Federation of Astronomical Societies

Editor: Michael Bryce

Newsletter

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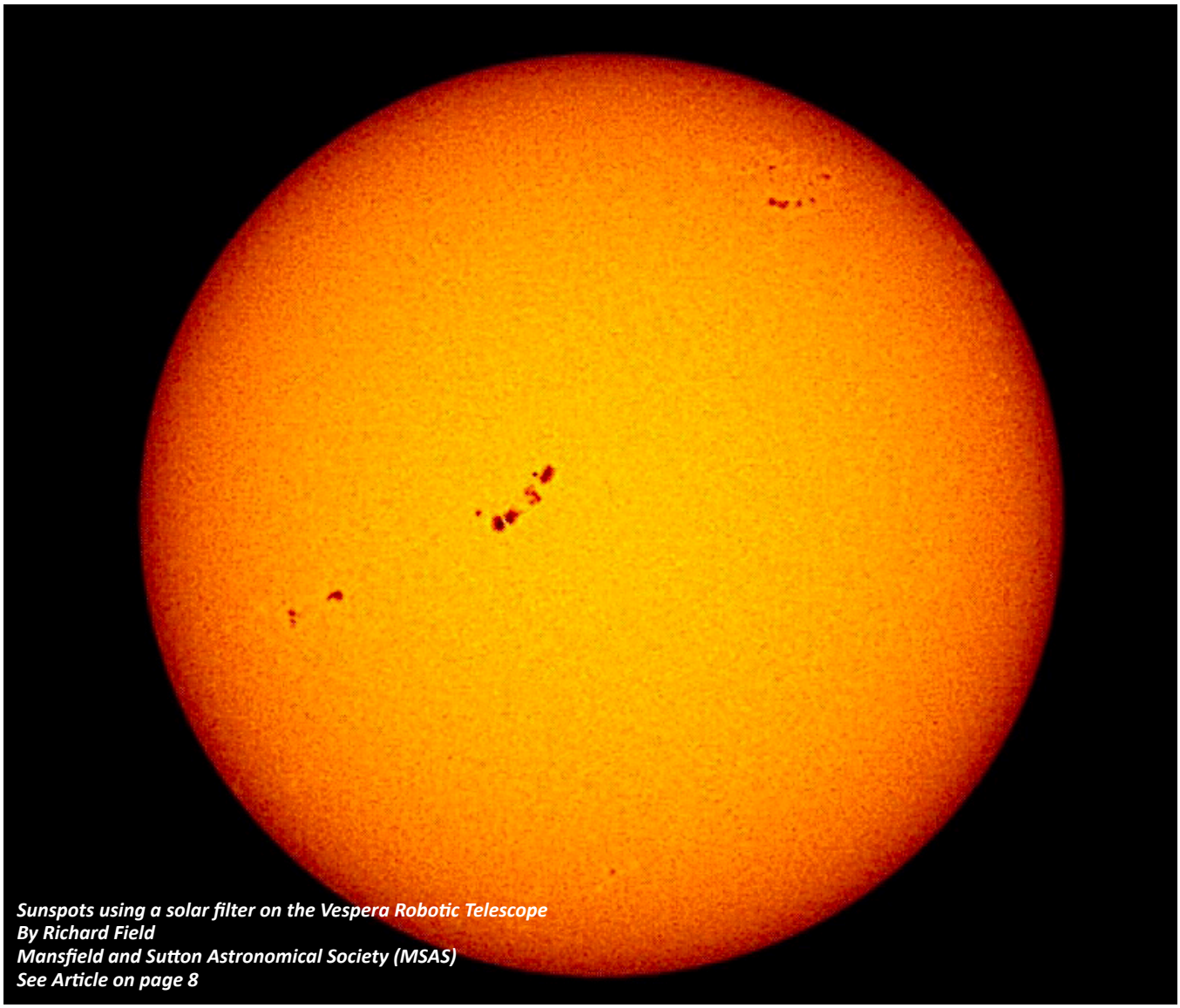

Sunspots using a solar filter on the Vespera Robotic Telescope
By Richard Field
Mansfield and Sutton Astronomical Society (MSAS)
See Article on page 8

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Interim President's Spot:

Dr Paul A Daniels

26 March 2024

If you received this newsletter a little later than usual then it's entirely *mea culpa* as I'm shamefully writing this *eleven* days after the deadline that allows our esteemed newsletter editor, Michael Bryce, time to put the newsletter together.

In my partial defence, I've been a bit preoccupied with helping to get the FAS PLI offering sorted out before the current policy expires (previous one by the time you read this). We have to thank our vice-president, Clare Lauwerys, for putting in the major footwork with lots of phone calls to brokers. Lots of thanks too to Tony Questa and some of his colleagues at SAGAS for reviewing the proposed policy documents. As of this time of writing, we're very likely to get something set up in the next two or three days.

If I'm allowed to come up with another, less diligent, excuse, there's also the YouTube distraction factor: starting to research something relevant to the task at hand… only to realise three hours later that you're no closer to the answer but you *do* now know a lot more about Donald Trump's court-room battles! As someone with a strong interest in geopolitics, living in 'interesting times', who hungrily seeks out news on the war in Ukraine, the Armenian goal of distancing itself from Russia, the secessionist activists in Kaliningrad, the Russian meddling in Moldova, the Russian-sponsored interference in Africa, the huge, terrible death tolls in Gaza, whether China will invade Eastern Russia, the shenanigans in US politics, the long-overdue election in the UK and, oh yes, the fabulous Amaury Guichon chocolate videos, you can well understand just what a distraction YouTube can be to a political nerd like me!

In the middle of all this seductive distraction, Andy Williams (Co-Lead IAU CPS Policy Hub/ESO External Relations) posted a message on the CPS' Slack message board with a link to an ESA Space-Based Solar Power R&D Study, 'Pre-Phase A System Study of a Commercial-Scale Space-Based Solar Power (SBSP) System for Terrestrial Needs', that proposes placing 3,987 mirrors each with a 1 km diameter in a Sun-Synchronous Orbit (SSO) about the Earth at an altitude of 890 km and an orbital inclination of 98°. Light would be directed down to one of over 30 ground stations (with an 8.3 km diameter spot size on the ground) with the goal of generating either up to 750 TWh of electricity *per annum* by 2050 or generating 10% of the European hydrogen consumption forecast to be needed by then.

I won't torture you here with a long description of the study results (I suggest you browse the documents available via the link above) but I was astonished to see that the 'Stakeholders' were mainly energy companies (*e.g.* ENGIE, EDF and DutchPowerGroup), fuel companies (e.g. Shell) plus Microsoft. Surely, the stakeholders are all those with a stake in the project and not just a narrow selection of commercially vested interests? Here's a good definition of the meaning of stakeholder from TechTarget:

> "A stakeholder is a person, group or organization with a vested interest, or stake, in the decision-making and activities of a business, organization or project. Stakeholders can be members of the organization they have a stake in, or they can have no official affiliation."

In other words, it's not just those that can exploit an activity for profit.

I count astronomers around the world as stakeholders in this and yet they are not included as stakeholders in this research. I include indigenous people who have a strong cultural link to the sky as stakeholders and yet they are not included as stakeholders in this research. As a group I include the billions of world citizens whose view of the night sky could be affected by this project if it comes to fruition and yet they are not included as stakeholders in this research.

Under the section 'Threats' it states the following:

> "An important threat to this concept is the **resistance of the public**. Due to concerns mentioned above, ecologic lobby groups are expected to oppose the creation of these concepts. The astronomy comnmunity will also not be in favour of the concept. Depriving areas and inhabitants from darkness at night is seen as highly impacting and not accepted in general. Risk averse decision making can result in a blocking point to obtain the needed approval and permits."

Aside from the fact that it's supremely arrogant to treat valid concerns from excluded stakeholders as 'threats', the principal effect of this would be to extend the length of daytime with a light intensity approximately equivalent to direct sunlight but, in all the documents provided for this project, there are less than two pages about the environmental impact and they've downplayed their assessment of that impact.

It amazes me that ESA has had the gall to use its funding to even consider such a proposal. Astronomers everywhere must be aware of the threats to our night sky and push back on those with commercial vested interests. I strongly recommend you consider joining the IAU's CPS group – you don't have to be an IAU member to join!

Stay safe and let's hope for clear, dark skies for all present and future generations

Paul

Calling All Young Stargazers!

Enter the FAS Astronomy Art Competition!

Is your child a budding artist with a passion for all things space related?

Unlock their creativity and take part in the FAS Astronomy Art Competition

Competition Details:

Theme: "Exploring the Universe Through Art"

Let their imagination soar as they capture the wonders of the universe on paper! From dazzling constellations to alien landscapes, the possibilities are as vast as the cosmos.

Who can enter:

The competition is open to all those aged 16 or under on 1 September 2023.

You must be a member of a FAS-affiliated astronomy society to participate.

Medium:

- Any drawing or painting materials (pencils, markers, watercolors, etc.)
- Models (Lego, clay, junk material etc)
- Art work created digitally (not AI generated art)
- Photographs

Prizes: First prize £50, second prize £25

How to Enter:

1. **Create Your Masterpiece**
   Let your imagination soar as you illustrate the wonders of the universe!
2. **Snap a Photo**
   Take a clear photo of your artwork.
3. **Submit entries online**
   Visit https://form.jotform.com/240372437683359 or scan the QR code.

Why Join the FAS Astronomy Drawing Competition?

- Ignite a love for astronomy through art.
- Foster creativity and imagination. Win a prize.
- Your artwork showcased on the FAS website and in our newsletter.
  By entering you are giving permission for the FAS to use your artwork on our website and in our newsletter.

Important Dates:

Submission Deadline: 1 June 2024
Winners Announcement: September 2024

The FAS Art Competition is part of the Graham Bryant Memorial Competition

Cosmic Rays

Build yourself a cloud chamber and take a peek into the world of sub-atomic particles that have travelled across the galaxy

By Dr Steve Barrett

University of Liverpool and Bromsgrove Astronomical Society

Cosmic Rays

High-energy charged particles are continually raining down on the Earth. Where do they come from and how do they gain so much energy? There is sill much to be learnt about the origins of cosmic rays [1], the stream of particles discovered in the early 1900s by Victor Hess [2] that won him the Nobel Prize in Physics in 1936. We know that sub-atomic particles – mainly protons, alpha particles and some heavier atomic nuclei – exist in interstellar and intergalactic space. There are many space-based instruments that have been recording incoming cosmic ray particles for decades (including, for instance, experiments on the Voyager spacecraft [3] and more recently on the International Space Station [4]).

The Earth's magnetic field protects us from many of these particles, but enough get through to hit atoms at high altitudes in our atmosphere, creating showers of secondary cosmic rays. The particles created in these air showers that survive to reach sea level – particles such as muons, electrons and protons – are the ones that can be detected by ground-based observatories.

Despite over a century of study, there are still many aspects of cosmic rays that are perplexing. Although we know what they are, we don't know from where they originate nor how the particles gain such extreme energies – the highest cosmic ray energies observed are many millions of times higher than the energies that we have been able to achieve in particle accelerators such as the LHC in CERN. Many astrophysicists believe that the shockwaves that result from supernovae (in our galaxy) or the jets emitted by supermassive black holes (in other galaxies) are able to accelerate charged particles to these extreme energies. However, although these objects may well be responsible for the particle acceleration, the details of the mechanisms involved are not well-understood and are active areas of research.

Building a Cloud Chamber

Modern cosmic ray observatories [5] use large numbers of sophisticated electronic detectors to determine the tracks of particles, identify the particles and measure their energies. A hundred years ago the detectors were much less complex and hence more suitable for amateurs to reconstruct today. A cloud chamber was the first type of detector that allowed the passage of cosmic ray particles to be seen and photographed. Just as an aircraft flying at high altitude can leave a condensation trail (contrail) in the sky as it passes through air that is laden with water vapour, so particles can leave condensation tracks in a cloud chamber if the temperature and pressure conditions are right. Inspired by sightings of the Brocken spectre from the top of Ben Nevis in 1894, Charles Wilson [6] developed chambers for studying cloud formation and optical phenomena in moist air. In 1911 he perfected the first cloud chamber and soon realised that when charged particles passed through the cloud chamber water droplets condensed to form visible tracks. As a result, his cloud chambers had an important role in experimental particle physics for decades. In 1927 he was awarded the Nobel Prize in Physics for the "most original and wonderful instrument in scientific history".

I wanted to build a cloud chamber for myself to provide a practical demonstration of how we can visualise cosmic rays and other particles collectively known as background radiation. I intended to use it as part of a talk on Cosmic Rays and also take it to other space-related outreach events as a table-top demonstration. These requirements led to the basic design criteria: It had to be compact and light enough to transport it in one aluminium travel case; it had to be able to run continuously for at least two hours without intervention and without the need for any dry ice; to allow others to copy the design and construction, it had to be easy to make out of readily available components at a modest cost of about £25 to £50, depending on what items were already on hand.

Making a 'cloud in a jar' requires a few basic elements: (i) a substance that is a vapour when warmed and a liquid when cooled; (ii) a source of heat; and (iii) a source of 'cold'. For clouds that form in the sky, the substance is water and the variation in temperature with altitude (from 20°C at sea level down to –70°C at high altitude) provides the right conditions for clouds to form. If water vapour is just at the point of wanting to condense into a cloud then the passage of an aircraft can 'trigger' this process, forming a contrail of water droplets. The passage of a charged particle through a cloud chamber can produce a visible track of liquid droplets in the same way.

Components and Construction

My cloud chamber (Figure 1) is a distant cousin of Wilson's original invention. The substance in the chamber is chosen to be isopropyl alcohol (IPA) rather than water because liquid and vapour can exist over a temperature range that is not too far from room temperature. My design also benefits from technology that was not available to Wilson a hundred years ago. Rather than using the expansion of gases to achieve the cooling effect necessary to condense vapour into liquid, my cloud chamber uses semiconductor devices called Peltier modules [7]. A Peltier module uses electrical power to remove heat from one side of a slab of semiconductor material and dump that heat onto the other side of the slab, where it is usually removed with a heatsink cooled

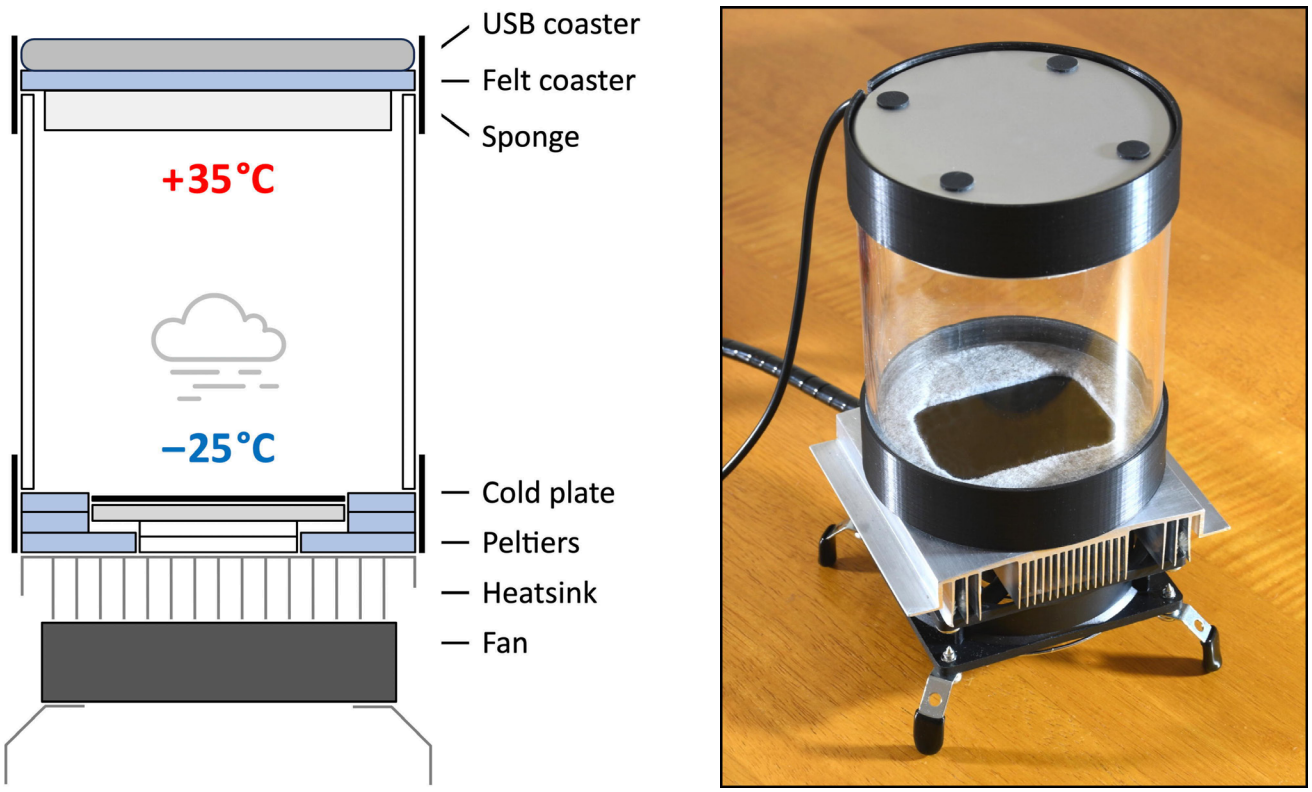


Figure 1 – Overview of the cloud chamber

Left Image: Schematic diagram of the cloud chamber shown as a section. The blue-shaded rectangles are the felt coasters. The one at the top separates the USB-powered mug-warming coaster (grey) from the sponge holding the IPA. The multiple layers of coasters at the bottom help to thermally insulate the cold plate (black) and Peltier modules (white) from the ambient warm air outside the chamber (see Figure 2).

Right Image: The cloud chamber sits on four Meccano™ pieces to lift the cooling fan off the table. The 3dprinted black plastic collars at the top and bottom of the cloud chamber help to keep all the components located securely in position. Though not necessary, they make the chamber less prone to 'rapid unscheduled disassembly' if accidentally knocked.

by a fan. The 'cold side' will stay cold for as long as the device is supplied with electrical power. The cold side of the Peltier module cools a cold plate (usually a small piece of aluminium a few cm in size) which needs to be brought into contact with the base of the cloud chamber to cool the IPA vapour inside. Hence this design of cloud chamber does not need any external source of 'cold' such as dry ice, making it much simpler to operate for those who do not work in universities or industries where obtaining cryogenic materials would be relatively straightforward.

Providing a source of heat to evaporate the IPA is easy enough, as the temperature required is somewhere above room temperature and below the temperature of a cup of tea. My design uses a USB-powered mug-warming coaster (~ £10) because they are a suitable size and provide just the right amount of heat to keep an IPA-soaked sponge at the top of the cloud chamber at a temperature above 30–40°C. Providing the cooling required to condense the IPA vapour back into a liquid is a little more problematic. The key to building a compact cloud chamber is the availability of small and relatively cheap (~ £15) refrigeration kits comprising a Peltier module, a heatsink and a fan. These kits have two functions: they are the source of 'cold' and also the platform on which the chamber itself stands. The chamber can take many forms, including a simple and cheap glass jar, but after some experimentation [8] I found that the optimum size/shape is a glass cylinder 10 cm in diameter and 10 cm tall. They are sold as 'candle holders' or 'hurricane glass' and can be bought in various sizes.

The essential function of a cloud chamber is to set up the thermal gradient that will create IPA vapour at the top of the chamber and condense the vapour into liquid as it falls slowly towards the base. As the IPA condenses, a mist of droplets forms at the base of the chamber and drizzles down onto the cold plate of the refrigeration platform. This is where the particle tracks become visible. The cheapest of the refrigeration kits do not get quite cold enough for the IPA to condense into a mist of droplets. I found that two Peltier modules, back-to-back, work better than one to get the temperature below –20°C, the base temperature required for effective operation of the cloud chamber. Figure 2 shows how the two-Peltier refrigeration platform is built up step by step.

Note that the pdf file 'Building a Cloud Chamber' [8] gives all the details of the components and construction of the cloud chamber, including a Technical Appendix that details how I tested various prototypes before deciding on the final design.

Operation

The Peltier modules in the refrigeration platform require a power supply of nominally 8–9V to provide the necessary cooling. Having a variable-voltage bench power supply has the advantage of being able to vary the power to see the effect on the base temperature reached by the cold plate. However, a fixed-voltage power supply should be fine providing it can supply the necessary current. Many amateur astronomers use a 'power tank' to power telescope mounts, cameras, dew heaters, etc, and these should provide

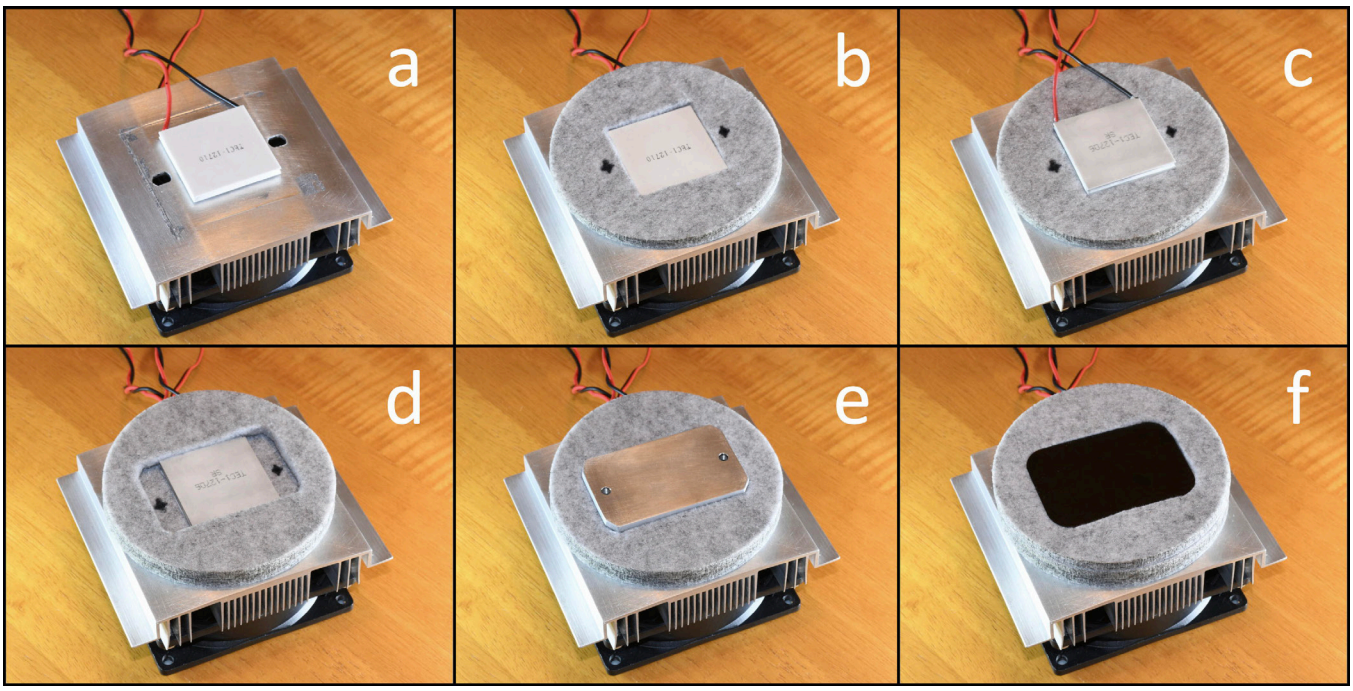


Figure 2 – Building up the refrigeration platform

a) An off-the-shelf refrigeration kit comprising a Peltier module, a heatsink and a fan.

b) A felt coaster with a square cut out of its centre placed over the Peltier module.

c) An additional Peltier module stacked onto the first (see the Technical Appendix of [8] for details).

d) A second coaster with a rectangular cut out to accommodate the cold plate.

e) An aluminium cold plate keeps both the Peltier modules clamped in place.

f) A black plate provides a dark background for the particle tracks to make them easier to see.

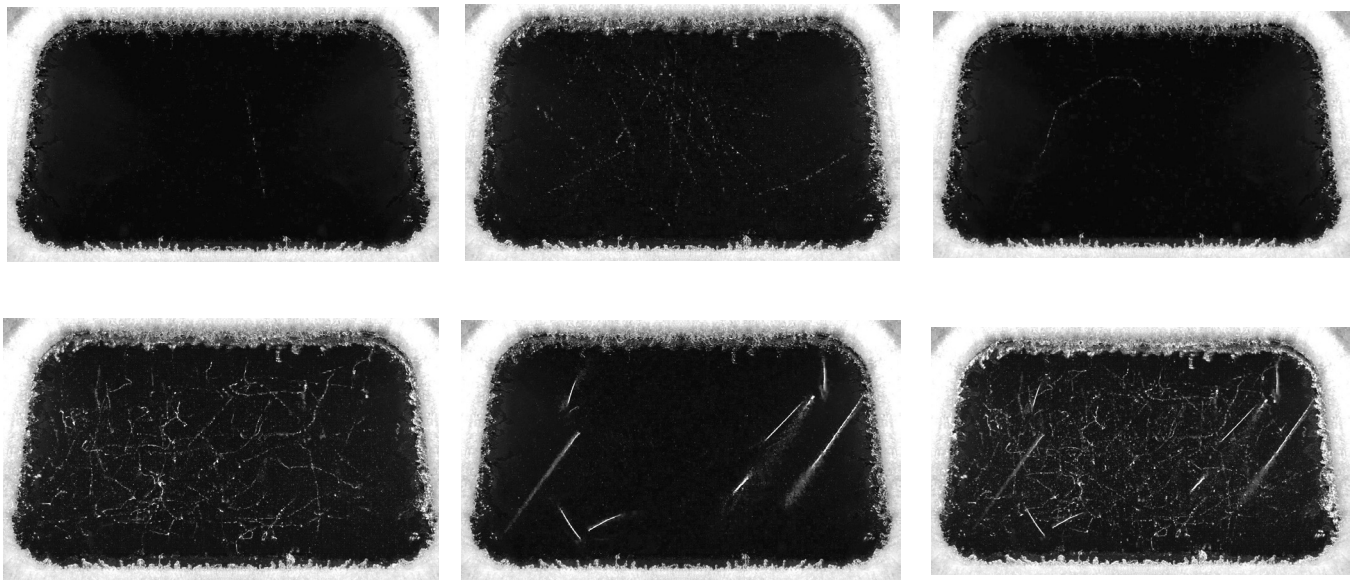


Figure 3 – Particle tracks

These images are either snapshots of single particle tracks or composite images of multiple tracks observed over an extended period of time (typically an hour). The composite images were made by manually selecting, extracting and superimposing dozens of still frames from a video.

About Dr Steve Barrett

As a Senior Research Fellow in the Department of Physics, University of Liverpool, my research interests span all aspects of imaging, image processing and image analysis. This includes medical imaging (biophysics), scanning probe microscopy of atoms, molecules and surfaces (nanophysics), microscopy of earth materials (geophysics) and astrophotography. I am a Member of Bromsgrove Astronomical Society.

Bromsgrove Astronomical Society

University of Liverpool

plenty of power for the Peltier modules. If you haven't already got one, fixed-voltage power supplies are reasonably priced – for instance, a 9V/6A power supply can be bought for ~ £10–£15.

The sponge located inside the glass jar or cylinder should be soaked with about 5 ml of IPA. I have found that this amount, when heated to about 30–40°C by the mug-warming coaster, allows the cloud chamber to operate for at least two hours. As a rough guide, the Peltier modules will cool from room temperature to –20°C in 5 minutes and the IPA-soaked sponge will warm from room temperature to 30°C in 10 minutes. When the IPA starts condensing a mist will appear to form at the bottom of the chamber as tiny droplets of IPA drizzle down onto the cold plate. This should be visible after about 5 minutes.

What you can expect to see

Cosmic rays will pass through the cloud chamber and leave visible tracks every few seconds. A simple torch should be enough to allow you to see the particle tracks – illuminate the inside of the chamber from the side as viewed by the observer(s) or camera. Figure 4 shows images of the various types of cosmic ray tracks that can be identified: muons, electrons, protons. The appearance of the tracks will depend on the ability of the particles to ionise the atoms in the air. Protons have a large mass and a high ionising power; hence they leave bright tracks. Muons have a lower mass than protons and so produce fainter tracks. Electrons have a very low mass and so their tracks tend to appear more straggly than the straight tracks of muons or protons.

In addition to cosmic rays, you may also see tracks from alpha particles. These have four times the mass and twice the electrical charge of a proton and so produce very broad tracks. Alpha radiation is emitted by the radioactive gas radon which is formed by the decay of the small amounts of uranium that occur naturally in all rocks and soils. Radon concentrations vary across the UK and will be higher in regions rich in granite, such as the South West.

Summary

More than a century on from Wilson's first cloud chamber, my design is compact, cheap to make and, most importantly, easy to operate – just add a little alcohol, switch it on, and wait for the sub-atomic particles from the cosmos to reveal themselves.

References

[1] https://en.wikipedia.org/wiki/Cosmic_ray
[2] https://en.wikipedia.org/wiki/Victor_Francis_Hess
[3] https://voyager.jpl.nasa.gov/mission/spacecraft/instruments/crs
[4] https://www.nasa.gov/mission/alpha-magnetic-spectrometer
[5] Pierre Auger Observatory: https://www.auger.org
IceCube Observatory: https://icecube.wisc.edu
Cherenkov Telescope Array: https://www.cta-observatory.org
[6] https://en.wikipedia.org/wiki/Charles_Thomson_Rees_Wilson
[7] https://en.wikipedia.org/wiki/Thermoelectric_cooling
[8] https://www.liverpool.ac.uk/~sdb/Astro/Cloud-Chamber-FAS.pdf

National Astronomy Week 2025

I am delighted to announce that National Astronomy Week will be returning in 2025.

It's very much at the planning stage at the moment but the steering committee (I sit on it to represent the FAS) is aware that many societies make plans a long way in advance. We wanted you to have the dates as soon as they were set to help you with your plans. The week that has been chosen is

Saturday 1 February to Sunday 9 February 2025

which we know is longer than a week but it gives everyone two weekends.

Why has this week been chosen? In early 2025 there will be a spectacular array of bright planets in the evening sky: Mars at opposition in Gemini, Jupiter a couple of months after opposition in Taurus, Venus at greatest eastern elongation and Saturn also visible in the early evening. During the 8 days, the Moon waxes from a crescent to full, moving past each of the planets as it does so.

More details will follow but for the time being, please put the dates in your calendar.

Kind regards
Clare Lauwerys
FAS Vice President

Website:
astronomyweek.org.uk
X (Twitter):
twitter.com/NatAstroWeek
Facebook:
facebook.com/astronomyweek

Alpine Astronomy

Richard J Field FRAS

Mansfield and Sutton Astronomical Society (MSAS)

In 1856, a year before the Alpine Club was founded, Charles Piazzi Smyth, Astronomer Royal for Scotland, arrived in Teneriffe, where he proceeded to have his equipment carried up Mount Guajara, at almost 2700 m (8,900 ft) on the south rim of the crater wall of Mount Teide. Here they built a hut and secure walls around his telescopes and instruments. He carried out numerous experiments and made drawings of his observations. His work was published in the 1863, volume 12 of the Edinburgh Astronomical Observations, but his popular account of his and his wife's experiences appeared earlier, entitled: "An Astronomer's Experiment, or Specialities of a Residence above the Clouds".

***Image Above**: Charles Piazzi Smyth*

Many years later, towards the First World War, the American astronomers took note of Piazzi Smyth's work and built all their telescopes on mountain tops. In the U.K. we forgot about him and built the Herstmonceux Observatory instead. Only in the 1980s did we move our telescopes to a mountain top on the Island of La Palma, west of Teneriffe, on La Roque de los Muchachos at almost 2440m (8,000 ft).

At the end of August this year, I finally joined the Alpine Club Aspirants as an elderly "hanger-on". As an amateur astronomer and Fellow of The Royal Astronomical Society, I decided to take with me a small robotic telescope – a Vespera, as seen below between my car and tent. Vespera, for the technically minded, is a 50mm aperture apochromatic quadruplet of 200mm focal length. It has a CMOS Sony IMX462. 1/2.8" sensor of 2.2 Mpixels.

The Schoenblick campsite at Saas Grund is at an altitude of 1559m (5,110ft) and after the initial snow we had on Monday 28th August, by the next Monday skies were extremely clear at night and I decided that it was good seeing for astrophotography. Of course, the one problem was that with the Mischabel 4000m peaks to the west and the hills and Weismiess and Lagginhorn to the east, my viewing was limited to the roughly N-S line of the valley.

My first photo was a long exposure of 75 minutes, but as the robotic telescope takes exposure of only 10s duration (due problems inherent in the alt-azimuth tracking system) it meant a total of 75 x 6 = 450 exposures. These are automatically stacked, or placed on top of one another, to cancel noise and increase the brightness of the body photographed. This is done automatically in an app on my ipad, used to control the telescope.

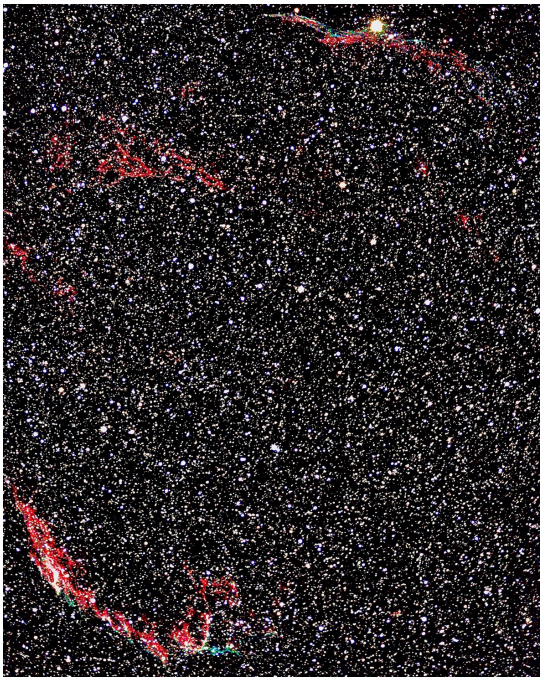
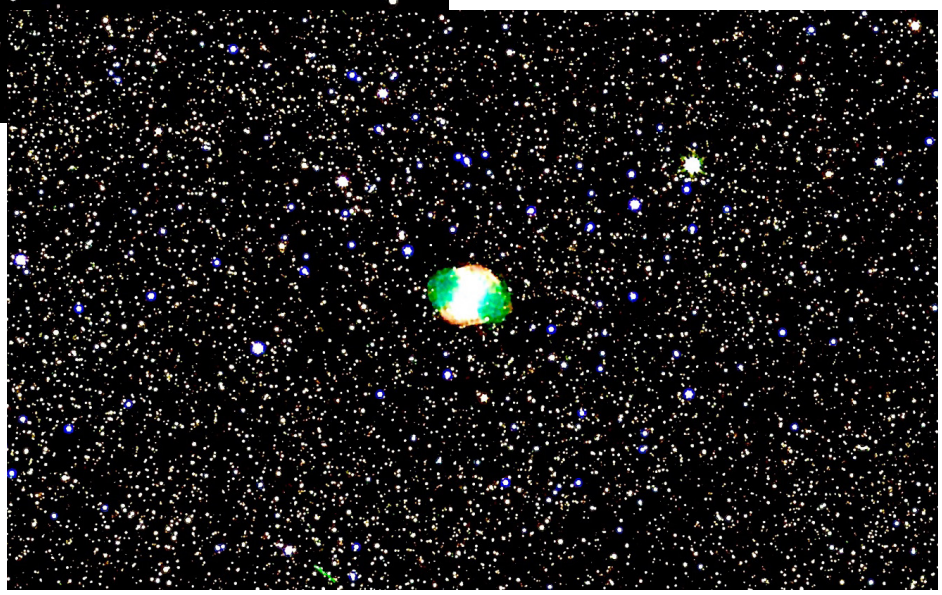


***Image Above**: Veil Nebula in Cygnus – the top bright gases are the Western Veil Nebula, or "Witch's Broom. The bottom bright gases are the Eastern Veil Nebula and the middle gases are "Pickering's Triangle".*

***Image above**: The North star, or Polaris, which produces this "wedding ring" effect in a long set of exposures.*

***Image Left**: Bode's Galaxy is almost at the Zenith but is a nice spiral galaxy to image.*

***Image Below**: The Dumbbell, or Apple Core Nebula is a favourite of amateur astronomers.*



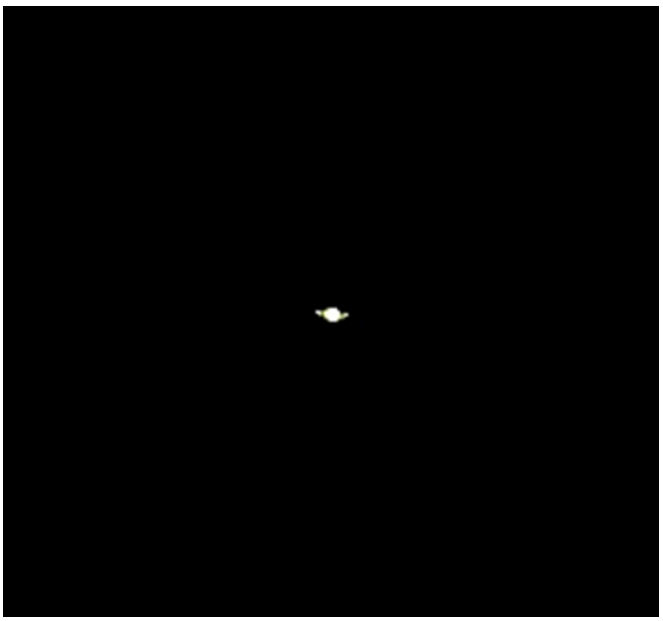


***Image Above**: Saturn was nice and bright in the south and is only just visible using such a short focal length telescope. The rings do show up though.*

The telescope I used weighs in at 5kg, without tripod and accessories. However, I now have a new smaller one of 50mm aperture weighing in at 2.5 kg. This will be fine to carry up to a high hut for even clearer views and I hope to do this in the Summer of 2024.

Richard Field
Mansfield and Sutton Astrnomical Society
sherwood-observatory.org.uk

For details about the Vespera telescope please visit:
vaonis.com/vespera

***Image Above**: My main "lens"/telescope at home. It weighs 15.7kg and is a 200-500mm f2.8 lens for a Nikon camera. The mount is an equatorial "harmonic drive", which when aligned to the pole star tracks astronomical bodies accurately.*

Calling All Astronomical Societies

Remember you can advertise your Society meetings and special events in the FAS Newsletter and on the FAS Web Site for Free. Just send full details of your meeting programme and special events to the following addresses:

For inclusion in FAS Newsletter:

newsletter@fedastro.org.uk

Deadline: For any publication month the deadline is the 15th of the previous month. I.e for the June 2024 issue the Deadline is 15 May.

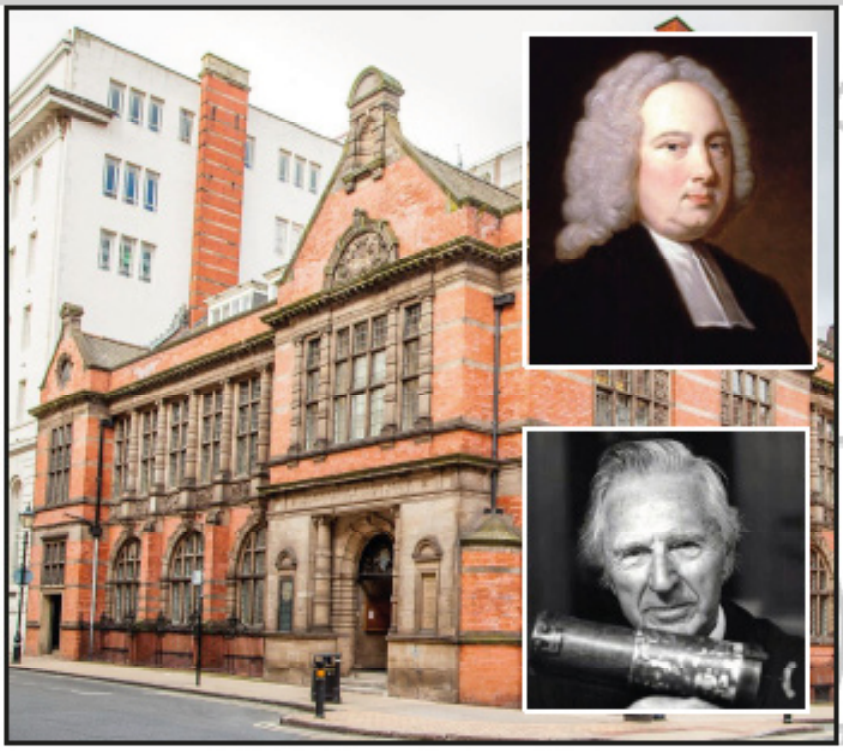
For inclusion on FAS Web Site and sent to all FAS Member Societies:

vicepresident@fedastro.org.uk

Allowing at least a weeks notice

Society for the History of Astronomy

Society Spring Conference 2024
Theme for the Day - "Astronomers Royal"
From 9:30am Saturday 20th April.



Lyttelton Large Lecture Theatre
Birmingham & Midland Institute
Margaret Street, Birmingham B3 3BS
The Michael Hoskin Lecture:
"James Bradley: The Man Who Moved the World "
Main Speaker: Dr John Fisher FRAS. Other Speakers Confirmed;
Dr Emily Winterburn FRAS, Dr Lee Macdonald FRAS,
Dr Peredur Williams, Professor Richard Ellis C.B.E., FRS

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Booking in Advance at £15 per person for SHA members.
£20 per person for non-members.
More details and pre-booking only. Please Contact
Meeting Secretary – meetings@shastro.org.uk

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The Society for the History of Astronomy

New Book

Japan In Space: Past, Present and Future by Brian Harvey

Reviewed By Michael Bryce

Spaceflight Author and Historian Brian Harvey, Dublin, Ireland, has published his latest book "Japan in Space: Past, Present, and Future" to accompany his long line of informative and comprehensive spaceflight publications.

This book presents an insightful and detailed look at the history of Japan's space endeavours since the 1960's but begins with a flashback to the 1940's when Japanese Commander and rocket expert Eiichi Iwaya brought to Singapore a Japanese Submarine stacked full of the Third Reich's most secret aviation rocket design papers from Augsburg, West Germany.

Covering the origins of Japan's space ambitions, guided by the visionary engineer Hideo Itokawa, who launched the first rockets, from the experimental small "Pencil" series to early Sounding rockets working and on to larger vehicles such as the "N" series derived from the American Thor rockets under a licence agreement with the United States.

In 1969 the Japan government, under the prime ministership of Eisaku Sato, established NASDA. Given the English tag line of the National Space Development Agency, NASDA was formed from the previous National Space Development Centre (NSDC). NASDA was specifically charged with responsibility for the development of launch vehicles; the promotion of technologies for remote sensing; and the promotion of space experiments. Japan introduced remote sensing satellites such as the Marine Observation Satellite (MOS) and the Japanese Earth Resources Satellite (JERS).

Towards the end of the century there was growing confidence in NASDA and the space industry that it was "made in Japan" time to enable Japan to be a launch provider in its own right. To do this, the government in 1990 set up a complex structure in which NASDA funded the next generation launcher, the H-II's development. The rocket was built and marketed by a newly created Rocket Systems Corporation (RSC).

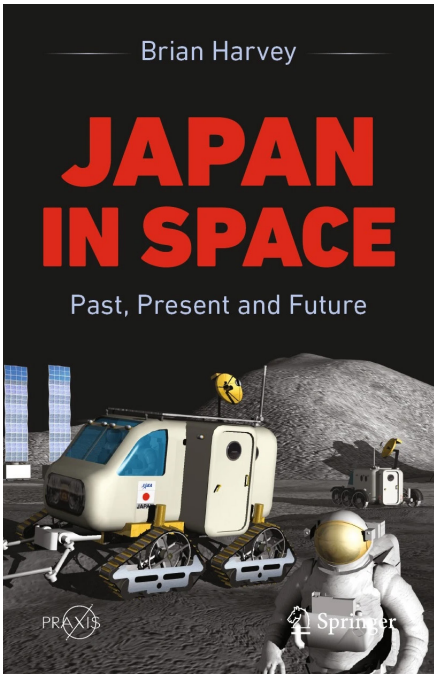

Image Above: *The front cover of Brian Harvey's book Japan in Space, Past, Present and Future depicting the Japanese proposal for lunar surface operations under Project Artemis*

Image Credit*: Springer Publishing*

Despite its problems, the H-II vehicle succeeded in its primary purpose of launching more advanced Earth observation satellites into orbit. ADEOS (Advanced Earth Orbiting Observation Satellite) was the third Japanese remote sensing satellite, following Momo and Fuyo. The last H-II never flew and was eventually put on display on its side outside JAXA headquarters, not unlike the leftover Saturn Vs from America's Apollo programme. A derivative of the HII rocket, the HIIA launched for the first time in 2001 and the launcher is still in use today and is Japan's most successful launch vehicle yet.

Japan enjoyed success with deep space missions. Although Europe's Giotto probe was probably the most well-known mission to Comet Halley, Japan's Planet A probe came as close as 10000 Km to the comet. Planet A was a small spacecraft able to carry just 10Kg of instrumentation. Suisei and Sakigake also joined the deep space armada to observe Comet Halley.

Deep Space success also came with the Hayabusa probe to Asteroid Itokawa, and then the Hayabusa 2 mission to Asteroid Ryugu. Japan also sent probes to the Moon and Venus. Japan enjoys continued success with joint planetary missions such as ESA's BepiColombo (Mercury) and JUICE (Jupiter)

For human spaceflight, the NASA Space Shuttle programme opened access to space to non-American Astronauts. However, Japan's first astronaut flew on a Russian, not an American spaceship. Toyohiro Akiyama, the first journalist in space launched on second December 1990 on Soyuz TM-11 with Viktor Afanasayev and Musa Manarov. This was the eleventh expedition to the Russian Mir Space Station and lasted eight days.

Two years later, Mamoru Mohri became the first Japanese Astronaut to fly into orbit aboard the American Space Shuttle, as a member of the Spacelab J mission (12 September 1992 to 20 September 1992. The Japanese had waited a long time for the Spacelab opportunity which had proved more expensive. The numbers of Spacelab missions were restricted because the shuttle only achieved as many as ten launches per year, not the 50 or so launches as originally expected. As a result of this and other cutbacks there was no Spacelab J2 mission.

Japan's contribution to the International Space Station, was for the 'design, development, operation and utilisation' of the space station. Providing its own laboratory for experiments in scientific, microgravity and materials processing research, to be launched by the American shuttle in its payload bay. Comprising of three main parts: the Japanese Experiments Module (JEM) a Logistics Module (LM); Pressurised Module (PM); and an Exposed Facility (EF). The Pressurised module became known as Kibo.

Kibo arrived on Station not long before the shuttle retired, so most missions in the 2010s were launched from and recovered in Russia. The first seat share predated shuttle retirement, with Japan's Soichi Noguchi flying 163 days on the station with Oleg Kotov and Tim Creamer, launched on Soyuz TMA-17 on 20th December 2009, returning on 2nd June the following year.

To the distant observer, the direction of travel of the Japanese space programme did not change greatly in the new century, the most visible marker being the integration of NASDA and ISAS under the new title of JAXA (Japan Aerospace Exploration Agency) in 2003.

Looking to the future, Japan experimented with spaceplanes such as HOPE (H-II Orbiting Plane), not unlike Europe's Hermes and other designs. HOPE was not the only Japanese space plane project of the period. The National Aerospace Laboratory made a number of paper studies of an aerospace plane in the 1990s and as many as 330 staff were assigned to the project at one stage. The idea was to build a Concorde-shaped aerospace plane 94 m long weighing 350 tonnes which would take off and land like a conventional jet but once in space fly a mission similar to the space shuttle. Sadly, none of the spaceplane ideas came to fruition.

With America's latest plans to return humans to the Moon under project Artemis, with a sustainable human presence on the surface, Japan quickly made it clear that they needed to be involved. Japan quickly drew up plans to repurpose the Kibo module as a cargo vehicle to bring supplies to a lunar surface base, calling it SELENE X. And proposing to develop a Global Positioning System for the Moon to aid surface navigation and communications. The successful H-II Transfer Vehicle (HTV) used to re-supply the ISS, could also be developed as a freighter, known as the HTVXG for the proposed Gateway lunar space station.

Japan marked the 2019 50th anniversary of the lunar landing by signing an agreement with Toyota for the development of a large pressurised lunar rover. Its purpose was to indicate the high level of Japanese interest, indeed enthusiasm for lunar exploration.

A most captivating read, Brian Harvey's Japan in Space provides a complete and excellent documentary on Japan's spaceflight history throughout the decades and describes Japan as a major player in the worldwide space exploration theatre.

Michael Bryce

Image Below: *Japan experimented with spaceplanes such as HOPE, not unlike Europe's Hermes and other designs.*

Image Credit: JAXA
global.jaxa.jp

Michael Bryce is Editor of Capcom Magazine and founder of GoSpaceWatch. Editor of the Federation of Astronomical Societies Newsletter. Member of the Bromsgrove Astronomical Society and the Carolian Astronomy Society (Kidderminster). Member of the British Interplanetary Society, Member of the Society for Popular Astronomy. Panel Member of Space Oddities Live! Weekly YouTube Astronomy Show. Michael is also a Member of Wolverhampton Photographic Society and Stourport Camera Club.

Hertford Astronomy Group

Forthcoming Meetings:

Our meetings take place on the 2nd Wednesday of each month from September to June, and we also have additional events throughout the year. Doors open at 7:30 and the meetings begin at 8pm. Alternatively you can watch the event on Zoom. In either case, go to the society website to book a place.

10 April: "Island Zero: A first step in producing large-scale space habitats"

by Jerry Stone, Spaceflight UK

8 May: "Our Island Universe - the Milky Way Galaxy and its place in time and space"

by Ian Morison, Jodrell Bank (Retd)

12 June: "Looking for life on Mars and Habitability of Jupiter's moons"

by Andrew Coates, UCL / MSSL / SPA VP

Meetings held at The Lindop Building on the College Lane Campus, Hatfield, AL10 9AB

For details and other information, go to hertsastro.org.uk

Space Oddities Live!

Space Oddities Live! Is a weekly YouTube show featuring an International panel of Astronomers who get together for a chat and discussion about the latest news in Astronomy and Space Exploration. We have Special Guests; Night Sky Notes; Viewers' Gallery; and more

We livestream every week on YouTube and Facebook. We are an international panel of amateur and professional astronomers. Panel Members are from the UK, Spain, the US and Canada. We chat about anything relating to the Universe and space exploration, keeping our audience up to date with the latest news. We also present interesting presentations on a huge variety of astronomical subjects and also create our own space-related videos for all levels of astronomical knowledge.

As well as our weekly shows we also go live for important space launches or other special events. We have a lot of fun, so why not join us? For livestream details, please visit our YouTube Channel at

youtube.com/@spaceodditieslive

For inclusion in our weekly viewers' gallery, please send your images to

spaceodditieslive@gmail.com

Please include your name, location, equipment, processing details etc

One image per email please, entitling it "Gallery Entry"

Tuesdays at 8:00 pm UK (3:00 pm US Eastern Time)

Stratford UponAvon Astronomical Society

Astronomical Society News

The Stratford upon Avon Astronomical Society meet every 1st and 3rd Tuesdays at 8pm (doors open at 7.30pm) at Alderminster Village Hall. Everyone is welcome, especially beginners and those wanting to learn more. The first Tuesday is a Club Night, in April that will be on 2nd April and the speaker on the third Tuesday, which is on 16th April 2024 is due to be Dr Dan Bayliss from the University of Warwick, with a talk entitled 'Exoplanets – could smaller stars host planets?' Please note that the speakers usually start quite promptly at 8pm.

Each month one of our members, Adrian Wakeham, writes an article to offer pointers to what to look for in the sky during the coming weeks. This month it is naked eye astronomy.

My favorite kind of astronomy is naked eye astronomy. Which requires no equipment other than your own eyes (with possibly eye glasses). I mainly do it whilst giving my dogs on an evening walk. On a clear night they end up having a 'stand!'

The main thing for astronomy is patience, your eyes need 20 minutes to adjust to the darkness. Once fully adjusted it's amazing how much more you can see! This can be immediately lost by a flash of white light (such as a car headlight, a security light or a torch). This means you need to find a dark site away from light pollution. One way to avoid light affecting your vision, but still being able to see what you are doing, is to use a red torch, as this does not affect your night vision.

A good place to start are the constellations, such as Orion and Ursa Major, but other things visible by this kind of astronomy are the moon, some of the planets in the solar system, such as Venus, Jupiter and Mars, as well as the stars, and when your eyes are adjusted you can look for star colours, which can help with identifying what you are looking at, such as the star Vega, which appears blue. Then there are the star clusters such as the Pleiades. You can also see galaxies. including Andromeda, meteors that usually shoot quickly across the sky and occasionally comets, which usually appear almost motionless. But a great thing to look for are satellites, which look like stars, but move slowly across the sky, if they are flashing, they are usually aircraft, but a special moving light to see is the International Space Station, which is usually very bright. There are several sites that give information of the best times to look, including http://www.astro.org.uk

Give it a try!

Ps. Although it is called naked eye astronomy, I cheat and keep my clothes on!

Club nights offer more information on what to look out for each month and if it is clear we do some observing just outside the Village Hall, so please join us. There is no charge initially to come along and find out more, but if you do want to become a member then the fee is JUST £15 A YEAR and it's free if you are in full time education. For more details go to the website http://www.astro.org.uk or contact the Chairman John Waller john.waller@astro.org.uk or on 07703 192188. Happy Observing!

Adrian Wakeham and David Bento

Stratford Upon Avon Astronomical Society Lecture Meeting:

16 April:

Dr Dan Bayliss from the University of Warwick:

Exoplanets – could smaller stars host planets?

Website: astro.org.uk

Mid-Kent Astronomical Society

Forthcoming Meetings

Friday 10 May

Nik Szymanek - Adventures with Robotic Imaging

With the many recent developments in this field Nik will enlighten us and illustrate his talk with many new images.

Friday 31 May

Carys Herbert - Hunting Out bursting Young Stars citizen science project

The Hunting Out bursting Young Stars (HOYS) citizen science project collects amateur astronomy data of nearby (<1 kpc), young (<10 Myr) star forming regions to conduct long term multi-filter photometric monitoring. The project aims to obtain one image per filter per region every day. Since the project launched in 2014, it has gathered around 100 000 images. In this talk, I introduce the citizen science project and offer details on involvement. I will present the science aims and achievements of the project, spotlighting my PhD research into surface spots on young stars.

Friday 14 June

Ashley King - The Story of the Winchcombe Meteorite Fall

The Winchcombe meteorite is the first 'rock from another world' to be recovered in the UK for 30 years. Guided by videos from the UK's meteor and fireball camera networks, the main mass was found on a driveway in Gloucestershire only 12 hours after landing. Over 500 g of the Winchcombe meteorite are now being curated at the Natural History Museum (NHM), London, and it is both scientifically and culturally priceless; as a fresh carbonaceous chondrite fall it holds vital clues about our origins, while its rapid recovery and analysis is a shining example of international collaboration between scientists, citizen-science projects, and local communities.

28 June

Sue Bowler - The Promise of Gravitational Waves

Over the past 5 years, a new type of astronomy has found a surprising number of otherwise undetected black holes and an unexpected range of masses. But why did it take 4 decades to detect gravitational waves? And what does the new detector technology offer for the future?

Meetings take place at Bredhurst Village Hall, Bredhurst, Gillingham. ME7 3JZ at 8 pm.

For more information visit: midkentastro.org.uk

2025 EU Conference on Amateur Radio Astronomy

The British Astronomical Association (BAA) Radio Astronomy Section together with RAL-Space are pleased to announce the 2025 EU Conference on Amateur Radio Astronomy. EUCARA is a biannual conference starting in 2014 and this will be the first in the UK. The Harwell campus visitor centre will be the location in September 2025 for this weekend event. The conference will include presentations from academic researchers, local amateurs, and students. We plan to have a poster session and demonstrations. If you wish to register an interest in this event, please visit the EUCARA website (www.eucara.org), where some information is already posted, and you can request to be kept updated on developments. The event organisers are Paul Hearn and Andrew Thomas.