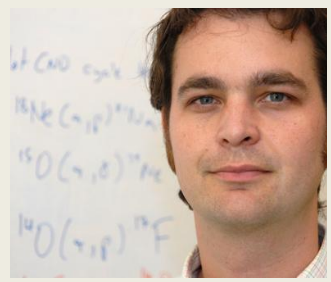
# TRANSIT

The April 2011 Newsletter of

Cleveland & Darlington Astronomical Society

| NEXT MEETING | |
|---|---|
| **8 April 2011**, *7.15 pm for a 7.30 pm start*<br>Wynyard Planetarium<br>**Nuclear astrophysics**<br>**Dr David Jenkins, *York University*** |  |

## Contents

# Editorial

*Rod Cuff*

At the time of writing, the future of the Wynyard Planetarium and of Ed Restall's post as Director still remain uncertain. CaDAS members, among others, have been gratifyingly active in contacting MPs, councillors and the media to good effect. Stockton Borough Council has said publicly that the Planetarium will remain available and will offer some kind of service, but the nature of the service and availability, Ed's role and future funding remain live issues. There have been many private and public expressions of support. Nothing is yet settled, it seems …

After last month's slightly downgraded issue (fewer illustrations and web links, no quiz), normal service is resumed in this one, with a strong observational bias. I had to rush the last one a bit because we went cruising up and down the Norwegian coast from Bergen to the Arctic Circle, partially in search of aurora sightings. We saw a few short ones, enough to (sorry) electrify me but leave me wanting more. Instead, alas, we got more storms: four gales of at least Force 9 (one of them gusting to Force 12), the worst weather on that route than anyone could remember. Maybe I should stick to solar eclipses (oops … sorry, Neil!).

**If *Transit* is going to the wrong email address or postal address, do please let me know. Also, if you get the mailed version and want now to switch to email, please let me know that too -- it will save us money!**

My thanks to all contributors, as ever. The copy deadline for the May issue is **Thursday 28 April**.

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

# Letter

## I've just met …

*from Neil Haggath*

... my fourth Apollo astronaut – Dick Gordon, of Gemini 11 and Apollo 12. He has signed my Apollo 12 crew photo, which was already signed by Alan Bean.

Before you ask – no, I'll never complete the set for that crew, cos Pete Conrad is dead. Would you believe, after going into space four times, he died in a motorbike accident!

*Neil*

# Skylights – April 2011

***Rob Peeling***

## The Moon

| 3 April | 11 April | 18 April | 25 April |
|---|---|---|---|
| New Moon | First Quarter | Full Moon | Last Quarter |

## The planets

**Saturn** is in the vicinity of Porrima, gamma (γ) Virginis, during April. Up to eight moons are detectable with amateur equipment. Titan is visible in almost all conditions (and through binoculars). Rhea is the next brightest, followed by Dione. Enceladus, Mimas and Tethys (together with Dione) stay pretty close to the ring system. Iapetus is easily seen but trickier to find, as it ranges much further away from the planet and can be well above or below the ring plane. Hyperion is the devil to spot because it wanders like Iapetus and is faint as well. A note of the time and a quick sketch of the orientation of the rings together with spots to show any flecks of light you notice is sufficient to sort out which are moons and which are stars, using a good planetarium program.

Have a look at **Porrima** while you're in the area. It's a close double that shows appreciable change over the years. Currently the separation is increasing.


**Figure 1. Saturn's satellites**

**(*credit*: the solarsystem wiki at http://thesolarsystem.pbworks.com/w/page/22154290/Titan)**

## Meteors

The **Virginids** shower provides a few meteors per hour from several radiants in Virgo, mostly through the first half of the month. There isn't really a clear maximum.

The **Lyrids** meteor shower lasts between 16 and 25 April with a maximum on the 21$^{st}$/22$^{nd}$ at up to 20 per hour. The radiant is in Lyra and the meteor stream is derived from Comet Thatcher.

## Deep sky

### Markarian's Chain

Markarian's Chain is a 1.5°-long arc of galaxies that all belong to the Virgo Cluster, although some of its members are in fact in the constellation Coma Berenices. It was first described by the Armenian astronomer B.E. Markarian (1913–85) in December 1961. A paper in 1983 by Litzroth supports the claim that seven of the eight do indeed seem to be moving away from us at the same velocity, i.e. as a group.

This area of sky is rich with galaxies. Photos easily pick out 14 galaxies along the original arc, from **M84** to **NGC 4477**. To the observer, the chain appears to logically extend an extra degree further north-east to **M88**, drawing in a further 4 potential members.

To find Markarian's Chain, first find the wonderfully named star Vindimiatrix or epsilon (ε) Virginis. This is a naked-eye star and so should be fairly easy to set your finder on. Now scan westwards (right) from Vindimiatrix to find a simple asterism of four stars with rho (ρ) Virginis in the centre. I call this the 'Space Rocket' because it reminds me of Thunderbird 3. Scan way up and to the right of the Space Rocket to find the next star as bright as ρ Vir; this should be 6 Com. Imagine a line between the rocket and 6 Com and start searching with a low-power lens just over halfway up to 6 Com. M84 and M86 should show up together in the same field, which is how you know you're in the right place. Now work slowly to the east (left) and you should pick up the first pair of galaxies. Continue east to some (very) faint stars; the next two galaxies are between them. Now work north (up) to pick up two more quite separate galaxies. Then take a biggish step north for one more, and finally sweep eastwards to see if you can finish on M88.

### Melotte 111, Coma Berenices star cluster

This cluster is impressively large and bright, filling the binocular view. It is the third-nearest star cluster to our Sun and only about 260 light years away. It is thought to be about 400 million years old, and because the force of gravity is so weak between its stars it is considered likely to disperse completely in the relatively near future – a few tens of millions of years! Scan your binoculars along a line between Denebola and Cor Coroli to find Melotte 111. It is somewhat closer to Cor Coroli than to Denebola. Unusually, the best views of Melotte 111 are with binoculars, not with telescopes. This is because the cluster covers so much sky.

### The Whale

Another nice galaxy to try for is **NGC 4631** in Canes Venatici, which is nicknamed the Whale. It is indeed a huge galaxy, and bright (for a galaxy, at any rate). It's also fairly straightforward to locate. Use Melotte 111, the Coma Berenices open star cluster, as a starting point. This is an easy naked-eye object. The stars in the cluster appear to indicate a direction northwards; follow this to a wide pair of 6$^{th}$-magnitude stars, scan south-eastwards with a low-power lens and you should catch your whale. There is no obvious core to this sprawl of stars, but there is a fairly well-defined bright band along the middle of its length.

# Keith's gallery

***Keith Johnson***

I've been experimenting and practising in readiness for Dalby starfest[1], to iron out any potential faults in my equipment. I've been using items from the list below, and am very grateful to John Gargett for his image-processing skills:

**Hardware**

Celestron 9.25" SCT
0.63× focal reducer
Meade 127mm triplet refractor
Williams Optics Mk3 0.8× flattener
EQ6 Pro equatorial mount
Canon 1000D DSLR (modified)

*Guiding*:

Williams Optics ZS66 apochromat
DMK 21 mono CCD camera

**Software**

Skymap Pro 9 (telescope control)
PHD (autoguiding)
Digital Photo Professional
Canon EOS (remote camera control)
DeepSkyStacker (image alignment and stacking)
Photoshop CS2 (image processing)

**Figure 2. The elusive M1 (Crab Nebula) in Taurus. [17 light frames, 10 darks, 14 flats]**

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[1] *[… which isn't until late August! The early astrophotographer catches the Whale … Keith also sent a composite picture showing before/at/after shots of a recent occultation of Eta Geminorum, but it wouldn't show up well here. It should look better on the Planetarium dome, though.*

*And by the way, Keith says these are 'only test shots', a statement that is very depressing for those of us struggling to get out of Base Camp on the Everest trail <8-) – Ed.]*

**Figure 3. M81 (*right*) and M82 in Ursa Major. [15 x 5-minute light frames @ ISO 800, 11 darks, 8 flats]**

**Figure 4. The Horsehead Nebula region in Orion.**

**Figure 5. Moon mosaic, 13/03/2011 [30x 10-sec. AVIs at 60 fps, aligned & stacked in Registax 5; each stacked frame stitched to others using Photoshop and levels adjusted to make them consistent]**

## First light with a digital camera

***Neil Haggath***

Here's a rarity, folks – some images from me! Years ago, in the days of film photography, I used to take close-up photos of the Moon through my Celestron C8 telescope. These images represent my first successful attempt to do so since joining the digital age, with my Canon 400D DSLR (a couple of previous attempts were defeated by clouds).

As most of you know, I work away from home, and spend weekday evenings in a hotel; I only spend weekends at my home. So for me to be able to do this at all requires a rare combination of circumstances, namely:

- a clear night on a Friday or Saturday (and one that doesn't clash with any other commitment)
- the Moon at a suitable phase

- the Moon high enough in the sky to not be hidden behind the huge 50-foot tree behind my house, which blocks most of my southern aspect.

In other words, it happens about as often as a total solar eclipse! But on Saturday 12 February, that rare alignment finally came together, so I went out and had a go.

All images were taken that evening, between 21:00 and 22:30 UT. All were taken with a Canon EOS 400D DSLR camera, through a Celestron C8, i.e. an 8-inch f/10 Schmidt–Cassegrain telescope.

**Figure 6. The 9-day-old gibbous Moon, taken at the telescope's prime focus, effectively using the telescope as a 2000mm telephoto lens – f/10, ISO 200, 1/125 second exposure.**

The next two images were taken using eyepiece projection, giving an effective focal length of just over 7 metres. The exposure details for each are: f/35, ISO 1600, 1/30 second.

**Figure 7. The Mare Imbrium region, with the Alps and Caucasus mountains left of centre; Plato, the Teneriffe Mountains and Straight Range at lower right; Cape Laplace at lower right near the terminator; Archimedes, Aristillus and Autolycus above centre.**

**Figure 8. The Apennines left of centre; Archimedes, Aristillus and Autolycus again below them; Eratosthenes at their end above centre; Copernicus and the Carpathian Mountains at upper right near the terminator.**

# First light with an astronomical camera

***Rod Cuff***

Oh well, if we're into first efforts …!

The astrophotography I've tried so far has all been with a webcam – a Philips ToUcam Pro II. In *Transit* I've included pictures of the Sun, Moon, Jupiter, Saturn and the ISS, in varying degrees of fuzziness. I'll be continuing to use the webcam to take video sequences of these things and to use Registax to process them into still (and I hope increasingly better) images; but I've also just started to get to grips with a purpose-built astronomical camera, the Meade Deep Space Imager (DSI) III. I've had it for quite a while but had not made a decent attempt to grapple with it until recently.

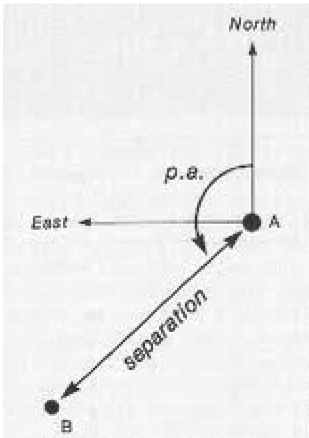
My first experimental effort (taken through a Meade 8" LX90 SCT at f/10) was to capture part of the Perseus Double Cluster region. The exposure-setting process is still a partial and misbehaving mystery to me, so I've no idea what magnitude the faintest stars captured are. Watch this (and other) space for better another time.

**Figure 9. Part of one of the Double Cluster pair in Perseus. 8" LX90 with an alt-az mount and Meade DSI III camera. Multiple short exposures stacked and post-processed using Meade's Envisage software (with a Drizzle technique to correct for field rotation) and Photoshop.**

# Measuring double stars with a crosshair eyepiece and a stopwatch

***John McCue***

Many amateur astronomers enjoy finding and observing double stars, and many like to take the observation one step further and measure the two important things about the two stars – how far apart they are (separation), and the position angle (p.a.) they present to the observer (from north measured through east).




Both of these measures can be then sent to the world repository of observations, the [Washington Double Star Catalogue] at the US Naval Observatory, and contribute towards the knowledge of that star and maybe towards a calculation of its orbit. The only direct way of measuring the mass of a star is from knowledge of its orbit around another.

The problem is that the two main methods are both quite expensive. One is to take a photographic CCD image of the double star, and afterwards measure its separation and p.a. using specialist software on your computer. The other method involves using an astrometric eyepiece, which has an illuminated grid inside it to allow direct measurement of sep. and p.a. at the eyepiece.


**Figure 10. A typical astrometric eyepiece …**

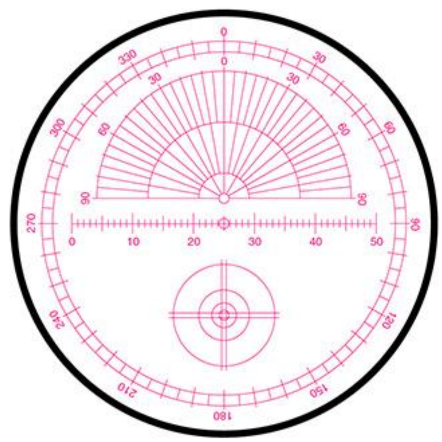


**Figure 11. ... and the illuminated view through it**

Here's a method, though, which is very cheap but untested, so I need your help to prove that it works. You need a simple crosshair eyepiece and a stopwatch. When you have the double star in your eyepiece, switch off the telescope drive and turn the crosshairs until one arm is aligned with the way the stars are drifting; that's E–W direction, of course. Move the telescope (with the motor drive controls if available) until the double is 'upstream' of the wires, and time the difference between when the primary crosses the N–S wire and when the secondary does so. In the diagram on the next page, the primary is shown at the central wire crossing, but that doesn't have to be the case; both stars just have to cross the N–S wire. Make a note of the time on your stopwatch. This will be time B1B2.

Next, turn the crosshairs until one arm is aligned with the two stars themselves (see the dotted lines in the diagram), then time the difference (again with the drive turned off) between when the secondary crosses that arm (with the primary crossing the central wire crossing point) and when it crosses the other arm. Again, the primary doesn't have to go through the centre, but if not, time the difference between when the two stars cross the 'non-aligned' arm, no matter whether on the top side or the lower side of the middle. This will be time B1B3.

The diagram shows the two formulae that can be solved to give the values of *s* (separation) and θ (position angle). Delta (δ) is the star's declination. When you've calculated *s*, don't forget to turn the seconds of time into seconds of angle by multiplying by 15.

The diagram also gives two example times: B1B2 = 3.4 seconds, and B1B3 = 7.3 seconds. If the declination is 60°, these two times should give separation = 37.4" and position angle = 43.0°.

Notice that if the position angle is more than 90° but less than 180°, the primary will still be leading the way across the wires, and the same formula holds good; but the calculated p.a. will be 180° – θ.

If the p.a. is between 180° and 270°, the secondary will now lead the way. Again the same method and formula can be used, and the calculated p.a. will be 180° + θ. Finally, if the p.a. is between 270° and 360°, the secondary will still lead the way, the same method and formula can yet again be used, but the calculated p.a. will be 360° - θ.

If the p.a. is close to 0° or 180°, then the timing becomes very difficult. I'm working on this!

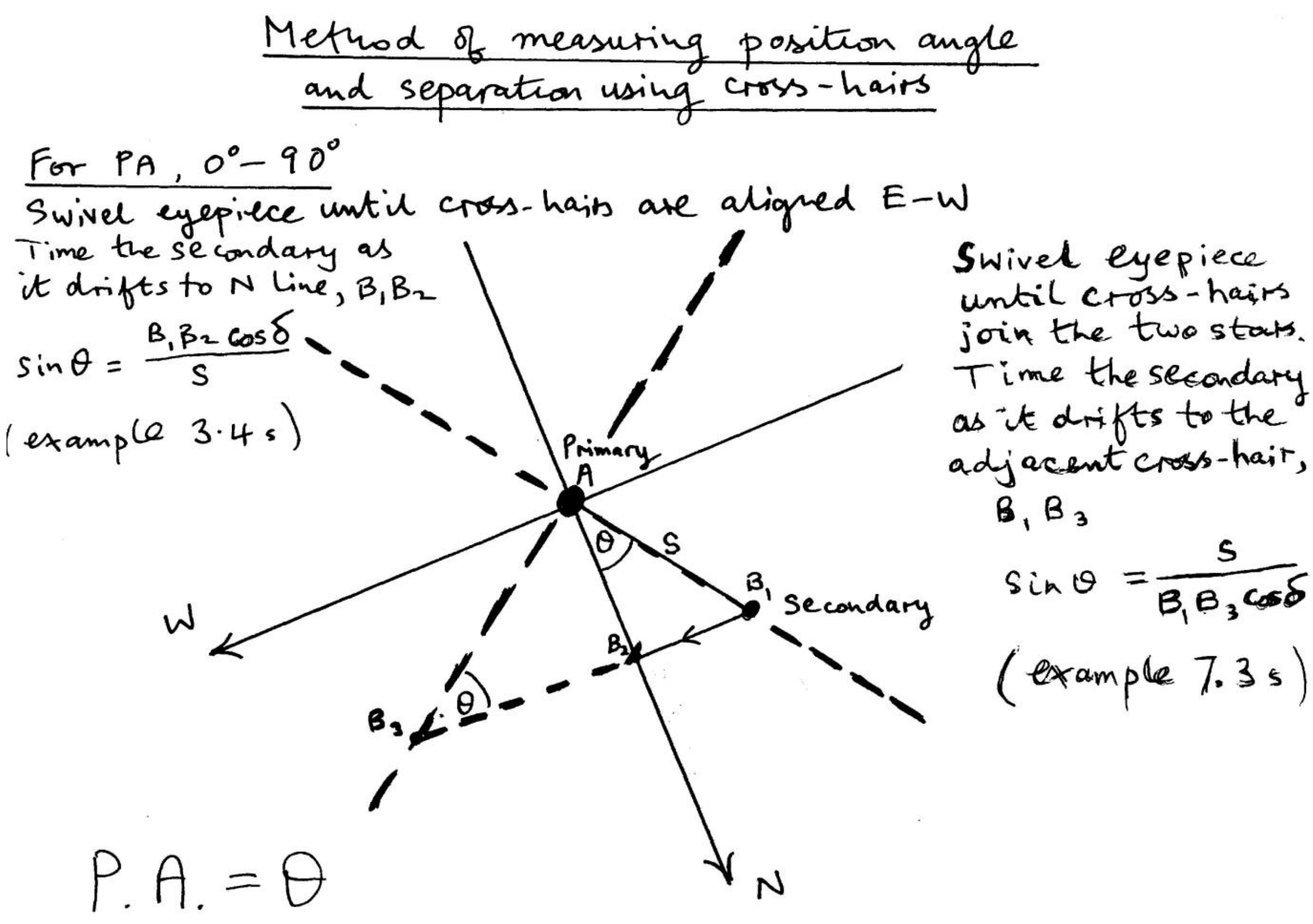


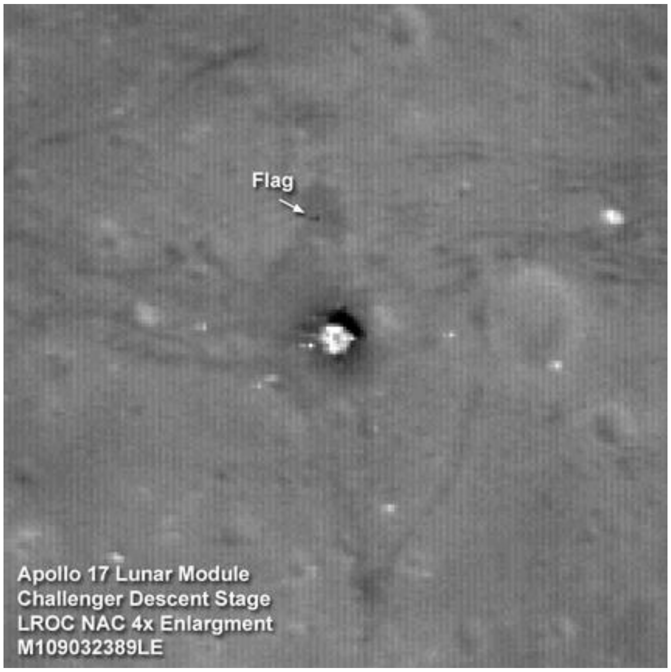

**Figure 12. Method of measuring position angle and separation of a pair of stars, using crosshairs.**

# Time on the Moon

***Michael Roe***

The passage of time on the Moon is of course the same as on Earth. On Earth our 24-hour day and 365¼-hour year, based on our rotating world orbiting around the Sun, are how we measure time, with subdivisions of hours, minutes and seconds. But on the Moon things are very different. No one visits the Moon any more, but if a long-term observers did go there, here is what they would observe.

The 29-Earth-day lunar day would be the main time period: 14½ of our days in daylight, then 14½ days night. Half the Moon can see the Earth almost motionless in its sky, whereas the far side (except for a small sliver of rim) never sees the Earth. The motion of the Sun as seen from the Moon is not exactly constrant all the time. As well as having a slightly elliptical orbit, the Moon librates[2] – wobbling a bit from presenting a permanent straight-on face to the Earth – and the Moon orbits around the Earth, affecting the Sun's apparent speed across the sky. Moreover, the whole Earth–Moon system goes around the Sun in an elliptical orbit. The changes in speed can surely be no more than a few percent – I'm not sure about the exact amount, but someone must have calculated it for use when predicting eclipses.



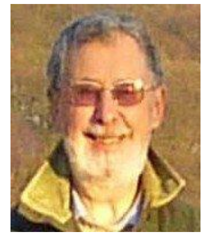

There are approximately 13 lunar days, very hot at midday and incredibly cold at night, to our year. But close to the lunar poles, things are different. The Sun should spend 14½ days barely above the horizon, then 14½ days slightly below it. However, libration can cause unusual alterations, especially near the mountainous South Pole region, where the Sun can disappear then reappear between great crater rims and mountains, so that daylight and nighttime vary from a few hours to several weeks.

Since the last astronauts left the Moon, the Lunar Modules' landing stages and other abandoned equipment have had 500 lunar days on the Moon, each day almost an Earth month long. Will these perferctly preserved relics of humanity ever be visited again, after 600 lunar days, or 700 or even 1,000 on the lunar surface? Perhaps they never will. It's an intriguing thought …

[2] *[There's a nice video sequence showing this at http://en.wikipedia.org/wiki/Libration. – Ed.]*

# Science fantasy

*Ray Brown*



Perhaps a good rant will initiate a polemic.

Arguably the most overused and misused word that one hears, particularly on radio and TV, is 'fantastic'. On visiting my bank, I comply with a request to sign a form and the clerk says 'fantastic'. Is it really fantastic that I can write my own name? The richness of the English vocabulary has been sacrificed on the altar of hyperbole. Sloppy expression often indicates sloppy thinking. CaDAS members must be painfully aware of the common failure to distinguish between astronomy and astrology. It seems to me that some media presenters and eminent scientists in this age of hype are losing the distinction between science fiction and reality.

An eminent and effective TV presenter speculates on what 'we' will do when the Sun becomes a red giant. Does anybody seriously believe that humankind will exist for billions of years? The same authorities contemplate man emigrating to extra-terrestrial planets when they, better than anyone else, must know that habitable planets, if they exist at all, are extremely rare and inaccessibly distant.

Even talk of manned visits to Mars exceeds my credibility threshold; although I do not doubt that a manned return journey to a Martian moon may be technically feasible within the foreseeable future, I cannot accept that it should be a priority. Mankind has not yet learned how to organise itself fairly and effectively on planet Earth; we are internationally dysfunctional. Take but a few examples from hundreds. North Korea remains delinquent. Mugabe and Gaddafi murder their fellow countrymen and the rest of the world is reluctant to intervene. Bankers continue to grab obscene bonuses because international agreement cannot be reached. How does humankind deal with near-exponential rises in population size and the related demands for energy and other resources? Those are the immediate priorities. There is a commonly held view that man's potential capability in the fields of science and technology is limitless. So where is the long-awaited general cure for cancer? Will we ever get power from nuclear fusion? If science cannot crack such problems, then we might as well forget the fantasies. Jules Verne's 1864 novel *Voyage au centre de la Terre* is a reminder to us that science fiction cannot always become reality.

I suppose the cost of current attempts to seek evidence for 'intelligent life out there' by scanning the heavens for radio signals is relatively small, but it seems to me a fruitless quest. In the

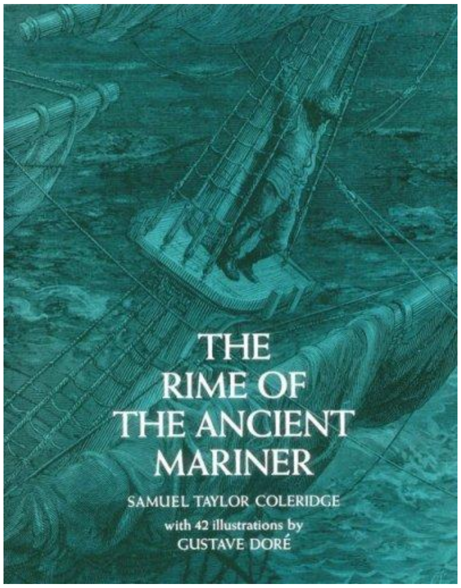
highly unlikely event of detecting such signals, what do we do about it? There's no point in replying, when that civilisation ceased to exist millions, if not billions, of years ago. As we Earthlings have shown (see above), technically advanced societies are still socio-politically primitive (i.e. cannot eliminate wars or agree on environmental action) so, even if there were no such phenomena as the supervolcanoes and meteorite strikes that have caused past species extinctions here, eventual self-destruction seems highly probable. Incidentally, the reader will have gathered that in the Rare-Earth Hypothesis versus Principle of Mediocrity debate I'm firmly in the former camp.

I recall the former Astronomer Royal predicting in 1957 that the whole idea of space travel was 'utter bilge', yet the first Sputnik was launched a few months later and we had to wait only another dozen years before men stood on the Moon. Nevertheless, I go along with the current Astronomer Royal, Professor Sir Martin Rees, who has argued for space exploration only by unmanned vehicles.

## The *Ancient Mariner* and the movements of the Sun

***John Crowther***

There was a time gap of many centuries between the expedition commissioned by Pharaoh Necho to circumnavigate Africa in a clockwise direction and the writing of Samuel Taylor Coleridge's famous poem *The Rime of the Ancient Mariner*. Yet there is a connection between the observations of the positions of the Sun both in the poem (in the words of a fictional sailor) and those of the actual explorers from Ancient Egypt..




This voyage wasn't repeated until the 15th century, and then in the opposite direction. From his HQ at Sagres in Portugal, Prince Henry the Navigator sent his explorers south to face real and imagined dangers (although *he* stayed at home). The voyages were gradually extended until the Cape of Storms, later to be renamed the Cape of Good Hope, was finally rounded. Unlike the Egyptians, the Portuguese didn't stop to obtain food by planting and harvesting.

In the *Ancient Mariner*, Coleridge uses the experience of earlier real-life explorers. For instance, the ship drives southwards with the crew being unsure as to how far the Cape extends, and encounters icebergs from Antarctica.

Then the ship heads north after rounding the Cape. It encounters the windless Doldrums and a sargasso-like sea of weeds – and we read the well-known line 'Water, water everywhere …'.

The voyage had begun with familiar landmarks dropping below the rim of the Earth, with the nearest and the highest disappearing last.

*Merrily did we drop*
*Below the kirk,*
*Below the hill,*
*Below the light-house top.*

*The Sun came up upon the left,*
*Out of the sea came he!*
*And he shone bright, and on the right*
*Went down into the sea.*

Then the equator was crossed and the Sun was in the northern sky. So, when the ship turned north to leave the ice behind:

*The Sun now rose upon the right:*
*Out of the sea came he,*
*Still hid in mist, and on the left*
*Went down into the sea.*

Thus in his poem Coleridge retells the fact that Pharaoh Necho and his people could hardly believe.

A humorous note to end with: in our class at school we had an Albert Ross. He got much teasing after we'd studied this poem!

## THE TRANSIT QUIZ

### **April's quiz**

*Recently we had a quiz all about the Sun. To balance things out, this one's about the Moon. Here are some Latin terms that are used frequently to identify types of geographic (strictly, selenographic) structure on the lunar surface and give names to specific objects. What do the terms mean in a lunar context? I've given an example next to each, in some cases using the plural of the term.*

1. Catena, as in *Catena Davy*.
2. Dorsum, as in *Dorsa Cato*.
3. Lacus, as in *Lacus Somniorum*.
4. Mare, as in *Mare Crisium.*
5. Mons, as in *Montes Alpes*.
6. Oceanus, as in *Oceanus Procellarum.*
7. Rima, as in *Rima Bradley.*
8. Rupes, as in *Rupes Cauchy.*
9. Sinus, as in *Sinus Iridum*.
10. Vallis, as in *Vallis Alpes*.