Stargazey Pie!

A slice of Highlands astronomical life!

Tues 7th July 2015

HAS Meeting Notices 7 July 2015

Current News and Dates for your Diary

- **Solar Saturdays** are up and running, weather permitting. These take place at the Observatory at Culloden Moor (park at the far back left of the NTS Battlefield car park, there is a grassy path to your left which leads to the Observatory).
  Please check the website (www.spacegazer.com) before setting off to find out what time (and whether) the session is running. We have two special telescopes for looking at the sun. Children welcome but must be supervised.

- **Last Call for Subscriptions** You can pay at the front desk or on-line banking if this is easier. (Sort Code 80-91-26, Account no 00715043) If we don't have your up to date details we will probably be in touch to ask you for these, or you can let us know at a meeting. Thank you for your continued support!

- **The next meeting is on Tuesday 4 August 2015** *Astronomical Adventures in Chile* Pat Escott, Rhona Fraser and Pat Williams of HAS.

Events:

- **Sigma Event** on Tuesday **14th July at Gordonstoun Chapel, 6.30 for 7.30pm**
  The George Fraser Memorial – a talk by David and Bryn Oh "Exploring Mars – A Family Perspective" http://sigmars.eventbrite.co.uk/ for on-line booking
- **Doors Open Day** at the Observatory Saturday **5 September 2.00 – 6.00pm**. Volunteers please see Pat Escott
- The renowned **Orkney International Science Festival** will be taking place **3rd – 9th September 2015**. There is much to see and hear on astronomical subjects this year, including Peter Higgs), but also music, arts, food and drink, and Orkney history. If you have not been before, and you can make it, then attendance is certainly recommended.
- **HAS Annual Dinner** (with guest speaker), Saturday **21st November**, 7.00 for 7.30pm Carvery at Fairways Restaurant, Inverness

- **Suggestion Box** is at reception. Don't forget to let us know if you have any ideas you would like the committee to look at. This is your Society, please help the committee to provide what you are looking for. Or of course speak to a committee member.

- **Aurorae and Telephone alerts** – should you see an aurora, noctilucent clouds, or anything else of astronomical interest, please alert Paul (01667 456789) or Pauline (07751 112 586). It is never too late at night to let us know. PLEASE NOTE, the wording of the telephone alert is a little strange. If you receive a telephone call with a disembodied voice beginning, "This call will not cost you anything..." – please don't hang up, it is your aurora alert!
  - Alerts can also be sent by **text** to your mobile. If you would prefer this option please check with Ronnie that we have you signed up for this.
  - Pat Williams has sent out the Alert System Guidelines by e-mail or post, to those opting into the system, together with each member's individual preferences for confirmation. If you have not received this information please let Pat know at *pat.williams999@gmail.com*.
  - If you have not already opted in and wish to do so then do let Ronnie know.
  - **NB** About two weeks after the July meeting anyone previously on the alert list but who has **not** paid their 2015-16 membership subscription will be taken off the list!

Main Event: Noteworthy comets

Our speaker tonight was Denis Buczynski who has a great interest in comets, which began in 1973/74 when Patrick Moore suggested we should look out for Kohoutek and, although the comet proved disappointing, it nevertheless kindled his interest in these celestial objects. He is currently Secretary of the BAA comet section and associate editor of the Astronomer Magazine. He was Council Director of the BAA deepsky section in the 1980s, was awarded an honorary MSC by the University of Lancaster in 1995, received the BAA's Stevenson award for observing in 1999 and in 2001 had the asteroid 8166 named after him. His talk was based on the noteworthy comets that have been seen over last few hundred years sprinkled with a few questions and interesting facts.

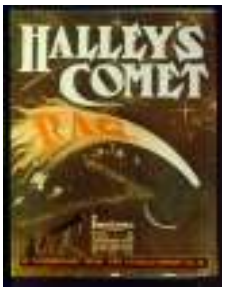
Comets have always created a stir amongst the public. Kirsch's comet was the subject of a painting in 1680. It appears to be very bright suggesting either it was a great comet easily seen because there was no light pollution at that time or it simply portrayed the terror people felt.

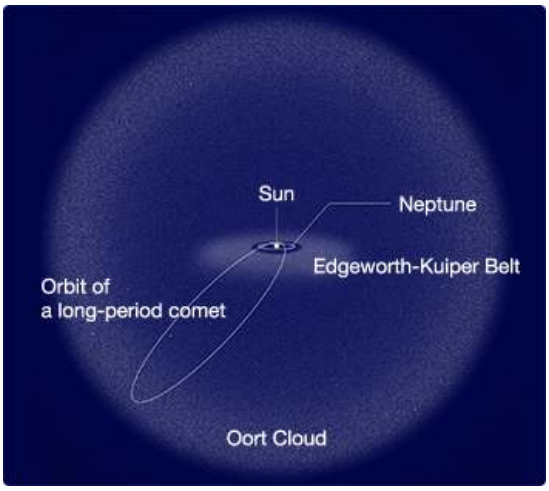
Why do comets make the news?

Perhaps it is because they can be very beautiful such as Donati's comet in 1858 or it may be because the public didn't understand what comets were and this created panic and worry. Fear of destruction caused by the comet was widespread. It was thought that Halley's comet in 1910 would destroy the Earth and the media played on the concerns of its readers by publishing ideas of all the terrible things that might happen, for example, astronomers discovered that one of the gasses in the tail of Halley's comet was cyanogen and the worry was that the world population would die of cyanide poisoning despite reassurances by the scientists.

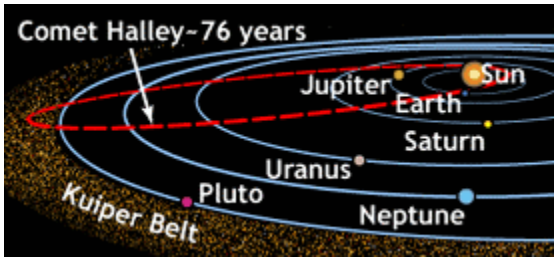
People's fear and ignorance was exploited by others who wrote books describing the dangers of comets or profited by selling anti-comet pills.

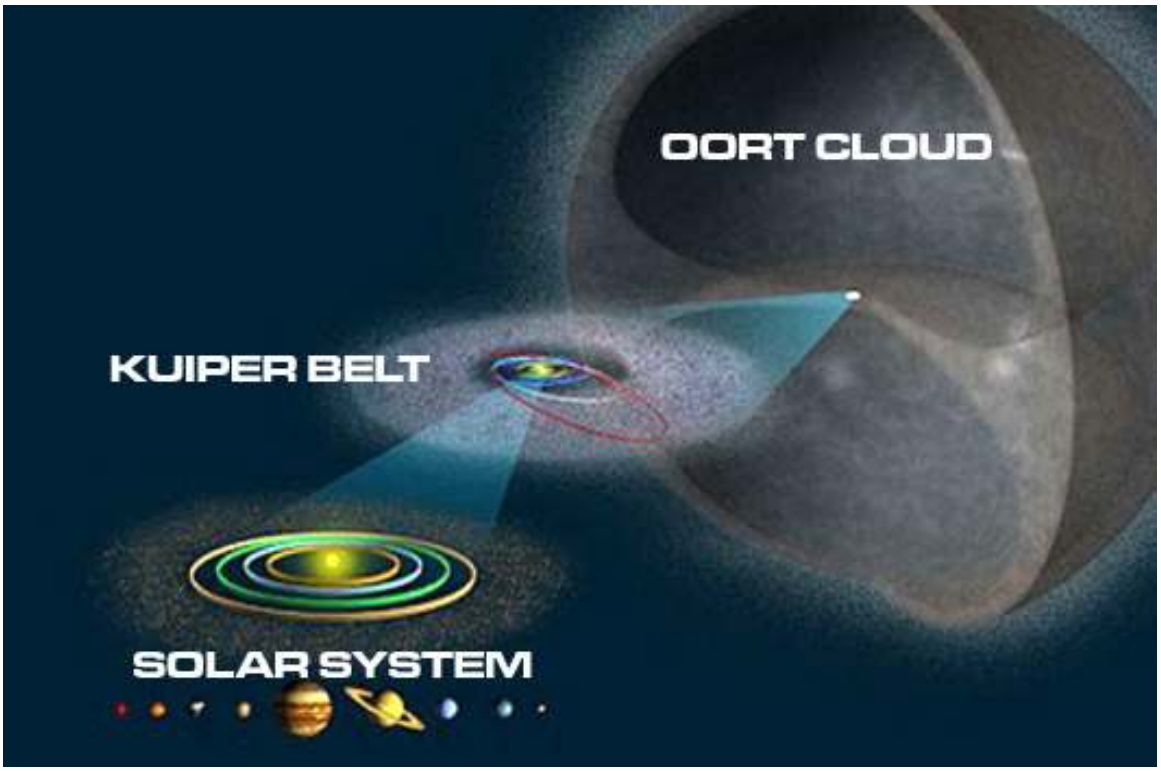
Some used satire to poke fun at the doomsday sellers and others promoted their brands such as comet whisky, comet ale, Pears soap or music in the form of Halley's comet Rag.





Comets move due to Newton's laws of motion and gravitation. Halley realised that his comet had been seen before and would return every 76 years. This meant that others would also return again and again. Comets have different orbital shapes and inclinations according to where they come from. The short period comets, like Halley's comet, originate from the Kuiper Belt and tend to follow the plane of the solar system whereas long period comets come from the Oort Cloud which means they can come from any direction.





Some of the great comets:

In this section of the talk, Denis described some of the spectacular comets that have graced our skies. He started in 1744 with Comet Klinkenburg (right) which was an amazing sight displaying six tails when its head was below the horizon.

Messier is better known for his catalogue in which he listed fuzzy objects so they wouldn't be confused with comets he was trying to find. He discovered a brilliant comet in 1769 – a Sungrazer. These are bright because they pass the Sun very closely.

The 19th Century had a number of bright comets.

The great comet of 1811 was discovered by Flaugergues. Midway through the century was the great comet of 1843.

Tebbutt's comet (left) in 1861 had multiple tails and was the first to be photographed with a camera soon after it had been invented. It must have been a very bright comet to be captured on insensitive film.

David Gill in South Africa photographed the great comet of 1882, which was so bright it could be seen during the day. He also showed that photographic plates could photograph the stars and this led to them being used to determine the position and brightness of all the stars in the sky.

Why are some comets bright whereas others are dim at perihelion (closest distance to the Sun)?

The Great Daylight comet of 1910 was exceptionally bright and upstaged Halley's comet of that year. However, Halley's 1910 apparition was brighter than its appearance in1986.
Comets may be different distances from the Sun, the closer they are the brighter they should be. However, size also matters; Hale-Bopp was quite far from the Sun and yet it was very bright but this was due to the large size of its nucleus. Smaller comets tend to be dimmer. Comets that come close to the Earth will appear brighter than those further away so their position in space is also important. Halley's comet in 1986 was quite dim because it was far from the Earth so we didn't get a good view of it whereas in 1910 it was much closer to our planet.

Some of the most brilliant comets tend to be the Kreutz Sungrazers. These are thought to be bits of a large comet that broke up and the pieces keep returning, orbiting the Sun very closely. SOHO usually spots the Sungrazers and has so far found 2000 of them although many are very small and are therefore not very bright and are not always well seen from the Earth. There are exceptions such as Comet Lovejoy in 2011 and other larger fragments have become some of the great comets.

Why are some predictions of a comet's brightness at perihelion wrong?

Comets will brighten as they approach the Sun. New comets tend to be coated in volatile materials but as soon as these materials are used up the comet, instead of continuing to intensify, will start to dim. An example is Kohoutek in 1973/74, which was predicted to attain a magnitude of –4 (by NASA) but reached only about +4. Comet Austin in 1990 was another that was not as bright as expected.

Continuing with the noteworthy comets, we come to the 1950s and comet Arend-Roland (left) which had a strange forward pointing tail. This turns out to be a perspective effect due to a curving dust tail seen edge on. This effect can be seen in Panstarrs in 2012 (right).

Ikeya-Seki (left) in 1965 was a mag –10 sungrazer that could be seen in daylight with the naked eye when close to the Sun.

Comet West was a spectacular pre-dawn object. It had a brilliant tail after it fragmented at perihelion due to all the dust lost from it.

IRAS-Araki-Alcock (right) in 1983, passed very close to the Earth and appeared the size of the Moon although it was very faint. It was the first to be discovered by a satellite as well as two observers.

Halley in 1986 was not as good as it was hoped to be due to its distance from the Earth but the southern hemisphere had a better view. The spacecraft Giotto was the first to image the cometary nucleus.

In 1994 Shoemaker-Levy 9 crashed into Jupiter and produced the darkest spots ever seen on the planet as the pieces of comet exploded on impact releasing a lot of carbon from the comet in the process.

Hale-Bopp (left) was visible to the naked eye for about 18 months from 1995 - 97. Had it been closer to the Earth it would have been even more spectacular. It inspired some religious fanatics to commit mass suicide.

Hyakutake (right) in 1996 had a tail that crossed the entire sky. It was small but closer to the Earth so was easily seen.

Ikeya-Zhang in 2002 was also seen in 1661 and is the longest return comet with a period of 366 years.

Holmes (left) was unusual being within our asteroid belt. It brightened overnight from mag 17 to naked eye visibility and appeared as large as the full Moon. It brightens periodically but no one knows the cause.

A truly great comet was McNaught, which originated within the Oort Cloud. It's magnificent tails were due the an immense amount of dust released when it reached perihelion.

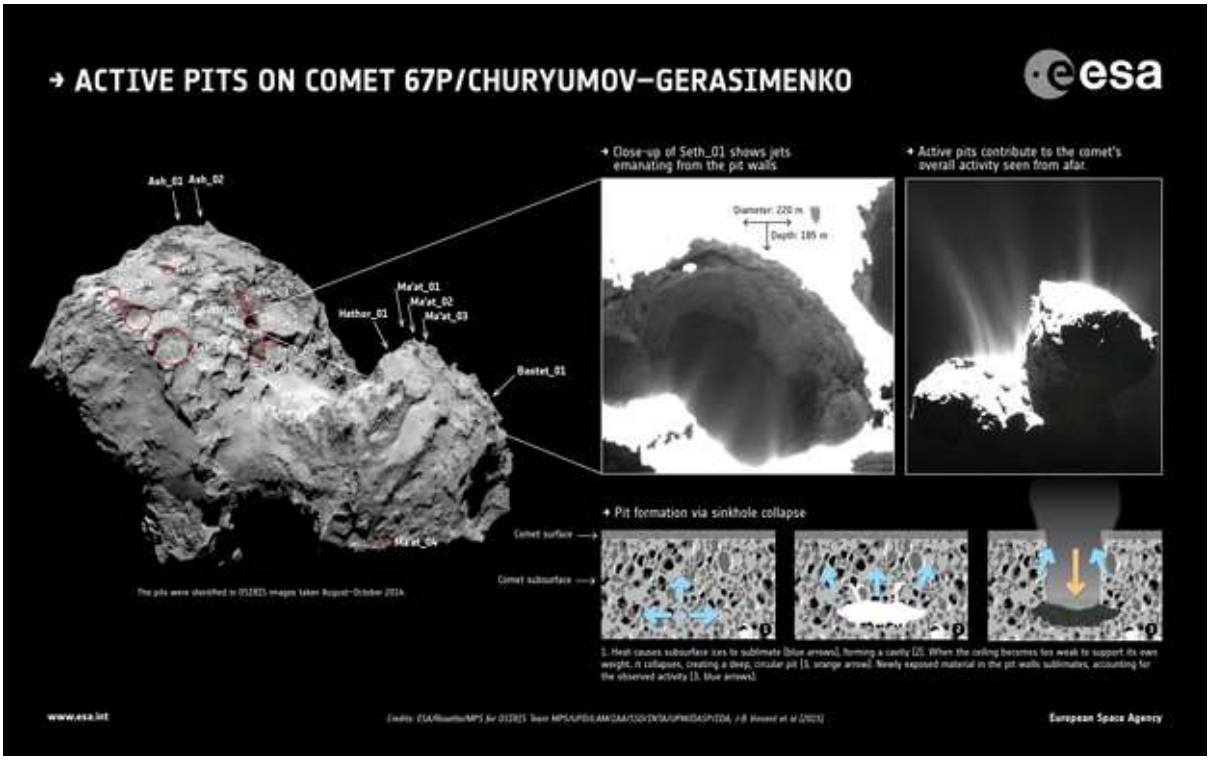
Terry Lovejoy discovered a Kreutz Sungrazer in 2011 which disintegrated at perihelion and became headless.

2012 ISON (left) also broke up at perihelion and the comet of the century became a damp squib.

This year, 2015, we have comet Lovejoy (right) which is still visible in the sky albeit rather faint now.

Perhaps the most well known comet at present approaching perihelion is 67P Churyumov-Gerasimenko. The Rosetta spacecraft, currently orbiting 67P, was the first mission to rendezvous with a comet and first to deliberately put a lander onto the surface. Little Philae bounced and came to rest in a dark crater but as the comet has moved closer to the Sun Philae has begun to wake up and has communicated briefly with Rosetta.

Rosetta is investigating the mechanism for gas emissions that occur as the comet warms up.



Left: 18 pits have been identified in high-resolution OSIRIS images of Comet 67P/Churyumov–Gerasimenko's northern hemisphere. The pits are named after the region they are found in, and some of them are active. The context image was taken on 3 August 2014 by the narrow-angle camera from a distance of 285 km; the image resolution is 5.3 m/pixel.

Middle, top: close-up of the active pit named Seth_01 reveals small jets emanating from the interior walls of the pit. The close-up also shows the complex internal structure of the comet. The image is a section of an OSIRIS wide-angle camera image capture on 20 October 2014 from a distance of 7 km from the comet surface. Seth_01 measures about 220 m across.

Right, top: context image showing fine structure in the comet's jets as seen from a distance of 28 km from the comet's surface on 22 November 2014. The image was taken with the OSIRIS wide-angle camera and has a resolution is 2.8 m/pixel. In both images the contrast is deliberately stretched in order to see the details of the activity. The active pits in this study contribute a small fraction of the observed activity.

Left, bottom: how the pits may form through sinkhole collapse. 1. Heat causes subsurface ices to sublimate (blue arrows), forming a cavity (2). When the ceiling becomes too weak to support its own weight, it collapses, creating a deep, circular pit (3, red arrow). Newly exposed material in the pit walls sublimates, accounting for the observed activity (3, blue arrows).

The good news is that the mission has been extended until September 2016 when the orbiter will move very close to the surface prior to crashing into it in order to get some good close up pictures.

Denis finished his talk with the advice that we should get out there and take a good look at any comets as they pass through our skies. Thank you Denis for taking us through all the noteworthy comets.

Until August and a talk from our very own HAS Ladies about their time in Chile, clear skies.

Pauline Macrae