Castle Eden Planetarium: *Newsletter 2*

incorporating

Transit

The magazine of the Cleveland and Darlington Astronomical Society

April, 2001

Located on the Nature Walkway near Thorpe Thewles, Stockton-on-Tees, and jointly founded in 2000 by the Cleveland and Darlington Astronomical Society and Stockton Borough Council, to bring the universe to everyone.

Editorial

from Alex Menarry (CaDAS)

In this edition we report on the fireball, seen from the Castle Eden Walkway by three of our members. At the March meeting, President Jack Youdale gave a typically interesting and entertaining annual lecture on the life of Dall. A short summary has been included in the Newsletter. I knew about Dall tubes for the measurement of flow, and the Dall optical test for mirrors, but had never realised the connection between the two. Jack's Dall Medal, awarded for his services to telescope-making was circulated for all to see.

Next month, on April 6th, we welcome Dr Adrian Jenkins of Durham University to give his lecture "Simulating the Universe", postponed from November because of illness. Open nights at the Castle Eden Walkway have been well attended and some clear, crisp viewing has been the reward. Notable observations have been satellite phenomena around Jupiter, and the magnificent sight of Saturn's ring system. Attendance at meetings is regularly around 40 and we welcome new members. Please remember, the Newsletter is always looking for interesting material, written by our own members or from other publications. If you are enthusiastic about something, you can be sure other members will be interested to hear about it - an observation, a trip to a good site, a comment on your telescope, your current interest. We want it all! Send it to me at a.menarry@virgin.net

Building progress

The serious outbreak of foot-and-mouth disease has caused the closure to the public.of the Castle Eden Nature Walkway near Thorpe Thewles. Observing is therefore at a standstill until the all-clear is given. However, building work on the planetarium, under strict precautions of course, can continue, and preparation work for the roof construction is currently underway.

Enquiries are being made at the Billingham Forum and the Middlesbrough Odeon Cinema for surplus seating which we hope will be useful to us in the planetarium. Both are scheduled for closure, stories trailed by the media, but it's an ill wind...!

Plans are slowly being made for computer equipment, stored away for months, to be fashioned into a network between the observatory and the planetarium. If successful, it would be, probably, a unique venture in British planetarium shows; views of the universe live from a serious astronomical telescope.

Thank you to the volunteers from our society who put their names forwrd to help with the interior of the planetarium once the roof is on. The more the merrier. We are all working hard now towards an opening in November.

The Millennium Telescope

Thanks to society member Dr. Ed Restall progress on the new giant reflector for the Castle Eden observatory has made a big step forward. He persuaded the gas supply company Transco to donate a 6-feet length of 20-inch diameter industrial plastic tubing, making the assembly of this near 19-inch telescope a lot easier. Also John McCue has taken the mirror to David Sinden's Optical Company in Newcastle for testing and coating. Although the grant of 500 is vital to meeting the cost of this project, the society will be looking to raise more funds during the next few months.

Adventures in telescope-making, part 1

From Darran Summerfield (CaDAS)

Last year, a nagging problem that I had previously managed to ignore developed into a sanity endangering condition. I was suffering

from a bad case of aperture fever, a condition that invariably infects an amateur astronomer at some point during their lives. Most victims learn to live with the affliction, others succumb to its effects. Unfortunately the only known cure is to acquire a bigger telescope. What makes my situation particularly irritating, is that I already have a really good telescope, a seven-inch Maksutov.

Looking at my telescope and my two-year-old son, I realised that even if I could afford it, hearing the reply "you already have one" from the house treasurer was virtually guaranteed. So with a sigh, I resigned myself to an extended period of saving, my cure would have to wait.

Then one day I had a revelation. If I couldn't afford to buy a new telescope, then perhaps I could make one. I can't specifically remember what put the idea into my head, but it stuck. However, since I have problems doing simple jobs like putting up shelves, such a prospect seemed ridiculous. I knew nothing of metalwork and had only a basic grasp of woodwork. My non-existent understanding of optics was only matched by my lack of experience with electronics. To the casual bystander, these handicaps must have seemed like insurmountable obstacles, but to me these inadequacies simply fuelled my naive confidence. After all, in a situation like this, thinking you can achieve something is far more useful than thinking you can't.

I decided to start the project, by surfing the Internet for articles on amateur telescope making. This turned out to very fruitful, in fact it's probably possible to build a telescope exclusively using the Internet as a source of information. As well as accumulating a huge amount of info and ideas, I came away with three conclusions: lots of people have done it; doing it didn't seem that difficult; and there seemed to be an infinite number of different ways how to do it. The only pre-requisites seemed to be patience, time and a willingness not to give up easily. Obviously I would have to acquire certain skills, but I hoped these would develop as the project progressed. After all, the only way to learn how to make a mirror is have a go.

From the many books available on the subject, I managed to compile a list of recommended titles, and for Christmas I received three of them: "How to Make a Telescope" by Jean Texereau; "Build your own Telescope" by Richard Berry and "Star Testing Astronomical Instruments" by Richard Suiter. Reading these books reinforced my belief that making a telescope was not so difficult, the only real issue is time. As an added bonus it seemed entirely possible that I could build a telescope that was not only significantly cheaper than a commercially available telescope of comparable size, but it could be of better optical quality. This final revelation came as an unexpected surprise and was the only encouragement I needed to convince me to make my own optics. For those that are curious, most telescope manufacturers produce optics that are, at best, slightly better than the bare minimum required to produce a good image.

For an amateur mirror maker, there is nothing to stop them from working on a mirror until it is much better than the minimum commercial standard. Of course making my own optics could backfire, but then any mistakes would be my own, and making them and correcting them would be the best way to learn (ask me whether I still believe this when I'm still trying to figure my first mirror after the fifth attempt). Although fabricating my own mirror would increase the build time, it would drive down the price significantly. As I was intending this to be a long-term project anyway, I deemed this an acceptable trade off.

Now that I'd decided to 'go the whole hog' and build a scope from scratch I needed to make some important decisions about what I was actually going to build. The type of telescope was settled right from the beginning, since a Newtonian is the universally accepted first scope for a budding telescope maker. I think this is mainly because the amateur only has to make one optical surface, the primary mirror. This coupled with a simple 'Dobsonian' mount minimises the complexity of such a telescope, and maximises the chance of success.

The size of the mirror was the next decision, I settled on a ten-inch f/6, meaning a mirror ten inches in diameter with a focal length of sixty inches. This was a good all round compromise. It would give me a mirror that was not too difficult to make, and would provide

an aperture significantly larger than my current telescope. I ordered the blank from Orion Optics because they would supply it with a pre-generated initial curve, and from Beacon Hill Telescopes, a grinding kit (minus a tool, to save money). I brought my newly acquired blank along to the March club meeting to get some advice about what grit size I should use on a pre-generated curve. I had no idea that Jack's talk would be about Horace Dall, talk about inspiration! I was also concerned that I might have bitten off more than I could chew by starting with a ten inch, but Jack quickly allayed my fears with his seemingly boundless enthusiasm and encouragement.

As of the end of March 2001 I'm just waiting for a bag of dental plaster to be delivered so I can make a tool to grind the mirror (I've since discovered that a simple bag of cement would have sufficed).

Soon the real fun will begin....

New Planetary Puzzlers

from Michael D. Lemonick, in Time mag., Jan. 22, 2001

sent by John Crowther (CaDAS)

The discovery of planets around distant stars has become like space-shuttle launches-newsworthy but just barely. With some 50 extra solar planets under their belt, astronomers have to announce something really strange to get anyone's attention. Last week they did just that. Standing in front of colleagues and reporters at the American Astronomical Society's semi-annual meeting in San Diego, the world's premier planet-hunting team - astronomer Geoffrey Marcy of the University of California, Berkeley, and his colleagues - presented not one but two remarkable finds. The first is a pair of planets, each about the mass of Jupiter, that whirl around their home star 15 light-years from Earth in perfect lock-step. One takes 30 days to complete an orbit, the other exactly twice as long. Nobody has ever seen such a configuration.

But the second discovery is far stranger - a solar system 123 light-years away, in the constellation Serpens, that harbors one "ordinary" planet and another so huge - 17 times as massive as Jupiter - that nobody can quite figure out what it can be, It is, says Marcy, "a bit frightening."

What's frightening is that these discoveries make it clear how little astronomers know about planets, and they add to the dawning realisation that our solar system - and by implication Planet Earth - may be an oddball. For years theorists figured that other stars would have planets more or less like the ones going around the sun. But starting with the 1995 discovery of the first extra solar planet - a gassy monster like Jupiter but orbiting seven times as close to its star as Mercury orbits around our sun - each new find has seemed stranger than the last. Searchers have found more "hot Jupiters" like that first discovery. These include huge planets that career around their stars not in circular orbits but in elongated ones; their gravity would send any Earthlike neighbors flying off into space. Says Princeton astronomer Scott Tremaine "Not a single prediction for what we'd find in other systems has turned out to be correct".

Last week's giant was the most unexpected discovery yet. Conventional theory suggests that it must have formed like a star, from a collapsing cloud of interstellar gas. Its smaller companion, only seven times Jupiter's mass, is almost certainly a planet, formed by the build-up of gas and dust left over from a star's formation. Yet the fact that these two orbs are so close together suggests to some theorists that they must have formed together - so maybe the bigger one is a planet after all. Or maybe astronomers will have to rethink their definition of "planet". Just because we put heavenly objects into categories doesn't mean the distinctions are necessarily valid. As Tremaine puts it, "When your classification schemes start breaking down, you know you're learning something exciting. This is wonderful stuff."

Deep Sky Corner: once in a new moon

from Darran Summerfield (CaDAS)

I used to think that only clear moon free nights were any good....nights when the sky is more willing to give up its faint secrets. But recently I had a change of heart. I was drawing an open cluster, M47 in Puppis to be precise, when a bank of mist rolled in and washed out the sky. Although this cloud spoiled the view, it actually made the cluster simpler to draw.

I found it easier to concentrate on accurately drawing the clusters brighter members. Later when the sky cleared, I was able to fill in the fainter stars without any difficulty. It was then I realised that this technique could be applied to bright moonlit nights.

So I suggest, that you don't waste those bright nights. This applies equally well to those of us that live in light polluted areas, don't wait until one of your trips to a dark sky site. With our climate, clear nights come few and far between, and don't always coincide with a new moon or with the chance to travel. I've now found that any clear night can be put to good use, regardless of how washed out the sky is.

On such nights I recommend making preliminary sketches. Fill in the brightest stars in the field and take the time to get their positions correct. Don't make the faintest star you can see the smallest dot you can draw. Then, when a dark night comes around, complete the faint details of the sketch, including the fainter stars. This way you won't waste precious 'dark sky time' filling in details you can see on any other night.

Not only is this a good way to maximise your dark sky time, but it is also one possible way of tackling bewilderingly complex objects like M11, M35 or M37. Such objects don't look so difficult to draw when seen through the glare of a bright sky.

While you are outside on such a night why not have a look at the moon itself, or any planets that might be in the sky, and certainly take the time to track down one or two double stars to round off the evening.

Fireball, 2nd March 200l
from Charles Rees (CaDAS)

A fireball was seen from Castle Eden Walkway on Friday 2 March 2001, at 21:32 hrs UT, heading from the constellation of Ursa Major heading towards the constellation of Coma Bernice and then onto Virgo, entering the Earth's atmosphere between the stars Acturus and Beta Leo major.

The fireball was estimated to be as bright as the planet Venus. As the fireball entered the Earth's atmosphere it appeared to be a yellowish/orange in colour and was breaking up as it entered the atmosphere. Then for a second breaking up ceased, then continued breaking up for a few seconds, then ceased as the fireball continued on its path towards Virgo before fading out of view. No sonic boom was heard after the event. The whole event was estimated to have lasted for at least 10 seconds.

The three people who observed the event at Castle Eden Walkway, was Charles. M. Rees. F.R.A.S., D. Weldrake. BSc (Hons). F.R.A.S., and D. Bushnell., all of whom are members of the Cleveland and Darlington Astronomical Society.

A comet surprise
from Darran Summerfield on the net

A faint in-bound comet, discovered in January and due to become a nice observing target in June, seems to have "turned on" much sooner than expected. Following a major outburst this past week, the comet is already within easy reach of small telescopes in the constellation Monoceros, low in the southwestern sky at nightfall.

Back in mid-January, the MIT Lincoln Laboratory team in Socorro, New Mexico, reported a 19th-magnitude object in Cancer that did not appear to be moving like a typical main-belt asteroid. Follow-up CCD observations at two observatories in the Czech Republic revealed a fuzzy rather than a point-source image, and Daniel W. E. Green of the Central Bureau for Astronomical Telegrams announced the discovery of Comet LINEAR (C/2001 A2) on IAU Circular 7564. This was the 54th comet discovered or co-discovered by the LINEAR team to date. (There have been a few more Comet LINEARs since.)

The orbital elements calculated by Brian G. Marsden, and the brightness observations available in January, suggested the comet would brighten slowly to perhaps 13th or 12th magnitude by the start of April, ultimately reaching about 9th magnitude in June.

But then, starting on March 26th, Michael Mattiazzo of Wallaroo, South Australia, noticed the comet was much brighter than expected. With a 20-centimeter reflector on the 26th and 28th, he found it to be magnitude 10.7. On March 30th, using a 25 x 100 binocular, he called it 8.0. Other observers around the world agree that something dramatic has happened to this comet.

The ephemeris below, calculated at Sky and Telescope from Marsden's elements, gives the comet's position at 0h Universal Time on each day for the next several weeks. The magnitude predictions given here are based on the current outburst, which may not last. The comet could fade by several magnitudes during this time. Text by Roger W. Sinnott of Sky and Telescope.

2001	R.A.	Dec.	Mag.
Apr 6	6 00.7	-08 07	7.5
Apr 7	6 00.3	-08 24	
Apr 8	5 59.9	-08 58	7.4
Apr 10	5 59.2	-09 15	
Apr 11	5 58.8	-09 33	7.3
Apr 12	5 58.5	-09 51	
Apr 13	5 58.2	-10 09	7.2
Apr 14	5 58.0	-10 27	
Apr 15	5 57.7	-10 46	7.1
Apr 16	5 57.4	-11 05	
Apr 17	5 57.2	-11 24	7.0
Apr 18	5 56.9	-11 43	
Apr 19	5 56.7	-12 02	6.8
Apr 20	5 56.5	-12 22	

The big freeze
from Neil Haggath (CaDAS)

This article is based on the BBC2 "Horizon" programme broadcast on 22nd. Feb., 2001, entitled "Snowball Earth".

We all know that several times in its history the earth has suffered ice-ages during which severe global climate changes caused the polar ice-caps and glaciers to expand into normally temperate regions. No-one knows for certain what caused them; one possibility is fluctuations in the output of the sun.

But imagine the prospect of a global super-ice-age, one so severe that the entire planet was entombed in ice up to a kilometre thick! Incredioble though that may seem, some geologists believe that, 600 million year ago, that is exactly what happened. This controversial theory has been around for over fifty years but 99 percent of all geologists have always disnmissed it as absurd...until recently. The programme explains...

For over fifty years a group of scientists has been trying to prove this incredible theory of Earth history, Struggling against sscepticism and disbelief. Now, finally the many mysteries have been solved and the scientific community is slowly coming around to the extraordinary idea not just of the dramatic freeze, but of an equally dramatic thaw. Scientists across the world are starting to believe that in the past the Earth froze over completely for ten million years... then warmed up rapidly about 600 million years ago. Almost all life was wiped out. But out of the freeze emerged the first complex creatures on Earth. Scientists now believe that the so-called Snowball Earth theory could hold the key to the evolution of complex life on this planet.

The discovery of this theory is a classic scientific detective story. For decades there had been a growing 'X-File' of geological anomalies haunting the scientific community. Telltale signs of past glaciation have been found in places that should have been much too hot - very near the equator. Even during the most severe ice age, scientists believed that the ice only reached as far down as Northern Europe and the middle of the USA. So what could these tropical deposits mean?

Back in the 1960s one of the first climate modellers, Mikhail Budyko, stumbled on an ingenious answer. Through some simple mathematical formulae, he calculated that if the polar ice caps had spread past a crucial point, a runaway freezing process would have followed, eventually freezing over the whole of the planet. The idea fascinated scientists, but no one thought his runaway glaciation was anything more than a theoretical result. Surely it had never actually happened on planet Earth?

The idea foundered because according to the model, once the Earth was frozen there was no way out - the Earth would remain frozen forever. The big freeze would wipe out all life; we would not exist today. It seemed patently absurd. But then came a series of insights and inspirations from a geologist in California, Joe Kirschvink, who came up with a brilliant solution - that volcanoes, protruding above the frozen landscape, would have carried on pumping out carbon dioxide, the greenhouse gas, even though the world had entered the deep freeze. On Snowball Earth there was no rain to wash this carbon dioxide out of the atmosphere. Instead it would have built up to higher and higher concentrations - until even-

tually it sparked off not just global warming but global meltdown.

So the idea of the big freeze is not so absurd after all. Not only does it appear to have happened, but perhaps it was also responsible for the existence of all advanced life on our planet - including us.

Exoplanets: The Hunt Continues! latest from the ESO

The intensive and exciting hunt for planets around other stars ("exoplanets") is continuing with great success in both hemispheres.

Today, 4th. April, an international team of astronomers from the Geneva Observatory and other research institutes is announcing the discovery of no less than eleven new, planetary companions to solar-type stars, HD 8574, HD 28185, HD 50554, HD 74156, HD 80606, HD 82943, HD 106252, HD 141937, HD 178911B, HD 141937, among which two new multi-planet systems. The masses of these new objects range from slightly less than to about 10 times the mass of the planet Jupiter.

The new detections are based on measured velocity changes of the stars, performed with the CORALIE spectrometer on the Swiss 1.2-m Leonard Euler telescope at the ESO La Silla Observatory, as well as with instruments on telescopes at the Haute-Provence Observatory and on the Keck telescopes on Mauna Kea (Hawaii, USA).

Some of the new planets are unusual: a two-planet system (around the star HD 82943) in which one orbital period is nearly exactly twice as long as the other - cases like this (refered to as "orbital resonance") are well known in our own solar system; another two-planet system (HD 74156), with a Jupiter-like planet and a more massive planet further out; a planet with the most elongated orbit detected so far (HD 80606), moving between 5 and 127 million kilometers from the central star; a giant planet moving in an orbit around its Sun-like central star that is very similar to the one of the Earth and whose potential satellites (in theory, at least) might be "habitable".

At this moment, there are 63 know exoplanet candidates with minimum masses below 10 Jupiter masses, and 67 known objects with minimum masses below 17 Jupiter masses.

The new results are the outcome of high-precision radial-velocity measurements. This fundamental observational method is based on the detection of changes in the velocity of the central star, due to the changing direction of the gravitational pull from an (unseen) exoplanet as it orbits the star. The evaluation of the measured velocity variations allows to deduce the planet's orbit, in particular the period and the distance from the star, as well as a minimum mass.

Further progress within the current programme is expected soon, when the Very Large Telescope Interferometer (VLTI) at Paranal becomes available. This new instrument will have the observational capability of very high-accuracy positional measurements (astrometry) and thus be able to detect even very small wobbles of stellar positions in the sky that are due to the pull of orbiting planets.

With the exception of the planet iota Hor, circular orbits among exoplanets have only been found for short-period systems, contrary to what is the case for the giant planets in our own Solar System. However, the orbit of the newly found planet near the sun-like star HD 28185 is very nearly circular and with a period of 385 days (close to 1 Earth year), its distance from the star, 150.6 million km, is almost equal to the distance betwen the Sun and the Earth (149.6 million km).

This new planet is therefore located in the "habitable zone" where temperatures like those on the Earth are possible. Still, it is a giant, gaseous planet (with a minimum mass of 3.5 times that of Jupiter, or about 1000 times that of the Earth) and thus an unlikely place for the development of life. Nevertheless, it may be orbited by one or more moons on which a more bio-friendly environment has evolved. The presence of natural satellites ("moons") around giant extra-solar planets is not a far-fetched idea, just look at our own Solar System.

Contact: Dr. John McCue, FRAS, john.mccue@ntlworld.com, 01642 892446 for CaDAS, or Mr. Martin Jenkins, 01642 358508, for Stockton Borough Council.