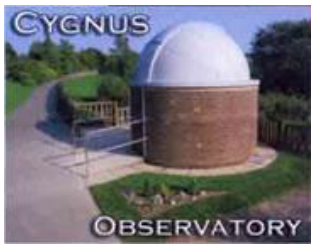
SAS NEWS

Sunderland Astronomical Society



In this issue: Society events + The Darke Side + NASA's *SpacePlace* + More controversies with *Old Boots*

Cover Photograph: IC443 Jellyfish Nebula in Gemini.
Photographer: Dave Williams, using a 78mm refractor and 20 minute subs:
H-alpha mapped to red and Sulphur II mapped to green and blue.

April 2012

www.sunderlandastro.com **Registered Charity #1071527**

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Events list

Sunday 08 Apr: 6pm Committee meeting / 7pm workshop meeting
Sunday 15 Apr: Speaker – **Professor Sir Arnold Wolfendale**, The former Astronomer Royal; Saturn at opposition
Thursday 19 April: Special event: Speaker - **Dr Saralyn Mark, NASA medical doctor.** WWT 7:30pm
Friday 20/Sat 21 April: Dark sky observing opportunity
Sat 21 April: New Moon
Sunday 22 April: Peak of the Lyrid meteor shower, from midnight until dawn on Sunday morning.
Thursday 03 May: **Space exhibition and observing, 9pm**, Reg Vardy Gallery, Sunderland University, Backhouse Park. SAS founder Don Simpson will be speaking on local Victorian astronomer T.W.Backhouse
Sunday 13 May: 6pm Committee meeting / 7pm workshop meeting
Sunday 20 May: **Annual astrophotography competition**. Also, New Moon; annular solar eclipse over Pacific and USA; Peak of the Sagittarid meteor shower

All Society events
- are free,
- are held in the Washington WWT facilities, and
- evening meetings start at 7:00pm unless otherwise noted.

Please bring a torch and warm clothing to any night-time observing sessions.
All observing sessions are dependent upon favourable weather and may be subject to cancellation.

Editorial

The April issue is now traditionally when I report on my experiences of the Kielder Star Camp, and this time I need to comment on the rather extreme weather conditions – I don't think we saw a single drop of rain the whole time I was there. That is, quite simply, unheard of for Kielder. I'm not complaining! In many ways the dry sunny weather was perfect for the star camp. However the night time conditions were less than perfect. The sky was clear and crisp on the Wednesday night, but later nights were misty.

Unexpectedly, the thin mist at times helped to provide some of the best views of Mars we've seen for a long time, by reducing the contrast between planet and sky. Dark surface markings were clearly visible on the planet, even thought the mist had blotted the light out from all but the brightest stars.

My personal thanks go to Michael Tweedy, with whom I completed a Messier Half-Marathon on the Wednesday night (or in other words, we only got halfway through the full marathon!) and what an interesting experience that was. We clocked up fifty of the "M" objects before a mixture of dew, ice and (in my case) tiredness made me retire for the night. The big surprise was how interesting and different the many open clusters in the Messier catalogue appear. I've never been a big fan of open clusters – the Perseus Double Cluster excepted – and this exercise really opened my eyes to them.

I've always resisted the Messier Marathon idea as a mere "box ticking" exercise, but I was again surprised by how long we could stop and observe each object. It turned out to be a very rewarding exercise, and Michael's computerised 11inch SCT worked well with my 12inch Dob to find the objects. I hope to resume the marathon and do the second half of the list either at Derwent or up at Kielder come the autumn. My thanks also go to Kev and Lynn for their hospitality, dedication and organisation, and to all the other attendees who make the Star Camp such a great place to be. – Dave N., Editor.

SAS Yahoo Forum
The Society's Yahoo group provides a forum for members to exchange ideas, ask questions, and a place to post their pics:
http://tech.groups.yahoo.com/group/SunderlandAstronomicalSociety/

The Planet in the Machine

By Diane K. Fisher and Tony Phillips

The story goes that a butterfly flapping its wings in Brazil can, over time, cause a tornado in Kansas. The "butterfly effect" is a common term to evoke the complexity of interdependent variables affecting weather around the globe. It alludes to the notion that small changes in initial conditions can cause wildly varying outcomes.

Now imagine millions of butterflies flapping their wings. And flies and crickets and birds. Now you understand why weather is so complex.

All kidding aside, insects are not in control. The real "butterfly effect" is driven by, for example, global winds and ocean currents, polar ice (melting *and* freezing), clouds and rain, and blowing desert dust. All these things interact with one another in bewilderingly complicated ways.

And then there's the human race. If a butterfly can cause a tornado, what can humans cause with their boundlessly reckless disturbances of initial conditions?

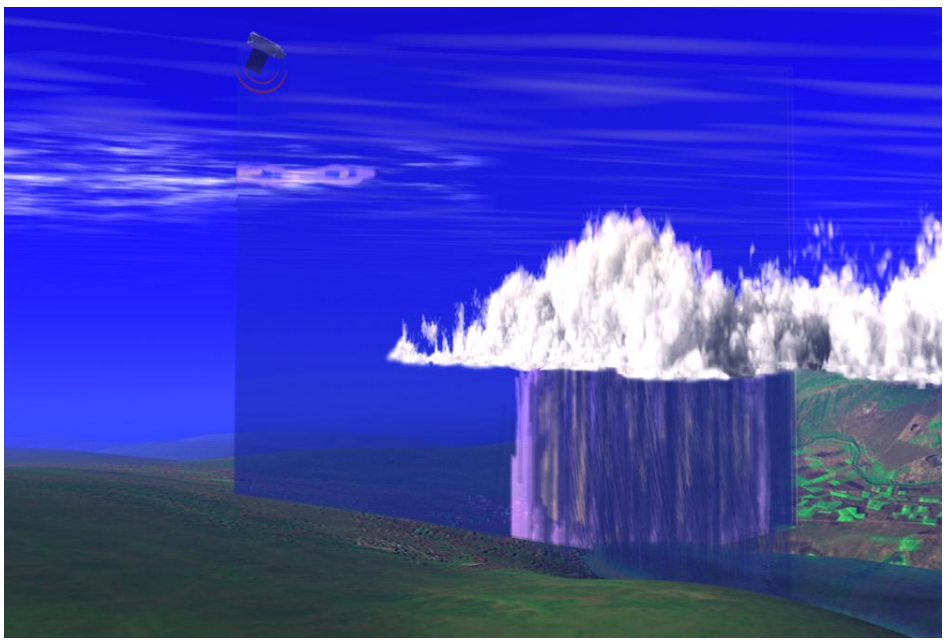
Understanding how it all fits together is a relatively new field called Earth system science. Earth system scientists work on building and fine-tuning mathematical models (computer programs) that describe the complex inter-relationships of Earth's carbon, water, energy, and trace gases as they are exchanged between the terrestrial biosphere and the atmosphere. Ultimately, they hope to understand Earth as an integrated system, and model changes in climate over the next 50-100 years. The better the models, the more accurate and detailed will be the image in the crystal ball.

NASA's Earth System Science program provides real-world data for these models via a swarm of Earth-observing satellites. The satellites, which go by names like Terra and Aqua, keep an eye on Earth's land, biosphere, atmosphere, clouds, ice, and oceans. The data they collect are crucial to the modelling efforts.

Some models aim to predict short-term effects—in other words, weather. They may become part of severe weather warning systems and actually save lives. Other models aim to predict long-term effects—or climate. But, long-term predictions are much more difficult and much less likely to be believed by the general population, since only time can actually prove or disprove their validity. After all, small errors become large errors as the model is left to run into the future. However, as the models are further validated with near- and longer-term data, and as different models converge on a common scenario, they become more and more trustworthy to show us the future while we can still do something about it—we hope.

For a listing and more information on each of NASA's (and their partners') Earth data-gathering missions, visit science.nasa.gov/missions/earth.html. Kids can get an easy introduction to Earth system science and play Earthy word games at http://spaceplace.nasa.gov/ecosphere

This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Left: CloudSat is one of the Earth-observing satellites collecting data that will help develop and refine atmospheric circulation models and other types of weather and climate models. CloudSat's unique radar system reads the vertical structure of clouds, including liquid water and ice content, and how clouds affect the distribution of the Sun's energy in the atmosphere. See animation of this data simulation at www.nasa.gov/mission_pages/calipso/multimedia/cloud_calip_mm.html.

THE DARKE SIDE

Society Update with Chairman Graham Darke

March Lecture Meeting

In a change to the scheduled talk, SAS member **Natalie Lowes** talked to a packed room about Exo-planets on Sunday 18th March. Natalie explained the blurring of boundaries between planets and stars with the strange class of objects known as "Brown Dwarves." She explained the historical context of extra solar planets, as postulated by Bruno.

She also explained how the first exo-planets were found and the techniques used to try and spot them. The gravitational tug of a planet on its host star as it orbits around it is one method as is the transit method where tiny reductions in light output from the host star occur as a planet passes in front of it. Most exo-planets are discovered/confirmed by the COROT and Kepler satellites and Natalie described some of the important recent discoveries like the exo-planet Kepler 22b which may exist in its host star's habitable zone.

Well done to Natalie on presenting such an excellent first talk to the club and I'm sure we'll be seeing her up there again in the future.

Remember, we have **Sir Arnold Wolfendale** speaking in April about a local genius, Thomas Wright: One not to be missed.

Additional Lecture – Thursday 19th April

I know we don't usually meet on Thursday evenings but an opportunity not be missed has arisen. **Dr Saralyn Mark** is a medical doctor with NASA who worked on the shuttle program and she is visiting the Northeast this month. We are therefore paying host to her at 7.30pm on Thursday 19th April at the WWT. We are going to open invitations to the general public and other local societies too.

Dance of the Planets

I'm one of those observers that likes to observe lots of different objects and I've certainly tailored my observing to where my telescope is set up.

At home, most of my observing time is spent on the planets and double stars as these objects are least affected by the blight of light pollution. I must say that late February and March have been something of a golden time for planetary observing. We have, of course, had the fantastic conjunction of Jupiter and Venus in mid March when the two brightest planets hung together in the south western twilight sky. Sadly, for the two evenings when they were at their closest, clouds did spoil the view!

Earlier in the month I had taken the opportunity to observe Mercury for only the third time in my life. I was visiting my parents on 1st March and luckily had my Celestron C6 and SkyTee mount in the boot of the car. As darkness approached I ventured out into the garden that I used to observe in as a kid and quickly picked up Mercury with the naked eye, nestled nicely between the tops of two roofs in the street backing onto to my parents'. The scope was soon set up and my Dad and I had a look at Mercury and Jupiter. Mercury was very small but bright through the eyepiece. The seeing was awful unfortunately and this, coupled with the low altitude of the planet, made for a messy view. All I could make out was an ill-defined blaze of wriggling colour! Still it was nice to observe it, as it is one of the most difficult planets to spot, not often being favourably placed.

Jupiter was higher and I was able to make out the northern and southern equatorial bands but nothing else. A few days later on the evening of 5th March, it was clear again on my return home from work. I set up again in twilight and this time was treated to much better conditions. Venus was lovely and steady at 100x showing a nice half phase. There was little false colour on show too. Jupiter was very nice with all four Galilean Moons lined up two-a-side. Sadly Mercury was too low to see from home. I left the scope set up so that I could take advantage later as Mars climbed higher.

Returning outside at 10.30pm, the sky was still nice and clear and the seeing seemed to have held up too. Mars was noticeably larger than when I last observed it at Derwent and some dark surface markings and a polar ice cap were visible in the C6. Just before retiring to bed I glimpsed Saturn low in the east. Four planets in one night wasn't bad and it could easily have been five had Mercury not been obscured by the trees.

Late in the month over the period 26th to 28th there was a picturesque alignment of Jupiter, Venus and a thin crescent Moon.

Telescopes for Ethiopia

The donations of binoculars keep coming in and work on the 18.5 inch mirror continues whenever I find a spare moment. As those who attended the workshop meeting on Sunday 11th March will have seen the mirror is looking quite different to when I started with it. All evidence of John Nichol's diamond saw has vanished to the unaided eye and the front surface is developing a nice spherical curve. Close examination of the mirror surface reveals no pits in the glass which was what I was hoping for having worked through finer and finer abrasives. I will bring the mirror back again this month for you all to see the progress.

Kilhope Lead Mining Museum – Saturday 31st March

What a great night we had at Kilhope. 30 members of the public received a talk, supper and some stargazing courtesy of our members. The museum want us to go back again in the Autumn and I'm sure we will. Thanks to all who supported the event.

Brownies at the Observatory 12th March

Thanks to all who helped make this, once again, a great night. This was our final Brownie group visit of the current season, but they'll be back starting again in October.

Astrophotography Competition 2012

This year's competition takes place on Sunday 20th May at 7.00pm. Everyone has an extra month this year to conjure up their entries. Please do participate in this event. So many times people have said that they had pictures at home which they didn't bring. Don't do that – bring them! Newcomers' images encourage other people to try for themselves. I know how many members have DSLRs now, so there's nowhere to hide, I want to see tables full of pictures please! You get the message.....

Stay up to date

Keep up to date with all society developments on the website www.sunderlandastro.com and why not sign up for the news group. Also, check out our Facebook and Twitter pages.

Clear Skies,

Ethiopian Telescope Appeal: Donations

We're still totalling up numbers but we're very close to (or have actually surpassed) our target for the first year in just ten weeks.
The breakdown looks something like this:

Working: 22 (44 lenses/eyepieces)
Broken: 8 (16 lenses / eyepieces)
Wrapped: 3 (6 lenses / eyepieces)
Dispatched: 4 (8 lenses / eyepieces)
Antique: 3 (opera glasses / ex-military)
Unsuitable: 4
Junked: 2 (0 lenses / eyepieces)
Telescopes: 4 (3 single lens/eyepieces / mirror)
18" primary mirror: 1

Total: 51
Available lenses / eyepieces = approximately 93.

- 'Working' means that they're fully functional but a bit old/battered.
- Broken means that the lenses / eyepieces are intact but the body has been damaged.
- 'Wrapped' means that they were provided by the members already stripped down. Not entirely sure of the quality / match between eyepiece and lenses.
- 'Antique' means instruments that are older than 50 years and therefore probably worth more intact than dismantled.
- 'Unsuitable' have small lenses (20 mm) and/or fully enclosed and rubberised bodies.
- 'Junked' means that the assembly was damaged beyond repair and that I cannot see anyway of turning the instrument into a usable telescope.

These latter categories will be auctioned off to members to assist in postage.

- David Hughes

+++ STOP PRESS +++

4/4/12
We have done it! The target for the first year of the Ethiopian Telescope Appeal was fifty donations or one hundred lenses, and we hit that target this morning. Better still, we did it in just three months!

The NAS have also donated the major parts from a disused 6" scope to the appeal. Committee members will decide how best to handle this donation once its condition has been assessed.

Earth has little to fear from a black hole attack

We can all rest easy. Small black holes that may be roaming space undetected would leave Earth unscathed if they hit us.

Various models suggest matter may have collapsed into black holes soon after the big bang. The smallest of these so-called primordial black holes would have evaporated through a process called Hawking radiation long ago.

But those weighing a billion tonnes or more could still be around, and many of these black holes would be hard to detect – unless they hit us, says Katherine Mack of the University of Cambridge. "We'd see that."

In fact, over-eager physicists have already flagged two false alarms. In 1908, a mysterious explosion flattened more than 2000 square kilometres of forest near the Tunguska river in Siberia. In 1973 physicists proposed that a colliding black hole was to blame – a suggestion that was later proved wrong.

Then in 2003, another group suggested that an unexplained set of seismographic data could be from a dense object called a "quark nugget" smacking into the planet. It turned out to be an earthquake.

Shravan Hanasoge at Princeton University and colleagues wondered if there was a way to avoid future false alarms. They ran detailed simulations of what would happen if a billion-tonne black hole struck Earth.

It would probably hit at a good clip, moving at a relative speed of a few hundred kilometres per second. But it would be smaller than an atomic nucleus, so it would only make a small, needle-like tunnel through the Earth.

Despite its small size, we would still know it had hit. That's because when the black hole first reaches and then exits the Earth's outer core, the outer core would vibrate, creating spherically symmetric shock waves. These would trigger every seismic detector on Earth at the same time – unlike regular earthquakes, which are more localised. "This distinguishes the signals from anything we would typically see," says Hanasoge.

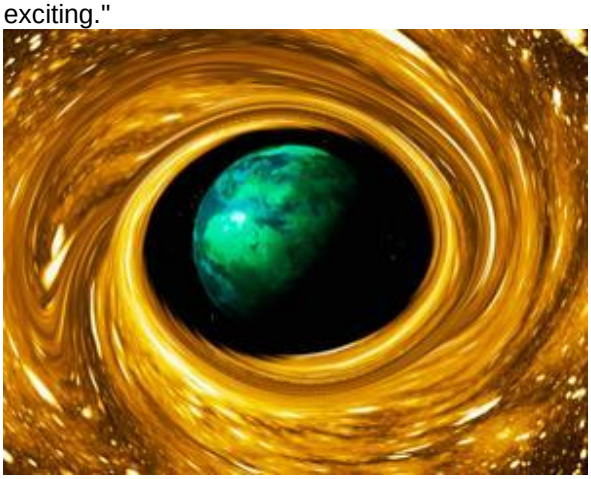
Happily, the effect would be minor, like a global magnitude-4 quake. "There would be no widespread destruction," Hanasoge says. "It would be almost unnoticeable."

Unfortunately for black-hole hunters such events would be extremely rare. Even if, as some predict, primordial black holes made up all of the dark matter in the galaxy, they would collide with the Earth just once every 10 million years.

But since we have the equipment that could detect them we might as well look, Hanasoge says. "It doesn't take much. With the existing apparatus and existing methods, we'd know if this happens."

Although the odds of success are low, the pay-off could be high. Primordial black holes may have arisen from objects such as cosmic strings, defects in the fabric of space-time that may have formed after the big bang.

"It gives us insight into what happened in the early universe that is hard to get at otherwise," Mack says. Finding something left over from the earliest moments of the universe "is like a message in a bottle from the big bang straight to us. It gives us a very direct picture of what happened at that time. And that's extremely exciting."



Square galaxy is a rebel

If a person is square they are a bit dull, but for a galaxy, it is the mark of a true rebel. A rectangular galaxy spotted 70 million light years from Earth is the boxiest galaxy known – and could bring a new understanding of how galaxies form and evolve.

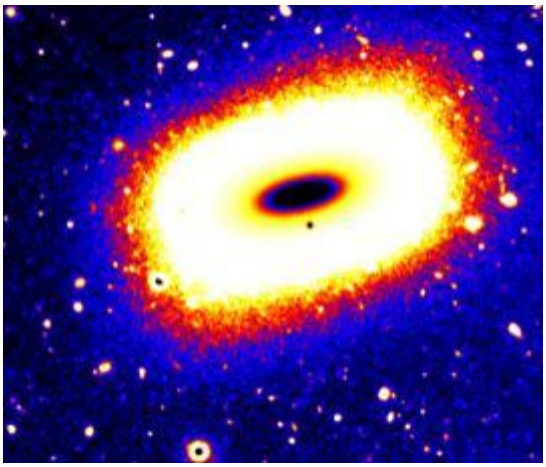
Galaxies take on one of three shapes: a flattened circular disc typically hosting a spiral pattern of stars like our Milky Way, an ellipsoid – like a rugby ball– or an irregular shape without clear symmetry. Box-like galaxies are virtually unheard of, says Alister Graham at the Swinburne University of Technology in Hawthorn, Victoria, Australia.

Graham is one of the researchers who discovered the rectangular galaxy - named LEDA 074886 - while using the Subaru and Keck telescopes in Hawaii to look for globular clusters of stars swarming around NGC 1407, a bright giant galaxy in the constellation Eridanus.

"It's one of those things that just makes you smile because it shouldn't exist, or rather, you don't expect it to exist," says Graham.

LEDA 074886 is a dwarf galaxy, a type much smaller than our Milky Way. His team aren't sure what its three-dimensional shape is. One

possibility is that it is an inflated disc that more closely resembles a cylinder and that looks like a rectangle because we view it side-on from Earth.
"The alternative shape, a cube, seems too bizarre to contemplate," says Alister, although he points out that stars with "box orbits" are already documented.



If it is a cylinder, how might it be formed? One option is gravitational torques from its giant neighbour, NGC1407. The trouble is that this wouldn't explain another curious thing about LEDA 074886: at its heart is an edge-on inner disc of young stars, 8000 light years across (see the black disc, in picture above).
Another option is that the angular galaxy formed out of the collision of two spiral galaxies. The impact threw the pre-existing stars from these galaxies into large orbits, creating the rectangular outline, while the gas sank to the middle and condensed to form the central disc of new stars.
That would suggest that LEDA's formation was a hybrid of two known types of galaxy formation. The outer rectangular shape is consistent with simulations of elliptical galaxy mergers, which don't involve the production of new stars because these galaxies don't contain much gas. The disc, on the other hand, is more similar to simulations of mergers of gassy galaxies, which involve star formation. "The hybrid nature of LEDA 074886 suggests that both types of event have occurred," says Graham.
"We can now combine lessons learned from both types of simulations," he adds. That might be useful for modelling other galaxies containing both old and young stars.
The researchers suspect that the inner disc may be "precessing" as well as spinning – rather like the way a spinning top both spins on its own axis and turns around the main vertical axis of rotation, says Graham.

Titanium Paternity Test Fingers Earth as Moon's Sole Parent

A new chemical analysis of lunar material collected by Apollo astronauts in the 1970s conflicts with the widely held theory that a giant collision between Earth and a Mars-sized object gave birth to the moon 4.5 billion years ago.
In the giant-collision scenario, computer simulations suggest that the moon had two parents: Earth and a hypothetical planetary body that scientists call "Theia." But a comparative analysis of titanium from the moon, Earth and meteorites, published by Junjun Zhang, graduate student in geophysical sciences at the University of Chicago, and four co-authors indicates the moon's material came from Earth alone.
If two objects had given rise to the moon, "Just like in humans, the moon would have inherited some of the material from Earth and some of the material from the impactor, approximately half and half," said Nicolas Dauphas, associate professor in geophysical sciences at UChicago, and co-author of the study, which appears in the March 25 edition of Nature Geoscience.
"What we found is that the child does not look any different compared to the Earth," Dauphas said. "It's a child with only one parent, as far as we can tell."
The research team based their analysis on titanium isotopes -- forms of titanium that contain only slight subatomic variations. The researchers selected titanium for their study because the element is highly refractory. This means that titanium tends to remain in a solid or molten state rather than becoming a gas when exposed to tremendous heat. The resistance of titanium isotopes to vaporization makes it less likely that they would become incorporated by Earth and the developing moon in equal amounts.
Titanium also contains different isotopic signatures forged in countless stellar explosions that occurred before the sun's birth. These explosions flung subtly different titanium isotopes into interstellar space. Different objects in the newly forming solar system gobbled up those isotopes in different ways through collisions, leaving clues that let scientists infer where the solar materials including the moon came from.
"When we look at different bodies, different asteroids, there are different isotopic signatures. It's like their different DNAs," Dauphas said. Meteorites, which are pieces of asteroids that have fallen to Earth, contain large variations in titanium isotopes. Measurements of terrestrial and lunar samples show that "the moon has a strictly identical isotopic composition to the Earth," he said.
"We thought that the moon had two parents, but when we look at the composition of the moon, it looks like it has only one parent," Zhang said.

Some Old Controversies in Transactions

By "*Old Boots*"

{An old and esteemed correspondent continues his reminiscences of the controversies which raged in the earlier numbers of this journal.}

West Hendon House.

The first lecture to the Society given in December of 1858 was by Sir Dandy Wiske, entitled "*How Strong Should Bookshelves Really Be*?" and was well received by the early membership.

Questions raised by members included "What Type of Timber Should be Employed in Construction," "Is the Use of Lignum Vitae Excessive," "Would an Oriental Design Cause Naval Problems With the Empress Dowager," and "Would the Use of Boxwood and Resulting Dust in Construction Cause Nasal Haemorrhaging?"

Sir Dandy replied to these and other questions put to him with ease and his usual sense of humour. In fact, the lecture was so successful he was asked by members to expand on the subject; a request that he said delighted him.

Above: Professor Sir Dandy Wiske. Forever lateral, electrifying at times, and inventor of the two-jaw chuck.

Airy, Christie, Dyson and the Royal Woolwich Arsenal.

In 1859 January he kept to his promise with the lecture "Notes on The Extension of Bookshelves: Is Planning Permission Really Required?" The short answer being "No: Unless the Said Bookshelves Protruded Through a Supporting or Boundary Wall."

As delighted members finished their applause, Sir Dandy asked for more members to volunteer their services and give a lecture on one or more of their favourite subjects and support Society activities.

His request was answered by "R. A. P." who announced that he would offer a lecture on; "Evidence to Support The Great Biblical Flood."

Share Valuations in Panasonic, Ronson Gas and X-Box 360.

February's lecture by "R. A. P." offered up the theory that the "Flood" (or "Deluge" as some members quoted) was caused by a "Steam Comet" that had passed close to Earth! The lecture bristled with controversy and resulted in some members leaving early.

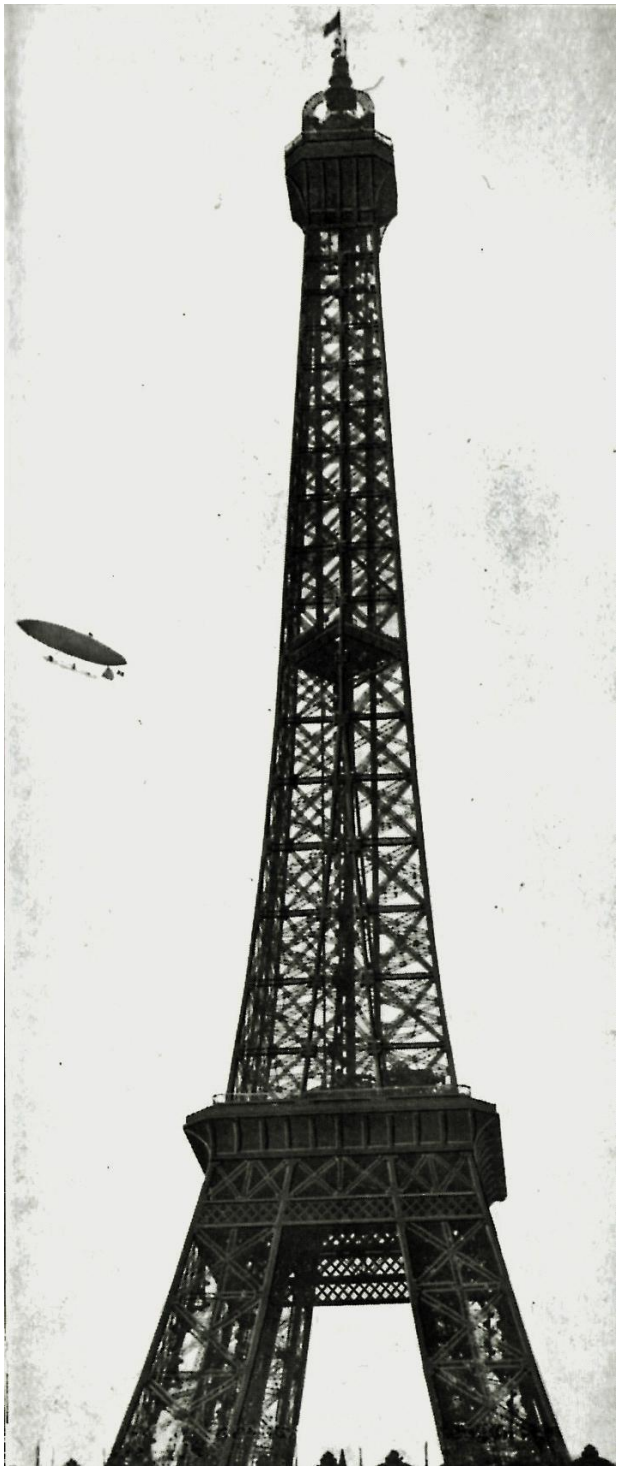
Questions to R. A. P. were kept short, however, due to the rantings of "Lamda", again, as he insisted that if there was a deluge 5000 years ago, then why did R. A. P. insist on "it" being caused by a steam comet and not a gas comet?

"The Harmonious Cyclist" stated that the lecture evening be brought to an end and all questions should be directed to the "Letters" page. This resulted in "K. L. B," as usual, writing several lengthy columns concerning the deluge. Clearly he was not of the opinion that "silence is golden." At last, in the third volume, K. L. B. retired in a huff saying; "The gibers may gibe on now unanswered." But though he retired to sulk in his tent, Transactions saw him again ere long in fighting form.

"The Quiet Pedestrian" asked "What proof is there that comets are composed of water at all?" Dr. Boffone*, a mesmerist, hindoo and keen violinist on a visit from India, stated; "I have just measured up the amount of space K. L. B. has taken up - fourteen and one half columns - and having given us one evidence (as he considers it, but no-one else), viz; "the rounded form of hills" and "sweep vales" he again tells us that "there is abundant evidence of a steam comet fall 50 centuries ago, but not one of gas, for at least many thousands."

* {The now late Dr. Boffone gave us all sorts of information, from how to make canoes, tobacco tins, hernia trusses, carborundum grinders, et hoc genus omne, down to the descriptions of the various races

he met in the jungles. I suppose he had as large a fund of knowledge as can fall to the lot of any man. I missed meeting him at Jubbulpore, C.P., India, by not going there till twenty years after he had left!}



Above: R. A. P. taking measures to avoid The Second Flood in 1860 by circling the Eiffel Tower and attempting a docking manoeuvre to establish camp in his patent Aeroblimp.
He was later arrested by French Authorities on a charge of causing panic. When caught digging an escape tunnel by the French gaolers he informed them that "*It was a drain to allow the water to escape*."

Another question was offered by "Practical Watchmaker" who insisted on knowing where all the water had gone. And stating that if there was a deluge 5000 years ago or not, there was certainly a deluge of words by "K. L. B."

In a later four column letter, "Iota" favoured readers with a sectional drawing of the Ark. "It was like a house" he stated, "with floors and galleries and louvre windows under a ridge roof."

In a later subscript "Reluctant Chemist" asked "Was Noah the only Biblical figure during this period to undergo sea trials with the Ark? And if not, why not?"(!)

R. A. P. informed members that there was solid evidence which indicated a second Flood which drew laughter from the audience. Most however left the evening's lecture with thoughts of Armageddon on their mind.

The U.S.S. Abraham Lincoln Enters The Straits of Hormuz.

An odd, and one would have thought an unmasculine, sort of controversy arose here in volume 3 out of a letter by "Volcanic Experience," who had cured his indigestion by wearing a belt around the waist. It was a belt of thin steel, leather lined, and was laced up tightly he said.

Another correspondent stated that his experience was identical, only he wore stays like those which ladies wear, and he knew several cases of "gentlemen of sedentry employment who had derived benefit from the use of stays." Of course the idea was ridiculed. It was suggested that "The best cure would be to eat less and take exercise, and not pinch up our wonderous mechanism in less space than nature intended it to occupy."

The controversy ran through the volume and spread over into the "Medical Column" which, was then running and conducted by "Jack-of-all-Trades, M. B." Once more, in a tile at "R. A. P.", the "Quiet Pedestrian" bobbed up again with a letter concerning the ancient constellations and finishing with a small paragraph on co-operative stores. K. L. B. also put his head above the parapet stating that he knew more than others about coals and coal prices and finished with a small paragraph on the potato disease. It was a solid volume, if not so lively as others.

To be continued…

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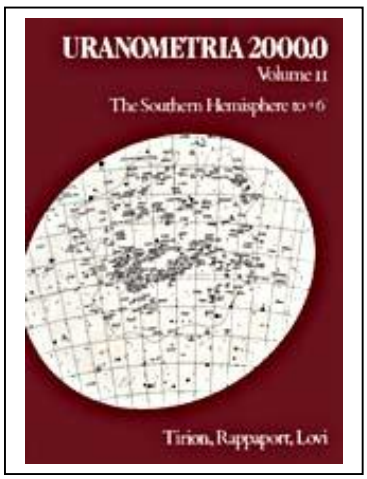

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All enquiries and offers to ASEservices@aol.com or via the editorial hotline, 0191 237 0355.