TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

05 October 2006

When the space shuttle Atlantis undocked from the International Space Station (ISS) September 17. Amateur astronomer Thierry Legault caught the two spaceships separating directly in front of the sun:

Editorial

Next meeting 13th October 2006

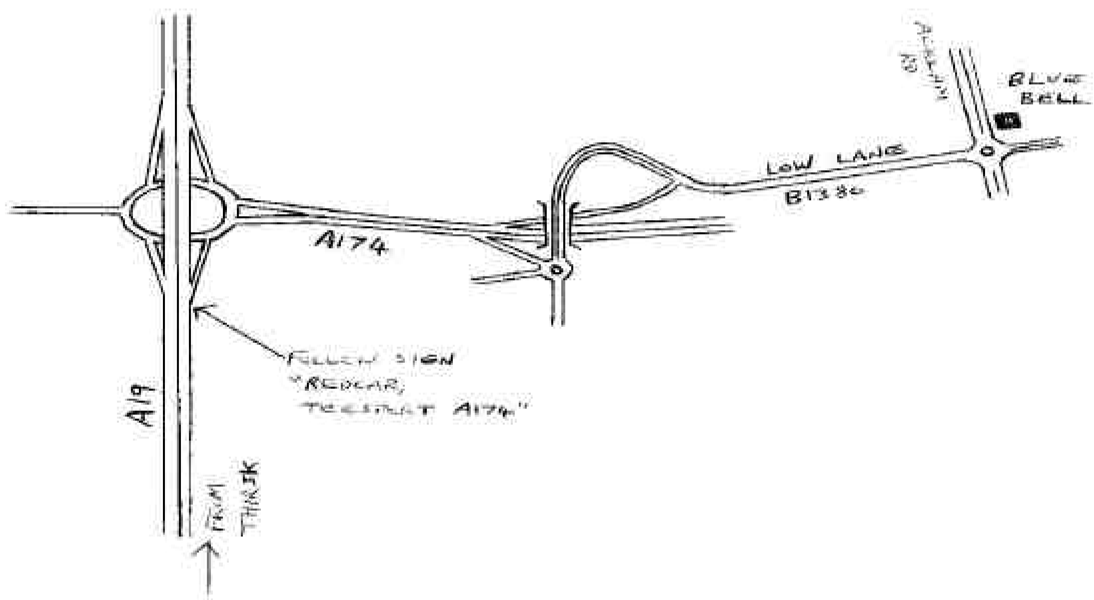
"The Scale of the Universe" by Paul Money FRAS FBIS

Yorkshire Astromind 2006 :

Date: Saturday 14 October 2006
Time: 1300 – 1700-ish
Venue: The Blue Bell Hotel, Acklam, Middlesbrough, Cleveland

Directions:

Approach Teesside on A19 from the south.
Leave A19 at exit marked "Redcar, Teesport A174." Follow A174 towards Redcar.
Leave A174 at first exit. Right at end of slip road, into Low Lane B1380.
At next roundabout, Blue Bell is ahead on left. Straight on at roundabout; car park is on left.
At Reception, ask to be directed to the Conference Room.



Letters to the Editor :

Any new observations, any comments on local or international astronomy, anything you want to share with your fellow members?

Dear Editor,

I was interested in Neil's (Hon Sec) letter of September 2006 on the use of the term "rocket science". As any engineering is primarily based on the science of its related subject they are difficult to separate in the average person's mind.
I show below some of the more prosaic formula presently in use by rocket scientists and engineers to exercise the minds of the Society members. Perhaps they can then make up their own minds on whether the term "its not rocket science" is a fair statement.

Line 1 : $G \times m \times M/R = m \times V_{ESC}^2\ /2$ **or**
Line 2 : $V_{ESC} = SQRT\ [2 \times GM / R]$

Line 3 : $v2 = Vp = r1 \times v1 \times \sin\phi 1 / Rp$

Line 4 : $r1^2 \times v12 \times \sin^2\phi 1 / Rp^2 - v1^2 = 2 \times GM \times (1 / Rp - 1 / r1)$

Line 5 : $e = SQRT\ \{r1 \times\ v1^2 / GM - 1)2 \times \sin^2\phi 1 + \cos^2\phi 1)$

Line 6 : $\tan\theta = (r1 \times v1^2 / GM) \times \sin\phi 1 \times \cos\phi 1 / [r1 \times v1^2 / GM] \times \sin^2\phi 1 - 1]$

Line 7 : $F_D = CD \times P\ (v^2 / 2) \times A$

Line 8 : $Nm = v / c$

Line 9 : $C = SQRT[k \times R \times T]$

Line 10 : $F = q \times Ve + (Pe - Pa) \times Ae$

Line 11 : $p = m \times v$

Line 12 : $f = dp/dt$

For those who need (?) explanations for each formula they are shown in Transit Tailpieces.

Bob Mullen

Borders Bookshop at Teesside Park off the A66 (lovely coffee shop) are stocking the latest edition of Norton's Star Atlas, due early October. Thanks to Ed the Webmaster.

The scientific theory I like best is that the rings of Saturn are entirely composed of lost airline luggage.

Mark Russell

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Red Stars

from Rob Peeling

When you first look at stars they initially all seem basically white with some brighter and some dimmer. Gradually you start to appreciate that there are in fact a range of subtle tones from pale orange through lemon yellow and white to a steely blue-white. There are however, a few stars that are genuinely deeply coloured. These are the "red" stars and it is always fun to be able to seek out one or two. To my eyes they aren't actually red but more a deep orange but once you find them they stand out amongst their pale colleagues and are well worth seeking out. Most of them are carbon stars but some are red giants or supergiants. What they all have in common are that they are stars approaching the end of their lives so that they have swollen hugely and consequently become redder and cooler. The carbon stars in particular fall into this deeply coloured class because their cores have moved from hydrogen fusion to helium fusion and are producing carbon, nitrogen and oxygen in their interiors. If there is more carbon than oxygen then carbon compounds will form in the star's atmosphere. The carbon compounds absorb blue light in preference to red and there you have it – a red star.

Here's how to find some of my favourite red stars that can be found in the autumn sky. None these stars is ever particularly bright and I have not restricted myself to the easiest to find. The chase is part of the fun after all.

V Aquilae

V Aquilae is a semi-regular variable and a carbon star varying from magnitude 6.6 to 8.1 with about a 350-day period. Find the elongated "C" at the southwest of Aquila near to M11 (the Wild Duck open cluster). Look for the brightest 2 stars in the "C". These are 16 & 12 Aquilae. Between them and closer to 12 Aquilae is a little line of 3 stars which point almost directly to V Aquilae which is about in the same field (about 30') but closer to the horizon. V Aquilae can probably be seen with binoculars but a small telescope will be needed to see the colour well. I find this star is pretty straightforward to track down.

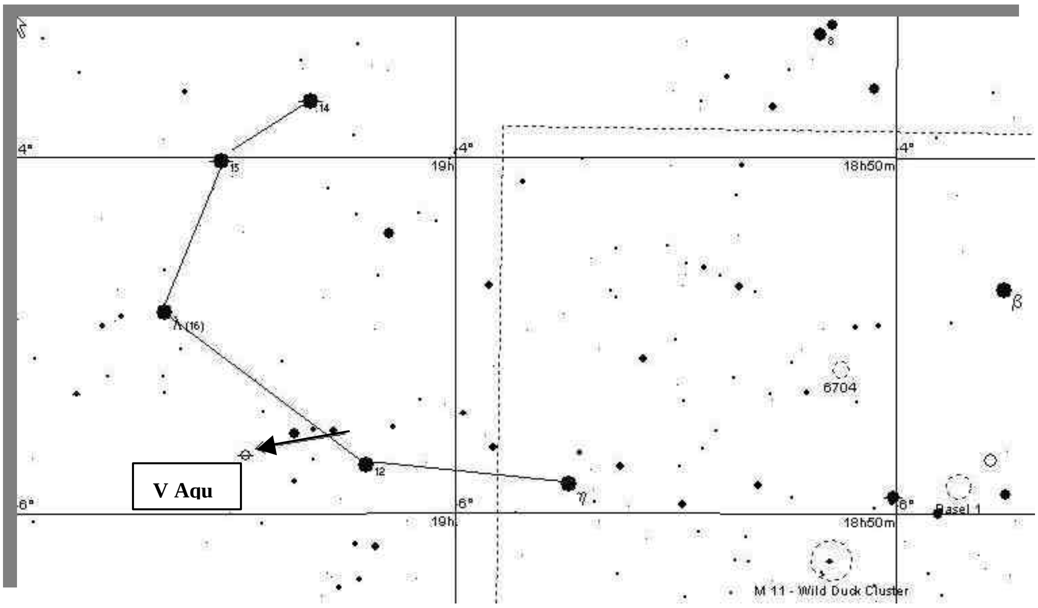


Figure 1:

V Aquilae

T Lyrae

T Lyrae is definitely harder to find than V Aquilae. It is again a carbon star and varies irregularly from magnitude 7.5 to 9.3. To find it you need to imagine a triangle with Vega, zeta Lyrae and kappa Lyrae at the corners. These are all easy to see in a finder scope. Aim for the centre of the triangle to find T Lyrae. It will probably take a couple of goes to spot but once you do it seems so obvious because of its colour that you'll wonder why you missed it. Don't forget to view M11 while you are looking in that direction.

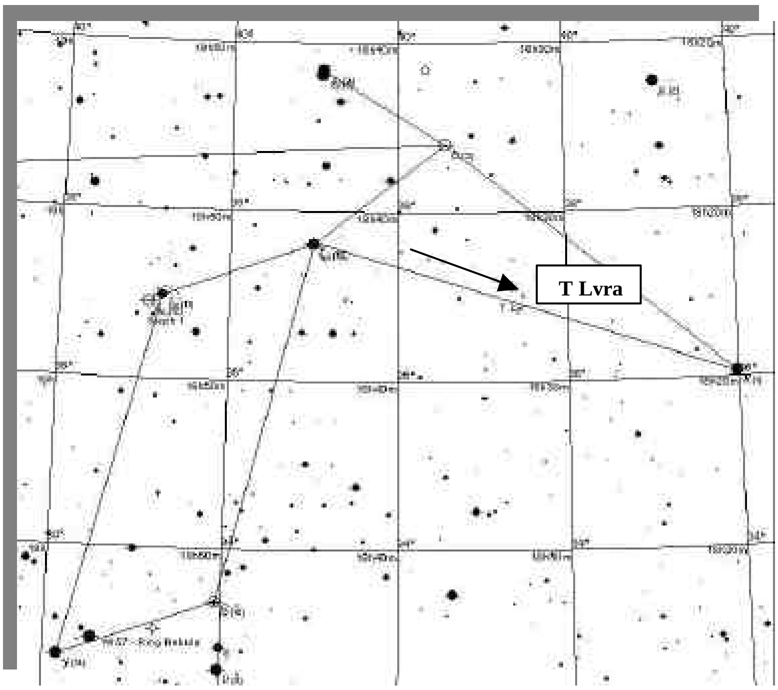


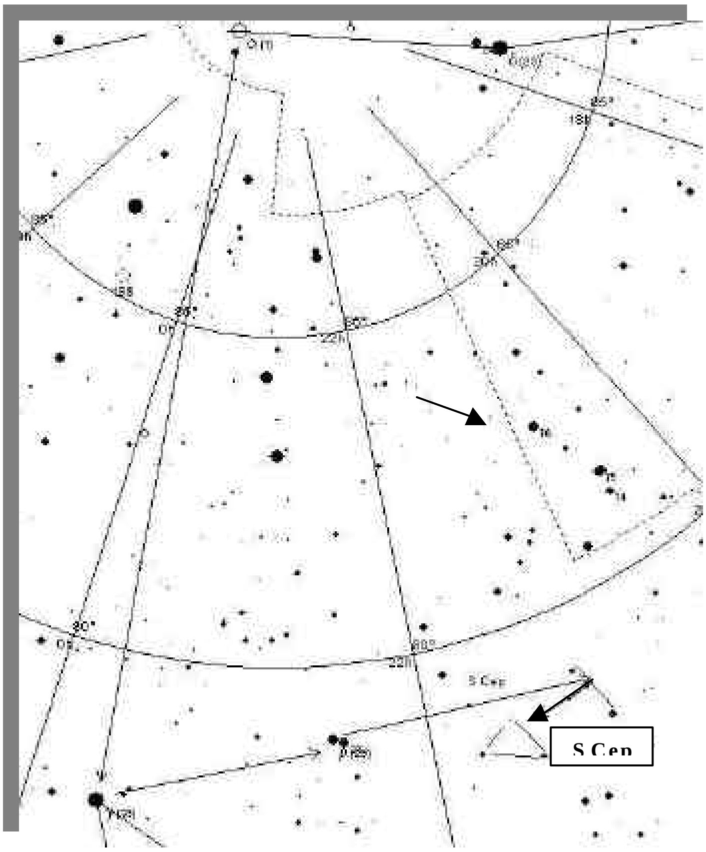
Figure 2: T Lyrae

S.Cephei

S Cep is definitely difficult to find but when I do it is probably my favourite. It is a carbon star and a variable between magnitudes 7 and 12, which partly explains the difficulty. It has a very high colour index that is the professional astronomer's way of saying that it is one of the reddest stars around if not the reddest of them all. The other problem is that it is so far north that it becomes pretty hard to persuade an equatorial mounted telescope to move in the right direction. Before I bought a telescope with a Dobsonian mount (which made things quite a bit easier), I usually found I had to shift the equatorial mount well away from polar alignment simply to get the telescope to point in roughly the right direction. I use rho Cephei as an initial guide and then track westwards with the finder to find the fainter stars I have highlighted in figure 3. S Cephei is the third corner of an imaginary triangle connecting it with the two stars I've connected with a line.

While in Cepheus, take a look at mu Cephei, which is William Herschel's Garnet Star. This star is a supergiant with a diameter similar to the diameter of Jupiter's orbit round the Sun. This makes it one of the largest stars known. It is visible with the naked eye but it takes at least binoculars to see any colour. It much more orange than red compared to the previous three.

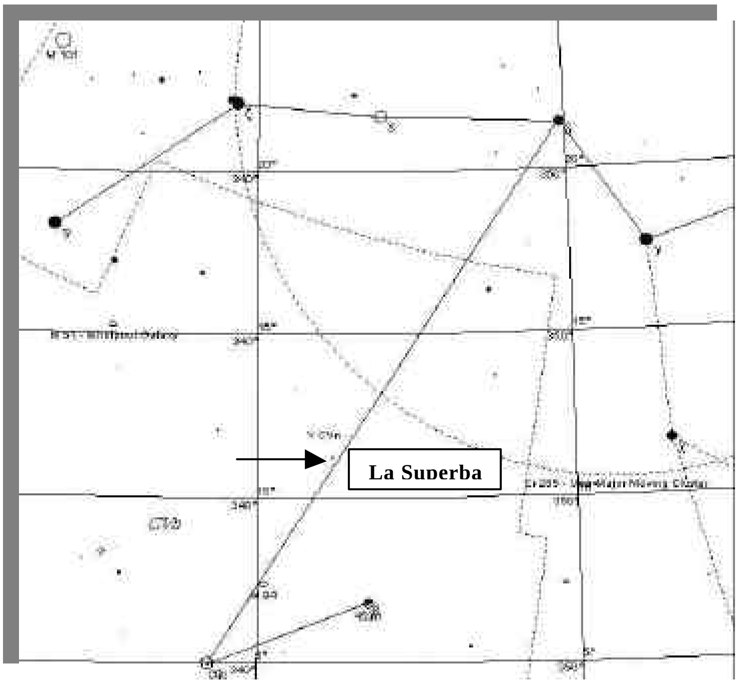
Figure 3: S Cephei



Y Canes Venatici – La Superba

This carbon star is brighter (range 4.9 to 6.0 magnitude) than the first three stars I've described. It is possible to pick it out with binoculars and see the colour. As with all the red stars a telescope showcases the colour better though. Finding La Superba is fairly simply. Find Cor Coroli and sweep upwards towards Alioth, which is the third star in from the end of the tail of the Big Dipper. La Superba is slightly to the right of the line I describe and about a third of the way from Cor Coroli to Alioth.

Fig 4 – Y Can V



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Put three grains of sand
inside a vast cathedral, and
the cathedral will be more
closely packed with sand
than space is with stars.

- Sir James Jeans, English Astronomer

A new definition removes Pluto as a full-fledged planet. It joins Eris (2003 UB_{313}) and Ceres in a new class called "dwarf planets."

Pluto Gets an Asteroid Number

After much debate, infighting, animosity, and angst, last month the IAU finally made its decision and decreed that the solar system has just eight planets. The now-former planet Pluto and 2003 UB_{313} were both dubbed "dwarf planets." And with the definitions set, yesterday the IAU announced the unnamed dwarf planet's new title.

According to the IAU Committee on Small-Body Nomenclature and the Working Group on Planetary-System Nomenclature, 2003 UB_{313} will now go by the name Eris (pronounced EE-riss). "The name is fitting," says Brown. Eris is the Greek goddess of strife and discord. As the story goes, Eris caused wars by creating infighting among others. Given the turmoil within the astronomical community surrounding Eris's classification, its name carries a much deeper, political meaning indeed.

But there's more to the name. "We were sad that Xena went away," says Brown, so the team held onto her in subtle ways — through the name of Eris's moon.

The satellite, now called Dysnomia (pronounced diss-NOH-mee-uh), is named for Eris's daughter, the goddess of lawlessness — a tribute, says Brown, to the actress who played Xena, Warrior Princess: Lucy Lawless. But Brown is quick to point out that the moon also follows another tradition for "dwarf planet" satellite names: Pluto's moon Charon was discovered in 1978 by James W. Christy, and the first syllable in Charon matches the first syllable in Christy's wife's name, Charlene. Brown's wife's name is Diane. "We're going to call the moon Di," says Brown.

The IAU sub-committees voted nearly unanimously in favor of the two names (as reported in IAU

Xena and Gabrielle now officially Eris and Dysnomia

Remember 2003 UB_{313}, the body often called by its nickname, Xena? On July 29, 2005, when Michael E. Brown (Caltech) announced his team's discovery of the distant Kuiper Belt object (KBO), it sent shock waves through the planetary-science community. Some 75 years after Clyde Tombaugh discovered Pluto, astronomers had at long last found an object larger than the "ninth planet." But what to call it? Was it a planet? A KBO? Something else? For more than a year the distant, icy body went by a nine-syllable jargony moniker, or by a nickname that came from a campy television show that starred a warrior princess. According to International Astronomical Union (IAU) guidelines, how an object is named depends entirely on how the object is classified. Planets are named for Roman gods, and classical KBOs are named for creation gods. But scattered-disk objects (bodies whose orbits are steeply inclined to the plane of the solar system) don't have naming conventions. So as long as 2003 UB_{313} might possibly earn planet status, it was stuck in naming purgatory.

Without fanfare, the September 7th batch of circulars from the Minor Planet Center assigns number 134340 to Pluto. This action brings Pluto into the ranks of small solar-system bodies having accurately known orbits — the same roster that starts with 1 Ceres, 2 Pallas, 3 Juno, 4 Vesta, and so on. The list includes such famous objects as 433 Eros, 1862 Apollo, 3200 Phaethon, and 50000 Quaoar.

Pluto's numbering comes close on the heels of the International Astronomical Union's recent vote about the definition of a planet. Pluto needs six digits because of the explosive rate of numberings in just the past decade. (At the end of 1996, the highest-numbered asteroid was 7367 Giotto!) The September circulars also provide numbers, but not official names, for three other large trans-Neptunian objects: 136199 goes to 2003 UB_{313}, 136108 to 2003 EL_{61}, and 136472 to 2005 FY_9.

In a separate notice issued by the Minor Planet Center the same day, Timothy B. Spahr comments that assigning permanent numbers to these large, faraway objects "does not preclude their having dual designations in possible separate catalogues of such bodies." Spahr is interim director of the center following last month's retirement of Brian G. Marsden, who had served as director since 1978.

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Someday I would like to stand on the moon, look
down through a quarter of a million miles of space and
say, "There certainly is a beautiful earth out tonight."

- Lt. Col. William H. Rankin, American author

Names of the Stars

by Alan M. MacRobert

Everyone who starts out in astronomy faces a bewildering variety of numbers and letters denoting the great works of creation. Sometimes the nomenclature almost seems designed to confuse. Anyone can look up and recognize a star as Vega — so why does it also need the names BD +38°3238, Alpha Lyrae, 3 Lyrae, HR 7001, GC 25466, HD 172167, SAO 67174, ADS 11510, and dozens of others?

At least beginners aren't alone in their confusion. The *First Dictionary of the Nomenclature of Celestial Objects,* 1983, described well over 1,000 different naming systems then in use, mostly for faint objects studied by professionals. Its editors despaired of the list ever being made orderly, reasonable, or complete. Celestial nomenclature is too freakish for that, too full of schemes from times long past.

Fortunately, a well-rounded amateur needs to know only a tiny fraction of these naming systems. In this article we'll cover those most often encountered for stars, with their meanings and histories.

Where is Zujj Al Nushshabah?

Since ancient times stars, like people, have had their own proper names, such as Vega or Deneb. But today proper names are widely used only for the brightest few dozen stars — and it's a good thing. Star names are poetic and embody old constellation lore (usually in garbled Arabic), but confusion runs wild. "Deneb" to most people interested in astronomy means the brightest star in Cygnus. But the same name has also been bestowed, at some time, on at least five other stars. It simply means "tail," a body part that a lot of constellations possess.

Moreover, there are simply too many proper names to ever remember. The Yale *Bright Star Catalogue,* 4th edition (1982), lists some 845 of them. Every astronomer knows what you mean by Sirius or Polaris, but not one in a hundred could identify Pishpai (Mu Geminorum), Alsciaukat (31 Lyncis), Dhur (Delta Leonis), or Zujj al Nushshabah (Gamma Sagittarii).

More tractable is the Greek-letter system introduced by the German astronomer Johann Bayer in 1603. In his beautiful star atlas, *Uranometria,* Bayer identified many stars in each constellation with lower-case Greek letters. He often named a constellation's brightest star Alpha, then sorted the rest into brightness classes and assigned letters within each class in order from the head to the feet of the traditional constellation figure.

Bayer's letters caught on immediately. They are used with the Latin genitive of the constellation name, so the leading star in Centaurus is Alpha Centauri ("Alpha of Centaurus"). Back when most educated people knew Latin and Greek this phrasing flowed off the tongue naturally, but today it's many skywatchers' first exposure to the Greek alphabet and Latin declensions. Sooner or later everyone who deals with stars has to sit down and learn the Greek letters (listed below) and the genitives of the 88 constellation names (listed in the back of most astronomy handbooks).

α - alpha	ν - nu
β - beta	ξ - xi
γ - gamma	o - omicron
δ - delta	π - pi
ε - epsilon	ρ - rho
ζ - zeta	σ - sigma
η - eta	τ - tau
θ - theta	υ - upsilon
ι - iota	ϕ - phi
κ - kappa	χ- chi
λ - lambda	ψ - psi
μ - mu	ω - omega

There are swarms of stars per constellation but only 24 Greek letters. Sometimes one letter is used repeatedly with superscripts to cover several adjacent stars. But as more and more stars needed names because of better sky surveys, astronomers adopted numbers. Around 1712 John Flamsteed, England's Astronomer Royal, began numbering stars in each constellation from west to east in order of right ascension — a big help when looking for a star on a map. For instance, 80 Virginis is east of 79 Virginis and west of 81 Virginis (at least in the coordinate system Flamsteed used — the equinox-1725 system — which still matches today's celestial east and west pretty well).

All bright stars were numbered whether they had a Greek letter or not, which is why Alpha Lyrae is also 3 Lyrae. In all, 2,682 stars received Flamsteed numbers. The highest Flamsteed number within any constellation is held by 140 Tauri.

There are occasional confusions. When the constellation borders were formalized in 1930, a number of Flamsteed stars found themselves stranded in exile. Thus the star 30 Monocerotis is today considered to be in Hydra, and 49 Serpentis is in Hercules. Such confusing designations are best swept under the rug, never to be used.

Nobody got around to numbering stars farther south than could be seen from England. So in far-southern constellations one often encounters upper- and lower-case Roman letters, such as g Carinae and L^2 Puppis. Roman letters were applied all over the sky by various star mappers from Bayer on, but in the northern sky they have largely passed out of use.

Herculean Lists

By the 19th century all these naming efforts were falling far short of the mushrooming need. Telescopes were revealing stars by the hundreds of thousands, every one of them an individual crying out for its own identity.

Meticulous and industrious, Bonn Observatory director Friedrich W. A. Argelander (1799–1875) organized the most massive star-cataloguing project up to his time, creating a star atlas and catalog that remained in everyday use by astronomers for the next century. 'The completion of this enormous task with such limited means,' wrote Joseph Ashbrook in *Sky & Telescope* for April 1980, 'was a tribute not only to Argelander's organizing powers and enthusiasm but also to his warm personality, which evoked full and willing cooperation from his staff.'

AAVSO

In 1859 the German astronomer F. W. A. Argelander at Bonn Observatory began measuring star positions with a 3-inch refractor to compile a gigantic list, the *Bonner Durchmusterung* (Bonn Survey). The *BD* eventually included 324,188 stars as faint as about magnitude 9.5. Argelander and his successors divided the sky into thin, 1°-wide declination bands wrapping around all 24 hours of right ascension. Stars within each band were numbered in order of right ascension; constellations were ignored. Thus Vega's designation BD +38°3238 means it was the 3,238th star (counting from 0 hours right ascension) in the zone between declination +38° and +39°.

The original *BD* covered just over half the sky, from the north pole to a declination of –2°. A later southward extension, the *SBD*, marched down to declination –23° to garner another 133,659 stars. The *Cordoba Durchmusterung* (*CD* or *CoD*) completed the job, picking up 613,953 more on its way to the south celestial pole. All in all, *Durchmusterung*, or "DM," names were bestowed on a grand total of 1,071,800 stars.

The *BD*, with its detailed star charts and its reliable, well-checked list of positions, remained an essential everyday tool of working astronomers for nearly a century. Durchmusterung designations are still sometimes encountered. The magnitudes of stars in these catalogs, however, are notoriously unreliable by modern standards. Most were merely quick eyeball estimates.

Variable stars have a naming system all their own. This too was instigated by the energetic Argelander. He denoted the first variable star found in a constellation by the capital letter R with the genitive of the constellation name (since the previous letter, Q, was the farthest Bayer had gone in Roman star-lettering). The next variable would be named S, and so on to Z. After Z came RR, RS, and so on to RZ, then SS to SZ, on up to ZZ. If a variable already had a Greek letter, Argelander left it alone.

But new variable stars kept getting discovered! After ZZ, astronomers decided to go to AA, AB, and on to AZ (omitting J since in some languages it could be confused with I), then BB to BZ, on up to QZ.

Even these 334 designations proved insufficient for the variables in some crowded constellations. Rather than start an even more awkward three-letter system, astronomers ruled that further variables in a constellation would simply be designated V335, V336, and so on forever. It was a wise move. By 2003 the highest numbered variable was V5112 Sagittarii

Multiplying Catalogs

The next great, widely used star list to appear after the *BD* was the *Henry Draper Catalogue* of stellar spectra, which Annie J. Cannon compiled in the 1910s at Harvard College Observatory. It includes 225,300 stars numbered in simple order of right ascension. More were added later in the *Henry Draper Extension;* these bear HDE numbers. Any star with an HD or HDE designation is guaranteed to have had its spectrum measured. Meanwhile another catalog had been issued at Harvard: the *Revised Harvard Photometry* of 1908, which sought to provide accurate magnitudes for the brightest 9,110 stars to about magnitude 6.5. Stars in this catalog bear HR numbers. Even now the HR list remains the basis of the modern Yale *Bright Star Catalogue,* which remains widely used for its detailed information about naked-eye stars.

Another star-numbering system used today is the SAO designation. This refers to the *Smithsonian Astrophysical Observatory Star Catalog* (1966), which also was produced (with companion star charts) on Harvard's campus. This catalog gives very accurate positions for 258,997 stars down to about 9th magnitude, though coverage is spotty for the fainter ones. The SAO stars are numbered by right ascension within 10°-wide declination bands. They cover the entire celestial sphere. SAO numbers supplanted the once widely used GC designations, from the *General Catalogue of 33,342 Stars* by Benjamin Boss (1937).

One of the largest modern star lists is the Hubble Space Telescope *Guide Star Catalog.* It is too big ever to print; instead it's distributed on two CD-ROMs. The *GSC* lists positions generally good to nearly 1 arcsecond and magnitudes accurate to a few tenths for 18,819,291 objects. The GSC's brightest entries are 9th magnitude (brighter stars couldn't be used by Hubble's guiding cameras); the faintest are typically about 13th or 14th magnitude, sometimes 15th. Of this total, 15,169,873 are listed as being stars; most of the remaining 3.6 million objects are small, faint galaxies. Most have never been examined by human eyes; machines measured their properties off of photographic plates. A typical individual in this list is GSC 1234 1132, a 13.3-magnitude luminary in Taurus. The first four digits specify one of 9,537 small regions of the sky; the last four give the object's serial number within this region.

More recently, the *Hipparcos and Tycho Catalogues* have largely supplanted the GSC for the brightest 1 million stars. TYC and especially HIP stars had their positions, magnitudes, distances, and motions measured to high accuracy by the European Space Agency's epoch-making Hipparcos satellite in the 1990s. Much vaster star catalogs are now coming online — such as the Sloan Digital Sky Survey (SDSS) and the infrared Two-Micron All Sky Survey (2MASS). And of course, no end is in sight.

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Congratulations to **David Bayliss** at the young age of eighty something recently won his Archaeology degree with an award ceremony at Leeds University, cap gown and all. All our best wishes – now for his three year Master's course, you have to admire him!

<u>Are we alone?</u>

from John Crowther

In his lectures Jack Youdale tells us of the importance of what is between the ears. In the July Transit Michael Roe's article "Alien Civilisations – How many are there?" may have persuaded us that as a civilisation that is able to broadcast its existence we may be unique.

This quote and what follows may be more believable than what it seems at first glance. "The universe is but an atom before the vastness of oneself!" – from the diary of W.C. Macready.

But did the writer of this sentence have his tongue firmly in his cheek?

It now seems that intelligent life occurs rarely in the Universe. We may be unique. As the Psalm says we may be 'a little lower than the angels crowned with glory and honour'.

So what is the purpose of this vast universe? Does it all exist just us to wonder and to marvel at? Or will some nasty green men one day shatter an illusion.

A philosopher once puzzled about an empty wood. This wood had no life in it to see, to touch, to taste or listen to. In the wood a dead tree falls. But with nothing there to see or to hear, does the sound of its falling exist?

Two limericks consider the problem:

There was a young man who said,
God must think it exceedingly odd,
If he finds that this tree,
Continues to be,
When there is no one around in the quad.

And the reply;

Dear Sir, your astonishment's odd,
I am always about in the quad,
And that's why the tree,
Will continue to be,
Observed by, yours faithfully,
GOD

Transit Tailpieces

Custom Telescopes UK.

Glen Oliver, a long-time member of the Society, can supply telescopes and accessories of all kinds. He operates from Hartlepool and has a website,
http://homepage.ntlworld.com/glen.oliver/custom.htm
e-mail glen.oliver@ntlworld.com.

Support local businessmen! Glen tells me that he now has an Astronomy and Space books page on his website

Transit Adverts If you wish to let members know what you want to sell or what you are looking for, please send an advert for the magazine.

CaDAS Website Don't forget to visit our very own website at www.**wynyard-planetarium**.net.

Articles Please send contributions for the newsletter to Bob Mullen, 18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 (b2mullen@hotmail.com) Copy deadline date is the 25th of each month.

Explanations for the rocket science formulae in Letter to the Editor

Line one or two : Escape velocity

Line three : Space vehicles orbit may be determined

Line four : Equation for the perigee radius Rp

Line Five : From which the eccentricity of the orbit can be calculated

Line six : To pin down the satellite's orbit in space, need to know the angle theta from the perilapsis point to the launch point

Line seven : The drag FD on a body is calculated by the equation

Line eight : Mach number given by :-

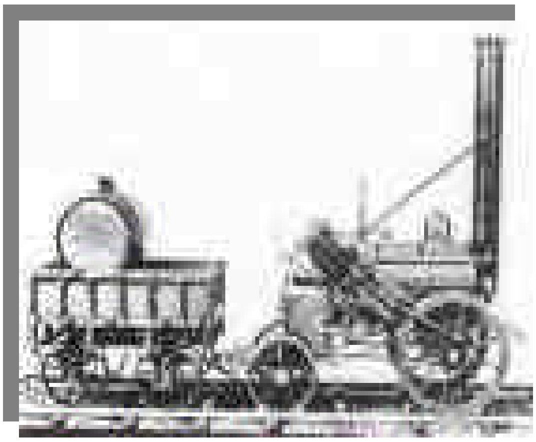
Line Nine : c is the acoustic velocity and is calculated by the equation. k is the specific heat ration equal to 1.40, R is the Gas Constant equal to 1,715 ft-lb/slug-R

Line ten : Thrust

Line eleven : Momentum of a particle is the product of its mass and its velocity

Line twelve : Second Law of motion

(With many thanks to the NASA coffee mug presently residing in the WWP Planetarium)



Rocket science or Rocket science ?