

Stargazey Pie – July 2012

Society Notices

1. 2012-13 Programme Update and Dates for Your Diary.

Please keep the weekend of 7th, 8th and 9th September 2012 free.

“A special event to celebrate the all new Orkney Astronomy Society (OAS) during this year’s Orkney Science Festival which is from 6 to 12 September. The event is exclusively for members of HAS, Sigma, Caithness Astronomy Society, OAS and Shetland. Individuals can of course extend their stay”.

All members were sent details of the event by e-mail on 30th June or, if not on e-mail, a postal letter is en route. Please let Pat Escott, our Events Secretary, know if you are going. Tel. 01463 239746 or <mailto:Pat.Escott@btinternet.com> She will have a sheet for you to sign to register your interest at tonight’s meeting.

If Orkney is too far, then that same weekend the BAA has their weekend meeting at King’s College, University

of Aberdeen AB24 3FX to consider Sun, Aurora and Noctilucent Clouds. <http://britastro.org/baa/>

Saturday 1st September 14:00 – 18:00

DOORS OPEN DAY when the general public are invited to view the observatory and use the solar telescope, weather permitting. Pat Escott is looking for volunteers to cover a 2-3 hour shift to welcome visitors (we had 100 last year). Contact details as above or simply sign the Doors Open Day sheet tonight.

Wed. October 17th Apollo 12’s Module Pilot Dick Gordon will be in Glasgow

<http://www.walkwithdestiny.com>

2. Solar Saturday Observing Sessions - JSL Observatory, NTS Visitor Centre Car Park, Culloden Moor. Please check www.spacegazer.com before setting out.

Date	For Whom	Time	Supervisor
Sat. 07 th Jul.	public and members	14:00 – 16:00	Gerry
Sat. 14 th Jul.	public and members	14:00 – 16:00	Pat W.
Sat. 21 st Jul.	public and members	14:00 – 16:00	Pauline
Sat. 28 th Jul.	public and members	14:00 – 16:00	Steve C
Sat. 04 th Aug.	public and members	14:00 – 16:00	t.b.a

From April to mid-September, weather permitting, Solar Saturdays will be held at the Observatory.

3. Solar Saturday Assistants – Antony is compiling a rota for July, August and September. Please contact him if you are willing to help out <mailto:antony@spacegazer.com> or 07733179670. When the Sun is shining we can have a good number of visitors and the supervisors would appreciate members being available to talk to them.

4. The Next Meeting is on Tuesday 7th August 2012.

Dr. John Davies will give a talk entitled *Runaway Rockets*. The Discussion Group will take place as usual and Maarten will run a break-out group to work out the mass of the Sun using Venus Transit distance details. The “Youngstars” session for 8-14 year olds, before the main meeting, will run from 19:00 until 19:30 led by Pauline and Triona.

5. Subscriptions were due by 3rd July 2012.

6. The Aurora and Telephone Alerts.

The Sun is active. Aurorae are forecast. Should you see an aurora, noctilucent clouds, sprites or anything else of astronomical interest please alert Pat W. (0793 0183 999), Paul (01667 456789) or Pauline (07751 112586). It is never too late at night. We currently have 37 members who are happy to be contacted in the wee small hours. Please look out for noctilucent clouds after midnight between now and August.

July 2012, Main Talk: Dark Matter by Samantha Smith and James Hitchmough

To Bary or not To Bary?

That was the question posed to us by two younger members of the society, Samantha Smith and James Hitchmough, both of whom have now finished their Standard Grades at Culloden Academy and are preparing for Highers. Both want to be astronomers, and this was their first presentation to the society.

Their topic was Dark Matter, non-baryonic as opposed to baryonic matter. The baryonic, comprised of galaxies, stars, Smithton Church and everything else we can see, amounts to 4.6% of the mass of the universe. Of the remaining approximately 95%, 72% is thought to be Dark Energy and 23% Dark Matter. Non-baryonic Dark Matter does not react with baryonic in any way. Astronomy, once a quest for light, is now looking for darkness.

How do we look for what cannot be seen?

The first method of detecting (which is the same as observing in this case) Dark Matter is by gravitational lensing, an effect associated with Einstein (1936) but first discussed in 1924 and only confirmed in 1979. Space-time around a massive object is curved, and if the massive object lies between a distant galaxy and an observer it can have a lensing effect, magnifying and distorting the light of the galaxy behind so that it creates multiple images perhaps in the form of an Einstein Cross or Einstein Rings. These effects lead to the calculation of the mass of the lensing object. The non-baryonic matter is thought to make up the missing mass of distant galaxies.

The second method is the Zwicky Method, created by Fritz Zwicky in 1933, who observed the velocity of perimeter galaxies at a cluster's edge and found that they were moving too fast. He used the brightness of the galaxies within a cluster to calculate the observable mass of the cluster and then determined the actual mass of the cluster. He found there was a discrepancy between the two results. Most of the evidence for Dark Matter comes from this or comparable methods.

What is Dark Matter made of? There are two main theories.

The first is WIMPs, Weakly Interacting Massive Particles. These interact with the weak force and with gravity but not with electromagnetism or the strong force. WIMPs are dark and slow and cold, properties not held by any particles in the standard model. They would rarely interact with other particles.

Have we found WIMPs already? It is possible that neutrinos are WIMPs, since they are insensitive to electromagnetism and the strong force. But could neutrinos solve the missing mass problem? At best, they can contribute 18%.

Or are axions WIMPs? Axions have mass but are 500x lighter than electrons. They are cold and were produced at the Big Bang but interact very little. The Axion Dark Matter Experiment is exploring this.

The second theory for what Dark Matter is proposes that it is comprised of MACHOs, Massive Astrophysical Compact Halo Objects. Candidates might include black holes, neutron stars, brown dwarfs, wandering planets, even white dwarfs and fainter red dwarfs. RAMBOs, Robust Associations of Massive Baryonic Objects, may also contribute a great deal of Dark Matter – these are atypical star clusters with very long lifespans.

But it is highly unlikely that the Dark Matter in MACHOs and RAMBOs can make up the deficiency in mass. What they do explain is the existence of pockets of Dark Matter revealed in the Cosmic Microwave Background.

There are alternatives to Dark Matter that might explain the observed lack of mass: Modified Gravitational Laws propose altering the gravitational constant and Quantum Gravitational Laws

represent an attempt to unite Newton and Einstein into a single mathematical framework or Grand Unified Theory.

So the conclusion? We don't know.

(But one can't help wonder if one or other or both of these two young astronomers might one day find out.)

After the break, the Society heard a shorter talk from Lewis Crombie, an astrophysics graduate of St Andrew's University and nephew of Gordon McKenna, who spoke to the Society in June. He spoke about Dark Energy and the fate of the Universe, explaining the search by competing teams (led by Brian Schmidt and Saul Perlmutter, Nobel Laureates in Physics for 2011) for evidence of how much the expansion of the universe was decelerating, as it was expected to do because of gravity. Both found evidence of cosmic expansion, propelled by Dark Energy. He showed models of various ends to the Universe from being blown apart to contracting to a single point, advising us not to worry too much as neither event was imminent. Work on Dark Energy is being taken forward by 3 projects: SNAP, Essence and WiggleZ.