



TRANSIT

The Newsletter of



10th June, 2005. Julian Day 2453532



Another wonderful spiral to identify. The top image is in visible light and the lower one is taken in infra-red wavelengths (false colour, of course) by the Spitzer Telescope. Sorry they are in slightly different orientations but I am sure you can imagine the superposition.

Editorial

May meeting. CaDAS President, Jack Youdale, give his annual address at last month's meeting. His subject was the History of Space Flight. It is 50 years since the wartime rockets were adapted for orbital "flight" and in 1957 Sputnik surprised the world and alarmed the USA. Jack's account of the subsequent events in space complimented the very different events in space-flight history, recounted by Neil Haggath in March.

June meeting. On Friday, June 10th, Barry Hetherington will talk about the history of the important observatories of the world. It was a year ago when he was scheduled to give this lecture. On the night there was a medial emergency and it was not possible to carry on with the planned evening. You will be pleased to know that the person who was ill on that night has made a good recovery.

May Galaxy. The Milky Way of course. No-one suggested a catalogue number for it, so it can't have one. Very odd, don't you think?

June's Galaxy. Another pair of images in different wavelengths.

May Moon picture. The region of the Moon in the back page picture last month was where some observers have reported seeing a natural arch – now called O'Neill's Bridge, after the first reporter. Nowadays no-one believes an arch exists.

The June Moon. Keith Johnson has been imaging the Moon again and sent me this month's Moon picture. You will now know the four mare off by heart (?). What names are given to the two prominent craters between the two letter "C's"?

NASA Earth Imaging Software. One person – Malcolm Bannister - mentioned at the last meeting that he had downloaded WorldWind and used it to look at his local area. The advice is that this very large program needs an advanced computer with a lot of power. The images really are sensational but use a lot of computing resources. Any more reports from anyone else? Comments from members would be welcome.

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John Crowther's Q and A last month

From Neil Haggath

In the May *Transit*, John Crowther quoted two astronomical "questions and answers" from the Daily Express, and commented on the paper's answers. I would like to comment further.

Answer 1 (Apparent sizes of the Sun and Moon):

The paper's answer is correct. It is, of course, nothing but a coincidence that the apparent angular sizes of the Sun and Moon are almost identical; the Sun is roughly 400 times bigger, and also 400 times further away. We don't quite "get a perfect fit", as the paper says. As the orbits of both Earth and the Moon are elliptical, the distances, and therefore the apparent sizes, of the Sun and Moon each vary by a few percent, so that the Moon sometimes appears slightly bigger than the Sun, and sometimes slightly smaller. Hence we have both total and annular eclipses.

They are also correct in saying that this situation is temporary - though their timescale isn't quite right. The Moon's orbit is indeed becoming gradually bigger, as a result of tidal interactions. Several hundred million years ago, the Moon was significantly closer to Earth, so there were no annular eclipses of the Sun, while total eclipses were more

These were exposed for 45 and 13 minutes each respectively, so allowing time for weather and other uses of the Orschin Schmidt 48 inch telescope, the survey took from 1948 to 1954 – 6 years to complete the Palomar Sky Survey.

The survey itself was originally taken on glass photographic plates, 879 red and 879 blue light sensitive plates, 1,758 altogether, each 6.6 x 6.6 degrees, at a scale of 1.8 inches equal 1 degree, or 25 arc minutes to the inch.. The photographs are 11½ inches square, 14x17 inches including the border. The plates and photographs are in negative form, black stars on a white background. The magnitude limit is +21.1 for the blue plates and +20.0 for the red plates. The resolution is extremely good, at 2 arc seconds or better.

So what do the Palomar plates show? Basically, the best view in existence of the Universe north of 30 degrees south, in a permanent photographic form. Stars appear as black circles. Those of magnitude +10 or brighter show diffraction spikes, making them rather attractive. Galaxies appear everywhere, except the Milky Way region, our own galaxy. The face-on spiral galaxies are very attractive in appearance. Other, fainter, galaxies often appear in clusters. Some galaxies are faint, ghostly patches. In the Milky Way region, millions of stars appear with star clusters and nebulae both dark and light. Double stars are visible too, though bright, close, double stars appear single but fainter doubles can be resolved, the magnitude +10 ones down to about 8 arc seconds apart.

Asteroids appear on the Palomar Plates, too. The longer, 45 minute, exposures reveal them as short streaks 10 to 20 arc seconds long. The shorter 13 minute exposures show slightly oval objects in slightly different positions – there is about an hour between the blue and the red exposures. Mostly these asteroids are near the ecliptic.

The photographs all have a plastic grid of celestial co-ordinates and a chart of objects, mostly stars and galaxies with obscure catalogue names and numbers, though RNGC means NGC galaxies.

Since the plates were completed in 1954, many discoveries have been made from them. Astronomers used them to locate interesting objects before using larger telescopes to photograph them. I know that faint comets have been discovered on the Palomar Plates as little as 10 years ago and the new Kuiper Belt objects can be located, enabling accurate orbital positions over 50 years to be made. If a genuine tenth planet is out there, it is quite likely to be somewhere on one of the Palomar Plates, hidden away among hundreds of millions of star images.

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The CaDAS Interview – Dave Blower

I remember a few years ago, at a Member’s Night, thinking what a brave man Dave was, when he gave a talk. He hadn’t been in the Society very long and yet had agreed to talk about his new “goto” telescope and how it worked. Since then we have been in touch quite a lot. When I told the Society about the BAA Variable Star Section project to convert their paper records to electronic form – which needs an awful lot of manual entry – Dave immediately agreed to do some of the work. It takes a long time to type up the data for even one star and the task has been going on for several years now. I thought it was time you all “met” this guy.

Where were you born and brought up? I was born in Stockton and was brought up there. I have two half sisters, one of whom still lives locally and we keep in touch.

Have you moved around the country a lot? No not a lot. I have stayed in the North East most of my life. The only time I moved away from here was when I worked in the Shetland Islands for two years.

Tell me about your own family. My mother is still alive she is now in a nursing home. I have two grown-up daughters - Elaine lives in Middlesbrough and Jean in Cornwall. So one is easy to visit but the other needs quite an epic journey to the deep Southwest.

When did you first get interested in Astronomy? It must have been about 4 years ago, when I thought I would extend a theoretical interest in astronomy into observing the sky. When asked what I wanted for a present, I first opted for some binoculars, since all the books say that is the way to begin. However, I promptly changed the request to a telescope. I now have a Tasco 4-inch reflector and a Meade Goto three-inch refractor. They are small and easy to set up and use. After a year of observing by myself, I discovered the Cleveland and Darlington and I joined the society about three years ago. Most of my observing is done in the back garden, it is so convenient to just go outside and get set up. However, I visit the Castle Eden Car Park on Friday nights occasionally and join the other keen observers. You learn a lot from the other people there.

What is your favourite type of astronomy? My favourite objects for viewing are the planets, the moon and star clusters. Distant galaxies interest me. The attraction is the thing Ros Balmforth talked about in last month's interview – the feeling of looking into infinity and thinking about the distances involved and light travelling all that way.

Have you done any telescope making? Not so far, although I admire anybody who does it. Maybe one day there will be time to do that sort of thing. It's all about finding time, I guess.

What is good about the Society and what would you change? I enjoy the talks each month; they are of consistently high standard. We are also fortunate to have some knowledgeable people who can give them as well as listen to them! I can't think of anything to criticise about the Society. The organisation is good and the Observatory and Planetarium are very high standard. I would like to see the Wynyard observing project put on a firmer footing. I know it is difficult since there are only a small number of local volunteers to help but if we could meet and observe more together, we would all get to know more people in the Society.

What was your educational route? I left school with just a few CSE's, then went to the local College to do my O & A levels. The subjects I enjoyed most were physics and art. For a career, I went on to study for an HND in Civil Engineering at the local Polytechnic. The Open University enabled me to do an honors degree in Technology. By profession, I consider myself an Engineer. I am fairly computer literate and use it for all the usual things – word processing, number crunching, typing up the BAAVSS stuff, the internet and email; that sort of thing.

Do you worry about asteroid strike and global warming? As far as asteroid strikes are concerned, No. If it's going to happen it will and I don't think we will ever have the technology to divert one away in time. Global warming is a serious concern, though, as the Antarctic is being affected, as well as glaciers all over the World. It is now so very noticeable that it seems impossible that there are those who deny global warming is a fact. The ozone is the thing that protects us and we are slowly destroying it. How can we be so stupid, collectively?

Do super massive black holes excite you? Black holes are endlessly interesting and fascinating. I don't think they're fully understood even now and it is interesting to watch the observations as they improve and the theorists trying to explain them.

In astronomy, you are a life-long learner – would you agree? I'm always learning something new from Dave & John on a Friday night. As well as the Open University degree I took, I have just finished an adult teaching certificate so I can maybe do some part time lecturing. Other external courses I have studied are basic Astronomy with the OU and Leeds University. Fred Stevenson's course "The Introduction to Astronomy" was very enjoyable. Meeting like-minded people there was part of the enjoyment. John McCue is someone who also inspires me to do more and learn more.

Do you like travelling? Yes, I went to Nice last November and visited the famous Matisse and Chagal museums. A couple of years ago I decided to go and to see a lifelong mate of mine, Derek. That was a very memorable trip. I love France and will be going there as often as possible. I have never been on an Astronomy holiday but keep looking at the adverts and considering one.

What is the essence of astronomy for you? Just enjoying looking at the constellations and planets. Observing the sky and just enjoying the wonder of it all. There is always something to search for and see again and see more each time.

Have you any heroes? Yes. Patrick Moore is a heroic figure, as far as I am concerned. Someone who didn't have a formal education in Astronomy but has become a major figure, known to astronomers the World over. I wouldn't miss the Sky at Night for anything.

Do you have time for any other interests and hobbies? Yes I paint and help run Cleveland Art Society. I am also a keen photographer.

And you like music? Oh, yes, I enjoy music a lot. I listen to classical music mainly. There are local church barn dances I go to from time to time and have a good evening there. I play the guitar in a local church music group.

What about the theatre and films? I love West End Shows and sometimes go to the Little Theatre in Middlesbrough. I like action movies, such as the James Bond and Indiana Jones movies - and the Star War films, of course. I have only been to one ballet and that was a classic - Swan Lake at the Billingham Theatre and I enjoyed that.

However, I wasn't inspired to take up regular visits to the ballet. I have seen all the Harry Potter and Lord of the Rings series and they were both very entertaining. My favorite film? It is a toss up between Where Eagles Dare (remember "Broad Sword calling Danny Boy") and the Terminator films ("I'll be back"). All great action stuff, very male and macho.

What are you reading at the moment? Current reading is a book about Cézanne, part of my study of modern French artists. For anyone who likes biographies of famous people, I would recommend the one by David Jenkins on Richard Burton entitled "A Brother Remembered". You tend to forget that the big stars of stage screen and radio had a family and were young lads at one time, with brothers and a normal life for a while.

What is your most satisfying astronomical achievement to date? I don't know if it an achievement but it was very satisfying to be able to take some photos of the occultation of Saturn by the Moon a couple of years ago. Watching these things is interesting in itself but to be able to photograph it all is very exciting. It all happens so quickly. I admire the guys like Keith Johnson and Malcolm Bannister who are able to get such amazing images all the time.

Do we do enough to combat light pollution? My back garden was lit by an intrusive streetlight, so I got the council to fit a cowl deflector and now my back garden is in darkness. Local councils are now beginning to replace new streetlights with designs that only shine onto the highway. The nearest road which could possibly affect the observatory is the main Sedgefield Stockton dual carriageway. I'm not sure what type of lighting is there. However, if my experience is anything to go by, they would be very sympathetic to changing the lighting to avoid ruining the view from somewhere like our Observatory.

Where does your motivation and enthusiasm come from? A detailed knowledge of the night skies and how to find objects takes a long time to acquire, so I've plenty to go at, even with the help of my 'Goto' scope. I have to confess that I sometimes find excuses for not getting the scope out (it's too cold or there's something good on TV) but if I make the effort, even if its only for half an hour, then if I do some observing I always feel it has been worthwhile.

Who has influenced you the most? In astronomy? That must be Dave, who on Friday nights is always willing to show me something new. Rob is another member of the Society who has also helped me a lot on the Wynyard project.

If you were World dictator, what measure would you introduce? Better redistribution of wealth globally. *And your definition of a civilised society?* One that tolerates each other's religion.

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Astronomy in Prague

by Neil Haggath

I've just spent a short mini-holiday in the beautiful city of Prague, capital of the Czech Republic. As well as the standard sightseeing, my trip took on something of an astronomical flavour.

Two of the greatest astronomers in history had associations with the city, and worked together there for a time – namely Tycho Brahe (1546-1601) and Johannes Kepler (1571-1630). Near the city's famous castle, in a street named after Kepler, stands this fine memorial to the pair of them.



Tycho, the Danish aristocrat, was the last “great astronomer” of the pre-telescopic era, and one of the greatest observers who ever lived. Most of his work was done at his private observatory on the island of Hven in Denmark, aided by very generous funding from the country's King Frederik. He produced a star catalogue and planetary tables, which were by far the best ever produced up to that time.

After his patron died, however, his son didn't approve of Tycho's work, and cut off the funding. After a major falling-out with the new King, Tycho decided to leave Denmark. He was invited to Prague by Emperor Rudolph II, to become his “Imperial Mathematician”; he accepted, and arrived in Prague in 1598.

Tycho then invited the young German, Kepler, to join him there as his assistant. Their partnership didn't last long, however, as Tycho died prematurely in 1601, as a result of his habitual over-indulgence in food and wine. (Quite appropriately, a house where they both lived for a time is now a beer hall!) His tomb is in a church near Prague's Old Town Square; unfortunately, I wasn't able to see it, as the church isn't open to tourists.

Though Tycho was a marvellously skilled observer, he wasn't much of a theorist; he was the last of the “great astronomers” to stubbornly hold onto the outdated idea that the Earth was the centre of the Universe. Kepler, by contrast, was one of the greatest theorists of all time – though he did have some strange ideas which were rooted in the ancient world. After Tycho's death, he succeeded him as Imperial Mathematician, inherited all his observations, and subsequently used them to prove his former boss wrong and Copernicus right.

At first, Kepler wasted a great deal of time and effort, developing a bizarre theory of the Solar System, which had more to do with mysticism than science. (See John Crowther's article in the April *Transit*.) But to his credit, once he realised that this didn't work, he abandoned it and started all over again – and second time around, he got it right.

Kepler not only proved that the Earth and other planets orbit the Sun; he was also the first to realise that their orbits were elliptical, rather than circular. He is most famous, of course, for his three Laws of Planetary Motion, which were a major step towards the later work of Newton and the Theory of Gravitation.

And here's Yours Truly with the two great men.



Now to astronomy of a more modern kind. I visited Stefanik Observatory, which is situated on the 300-metre-high Petrin Hill in the suburbs of Prague. A funicular railway runs up the hill, but Sod's Law dictated that it was closed for maintenance, so I had to walk up. The observatory is open to the public, both during the afternoon for solar observing, and in the evenings for planetary and/or deep sky observing. It's equipped with a 16-inch Maksutov reflector and a pair of twin 8-inch refractors.



need exceptional equipment to ensure that we capture the event, whatever the details of the impact turn out to be," he explained.

Imagery and other data from the Deep Impact cameras will be sent back to Earth through the antennas of the Deep Space Network. But they will not be the only eyes on the prize. NASA's Chandra, Hubble and Spitzer space telescopes will be observing from near-Earth space. Hundreds of miles below, professional and amateur astronomers on Earth will also be able to observe the material flying from the comet's newly formed crater.

Deep Impact will provide a glimpse beneath the surface of a comet, where material and debris from the solar system's formation remain relatively unchanged. Mission scientists are confident the project will answer basic questions about the formation of the solar system, by offering a better look at the nature and composition of the celestial travelers we call comets.

"Understanding conditions that lead to the formation of planets is a goal of NASA's mission of exploration," said Andy Dantzler, acting director of the Solar System division at NASA Headquarters, Washington. "Deep Impact is a bold, innovative and exciting mission which will attempt something never done before to try to uncover clues about our own origins."

With a closing speed of about 37,000 kph (23,000 mph), what of the washing machine-sized impactor and its mountain-sized quarry? "In the world of science, this is the astronomical equivalent of a 767 airliner running into a mosquito," said Don Yeomans, a Deep Impact mission scientist at JPL. "It simply will not appreciably modify the comet's orbital path. Comet Tempel 1 poses no threat to the Earth now or in the foreseeable future," he added.

Ball Aerospace & Technologies in Boulder, Colo., built NASA's Deep Impact spacecraft. It was shipped to Florida Oct. 17 to begin final preparations for launch. Lift off is scheduled for Jan. 8 at 1:39:50 p.m. EST, with another opportunity 40 minutes later.

Principal Investigator A'Hearn leads the mission from the University of Maryland, College Park. JPL manages the Deep Impact project for the Science Mission Directorate at NASA Headquarters. Deep Impact is a mission in NASA's Discovery Program of moderately priced solar system exploration missions.

For more information about Deep Impact on the Internet, visit:
<<http://www.nasa.gov/deepimpact>>

NASA Observes one of the Brightest Cosmic Explosions

NASA press release sent by Ray Worthy

Scientists detected a flash of light from across the Galaxy so powerful; it bounced off

the moon and lit up the Earth's upper atmosphere. The flash was brighter than anything ever detected from beyond our Solar System, and it lasted over a tenth of a second.

NASA and European satellites and many radio telescopes detected the flash and its aftermath on December 27, 2004. Two science teams are reporting about this event at a special press conference today at 2 p.m. EST at NASA Headquarters, Washington.

NASA's Swift satellite and the National Science Foundation-funded Very Large Array (VLA) were two of many observatories that observed the event arising from neutron star SGR 1806-20. It is a unique neutron star called a magnetar, about 50,000 light years from Earth in the constellation Sagittarius.

The apparent magnitude was brighter than a full moon and the brightest of all historical star explosions. The light was brightest in the gamma-ray energy range, far more energetic than visible light or X-rays and invisible to our eyes.

"This might be a once-in-a-lifetime event for astronomers, as well as for the neutron star," said Dr. David Palmer of Los Alamos National Laboratory, N.M. He is lead author on a paper describing the Swift observation. "We know of only two other giant flares in the past 35 years, and the December event was 100 times more powerful," he added.

Dr. Bryan Gaensler of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., is lead author on a report describing the VLA observation, which tracked the ejected material as it flew out into interstellar space.

Other key scientific teams are associated with radio telescopes in Australia, The Netherlands, United Kingdom, India and the United States, as well as with NASA's High Energy Solar Spectroscopic Imager (RHESSI).

Neutron stars form from collapsed stars. They are dense, fast-spinning, highly magnetic, and only about 15 miles in diameter. Only 12 magnetars are known among the millions of regular neutron stars in our Galaxy and neighboring galaxies.

SGR 1806-20 is also a soft gamma repeater (SGR) because it randomly flares and releases gamma rays. Only four SGRs are known. The giant flare on SGR 1806-20 was millions to billions of times more powerful than typical SGR flares. For a tenth of a second, the giant flare unleashed more energy than the sun emits in 150,000 years. Magnetic fields around magnetars are responsible for SGR outbursts, but the details remain unclear.

"The next biggest flare ever seen from any soft gamma repeater was peanuts compared to this incredible December 27 event," Gaensler said. "Had this happened within 10 light years of us, it would have severely damaged our atmosphere. Fortunately, all the magnetars we know of are much farther away than this," he added.

During the 1980s scientists wondered whether gamma-ray bursts were star explosions

from beyond our Galaxy or eruptions on nearby neutron stars. By the late 1990s it became clear gamma-ray bursts did indeed originate far away. But the extraordinary giant flare on SGR 1806-20 reopens the debate, according to Dr. Chryssa Kouveliotou of NASA's Marshall Space Flight Center, Huntsville, Ala., who coordinated multiwavelength follow-up observations. A small percentage of short gamma-ray bursts, less than two seconds, could be from SGR flares.

"An answer to the short gamma-ray burst mystery could come any day now that Swift is in orbit", said Swift lead scientist Neil Gehrels. Scientists around the world have been following the December 27 event. RHESSI detected gamma rays and X-rays from the flare. Drs. Kevin Hurley and Steven Boggs of the University of California, Berkeley, are leading the effort to analyze these data.

For more information about the event on the Internet, visit: http://www.nasa.gov/vision/universe/watchtheskies/swift_nsu_0205.html

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Mike's May Letter

Mike Gregory often takes the trouble to write me a letter about the Transit he receives each month. It is always an ego-boost for me. If anyone is enjoying the monthly effort so much that they are moved to write and say so, It is all very worth while. It sounds as if Mike is about to emigrate to Europe and join his brother very soon.

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May 27th 2005.

Dear Alex,

Thanks for the May edition of Transit. Once again, no worthwhile observing for months, thanks to poor weather, light pollution, and assorted hassles! The last good night was about the middle of last September. Unfortunately our immediate neighbour has our garden bathed in light after dusk and most local households have some kind of security lighting now. Furthermore, our local residents' association is determinedly promoting the Cleveland Police policy of 'blighting the night with light' (my words but it means as much). It is no longer practicable to observe at home and I never feel safe setting my refractor up at Wynyard Woodland Park. All a bit depressing especially as I was given Sky Atlas 2000 for Christmas and I bought myself the companion catalogue. Sky Catalog 2000. I have never had any opportunity to use them in the field!

As to this month's galaxy, it is our Milky Way, though conditions are now so bad that I have not been able to see it with the unaided eye for some time. However, according to someone I know who lives at Charltons (near Guisborough), the Milky Way is regularly visible to the naked eye from his back door! I am not so sure about the Moon quiz as I am not much of a Selenographer. Is it regarding the area where bright light has supposedly been seen or where some astronomer claimed to have seen a natural bridge?

If memory serves me correctly, there was an article about this last subject some years back in one of the astro magazines.

Yours astronomically,

Mike Gregory

PS - My brother has just phoned at 23.00 hours from Pfarrkirchen in south east Germany. Pleasantly warm and the sky a mass of stars.

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Nostalgic Memories
By John Crowther

While on holiday in a seaside cottage, I found lots of reading in their little library for the evenings. There was Patrick Moore's "Yearbook of Astronomy for 1980" and "The New Annual of Modern Marvels", which was published in 1949. This book, aimed at young readers, starts with an article called "Rockets and Space Travel" by C.H. Gibbs Smith, M.A., F.S.R.A. and Companion of the Royal Aeronautical Society. The illustrations predate those of the winged step rockets of the 1950's and seem quaint to us nowadays.

One illustration shows a rocket above the highest clouds, heading towards a Moon which is circled by a halo. When it arrives, the caption says, there is a cloud of steam released to mark its position. In the main text this is altered to a load of white powder which is to be dispersed by an explosive charge and an automatic radio transmitter will also be used.

There were five other ancient illustrations of the author's idea of what space craft would look like in the future but they had been "crayoned" by a very young reader and rendered almost illegible.



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Transit Tailpiece

Quote/Unquote

These are all from John Crowther:-

The Universe is not to be narrowed down to the limits of understanding, which has been man's practice up to now, but the understanding must be stretched and enlarged to take in the image of the Universe as discovered.

Francis Bacon (Parasceve (Aphorism 4)

The food critic Sir Clement Feud has decided on his epitaph. His tombstone will read "Best before – followed by the date of his demise".

On the same theme an interesting sign has been displayed in a Pennsylvanian cemetery. It reads as follows : "Persons are prohibited from picking flowers from any but their own grave".

From a speech in the House of Commons : "Hands off the Church of England, it's the only thing that stands between us and Christianity".

In the days of compulsory Church parades, the Sgt Major marched the men to the church. He then appeared to become a little muddled as he ordered "ROAM OUT THE FALLEN CATHOLICS",

A council made an unfortunate choice in siting a box junction with the warning sign. It was put next to another sign which read "Make sure the exit is clear before you enter your box".

Famous Astronomers Series – 1

Fraunhofer, Joseph von, 18787-1826. Outstanding German optical researcher, orphaned in early childhood and rescued from poverty by the Elector of Bavaria. He joined the Physical and Optical Institute of Munich and was director from 1823. He invented the diffraction grating, constructed the best lenses in the world at that time and studied the dark lines in the Solar spectrum – the Fraunhofer Lines. He made the Dorpat refractor for Struve, which was the first telescope to be clockwork driven, and the famous Konigsberg heliometer. His comparatively early death was a tragedy for science.

Articles Please send contributions for the newsletter to Alex Menarry, 23, Abbey Road, Darlington, DL3 7RD, 01325 482597 (a.menarry@virgin.net) or to John McCue, 01642 892446 (john.mccue@ntlworld.com). Copy deadline date is the 25th of each month.

The Back Page Pictures



Our man on the spot for the Interview in June is Dave Blower, a very regular attendee of the monthly meetings and the observing sessions at the Planetarium.

And the Moon picture this month



Another of Keith Johnson's great images. It shows the four seas, which were the subject of the April brain tester, so you now know those, it goes without saying (?). Now, name the two prominent craters between the white and black letter Cs, at the edge of the Mare Nectaris. You may need to deploy the magnifying glass!