



*Astronomy, and the musical family
that did so much to pioneer it.*

CHAIRMAN'S REPORT ON 2022

2022 was dominated by our Herschel 200 programme, culminating in our Concert and Conference over the weekend of 30 September/ 1 October. As many of you will know from first-hand experience, both were very well received. The Concert mounted by Matthew Spring had an enthusiastic audience, some of whom were hearing the amazing range of William's music for the first time. The Saturday conference provided a day of great insights into William's astronomy from leading experts in the field. The introduced showing of George Sibley's film a week before proved a good preliminary evening. And the walk led by Mike Edmunds around Herschel-related Bath sites on the Sunday made a fitting finale.

We have ensured that these events will have a legacy. In the case of the Concert, this was pre-existing in the video commissioned by the RAS in 2001, and now available on YouTube. For the conference, most of the talks and discussion are also available on YouTube, and an excellent detailed report on them was written by Sue Bowler, editor of the RAS house magazine, and reprinted in the Spring 2023 issue of our Journal. The walk is one of many new Herschel-related resources available on the Museum website.

Our project to develop a virtual 3D model of William's most successful telescope led to valuable new relationships with both Bath Spa University and the Spanish Royal Observatory. Our efforts to capture and report on the activities of others marking the anniversary year have also led to new relationships that we hope will endure.

We worked closely with our Herschel Museum colleagues on our respective Herschel 200 programmes. Their collaboration with interested parties in Slough, and particular St Lawrence Church, also provided valuable new connections for us. The long-standing collaboration with BRLSI on our Lecture programme went into overdrive for our Conference.

It was, of course, a lot of work, and only made possible by the efforts of my Committee, many other members, and colleagues elsewhere who shared our aim of making the most of the anniversary events. I am particularly grateful to Mike Edmunds for all the connections he made for us; to Matthew Spring for planning, managing, (and performing in) the musical aspects of our Friday Concert; and Tony Symes for managing so much of the detail on finance, ticketing, zooming and communications -especially persuading Bath Magazine to give us a colour centre-page spread on our key weekend events.

Turning to other matters - The 5th Caroline Herschel Prize Lecture was delivered by Dr Alexandra Amon on Tuesday 15 November at the University of Bath. Her topic was: Unveiling the Dark Universe with the Dark Energy Survey.

Charles Draper

Chairman



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Annex A - Lecture report for 2022

In 2022 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 following list includes the film showing with George Sibley, but neither the bicentenary conference nor the concert.

The yearly average attendance figures (excluding the CH Prize lecture and all-day conference) are:

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

A Tour of the Dynamic Universe

Date: Friday 4 February 2022

Lecturer: **Dr Jeffrey Scargle**

Mode: Zoom

Attendance: 87

Jeff Scargle delivered his lecture from California. He started off by describing the “clockwork universe” as understood by Ptolemy, Copernicus, Kepler and Newton, and showed how this concept can still be used to discover a new moonlet, Pan, in the Encke Gap of Saturn’s rings. He used the 1054 supernova, which later produced the Crab Nebula, as an example of the kind of event which indicates a more dynamic universe.

He then took us on a tour of dynamic events, starting with Earth and igneous events, then the Aurorae of Jupiter, the motion of stars around our galaxy’s central black hole, and the huge variability in both optical and X-ray spectra of active galaxies. He finished with a discussion of the most extreme events, gamma ray bursts which can outshine the entire universe for a few milliseconds and black hole mergers whose gravitational waves have been detected by LIGO.



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The William Herschel Lecture – The James Webb: The Next Generation of Hubble Telescope

Date: Friday 4 March 2022

Lecturer: **Professor Martin Ward**

Mode: In person at the BRLSI and Zoom

Attendance: 100

Martin Ward was only our second in-person lecturer at the BRLSI since the start of the covid pandemic. After an introduction describing astronomy at Herstmonceaux and Durham, he explained the background for the development of space telescopes, compared to much larger Earth based telescopes like the ELT with a reflector diameter of 39m. The Hubble has a diameter of 2.5m and uses the visible spectrum and part of the UV spectrum. The JWST has a diameter of 6.5m and uses the near and mid infrared spectrum.

The JWST has instruments including the FGS (Fine Guidance System) for orientation, MIRI for the mid infrared, and NIRCам and NIRSpec for imaging and spectroscopy respectively in the near infrared. These instruments will enable the JWST to see the first galaxies in the Universe which are very red-shifted, inside dusty active galaxies including spectra, and exoplanets (spectra and transits) which may enable atmospheres to be characterised in some cases.

The Water Cycle of a Cold Early Mars and its Potential Role in the Persistence of a Northern Ocean

Date: Friday 1 April 2022

Lecturer: **Steve Clifford**

Mode: Zoom

Attendance: 28

Steve Clifford delivered his lecture from Texas. He described the Mars that we see today with the heavily cratered Southern Highlands contrasting with the Northern plains without craters. He explained the evidence for a large Northern ocean of 4.5 – 3.0 billion years ago with still visible shorelines and tsunami backwashes. He discussed the water cycles which could move water from one part of the planet to another.

95% of the original surface water (which had a global equivalent level (GEL) of 500 – 1,000 metres) is lost but solar wind erosion can only account for a part of that. Remaining water could be saline groundwater, in the cryosphere or frozen masses under dust and debris. There is a lot more to be discovered.



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21-cm Radio Cosmology with the Square Kilometre Array (SKA): What happened after the Big Bang?

Date: Friday 6 May 2022

Lecturer: **Eloy de Lera Acedo**

Mode: Zoom

Attendance: 33

Dr Eloy de Lera Acedo delivered his lecture from Cambridge, UK. He started with a brief history of Radio Astronomy which could be said to begin in 1933 when Jansky discovered radiation from the Milky Way. In 1967 the IPS array was used by Dame Jocelyn Bell-Burnell to discover pulsars. The SCUBA instruments have been used since the late 90s for sub-millimetre sky surveys.

The new tech coming into use includes SKA (The Square Kilometre Array) in South Africa and Western Australia and LOFAR (The Low Frequency Array) located mainly in the Netherlands. The SKA started construction in 2021 and first light is expected in 2028. It will study the interaction between the CMB (Cosmic Microwave Background) and intervening clouds of hydrogen which emit at 21cm (1.4GHz) which will be significantly red-shifted. This will enable study of early epochs of the Universe, the Cosmic Dawn and Reionisation.

Exploring Astronomy and Space Through Philately – A Brief Introduction

Date: Friday 2 September 2022

Lecturer: **Dr Katrin Raynor**

Mode: Zoom

Attendance: 12

Katrin Raynor gave the talk remotely from South Wales. She started by explaining all the areas of interest to philatelists and the different specialities in astronomy and space. She then took us on a tour of many of the most impressive stamps, starting with the first, a Brazilian stamp of 1880 featuring the Southern Cross and including the UK stamp featuring Jodrell Bank in 1966. Many spectacular images were shown.

Film showing: William Herschel and the Universe

Date: Friday 23 September 2022

Lecturer: **George Sibley, director**

Mode: In person and Zoom

Attendance: 65

George Sibley gave a detailed introduction to the film, explaining how he made it with an extremely small budget and acknowledging the crucial help and guidance given by Michael Hoskin.



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Views of the Universe with the NASA Chandra X-ray Observatory's Sharp Eyes

Date: Friday 4 November 2022

Lecturer: **Dr Belinda Wilkes**

Mode: In person at the BRLSI and Zoom

Attendance: 31

Belinda Wilkes started by showing how NASA's observatories cover the EM spectrum and where the Chandra X-ray Observatory (of which she was the director) fits. Chandra uses grazing incidence mirrors to give 0.5" resolution, saw first light in August 1999 and is still working 23 years later, a life that is way longer than it was designed for.

She then took us on a tour through X-ray sources at all scales of the Universe from planetary aurorae, stars at various points in their lives, supernova remnants, black holes, AGNs and galaxy clusters. X-ray images were compared and combined with optical/infrared images.

Caroline Herschel Prize lecture: Unveiling the Dark Universe with the Dark Energy Survey

Date: Tuesday 15 November 2022

Lecturer: **Dr Alexandra Amon**

Mode: In person (at the University of Bath) and Zoom

The Fermi paradox or "Where is Everybody?"

Date: Friday 2 December 2022

Lecturer: **Dr Michael Perryman**

Mode: In person at the BRLSI and Zoom

Attendance: 89

Michael Perryman gave a lecture full of information which covered and summarised the whole field most effectively. The starting point was the Fermi paradox posed by Enrico Fermi in 1950. If (as we now know) there are >200 billion stars in our galaxy and a similar number of galaxies in the Universe and life is common, then where is everybody?

Michael Perryman then discussed the definition of life and how it might evolve and survive in our solar system – maybe simple life on Mars and Venus in the past and possibly now in the liquid oceans on the moons of the gas and ice giant planets.

The Drake equation was explained. We now have firm figures for stars, planets and planets in the habitable zone, but not a clue as to the other terms like how often life can evolve when conditions are right. The lecture went on to cover the history and current state of SETI, searches for radio signals, optical signals, biosignatures in spectroscopy, evidence of alien engineering. Finally he listed the remarkable number of characteristics that seem to make Earth uniquely suitable for life, at least as we know it.



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Annex B - Report for Herschel Society AGM from Matthew Spring, Feb 2022 to Feb 2023

The year 2022 saw a good deal of exposure for Herschel's music, much of which linked with the Herschel200 celebrations. Some of the live performances were either built around William's music or had programmes which consisted of a lot of Herschel's composition. Herschel concerts took place in: Slough (26 March); Orkney Festival (6 September); Dartington Great Hall (11 September); and Sligo (25 September). There were major concerts that showcased Herschel's music as part of the Herschel Symposium in York (11 June 11) and the Bath Conference (30 September). Among the pieces programmed were the symphonies, chamber music, a capelle vocal pieces and music for instruments and voices. Many of the pieces (like the Symphonies) have been heard before, but a good deal of the music played has been but rarely heard. Much of the activity took place in September itself but there were concerts with Herschel's music in other parts of the year. The concert for the Bath conference was a successful event that followed his life as a musician and included music by a number of his close colleagues and friends.

Radio 3 featured Herschel music on several occasions during the year (for instance 20 February, 24 August, 14 June). Sadly, I was unable to get either BBC radio 3 or 4 to create a programme or programme series on Herschel's music, though a number of meetings were developed with Loftus Productions in the lead up to Herschel 200 . In the end they did not pursue the project.

York University hosted a one- day symposium on 17 June. COSMIC HARMONIES: A SYMPOSIUM CELEBRATING THE LIFE, SCIENCE, MUSIC, AND LEGACY OF WILLIAM HERSCHEL (1738-1822).

Five papers were concerned with music and four specifically on Herschel's music and musical life:

1. Roz SOUTHEY (University of Newcastle): *William Herschel in the North East*
2. Rachel COWGILL (University of York): *Herschel in Concert: Networks of Professional German Musicians in Eighteenth-Century England*
3. Sarah WALTZ (University of the Pacific): *Herschel's Systematic Thinking in his Music Treatise* (30m)
4. Meredith MICHAEL (Indiana University, Jacob's School of Music): *The Inhabited Moon: Imagination, Female Astronomers, and 18th-Century Opera* (30m)
5. Matthew SPRING (Bath Spa University) *From musician to astronomer: The Herschel's family's years of transition*

Of great importance will be the work of Sarah Waltz who, working alongside Woody Sullivan, is writing a book on Herschel the musician. She has recently proposed updating Grove's entry on Herschel as joint enterprise with me and she will be visiting Bath in March.

The Slough based Dionysus Ensemble's new recording of Herschel's chamber music was produced in time for the Centenary Year (Sonatas for Harpsichord, Violin and Cello). As well as producing concerts with Herschel's music the group have a continuing programme of schools and community outreach work that links science and music and emphasis the Herschel family's connection to Slough.

Work on the catalogue on Herschel's music is progressing and the keyboard and chamber music continues to be worked on. Alex Voice continues to produce his editions of Herschel's symphonies. I have produced a number of his vocal pieces for use by various groups and this work will be updated and hopefully made available on the website.