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## Chairman's Report to Herschel Society AGM on 2 March 2024

The start of 2023 was focussed on our Membership Survey and the issues arising from that, which was the major focus of our 2023 AGM. A series of Actions arose from that discussion, many of which have been progressed over the past year. Annex A highlights those areas (in red), and I will expand on several of them orally at our meeting.

The second part of the year saw the initiation of our plans to have a one-day conference on John Herschel this year. Annex B gives a summary of this which I will also elaborate on.

As the Lecture Report at Annex C shows, our Lecture Programme has continued to thrive. The Caroline Herschel Prize Lectureship process produced its sixth winner. The importance of the various issues around light pollution was highlighted by four of our lectures in the autumn. Unfortunately we still lack a suitable and willing candidate to take on the future direction of our related Starlit Skies initiative. The main development on the music side has been the co-option of Sarah Waltz to join Matthew Spring on our Committee as a source of musical expertise. A Report on Music activities is at Annex D (not yet)

More generally, 2023 saw the usual stream of incoming contacts either via the Herschel Museum, our own website, or by email with questions, new ideas, or other developments on things Herschellian. This year for example it brought us a great new connection with Armagh Observatory and Planetarium.

As always, I am grateful for the support of our Committee, which provides an increasing breadth and depth of expertise in our areas of interest. But we are still weak in numbers of those able and willing to undertake the administration of the Society. The remains the only significant threat I can see to our future.

Charles Draper

20 February 2024



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## Annex A

### Discussion at 2023 AGM on Membership Issues – 2024 Updates in red.

Charles said it had been clear for some time that our overall membership numbers had been declining. The Committee had agreed that we needed to improve our marketing materials and had already upgraded our social media activities, but this seemed a good time to consult our members about their motivations more generally. A survey was the obvious way of doing this, and Will Herschel-Shorland very kindly offered to use his professional skills as a market consultant to conduct it. Members were sent the survey on 28 January, and responses were sought by 13 February. Members received a summary of the results on 24 February.

Will then presented the results in full. Charles thanked Will for both the work and presentation. Charles then said that the Committee was glad to see that survey had a very good response rate (56, or 35%), and that the main message was that the membership liked what we did. The Journal was popular, but the website was under-used. There were lots of suggestions for the future, some very useful, but others suggested that the relationship between our Society, the Museum, and Bath Astronomers was not well understood by some members.

The main questions for discussion from the survey responses seemed to be:

- (1) How should we best leverage the relationships between the Herschel Society, Herschel Museum, and Bath Astronomers for the benefit of all?
- (2) How should we improve our website?
- (3) How should we use social media to attract new members?
- (4) Should we seek to grow locally, or internationally, or both?

Charles then invited comments from those present. The main points made in discussion were:

1. Something like an “Astronomy in Bath” website that linked to all three organisations could be useful.

**Action: Simon had already set this up here. <http://astronomyinbath.uk/>**

**It would be even better with a good image of Uranus in the background.**

**Update – the background has been updated accordingly.**

2. Perhaps each organisation should also have a statement explaining how the “trinity” works.

**Action: We can use Charles’ table for this, or an alternative. It could also go on the Astronomy in Bath website.**



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3. It would be useful to have a means of feeding ideas from Herschel society members into Herschel Museum plans.

**Action: We should do this at the stage when specific ideas were being sought. This was likely to be 2024 for the current planning round. This could be via a survey or drop-in sessions. Update: The BPT's draft plans for Herschel Museum development will be a good opportunity for this.**

4. Each of the three organisations had a wide range of collaborative relationships with other organisations locally and further afield.

**Action: We will continue to develop them.**

5. The Herschel Society could try linking into other scientific person focused societies (eg Darwin)

**Action: Charles will look into this. The most attractive options are likely to be the obvious parallels, such as the Flamsteed Society in Greenwich. Update: Charles will explain what he learned from a very useful discussion with the Flamsteed Society in December.**

6. We should continue to foster our links with Slough.

**Action: The Herschel Museum will continue to lead on this through their Museum contacts.**

7. Could we learn something useful from analysing hits on our website?

**Action: Tony Symes will look into this. Claire's colleague Mary could offer advice on how.**

8. Should we link more to 19<sup>th</sup> Cent astronomy?

**Action: We are open to this in e.g. our lecture programme. It could be other scientific developments with a John Herschel link. Update: Our John Herschel Conference in June and other associate events should have a good impact here.**

9. Should we connect more to Bristol Institutions (e.g. the University, the Astro Soc). (*Bristol is twinned with Hannover*)

**Action: The Herschel Museum can offer a useful contact through one of their Trustees.**

10. The HS website might be used more if we improved its quality.

**Action: Charles will look into this, perhaps by buying in professional help. Update: The website was updated in June.**

11. How about reaching out to Society members overseas and encouraging them to recruit compatriots?

**Action: We would welcome any and all members recruiting others who might be interested, whether in the UK or overseas. We have an open mind about the future geographical base of our membership.**



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12. Caroline Herschel's story should be a good way of getting more women and younger people interested in the Society. Tweets about her get the most views now.

**Action: Charles will think about how we can use the Prize Lectureship Process to help generate new membership.**

13. The musical aspect of the Herschels' story had great potential. However, concerts were expensive to mount, and impractical to arrange from a distance. Various musical groups and the BBC had programmed Herschel's music from time to time, and various groups had produced contemporary works relating to the Herschels' stories.

**Action: Charles and Matthew discussed this with Sarah Waltz after the AGM. There was lots of potential, but the key was likely to involve getting a suitable grant. The University of York had a good record here, and their History of Ideas focus ideal for our purpose. We could hope that a book would appear following their Conference last June. Matthew would pursue the possibilities there and elsewhere.**

13. Current HS publicity material is good and informative, but doesn't draw people in. Putting opinions out there to get dialogue going might help. Facebook is good for this kind of thing. Social media is the way to get more women and young people in. BA and BPT share a lot on Social media, and 2/3 of BA growth comes that way, but currently HS is not part of that.

**Action: Mark Whalley would discuss with Simon how best we could improve our game on this. We should also draw on the recent successes at the museum. Update: Jonathan Hall has now taken on the Social media role. We have produced, and regularly use, a new recruitment flyer, and a stand-up banner at Society events.**

14. We could also try getting astro -podcasts as their topic of the month.

**Action: Charles would look out for opportunities.**

15. Could national astronomy organisations do more to promote what we do? One possibility was a London based event on Herschel Archives. The Royal Society were already planning an event built around their recent grant to digitize their John Herschel archives. The RAS and HS were already involved.

**Action: Charles is in touch with the RAS about this. Update: The central role we are playing with the RAS and others in the John Herschel events this summer should help with this.**

16. The whole topic of light pollution, the impact of artificial light on our health (let alone astronomy), and the optics of the body and importance of infra-red was going to get very big in the healthcare world, and William's role as the discoverer will gain more prominence. The existing Bath and Surrounds Starlit Skies group could help take a lead local role on this, but the group needed a new leader (Charles had done so from 2017 but stood down in 2020).

**Action: Discussions are in hand on this.**



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## Annex B

### JOHN HERSCHEL CONFERENCE AT BRLSI ON SATURDAY JUNE 8th

John Herschel was one of the most eminent of 19<sup>th</sup> Century scientists, with important contributions in many fields, yet today he is a rather neglected figure. One of the reasons for this is that the sheer range of his contributions makes the scope of any full assessment daunting for any biographer.

Several developments in 2024 should help put this right. Cambridge University Press are publishing a Companion to John Herschel in February this year, with thematic contributions from 12 academic experts covering this wide field. We have agreed with one of the co-editors of the Companion (Professor Stephen Case) and encouragement of the CUP to hold a one-day hybrid conference at BRLSI on Saturday 8 June this year covering this same ground, with as many of the contributors as possible. The format will be broadly similar to the very successful conference on William that we held in October 2022, with the conference content aimed as before at an interested lay audience.

We have also been liaising with the Royal Society, which has been digitising their very substantial John Herschel Archive to enable and encourage much wider access to it. This project also completes this spring. They will mark this event with an academic workshop in London drawing out various themes from the correspondence, including his extensive interactions with contemporary women thinkers. This will involve some of the same participants as our conference speakers, and will take place on Friday 7 June.

Finally, the Herschel Museum is currently undertaking a feasibility study on the practicalities and potential benefits of expanding into the upper two floors (currently rented out) of Herschel House. One of the questions they plan to explore is how best they should tell John Herschel's story as part of their new broader interpretation strategy. They will be consulting widely on this and many other issues, but the expected presence in Bath of so many John Herschel scholars is an obvious opportunity so there will be an engagement event for them at the Museum on Sunday 9 June.

All these events should in different ways enable John Herschel's achievements to be more widely appreciated, and we hope and expect they will trigger others in the future. We will be advertising the 8 June Conference jointly with BRLSI in the coming months.



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## Annex C Lecture report for 2023

In 2023 we again managed a programme of 9 lectures. All these lectures were delivered to a remote audience via Zoom, and given by the lecturer either in-person at the BRLSI or remotely. Note that most lectures are recorded and freely available on the BRLSI YouTube channel one month after the event and are most easily accessed via the Events page of the HS website.

The yearly average attendance figures (excluding the CH Prize lecture) are:

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Lectures	10	9	8	7	9	8	6	8	8	8
Attendance	40	41	56	57	51	50	43	44	57	64

### Ireland and the Herschels – Some Surprising Connections

Date: Friday 3 February 2023

Lecturer: **Professor Michael Burton**

Attendance: 77

Michael Burton delivered this lecture by Zoom from Armagh, NI. He started with the founding of Armagh Observatory by Archbishop Richard Robinson in 1790 following the surge of interest in Astronomy resulting from the work of William and Carline Herschel. The Troughton dome was built in 1790 and was supplemented later by the 1827 dome.

The first connection is through William and Caroline Herschel, by way of the Astronomer Royal, Neville Maskelyne, the first Director of Armagh Observatory, Dr Hamilton, and the patron of the Observatory, Archbishop Robinson. The second connection is through the long correspondence between the third Director, Dr Robinson, and John Herschel. The final connection is through Joseph Alfred Hardcastle, great grandson of William Herschel, appointed Director of Armagh Observatory in 1917, but who tragically never lived to take up his post. John Dreyer became director in 1882 and edited the scientific papers of William Herschel, producing the NGC based on the Herschel's data.

Michael Burton went on to describe the archive and collections, including a 9" speculum mirror in a case. He also linked Armagh with the 'Leviathan' telescope at Birr Castle in the Irish Republic, built by William Parsons, the 3rd Earl of Rosse. With a 6' aperture, this telescope was the largest in the world for 72 years and enabled the spiral nature of galaxies to be seen (M51 Whirlpool Galaxy drawn in 1848).



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## **The William Herschel Lecture – Accuracy, Innovation and the Advance of Astronomy 1923 – 2023**

Date: Friday 3 March 2023

Lecturer: **Professor Mike G. Edmunds**

Attendance: 53

In this lecture, Mike Edmunds showed how new technology, the use of space based instruments and computing power has affected astronomy.

Just before the start of the period, technology was just good enough for the Dyson & Eddington expedition to the Atlantic eclipse to check one of the predictions of Einstein's theory of General Relativity and observation was visual only.

In 1933 Jansky in the U.S.A. started radio observation which was further advanced in Cambridge in the 1950s. Very Long Baseline Arrays (Hawaii – Virgin Islands) made radio observation much more accurate. In 1965 Penzies & Wilson accidentally detected the CMB, and since then the CMB has been mapped in increasing detail, COBE in 1992, WMAP in 2003 and Planck in 2009-13, showing angular fluctuations of temperature that arose from the Big Bang.

Optical observation has advanced through ever larger ground based telescopes, Mt. Wilson 100" in 1917, Mt. Palomar 200" in 1949, Anglo-Australian 3.9m in 1974, Keck 10m in 1993 and the ELT 39.3m in 2027. The use of image intensifiers followed by CCDs and optical fibres (for separate spectroscopy), and more recently adaptive optics has further improved observation.

Astrometric accuracy had been increasing very slowly from 100 arcsec in 1600, the time of Tycho Brahe, to 0.1 arcsec in the 1950s. Then the space based observatory Hiparchos improved this to 0.001 arcsec in 1990-3 and its successor Gaia in 2013 to an astonishing 0.00001 arcsec, mapping stars in our galaxy out to a range of 10 kpc. Mike ended by describing the detection of gravitational waves by LIGO.





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## **Supermassive Black Holes: How to feed them and what happens when you do**

Date: Friday 14 April 2023

Lecturer: **Dr Carolin Villforth**

Attendance: 66

Carolin Villforth started by describing the evidence for a supermassive black hole in the centre of our galaxy at Sagittarius A. This comes from the observation of nearby stars orbiting a dark object with a mass of several million Suns.

Further evidence shows that all galaxies have a supermassive black hole at their heart with a mass ranging from millions to billions of solar masses. However since this is typically about 0.1% of the galactic mass, its gravitational influence is limited to a tiny region but its emissions can effect the whole galaxy. Matter falling in through the accretion disc can convert 10% of its mass to energy (cf ~1% for nuclear fusion) which means that an active black hole can outshine an entire galaxy. However only about 1% of galaxies have an accreting black hole at any one time. To start accreting, the galaxy must be disrupted by a collision or merger which drives gas to the centre.

Carolin finished by showing a beautiful simulation of galactic formation in the early universe. We first saw gas concentrating along the lines of an intricate web, then condensing to form galaxies. After a time the galaxies began to light up with accreting black holes whose emissions drive gas out of the galaxies.

## **The Quest for Cosmic Dawn: First Results from the James Webb Space Telescope**

Date: Friday 5 May 2023

Lecturer: **Dr Richard Ellis**

Attendance: 95

Richard Ellis started with the history of recognition of galaxies, first by Thomas Wright who saw the Milky Way as a disc of stars in the 1700s, then by William Herschel who speculated that nebulae could be other galaxies. A century later Hubble was able to start measuring the distance of galaxies by the luminosity of cepheid variables. Hale raised the money for the 200" Palomar telescope and started the idea of 'look back in time'. Redshift ( $z = (\lambda_{\text{obs}} - \lambda_{\text{emit}}) / \lambda_{\text{emit}}$ ) was seen which led to the observation that galaxies are generally moving away from each other.

From 1980 CCD based cameras and fibre-optics positioned by robots to pick up spectra advanced the subject much further. The Hubble deep field imaging of an 'empty' part of the sky plus gravitational lensing by intermediate objects enabled us to look further back in time and count early galaxies of which there were far fewer than now.

The JWST took 25 years to build and was launched on Christmas day 1921. It is finding early galaxies more numerous and more luminous than had been expected. Even at a redshift of 10.6, which corresponds to an age of the universe of less than 500 Myr, elements including C & N are seen in spectra. We need to find 'pristine' early galaxies composed of H and He.





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## **The Right Light at Night**

Date: Friday 8 September 2023

Lecturer: **Steve Tonkin**

Attendance: 54

This was the introductory lecture in our theme for the Autumn: Conserving the Night Sky. It was to have been given by Bob Mizon who sadly died in April. Steve started by talking about Bob Mizon, a personal friend, who has done more than anyone to raise awareness of what we stand to lose.

Steve first acknowledged that light at night is needed. But UK street lighting accounts for up to 30% of Council carbon emissions, and most of the light goes upwards. There followed a long list of the effects of night time illumination, including the deaths of billions of migrating birds, and the insect apocalypse as possibly the biggest cause along with pesticides and habitat loss. He discussed the problem of excessive blue in the spectrum of LED lighting and its bad effects on human health. Ubiquitous skyglow could hide small dark asteroid impactors which are hard to detect.

The Right Light is useful, targeted, not brighter than necessary, only on when required, and has a warm white colour temperature of 2,700°K or less as opposed to blue light at 6,000°K.

## **The Astrophysics of Earth: light-life interactions beyond photosynthesis**

Date: Friday 13 October 2023

Lecturer: **Dr Robert Fosbury (& Dr Glen Jeffery)**

Attendance: 78

This was a fascinating lecture full of material which was new to the audience. Bob started off by describing and contrasting chloroplasts and photosynthesis with mitochondria and the production of ATP for energy. He compared higher energy light at the UV/blue end of the spectrum (makes vitamin D but ionises and damages DNA), visible light (excites electron transitions and is strongly absorbed), and relatively low energy infrared which has a high photon count and vibrates molecules but is not easily absorbed.

The rest of the lecture was about NIR (Near infrared light). Photons are scattered in body tissue and have a certain mean free path. Because of weak absorption, photons accumulate in the body. When NIR photons are absorbed by mitochondria, they speed up ATP synthesis and control the level of damaging reactive oxygen species. This is health giving and therapeutic, especially in the eye where the retina needs a lot of energy giving ATP.

The health- giving properties of NIR were further explained by Bob's collaborator Dr Glen Jeffery.



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## **A cluttered and noisy sky? Meeting the challenge of satellite constellations (and why you should care)**

Date: Friday 3 November 2023

Lecturer: **Dr Robert Massey**

Attendance: 59

Robert Massey took us through the history of satellite launching starting in 1957 with Sputnik, and listed their various uses and benefits. He described Project West Ford in 1961 which aimed to place 480 million copper needles as dipole antennae into orbit to form an artificial 'ionosphere' to reflect radio signals. Fortunately this was stopped due to protests before much damage was done.

The current surge in low Earth orbit satellites started in 2019 with 2,000 Starlink satellites. This year there will be a further 5,000 at 550Km and maybe a total of 400,000 (including OneWeb, AST, project Kuiper etc) in the near future.

The effects on astrophotography are bad for wide angle long exposures (eg for meteor counting), and can be severe for satellites that pass over space telescopes like the Hubble because they are relatively close and produce bright wide streaks. Using remote sites for observing is no help – 40% of frames can be affected.

Radio astronomy can be affected by radio transmissions from satellites that can be a trillion times more powerful than astro signals. Robert then talked about various space treaties and physical attempts to mitigate these effects. One example of a mitigation attempt is the Effelsberg agreement which has resulted in Starlink satellites turning off transmissions as they pass overhead.

## **Caroline Herschel Prize lecture: Dying Stars Seeding the Universe**

Date: Thursday 16 November 2023

Lecturer: **Dr Marie Van de Sande**

Attendance: 80

This lecture started with a discussion of the life cycle of stars and how they end with blowing off their outer layers either as a planetary nebula or as a supernova explosion. From the 1940s onwards molecules were detected at first simple ones like CN and later H<sub>3</sub>CN right up to buckyballs with 60 atoms.

The lecture went on to describe different stellar wind zones and the formation of dust grains which build complex molecules on their surfaces and which later may form protoplanetary disks. Finally the complex molecules in comets were described.



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## **Space debris: Hazards, Situational awareness and responsible use of space**

Date: Friday 1 December 2023

Lecturer: **Dr Philippe Blondel**

Attendance: 58

The lecture described sources of orbital debris such as from tool bags, bolts released from rocket stages on separation, the destruction of satellites by testing anti-sat missiles. This debris is tracked as far as possible by databases of known objects. Estimated numbers are 150M objects of around 1mm in size and 750K of 1cm all with an average velocity of 7-9 Km/s. Mapping of debris could be improved by an in-space transmitter with many receivers in different positions. The Kessler effect is a destructive chain reaction of collisions which could suddenly increase the problem.

The lecture continued with a discussion of Space mining of asteroids (such as Psyche, 280 Km in diameter and mostly made of metals) and how rules for such exploitation are still evolving from those for deep sea mining. However there have been no new regulations agreed since 1967. Finally the interesting idea of recycling old satellites in space was raised.



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## ANNEX D

## MUSIC REPORT

Matthew Spring gave a talk in Harlow at St. John's Arts and Recreation Centre, January 16 2024, on William Herschel: Music and Astronomy.

The Dionysius Ensemble continues to programme Herschel into their concerts including a forthcoming concert at St Mary's Church in Slough on Sunday March 17th.

Sara Stowe will be playing Herschel's Sonata in G major (Sie Sonata per il Cembalo, 1769) at The ARC Centre, Harlow on 8 March.

Sarah Waltz published "William Herschel's 'Gravitational Theory' of Musical Expression," in *Courts, Colonies, and Cosmopolitan Exchange in Eighteenth-Century Music*, ed. Beverly Wilcox (Ann Arbor, MI: Steglein Press, 2023), pp. 129–145. She also gave a talk on Herschel's music theory (modulation) for the Society of Music Theory meeting in Denver, CO, USA and one on Herschel's interest in Handel for the Thirteenth Handel Institute Conference in London, both in November 2023. A general talk on Herschel's music is planned to coincide with the solar eclipse on April 8, 2024 in Oberlin, Ohio, which is in the path of totality.

Margaret-Mary Sauppé, an organist with the DMA from the Eastman School of Music, published "John Snetzler and the Organ Works of Sir William Herschel" in *Tracker: Journal of the Organ Historical Society* (October 2023): 12-19, concentrating on the particular sound of a Snetzler organ and what qualities of Herschel's works seen influenced by Snetzler's characteristics. The article derives from doctoral research by Sauppé completed in early 2023.

A number of musical visitors are noted in Wolfgang Steinicke's "Visitors to the Herschels Between 1777 and 1822" *Journal of Astronomical History and Heritage* 26/3 (2023): 545-598, paving the way for additional research. Of note are Fanny Burney (Madame d'Arbly) and her father Charles Burney, his Halifax colleague Joah Bates, old Bath acquaintances Thomas Linley and Dr. Harington, flutist Christopher Papendiek, J. P. Salomon, members of Beethoven's circle including Ferdinand Ries and cellist Bernhard Romberg, and others.