TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

12th April, 2002. Julian Day 2452377

Editorial

March Meeting. Dr John Steele, of Durham University, gave us a fascinating insight into very early developments in a talk entitled "Astronomy in Ancient Babylon".

Planetarium Official Opening. John McCue announced the official opening of the Planetarium on February 26th. It was attended by VIPs, Councilors, a choir and the professional musicians 'Angels of the North'. John has been appointed to run the Planetarium full time from April 8th . After Easter there will be regular public shows on Fridays at 7.30pm and Sundays at 3pm. The telephone number is 01740 630544.

Society September Meeting. A special Planetarium show for members is being arranged for the September meeting. Watch out for notices and next year's programme.

Subscriptions are now over-due and should be paid to Ian Miles, the Society treasurer.

New Members. Four new members were welcomed to the Society and received Neil's information pack.

April Meeting. Dr Paula Chadwick will give a talk to the Society on Gamma Rays.

Scarborough Star Party Weekend. Neil reminded us about this weekend at a dark sky site in the North York Moors, which he enjoyed very much last year. August 9th to 12th, cost £15, contact Scarborough AS or the Editor for application forms. Booking in advance essential.

Ilkeston 21st Birthday Convention, 11th May. On Saturday 11 May, Ilkeston A.S. (near Derby) is hosting a convention for its 21st birthday. One of the speakers is our Secretary, Neil Haggath. Full details can be found on their web site: http://hometown.aol.com/idasastro/convention.htm

Book Review. John Crowther has kicked off this Transit regular feature (see later) and I hope others will follow his example.

Astronomy Basics. Another regular feature starting this month is a series for those who are beginners in astronomy (-aren't we all?). Each month an article by Neil Haggath or John McCue will examine a topic which will illuminate some of the interesting, and perhaps difficult, topics of our subject. This month – Magnitudes (with maths!).

Comet Ikeya Zhang. At the last meeting Jack Youdale pointed out that this newly-discovered comet is now becoming visible to binocular observation, low in the west. It promises to be a very spectacular sight as it gets nearer the Sun. Rod Cuff, one of our newer members, has sent in an observation report (see later).

Light Pollution. My hobby horse subject is reported on again. I hope this doesn't produce a chorus of groans!

TV Cameras. Further to the report last month on the use of webcams and the like, we have a piece on some development work in this area. Quite a few members are now becoming interested in using these cameras and are producing some wonderful pictures. Transit is negotiating a series of articles on this subject. Anyone interested in contributing, please make contact.

Darran's Little Bundle. You may remember that at the Quiz Meeting before Christmas (Dec15th), Darran Summerfield kept a mobile phone handy, since he and Jenny were expecting at any time.

Abbie Lauren Summerfield was born on Saturday 22nd December 2002 at 10:32am weighing in at 9lb 5oz. Mother, Daddy and baby returned home about six hours later. Abbie's big brother, Joel, aged 3, loves his sister very much. Abbie is continuing to feed well and at 3 months weighs over a stone, and is the most smiley baby Darran has ever known.

We wish the family well and hope Abbie will be allowed an official unbirthday in the summer, well away from Christmas. Transit can deny categorically the rumour that Darran wanted to call her NGC6405.

The CaDAS Interview – Neil Haggath

There is no doubt that the main feature of the Society's collective activities is our unfailingly regular, high-class lecture. If you have ever wondered how the superb Society Lecture programme appears each month, the answer is "Neil Haggath". With his very extensive network of contacts, and an immense amount of work we don't see, our Secretary succeeds in bringing the very finest talks for our enjoyment. Neil is another of those people who are always there, ensuring that the Society runs so well. His fame as the five-times Yorkshire Astromind needs probing and analysing. His enthusiasm in continuing as a member of CaDAS, while living and working many miles away needs explanation. The Interview reveals all!

How did you become interested in astronomy?

Astronomy, for me, is not so much a hobby as a *raison d'etre*! I've been interested since as early an age as I can remember. I think it was a natural consequence of the era in which I grew up; born in 1961, I "grew up with the space age". In any astronomical society, or any convention or gathering of astronomers, you'll usually find a disproportionate number of people around my age. When I was a kid, spaceflight was always in the news – those were the heroic pioneering days - so we were all interested in it. For many of us, an interest in astronomy followed naturally. I could recite the distances of all the planets from the Sun by the time I was 10. For some, the passion stayed with us as adults, and will stay with us for life.

For the benefit of our newer members who don't know you so well; how did you come to be Secretary of CaDAS, while living 140 miles away in Derby?
I come from Cleveland, and I've been a member of CaDAS for 21 years. I wasn't quite a founder member; I joined during the first National Astronomy Week in 1981. I became Secretary in '89, while still living in Cleveland. But in '92, I was made redundant, and couldn't get another job in the area, so I had to move away. I worked in London for a while (and couldn't get away from the place quick enough; I always say the only good thing to come out of London is the M1, because it goes to Yorkshire!), then moved to Derby, where I've lived since '96. And because I'd had such a long association with CaDAS, and had so many friends here, I didn't want to give all that up. It's lucky that we have our meetings on Fridays, otherwise I wouldn't be able to do it. Each month I travel up for the meeting and spend the weekend with my parents in Eston.

Do you specialise in any particular area of astronomy?
If you mean observing or practical astronomy, no. I'm the first to admit that I'm not much of an observer at all. I have an 8-inch Celestron, but I'm afraid it rarely comes out of its case these days. I was keen when I was younger, but these days it's hard to find the time. Most of my observing is done at events like the Scarborough Star Party and the Horncastle Astronomy Weekend where, instead of groping around for the few objects I can remember how to find, I can take advantage of the knowledge of the real experts, like John Harper and Paul Money.
I like to think that my contribution to astronomy is as an organiser. As well as organising the programmes of speakers for CaDAS, which I've been doing for nearly 13 years now, I've organised the four Cosmos North-East conventions. I managed to attract such big name speakers as Heather Couper, Dr. Allan Chapman, Professor Sir Arnold Wolfendale, Dr. Paul Murdin – and even Dr. David Malin. (No, we didn't pay for him to come over from Australia; I fixed the date to coincide with him being back in the UK). Many of the speakers who have entertained us at our meetings have been people whom I had previously met at the various Conventions I travel to around the country;
I also travel around giving talks to other societies. While I lived in Cleveland, I did the rounds of most of those in the North-East and Yorkshire; now I'm becoming known in the Midlands.

What was your most memorable astronomical experience?
That's easy; my first total solar eclipse. Or rather, my first *successful* one; I've *been* to two, but *seen* only one. My first attempt, in July '91, was a disaster. Together with four CaDAS friends, I travelled 10,000 miles to Hawaii, to watch a lot of clouds turn dark! I succeeded in August '99. While everyone in Cornwall was getting clouded out and rained on, I was a bit further east – the Black Sea coast of Bulgaria, to be exact, together with Don Martin and John and Elaine McCue. We had a perfect view, with the eclipsed Sun high in a cloudless sky. It was breathtaking.
I wrote a lengthy report of our adventure in the September '99 Transit; the best way to describe it briefly is to repeat the words with which I began the report: "The word 'awesome' is much used and abused these days; youngsters use it simply as a 'trendy' word for anything good. Experiences which are truly 'awesome' are few and far

between; I've been lucky enough to have four in my lifetime so far. The last of these was seeing my first total solar eclipse."

What were the others?
Two of them were visiting the two most spectacular natural sights on this planet – the Grand Canyon and the Falls of Iguacu in Brazil. The third: I was privileged to be present at London Arena on 25 February 1995, when Nigel Benn and Gerald McClellan fought the greatest fight ever seen in a British boxing ring. No-one who was there will ever forget it.

What other hobbies and interests do you have, apart from astronomy?
While astronomy is my all-consuming interest, I have so many others that there aren't enough hours in a day, or days in a week, to keep up with them all. The main ones are:
The Royal Naval Reserve: I've been a member of the RNR for 24 years, since I was 16. For those who haven't heard of it, it's the Naval equivalent of the TA; we train with the Royal Navy, and could be called up to serve alongside the regulars in the event of hostilities. I've been based at five different RNR centres, as I've moved around the country to University and then various jobs; I'm now based at HMS Sherwood in Nottingham. I'm a Radio Supervisor; that's a Petty Officer in the Communications branch. This is very much more than a hobby; it's a serious commitment, meaning that I'm willing to fight for my country, if and when the need arises.
Cycling: When I was young, I used to cycle a lot on the North York Moors. Then I lost interest for some years, but revived it when I moved to Derby – plenty more beautiful country to explore, in the Peak District and Derbyshire Dales. Each of the last two summers I've done a cycling tour in the Highlands of Scotland, doing about 180 miles in three days. Yes, you may call me a loony if you like!
Boxing: I mean watching it, not doing it! I'm an absolute fanatic; I travel all over the UK to boxing events. Watching on the telly just doesn't compare with actually being there! Two years ago, I achieved one of my great ambitions, which was to go to a really big fight in Las Vegas. Yes, I flew all the way there for a weekend, just to go to the fight!
Scuba diving: For the last few years, this has been a passion to almost rival astronomy! I became a qualified diver in '97 and now I'm an advanced diver. Just in those few years, I've already dived in several tropical countries and done some of the best dives in the world.
Foreign travel: I love going on holidays to exotic parts of the world. I've been to 27 countries on five continents and there are still plenty more I want to see. Of course, this now goes hand in hand with my diving and sometimes brings other benefits. This summer, I'm going on holiday to Japan, one of the countries on my "must see" list. A nice added bonus is that I plan to meet up with some friends in Tokyo – an American who works there, and his Japanese wife. We met on a previous holiday, in the Philippines, where we became diving buddies.
Writing: I've tried my hand at writing, some science fiction – a few short stories and a novel, which I wrote in '94 while I was "between jobs". But I haven't been able to get anything published.

And you also find time to accrue an amazing knowledge of astronomical facts and figures. Tell me about the Astromind Event and how you came to be the Astromind winner, year after year.

Yorkshire Astromind has been going for about 20 years, but I've only been involved for the last 9. It's held every October, hosted by a different society each year, and is open to all the societies in Yorkshire, though there are only half a dozen which regularly compete. Each society enters a single contestant; as the name implies, the quiz is a Mastermind-style individual grilling.

I was first invited to compete in 1993. West Yorkshire A.S. hosted it that year; they knew me well, as I'd given them a couple of talks, and decided that our society could be considered "fringe Yorkshire". I know that CaDAS doesn't quite qualify geographically, but I'm a Yorkshireman by birth anyway. I didn't win it the first time, or the next three. My first win came in '97, my fifth time of trying. But since then, I've won it every year. That's five consecutive wins so far. I need one more to equal the all-time record.

In the early days, before I competed, my friend Nigel Palmer, of Mexborough and Swinton A.S., won it six years on the trot. He was then persuaded to stand down and give someone else a chance, and hasn't competed again since. Nigel is just unbeatable. If there's really such a thing as a photographic memory, he has it. Thankfully, I've never had to compete against him.

If and when I achieve the double hat trick and equal his record, then I'll also stand down. I'll then volunteer CaDAS to host the next year's contest, because I'd love to have a go at chairing one and setting the questions. I'll also challenge Nigel to meet me in a special head-to-head contest, to find the Champion of Champions. I'll have no chance of beating him, but it'll be fun to try…

You are a computer programmer, so my question about being computer and mathematics literate is superfluous, but tell me about your early years , family life, where you were brought up, school and education route. Did you enjoy your education?

I was born in Middlesbrough, and brought up in Teesville and later Eston. I went to Stapylton School in Eston, which no longer exists. Yes, I enjoyed my education, but there were certain setbacks. My school year was the first year in which the comprehensive system was introduced in the area, so I just missed out on going to grammar school. We were the guinea pigs for the new system. Those of us who were of grammar school standard found ourselves in a school which wasn't accustomed to teaching at that level, and had to do a lot of extra work to realise our potential. My parents were always supportive. My Dad served as chairman of the school PTA for several years, and was partly responsible for pressuring the school into providing extra tuition where it was needed. Of course, my best subjects at school were always maths and the sciences.

I then went to South Park Sixth Form College in Normanby, where I gained four A-levels, and then onto Leeds University from 1980-83, where I gained an honours degree in Physics with Astrophysics. Those days were great fun.

I always wanted to get into astronomy professionally, but wasn't able to, as I didn't get the necessary grade to stay on and do a higher degree. My profession – software engineering – is simply something I ended up doing, almost by accident; the consolation is that it pays better!

You are an FRAS. How did that come about?
Yes, I was elected FRAS in 1993. My great friend Paul Money proposed me, and John McCue was one of my seconders.

What are you reading at the moment? Have you any recommended reading for us all?
I love reading, but don't get much time for it these days, due to all the other things which take up my spare time. I barely find the time to keep up with the magazines to which I subscribe – including Sky and Telescope, naturally!
I have a library of literally hundreds of books, including dozens on astronomy and spaceflight. When my time comes, I'll leave my library to CaDAS. One of my proud possessions is a copy of Heather Couper's *The Stars* – the book of her TV series – which was given to me by the lady herself, at the first Cosmos North-East convention.
I like reading Arthur C. Clarke's science fiction; I have every one of his novels. I also enjoy espionage thrillers, particularly Frederick Forsyth. And more recently, I've read the whole series of Bernard Cornwell's *Sharpe* novels. Just about the only time I manage to read novels now is during my holidays; I can usually read a whole novel during a long-haul flight, and another on the way back.
As for recommended reading; I haven't bought any new astronomy books for quite a while (there's no room left on my shelves!), so I can't recommend anything new. But one book which I would strongly recommend to any astronomer is 'The Victorian Amateur Astronomer', by our old friend Dr. Allan Chapman. The bad news is it costs about £50. I believe I was the first person to buy a copy, the first day that it went on sale.

What is good about the Society and what would you like to change?
I can't think of much that I'd like to change; I think we're a pretty good Society. I hope a few more people will volunteer to join the Castle Eden Observatory duty observers' roster. Just a handful of people are doing that at the moment, and having to devote a lot of their Friday evenings to it. The more people volunteer, the less often each person will have to work!
In the past, we messed our members about a lot, by changing our meeting venues every couple of years, and we used some venues which weren't very satisfactory. But that's changed now; Grindon Parish Hall is excellent for the purpose, and also pretty cheap. Hopefully we can keep on meeting there, unless of course we use the Planetarium in the future.
There's one thing that we used to do years ago, which doesn't happen much now – Society observing nights. Quite often, when there was, say, a lunar eclipse happening, or a bright comet in the sky, we used to have informal gatherings – sometimes at the Castle Eden Walkway, before the Observatory was built – where those of us with portable telescopes brought them along, and others were welcome to use them. Now, of course, we could do that at the Observatory, and bring a few portable scopes as well.

In a short sentence what is your definition of a civilised society?
Will it ever actually exist? One in which no-one cares about people's race or the colour of their skin, and in which people don't kill each other, or fight wars, for stupid and trivial reasons like following the wrong religion. Sorry, that was a *long* sentence!

Have you any heroes?
Plenty! Given the era in which I grew up, you won't be surprised if I name the pioneering astronauts and cosmonauts as heroes, especially those who died. My novel is about a space disaster, and I dedicated it as follows: "To the memory of the fourteen astronauts and cosmonauts who have so far given their lives, so that others might conquer space. On worlds as yet unknown, may their names live forever."
Also among my heroes are the great scientists of the past, especially the astronomers, who built the foundations of modern science. In particular, Copernicus and Galileo, who overthrew "conventional wisdom" at a time when it was dangerous to do so.
Slightly less importantly, I have a few sporting heroes from the history of boxing. Muhammad Ali, naturally, who was so much more than just a boxer; he was a truly great man. And Jack Johnson, the first black world heavyweight champion, who defied hatred, bigotry and a hostile "Establishment" to achieve his goal.

Who should I interview in the future?
Ian Miles, our Treasurer, to complete the set of committee members.
Dave Graham, who I believe is already on your list. He's one of our most experienced observers, and Director of the BAA Saturn Section. He has some well-known friends in the States, and has made several astronomical trips across the Atlantic, including a stint of observing at Lick Observatory.
Dave Weldrake, our "resident professional", who is currently researching for his Ph.D. at Mt. Stromlo Observatory in Australia.
Don Martin, our resident eclipse expert; he's a veteran of five eclipse expeditions to diverse parts of the world, and also went to Australia for the 1986 apparition of Halley's Comet.

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A Good Look at the Moon.

by Ray Worthy

Have you ever looked at the Moon? I know that this question is a peculiar one to pose before members of an astronomical society, but I ask it again. " Have you ever really looked at the Moon ?" My wife and I were driving from Durham City to Hartlepool the other evening and there in front of us, in a clear sky was the nearly full Moon. I asked Josie what the shape of the Moon was. She replied without any hesitation that it was round.
"How do you mean, round?" I asked. "Round flat, or round spherical?". "Don't be daft " She said, showing her usual respect for her lord and master, "It's round spherical, like a ball." "All well and good", I replied, "But look at it again. Can you tell from looking at it now?". "Come on", she said, "Out with it. What are you getting at?"
OK, suppose you were looking at a ball, illuminated by any light, even the Sun. You would see a highlight where the brightest reflection indicated the position of the source of the light. Think of a white ball. As the eye travelled around from the centre spot and moved around the curve, you would see a progressive diminution of the intensity of the reflection as the angle of the surface changed relative to your eye.

"Yes, I agree", Josie said, because, after all, she is a scientist, though not an astronomer. "Now look at the Moon again", said I, carefully parking the car at the appropriate angle. Can you see any diminution of the reflection as your eye moves around the curve?". "No, I cannot" Josie said, "In fact, now that you have mentioned it, the reflection at the edges appear to be brighter than in the centre".
"Well, apart from the fact that the mare are near the centre, I do not think that is the case. That is probably an optical illusion as at the edges you get the high contrast between the Moon's surface and the darkening sky. Nevertheless, these reflections can be measured and they appear to be more or less the same no matter where you look on the Moon."
Josie started thinking. "Why is that?" she asked. "Well," I murmured, "It's all a con job. The Moon is really a flat plate". "Don't be daft". said Josie, showing more disrespect, "What about the evidence of the phases? It is a sphere. What is the true cause?".
Answers please to Ray Worthy, each one attached to a five pound note.

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Weather Email Exchange

Do you get as fed up as me when, having gone to bed clouded out at 11pm, the sky is crystal clear at 6.30am? So I asked the BBC if they would include a "sky clarity" bit in the weather forecast. I thought members would be interested in the reply.
From: Helen Civil, <helen.civil@bbc.co.uk> Subject: Astronomy and Cloud Cover
Hello Alex. We have been hoping to set up an 'astronomy weather' section on our website for some time, and hope to be able to launch it over the next few months. Why not subscribe to our weekly newsletter and we will publicise it in that when it is launched, (see our home page). We would be unlikely to be able to add this information to every TV and radio bulletin as we don't get a lot of time and the emphasis of the weather story changes each day. Sometimes we give extra info when, for example you can see the space station or a special astronomical event such as an eclipse etc.
On the website, however we hope to give a regular extra section focusing on cloud cover and visibility (and hopefully with a light pollution index too), but it all relies on us being able to get regularly updated, good quality and accurate data.
Hope this helps
Helen Civil, Duty Producer, BBC Weather Centre

And, lo and behold, in this month's 'Astronomy Now' we have the following piece:
Astro weather
If you are wondering whether to take your scope out tonight, a new BBC website will give you a better idea of the night time weather. Logging on to *www.bbc.co.uk/weather/astronomy* will show the likelihood of good observing weather in your region. "It's been difficult in the past to get data for making accurate weather forecasts for astronomers, says Helen Civil, of the BBC's weather department. "Now our team takes data from a number of new sources to provide two simple indexes of the likelihood of good weather for planetary and deep sky observing. Helen Couper provides monthly sky-charts and features on astronomical topics."

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July 1819 Comet Nantucket

A Book Review from John Crowther

" Nantucket was a town of roof dwellers. Nearly every house, its shingles painted red or left to weather into gray, had a roof-mounted platform known as a walk. While its intended use was to facilitate putting out chimney fires with buckets of sand, the walk was also an excellent place to look out to sea with a spyglass, to search for the sails of returning ships. At night the spyglasses of Nantucket were often directed towards the heavens and in July, 1819, islanders were looking toward the northwest sky. he Quaker merchant Obed Macy, who kept meticulous records of what he determined were the " most extra-ordinary events" in the life of his island, watched the sky from his house on Pleasant Street. " The comet (which appears every clear night) is thought to be very large from its uncommonly long tail", he wrote, " which extends upward in opposition to the Sun in an almost perpendicular direction and heaves off to the eastward and nearly points for the North Star."

From the earliest times, the appearance of a comet was interpreted as a sign that something unusual was about to happen. The New Bedford Mercury, the newspaper Nantucketers read for lack of one of their own, commented "True it is, that the appearance of these eccentric visitors have always preceded some remarkable event". But Macy resisted such speculation : "The philosophical reasoning we leave to the scientific part of the community, still it is beyond a doubt that the most learned is possessed of very little undoubted knowledge of the subject of cometicks".

As will be seen from this extract from Nathaniel Philbrick's book "In the Heart of the Sea", the real name of this comet isn't mentioned but I am sure that some of our members will be able to identify it. The book tells the story of the sperm whale which sank the whaler "Essex", a story which inspired Herman Melville to write "Moby Dick". The attack, which left the twenty-one men of the "Essex" in three whale boats, led to terrible sufferings and cannibalism before rescue more than three months later. A recent television programme covered the story, but in much less detail, and the comet, the so-called herald of a disaster, wasn't mentioned.

An unputdownable book.

In the Heart of the Sea, Nathaniel Philbrick, Harper-Collins, £6.99, ISBN 0-00-653120-2

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Nearby Sun-like Stars and Life

By Michael Roe

Many books and articles on life and extra-terrestrial civilisations mention sun-like stars, hopefully with planets orbiting them suitable for life. But which of the stars we can observe with the naked eyes or through binoculars or telescopes are sun-like and how close in luminosity and colour to our own Sun does a star have to be to nurture life?

Our Sun is known as a yellow dwarf; a stable, long-lived star not particularly rare or common. Its exact dimensions are diameter 865,000 miles, spectrum dG2, absolute magnitude (if it was at the distance of 10 parsecs or 32.6 light-years) +4.8. Its colour is

more cream than yellow. Of course, similar stars exist among the millions visible in the telescope. A nearby star which is almost a twin of our Sun is 72 Herculis, spectrum dG2, absolute magnitude +4.8, distance from us 4.3 light years. The spectrum dG2 means d for dwarf, G a yellowish class of the spectrum G0 toG9. G0 is whiter than G9, nearer to orangish stars. A few stars, mainly just visible to the naked eye are scattered around the sky, ranging from G0 to G6 in spectrum and absolute magnitude +5.5 to +4.0, which is half to twice our Sun's luminosity. Many are binary stars of various types like a Centauri, the Sun's neighbouring star system. A couple of easily-visible sun-like stars in the northern sky are ß Canum Venaticorum, 30 light years away and ß Comae Berenices, 27 light years distant. Both are absolute magnitude +4.3 and spectrum dG0.

The nearest really similar star to our Sun is d Pavonis, only 19.4 light years distant, in the far southern sky, apparent magnitude +3.36 absolute magnitude +4.7, spectrum dG4. A few intrinsically fainter type G stars are nearer, such as t Ceti, e Eridani and s Draconis.

So which of these sunlike stars produce life? That depends on what kind of planetary system it has. An Earth-like planet, with abundant water at the right orbital distance seems to be essential. Its size and chemical composition and a fairly circular orbit around a stable star are vital, too. Intelligent life seems to be sparsely scattered in the Galaxy. Our radio telescopes searches for signals have found nothing but one-celled microbes to larger animals could exist on a planet around some sun-like stars. I suspect we may never know. Our best future technology may detect oxygen in the spectrum of a tiny pinpoint image of such a planet. Still, our discovery of giant planets around the stars using gravitational effects is a great achievement for astronomy.

Here is the list from my Atlas Coeli star catalogue of sun-like stars mostly within 40 light years of our own Sun.

Nearby Sun-like Stars (D = double star)

Name	Distance ly	Spectrum	App mag	Abs mag	
72 Herculis	4.3	dG2	+5.36	+4.8	
µ Cassiopeiae	25	dG4	+5.26	+5.8	
? Pheonicis	41	dG0	+4.88	+4.4	
GC 2050	38	dG0	+5.10	+4.8	
d Trianguli	34	dG0	+5.07	+4.6	
? Reticuli	30	dG0	+5.16	+5.2	
a Mensae	27	dG6	+5.14	+5.4	
? Ursa Majoris	25	dG0	+3.88	+4.5	D
ß Canum Venaticorum	30	dG0	+4..32	+4.5	
ß Comae Berenices	27	dG0	+4.332	+4.8	
a Centauri	4.3	dG0	-0.06	+4.1	D
? Bootis	22	dG5	+4.64	+5.5	D
d Pavonis	19	dG4	+3.36	+4.7	
61 Virginis	27	dG6	+4.80	+5.5	

A Shining Example

New efficient street lights have made Durham County Council an annual saving of £265, for just one section of road in Durham city. The lights dim after midnight by reducing the wattage but at the same time maintain sufficient illumination for traffic levels between midnight and dawn. The County Council is proposing to carry out similar schemes elsewhere in the County.
From the (free) Advertiser, March 16th, 2002

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Comet Ikeya-Zhang

From Rod Cuff

Found with my 8x42 bins at around 8 pm last night. It is below naked-eye detection at the moment with local viewing conditions around my house in Guisborough - but it looks very nice! Good tail, and it could be mag 3 late this month according to this web-site:
http://SkyandTelescope.com/observing/objects/comets/article_477_1.asp
If only the Meade telescope that I have on order had been ready . . . .
To find it look west soon after sun-set and about a handspan at arm's length to the north of Mars. The altitude is about 20 degrees.

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NASA's Future Space Telescopes

(NASA Release via Darran Summerfield)

Will we ever see an image of a planet orbiting another star? NASA thinks so, and they're confident it will happen sooner than you think. A quick look at the NASA website reveals that they have ambitious plans forming the core of their Origins program and their exciting plans for the future. Most of these missions use space based interferometers. Interferometry allows the light from two or more telescopes to be combined to synthesise the resolving power of a much larger telescope. Several ground based observatories, such as Keck and the VLT, are already pressing ahead with ground breaking interferometer research. With their Origins program, NASA hopes to take this blossoming technology into space.

The First Generation Missions
Everything kicks off with a series of first generation missions that will serve as technology test-beds for the new technology required for their more ambitious projects. Not only will these exciting missions be important stepping stones they will accomplish excellent science in their own right.
Starlight
Unlike any optical platforms launched by NASA in the past, Starlight will fly two separate spacecraft in precise formation, potentially able to mimic the resolving power of a telescope one kilometre in diameter. The precision baseline interferometry will pave the way for much larger interferometers of the future.

Launch Date: 2005 Operational life: 12 months

Space Interferometry Mission (SIM)

Using the interferometry lessons leaned from Starlight, SIM will use a rigid baseline interferometer to provide a pinpoint accuracy several hundred times greater than any previous mission. SIM will begin identifying stars that have planetary systems around them. SIM will use two telescopes joined by a boom that will hold each instrument at a precise distance from the other while allowing that distance to be adjusted. NASA's Space Interferometry Mission (SIM) will continue the search for extra solar planets by identifying stars that "wobble"--that is, stars that are pulled back and forth as orbiting planets move from one side of the star to the other. While this method of finding planets is indirect, it paves the way for Terrestrial Planet Finder and other missions that will eventually image the distant worlds first discovered by SIM.

While ground-based observatories have identified large, gaseous planets around other stars, only SIM's incredible precision will allow us to begin detecting the extremely tiny star wobble caused by an Earth-sized planet. In its efforts to find Earthlike planets that lie closer to their parent stars, SIM will also pioneer a technique to block out the star's light so that the tiny, faint, orbiting planets can be imaged directly.

Launch Date: 2009 Operational life: 5 years

Next Generation Space Telescope

Originally conceived as a remotely deployed telescope with a folding mirror nearly four times the size of Hubble Space Telescope. The latest design for the NGST has been trimmed down a bit, with a solid mirror about three times the size of Hubble's that will be tested by astronauts before being propelled into deep space. Despite this trimming, the NGST will still be capable of achieving all the observational goals of the original design, the study of the first stars and galaxies to emerge in the Universe.

The Next Generation Telescope (NGST) will look back to an extremely important period in the early history of the Universe when the first stars and galaxies began to form. While we have a fairly good understanding of the Universe in other periods, we have so far been unable to observe this very early epoch, when the Universe was between 1 million and a few billion years old. NGST's studies will help us understand the shape and chemical composition of the universe, the evolution of galaxies, and the nature of unseen "dark matter."

NGST will study infrared (heat) emissions from this early time, seeing objects 400 times fainter than those currently studied with large ground-based telescopes or the current generation of space-based infrared telescopes.

Launch Date: 2009 (approx.) Operational life: 5-10 years

The Second Generation Mission

Terrestrial Planet Finder (TPF)

The culmination of a decade's work, this single mission will combine preceding technologies to begin revealing whether life is a cosmic imperative. It is probably the one orbiting observatory that NASA is striving for at all costs.

Flying four advanced telescopes in formation as an interferometer, TPF will give NASA the first "family portraits" of other planetary systems, and maybe even a picture of a planet where life might exist. TPF will study all aspects of planets, from their formation to their final characteristics. In addition to measuring the size, temperature, and

placement of Earth-sized and other planets, TPF will look for gases such as carbon dioxide, water vapor, ozone, and methane that would indicate that a far-away planet could, or even does, support life. TPF will find the tiny, faint planets around distant stars by reducing the glare of their parent stars a hundred-thousand times (technology that will be pioneered by SIM). It will take pictures of planetary systems as far away as 50 light years. With pictures a hundred times more detailed than those of the Hubble Space Telescope, TPF will also allow us to study such things as the black hole at the center of the Milky Way and other exciting phenomena in the universe.
TPF can be used with baselines as long as 1 km. The angular resolution at the longest baseline is designed to be better than 0.25 milli-arcsecond (mas), depending on the wavelength of light being studied. Recently a ground based interferometer determined that the visible disk of the star Altair is just over 3 mas wide, easily big enough to be resolved by the TPF.
Ground and space-based observatories, in particular the Keck Interferometer and the Space Interferometer Mission (SIM), will set the stage for TPF. They will make a complete census of planets as small as 5 Earth-masses, for stars within 33 light years, and for planets as small as a few Earth masses around the nearest stars (less than 16 light years). TPF will build on the work of predecessor observatories, like SIM, to complete a census of planetary systems down to 1 Earth mass for stars out to 50 light years, before going on to study the physical properties of the terrestrial planets that SIM and TPF itself might discover. This census will include literally hundreds of stars.
Launch Date: 2012 Operational life: 6 years

The Third Generation Missions
For now, these missions remain just a vision because the required technology is not on the immediate horizon. Today and near future missions, however, put NASA on the path toward such monumental achievements. NASA is unprepared to even guess a possible implementation dates for these missions (or a possible price tags). Believe it or not they are on the drawing board, and could be launched before the one-hundredth anniversary of Clive Tomabaughs discovery of Pluto the last new world to be imaged.
Life Finder
Once NASA identifies any habitable planets, Life Finder would fly telescopes at even larger distances to detect chemicals that actually reveal biological activities - that is, the presence of life. If earlier Origins missions lead to the discovery of other worlds with life-sustaining conditions, it doesn't necessarily mean that life has actually emerged there. Life Finder (LF) will seek to determine if a distant planet with the right living conditions actually has an abundance of living things!
Life Finder will be even more sensitive than Terrestrial Planet Finder, but the principle of characterising a planet's conditions is the same. If a planet harbours life, biological activity on the planet will impact the atmosphere, just as it does on our own home planet. When we analyse the radiation coming from the planet, we can look for much finer dips in the energy received. These dips indicate the presence of methane and other chemicals we don't expect to find in nature unless biological activity is pumping it into the atmosphere.
We will also have to keep in mind the history of Earth in relation to a new world. The simplest life forms existed on Earth well before an abundance of oxygen appeared in the

atmosphere, which in turn allowed multi-celled organisms to flourish. Origins astrobiology research will help us expand our knowledge of "life signs" that would appear at different stages in a planet's history, as well as signs that would appear given a planetary chemistry that isn't exactly the same as our own. With these insights, NASA will have the best possible chance of recognising life if and when they find it somewhere else.
Launch Date: 20??

Planet Imager

If NASA found a planet that they were certain harboured life, there would be enormous support for a mission to actually view the surface of that planet. To create such an image would require a small fleet of telescopes flying in formation to achieve the resolving power of an unimaginably large telescope. Just imagine knowing that another Earthlike planet is out there . . . and that for the first time we know exactly where it is! That could never be the end of the story, because our thirst for knowing about that distant planet would be enormous. Would it have continents like ours? Oceans as large? Clouds? Or would it be foreign enough to rival the creations of our very best science-fiction writers?
NASA do have an idea of what would be needed to accomplish this goal: an array of interferometers that each carried NGST-sized telescopes (about six to eight meters). They would have to fly in exquisitely precise formation, over distances of 6,000 kilometers or more! Right now, NASA aren't even close to having the technology to accomplish this task, but the generations of Origins missions, leading up to Planet Imager, will pave the way. They are determined to do this, it's just a matter of time.
Launch Date: 20??

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Astronomy Basics

by Neil Haggath

Introductory note:
The membership of CaDAS covers all levels of knowledge and experience, from complete novice to expert. Some of those at the "novice" end of the scale have sometimes commented that the subject matter of a talk was a little over their heads. The same may also be true of some of the articles in *Transit*; some of us – and I'm among the guilty – tend to write in a manner which assumes a certain level of knowledge among the readers.
So I've decided to write something for the benefit of our "beginning" astronomers – those whose lack of knowledge or experience is more than compensated for by their enthusiasm. Over the next year or so, I'm planning to write – with a lot of help from John! – a series of articles on basic astronomical concepts, to explain some of the technical terms and jargon which the hardcore astronomy nuts among us tend to use without thinking.
I hope those members in the latter category will excuse me; I don't mean to insult anyone's intelligence!

Neil

No. 1: Stellar Magnitudes

Astronomers refer to the brightness of stars and other objects by means of *magnitudes*; we refer to "first magnitude stars", describe a faint galaxy as "magnitude 9.5", and talk about the "limiting magnitude" of a telescope.. So what do these strange numbers actually mean?

The first attempt to classify stars in terms of brightness was made by the Greek astronomer Hipparchus in the Second Century BC. In his star catalogue, he divided all the stars he knew (i.e. naked-eye ones) into six classes of brightness, calling the brightest few dozen "stars of the first magnitude", and those near the limit of naked-eye visibility "the sixth magnitude". (In those days, when the stars were thought to be fixed on a sphere, and therefore all at the same distance, stars were described as "large" and "small", rather then "bright" and "faint" – hence the rather strange use of the word "magnitude".)

This simple system sufficed for many centuries. But of course, after the invention of the telescope, people could see stars far fainter than Hipparchus' "sixth magnitude", so they logically described them as seventh, eighth, etc.

But the system was still pretty crude. Each of Hipparchus' magnitude classes covered a considerable range of brightness, and a trained observer could easily discern several different levels of brightness within a single class. This is what variable star observers do, when they compare the brightness of a variable with those of nearby stars, and estimate it in tenths of a magnitude. In the Nineteenth Century, when the first methods of actually measuring stellar brightness were invented, something better was needed; magnitudes had to be defined as a mathematical scale.

By this time, it was known that the response of the human eye to light levels is logarithmic, rather than linear; the signal which the eye sends to the brain is proportional to the logarithm of the light intensity. If you looked at a series of lamps, with powers of 10, 20, 40 and 80 watts, you would perceive the difference in brightness between each two as being the same, even though each is actually twice as bright as the previous one. This is why our eyes can adapt to a huge range of light levels; it's why we can see faint stars at night, and can see clearly by moonlight, while not being blinded by the Sun.

It was found that Hipparchus' "first magnitude" stars were roughly 100 times as bright as those of the "sixth magnitude". So in 1856, Norman Pogson defined a scale of magnitudes, in which a difference of five magnitudes corresponds to a brightness ratio of exactly 100. The "zero point" of the scale was fixed arbitrarily, to correspond to some particular value of light intensity.

So a difference of one magnitude corresponds to a brightness ratio of the fifth root of 100, which is approximately 2.512. A star of magnitude 2 is 2.512 times fainter than one of magnitude 1, one of magnitude 3 is 2.512^2 times fainter than one of magnitude 1, and so on. Brightness levels in between are represented by decimal fractions of magnitudes.

To make things awkward, Hipparchus' group of "first magnitude" stars turned out to cover a range of brightnesses greater than a 2.512 ratio, so the system had to be extended to include zero and negative magnitudes. The third brightest star in the sky, Alpha Centauri A, has a magnitude of exactly zero. The two brightest, Sirius and Canopus, have magnitudes of –1.42 and –0.72 respectively. All the planets from Mercury to Saturn

also have negative magnitudes when at their brightest; Venus can be as bright as magnitude –4.4.
At the other end, the scale can of course be extended indefinitely; the higher the magnitude number, the fainter the object. The faintest stars visible to the average person's naked eye are about magnitude 6.5. The faintest objects photographed by the Palomar 200-inch telescope are about magnitude 23. And the famous Hubble Deep Field, taken by the Hubble Space Telescope, shows objects as faint as magnitude 30, or a million million times fainter than Alpha Centauri A!
Now it's time for a little maths – nothing too horrible, I promise – to show how magnitude and brightness are related. Suppose two stars have magnitudes m_1 and m_2, and we denote their brightnesses (as measured by, say, a photoelectric photometer) by B_1 and B_2. Then the ratio of their brightnesses can be calculated from the difference in magnitudes by the equation:

$$B_1 / B_2 = 2.512^{-(m1 - m2)}$$

This is known as Pogson's Equation. Note the minus sign before the bracketed term; this is because the scale runs "backwards", with higher magnitude numbers for lower brightness.

If we take the logarithm of each side of the above equation, we get:

$$\log_{10} (B_1 / B_2) = - (m_1 - m_2) \log_{10} (2.512)$$

or

$$\log_{10} (B_1 / B_2) = - 0.4 (m_1 - m_2)$$

(0.4 is the logarithm of 2.512, i.e. $\log_{10} (100)$ divided by 5).
or conversely:

$$m_1 - m_2 = - 2.5 \log_{10} (B_1 / B_2)$$

Pogson's Equation can be written in any of the above forms. It can also be simplified as follows; the magnitude m of a star of brightness B is given by:

$$M = k - 2.5 \log_{10} B$$

where k is a constant, whose value is determined by the choice of the zero point of the magnitude scale.
Usually, when we refer to the magnitude of a star or other astronomical body, we are describing its *apparent* brightness, as seen from the Earth; we call this its *apparent magnitude.* But this tells us nothing about the star's actual intrinsic brightness, or luminosity, unless of course we know how far away it is. A star's apparent magnitude depends on its intrinsic luminosity and its distance from us. (It also depends on absorption in the interstellar medium, but we'll ignore that for this discussion). So if we measure a star's apparent magnitude and its distance, we can work out its luminosity. (How we measure the distances of stars will be the subject of a later article).
Astronomers use two different ways of describing the luminosity of a star. One is simply to compare it with the Sun; luminosities are often listed on a scale where the Sun's

luminosity is one. So when we say Sirius has a luminosity of 26, we mean that it's 26 times as powerful as the Sun.
The other way is to use its *absolute magnitude*. This is equal to the apparent magnitude that the star would have, if it were viewed from a certain standard distance, defined as 10 parsecs, or 32.6 light years. (The parsec is a commonly used unit of distance; where it comes from will also be explained in a later article). The absolute magnitude of Sirius is 1.6, meaning that it's a fairly luminous star, but not exceptionally so; it appears so bright to us, because it's both intrinsically bright and close to us, at only 2.7 parsecs. The Sun's absolute magnitude is 4.8, showing that it isn't really very bright at all!
The apparent brightness of a star is inversely proportional to the square of its distance; move it twice as far away, and it would appear a quarter as bright. This is called the Inverse Square Law. By combining the Inverse Square Law with Pogson's Equation, we can derive a simple equation which relates absolute and apparent magnitudes. (I won't bother to go through the derivation here; in the unlikely event that anyone is sufficiently interested, I'll show you!). If we denote a star's absolute magnitude by M, its apparent magnitude by m and its distance in parsecs by d, the equation is:

$$M = m + 5 - 5 \log_{10} d$$

So if we know a star's apparent magnitude and its distance, we can easily deduce its absolute magnitude, and therefore its luminosity. Conversely, if we know an object's absolute and apparent magnitudes, we can deduce its distance. The latter is very important, since there are some classes of objects, such as Cepheid variable stars, whose intrinsic luminosities can be deduced from their other characteristics. This provides us with a means of deducing the distances of many objects which are too far away to measure directly. But that's another story.

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Letter from New Zealand
by Frank Gibson

Kia ora. I am writing this on the morning of 31 March New Zealand time. At the moment if the weather is fine in England you will be peering through a telescope at the sky or if it is not you will be close to if not actually in bed. Autumn is a coming in and it is raining. I hope I do not miss the deadline for this article. If I do I apologise in advance. Times have been busy. As well as the usual non stop deluge of work created by being a teacher I have had to rebuild the hayshed to store 150 bails of hay for winter feed for the animals. Yesterday we actually took in the bails and they are now safely stacked. Unusually for the weather it began to rain just after (i.e. not during) the hay stacking. Wet hay not only rots and becomes useless it can also become so hot by fermentation that it burns down your hayshed.

Back to the story of my observatory. Last month I told you how I put in the concrete block for the telescope to stand on and built a decking floor around it. Now I was faced with the task of building a roof.

In many ways I envy people who simply go out and build things. Many years ago I got myself a degree in engineering and cannot shake off the problem-solving approach inherent in this discipline. It means that the things I build tend to work but the design stage can be quite protracted as I come up with solutions and then work out the advantages and disadvantages of each option. I rapidly discounted the idea of a revolving dome because I wanted to keep it cheap and as homemade as possible. I realised very quickly that simply getting the tracks to an acceptable degree of circularity would be difficult and that if this was not achieved then moving the dome would be a constant problem. A further factor was that as I intended to build in wood even if good circularity was achieved it is unlikely that the rails would stay that way due to temperature and humidity changes. I decided to play to my strong points. I have built two sheds and part of a house from wood and am good at making roofing trusses and so decided to make a gable shaped roof that would sit on straight rails. The rails would extend beyond the end of the building so that the roof could run completely off the top of the building.

To make the rails I nailed together lengths of 100mm x 50mm building timbers to form 100mm by 100mm beams. I then used a router to cut channels in the top side of the beams. The beams had to be twice as long as the roof i.e. about 8.5 m. I realised that I could not possible manoeuver that sort of mass of timber into position while standing at the top of a ladder and so built each beam in two sections, which would be joined together when in position. Obviously an overhang of about 4 m would be far too weak to support the roof when it was run off and so I put in a framework of four rough-cut tanallised (treated for exposure to water) four metre poles with cross beams to support the ends of the rails.

I realised that I would still be faced with the problem of expansion and contraction of the timber rails and so fastened one end firmly but rested the middle and outer ends on aluminium plates, which I cut from an old door, with slots rather than round holes for the fixing bolts so that the timber could move to some extent (the same principle as fishplates on railways).

Now for the roof. I first made a scale drawing to check that the space beneath the roof would be high enough to allow the roof to run off without hitting either my head or more importantly the telescope. From this I worked out the angles for the roofing trusses. I then laid out these angles on a piece of composition board and marked the lines by gluing in dowelling pegs. This board then acted as a pattern to ensure that each of the trusses had the same angles. Having cut the required lengths of 100 x 50 mm timber I laid them on the pattern and completed the structure by connecting the timbers using nail plates. Repeating this four times gave me four roofing trusses, which were pretty close to being the same.

I thought about assembling the roof on the ground and then raising it into position but a rough calculation gave me a weight of 250 kg so I decided to recall my climbing skills and build the roof in situ. The base of the roof consisted of beams again made from 100 x 50 timbers nailed to form two 100 x 100 beams. Onto each of these I bolted two heavy

duty trolley wheels and again to allow for movement and inaccurate building I mounted the wheels on rectangles of 1 cm thick Perspex which I cut from an old advertising hoarding which I picked up in a junk auction for $2 (new Perspex is expensive stuff). The Perspex plates were mounted onto the beams using bolts through slot holes to allow some lateral movement.

At this point I had to put trust in my own workmanship. I clamped the beams in position and climbed up onto them. I then progressively nailed each truss to the beams and then finished the job by cladding the roof with corrugated steel. This makes an excellent water and weatherproof roof but is horrible stuff to work with. I have built three rooves using corrugated steel and always finish up with lots of little cuts on my hands – most unpleasant.

The final job was to slap generous helpings of engine grease onto all of the moving parts. As well as helping the roof to move smoothly it also helps to protect the wooden beams from the effects of powerful sunshine and heavy rain.

In order to actually move the roof I rigged up a system of pulleys. For my first attempt at this I used quite small cheap pulleys and green plastic line. This worked but because of the thinness of the line it tended to cut into my fingers which was not good. I decided at this point to sacrifice some items, which I brought from England almost fifteen years ago but never used since. These were the ropes and rope clamps that I used when I was a keen caver in the nineteen eighties. They worked admirably and because of greater diameter and small degree of stretch of caving ropes were much nicer to handle. I can now have the roof off or back on in about a minute. This has the big advantage that it is possible to take advantage of small clear breaks in weather without risking getting rain on the equipment.

Next month I shall give a rundown on the equipment I am using.

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Use of TV Cameras

from Malcolm Bannister

Using Jack's 12" Cassegrain telescope, we mounted a Philips Toucam 740K USB webcam without the lens at prime focus. (All done with mirrors!) The images are made from an AVI sequence using Vega software and shot at 5 frames per second at 1/50th second exposure. Auto white balance was used and sensitivity was about 35%. No tweaking of the brightness or contrast was attempted, as we are trying things out bit by bit and really wanted to get any images that we could just to try things out. Six frames were stacked with Astrostack from about 45 shot in this sequence and just a mild unsharp mask used together with flatfield and darkframe correction. We're just scratching the surface of what can be done right now as the seeing was really bad at the time. We've since used a Barlow to increase the image size with promising results. When we get up to speed with the software we should be turning out much better images, given the hardware we are using.

Transit Tailpiece

Word Game

Have you come across that game where you change, add or delete a letter from a word to make one that didn't exist before? Like 'Parkherd' - a Celtic football crowd, or 'genetically moodified' - women. What do you think of this one I made up the other day? 'Planetorium' - observatory for sick astronomers. Well, ok, you do better, then

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Quote/Unquote

Damn the Solar System. Bad light, planets too distant, pestered with comets, feeble contrivance. Could make a better one myself. Lord Jeffrey.

Are there an infinity of other universes that are 'badly tuned' and therefore sterile? Is our entire universe an 'oasis' in a multiverse? Or should we seek other reasons for the providential values of our six numbers. Sir Martin Rees, "Just Six Numbers".

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.

"Astronomy Now" and "Astronomy". Gareth Morris is now bringing a number of back issues of these magazines to each meeting. Everyone is welcome to help themselves. Gareth says they have to go, for marital tranquility.

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 www.goliver.freeserve.co.uk. Support local businessmen! Glen tells me that he now has an Astronomy and Space books page on his website.

CaDAS Website Don't forget to visit our very own website and give John McCue your comments (www.stocktonsfc.ac.uk./mccue/caseden.htm).

Sunderland Astro Soc Website If you get withdrawal symptoms and want to go to meetings between CaDAS monthlies, visit www.sunderlandastrosoc.com to see what they are doing.

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).