TRANSIT

The July 2010 Newsletter of

NO MEETING IN JULY OR AUGUST

The next regular meeting is on 10 September 2010

Contents

Editorial

Rod Cuff

I've now edited a year's worth of *Transits*, so it feels a good time to review what they've contained. I started out wanting to include as much material as possible from CaDAS members, so it's deeply satisfying to realise that every contribution but one in this period was written by one of us: no internet copy or press release or even material *based* on a press release (just one article from *Practical Astronomy* magazine about the Ghana planetarium). So take a bow, all those below in alphabetical order who have contributed at least one letter, article, review or photograph during the past year:

Sue Barnes, Dave Blenkinsop, Ray Brown, John Crowther, Pat Duggan, Andy Fleming, Mike Gregory, Neil Haggath, Barry Hetherington, Keith Johnson, Dave Lewis, John McCue, Alex Menarry, Ian Miles, Rob Peeling, Ed Restall, Michael Roe, Mike Smith, Ray Stapleton, Dave Weldrake and Ray Worthy

Keith, **Alex** and **Dave** all did rewarding series; moreover, Keith and Alex each contributed at least 12 items.

The star turn is of course **Rob**, who not only wrote more than a dozen one-off items but also supplied us with his monthly Skylights, which must have fuelled numerous observing sessions during the season. Thank you, Rob and everyone, for making *Transit* whatever it is. (Now please do it all over again for the next 12 months ...)

The *For sale or wanted* section hasn't exactly been a success, though …

A few other things:

- See item 6 of the accompanying minutes of the recent committee meeting for an outline of a new venture this coming season: informal or semi-formal workshops, tutorial sessions, call them what you will. More on this in next month's issue.
- Is anyone interested and active in amateur radio astronomy? If so, please contact Dani at GNF00X@gmail.com – Dani came to our June meeting.

And I'm going to pull Editor's Privilege and include a chunk of poetry. I find it quite affecting, reminding me of feelings I sometimes have in the quiet dead of night gazing up at the stars – but I also have an ulterior non-astronomical motive for including it (see later):

> As I watch the bright stars shining, I think a thought of the clef of the universes and of the future.
>
> A vast similitude interlocks all,
>
> All distances of place however wide,
>
> All distances of time,
>
> All souls, all living bodies though they be ever so different,
>
> All nations, all identities that have existed or may exist,
>
> All lives and deaths, all of the past, present, future,
>
> This vast similitude spans them, and always has spanned,
>
> And shall forever span them and compactly hold and enclose them.

This is by Walt Whitman, from *On the Beach at Night Alone*, part of his collection *Leaves of Grass*. It was set to music by Ralph Vaughan Williams as the slow movement of his *Sea Symphony*, which I and the rest of Cleveland Philharmonic Choir are performing, with an excellent orchestra and world-class soloists, on 31 July as part of the opening concert of Hartlepool's Tall Ships celebrations. You'll find more about it, along with links to evocative videos of some of the music, at www.clevelandphilharmonicchoir.com/futureconcerts.htm . It

should be a terrific concert; if you like classical music at all, do please consider coming along. If you're curious to hear a bit of the music or you love whales and dolphins, click on the link above and then on the Movement 3 video.

This issue is a fine example of Rob's productivity, as you will see from the Contents page! Nevertheless, it's shorter than usual, which has tended to be the case for out-of-season issues in general. The same might well be true of August's, but feel free to prove me wrong – the copy deadline is **Friday 30 July**.

Rod Cuff, info@cadas-astro.org.uk*,1 Farndale Drive, Guisborough TS14 8JD (01287 638154)*

Letters

Detective work on the NGC

Rob Peeling

Recently I've been engrossed in trying to work out which galaxies Admiral Smyth is talking about in his *Cycle of Celestial Objects* (Smyth's telescope is shown here). The other night I found an error in the 1864 General Catalogue by John Herschel which the NGC/IC Project team have not spotted.

It refers to a galaxy (near M84 & M86), the discovery of which the project's website credits to Auwers. This is because John Herschel gives the credit to Auwers in 1862 in the General Catalogue (GC) – but in fact Herschel got his records scrambled, and the first observation seems to have been by John himself before 1833. The position he gives in his 1833 Slough Observatory catalogue precessed more or less spot-on to the modern position.

Also, how could Smyth (using John H's 1833 catalogue reference) be referring to an object in a book published in 1844 if it was discovered by Auwers 18 years later?! Smyth's chart (horribly inaccurate) definitely indicates the area near M84 & M86. The position for the same (1833) reference in the GC is different and points to a spot about 10° further north (in the region of M88) where there seems to be nothing!

The Mysterious Universe

John Crowther

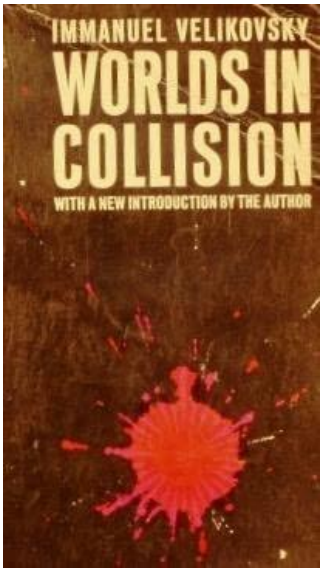
I hope this letter will make a connection with what John McCue wrote last month about why Venus spins backwards.

Many years ago in North Ormsby Market I bought a book for 10p (or it may have been two shillings). It was *The Mysterious Universe* by Sir James Jeans. The book had first been published in 1939, though my rather tatty dark blue hardback was slightly newer.

The preface quotes from Plato, where he speaks of his knowledge being limited, as ours still is. So he describes our experience of the world as viewing the back of a cave on which puppets cast vague shadows. John spoke to the Classics master of the college where he worked about this, though I can't remember his view.

In his book, Jeans' theory of the origin of the Solar System was that a near-miss by a passing star pulled out a filament from the Sun. This, he said, would have been cigar-shaped. From it the planets would have condensed, with the gas giants appearing from the thick centre. So the formation of a planetary system, according to Jeans, would be a rare event.

To our eyes, nature is wasteful, so Jeans' theory may boost our egos, for we set value on rarity, as stamp and coin collectors realise. In nature, for example, the percentage of adult fish surviving from the spawn of their parents is very low.



We now know that the number of protoplanets seems to be large. Yet when we consider the number of stars in a galaxy and the number of galaxies, it is still a very low percentage – all is relative.

As well as having Jeans' book, at that time I also had a copy of Velikovsky's *Worlds in Collision*. This was thick but even scruffier, once being mistaken for a Bible. It was published by Doubleday because Macmillan thought it beyond the pale. One aspect of the author's ideas resembled those of Jonathan Swift – this time it was not the realisation of a prediction about the moons of Mars, but that of the retrograde rotation of Venus.

Comments welcomed from members – John, Barry, Neil or others – to clarify my memories.

OBSERVATION REPORTS AND PLANNING

Skylights – July 2010

Rob Peeling

The Sun

The Sun is still remaining spot-free for longish periods. Have a look for some other effects while we wait for greater solar activity:

- 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 phenomenon is one of the lines of evidence that the Sun is gaseous, not solid.
- Examine the solar disk carefully for signs of **granulation** (a graininess over the disk) caused by small cells of circulating gas at the solar surface.
- Look for signs of **filaments** – brighter 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

4 July	11 July	18 July	26 July
Last Quarter	New Moon	First Quarter	Full Moon

Planets

Jupiter finally starts to rise before midnight in early July. The disappearance of the south equatorial belt has been widely reported by the media.[1] This should mean that lower-power views of the planet will show only one dark belt crossing the disk in place of the more usual two. It also means that the **Great Red Spot** (GRS) is more prominent, and in fact its colour is reportedly intensifying. I have found a website that predicts the transit times of the GRS at http://acquerra.com.au/astro/software/jupiter.html. The GRS will be my target this month because I have only seen it on a few occasions.

Neptune leads Jupiter into the sky in the evening. It lies roughly 2° northwest of iota (ι) Aquarii, a 4th-mag star about 13° south of Sadalmelik, alpha (α) Aquarii. Neptune will appear as a 7th-mag. 'star' in binoculars or a telescope finder – see the finder chart on the next page. Through a telescope using higher power, it becomes a tiny, bluish disk. I have two challenges for you to try with Neptune.

- Firstly, once you've found the planet and understand the surrounding star field, find out what the *smallest* optical aid is that you need to spot the planet. I've managed to get down to 10×25 binoculars on a couple of occasions – without going to a dark site.
- The second challenge is to obtain an image of Neptune's largest moon, **Triton**. At ~13.5 magnitude, a visual detection of Triton will be very difficult but not impossible with larger telescopes and dark skies. To help confirm your observation, you can find a predictor at www.skyandtelescope.com/observing/objects/planets/13795272.html for the position of Triton with respect to Neptune.

Uranus is conveniently signposted, as it lies only about 2° west of Jupiter. Uranus is much brighter than Neptune at 5th magnitude and therefore a relatively easy binocular/finder target. In the telescope you should easily spot the planet as a blue disk. It should be easy to spot without a finder chart as the brightest 'star' to the right of Jupiter in a binocular field. There is a star *almost* as bright as Uranus in the area (~ 0.5 mag fainter) but, as this is the one nearer to Jupiter, it won't be hard to tell the star and planet apart.

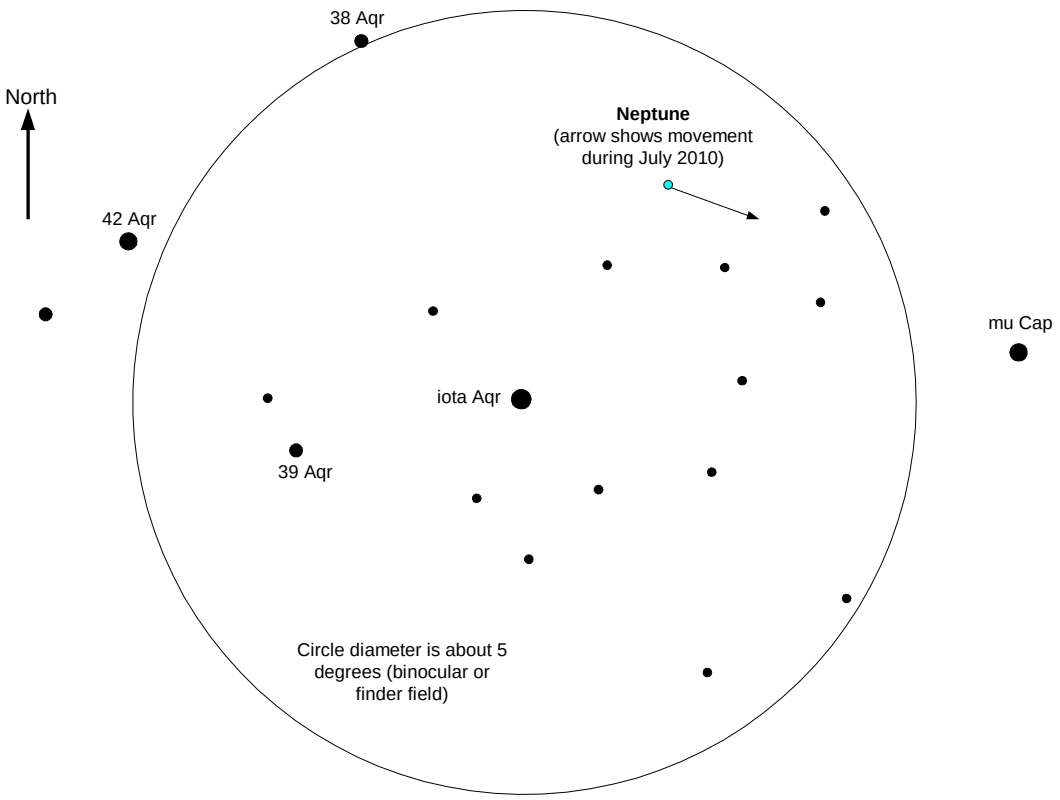
Noctilucent clouds

Between mid-May and mid-August is the best time for observing noctilucent clouds (NCL). The reasons for and origins of these clouds are still mysterious. They are completely different from the tropospheric (weather) clouds found in the lower 10 km of the Earth's atmosphere. NCL exist at around 80 km high in the atmosphere and seem to be ice crystals. They can only be noticed 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. NCL 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
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 is the Noctilucent Cloud Observers' homepage and contains plenty of information on how to record observations and the different types to be seen, together with photos to help you understand what to look for.

[1] *[See also the comparison pictures Rob showed in last month's* Transit*. – Ed.]*



Finder chart for Neptune in July 2010 (*R Peeling*)

NLC 2001 July 27–28 (*Tom Eklund, Valkeakoski, Finland*)

More double stars

Dave Blenkinsop

After the collection of double stars in Boötes that I talked about last month, here is another stroll through (mostly) doubles that I've observed through my 6-inch Dobsonian and 70mm refractor.

But first, let's start this time with a bang – the star cluster IC 4665, which I can easily see from my back yard with binoculars. It's just above and east of beta (β) Ophiuci. With my 70mm at 17× I see 16 stars of 7th–8th magnitude, well spread across the field. However, what about double stars in **Ophiucus**? I saw these next four on one particular night recently.

61 Oph: An easy, wide double with the refractor at 35×. Both components are white and with the same brightness, like a cat's eyes in the dark.

68 Oph: This looks like a wide, but it's actually just an optical double.

67 Oph: A nice double with the refractor at 17×.

70 Oph: Don't miss this one. With 47× on the refractor, I can just split it – it helps if you *know* it's a double! At 115× the main star is yellow-white and the companion reddish. It's about 20 light-years away. One interesting thing to do is to make a drawing of it (including a note of the magnification used), then check it out in the coming years to see the change in separation and position angle.

By the time I had observed these, it was 3:15 a.m., and I noted "The daylight cometh – I have to try another night." Cut, then, to a few nights later, waiting for the skies to get darker .. time to take a look at **alpha (α) Librae** – a wide double for hand-held binoculars – before moving to **Serpens Caput**.

Delta (δ) Ser: With the refractor at 47× I can just see it as a double, although it's much better at 140×. Both stars are white, one being about a magnitude brighter than the other.

α Her[culis] is a double to look at every night that you can. Tonight with the refractor at 140× the main star is pale yellow, the companion pale blue. The colours should be even better displayed at a darker site than from my yard.

If we go back to 70 Oph, move to 73 Oph, then half a low-power field east, and up one or two field widths, we find a wide double, one above the other, about 8th and 9th magnitudes. Moving further up one low-power field's width reveals a wide, faint double running east to west. The brighter component is a planetary nebula, NGC 6572[2]. It shows well with the 6-inch Dob, but I couldn't find it with the refractor from my yard.

Far to the east is **theta (θ) Ser** – two equally bright stars of about 8th magnitude easily seen at low power (again rather like a cat's eyes) and encased in a good low-power field. One of the pair is red.

Alas, there have been too many cloudy nights preventing me from finding more targets!

Venus

For those of us new to telescope observing, Venus has become interesting. Find it in early twilight, point your telescope at it and try a high power – the earlier you can catch it, the higher in the sky it will be and the less affected by the atmosphere.

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[2] *[The Blue Racquetball. – Ed.]*

So what would you see? In June Venus appeared rather small a bit more than half-phase, but was moving well away from the Sun. It reaches eastern elongation on 20 August, when it will be at half-phase. After that it gets bigger as a crescent phase. Because Venus has a thick, cloudy atmosphere, no surface markings can be seen, although faint shading can sometimes been seen along the terminator.

The planet is easy to find in the daylight sky if you have an equatorial mount – I found it recently at 14:50 GMT. The way to find it is to take an offset from the Sun, using information in *Sky and Telescope* or *Astronomy Now*.

GENERAL ARTICLES

Visit to Boulby Mine Dark Matter Experiment

Rob Peeling

You may or may not already know, but one of the top two or three physics labs searching for 'dark matter' in the world is on our doorstep. It's right at the bottom of Boulby Potash Mine to take advantage of the very low background radiation conditions there.

Ordinary everyday matter, such as that comprising you, me and the Earth, is by wide consensus only believed to account for about 4% of the total 'stuff' in the universe. Dark matter is believed to constitute a further 26% with the even more mysterious dark energy providing the balance. Theories exist about what dark matter actually is, but so far it has not been detected, as it barely interacts at all with our everyday world despite the stuff sleeting past and even through us the whole time. A couple of months back the international press covered a (so far) false alarm from the USA that dark matter had been detected.

The Zeplin III experiment at Boulby, together with the Americans and perhaps one other group worldwide, are the only experiments currently capable of operating in the expected range to detect dark matter. Detection is of a statistical rather than instantaneous nature, and each experiment needs to operate for roughly another 12 months to have a chance of making the big discovery.

On 19 May, three CaDAS members took advantage of a rare opportunity to descend to the bottom of the mine and visit the lab. Pat Duggan, George Gargett and I were the lucky trio and we were joined by another familiar face, Jürgen Schmoll, together with two of his colleagues from NetPark who had been separately invited. We were all kitted out with overalls, boots, helmets etc. and given a thorough safety briefing (Boulby Potash remains a fully functional commercial mine), and headed for the pithead. We collected our helmet lamps and respirators (in case of fire) and, having handed our tallies to the Onsetter, got into the cage. It takes about 6 minutes to descend 1100 metres. At the bottom of the shaft it was warm, very dry and very dusty, but the dust was pure salt. The Dark Matter Lab was about a 600-metre walk away through the 1000 km maze of tunnels that is Boulby Mine (they add another 40 km each year). The miners themselves work 14 km away underground in much hotter and harsher conditions than we experienced. Fittingly for a dark matter lab, the tunnels are unlit and you have to rely on your helmet light until you reach the lab. Occasionally diesel pick-up trucks drive past in choking clouds of salt dust carrying miners about their tasks. The tunnels are big, about 8–10 metres wide and 3–4 metres high. The salt keeps the air bone-dry, so despite the heat it wasn't uncomfortable. There is a strong draft of air at all times (forcing fresh air to the miners working 14 km away).

The biggest surprise in the lab itself is that it a bit like the crazy house at the fair! It turns out to have been built across a geological fault and this has shifted, leaving the floors, walls and ceilings at all sorts of strange angles. The challenge for the scientists has been to keep the

dust of the mine out (the lab is a 'clean' room as in an electronics factory). The result is that large parts of the lab look as though they are held together with gaffer tape.

Our guide and host gave a great explanation of the working experiments as we looked at them all. One surprise was that the lab is also starting to host experiments investigating aspects of climate change – the reason being that the low-radiation environment is exactly what's needed to investigate details of cloud formation.

To quote Wallace and Gromit, 'A grand day out'. Sadly, the Science and Technology Facilities Council (STFC) funding for Zeplin runs out in October. Unless further funding is found, then Britain will be out of the race. There is a further and similar experiment down the mine – DRIFT – but the funding is 100% USA and in its current development configuration it is not sensitive enough to make the essential first detection.

As big, flagship science for the UK, the Boulby project represents something of a bargain for British people. As is it established within a fully operating commercial mine, the operating cost of keeping the facility open is only about £300,000 p.a. Probably another £1M is sufficient to keep the Zeplin experiment running for long enough to perhaps win the (Nobel) prize. As value for money, this has to compare highly favourably with the £500M so far invested by STFC in the Large Hadron Collider at CERN. The USA is spending half a billion dollars on a new dark matter research facility at Homestake Mine in South Dakota.

Times are of course hard, and cuts have to be made. However, it seems complete folly for the STFC not to fund (as at present seems likely) such a cost-effective opportunity for our country to excel and lead in science. It's a trifling amount to trim from big projects such as the LHC to keep the Boulby experiment going. What if they succeed? With hard times ahead, we will urgently need some good-news stories. Perhaps this could be the one.

If you too feel the Boulby Dark Matter experiments should be a special case, please try writing to your local MP or to the Minister of State for Universities and Science, David Willets. I have done so, and my MP has written back to me enclosing a copy of a letter supporting Boulby that he sent on to David Willets.

Zeplin-III (the outside of the Gamma Ray Shield)

Picture: www.hep.ph.ic.ac.uk/ZEPLIN-III-Project

Caroline Herschel's Nebulae

Rob Peeling

Caroline Lucretia Herschel (16 March 1750 – 9 January 1848) was the younger sister of William Herschel, the discover of Uranus. She originally followed her brother from Hanover to England in order to establish herself as a singer with William's support and protection. He was at the time the Director of Music in Bath. Instead, she became the world's first female professional astronomer, with an annual pension from King George III. Most of her work was in support of her brother's observations, by keeping his records and helping prepare his catalogues for publication. To some extent she provided similar assistance to William's son John when he followed in his father's footsteps. In 1782, William gave her a telescope of her own. Over the years, she used this to discover or re-discover eight comets and a number of deep-sky objects thus establishing Caroline ((shown here in her nineties) as a skilled observer in her own right.

She discovered her nebulae in a short, 18-month period starting in 1783. The previous year William and Caroline had moved from Bath to Datchet to allow William to take King George's offer of a position as the King's personal astronomer, following his discovery of Uranus. This is the point in William's life when he changed from being a professional musician and amateur astronomer to a being a professional astronomer (and telescope maker – one of her telescopes is shown here).

This is Caroline's own memoir of this short period of discovery:

In my brother's absence from home, I was of course left solely to amuse myself with my own thoughts, which were anything but cheerful. I found I was to be trained for an assistant-astronomer, and by way of encouragement a telescope adapted for 'sweeping', consisting of a tube with two glasses, such as are commonly used in a 'finder', was given me. I was to 'sweep for comets', and I see by my journal that I began August 22nd, 1782, to write down and describe all remarkable appearances I saw in my 'sweeps', which were horizontal. But it was not till the last two months of the same year that I felt the least encouragement to spend star-light nights on a grass-plot covered with dew or hoar frost, without a human being near enough to be within call. I knew too little of the real heavens to be able to point out every object so as to find it again without losing too much time by consulting the Atlas. But all these troubles were removed when I knew my brother to be at no great distance making observations with his various instruments on double stars, planets, &c., and I could have his assistance immediately when I found a nebula, or cluster of stars, of which I intended to give a catalogue; but at the end of 1783 I had only marked fourteen, when my sweeping was interrupted by being employed to write down my brother's observations with the large twenty foot.[3]

[3] Memoir and Correspondence of Caroline Herschel by Mrs John Herschel, 2nd Edition, John Murray, 1879 (reprinted 2000 by the William Herschel Society).

On page 12 is that list of 14 objects. Except for number 7, NGC 253, Caroline's galaxy in Sculptor, they are all fairly easy to observe from Teesside. In theory, it is possible to catch them all in one night in early October or so. In reality they are best picked up steadily over the year. I don't recommend these as necessarily the most dramatic and interesting objects in the sky, but I do think the history of their discovery makes finding them worth the effort.

You may well be wondering how on earth a couple of Messier objects got into the list, as Messier published before Caroline began her sweeping. Here is Caroline's account of her (re-)discovery of M48:

M48: 8th March 1783
At an equal distance from 29 & 30 Monocerotis, making an equilateral triangle with those two stars is a nebulous spot. By the telescope it appears to be a cluster of scattered stars, it is not in Mess. Catalogue.[4]

Caroline was right. Messier had made a mistake in his published position for his 48th object. This wasn't corrected until 1959 by TF Morris.

So modern scholarship has been able to show that, for a number of the objects, Caroline was not in fact the first to report them. However, she could not be aware of these prior claims and therefore can be fully credited for their independent re-discovery. I very much like the note of quiet satisfaction when she noted that an object is not in Messier's catalogue, as here:

NGC 6633: 31st July 1793
About halfway from S Sepentarii towards theta Serpentis, a Cluster of large stars. I counted about 80. ***Mess. has it not.***

THE *TRANSIT* QUIZ

Answer to June's crossword

Across

9. Acrobat. 10. Eridani. 11. Andromeda. 12. Encke. 13. Clump. 14. Chi. 16. Hydra. 16. Pinstripe [*Pinwheel Galaxy, tiger stripe*]. 21. Orion. 22. Ice. 23. Aloha [*Keck is on Hawaii*]. 24. Polar. 26. Principia. 28. Cassini. 29. Tourist.

Down

1. Balance. 2. Iridium. 3. Absorption. 4. PTFE [*polytetrafluoroethylene*]. 5. Beta Librae. 6. Mice. 7. Cascade. 9. Wise man. 14. Cassiopeia. 15. Hipparchus. 17. Compact [*MAssive Compact Halo Object*]. 18. Airless. 19. Dolphin. 20. Galacto. 25. Rain. 27. Iota

July's quiz

Where in the Solar System would you find the following?

1. STZ 2. Nereid 3. The Kirkwood gaps 4. Carrington rotations
5. TLPs 6. May transits of 13 and 46 years 7. Counterglow
8. Stickney 9. Valhalla 10. Chondrules

[4] Deep Sky Companions: Hidden Treasures, Stephen James O'Meara, Cambridge University Press, 2007

Caroline Herschel's Nebulae

Number (in order of discovery)	Date of Discovery	M/NGC/IC	Constellation	Object Type	J2000.0		Mag.	Diam.	Remarks	Discovery Instrument
					RA	Dec				
1	26/02/1783	2360	CMa	Open Cluster	07h17.7m	-15°38'	7.0	14.0'		4.2" Reflector
2	08/03/1783	M48	Hya	Open Cluster	08h13.8m	-05°45'	5.8	30'	Re-discovery (Messier 1771)	3.3" Refractor
3	23/07/1783	6866	Cyg	Open Cluster	20h03.9m	+44°09'	7.6	15'		4.2" Reflector
4	31/07/1783	6633	Oph	Open Cluster	18h27.2m	+06°30'	4.6	20'	Re-discovery (de Cheseaux 1745)	Refractor
5	31/07/1783	IC 4665	Oph	Open Cluster	18h38.9m	+05°26'	4.6	40'	Re-discovery (de Cheseaux)	4.2" Reflector
6	27/08/1783	M110	And	Galaxy	00h40.4m	+41°44'	8.0	22'x11'	Re-discovery (Messier 1773)	3.3" Refractor
7	23/09/1783	253	Scl	Galaxy	00h47.6m	-25°17'	7.1	26'x6'	Caroline's galaxy	4.2" Reflector
8	27/09/1783	659	Cas	Open Cluster	01h44.4m	+60°40'	7.9	6'		4.2" Reflector
9	27/09/1783	225	Cas	Open Cluster	00h43.6m	+61°46'	7.0	15'		4.2" Reflector
10	27/09/1783	189	Cas	Open Cluster	00h39.6m	+61°06'	8.8	5'		4.2" Reflector
11	29/09/1783	752	And	Open Cluster	01h57.6m	+37°50'	5.7	75'	Naked Eye, Hodierna 1654?	Refractor
12	30/10/1783	7789	Cas	Open Cluster	23h57.5m	+56°43'	6.7	25'		4.2" Reflector
13	12/05/1784	6819	Cyg	Open Cluster	19h41.3m	+40°11'	7.3	5'		4.2" Reflector
14	07/08/1784	7380	Cep	Open Cluster	22h47.3m	+58°08'	7.2	20'		4.2" Reflector