Telescope](#).



Figure 3

Between 1994 and 1999, the Leviathan was fully restored by a team of volunteers, at a cost of around £1 million, financed by a charitable foundation. Much effort was made to keep as closely as possible to its original design and construction. This was made feasible because some of the third Earl's original engineering drawings still survive, as well as photographs taken by his wife, Countess Mary Rosse. In the name of authenticity, it was again fitted with a metal mirror, rather than a modern glass one – though it's made from a modern aluminium alloy, rather than speculum.

Birr Castle itself is still the family home of the seventh Earl – but its surrounding park, or Demesne, is open to the public. The telescope is to be found in the middle of the Demesne. Details can be found at www.birrcastle.com.

And so we come to my visit. As I said earlier, I hired a car and drove to Birr from Dublin. Speaking as a person who spends far too much of his life on the horribly congested motorways of the English Midlands, driving in Ireland was a rare pleasure! From my hotel on the outskirts of Dublin to Birr Castle was 86 miles, which took me 90 minutes each way – legally, without ever breaking the speed limit. I was able to cruise at dead on the speed limit for mile after mile (getting 50 miles to the gallon) – no queues or congestion, and not a cone to be seen!

When you enter the castle grounds, the first thing you see is a pleasant little café; I had lunch there at the end of my visit. Then there is the Science Centre, which includes a beginners' and children's guide to basic astronomy, as well as an extensive display on the story of the third Earl and his telescope. Then you emerge into the Demesne itself.

Thankfully, on the day of my visit, the weather cooperated. It stayed dry, and by the late morning it was quite warm with bright sunshine – though with a blustery wind that meant I had to



Figure 4

literally hold on to my hat! The park includes a very pleasant walk around its perimeter, following a river and through woodlands. Much of the interior is open grassland, in the middle of which stands the Leviathan itself. Figures 2 & 4 show how it looks today. (Note the barriers; it's a definite case of 'look, but don't touch!') It's an impressive structure, and a fascinating glimpse into the engineering of the early Victorian age; I can best describe it as 'Heath Robinson on a gigantic scale'!



Figure 5

An interesting novelty of the park is the Whirlpool Spiral Walk – a tree-lined walkway that traces the shape of M51, the Whirlpool Galaxy. You can walk through it to get from the far side of the park to the Leviathan. This was created at about the time of the telescope's restoration; the first tree was planted by no less a person than [Sir Bernard Lovell](#)!

After lunch, before heading back to Dublin, I took a walk around the town of Birr. It's a very pleasant and picturesque little town and, fittingly, the third Earl is honoured by a statue in one of its main streets (Figure 5).

So if anyone is ever in Ireland for any reason, Birr Castle is well worth a visit.



UFOs, space and sanity²

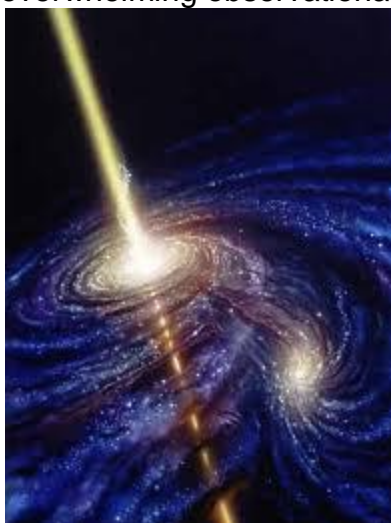
Andy Fleming



Immediately your friends, acquaintances and colleagues discover that your hobby is amateur astronomy, you can prepare for the two main predictable questions: what do you think about black holes, and have you ever witnessed a UFO? It's a shame really, because the ancient and gateway science of astronomy offers its students wonders and awe aplenty... all far more fascinating and satisfying than the so-called pseudoscience of ufology.

My friends' former question about black holes is a perfectly commendable query about an actual scientific and astronomical entity, whereas the enquiry about UFOs raises a subject steeped in wild speculation, the paranormal, the super- (should that be sub-?) natural, hearsay, conspiracy theories, vivid imaginings, plain old charlatanry and sheer profiteering by ufologist authors and 'experts'.

So, coming down off the fence, what are my answers to these two questions? Well, there is overwhelming observational proof of the existence of black holes (see *left for an artist's impression*), and Einstein's General Theory of Relativity, one of the foundations of modern physics, has predicted their existence since 1915. Indeed, most astronomers now believe that there is a black hole of super-massive proportions at the centre of each galaxy, including our very own Milky Way. The enormous velocities of stars at its centre as they rotate around something with a gargantuan mass is indirect evidence from mathematical calculations that this object, known as [Sagittarius A*](#) (pronounced 'A-star') must be something with the density of a black hole.



My thoughts regarding UFOs, however, are quite different. Before I go further, I'd better repeat the commonly held definition of the acronym 'UFO': a guided spacecraft of non-human origin, emanating from either beneath the Earth, its oceans or an alien world. Henceforth in this article, all references to UFOs will adopt

this definition, rather than the proper definition of 'natural or unnatural unidentified aerial phenomena'.

Sadly for proponents of the existence of UFOs from an alien race, there is no scientific or astronomical evidence to which I've ever been party that shows they actually exist (and I've studied theoretical astronomy and cosmology, which has included the consumption of a large amount of contemporary science literature, journals and magazines). And in science, which happens to be my preferred method for understanding reality, any hypothesis for which no physical evidence exists remains just that: an entirely speculative hypothesis. To graduate to being a theory – a description and explanation of reality – any hypothesis must be testable and the associated observations and experiments must be repeatable and verified by a peer group. To have a 'gut feeling' that unidentified objects in the sky are emissaries, robotic or otherwise,

² [A slightly modified version of an entry in Andy's excellent [Andromeda Child blog](#). – Ed.]

from another world does not cut the ice, I'm afraid. Science emphatically requires its followers to think with their brains, not with their guts.

There is also a well-known and accepted principle in science popularly known as Occam's Razor. This states that, where there are competing explanations for any phenomena, it is the simplest explanation that should be adopted. For example, a bright, stationary, small disc hanging over the western horizon at sunset should be regarded as an astronomical entity such as the planet Venus, before one jumps to the conclusion that it's an alien artefact (an appearance by Venus can be confirmed using a star chart). If it's not Venus then other hypotheses simpler than the alien spacecraft variety can be tested, such as a helicopter or aircraft landing lights.



I've been interested in the fascinating science of astronomy since I was a child, using just the naked eye, then a plethora of binoculars, before graduating to a 200mm Newtonian reflector five years ago. My telescope is a fine piece of equipment, and indeed is perfectly capable of resolving the most popular and brightest deep-sky objects such as galaxies, planetary nebulae and multi-stellar systems, as well as planets, asteroids and comets within our own solar system.

During the hundreds of observing sessions with my telescope, I have not once seen a UFO through its eyepiece. Neither have I seen one through binoculars, or even with my naked eyes. Despite enjoying the night sky for decades, I have, however, seen objects aplenty that I could not identify, and if I didn't know and rationalise better I could put many of them down to the presence of Little Green Men. Indeed, most of the fainter stars below magnitude three I would be unable to recognise without the help of *Norton's Star Atlas* or the superb *Stellarium* planetarium simulation software. And then there are all the artificial satellites such as the Cosmos or Iridium series (the latter famous for its 'flares' when high up above the Earth – the spacecraft's massive solar panels reflect the Sun's rays down to the observer on a small footprint).

One of the most stunning phenomena commonly misinterpreted as a UFO is when the manned International Space Station (ISS) passes overhead, especially when NASA's Space Shuttles or Russia's Soyuz spacecraft have been docked to this orbiting space outpost. Its appearances can be researched and predicted, as can those of most satellites, via a little work and the use of websites such as [Heavens Above](#) where the celestial position of particular satellites is exquisitely and accurately portrayed for any location on Earth. The ISS is so bright, is so huge and has such a high velocity that it would be so easy for the uninformed occasional visitor to the night sky to regard it as a guided alien spacecraft.

And then of course there are the planets, two of which are so bright that when literally hanging in the sky above the horizon they can transfix and mesmerise the observer. This is especially true of Earth's sister planet Venus, which is only about 30 million miles distant, with a stifling atmosphere of carbon dioxide and a high albedo due to highly reflective lemon-coloured sulphur dioxide clouds. It shines as the third brightest object (after the Moon and Sun) in terrestrial skies at magnitude -4.3 . Jupiter, although not quite so bright, can have a similar effect on the observer. When Venus and Jupiter join together in the night or twilight sky at conjunction, then even I have been startled as they both hover above the trees at the bottom of our garden.

Other easily explained reports of UFOs include comets, such as the appearance of Comet Hale–Bopp (*right*) in 1997, C/2006 P1 Comet McNaught in 2006, and Comet 17P/Holmes in October 2007. To the uninitiated, they could all have been mistaken as being of alien origin – which indeed they are, of course, although strictly natural in formation.



Then there are meteor showers such as the Perseids in August each year. The apparent point of origin (or radiant) of this shower lies in the constellation of Perseus and, with a peak rate of over one hundred meteors per hour, can resemble a squadron of attacking Mosquito aircraft. They are caused by grains of sand-sized debris (normally from the tails of comets through which the Earth has passed during its orbit around the Sun) entering the atmosphere at immense velocities. Friction with the atmosphere causes them to melt and glow white-hot.

Again, a small amount of research in one of the summer editions of the popular astronomy magazines such as *Astronomy*, *Astronomy Now* or the BBC's *Sky at Night Magazine* soon enables the reader to predict the appearance of such meteors. Fireballs are less common, but once again are (larger) cosmic debris entering the Earth's atmosphere at high velocity, causing their outer layers to melt and glow white-hot. When they fall to Earth over the planet's polar ice caps, they stand out easily against the white snow and ice, and can be discovered by scientists and collectors as meteorites, ranging from pebble size to the size of a television set.

Despite the fact that the majority of sightings can be explained away as either astronomical or terrestrial phenomena, even the most ardent sceptic must admit that there is a very small minority of reports that defy scientific explanation. These are seized upon by active and vocal ufologists such as [Richard D. Hall](#) or [Stanton T. Friedman](#). Friedman especially continues a tirade against those he sees as 'nasty, noisy negativists'. Another feature of UFO proponents is their insistence on their scientific qualifications to study the subject, pointing out that in the past they were atomic physicists, aerospace engineers or rocket scientists – all designed to maximise their credentials and the seriousness of their lucrative work. Well, there are books to be sold and presentations to be given, aren't there? And it must be very lucrative, else why relinquish a well-paid career in mainstream science?

The overriding problem for ufologists, however, is that there is no physical evidence to support their hypotheses. A *belief* in UFOs is really all it is. As [Seth Shostak](#), senior astronomer at the Pasadena -based SETI Institute³, says, he'd love to discover scientific proof that aliens were visiting the Earth. This is despite the likelihood that such evidence would throw him onto the dole queue... But nothing short of a spacecraft part or capsule hatch or even an alien onboard guidance computer part on display at the Smithsonian Museum would be adequate evidence for him.

³ SETI, the Search for Extraterrestrial Intelligence, is the scientific endeavour to detect alien radio signals using some of the world's largest ground-based radio telescopes such as the Arecibo antenna in Puerto Rico.

And that's just the point, isn't it? There is no physical evidence apart from grainy photographs or shaky videos of unidentified aerial objects, which in any case may have been doctored. Even the alleged UFO reported to Mission Control at Houston by Armstrong and Aldrin 200,000 miles out from the Earth in their Apollo 11 spacecraft, although not the S4B third stage of their Saturn V booster, was much more likely to be other human space junk or an asteroid than a UFO. It's the same for the UFO reports around the secret US Air Force aircraft technology and development base of Area 51 in Nevada (where the top-secret Stealth Bomber was developed), or the famous Roswell crash 'incident' in New Mexico in 1947... No physical proof... period.



How can anyone be surprised at the presence of unidentified aircraft in the skies around a base specialising in top-secret, high-technology aircraft? As Sagan⁴ pointed out: why would aliens travel light years across the Milky Way in crafts so technologically advanced they're beyond even our wildest imagination, only to abduct a handful of humans, mutilate cattle, draw crop circles, or embarrassingly crash in the sands of New Mexico? The cost of freightage at relativistic speeds even to such a technologically advanced civilisation would be huge indeed.

Since 1995 over five hundred extra-solar planets (those around other stars) have been discovered, most of them gas giants the size of our own Jupiter or larger. Through NASA initiatives such as the [Kepler Space Telescope](#), however, we are on the cusp of confirming the presence of Earth-sized worlds around other suns. Planets, once thought to be oddities of our own solar system, turn out to be commonplace in the universe. Travelling to them, though, may present insurmountable problems. The Alpha Centauri triple-star system, containing our closest neighbour, the red dwarf star Proxima Centauri, is 4.3 light years away. A light year is one of the standard astronomical units of distance when measuring in miles gets silly.

Consider this: the photons of light travelling from Alpha Centauri take nearly four and a half years to enter your pupil... and that's travelling at the speed of light (at 186,000 miles per second – Einstein's Theory of Special Relativity states that this is the cosmic speed limit). I'll allow the reader to calculate this gargantuan distance in miles, but remember: this is just the very closest stellar system to the Earth! Some of the newly discovered extra-solar planets are hundreds, even thousands, of light years distant. It's all a far cry from the three days it took NASA to deliver their astronauts to the furthest point in deep space that the human race has ever travelled... a measly 230,000 miles to the far side of the lunar orbit of Apollo 13.

Interstellar travel either at speeds close to that of light, or travelling through theoretically possible wormholes (tunnels through the fabric of space-time with a black hole at one end, and a white hole for ejection at the other) as propounded by both Caltech's [Kip Thorne](#) and Carl Sagan, both require the energy of a star, according to Einstein. At the speed of light, time stops for the observer in the reference frame of the spacecraft, so it literally would take no time at all for a round trip to, say, the Andromeda Galaxy, 2.5 million light years distant. However, although

⁴ Sagan, Carl, *The Demon-Haunted World: Science as a Candle in the Dark*, Ballantine Books, 1995, ISBN: 978-0345409461.

our travellers would not have aged at all, to the people the astronauts left behind on the Earth a round trip for the mission would take five million years, meaning that when the voyagers returned, their colleagues and friends would be long gone – even the human race itself might be extinct or have evolved into something else. The same would be true of any aliens planning the same feat.

There are further perhaps insurmountable problems, however. According to Einstein's famous equation $E = mc^2$, as a (non-photon) object approaches the speed of light its mass tends to infinity. Hence, an infinite supply of fuel would be required. Indeed, at any meaningfully relativistic speed to cut journey times, these same problems apply. ET, the extraterrestrial, would have to overcome these challenges if it had a human lifespan, unless multi-generational trips were adopted – hardly an attractive prospect for the travellers who would be born and die on the spacecraft.

So, although belief in UFOs may be a new religion to some, their existence is scientifically highly unlikely. Although there are probably millions of habitable worlds in the cosmos, on average they must be many thousands of light years apart, and the technology required to travel such distances would place any civilisation possessing it vastly ahead of homo sapiens in evolutionary terms. Even if there do exist sentient beings capable of such travel, the costs to their civilisation would be enormous. And why expend such energy just to abduct our women and mutilate our bovine livestock? Presumably any such advanced civilisation would have the power to replicate anything it desired, rather than want to travel vast distances for the real thing. The lack of any physical evidence at all from either the present day or from antiquity is also telling; grainy photographs and anecdotal stories simply aren't enough.

Stories of abduction, such as [Travis Walton](#)'s alleged abduction by an alien spacecraft in Snowflake, Arizona, in November 1975 and immortalised in his subsequent book *The Walton Experience* and the 1993 movie *Fire in the Sky*, again have produced no physical evidence that the events concerned truly happened. As with the [Betty and Barney Hill](#) case before it in September 1961, Occam's Razor offers the simpler solution of psychological trauma and phenomena on the part of the 'abductee', rather than physical abduction by inhabitants of Zeta Reticuli.

In all my time in amateur astronomy, I have only had one tantalising moment when I truly witnessed something in the night skies above County Durham that, although I could explain it, was at the time quite exciting, and the acronym 'UFO' ran through my mind. On a balmy May evening in 2010, I had been observing some deep-sky objects, such as Bode's Nebula M81 and M82, with my Newtonian reflector. Every so often then, as now, I would look up with my naked eyes to see if there were any satellites passing overhead or any meteors making a show. Travelling quite high up in the east from north to south were five bright orange lights in a large triangular shape possibly five or six degrees in size. Between the lights I couldn't see any stars, and the lights were moving quickly, perhaps at the speed of a commercial passenger jet aircraft. Several weeks later there were reports on the internet from members of the public in other areas of north-east England concerning the orange lights in the sky.

So what were they? A huge V-shaped alien craft with orange markers around its silhouette? Were the Phoenix lights visiting County Durham? But just when you start to get excited and want to call [MUFON](#), your scientific mind engages that pesky Occam's Razor and scepticism.

Sure, the lights could have been all of those things, and much more. But they are thousands of times more likely to have just been a squadron of RAF aircraft flying in formation over the night

skies over north-east England. Not exciting at all, really, unlike the UFO hypothesis, but much nearer the truth. Now just imagine how many fewer UFO reports and books would be written if the general public used a little less imagination and a little more scepticism. And more to the point, just think of the money saved by the gullible against the charlatans purveying their UFO literature and promotional merchandise!



Snippets

John Crowther



West or east?

The *Evening Gazette* apparently doesn't know the difference – to be more accurate, at this time of year it appears not to know the difference between north-east and north-west. For it labelled a photograph of the sun rising just north of [Huntcliff](#) as viewed from Saltburn as 'a stunning Saltburn sunset'.

So does this error put in the shade (pun unintentional) Neil's overhearing the words 'Where's the North Gate?' as the sun set?

Card rockets

Having built card model kits of historic sailing ships, I receive the free quarterly leaflet *Cutting Remarks* from [Marcle Models](#) (tel. 01494 765910). The latest one had an article 'Journey into Space', with details of kits for rockets, lunar vehicles and so forth. It's surprising how one's interests sometimes blend into each other.

[John enclosed a copy of the article, which is too long and detailed to include here – and I'm a bit iffy about reproducing its contents verbatim anyway, for copyright reasons, even if it is effectively an advertising brochure! However, for those who might be interested, below is a selection of kits mentioned. – Ed.]

- V1 and V2 rockets (1:24), £15.95 from JSC
- Vostok 1 (1:25), £18.95 from Quest
- (Alan Shepard's) Mercury–Redstone MR3 (1:50), £12.95 from Modelik (see *Figure 6*)
- (John Glenn's) Mercury–Atlas MA6 (1:50), £16.95 from Modelik
- Titan II and Gemini (1:33), £20.95 from Hobby Model



Figure 6

- NASA Lunar Vehicle (1:25), £10.95 from Wilhelmshaven (see Figure 7)
- Columbia Space Shuttle (1:72) , £29.95 from Hobby Model
- Titan 34 D (1:33), £19.95 from Hobby Model (standing about 5 feet tall!)

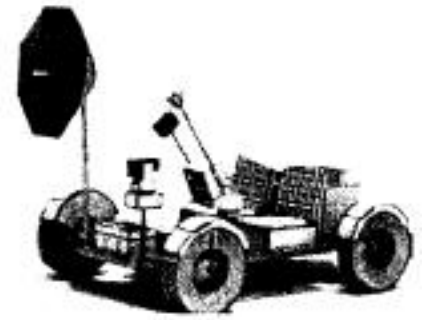


Figure 7

THE TRANSIT QUIZ

Answers to June's quiz

[As in an earlier, quiz, the questions were based on end-of-chapter summaries in [Universe](#) (6th edn), by Roger Freedman & William Kaufmann III (WH Freeman and Co., New York, 2001.).]

1. All clouds on Uranus and Neptune are composed of **methane**, which absorbs light and gives these planets their greenish-blue colour.
2. Resonances from Jupiter's gravity cause empty regions, called **Kirkwood** gaps, in the asteroid belt.
3. As a comet approaches the Sun, an ion tail and a dust tail form, pushed out by the **solar wind** and **radiation pressure** respectively.
4. Comets are thought to originate from two regions, the **Kuiper** belt and the **Oort** cloud.
5. **Helioseismology** is the study of how the Sun vibrates.
6. The absolute magnitude of a star is the apparent magnitude it would have if viewed from a distance of **10 parsecs**.
7. The Sun has been a main-sequence star for about 4.6 billion years and should remain one for another **5 billion** years.
8. When the central temperature of a red giant reaches about 100 million K, **helium burning** begins in the core.
9. **Cepheid** variables are high-mass pulsating variables, with a direct relationship between period of pulsation and luminosity.
10. More than 99% of the energy from a Type II supernova (a collapsing high-mass star) is emitted in the form of **neutrinos**.

The summer's (longer) quiz

Answers to all the following questions could have been found in recent editions of *Sky at Night Magazine*.

1. NASA's Cassini probe has found evidence indicating that Titan's deserts darkened following what event?
2. In what year did Comet Shoemaker-Levy 9 crash into Jupiter?
3. Associated with two astronomers in the 1940s, of what is the following a definition? 'Small patches of nebulosity associated with newly born stars, formed when gas ejected by young stars collides with clouds of gas and dust nearby at speeds of several hundred kilometres per second.'
4. Which moon of which planet is sometimes called the 'yin-yang' moon, and why?
5. What is the popular name of β Cygni, a beautiful yellow and blue double star?
6. Who commanded the first orbital Space Shuttle mission, on 12 April 1981?
7. Why should we astronomers be very grateful to Story Musgrave, Jeffrey Hoffman, Thomas Akers and Kathryn Thornton?
8. There are two globular clusters in Hercules that are in Messier's catalogue. The famous one is M13 – what's the other?
9. On 29 January, the Pan-STARRS PS1 telescope in Hawaii discovered 19 previously unknown examples of a particular kind of object. Which was?
10. What have or had Paul Johnstone, Pat Owttram, Pat Wood, Pieter Morpurgo and Jane Fletcher in common?
11. Which faint Southern Hemisphere constellation contains the Small Magellanic Cloud?
12. What was the UK's first Dark Sky Park?
13. Who first determined the parallax of a star other than the Sun, and when and for what star?
14. What/who was B2FH?
15. In 2001 the Hubble Space Telescope measured the Hubble 'constant', the rate of expansion of the universe, at approximately 72. But in what units?
16. What enduringly important relationship was discovered by Henrietta Swan Leavitt in 1908?
17. The Cosmic Microwave Background was first mapped by the COBE satellite and then in

greater detail by WMAP. What's the name of the current, even more accurate survey mission?

18. The Cassini Division is a gap between which two rings of Saturn?

19. What's the better-known, English name of the lunar feature Rupes Recta?

20. What was the only space probe so far to travel close to Uranus?

