ROYAL ASTRONOMICAL SOCIETY

England & Wales · Charity number 226545

Details

Status	Registered
Legal form	Other
Registered	1963-09-23
Register	View on the Charity Commission register

Contact

Address	Royal Astronomical Society Burlington House Piccadilly London W1J 0BQ
Phone	02077344582
Email	accountant@ras.ac.uk
Website	www.ras.ac.uk

Activities

Objects: THE ENCOURAGEMENT AND PROMOTION OF ASTRONOMY AND GEOPHYSICS.

Activities: The Society promotes the study of astronomy and geophysics.

Classification

- **How:** Makes Grants To Individuals, Makes Grants To Organisations, Provides Advocacy/advice/information, Sponsors Or Undertakes Research, Other Charitable Activities
- **What:** Education/training, Other Charitable Purposes
- **Who:** Other Charities Or Voluntary Bodies, Other Defined Groups, The General Public/mankind

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Geography

- **Area of benefit:** NATIONAL
- Northern Ireland
- Scotland
- Throughout England And Wales

Finances

Period end	Income	Expenditure	Assets	Employees
2024-12-31	£5,156,988	£4,701,437	£26,970,240	25
2023-12-31	£7,082,695	£5,276,132	£25,823,874	23
2022-12-31	£5,280,990	£4,733,200	£23,477,081	24
2021-12-31	£5,236,311	£4,455,397	£23,646,473	24
2020-12-31	£4,845,401	£4,532,478	£21,507,367	23

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Trustees

Name	Role	Appointed
Dr Andrew Young		2024-05-10
Dr Andy Nowacki		2026-05-08
Dr Arvind Parmar		2024-05-10
Dr Chrysa Avdellidou		2024-05-10
Dr Cyrielle Opitom		2025-05-09
Dr Emma Elizabeth Kavanagh		2026-05-08
Dr Iain Hannah		2024-05-10
Dr Michael Peel		2025-05-09
Dr Olivia Keenan-Williamson		2026-05-08
Karen Anne Devoil		2025-05-09
Prof David Alexander		2026-05-08
Prof Jorick Vink		2026-05-08
Prof Mark Lester		2017-05-12
Prof Peter Gallagher		2026-05-08
Prof Steven Miller		2017-05-12
Professor Andrew Curtis		2023-05-12
Professor James Hammond		2023-05-12
Professor James Wild		2025-05-09
Professor Paul Crowther		2025-05-09
Professor Stephen Eales		2022-05-13

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ROYAL ASTRONOMICAL SOCIETY

England & Wales - Charity number 226545

Accounts

Royal Astronomical Society

Annual Report & Financial Statements 2024

[Image: L Offer/RAS]

Royal Astronomical Society

Patron
His Majesty the King

Trustees

Prof Mike Edmunds (President until May 2024, University of Cardiff)
Prof Mike Lockwood (President from May 2024, President-Elect until May 2024, University of Reading)

Dr Chrysa Avdellidou (Councillor, G, from May 2024, University of Kent)
Dr Joanna Barstow (Councillor, A, until May 2024, Open University)
Dr Alan Cayless (Councillor, A, Open University, retired)
Prof Mike Cruise (Interim Treasurer until May 2024, A, University of Birmingham)
Prof Andrew Curtis (Vice-President, G, University of Edinburgh)
Prof Stephen Eales (Vice-President, A, until May 2024; Councillor from May 2024, University of Cardiff)
Dr Imogen Gingell (Councillor, G, University of Southampton)
Prof Matthew Griffin (Vice-President, A, University of Cardiff)
Prof James Hammond (Secretary, G, Birkbeck College)
Dr Iain Hannah (Councillor, G, from May 2024, University of Glasgow)
Dr Olivia Keenan (Councillor, A, King's College London)
Prof Mark Lester (Senior Secretary, G, University of Leicester)
Dr Matt Middleton (Vice-President, A, University of Southampton)
Prof Steve Miller (Councillor, G, University College London)
Dr Arvind Parmar (Treasurer, A/G, from May 2024, University College London)
Dr Jasmine Kaur Sandhu (Councillor, G, until May 2024, University of Leicester)
Prof Caroline Smith (Councillor, G, until May 2024; Vice-President from May 2024)
Dr Ashley Spindler (Councillor, A, University of Hertfordshire)
Mrs Patricia Tomkins (Councillor, A)
Dr Sheona Urquart (Secretary, A, Open University)
Prof Derek Ward-Thompson (Councillor, A, University of Central Lancashire)
Prof Clare Watt (Vice-President, G, until May 2024, Northumbria University)
Prof Belinda Wilkes (Councillor, A, until May 2024, University of Bristol)
Dr Andrew Young (Councillor, A, from May 2024, University of Bristol)
Prof Silvia Zane (Councillor, A, University College London)

- Note: 'A' signifies all areas of astronomy and astrophysics; 'G' covers geophysics, solar-terrestrial physics and planetary sciences.

Cover image: Aurora seen over Oxfordshire on 10 May 2024 (L Offer/RAS)

Senior staff
Executive Director: Philip Diamond
Deputy Executive Director: Dr Robert Massey

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Charity registration number
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Our Mission & Values

Our Mission Statement

The Royal Astronomical Society supports and connects astronomers and geophysicists, in the UK and globally, throughout their careers. We assist them to sustain and advance the rigorous scientific study of the origins and evolution of our own planet and the whole wider cosmos. We promote a better understanding of the relevance and value of our subjects throughout all society, from inspiration for young people to advice to government.

Our Values

We are a supportive community

We are passionately curious about the universe, and recognise the importance of mutual support in its study. We are custodians of the past, learning from the history of our sciences but looking to apply our knowledge for the future. We promote the need for vital research support, for appropriate collaboration and scrutiny, and for the sharing of methods and results.

We share our expertise in astronomy and geophysics

We are a respected, independent, self-governing organisation, free to speak frankly on behalf of our members, the science and the profession. For over 200 years, we have been a credible, independent source of the latest scientific discoveries in the field. Within our resource limitations, we willingly provide professional advice on all aspects of our subjects.

We are an inclusive and welcoming Society

We celebrate and encourage diversity, understanding that every individual is unique and recognising and appreciating our individual differences. We will provide an inclusive environment where every member of the Society is welcome and supported, and acts with respect to all other members.

We play our role in understanding and protecting our environment

We care about the future of humanity, the sustainability of our planet and the impact of our activities. We seek to understand our role in the wider universe and use our knowledge and expertise to the benefit of humankind.

Welcome From Our President

It is a pleasure to introduce the Annual Report of the Royal Astronomical Society for 2024.

We have, at last, secured a 999-year lease for New Burlington House, our home since 1874. This opens up new possibilities and opportunities for the society, especially in outreach and engagement – and indeed that we exploit those opportunities is part of the lease agreement. In addition, after a review by Buckingham Palace of the Patronages held by the monarch, I am delighted to say that HRH King Charles remains the Patron of our Society.

I am also pleased to report that Fellows of the Society were recognised in the New Year Honours list 2024. Former Presidents Profs Emma Bunce and Mike Cruise were awarded OBEs, Prof Philip Diamond, Director General of the Square Kilometre Array, was made a CBE and space scientist Dr Maggie Aderin Pocock was made a Dame.

2024 saw the launch of the new Strategy for our Society, to which a great many individuals contributed. There are many areas addressed; two important ones have already begun implementation. The first is that there is much behind-the-scenes work to do on updating our computer and information systems. The second is to build on the fantastic success of the Slough workshops based on the Herschels who, of course, lived and worked in the area: this is an exemplary partnership approach with a local organisation, which we will deploy again in the future. We later supported the public event that was part of NASA's International Observe the Moon Night at Reading University; another successful partnership.

The Society's journals are now all Open Access – something we are very pleased about, while monitoring the numbers of submitted papers. We are working with our publishers, Oxford University Press, to help inform potential authors about publishing under read-and-publish deals.

In 2024 the Society continued its excellent and vital programme of scientific meetings, now established in hybrid format. While this has its complications, it does prevent stretched budgets and busy schedules from stopping Fellows hearing talks that they are interested in. It also helps reduce our carbon footprint. It is an irony that an interval as dark as the Covid pandemic has driven forward an enhancement in our activities. The National Astronomy Meeting in Hull – also fully hybrid – was a great success. And it was a great pleasure to meet and honour the brilliant scientists at the RAS awards dinner.



We released our report on bullying and harassment in astronomy and geophysics. The results of the survey that it was based on gave cause for concern and there is work to be done. This was a good start, but it is just the start.

On behalf of the Society, I signed the international Zero Debris Charter, aimed at maintaining a safe and sustainable environment in space, which was launched in October in Tallinn, Estonia.

Council is in the process of responding to a wide-ranging governance review, to check that our procedures and byelaws are fit for purpose, observe due diligence, and accord with modern charity law. This process will be completed over the coming year.

Lastly, I want to thank all the people who have contributed time, effort and resources to allow the Society to further scientific studies and careers in astronomy and geophysics. This includes the trustees and officers, the staff, the committee members, the referees on proposals, the expert consultants, the donors, and the Fellowship as a whole. Thank you all.

Prof Mike Lockwood FRS
President

Objectives for 2024

The RAS exists to advance, and to record the history of, our understanding of the Earth, the solar system, the stars and galaxies, and the nature of the universe. It does this by promoting astronomy and geophysics, interdisciplinary sciences that encompass and further our understanding of physics, chemistry, mathematics, biology, engineering and computer science to answer deep questions about the origin and fate of the cosmos, and people's place in it. Through this, the Society contributes to the growth and dissemination of knowledge and thereby fulfils its charitable objective of serving the public interest.

The Society refers to the Charity Commission's general guidance on Public Benefit when reviewing its aims and objectives and in planning future activities. These disclosures comply with the Charities Act 2011.

Our objectives for 2024 fell within two broad areas: advancing understanding and sharing knowledge. The organisation of the Society supports these goals through our Strategy.

In 2024 we continued our current valuable activities:

- Providing a learned and professional membership Society
- Holding regular scientific meetings
- Publishing, in journals and more widely
- Giving policy advice to government
- Awarding grants and medals
- Providing education and outreach activities
- Curating our heritage.

In addition we worked to develop these areas:

- Meeting the needs of our members and improving how we communicate with them.
- Providing inspirational programmes in astronomy and geophysics education and outreach
- Achieving maximum impact from the library, archive and object collections.
- Publishing high quality research, accessible to all
- Exploring and nurturing partnerships for collaboration and influence

Advancing Understanding



Satellite data is valuable for understanding areas of active tectonics – the subject of a Specialist Discussion Meting in 2024 – and features such as ice cover, as here in Svalbard

[contains modified Copernicus Sentinel data (2024), processed by ESA]

Members

Our Strategy sets out a clear outline for us to meet the needs of our Fellows. We have developed a delivery plan that sets out key activities to help shape the future of our Fellowship.

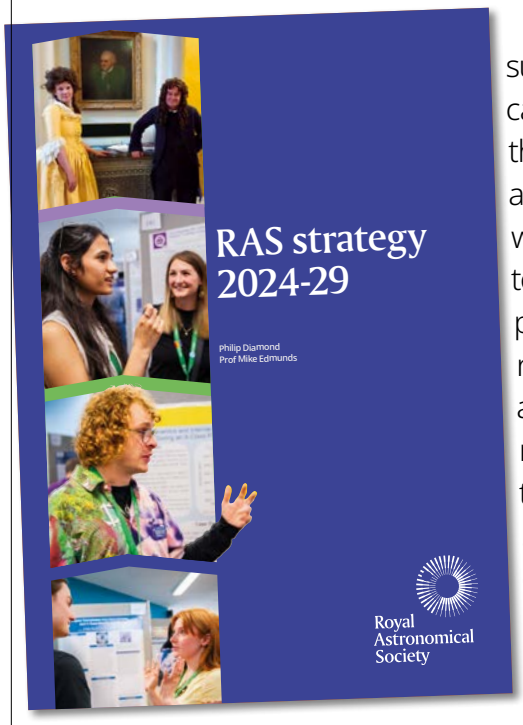
Our Fellows are at the heart of what we do and the activities in our delivery plan are intended to improve Fellows' interactions with the Society, heighten their experience, encourage and foster engagement, and create and develop opportunities.

In order to achieve these goals, we need to ensure that we have the resources and infrastructure in place to make them possible. We have begun to work on the internal infrastructure to ensure that we can deliver this. We have been making improvements to our customer relationship management (CRM) system, our payment systems, and processes. A key part of this initiative was the successful migration and cleanup of our data in the CRM system, ensuring more accurate and efficient membership management in future. We also reviewed and enhanced our membership subscription options to include both annual and monthly direct debit options that can be easily set up online, improving the ease and convenience of payments for all members. We are currently undertaking work on reviewing the website. While this is necessarily a background activity, we hope that Fellows will appreciate gradual improvements as this project progresses.

Membership of our Society is all about developing and maintaining links across our community. We are working to connect our Fellows through an online portal where they can communicate, connect, share and showcase their talents. By connecting Fellows online we can bring our scientific community closer together, locally, nationally, and globally.

The RAS is committed to advancing understanding of our sciences by:

- Supporting an open and inclusive membership that represents our community
- Producing a magazine for our members
- Publishing excellent research in our journals
- Supporting scientists financially with fellowships and grants
- Organising scientific meetings
- Recognising excellence through awards
- Running a Library and Archive for research
- Advocating for the community with government
- Promoting diversity in our community
- Supporting early-career researchers



The RAS's delivery plan sets out how we aim to shape and develop the Society's near-term future

We are committed to supporting our early-career members through the Early Career Network and we want to engage with our retired members too. We are exploring the possibility of a special rate for a 'one-day' attendance at NAM for retired members to keep them connected to the Society and their scientific community, and looking at having a town meeting for retired Fellows. During 2024, we held a Specialist Discussion Meeting in Edinburgh, to support Fellows based out of London.

While we continue to provide Fellows with our membership magazine, *A&G*, we have been looking at our communications to our Fellows. We have developed a new e-newsletter for both members and non-members.

Ensuring that we provide value for our Fellows is extremely important, especially given the current socio-economic climate. We are in the process of reviewing our offerings to Fellows, especially international Fellows, to provide an appealing and valued service. In addition,

we are exploring the opportunities of a 'green' membership to lessen our impact on the environment. Our roadmap set out in our delivery plan, underpinned by our Strategy, contains many activities which will help develop and shape our future.

Our membership magazine

A&G continued throughout 2024 to highlight both advances in research and activities of RAS Fellows and staff. We published 45 features, one in four of them reporting on scientific meetings; articles were downloaded 144,942 times over the year. Topics ranged from axions in astrophysics to comets in literature, including our President musing on how the RAS should react if there's a credible sign of aliens. A particular pleasure was a series of short articles from members of the Committee on Diversity in Astronomy and Geophysics, addressing some of the challenges involved in making our sciences open and appealing to all: these range from nominating excellent scientists for awards to simply saying "hello and welcome" to new faces at meetings. Thanks to all those who take the time to write about their research, outreach and interests; authors make it possible to produce a magazine reflecting the work of our community.



A&G goes from strength to strength, reflecting the work of our community

Journals

The Society's journal portfolio consists of three Open-Access (OA), peer-reviewed, scholarly publications: *Monthly Notices of the Royal Astronomical Society* (*MNRAS*), *Geophysical Journal International* (*GJI*) and *RAS Techniques and Instruments* (*RASTI*).

MNRAS is one of the world's leading astronomy journals and publishes articles in astronomy and astrophysics, including work that is observational, theoretical or concerned with astronomical instrumentation and software. The *MNRAS* editorial board of 24 scientific editors continues to be led by Prof David Flower as Editor-in-Chief. In 2024 *MNRAS* received 2866 submissions, published 3514 papers, and had 4.49m downloads. Its two-year impact factor for 2023 was 4.8.

GJI is an international journal publishing primary research articles on all aspects of theoretical, computational, experimental, applied and observational solid-Earth geophysics. New Editor-in-Chief Dr Margarita Segou leads an editorial board of 30 scientific editors. In 2024 *GJI* received 792 submissions, published 449 papers, and had 1.36m downloads. Its two-year impact factor for 2023 was 2.8. The RAS ceased the printing of *GJI* at the end of 2023 to reduce the carbon footprint of its publishing activities.

RASTI published its third volume in 2024. *RASTI* is broad in scope and encourages submission of papers that cover topics in both astronomy and geophysics, ranging from instrumentation, data science, machine learning, software, and numerical and statistical methods. The Editorial Board, led by Prof Jonathan Tennyson, consists of 15 scientific

A&G THANKS ALL THOSE WHO TAKE THE TIME TO WRITE ABOUT THEIR RESEARCH, OUTREACH & INTERESTS

editors. During 2024, *RASTI* received 74 submissions, published 62 articles and had 22,561 downloads. *RASTI* has recently been accepted for indexing in Scopus and will receive its first CiteScore in 2025.

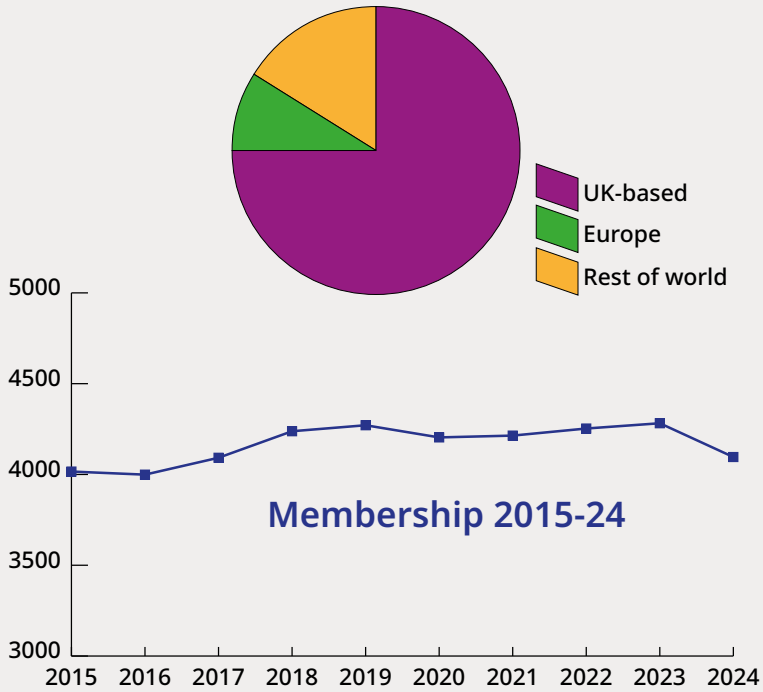
All three journals are published in partnership with Oxford University Press (OUP). OUP will remain the Society's publishing partner until the end of 2028.

The RAS portfolio completed its move to OA with the first issues of *MNRAS* and *GJI* in 2024 consisting of only OA articles. This means that subscriptions are no longer needed to read any content published in the journals and there are no RAS journal articles behind a paywall.

On 1 January 2024 the RAS back archive was made free to read in its entirety. This change has opened up readership to scientific communities across the world where previously subscription barriers restricted access.

ON 1 JANUARY 2024 THE RAS BACK ARCHIVE WAS MADE FREE TO READ IN ITS ENTIRETY

Our membership



During 2024, the RAS had 4096 Fellows, including 157 Honorary Fellows. 798 (19%) of our Fellows were female, 1281 (29%) aged 56 and over, and 150 (3%) under 25 years of age. Most of our Fellows, 3084 in total (75%), lived in the UK, with 368 (9%) in Europe and 636 (16%) elsewhere. We elected 255 new Fellows in 2024.

OA means authors pay an Article Processing Charge (APC) for publication and articles are published with Creative Commons licences allowing reuse of the work with attribution. Authors are able to access funding for the APCs via a number of routes which include Read and Publish agreements between OUP and institutions, and the OUP Developing Countries Initiative. The RAS introduced a waiver scheme to ensure that authors who do not have access to funding for APCs, and wish to publish in the RAS journals, can continue to do so.

To support membership of the RAS, a 20% reduction in the APC rate is offered to its members and a 20% reduction in the APC rate is also offered to members of the Deutsche Geophysikalische Gesellschaft when they publish in GJI.

All three RAS journals are now listed in the Directory of Open Access Journals (DOAJ) which indexes and promotes quality, peer-reviewed, OA journals from around the world that uphold the reputation for best practices and standards in OA journals.

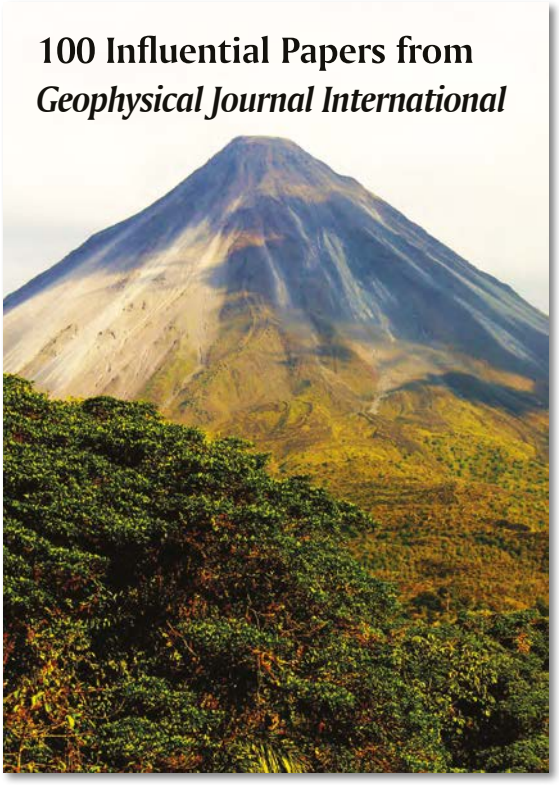
Two part-time heads of publishing manage the RAS journal team, and eight assistant editors oversee the administration of the peer-review process. The peer-review process on RASTI is provided by OUP. In April, the journal team, Editors-in-Chief and OUP presented their annual reports to the RAS Publications Management Committee.

At the 2024 meetings of the American Astronomical Society (AAS), American Geophysical Union (AGU), British Seismological Society (BSS), European Astronomical Society (EAS), European Seismological Commission (ESC) and the International Astronomical Union (IAU) the RAS, in partnership with OUP, promoted the RAS journals to international scientific audiences by exhibiting at these events.

At the National Astronomy Meeting at the University of Hull, the journal team organised an OA question and answer session with the *MNRAS* Editor-in-Chief and, at the ESC meeting, the *GJI* assistant editors and Editor-in-Chief ran a workshop for early career researchers. The journals were actively promoted on the RAS social media platforms X (@RAS_Journals) and BlueSky (@royalastrosoc.bsky.social), and the RAS Communications Team supported author press releases.

Direct engagement with scientists was made with commissioned special issues on Next-Generation Interferometric Image Reconstruction, from SKA to ngEHT in *RASTI*, and in *GJI* Advances in Induced Polarization, in addition to ongoing *MNRAS* collections of papers on the MillenniumTNG Project, and Zooniverse papers which are the results of collaborations with hundreds of thousands of 'citizen scientist' volunteers.

In June, the virtual collection series of the 100 most influential geophysics papers published in *GJI* was completed. The final illustrated interactive PDF included 12 collections of *GJI* papers selected by the *GJI* editors with accompanying editor introductions to each collection. The interactive PDF is free to download and was widely promoted at geophysics events throughout the year.



We published a collection of 100 Influential Papers from Geophysical Journal International, selected and introduced by the GJI editors to celebrate the centenary of geophysics publishing by the RAS.

The RAS journals were represented at international meetings, including the General Assembly of the International Astronomical Union. Head of Publishing Kim Clube and MNRAS Editor Ralph Wijers.



MNRAS launched its first student prize in 2024. The winners of the long-established *GJI* Student Award for the best paper by an early career scientist were Théo Santos and Simone Puel, who each received a certificate and cash prize.

Further details on the RAS journals, the editors and editorial boards can be found on our website at ras.ac.uk/journals.

Research fellowships and grants

The RAS grants, research fellowships and awards support research, education and outreach activities. 113 grants, fellowships and awards, totalling £257,975 were awarded to institutions and 38 grants, medals and awards totalling £32,723 were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £35,733. The 2024 Norman Lockyer Fellowship totalled £57,000.

A full list of grantees and futher analysis can be found on the Society's website.

RAS research fellowships

In 2024 the Norman Lockyer Research Fellowship was held by Dr Christopher Osborne (University of Glasgow) to work on 'Unifying solar non-equilibrium radiative transfer and magnetohydrodynamic models'.

The RAS Research Fellowship was held by Dr Rebecca Smethurst of the University of Oxford on the topic of 'Co-evolution cracked: the contribution of non-merger processes to supermassive black hole growth.'

Scientific Meetings

The Society held 16 Specialist Discussion Meetings in 2024, with a total attendance of 1136, just under half of whom were attending in person, on average (47% versus 53% online). In April, a Specialist Discussion Meeting about the future potential of ultraviolet astronomy was held at the Royal Observatory Edinburgh, in line with our Strategic objective to move some meetings out of London. These were the topics:

Simulation-based inference in astrophysics;
Energetic particle acceleration and heliosphere-interstellar medium attractions: **preparing for IMAP**;
A multi-tracer view of **galaxies in the first few billion years**;
Investigating the dynamic solar atmosphere in the age of **Solar Orbiter**;
Meeting the challenges of limited observations for global modelling of **the ionosphere-thermosphere system**;
Roadmap to the **next-generation infrared interferometric facility**;
Exploring the universe with **future UV facilities**;
Tectonics, magmatism and georesources of the East African Rift: perspectives on past and future research
Advances in techniques in **space plasma physics**;



An RAS grant supported work on the northern lunar standstill at Stonehenge

THE SOCIETY HELD 16 SPECIALIST DISCUSSION MEETINGS IN 2024, WITH A TOTAL ATTENDANCE OF 1136

30 years of superluminal motion in **GRS1915+105**;
Black holes and AGN in the era of the Event Horizon Telescope, JWST and the Rubin Observatory;
Non-equilibrium thermodynamics in the **solar atmosphere and interior**;
Third meeting on **Progress in Astrophysics with Type 1A supernovae (PATIAS)**;
Energetic particle injection: its causes and effects;
Blowing hot and cold: exploring the **plumes of Io and Enceladus**;
Exploring **the low-surface-brightness universe** with next-generation instruments.

Highlights Meetings

The RAS held eight A&G Highlights meetings (formerly Open (A&G) Meetings) in 2024, with a total attendance of 930; once again slightly more attendees participated online (53% versus 47%).

Dr Matina Gkioulidou (Applied Physics Laboratory, Johns Hopkins University, USA) Interstellar Mapping and Acceleration Probe (IMAP) mission: Exploring our solar neighbourhood;

Liyam Lin (University College London) Simulation-based inference of the Kilo-Degree Survey;

Dr Dominic Bowman (Newcastle University) Asteroseismology unlocks the hidden physics of stellar interiors – George Darwin Lecture;

Dr Laura A Hayes (ESA) The Active Sun: New scientific insights from ESA's Solar Orbiter Mission;

Dr Joris Witstok (Kavli Institute for Cosmology, University of Cambridge) The origin of metals and dust within galaxies in the first billion years of cosmic time;

Max Alexander Our Fragile Space: Protecting the near-space environment;

Dr Ravindra Desai (Imperial College, London) Extreme space weather events – the Winton award;

Dr Hannah Übler (Kavli Institute for Cosmology and University of Cambridge) Massive black holes during the first billion years with the JWST;

Dr Stephen Taylor (Vanderbilt University, Tennessee, USA) The dawn of galaxy-scale gravitational wave astronomy – the Eddington Lecture;

Dr Rita Kounoudis (University of Oxford) Continental break-up along the East African Rift: new insights from the Turkana Depression;

Dr Christopher Berry (University of Glasgow) Gravitational waves and the origins of black holes – Fowler award;

Dr Ziri Younsi (Mullard Space Science Laboratory/UCL) Magnetic fields at the edge of the Milky Way supermassive black hole;

Prof Mike Edmunds (University of Cardiff) Gas flows and the evolution of element abundances in galaxies – the 2024 Presidential Address;

Prof Roberto Orosei (IRA/INAF, Bologna) Unveiling the interior of the martian polar caps with radar;

Dr Dmitrii Kolotkov (Warwick University) What makes waves in the Sun's corona wavy?;

Dr Jan Roder (Max Planck Institute, Bonn, Germany) A multi-frequency study of sub-parsec jets with the Event Horizon Telescope;

Prof Pilar Ruiz Lapuente (Instituto de Física Fundamental, Madrid) What Type Ia supernovae are telling us about our universe;

Dr Or Graur (University of Portsmouth) Old dogs, new tricks: Late-time observations of Type Ia supernovae with the Hubble Space Telescope;

Prof Chiaki Kobayashi (University of Hertfordshire) The origin of elements in the universe – the George Darwin Lecture;

Dr Deborah Kent (St. Andrews University) To Burlington House and the Kerguelen Islands: The 150th anniversary of RAS movements near and far – The RAS Diary Talk 2024;



Prof Sugata Kaviraj (University of Hertfordshire) Dwarf galaxies in deep-wide surveys: a new frontier in the study of galaxy evolution;

Dr Ryan Ogliore (Washington University, St. Louis) Sample return missions: past, present and future.

National Astronomy Meeting 2024

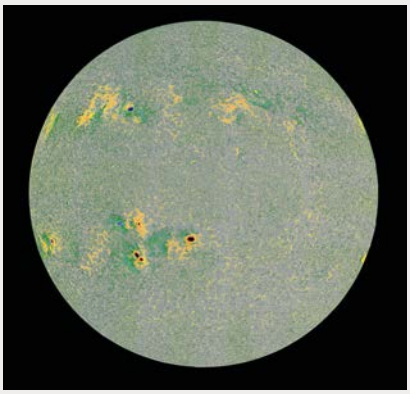
NAM2024 returned to the E A Milne Centre for Astrophysics in 2024, with 450 people (including around 80 online) enjoying the tried-and-tested mix of plenary lectures, specialised sessions held in parallel, and community- and career-focused sessions.

Astronaut Helen Sharman gave a very well-received public lecture and the research presented in Hull gave rise to a steady stream of press releases and social media posts.

Big hitters from STFC and UKSA welcomed the new government at the RAS Community session, while expressing concern at the prospects for future funding.

Once again, the winners of the 2024 RAS Awards received their medals and prizes at the conference dinner making for a very enjoyable evening.

Supporting undergraduate education



The Sun's magnetic field, subject of an RAS undergraduate grant (ESA&NASA/Solar Orbiter)

RAS grants supported bursaries for eight undergraduate students to carry out research as part of their degree courses. Topics covered all aspects of RAS sciences, ranging from runaway stars and exoplanets in white dwarf binary systems to classifying gravitational wave signals, supervoids and the large-scale structure of the universe. Others tackled models for extrapolating solar magnetic fields, tracking magentic activity cycles in Sun-like stars and developing statistical methods to identify galaxy clusters. Two of these projects have led to a publication; all of them opened up the research process to undergraduate students, as one of the recipients explained: "The project gave me an insight to how PhD students and post-doctoral fellows work in a professional environment and the sense of community that comes with working in a small office. This gave me an idea of what life in research would be like and strengthened my decision to choose this field of work."



2024 RAS Awards

Gold Medal for Astronomy Prof Gilles Chabrier, Ecole Normale Supérieure de Lyon and University of Exeter

Gold Medal for Geophysics Prof John-Michael Kendall, University of Oxford

Herschel Medal Prof Emeritus Roberta Humphries, University of Minnesota, USA

Eddington Medal Prof Pedro G Ferreira, University of Oxford

Chapman Medal Prof Valery Nakariakov, University of Warwick

Price Medal Prof Christopher Davies, University of Leeds

Jackson-Gwilt Medal Dr Keith Bannister, Australia Telescope National Facility, CSIRO, Australia, and Prof Ryan M Shannon, Swinburne University of Technology, Australia.

Annie Maunder Award The Africa Millimetre Telescope Planetarium Team working in Namibia, led from Radboud University, The Netherlands.

Primary Education Award Teresa McGrory, St Joseph's Catholic Primary School, Selly Oak, Birmingham

Secondary Education Award Arabi Karteepan, Croydon High School

Higher Education Award Dr David Cornwell, University of Aberdeen

Award for Service in Astronomy Prof Ian Robson, Science and Technology Facilities Council

Award for Service in Geophysics Prof Ian McCrea of RAL Space

Winton Award Astronomy Dr Chris Lovell, University of Portsmouth

Winton Award Geophysics Dr Andy Smith, Northumbria University

Fowler Award Astronomy Dr Leah Morabito, University of Durham

Fowler Award Geophysics Dr Christopher Smith, Huddersfield New College

Group Award in Astronomy The JWST-MIRI Consortium

George Darwin Lecture Prof Chiaki Kobayashi, University of Hertfordshire

Harold Jeffreys Lecture Dr Jessica Irving, University of Bristol

James Dungey Lecture Dr Gabrielle Provan, University of Leicester

Honorary Fellow, Astronomy Prof Ganesan Srinivasan of the Raman Research Institute, India

Honorary Fellow, Geophysics Dr Nicola Fox, NASA

The Caroline Herschel Medal



(ESO/M Zamani)

In 2024 the Caroline Herschel Medal was awarded to Dr Linda J Tacconi of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, former President of the European Southern Observatory Council. Dr Tacconi was recognised for her research in millimetre and submillimetre interferometry and high-resolution infrared spectroscopy, including her work on the evolution of dense star-forming molecular gas in galaxies and the formation and long-term evolution of galaxies. The medal also recognised her "unique contributions to international leadership in astronomy and service to the European Astronomical community". The medal was presented in a ceremony at the British Embassy in Berlin on 21 March 2024.

This award was launched in 2021 by the UK Government in honour of former German Chancellor Angela Merkel. It celebrates international collaboration in science and commemorates astronomer Caroline Herschel (1750–1828). She, with her brother William, revised and greatly improved catalogues of stars, clusters and nebulae, and herself discovered eight comets. The medal recognises both her legacy and the deep and enduring scientific links between Germany and the UK. The award recognises outstanding research by women in astrophysicists and is awarded in Germany and the UK in alternate years. The RAS and the Astronomische Gesellschaft together administer the award.

Grant support for early career researchers

RAS grants have been used to support early career researchers attending three major meetings in 2024. For the May meeting on Frontiers in Cosmology and Gravitational Physics at the University of Portsmouth, an RAS grant allowed the organisers to reimburse registration fees for postgraduate students from outside the university. At the 2024 European Lunar Symposium in Dumfries in June, RAS funding partially supported 14 early career researchers, one of whom said: "My participation was greatly enhanced by the travel grant I received, which covered registration fees and part of the accommodation costs. This financial support was instrumental in enabling my attendance, allowing me to engage fully with the conference activities." For the Galactic Star Formation Workshop held at Armagh Observatory and Planetarium in September, 15 postgraduate students received a grant of £100 each, reducing the cost of student registration and supporting their travel to Northern Ireland.

Individual travel grants allowed 23 researchers, including undergraduate and postgraduate students, to attend conferences that would otherwise have been unaffordable. Recipients valued the opportunities to share their work through talks and posters, and to meet people in their fields at different institutions. These grants made possible collaboration, learning, collecting data and networking, as well as opportunities to develop wider career skills.

DR LINDA J TACCONI WAS RECOGNISED FOR HER RESEARCH IN MILLIMETRE AND SUBMILLIMETRE INTERFEROMETRY AND HIGH-RESOLUTION INFRARED SPECTROSCOPY

RAS Thesis Prizes

In 2024 the RAS awarded prizes for the best PhD theses submitted during 2023 in the fields of astronomy and astrophysics (the Michael Penston Prize), geophysics and planetary science (the Keith Runcorn Prize), and instrumentation (the Patricia Tomkins Prize).

Dr Georgina Dransfield (University of Birmingham) won the Michael Penston Prize for her thesis entitled 'Planetary systems unlike the solar

system'. The runner-up was Dr William Roper (University of Sussex) with a thesis entitled 'A tale of birds and bug fixes: computational astrophysics in the Epoch of Reionisation'.

Dr Jesse Coburn (Queen Mary University) won the Keith Runcorn Prize for the thesis 'The Effective Mean-Free-Path of the Solar Wind'. The runner-up was Dr Joe McNeil (Open University) for his thesis entitled 'Mounds in Chryse Planitia and Oxia Planum, Mars: an unrecognised archive of Noachian geology'

Dr Lawrence Jones (Open University) won the Patricia Tomkins Prize 2023 for his thesis 'Advancements in image sensor technology for soft X-ray spectroscopy in space: CIS detectors for the Auroral X-ray Imaging Spectrometer'.

The runner-up was Dr Thomas Sweetnam (University of Manchester), for the thesis 'Development of Superconducting Parametric Amplifiers for Astrophysics Applications'.

Library and archives

The Library was open for research four days per week during 2024. There were 122 Library research visits by Fellows and Friends of the RAS and 103 by external researchers, to consult the Society's archives, photographs, book and journal collections. Some 215 research enquiries were handled remotely by RAS staff.

As in previous years, displays of archive and rare book materials suggested by Fellows and visiting speakers were put together to complement public lectures, Specialist Discussion Meetings, A&G Highlights talks and other scientific conferences; the Library also welcomed research visitors including groups from postgraduate training days. The Librarian spoke on Asian Collections at the Royal Astronomical Society at the National Committee for Information Resources on Asia Conference at the British Library.

THERE WERE 122 LIBRARY RESEARCH VISITS BY FELLOWS AND FRIENDS OF THE RAS AND 103 BY EXTERNAL RESEARCHERS, TO CONSULT THE SOCIETY'S ARCHIVES, PHOTOGRAPHS, BOOK AND JOURNAL COLLECTIONS

Advocating for the community with government

In 2024 the RAS expanded its policy work to include deeper engagement with UK parliamentarians and international bodies, as well as with partners such as the Campaign for Science and Engineering (CaSE), the Science Council and the UK Space Agency.

The Society responded to the following UK government consultations and inquiries:

- National Planning Policy Framework (light pollution)
- Rendezvous and Proximity Operations (for the Department of Science, Innovation and Technology, DSIT)
- Curriculum and Assessment Review (for the Department for Education)
- Subject Benchmarks Consultation (for the Quality Assurance Agency for Higher Education)
- Research Excellence Framework on Open Access
- House of Lords Science and Technology Committee inquiry into noise and light pollution
- House of Commons Science, Innovation and Technology Committee inquiry into astronomy
- Space Science Roadmaps workshops: Astronomy (for DSIT)

Additionally the Society agreed statements supporting the call for the UK to be a leading country in the G7 on R&D investment, and opposing space-based advertising.

We continued to give formal advice to bodies such as the UK Space Agency (via the Discovery Advisory Committee) and the Science Council (through its Policy Forum). In April we presented

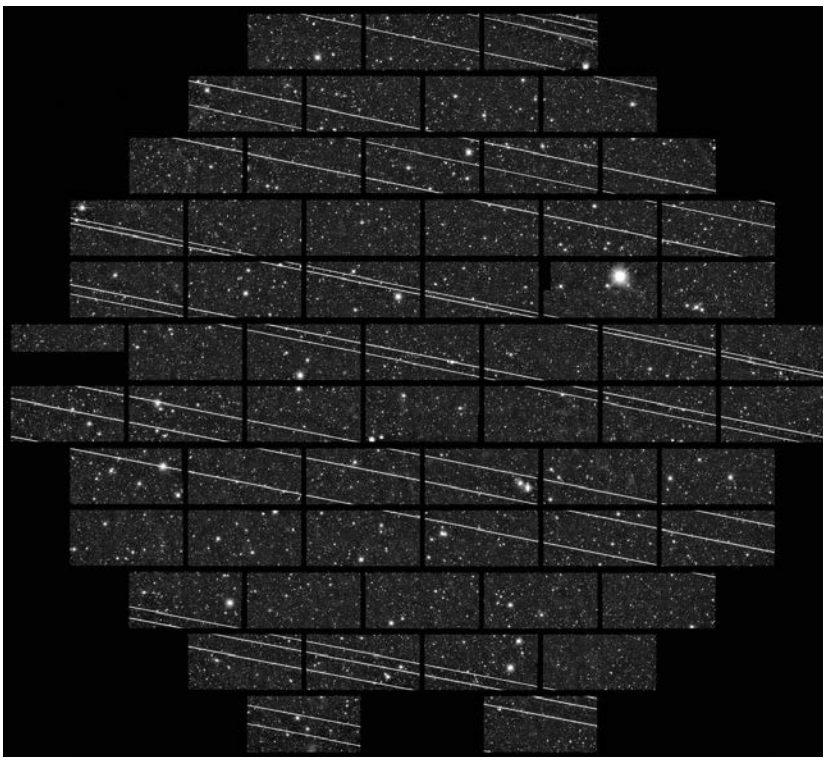
at the Science Council conference on Perspectives in Policy Work, citing our work on satellite constellations. The RAS president gave oral evidence to the Commons Science, Innovation and Technology Committee, as part of their inquiry into astronomy, advocating longer-term funding and for funding to be restored to the levels of a decade ago. MPs noted the value of astronomy in engagement in STEM subjects, citing the 'Lockdown Learning' virtual lessons run by the RAS Education and Outreach team during the Covid pandemic.

Before the General Election in July, we asked Fellows to contact their parliamentary candidates to solicit their views on fundamental science. In October the Society was one of 37 signatories of the CaSE open letter to Chancellor of the Exchequer Rachel Reeves, making the case for investment in science and technology. In the subsequent budget the allocation for science received some protection.

The impact of satellite constellations on astronomy was debated in parliament with responses from the science minister, who later referred to examples from the RAS in the debate on the economic benefits of science and technology. The Society also provided the secretariat for the All-Party Parliamentary Group for Dark Skies, which now has 24 members.

In the devolved parliaments, the Society was represented at the annual science policy events in the Senedd and the Northern Ireland Assembly, meeting members of these bodies to raise awareness of astronomy and geophysics in both nations.

Internationally, the RAS worked with United Nations bodies and their affiliates, and the IAU Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference, to which we are a contributing member. At UN level



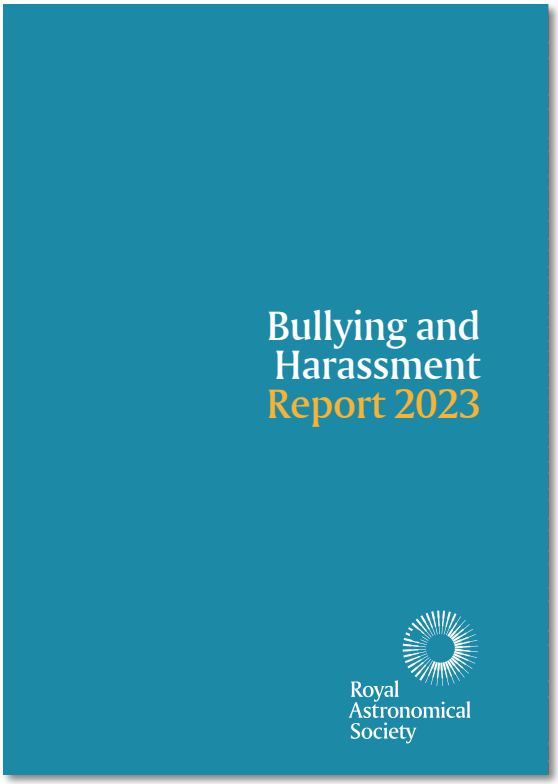
Trails from 19 Starlink satellites observed in 5.5 minutes with DECam on the Blanco 4m telescope at the Cerro Tololo Inter-American Observatory (NSF's National Optical-Infrared Astronomy Research Laboratory/CTIO/AURA/DELVE)

the RAS was appointed as an advisor to the UK delegation to the Committee on the Peaceful Uses of Outer Space, and our Policy and Diversity Officer addressed the UN Conference on Space Law and Policy in Vienna in November, on the challenge of protecting radio astronomy. The Society joined the executive committee of the new UK group, the Earth Space Sustainability Initiative, in May.

The RAS also campaigned to oppose the planned demolition of a building marking the location of Flamsteed's meridian telescope in the Royal Observatory Greenwich. The plans were approved and the Society continues this work with ROG to minimise the impact of this change on the heritage of the site. The RAS is also supporting the campaign to preserve the Observatory Science Centre at the former site of the Royal Greenwich Observatory in Herstmonceux, Sussex, and its telescopes.

Promoting diversity in our community

The RAS Committee on Diversity in Astronomy and Geophysics (CDAG) worked to support diversity in our community by sharing with RAS Fellows



In May the Society formally launched its report into Bullying and Harassment to an audience of 50 in person and 200 online.

issues discussed by the committee through regular articles in *A&G*. Early-career researchers – and their supervisors – shared strategies for better supervision; RAS staff shared the way that unusual venues and activities bring a wider audience to outreach; the imbalance between the diversity of people in our research communities and those receiving prizes and awards; steps fellows can take to make meetings more widely accessible; and the pressures of a research career and how to mitigate their effects.

CDAG continued to highlight diversity with sessions at the National Astronomy Meeting in Hull and with the RAS Early Careers Network. CDAG continued the financial support to help carers attend NAM2024.

In May the Society formally launched its report into Bullying and Harassment to an audience of 50 in person and 200 online. The report was also the subject of the first plenary session on diversity and inclusion to be held at the NAM. The Society also created a digital 'Inclusion Best Practice' guide, primarily for higher education (tinyurl.com/3the9fey).

Early Career Network

The Early Career Network continued to draw together researchers in the early stages of their careers. A highlight of the year was the careers session organised by the Early Career Network at the National Astronomy Meeting in Hull. The session began with a presentation on the variety of options available for those embarking upon careers in astronomy and geophysics, illustrating possibilities in education, research, and outreach. From this, the session then moved to open discussion among the participants.

Thereafter, a networking session provided an important forum in which early-career researchers could mingle with their colleagues, and nourish the relationships with each other which will support them throughout their careers.

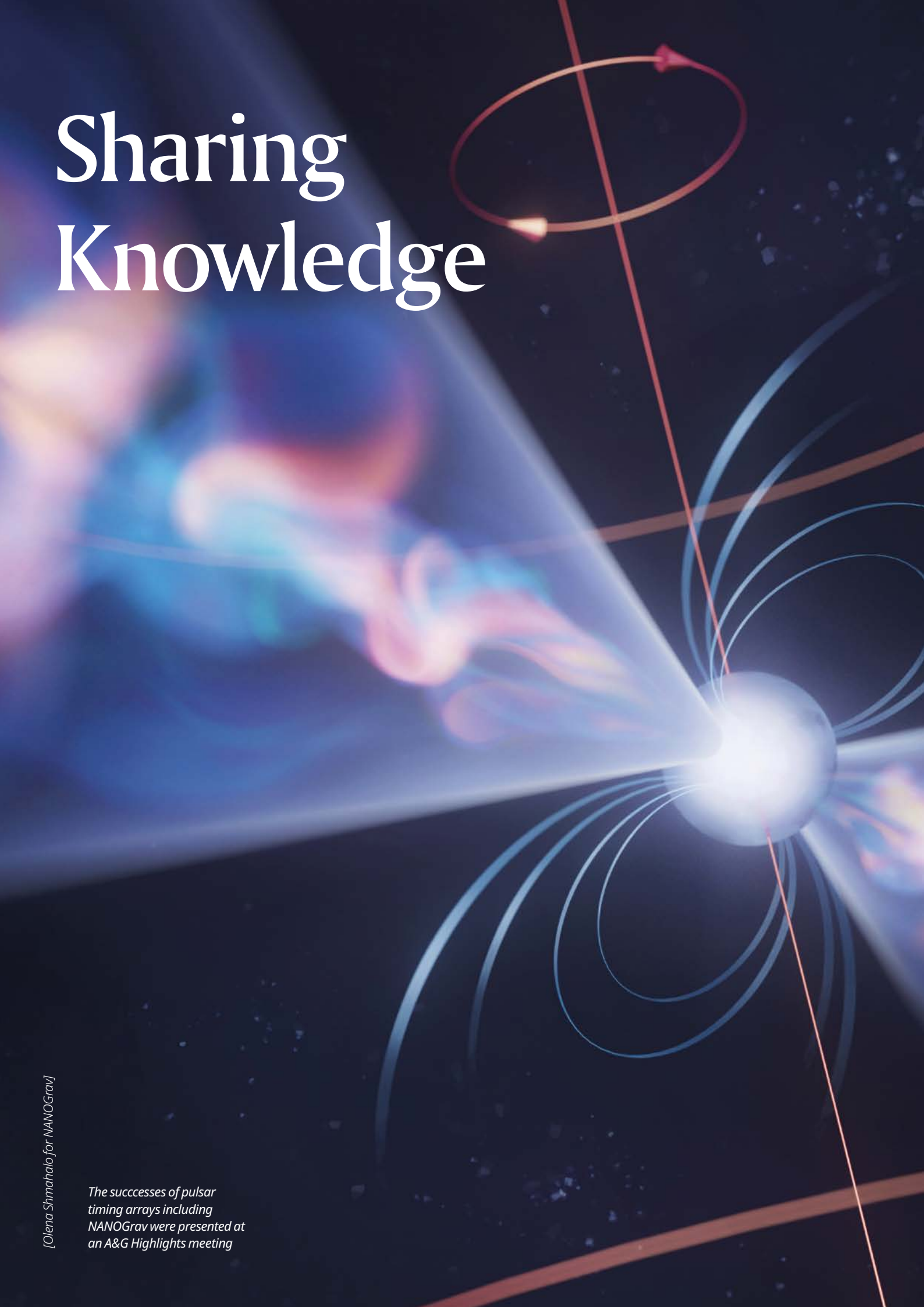






A highlight of the year was the careers session organised by the Early Career Network at the National Astronomy Meeting in Hull
(RAS/Darryl Brooks)

Sharing Knowledge



[Olena Shmahalo for NANOGrav]

The succcesses of pulsar timing arrays including NANOGrav were presented at an A&G Highlights meeting

Education and outreach events

June saw the final cohort of GCSE Astronomy students (33 in total) in London schools (Grey Coat Hospital, St Marylebone and Queen's College), and in the northwest of England (Ashton Community Science College, Garstang Community Academy, Armfield Academy and Montgomery Academy) completing their two-year programmes. Pupils based in London were taught at Burlington House. In September the RAS launched a new Higher Project Qualification course in astronomy to replace the GCSE. Each completed year of HPQ is equivalent to half a GCSE qualification. Some 27 students from secondary schools near Burlington House are taking part.

The Society also set up a new Astronomy Educators Online Network to serve GCSE Astronomy teachers more widely, providing support, events and training. We also carried out teacher training in partnership with the UK Space Education Resource Office.

Talks to large audiences included an online presentation about space careers with the National Extension College and six school talks/assemblies in the northwest in this period, amounting to direct intervention for over 1500 students. RAS education and outreach staff also gave talks at the Communication Astronomy with the Public conference, the European Astronomical Society annual meeting and the European Astrofest.

The outreach team got off to a flying start to 2024 with a grant from the Association of Science Discovery Centres to run a series of workshops for families in partnership with Slough Museum. These took place over four Saturdays in May, focusing on aspects of the lives and work of William, Caroline and John Herschel. Actors brought Caroline and John into the room to talk about their lives and their science, and items from the RAS collections linked their work to hands-on activities such as making cyanotypes.

Staff from the RAS and Slough Museum, together with volunteers including RAS Fellows, worked together to share the achievements of these former residents of Slough. Feedback showed that the workshops were highly valued by attendees – as were the stickers and certificate of attendance.

The Society disseminates knowledge to students, the press and the wider public by:

- Organising education and outreach events
- Arranging a programme of Public Lectures
- Exploiting the resources of the Library and Archives
- Promoting research in the media and social media
- Supporting the Friends of the RAS
- Working with the Courtyard Societies as a cultural hub









The outreach team ran a series of workshops for families in partnership with Slough Museum. These focusing on aspects of the lives and work of William, Caroline and John Herschel, who were there 'in person'. (RAS/M Wrigley)

In January the annual RASreach conference on public engagement took place at ThinkTank in Birmingham, with about 60 people attending in person and 50 online. The conference aims to upskill those working with the public, including RAS Fellows, and this year had 19 speakers covering various topics ranging from ethics to working with libraries. September saw the Interact meeting for public engagement professionals, co-organised by the Science and Technology Facilities Council with the RAS, which took place at Northumbria University in Newcastle. Outreach staff also took part in events with the British Science Festival and National Numeracy Day, and chaired the UK office of the IAU Office for Astronomy Education.

Public lectures

A total of 1412 people attended the eight public lectures offered by the RAS in 2024; most of them (75%) watched online. They carried on attracting viewers after the event, with more than 4000 views on the RAS YouTube channel. They included:

Dr Sam Illingworth (Edinburgh Napier University) Science communication through poetry – from dissemination to participation;

Catherine Regan (MSSL/UCL) Eyes on Mars – Increasing awareness of UK Mars exploration;

Dr Marie Van de Sande Dying stars seeding the universe;

Prof Kevin Walsh (University of Westminster) Astronomy – Teaching and learning about the oldest science;

Dr James O'Donoghue A planetary scientist's unexpected (animated) journey;

Anna Von Mertens The Resonance of Astronomer Henrietta Leavitt's Life and Work;

Prof Ian Crawford The Fermi Paradox – where are the aliens?

Dr Jenny Shipway Look up! Working together to bring astronomy to people across the UK.

1412 PEOPLE ATTENDED THE EIGHT PUBLIC LECTURES OFFERED BY THE RAS IN 2024

The Life Scientific

Burlington House was the setting for a live recording of an episode of the BBC Radio 4 series 'The Life Scientific', featuring RAS President Mike Edmunds. The interview by Jim Al-Khalili covered Mike's research on the chemistry of the universe as well as his interest in ancient artefacts, and featured a 'guest appearance' by Sir Isaac Newton.

The second John Brown Memorial Lecture

Burlington House was the setting for the second John Brown Memorial Lecture in December. In 'Exploring Cosmological Phenomena: An Artist's Perspective', the artist Ione Parkin shared her work and work by other artists inspired by astronomy and planetary science, giving the audience a spell-binding – and mind-expanding – sequence of images. Her work references scientific imagery such as the evolution of features on the solar

Funding school astronomy in rural India

RAS grant funding supported astronomy in schools in rural East Rukum, India. Astronomy workshops and an observing session in October 2023 took 'astro-kits' to students from 12 local schools. Local communities were also involved. The team led from Pokhara Astronomical Society demonstrated the use of clinometers, sundials, star wheels and star clocks in the astro-kits, and distributed telescopes to all the schools involved. They trained teachers and some of the students to use the telescopes and left each school with a video tutorial and more astro-kit equipment. The team reached 2000 people – aged between 13 and 50 – from varied geographical and ethnic backgrounds, 100% of whom were excited about having a telescope in their local school.





surface, dust-blown polar ice caps on Mars and cometary surfaces, and raises questions about observation in science and art.

Ione Parkin's art, which references scientific imagery such as the evolution of features on the solar surface, dust-blown polar ice caps on Mars and cometary surfaces, formed the core of the second John Brown Memorial Lecture (Ione Parkin)

Our Library and archive

We hosted a further 261 visitors during 17 group visits and other library-centred events, including Open Age and local astronomical societies. At an event to mark the 150th anniversary of the move to New Burlington House and the 1874 Transit of Venus expeditions in November, the Assistant Archivist led an exclusive behind-the-scenes tour of the RAS.

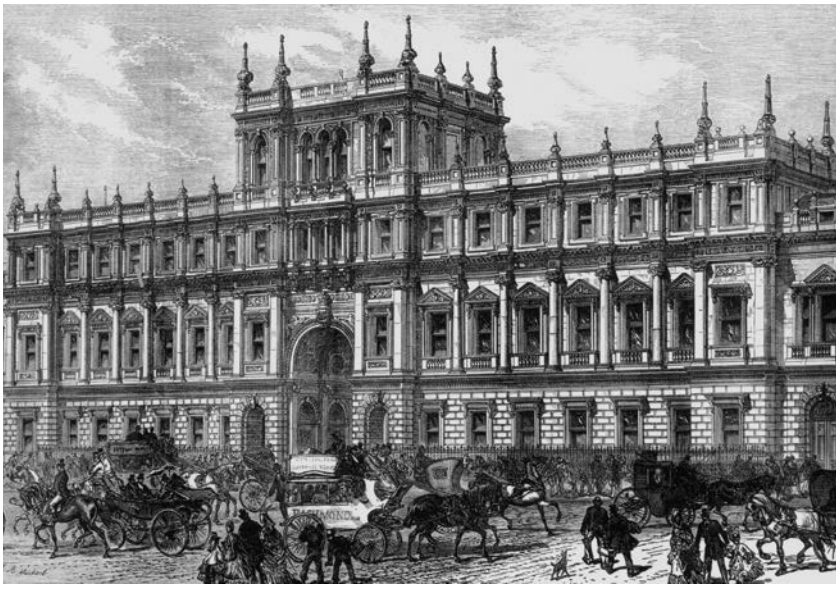
The RAS Bicentennial Quilt was on display in St Magnus Cathedral in Kirkwall as part of the Orkney Science Festival in September. Over the seven days that the quilt was on show, the cathedral had more than 8000 visitors; about a quarter of them spoke to the RAS staff and Festival volunteers (who included an RAS Fellow). The story of the quilt and the skills on display appealed to visitors, as did the scientific stories within the 100 squares. Feedback included: "Superb – makes me think about the cosmos, nature, beauty and being part of a greater existence. Really special and poignant. A great connectedness"; and "Totally amazing. So much information shown in one place! Truly talented people."

The partnership with Orkney Science Festival also made it possible for local primary schools to come and see the quilt; eight groups (146 pupils and 32 staff) came and took away with them a classroom activity we created for pupils to draw their own astronomical 'quilt squares' with chalk on black origami paper.

Lectures given this year based on the RAS collections included Astronomy Past and Present: the History of the RAS, at Paddington Public Library and The Sky above, the Earth below, at Orkney International Science Festival.

The RAS Library was an invaluable resource for the team behind the play 'The Lightest Element' at the Hampstead Theatre. This original production explored the life of Cecilia Payne Gaposchkin, who as a research student in 1925 determined that the Sun and stars were made mostly of hydrogen and helium. RAS staff supported the writer and director and briefed the cast, as well as taking part in after-show discussions with the audience.

It is 150 years since the Royal Astronomical Society arrived at New Burlington House (RAS/SPL)



Promoting research in the media

The Society issued 35 press releases in 2024, and RAS staff gave 41 radio and TV interviews. Over the year, the Society concentrated on targeting specific relationships with journalists, and yielded more impactful coverage from press releases as a result. There was a huge

An imperfect account of a comet

An RAS grant supported the display of 'An Imperfect Account of a Comet', developed by Orkney artist Lynda Laird, at Orkney International Science Festival in September 2024.

This installation features glass plates representing stars missing from John Flamsteed's British Star Catalogue; it was inspired by the discoveries of Caroline Herschel. Together with an audio performance, titled '8 Comets', featuring music and excerpts from Herschel's journals, and pop-up banners about comets, the installation provided a multidisciplinary framework for conversations with visitors.

Pupils from eight island schools also visited, making models of comets and trying their hands at cyanotype printing. More than 400 people in all visited the installation in Kirkwall Town Hall and feedback from the schoolchildren was positive, with 60% showing interest in exploring the subject.

Part of the RAS grant funding allowed improvements to the structure of the installation that make it – especially the glass plates – easier to store, assemble and transport; this opens up the possibility of displaying it at other science festivals and dark sky sites.

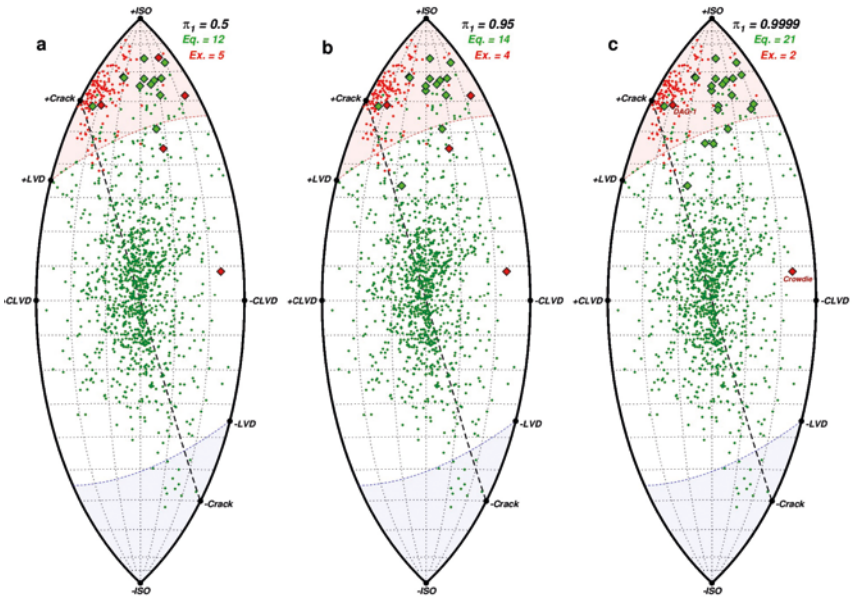
increase in the number of successful press releases this year, compared to previous years. Of these, 14 did particularly well, but our releases were regularly covered by the biggest media organisations globally. The rollout of video explainers has also been a great success. Popular topics included astronomical events such as comets and meteor showers, the true colours of Uranus and Neptune, pulsars and dark matter, Webb's weird galaxy, Venus (and an exo-Venus) and – from NAM – using optics to spot deepfake images.

Social media continues to play a part in promoting RAS research and activities. The Society has accounts on X (54400 followers), Facebook (19400), Instagram (12600), LinkedIn (17600), BlueSky (4200), Threads (4900) and Mastodon (4900). The RAS YouTube channel now has more than 15000 subscribers.

The Supermassive podcast has become the leading astronomy podcast in the UK. As of the end of 2024, 2.25 million people had listened, placing it in the top 1% of podcasts of any kind in the UK, and approaching the top 2% globally. 34% of listeners live in the US, 30% in the UK, 8% in Australia and 7% in Canada. Typically 20000 people listen to each episode within 30 days of release.

Filming a Dark Sky Sanctuary

An RAS grant made it possible for a writer and a filmmaker to capture the spectacular – but remote – dark skies of the Hebridean island of Rum, as part of a project to showcase the journey towards Dark Sky Sanctuary status for this island community. Luke Waterson and Davey Poremba travelled to Rum to film from remote locations as well as interviewing key figures involved in the now-successful bid for Dark Sky Sanctuary status. They edited the footage into a provisional final cut for the film they are provisionally calling 'Rum's Dazzling Dark Skies' and plan to show the film in schools in central Scotland and in the new Rum visitor centre.



RAS press releases helped to communicate the news of real-time monitoring of potential underground nuclear tests

RAS 200

RAS200: Earth and Sky, the decade-long outreach project established to mark the bicentenary of the Society, published its final report at the National Astronomy Meeting in 2024. Sharing our sciences with wider sectors of society has had a lasting impact. Seeking further partnerships is now part of the RAS Strategy for 2024-2029.

A press release highlighting the true colours of Uranus and Neptune – based on a research paper in *Monthly Notices of the RAS* – managed to garner a great deal of attention, (not to mention causing the last-minute hasty re-colouring of an over-blue Neptune in a feature in *A&G* magazine on its day of going to press!). tinyurl.com/tm5zzn2b

Friends of the RAS

The group of supporters of the RAS reached a membership of 257 in 2204. Friends enjoyed a series of exclusive lectures at Burlington House from the following speakers:

Prof Ian Robson Confessions of an astronomer;

Prof Nick Achilleos Exploring giant planet magnetospheres;

Prof Erminia Calabrese New frontiers in cosmology with Cosmic Microwave Background surveys (with a focus on the UK programmes);

Peter Grimley The European Southern Observatory – over 60 years at the cutting edge of observational astronomy;

Sally Russell Capturing the Moment – an illustrated personal journey through four decades of practical amateur astronomy;

Anna McLeod Massive stars and where to find them;

Prof Chris Clarkson Einstein's aftermath: dark energy, black holes and the Big Bang.

SHARING OUR SCIENCES WITH WIDER SECTORS OF SOCIETY HAS HAD A LASTING IMPACT

Working with Courtyard Societies

The spectacular aurora seen across wide areas of the UK in May provided a topical theme for the Courtyard Late event in June. RAS president Mike Lockwood spoke on the great auroral display of May 2024, discussed the origins of the aurora and what made May's events so unusual. Visitors had the chance to visit the Library and see original historical reports of solar observations, including the Carrington event of 1859 and John Herschel's sunspot observations.

Along with other Courtyard Societies, the RAS was part of Open House 2024, and opened to the public on Saturday 16 September, hosting two children's activity sessions, and 12 tours attended by 377 people, our highest attendance since 2018. Spectrum Drama actors playing the roles of Caroline Herschel and her nephew John Herschel were complemented by special library displays and tours led by RAS staff and Open House volunteers.

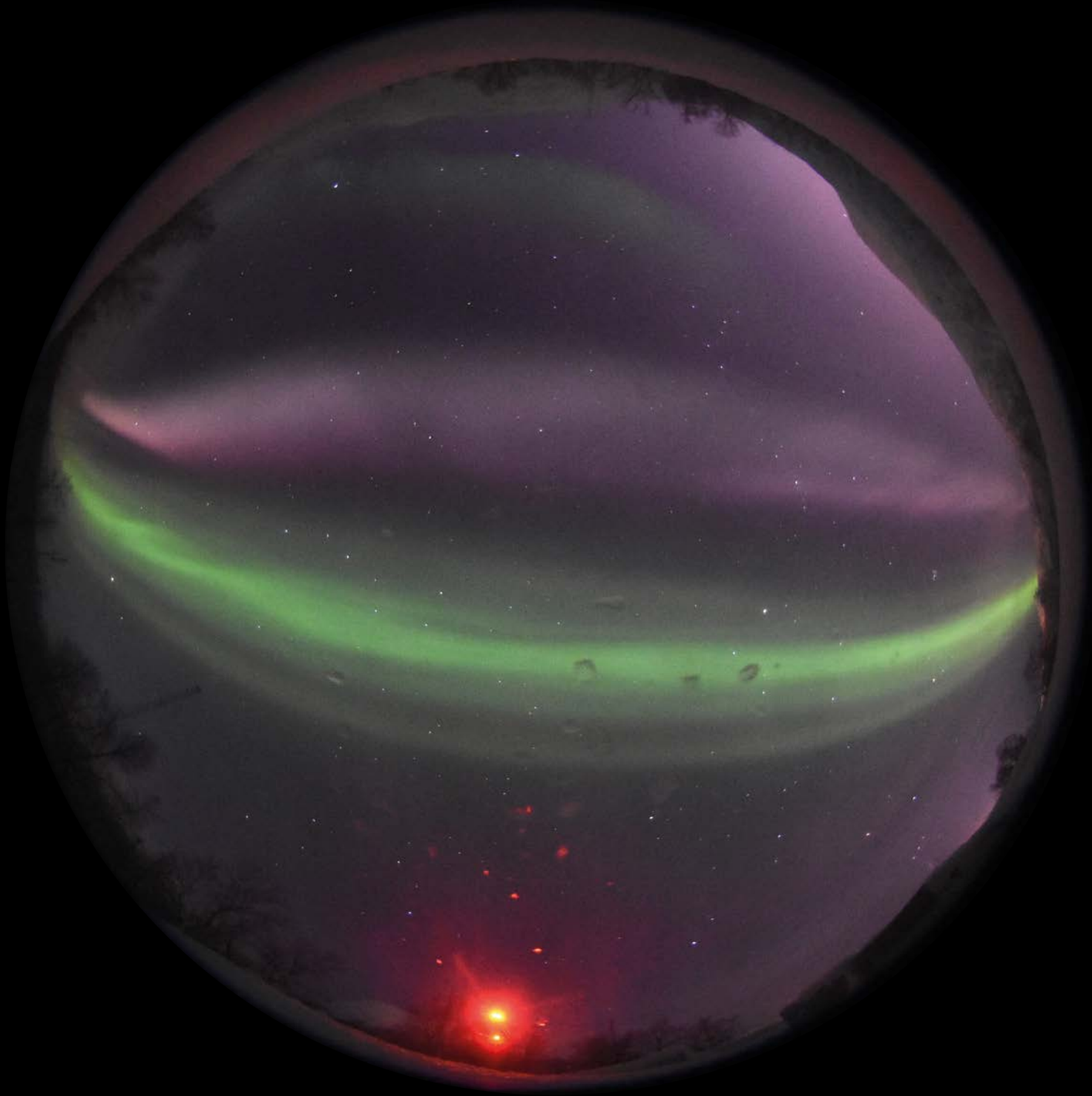
Perfect partners

The RAS supported International Observe the Moon Night in 2024, providing a livestream of the event organised by the University of Reading on 14 September 2024. At this annual event led by NASA, there were talks about lunar science and culture and a live observing link to Cyprus. 150 people attended in person; 1100 took part online through the partnership with the RAS.



[moon.nasa.cov/observe]

Our Organisation



In a bumper year for aurora, the RAS President spoke about space weather at the June Lates public event to celebrate our 150 years at Burlington House

[Ramfjordmoen Research Station]

Our strategy

We will continue our current valuable activities:

- Providing a **learned and professional membership Society**;
- Holding regular **scientific meetings**;
- **Publishing**, in journals and more widely;
- Giving **policy advice** to government
- Awarding **grants and medals**;
- Providing **education and outreach activities**;
- Curating **our heritage**.

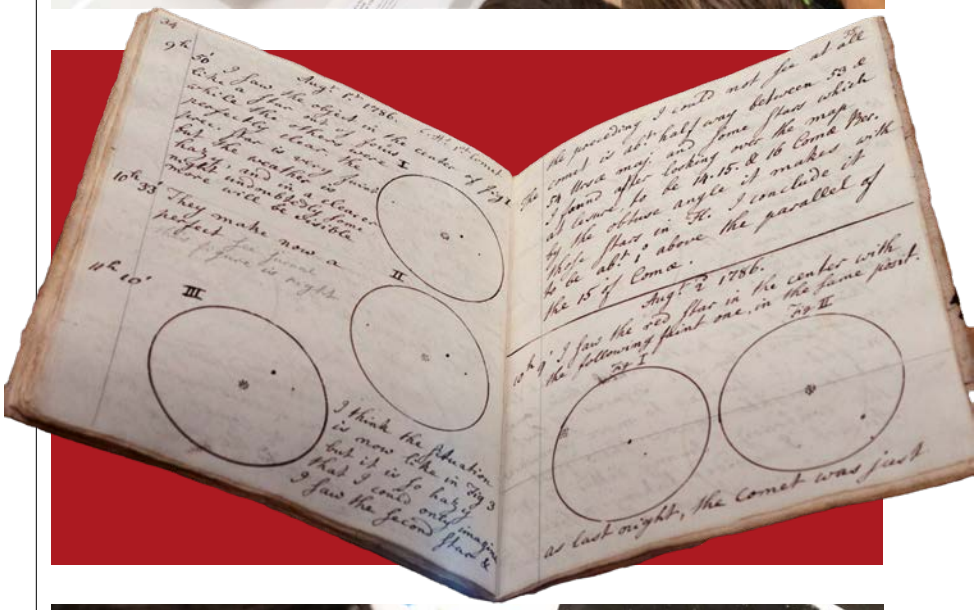
In addition we will develop these five priority areas:

- Meeting the needs of **our members** and improving how we communicate with them;
- Providing **inspirational** programmes in astronomy and geophysics **education and outreach**;
- Achieving **maximum impact from the library**, archive and object collections;
- Publishing **high quality research**, accessible to all;
- Exploring and nurturing **partnerships for collaboration and influence**.

Our objectives for 2024 centred on the RAS Strategy 2024-29.
We published the Strategy and our Roadmap to Delivery, setting out targets in line with improvements in the five priority areas: membership, education and outreach, library and heritage, publishing and collaboration and influence.

Membership: We have agreed the terms of a 999-year lease on our headquarters in Burlington House, and are developing plans to use the building for public events. We have worked to streamline







The RAS archive came to life as a series of workshops and outreach initiatives in Slough organised in partnership with Slough Museum, brought astronomy to a new generation. Caroline Herschel's notebook returned to Slough after some 200 years. (RAS/M. Wrigley)

our organisation's IT systems to support our members. We completed the analysis of the Survey of the Research Interests and Demographics of the UK Astronomy and Geophysics Communities, finding continued growth in the size of the research community. We have upgraded our Newsletter to Fellows. We have improved support for the Committee on Diversity in Astronomy and Geophysics, and shared their work to our members through *A&G*. We held one of our Specialist Discussion Meetings at the Royal Observatory Edinburgh and made plans to hold at least one of our Specialist Discussion and A&G Highlights Meetings at other venues in the coming years. We initiated a Governance Review.

Education and outreach: We have developed new outreach activites in partnership with Slough Museum and the University of Reading, among others, in order to increase their impact, reach and focus. We have prioritised events targeted at under-served communities, whether for socio-economic, geographic or access reasons.

Library and heritage: We have continued to explore digitisation of Caroline Herschel's notebooks, to increase accessibility for research and public interest. We have displayed material including those notebooks, to support meetings, lectures and events in Burlington House, as well as in Slough, supporting outreach workshops for families. We also worked with Orkney Science Festival to display the RAS Bicentennial Quilt in Kirkwall, to the public and to primary school children.

Publishing: We have been promoting our Open Access journals at meetings and highlighting the archive content that is now freely available. We compiled and promoted a booklet to highlight our role in geophysics publishing.



The April 2025 RAS meetings were held in Dublin, with one Specialist Discussion Meeting focusing on the role historical observatories such as Dunsink can play in outreach. (RAS/SPL)

Our objectives

Collaboration and influence: We have made contact with organisations with which we have common goals, in outreach and influence, such as CaSE, the Campaign for Science and Engineering. We have taken part in events with fellow Societies around the Burlington House courtyard and have set up shared administration structures. We strengthened our links with members of the UK parliament and encouraged our Fellows to work with prospective MPs ahead of the General Election.

For 2025, we will continue our work in line with the Strategy and our priority areas of membership, education and outreach, library and heritage, publishing and collaboration and influence.

In particular:

- We will complete our Governance Review and bring our proposed amendments to the Charter and Bye-laws to the AGM;
- We will hold at least one Specialist Discussion meeting (both A and G) and Highlights meeting away from London. In 2025 it will be in Dublin;
- We will enhance functionality on our member's database to allow Fellows to find and contact Fellows with



similar interests, whilst remaining compliant with GDPR legislation;
- We will work towards upgrading our website;
- We will prepare a plan to celebrate the Bicentenary of *MNRAS* in 2027.

Events since the year end

In January, the Royal Astronomical Society held a one-day conference on Light Pollution and its Impacts at our offices in Burlington House, London. There were multiple sessions from invited speakers, with representation from organisations including the All-Party Parliamentary Group for Dark Skies, Buglife, CPRE, Dark Skies Cumbria, Dark Sky UK and Dark Sky International. Topics covered included policy and regulation, the environment and biodiversity, and human health. The meeting explored approaches to tackling light pollution, looking at the current regulatory landscape in the UK, opportunities for improvement, local interventions, and best practices here and from elsewhere in the world.

> WE EXPLORED TACKLING LIGHT POLLUTION, LOOKING AT THE CURRENT REGULATORY LANDSCAPE IN THE UK

In February we announced the award of the 2025 Caroline Herschel Medal to Prof. Isobel Hook of the University of Lancaster (centre left), in recognition of her outstanding work on the faint and distant universe. She is pictured at the award ceremony with the President of the RAS, Prof. Mike Lockwood (right) and four past presidents, from left Prof. John Zarnecki, Prof. Emma Bunce, Prof. Kathy Whaler and Prof. Mike Edmunds (RAS/ Lynda Laird)

In February we announced the award of the 2025 Caroline Herschel Medal to Prof Isobel Hook of the University of Lancaster, in recognition of her outstanding work on the faint and distant universe. Prof Hook received her medal at a ceremony in London in March.

We were pleased to find out that the Association for Science and Discovery Centres have funded another series of our successful outreach workshops taking the works of the Herschels back to their home town of Slough for 2025.

We consulted members about our Governance Review through a dedicated website, gaining insight into Fellows' priorities to inform the Trustees' decision-making.

Structure and Governance



The promising plumes of Enceladus and Io featured in a Specialist Discussion Meeting in December

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in 2015. The objectives, charters and byelaws are detailed on the Society's website ras.ac.uk.

The control of the Society rests with the General Meeting of Fellows. Subject to that, direction and management are the responsibility of the Council (as the Trustees of the charity). The Council consists of a President, a Treasurer and three Secretaries together with four Vice-Presidents and 12 Councillors. In addition, the President-Elect attends Council for one year prior to taking up the post.

Trustee recruitment and appointment

Annually, the full membership of the Society is asked to nominate themselves or other members of the Society to available positions on Council.
A nomination must be supported by two other members of the Society. Council approves the ballot list and this together with a narrative on each candidate is sent to the full membership for their consideration prior to casting their votes. We moved to fully electronic voting and an online AGM in 2020 in line with Covid-19 restrictions; we will continue with solely online voting in future. Members of the Council are elected by ballot at the AGM, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

- President, two years
- Vice-Presidents, two years
- Treasurer and Secretaries, five years
- Councillors, three years.

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to complete a conflict-of-interest declaration and to sign a Trustee declaration form. Trustees have the opportunity to attend training, where appropriate; for example, on Governance, and Heritage Architecture

Regulations and procedures of the Society:

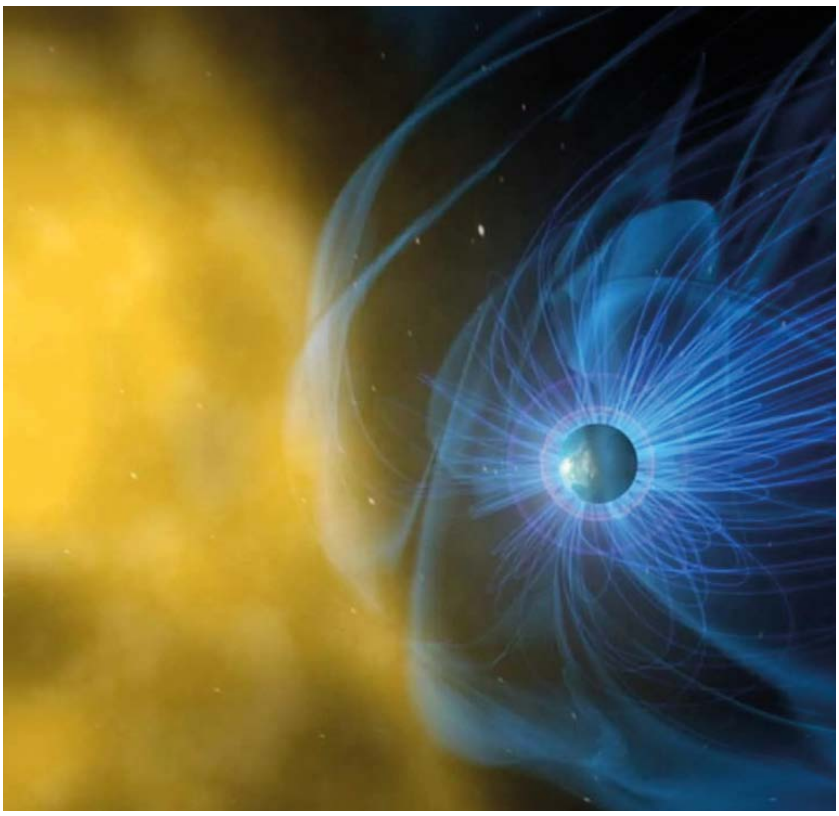
- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- Organisational structure
- Risk management

Fundraising

The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

Organisational structure

The RAS Council normally meets six times during the year and its function is to direct, on behalf of the Society, all the affairs and business of the Society. Council appoints standing committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, Remuneration, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and *ad hoc* committees (e.g. Awards) to forward its objectives. It appoints the Editors-in-Chief and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society*, *Geophysical Journal International*, and *RAS Techniques and Instruments*, who provide their services, as does the Treasurer, for an honorarium. The Society has formal associations with a number of organisations having shared interests, and



Energetic particle injection: its causes and effects was discussed at the RAS in November 2024 (NASA)

has less-formal arrangements with several other bodies. These include:

- The British Geophysical Association, jointly sponsored by the RAS and the Geological Society of London to represent solid-Earth geophysicists whose interests fall within the remits of both parent societies
- The Paneth Meteorite Fund that the Society administers under the direction of the Paneth Fund Trustees
- The Society is the UK national member organisation of the International Astronomical Union and the European Astronomical Society and is represented on the UK Panel of the International Union of Radio Science
- The Society is represented on a number of organisations including the Science Council, the Parliamentary and Scientific Committee and the Campaign for Science and Engineering

The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories and science centres, use of the Society's Library, as well as a reduced subscription to the Society's members' magazine *A&G*.

RIGOROUS PEER REVIEW IS USED TO MAINTAIN THE QUALITY OF THE THREE JOURNALS

Risks

The principal risks and uncertainties identified by the Trustees are:

- Maintenance of the quality of, and income from, publications (a significant income stream of >60%) having transitioned to Open Access publishing
- Cost of maintenance and Burlington House Upgrades

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is exposed and the systems that have been established to manage those risks. In regard to the most significant risks:

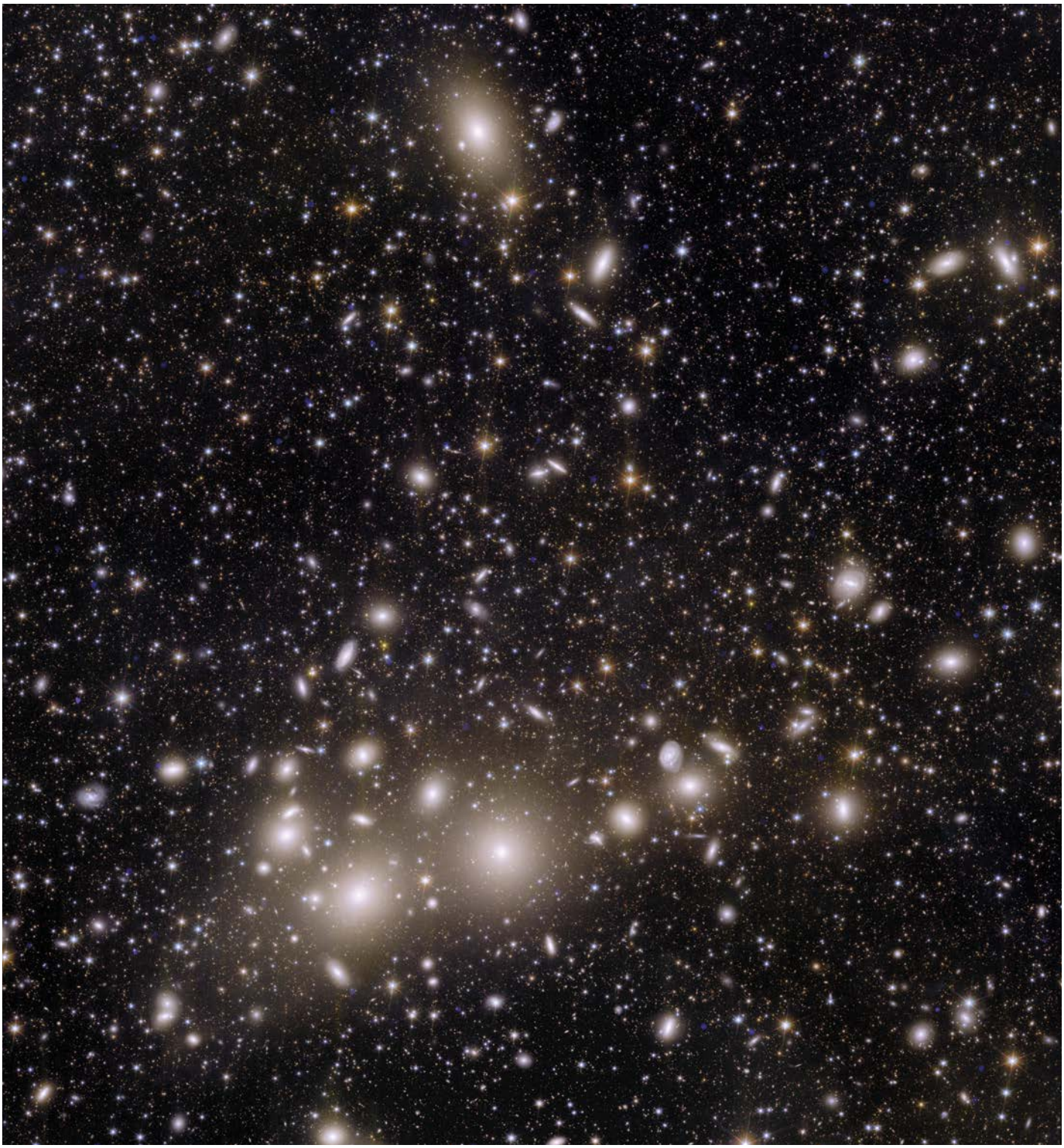
- The Society insists that rigorous peer review is used to maintain the quality of the three journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.
- Maintenance of the (listed) premises is ensured by regular repair and refurbishment.

Other key risks identified and their mitigation measures include:

- Maintenance of the size of the membership (by regular review of services and subscriptions and outreach activities to potential new members)

- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

The Trustees consider the fluctuations in investment fund values and variability of investment returns to be a risk for the Society. The fund, Newton Growth and Income Fund for Charities, is actively and expertly managed and administered by Newton Investment Management who were reappointed after a competitive tender. Funds are invested in a diverse portfolio comprising mainly equities and bonds. This managed strategy mitigates fluctuations in fund values and seeks opportunities for fund growth and income. The Trustees consider this approach mitigates the subsequent exposure to any investment risk.



A Specialist Discussion Meeting in December considered the low surface brightness universe featuring data coming from the Euclid space mission
[ESA/Euclid/Euclid Consortium/NASA, image processing by J.-C. Cuillandre (CEA Paris-Saclay), G. Anselmi]

Financial Statements



[NASA/JPL-Caltech/SwRI/MSSS Image processing by Emma Wilmaki]

FINANCIAL REVIEW

The Society's total funds increased from £25,823,874 to £26,970,240 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art) which totalled £9,470,879 (2023 – £9,470,879). Income decreased to £5,156,988 (2023 – £7,082,695) mainly due to decreased income from publishing and increased income from investments. The Society's expenditure decreased to £4,701,437 (2023 – £5,276,132) which is mainly due to a fall in publication expenditure.

Policy on reserves

The reserves policy aims to maintain adequate financial cover for the main risks to the Society and provide in the normal way for an efficient winding-up if that ever became necessary. Working cash reserves are maintained so the Society does not rely on realisation of investments gains, or capital invested. The total funds amounted to £26,970,240 of which £9,470,879 are held in heritage assets, leaving funds of £17,499,361 (2023 – £16,352,995) to cover the main risks and the operational needs of a going concern.

The requirement for significant reserves falls into two areas:

- The need to have contingency plans in place to maintain publication income now that, from 1 January 2024, the two main journals, Monthly Notices of the Royal Astronomical Society and Geophysical Journal International, are fully Open Access. The first Open Access year remained profitable, but journal submission numbers were lower.
- The need to make provision for substantial increases in the cost of Burlington House accommodation. The purchase of a 999-year lease, alongside four other Courtyard Societies, at a peppercorn rent, was completed on 29 October 2024 from the Department for Levelling Up, Housing & Communities, thereby giving greater certainty to the future of the premises but making the Society liable for the costs of backlog maintenance, environmental improvements and greater accessibility.

The Accommodation fund has been merged with the Burlington House fund to form the Tangible fixed assets fund as a result of the purchase of the 999 year long lease and is represented by the net book value of tangible fixed assets. This fund is detailed in note 17, page 59, along with the other Designated funds.

The Open Access fund is currently maintained at high levels to support any significant changes to the Society's operations and the General Fund is available to provide further financial support if either of these risks materialise. The General Fund is also available, should it ever be needed, to enable an orderly winding up of the Society. At present the free reserves of the Society, defined as unrestricted, undesignated funds, are £7,879,686 (2023 – £7,659,982) and these would allow operation of the Society for at least 20 months if publishing were continued and expenditure incurred during that period and 43 months if publishing were halted. The trustees are satisfied that the current level of reserves is appropriate given the risks and uncertainties outlined above.

It has been the policy of the Society to fund grant activity from the Research and Grants fund, which is now included in the balance of designated reserves.

Investment policy

Investments are held with BNY Mellon Charities Fund: Newton Growth and Income Fund for Charities, with the aim of generating capital growth and income over the medium to long term, with actively managed assets held in global equities and fixed income

securities. Surplus cash is held in the COIF Charities Deposit Fund with CCLA Investment Management, which provides a high level of capital security, interest, and liquidity. The Fund has an actively managed diversified portfolio of sterling denominated money market deposits and instruments. Income and gains from these investments contribute to fund the Society's charitable activities. Investment performance is monitored by the accountant, treasurer, finance committee and Council.

The trustees, by resolution, adopted a total returns approach to the invested endowment funds in accordance with the requirements of the Charity Commission believing that this approach is in the best interests of the Society. The fund reconciliation is disclosed in note 12. This approach was applied from 1 January 2015 when the value of the endowment funds at that date of £1,652,682 was used as a proxy for the original value of the endowment funds. In adopting this policy, permanent endowment funds will not be permitted to fall below the original value of £1,652,682. The trustees aim to maintain the real value of the permanent endowment as a measure against the movements in the Consumer Prices index (CPI), rather than the Retail Prices Index (RPI) as this highly inflated, out of favour index prevented any transfers to the restricted fund. The CPI was 2.5% for the year (2023 – 7.3%). £281,057 was transferred to the restricted funds during the year, (2023 – nil).

Grant making policy

The RAS has for many years provided small grants to support the community in activities not funded by the research councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to experience working in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

In addition to these grants to individuals the Society funds a series of fellowships to promote the careers of the highest quality young postdoctoral scientists. These currently include RAS Fellowships (on any subject) and the Norman Lockyer Fellowship (in Solar and Solar Terrestrial Physics). The Norman Lockyer Fellow is funded from an endowment fund set up for that purpose.

A further activity funded by the Society is the award of medals to recognise the highest quality work in various categories. These awards are proposed to Council by a separate awards panel and no awards are made to serving councillors.

The grants, fellowships and awards are funded from several sources including the restricted and endowment funds invested with Newton Investment Management. The income and gains from these investments and interest from the CCLA COIF Charities Deposit Fund, are used to support the grants expenditure in accordance with the bequests.

The grants panel deliberates twice a year and further grants are awarded by the Education and Outreach Committee. It comprises the Treasurer (Chair) and the three secretaries. 208 applications were received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

FINANCIAL REVIEW (CONTINUED)

Key management personnel

The key management personnel of the charity in charge of directing and controlling, running and operating the charity are the trustees, the Executive Director and the Deputy Executive Director; the latter two are employees. They are assisted by the Accountant, a further five managerial level officers and other staff.

Council ensures that the Society carries out a salary comparison exercise every 3-5 years. The comparability study compares the staff salaries to other similar external positions to reassure the trustees that the levels of remuneration are appropriate. The last comparison exercise was carried out in 2023 and the newly created Remuneration Committee started the process of a full review in January 2024.

The Society does not have a performance related pay scheme. The trustees set up the Remuneration Committee to advise on the appropriate level of salary increase in response to the cost of living increases for all staff and consider any changes to staff roles and responsibilities.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has two deferred members and nine annuitants. The Society operates a defined contribution group personal pension scheme for current staff.

Legacies and donations

The Society encourages Fellows to include donations to the Society in their wills and receives donations during the year from Fellows and members of the public. During the year the Society received donations of £28,069 (2023 - £2,167) and legacies of £nil (2023- £10,000).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5 million. The Society does not regard these as assets which can be converted to their cash value, except in the most dire circumstances.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. Where a valuation is available for additions to the collection, this is reflected in the financial statements. A valuation will always be obtained for additions that are financially material to the whole collection

Investment performance

The Newton Growth and Income fund for Charities provided a yield of 2.3% and a total return net of 9.2% in the year. Annual management charges of 0.6% are taken from the capital of the fund. Interest from the COIF Charities Deposit Fund yielded 4.9%. Performance of the fund managers is kept under continual review.

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The trustees are responsible for preparing the Trustees' report and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The law applicable to charities in England and Wales requires the trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of the income and expenditure of the charity for that period. In preparing these financial statements, the trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102);
- make judgments and estimates that are reasonable and prudent;

- state whether applicable United Kingdom Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in operation.

The trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and the provisions of the Royal Charter and Bye Laws. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities. The trustees are responsible for the maintenance and integrity of the charity and financial information included on the charity's website.

The Council of the Society believes that it has carried out these requirements.

AUDITORS

A resolution to appoint Buzzacott Audit LLP for 2025 will be proposed at the Annual General Meeting.
Approved by the Council and signed on its behalf by:

Professor Michael Lockwood

President
Date: 9th May 2025

INDEPENDENT AUDITOR'S REPORT TO THE TRUSTEES OF ROYAL ASTRONOMICAL SOCIETY

Opinion

We have audited the financial statements of Royal Astronomical Society (the 'charity') for the year ended 31 December 2024, which comprise the statement of financial activities, the balance sheet, the statement of cash flows, the principal accounting policies and the notes to the financial statements. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland' (United Kingdom Generally Accepted Accounting Practice).
In our opinion, the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2024 and of its income and expenditure for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Conclusions relating to going concern

In auditing the financial statements, we have concluded that the trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue.

Our responsibilities and the responsibilities of the trustees with respect to going concern are described in the relevant sections of this report.

Other information

The other information comprises the information included in the annual report and financial statements other than the financial statements and our auditor's report thereon. The trustees are responsible for the other information. Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

Our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether this gives rise to a material misstatement in the financial statements themselves. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

Matters on which we are required to report by exception

In the light of the knowledge and understanding of the charity and its environment obtained in the course of the audit, we have not identified material misstatements in the trustees' annual report.

We have nothing to report in respect of the following matters in relation to which the Charities (Accounts and Reports) Regulations 2008 requires us to report to you if, in our opinion:

- the information given in the trustees' annual report is inconsistent in any material respect with the financial statements; or

- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Responsibilities of trustees

As explained more fully in the trustees' responsibilities statement, the trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the trustees either intend to liquidate the charity or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

We have been appointed as auditor under section 144 of the Charities Act 2011 and report in accordance with the Act and relevant regulations made or having effect thereunder.

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud is detailed below.

Our approach to identifying and assessing the risks of material misstatement in respect of irregularities, including fraud and non-compliance with laws and regulations, was as follows:

- the engagement partner ensured that the engagement team collectively had the appropriate competence, capabilities and skills to identify or recognise non-compliance with applicable laws and regulations;
- we identified the laws and regulations applicable to the charity through discussions with management, and from our knowledge and experience of the sector;
- we focused on specific laws and regulations which we considered may have a direct material effect on the financial statements or the operations of the charity, including the Charities Act 2011, data protection legislation, anti-bribery, employment, pensions and health and safety legislation;
- we assessed the extent of compliance with the laws and regulations identified above through making enquiries of management and inspecting legal correspondence; and
- identified laws and regulations were communicated within the audit team regularly and the team remained alert to instances of non-compliance throughout the audit.

We assessed the susceptibility of the charity's financial statements to material misstatement, including obtaining an understanding of how fraud might occur, by:

- making enquiries of management and those charged with governance as to where they considered there was susceptibility to fraud, their knowledge of actual, suspected and alleged fraud; and
- considering the internal controls in place to mitigate risks of fraud and non-compliance with laws and regulations.

To address the risk of fraud through management bias and override of controls, we:

- performed analytical procedures to identify any unusual or unexpected financial relationships;
- tested journal entries to identify unusual financial transactions;
- tested authorisation controls during substantive testing of expenditure;
- assessed whether judgements and assumptions made were indicative of potential bias; and
- investigated the rationale behind significant or unusual financial transactions.

In response to the risk of irregularities and non-compliance with laws and regulations, we designed procedures which included, but were not limited to:

- agreeing financial statement disclosures to underlying supporting documentation;
- reading the minutes of meetings of those charged with governance;
- enquiring of management and those charged with governance as to actual and potential litigation and claims; and
- reviewing correspondence with HMRC and the charity's legal advisors.

There are inherent limitations in our audit procedures described above. The more removed that laws and regulations are from financial transactions, the less likely it is that we would become aware of non-compliance. Auditing standards also limit the audit procedures required to identify non-compliance with laws and regulations to enquiry of the trustees and other management and the inspection of regulatory and legal correspondence, if any.

Material misstatements that arise due to fraud can be harder to detect than those that arise from error as they may involve deliberate concealment or collusion.

A further description of our responsibilities for the audit of the financial statements is located on the Financial Reporting Council's website at www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditor's report.

Use of our report

This report is made solely to the charity's trustees, as a body, in accordance with the Charities (Accounts and Reports) Regulations 2008 and with regulations made thereunder. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's trustees as a body, for our audit work, for this report, or for the opinions we have formed.

Buzzacott Audit LLP 11 May 2025

Statutory Auditor
130 Wood Street
London
EC2V 6DL

Buzzacott Audit LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2024

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2024 Total funds £	2023 Total funds £
Income						
Donations and legacies	1	**26,249**	**570**	**1,250**	**28,069**	12,167
Other trading activities		**14,373**	—	—	**14,373**	13,181
Investment income	2	**359,483**	**20,084**	**125,945**	**505,512**	429,590
Charitable activities	3	**4,609,034**	—	—	**4,609,034**	6,627,757
Total income		**5,009,139**	**20,654**	**127,195**	**5,156,988**	7,082,695
Expenditure						
Raising funds		**11,639**	—	—	**11,639**	19,615
Charitable activities	5	**4,627,022**	**62,776**	—	**4,689,798**	5,256,517
Total expenditure		**4,638,661**	**62,776**	—	**4,701,437**	5,276,132
Net income (expenditure) before investment gains		**370,478**	**(42,122)**	**127,195**	**455,551**	1,806,563
Net gains on investments	12	**476,662**	**29,454**	**184,699**	**690,815**	540,230
Net income (expenditure) for the year		**847,140**	**(12,668)**	**311,894**	**1,146,366**	2,346,793
Transfer between funds	12	—	**281,057**	**(281,057)**	—	—
Net movement in funds		**847,140**	**268,389**	**30,837**	**1,146,366**	2,346,793
Reconciliation of funds:						
Total funds brought forward at 1 January 2024		**22,607,102**	**1,036,122**	**2,180,650**	**25,823,874**	23,477,081
Total funds carried forward at 31 December 2024		**23,454,242**	**1,304,511**	**2,211,487**	**26,970,240**	25,823,874

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 49 to 63 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2023

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Income					
Donations and legacies	1	11,176	991	—	12,167
Other trading activities		13,181	—	—	13,181
Investment income	2	299,888	17,905	111,797	429,590
Charitable activities	3	6,627,757	—	—	6,627,757
Total income		6,952,002	18,896	111,797	7,082,695
Expenditure					
Raising funds		19,615	—	—	19,615
Charitable activities	5	5,192,332	64,185	—	5,256,517
Total expenditure		5,211,947	64,185	—	5,276,132
Net income (expenditure) before investment gains		1,740,055	(45,289)	111,797	1,806,563
Net gains on investments	12	372,759	23,119	144,352	540,230
Net income (expenditure) for the year and net movement in funds		2,112,814	(22,170)	256,149	2,346,793
Reconciliation of funds:					
Total funds brought forward at 1 January 2023		20,494,288	1,058,292	1,924,501	23,477,081
Total funds carried forward at 31 December 2023		22,607,102	1,036,122	2,180,650	25,823,874

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 49 to 63 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2024

	Notes	2024 £	2024 £	2023 £	2023 £
Fixed assets					
Tangible assets					
. Heritage assets	11	**9,470,879**		9,470,879	
. Other assets	11	**3,979,183**		482,016	
Investments	12	**10,386,828**		9,696,013	
			23,836,890		19,648,908
Current assets					
Debtors	13	**566,625**		1,052,260	
Cash at bank and in hand		**7,327,655**		7,415,452	
		7,894,280		8,467,712	
Creditors: amounts falling due within one year	14	**(2,319,071)**		(2,228,747)	
Net current assets			**5,575,209**		6,238,965
Total assets less current liabilities			**29,412,099**		25,887,873
Creditors: amounts falling due after one year	14		**(2,441,859)**		(63,999)
Total net assets			**26,970,240**		25,823,874
The funds of the charity					
Endowment funds	15		**2,211,487**		2,180,650
Restricted income funds	16		**1,304,511**		1,036,122
Unrestricted income funds					
. Designated funds	17	**15,574,556**		14,870,434	
. General funds		**7,879,686**		7,736,668	
			23,454,242		22,607,102
			26,970,240		25,823,874

The financial statements were approved by Council on 9 May 2025 and signed on its behalf by

Professor M Lockwood
President

The notes on pages 49 to 63 form part of these financial statements.

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2024

	Notes	2024 £	2023 £
Cash flow from operating activities			
Net cash provided by operating activities	A	**423,617**	2,169,313
Cash inflow from investing activities			
Dividends and interest from investments		**505,512**	429,590
Purchase of tangible fixed assets		**(1,016,926)**	(37,060)
Net cash provided by investing activities		**(511,414)**	392,530
Change in cash and cash equivalents in the year		**(87,797)**	2,561,843
Cash and cash equivalents at 1 January 2024	B	**7,415,452**	4,853,609
Cash and cash equivalents at 31 December 2024	B	**7,327,655**	7,415,452

NOTES TO THE STATEMENT OF CASH FLOWS FOR THE YEAR TO 31 DECEMBER 2024

A Reconciliation of net movement in funds to net cash flow from operating activities

	2024 £	2023 £
Net movement in funds (as per the statement of financial activities)	**1,146,366**	2,346,793
Adjustments for:		
Depreciation charge	**144,759**	125,211
Net gains on investments	**(690,815)**	(540,230)
Dividends and interest from investments	**(505,512)**	(429,590)
Decrease in debtors	**485,635**	89,232
(Decrease) increase in creditors	**(156,816)**	577,897
Net cash used in operating activities	**423,617**	2,169,313

B Analysis of cash and cash equivalents

	2024 £	2023 £
Total cash and cash equivalents: Cash at bank and in hand	**7,327,655**	7,415,452

C Reconciliation of net funds (debt)

	1 January 2024 £	Cash flows £	31 December 2024 £
Cash and cash equivalents	7,415,452	(87,797)	**7,327,655**
Loan	—	(2,625,000)	**(2,625,000)**
Net funds	7,415,452	(2,712,797)	**4,702,655**

PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted, judgements and key sources of estimation uncertainty in the preparation of the financial statements are laid out below.

Basis of preparation

These financial statements have been prepared for the year to 31 December 2024.

The financial statements have been prepared under the historical cost convention with items recognised at cost or transaction value unless otherwise stated in the relevant accounting policies below or the notes to these financial statements.

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (Charities SORP) the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) and the Charities Act 2011.

The charity constitutes a public benefit entity as defined by FRS 102.

The financial statements are presented in sterling and are rounded to the nearest pound.

Critical accounting estimates and areas of judgement

Preparation of the financial statements requires the trustees and management to make significant judgements and estimates.

The items in the financial statements where these judgements and estimates have been made include:

- the liability for multi-year grant commitments;
- the useful economic life of tangible fixed assets; and
- the classification of the loan as a concessionary loan.

Assessment of going concern

The trustees have assessed whether the use of the going concern assumption is appropriate in preparing these financial statements. The trustees have made this assessment in respect of a period of at least one year from the date of approval of these financial statements.

The trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased costs for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk, that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves Policy in the Trustees' report provides more detail.

The most significant areas of judgement that affect items in the financial statements are mentioned above and detail provided in the section on risks in the Trustees' report.

Income recognition

Income is recognised in the period in which the charity has entitlement to the income, the amount of income can be measured reliably and it is probable that the income will be received.

Income comprises donations, investment income, income from the sale of publications, membership subscriptions, and other related income.

Donations are recognised when the charity has confirmation of both the amount and settlement date. In the event of donations pledged but not received, the amount is accrued for where the receipt is considered probable. In the event that a donation is subject to conditions that require a level of performance before the charity is entitled to the funds, the income is deferred and not recognised until either those conditions are fully met, or the fulfilment of those conditions is wholly within the control of the charity and it is probable that those conditions will be fulfilled in the reporting period.

Legacies are included in the statement of financial activities when the charity is entitled to the legacy, the executors have established that there are sufficient surplus assets in the estate to pay the legacy, and any conditions attached to the legacy are within the control of the charity.

The Society has a contract with Oxford University Press for the publication of journals, which gives a percentage of the surplus made to 31 December each year to the Society. Although payments are received net, income is recognised in the financial statements on a gross basis which reflects that the Society retains the underlying long-term rights. All publication income is accounted for on a receivable basis.

Membership subscriptions are payable in respect of a twelve-month period in advance. The unearned portion of income received relating to the period after 31 December is carried forward as deferred income.

Investment income is recognised once the dividend has been declared and notification has been received of the dividend due.

Interest on funds held on deposit is included when receivable and the amount can be measured reliably by the charity; this is normally upon notification of the interest paid or payable by the bank.

Expenditure recognition

Expenditure is recognised as soon as there is a legal or constructive obligation committing the charity to the expenditure. All expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all costs related to the category.

Expenditure on charitable activities includes all costs associated with furthering the charitable purposes of the charity as described in the Trustees' Report.

Grants payable for the support of research or study in any areas of astronomy and geophysics are recognised in the financial statements as soon as the obligation has been authorised by the Grants Committee, which meets twice-yearly (ca. February and August) to allocate funds, the recipient has a reasonable expectation that they will receive a grant and any condition attaching to the grant is outside the control of the Society.

The costs of raising funds consist of room hire expenditure and RAS diaries bought for resale.

Allocation of support and governance costs

Support costs, including governance costs, represent indirect charitable expenditure. In order to carry out the primary purposes of the charity it is necessary to provide support in the form of personnel development, financial procedures, provision of office services and equipment and a suitable working environment.

Governance costs comprise audit fees, legal advice for trustees and costs associated with constitutional and statutory requirements, e.g. cost of trustee meetings and preparing statutory financial statements as well as costs associated with the strategic management of the Society

Support costs are apportioned based on the proportion of floor area occupied by, or proportion of staff time spent on, the activity.

Taxation

The Society is a registered charity and no liability to taxation arises on the results of its activities as applied for charitable purposes, with the exception of investment income, which is taxed at source.

Operating leases

Rentals under operating leases are charged to the statement of financial activities on a straight-line basis over the term of the lease.

Pension costs

The Society operates two pension schemes for employees and former employees. The assets of the schemes are held separately from those of the Society.

The Society operates a defined benefit pension scheme for former employees, who joined its service before 1 January 2002, providing benefits based upon final pensionable earnings. Royal London manages the pension scheme, with the investments now 100% held by Royal London.

The latest actuarial valuation at 31 December 2021 shows a pension surplus which is not recognised on the balance sheet as an asset because it is not available to the Society by way of reduced future contributions.

Actuarial gains and losses arising from new valuations and from updating valuations to the balance sheet date are recognised in the statement of financial activities as other recognised gains and losses.

The Society has established a second pension scheme (a defined contribution scheme) for employees who began service with the Society after 1 January 2002. The amount charged in the statement of financial activities in respect of the defined contribution pension scheme is the contributions payable in the year.

Heritage assets

Heritage assets are included in the financial statements at a historic valuation which is being treated as deemed cost. There are two main classes of heritage assets that the Society possesses, which are:

- Rare Books and Manuscripts
- Fine Art and Collectibles – Historic books, portraits, busts, instruments and antique furniture.

The Society's rare book and manuscript collection is reported in the balance sheet at a valuation by Christies in 1996, with a number of items re-valued by B Quaritch Limited in 2011. The valuation basis was High Auction Estimate.

The Society's fine art and collectibles are reported in the balance sheet at a valuation by Bonhams in 1992, including index linking, with a number of items revalued by Bonhams in 2011.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. The Society would only obtain a valuation of the donation, if it was deemed to materially affect the overall value of the heritage asset portfolio.

Depreciation is not charged on heritage assets due to immateriality based on their extremely long useful lives and high residual values.

Other tangible fixed assets

The Society capitalises tangible fixed assets with a cost greater than £250 and an estimated useful life over one year.

Tangible fixed assets are depreciated on cost on a straight-line basis from the date of acquisition over their expected useful lives as follows:

- Long leasehold property ..... 50 years
- Leasehold Improvements ..... 20 years
- Telephone, security system and computer equipment..... 4 years
- Plant and machinery ..... 10 years

Investments

Listed investments are a form of basic financial instrument and are initially recognised at their transaction value and subsequently measured at their fair value as at the balance sheet date using the closing quoted market price.

Realised gains (or losses) on investment assets are calculated as the difference between disposal proceeds and their opening carrying value or their purchase value where the investment is acquired subsequent to the first day of the financial year. Unrealised gains and losses are calculated as the difference between the fair value at the year end and their carrying value at that date. Realised and unrealised investment gains (or losses) are combined in the statement of financial activities and are credited (or debited) in the year in which they arise.

Debtors

Debtors are recognised at their settlement amount, less any provision for non-recoverability. Prepayments are valued at the amount prepaid.

Cash at bank and in hand

Cash at bank and in hand represents such accounts and instruments that are available on demand or have a maturity of less than three months from the date of acquisition.

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt. Concessionary loans are recognised at the amount received with the carrying amount adjusted in subsequent years to reflect repayments and any accrued interest.

Fund structure

Endowment funds comprise assets which normally must be held as capital. The income arising therefrom is used to support specific activities determined in accordance with the wishes of the donor.

Restricted funds comprise monies raised for, or their use restricted to, a specific purpose, or contributions subject to donor imposed conditions.

Designated funds represent monies set aside out of unrestricted funds and designated by the trustees for a specific purpose.

Unrestricted funds represent those monies which are freely available for application towards achieving any charitable purpose that falls within the Society's charitable objects.

1. Donations and legacies

	Unrestricted funds £	Restricted funds £	Endowment funds £	2024 Total funds £
Donations	**26,249**	**570**	**1,250**	**28,069**
2024 Total funds	**26,249**	**570**	**1,250**	**28,069**

	Unrestricted funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Donations	1,176	991	—	2,167
Legacies	10,000	—	—	10,000
2023 Total funds	11,176	991	—	12,167

2. Investment income

	Unrestricted funds £	Restricted funds £	Endowment funds £	2024 Total funds £
Income from listed investments	**153,334**	**9,482**	**59,461**	**222,277**
Bank interest	**206,149**	**10,602**	**66,484**	**283,235**
2024 Total funds	**359,483**	**20,084**	**125,945**	**505,512**

	Unrestricted funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Income from listed investments	155,914	9,670	60,379	225,963
Bank interest	143,974	8,235	51,418	203,627
2023 Total funds	299,888	17,905	111,797	429,590

3. Income from charitable activities

	Unrestricted funds	
	2024 £	2023 £
Publications (note 4)	**4,173,081**	6,209,917
Membership	**373,171**	370,606
Scientific meetings	**33,871**	30,225
Public policy	**2,555**	731
Library	**2,606**	3,492
Educational	**11,750**	210
Other	**12,000**	12,576
Total funds	**4,609,034**	6,627,757

4. Publications

	2024 £	2023 £
Income (see note)		
Monthly notices of the Royal Astronomical Society	**3,424,155**	4,758,987
Geophysical Journal International	**603,347**	1,278,672
Astronomy & Geophysics	**77,422**	106,360
Royal Astronomical Society Techniques & Instruments	**63,702**	60,032
Other	**4,455**	5,866
	4,173,081	6,209,917
Expenditure		
Monthly notices of the Royal Astronomical Society	**2,294,268**	2,735,624
Geophysical Journal International	**439,399**	686,333
Astronomy & Geophysics	**205,188**	187,045
Royal Astronomical Society Techniques & Instruments	**64,871**	56,020
Other	**7,502**	5,982
	3,011,228	3,671,004

Publications income in 2023 included a sum the Society received for renewal of the publishing agreement with Oxford University Press.

5. Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2024 £	Direct costs £	Support costs £	2023 £
Publications (note 4)	**2,499,505**	**511,723**	**3,011,228**	3,196,294	474,710	3,671,004
Scientific meetings	**46,250**	**252,225**	**298,475**	96,917	229,999	326,916
Membership	**7,445**	**58,179**	**65,624**	10,377	54,618	64,995
Educational	**378,328**	**110,619**	**488,947**	343,340	93,225	436,565
RAS 200	**2,149**	**350**	**2,499**	18,602	3,000	21,602
Library	**127,349**	**501,370**	**628,719**	104,699	445,004	549,703
Public policy	**88,727**	**105,579**	**194,306**	94,379	91,353	185,732
	3,149,753	**1,540,045**	**4,689,798**	3,864,608	1,391,909	5,256,517

Grants, fellowships and awards in support of research are principally included under Educational and RAS 200 above to reflect the responsibilities for the management and administration of grants. 113 grants, fellowships and awards, totalling £ 257,975 (2023 – £252,511) were awarded to institutions and 38 grants, medals and awards totalling £32,723 (2023 – £20,683) were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £35,733 (2023 - £35,365). The 2024 Norman Lockyer Fellowship totalled £57,000. Adjustments to other grants resulted in credits to expenditure totalling £15,458 (2023 – £21,768).

Total grant making support costs were £40,000 (2023 - £36,000).

A full list of all grantees and analysis can be found on the Society's website.

All expenditure on charitable activities is unrestricted except for £62,776 (which is entirely included within the educational category) which is restricted (2023 – £64,185).

6. Support costs

Support costs analysed by function are as follows:

	2024 £	2023 £
Executive	**145,648**	144,233
Finance	**125,465**	100,298
Facilities	**135,256**	112,288
Membership	**49,130**	47,534
IT	**186,967**	154,975
Policy, development and press	**149,586**	118,719
Burlington House	**207,980**	173,584
Other	**353,788**	379,035
Governance (note 7)	**186,225**	161,243
	1,540,045	1,391,909

Staff time (based on a review of staff time apportionment) and floor area, are used as bases of apportioning support costs over charitable activities.

7. Governance costs

	2024 £	2023 £
Auditor's remuneration	**30,840**	25,510
Trustees' and Committee costs	**38,649**	41,235
AGM expenses	**5,692**	4,330
Staff time and other expenses	**111,044**	90,168
	186,225	161,243

8. Net income (expenditure) for the year

This is stated after charging:

	2024 £	2023 £
Depreciation	**144,759**	125,211
Auditor's remuneration:		
. Charity audit	**21,500**	19,600
. Pension scheme audit	**—**	5,160
. Other services	**9,340**	750
Operating lease rentals		
. Office equipment	**9,229**	10,830

9. Staff costs and remuneration of key management personnel

	2024 £	2023 £
Wages and salaries	**1,150,735**	1,035,906
Social security costs	**116,969**	110,409
Pension costs (see note 20)		
. Stakeholder pension scheme	**91,319**	86,248
. Death in service contributions	**9,853**	8,469
	1,368,876	1,241,032

During the year one employee earned between £90,000 and £100,000 (2023 -one employee) one employee of the Society earned between £80,000 and £90,000 (2023 – no employee), one employee earned between £70,000 and £80,000 (2023 – one employee) and no employee earned between £60,000 and £70,000 (2023 – one employee). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £26,757 (2023 – £24,080).

The average number of employees was 25 (Administration 8, Outreach 2, Editorial 10, Library 2, House 1, Press & Policy 2) (2023 – 23).

The key management personnel of the charity in charge of directing and controlling, running and operating the charity on a day to day basis comprise the trustees and the Executive and Deputy Executive Directors. The total remuneration (including taxable benefits and employer's pension and national insurance contributions) of the key management personnel for the year was £224,272 (2023 - £222,491).

10. Transactions with trustees

The trustees receive reimbursement for travel expenses incurred in attending meetings. The amount reimbursed during the year for 17 trustees was £23,942 (2023 – £23,891).

Remuneration of £2,613 was paid to one trustee during 2024 (2023 – £11,510 to two trustees). By agreement with the Charity Commissioners (dated 14 June 2004, case No. 299189, Sealing No. 344/04) the Treasurer is paid an Honorarium. This is formally approved each year by Council.

Grants Made to Councillors

The following grants were made to Councillors during the year as part of the RAS grant awarding process. The recipients had no influence or part in the decisions on the award of these grants. For the most part the grant holders were not the main personal beneficiaries as the support was directly received by their students or meeting attendees. Excluding Councillors from the grants round completely is not seen as a satisfactory policy. It would strongly dissuade members from standing for election as Councillors and would be at variance with the accepted practice in Research Councils where members of grants panels are not excluded from applying. The process of grant review and award fully complies with the Nolan Principles and closely follows Government Research Council practice. The grants were:

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of trustees as the Society).
- F A Paneth Meteorite Collection as disclosed in note 22. Dr Arvind Parmar, Treasurer, is a trustee
- A £1,000 P Tomkins Thesis Prize and a £2,000 P Tomkins Foundation Instrumentation Grant were awarded during the year. Patricia Tomkins is a trustee.
- The Society awarded funding of £4,000 to the British Geophysical Association (BGA). BGA Committee members Prof James Hammond and Prof Andrew Curtis are trustees.
- A £1,200 Summer Undergraduate Research Bursary was awarded to the University of Southampton. The supervisor was Dr Matthew Middleton, trustee

11. Tangible fixed assets

a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	**Total £**
At 1 January 2024 and 31 December 2024	4,951,500	4,519,379	**9,470,879**

Fine art and collectible additions of £30,000 were recorded in 2020. There were no other additions in the last five years.

The rare book collection is preserved by storing in an air-conditioned, temperature-controlled environment; the fine art and collectibles are also continually preserved in order to maintain their values.

Certain heritage assets are on public display at exhibitions. The Society's Librarian controls access to those heritage assets which are kept at Burlington House.

b) Other assets

	Long Leasehold property £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	**Total £**
Cost					
At 1 January 2024	1,888,479	38,875	366,947	9,994	**2,304,295**
Additions	3,537,806	—	103,572	548	**3,641,926**
Disposals	—	—	(86,828)	—	**(86,828)**
At 31 December 2024	**5,426,285**	**38,875**	**383,691**	**10,542**	**5,859,393**
Depreciation					
At 1 January 2024	1,483,149	24,950	314,180	—	**1,822,279**
Charge for the year	107,759	3,888	33,112	—	**144,759**
Disposals	—	—	(86,828)	—	**(86,828)**
At 31 December 2024	**1,590,908**	**28,838**	**260,464**	—	**1,880,210**
Net book values					
At 31 December 2024	**3,835,377**	**10,037**	**123,227**	**10,542**	**3,979,183**
At 31 December 2023	405,330	13,925	52,767	9,994	482,016

12. Investments

	2024 Total funds £	2023 Total funds £
Market value at 1 January 2024	**9,696,013**	9,155,783
Net unrealised investment gains	**690,815**	540,230
Market value at 31 December 2024	**10,386,828**	9,696,013
Historical cost as at 31 December 2024	**4,917,081**	4,917,081

Investments comprise BNY Mellon: Newton Growth and Income Fund for Charities

The permanent endowment fund investments and movements in the unapplied total return are set out below.

	Trust for investment £	Unapplied total return £	Total endow-ment £
At 1 January 2024	**1,652,682**	**527,968**	**2,180,650**
Add: Total return			
. Investment income & donation	—	**127,195**	**127,195**
. Net gains on listed investments	—	**184,699**	**184,699**
	—	**311,894**	**311,894**
Less: Extraction of Income from total return	—	**(281,057)**	**(281,057)**
At 31 December 2024	**1,652,682**	**558,805**	**2,211,487**

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2023	1,652,682	271,819	1,924,501
Add: Total return			
. Investment income	—	111,797	111,797
. Net gains on listed investments	—	144,352	144,352
	—	256,149	256,149
At 31 December 2023	1,652,682	527,968	2,180,650

When adopting total applied return with effect from 1 January 2015, in the absence of reliable records of the original donations, the trustees considered that the market values of the investments as recorded as at 1 January 2015 were appropriate to be considered as the initial value of the trust for investment. Since that figure sets the baseline below which disposals may not be made, taking a higher value than the actual original donations was considered to be prudent.

The trustees have resolved that they wish to maintain the real value of the permanent endowment using the consumer price index as a measure. £281,057 was transferred to the restricted funds in the year (2023 – £nil).

13. Debtors

	2024 £	2023 £
Trade debtors	**41,195**	5,346
Prepayments and accrued income	**524,505**	1,046,255
Other debtors	**925**	659
	566,625	1,052,260

14. Creditors

a) Amounts falling due within one year

	2024 £	2023 £
Trade creditors	**25,211**	28,486
Loan (see note 14b)	**262,500**	—
Accruals	**116,552**	107,788
Grants payable	**209,648**	168,647
Tax and social security	**246,659**	552,937
Deferred income	**1,349,066**	1,299,417
Other creditors	**109,435**	71,472
	2,319,071	2,228,747

b) Amounts falling due after more than one year

	2024 £	2023 £
Grants payable	**79,359**	63,999
Loan (see note below)	**2,362,500**	—
	2,441,859	63,999

The loan is from the Department for Levelling Up, Housing and Communities, supporting the purchase of the 999 year lease of Burlington House and is repayable over ten years in equal instalments but with early repayment permitted. Interest is payable at 5.8%. The loan is a concessionary loan.

c) Deferred income

	2024 £	2023 £
Balance as at 1 January 2024	**1,299,417**	1,038,917
Released to income	**(1,299,417)**	(1,038,917)
Income received from Fellows in advance	**71,269**	47,428
Publications income received in advance	**1,250,919**	1,250,000
Other income received in advance	**26,878**	1,989
Balance as at 31 December 2024	**1,349,066**	1,299,417

15. Endowment funds

	1 January 2024 £	Income £	Investment gains £	Transfers between funds £	31 December 2024 £
Research and Grants funds:					
. Sir Norman Lockyer fund	**1,686,954**	**97,431**	**142,883**	**(217,182)**	**1,710,086**
. Other funds	**169,176**	**9,771**	**14,329**	**(21,688)**	**171,588**
	1,856,130	**107,202**	**157,212**	**(238,870)**	**1,881,674**
Benevolent fund	**106,183**	**7,383**	**8,994**	**(14,866)**	**107,694**
Library fund	**50,437**	**2,913**	**4,272**	**(6,467)**	**51,155**
Lectures & Awards fund	**167,900**	**9,697**	**14,221**	**(20,854)**	**170,964**
	2,180,650	**127,195**	**184,699**	**(281,057)**	**2,211,487**

	1 January 2023 £	Income £	Investment gains £	Transfers between funds £	31 December 2023 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,488,797	86,486	111,671	—	1,686,954
. Other funds	149,304	8,673	11,199	—	169,176
	1,638,101	95,159	122,870	—	1,856,130
Benevolent fund	93,711	5,444	7,028	—	106,183
Library fund	44,512	2,586	3,339	—	50,437
Lectures & Awards fund	148,177	8,608	11,115	—	167,900
	1,924,501	111,797	144,352	—	2,180,650

16. Restricted income funds

	1 January 2024 £	Income £	Expenditure £	Investment gains £	Transfers between funds £	31 December 2024 £
Research & Grants fund	**741,144**	**10,045**	**(60,000)**	**14,732**	**238,870**	**944,791**
Benevolent fund	**41,597**	—	**(776)**	—	**14,866**	**55,687**
Library fund	**51,926**	**1,676**	—	**2,458**	**6,467**	**62,527**
Education fund	**144,788**	**8,933**	**(1,000)**	**12,264**	—	**164,985**
Lectures & Awards fund	**56,667**	—	**(1,000)**	—	**20,854**	**76,521**
	1,036,122	**20,654**	**(62,776)**	**29,454**	**281,057**	**1,304,511**

	1 January 2023 £	Income £	Expenditure £	Investment gains £	Transfers between funds £	31 December 2023 £
Research & Grants fund	781,837	8,994	(61,300)	11,613	—	741,144
Benevolent fund	41,815	—	(218)	—	—	41,597
Library fund	48,517	1,488	—	1,921	—	51,926
Education fund	127,789	8,414	(1,000)	9,585	—	144,788
Lectures & Awards fund	58,334	—	(1,667)	—	—	56,667
	1,058,292	18,896	(64,185)	23,119	—	1,036,122

16. Restricted income funds (continued)

The Restricted Funds are consolidated into five groups to serve the Council's priorities and address modern needs: Research & Grants, Benevolent, Library, Education and Lectures & Awards.

A detailed fund summary can be found on the RAS website.

The restricted funds were classified to either Restricted (R), Endowment (E), Designated (D), or General (G) funds as indicated below:

Research & Grants fund

E AG Stillhamer Trust Fund (1937)

D EW Brown Trust Fund (1939)

E Plummer Bequest (1946)

G General

R Victor Nadarov Fund (1950)

E Sir Norman Lockyer Memorial Trust (1990)

R Hosie Bequest (2000)

D Mrs. J.M Jelley-Freeman Bequest (2000)

D CAG Bearpark Trust (2000)

R Patricia Tomkins Fund (2011)

G Special Purposes Fund

E E A Milne Travel Fund (2013)

R R Potter Research Fund (2017)

R Osmaston Fund (2020)

Benevolent fund

E Lee & Jansen Trust Fund (1834/1879)

E Gerald Merton Fund (1986)

G Donald R. Barber Fund (2001)

Library fund

E Turnor Fund and Horrocks Memorial Fund (1853/1876)

E Harry Watson Memorial Fund (1923)

E Warin Bushell Fund (1964)

E Gaythorp Bequest (1969)

E Ian Ridpath Conservation Fund (2006)

R Dewhurst Fund (2013)

Education fund

R Newbigen Fund (1990)

R Michael Penston Memorial Fund (1991)

R Sir William Hunter McCrea Memorial Fund (2000)

R Paul Ruffle Memorial Fund (2014)

D Education Committee

Lectures & Awards fund

E Hannah Jackson-Gwilt Trust Fund (1861/1893)

E George Darwin Lectureship Fund (1926)

E George Darwin Support Fund

D AS Eddington Commemoration Fund (1948)

E Harold Jeffreys Lectureship Fund (1962)

E AT Price Medal Fund (1999)

E Gerald Whitrow Memorial Lecture Fund (2001)

E Fowler Prizes Fund (2004)

17. Designated funds

	1 January 2024 £	New designations £	Utilised/ released £	Transfers £	31 December 2024 £
Tangible fixed assets fund	**3,000,000**	**759,732**	**(144,759)**	**364,210**	**3,979,183**
Burlington House fund	**364,210**	**—**	**—**	**(364,210)**	**—**
Heritage Asset fund	**9,470,879**	**—**	**—**	**—**	**9,470,879**
Building fund	**1,500,248**	**93,964**	**—**	**—**	**1,594,212**
Open Access fund	**385,097**	**—**	**(30,000)**	**—**	**355,097**
Research and grants fund	**150,000**	**175,000**	**(149,815)**	**—**	**175,185**
Total designated funds	**14,870,434**	**1,028,696**	**(324,574)**	**—**	**15,574,556**

17. Designated funds (continued)

	1 January 2023 £	New designations £	Utilised/ released £	Transfers £	31 December 2023 £
Accommodation fund	1,500,000	1,500,000	—	—	3,000,000
Burlington House fund	458,823	—	(94,613)	—	364,210
Heritage Asset fund	9,470,879	—	—	—	9,470,879
Building fund	1,405,635	94,613	—	—	1,500,248
Open Access fund	392,596	—	(7,499)	—	385,097
RAS 200	55,503	—	(55,503)	—	—
Research and grants fund	102,452	47,548	—	—	150,000
Total designated funds	13,385,888	1,642,161	(157,615)	—	14,870,434

(i) Tangible fixed assets fund (previously Accommodation fund)

This fund is now represented by the net book value of the charity's tangible fixed assets including Burlington House and recognises that this amount is not readily available to meet expenditure. Previously this fund represented funds set aside for accommodation at Burlington House or elsewhere.

(ii) Burlington House fund

This fund has now been merged with the Tangible fixed assets fund following the purchase of the lease. In 2006-7, the Society executed a refurbishment project on the interior of the apartments. Expenditure incurred on the project was capitalised and designated as the Burlington House fund.

(iii) Heritage Asset fund

A fund has been established to include the Society's heritage assets to recognise that there is no intention to dispose of these assets and the amount is not readily available to meet expenditure.

(iv) Building fund

The repairs and maintenance of the exterior of the building, its insurance and some security costs were previously carried out by the landlord for all the occupants and a proportion recharged to the Society. The purchase of the lease places the liability for backlog maintenance, environmental regulation compliance and accessibility improvements on the Society. The Finance Committee will recommend how much more to accumulate in this fund and at what rate. The timescale for expenditure is difficult to forecast but in principle could start within five years.

(v) Open Access fund

A fund has been established to provide against the risk of the possible loss of income from publishing due to the adoption of Open Access. The timescale for expenditure is difficult to forecast but could in principle start within five years.

(vi) RAS 200

The original fund balance of £1,000,000 was the total committed grant expenditure for RAS 200. RAS 200 grant expenditure was being charged to this fund from 2015 to 2023.

(vii) Research and grants fund

This represents those funds to be used for research and grants.

18. Analysis of net assets between funds

Fund balances at 31 December 2024 are represented by:

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2024 Total funds £
Tangible assets					
. Heritage assets	**—**	**9,470,879**	**—**	**—**	**9,470,879**
. Other fixed assets	**—**	**3,979,183**	**—**	**—**	**3,979,183**
Investments	**5,276,618**	**1,594,212**	**1,304,511**	**2,211,487**	**10,386,828**
Current assets					
. Debtors	**566,625**	**—**	**—**	**—**	**566,625**
. Cash at bank and in hand	**4,096,341**	**3,155,282**	**76,032**	**—**	**7,327,655**
Current liabilities	**(1,980,539)**	**(262,500)**	**(76,032)**	**—**	**(2,319,071)**
Non-current liabilities	**(79,359)**	**(2,362,500)**	**—**	**—**	**(2,441,859)**
Total net assets	**7,879,686**	**15,574,556**	**1,304,511**	**2,211,487**	**26,970,240**

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Tangible assets					
. Heritage assets	—	9,470,879	—	—	9,470,879
. Other fixed assets	76,686	405,330	—	—	482,016
Investments	4,343,369	2,135,872	1,036,122	2,180,650	9,696,013
Current assets					
. Debtors	1,052,260	—	—	—	1,052,260
. Cash at bank and in hand	4,358,452	3,000,000	57,000	—	7,415,452
Current liabilities	(2,094,099)	(77,648)	(57,000)	—	(2,228,747)
Non-current liabilities	—	(63,999)	—	—	(63,999)
Total net assets	7,736,668	14,870,434	1,036,122	2,180,650	25,823,874

19. Leasing commitments

At 31 December 2024, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

Office equipment	**2024 £**	2023 £
Amounts payable within one year	**6,183**	6,390
Amounts payable between two and five years	**16,433**	20,188
	22,616	26,578

20. Pension schemes

A qualified actuary carried out a triennial review of the defined benefit scheme as at 1 January 2022; the actuarial valuation showed that the market value of the Scheme's assets was £1,009,000 which represents 124% of the benefits that accrued to members after allowing for expected future increases in earnings. The actuary has calculated that no contributions are payable from 1 January 2016.

20. Pension schemes (continued)

Pension costs comprise £91,319 (2023 – £86,248) in respect of the defined contribution scheme and £9,853 (2023 – £8,469) in respect of Death in Service contributions.

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS 102 purposes, at 31 December 2024, shows a pension surplus of £423,000 (2023 – £473,000) which cannot be recognised as this is not available to the Society by way of reduced future contributions.

The amounts recognised in the balance sheet are as follows:

	2024 £'000	2023 £'000
Present value of funded obligations	**(121)**	(121)
Fair value of scheme assets	**544**	594
Surplus not recognised	**(423)**	(473)
Surplus in scheme at end of the year and available to the Society	**—**	—

Changes in the present value of the defined benefit obligations are as follows:

	2024 £'000	2023 £'000
Opening defined benefit obligation	**121**	259
Interest cost	**6**	9
Re-measurement arising from changes in assumptions and experience	**(6)**	51
Benefits paid	**—**	(198)
Closing defined benefit obligation	**121**	121

Changes in fair value of scheme assets are as follows:

	2024 £'000	2023 £'000
Opening scheme assets	**594**	766
Interest Income	**28**	34
Actual return on plan assets, excluding interest income	**(78)**	(8)
Benefits paid	**—**	(198)
Closing scheme assets	**544**	594

The amounts recognised in other recognised gains and losses are as follows:

	2024 £'000	2023 £'000
Remeasurement of defined benefit obligation	**(6)**	51
Return on plan assets	**78**	8
Effect of surplus restriction	**(72)**	(59)
Total	**—**	—

The actual return on scheme assets was negative £ 50,000 (2023 – positive £26,000).

20. Pension schemes (continued)

Retirement benefits disclosure under FRS102 (continued)

The major categories of scheme assets as a percentage of total scheme assets are as follows:

	Proportion of scheme assets	
	2024 %	2023 %
Equities	**1**	1
Bonds	**1**	1
Cash	**5**	6
Gilts	**93**	92
	100	100

Principal actuarial assumptions at the balance sheet date (expressed as a weighted average):

	2024 %	2023 %
Discount rate at 31 December	**5.6**	4.7
Retail Prices Index	**3.0**	3.0
Consumer Prices Index	**2.5**	2.4
Increases in deferment	**2.5**	2.4
Future pension increases – pension earned before 6 April 1997	**0.0**	0.0
Future pension increases – pension earned on or after 6 April 1997	**3.0**	3.0

The current mortality rate assumptions include sufficient allowance for future improvements in mortality rates. The assumed life expectancy for a pensioner retiring at 65 on the balance sheet date is:

	2024 No.	2023 No.
Retiring now		
Male	**20.9**	19.7
Female	**23.4**	21.9
Retiring in 20 years		
Male	**22.1**	20.9
Female	**24.8**	23.3

Amounts for the current and previous four periods are as follows:

Defined benefit pension scheme:

	2024 £'000	2023 £'000	2022 £'000	2021 £'000	2020 £'000
Defined benefit obligations	**121**	121	259	537	548
Scheme assets	**544**	594	766	1,009	916
Surplus	**423**	473	507	472	368

21. Grants committed

Grants, principally fellowships and travel and research grants to the value of £373,500 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2023 – £285,250). These grants were not approved or communicated to the recipients until after the year end and therefore have not been accounted for in the year ended 31 December 2024.

22. Connected Charities and related party transactions

Since 2001, the Society has been the administration agent for the trustees of FA Paneth Meteorite Collection, a charity connected to the Royal Astronomical Society. The Paneth trustees decided that its income should support research in Cosmochemistry by graduate and postdoctoral students. The accumulated net expenditure of £51,262 (2023 – £50,908), is included in Other Creditors. Grants awarded in 2024 totalled £10,377 (2023 - £10,800). Total income was £ 11,210 (2023 - £11,399).

The Society also administers the Sir Norman Lockyer Memorial Trust, (charity registration number 900135). By agreement with the Charity Commission the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836-1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2019, 2022, 2025 etc. for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. During the year The Norman Lockyer Fellowship funded one fellowship. Expenditure for the year amounted to £ 57,000 (2023 - £57,000). The fund balance, including the unspent balance in the restricted fund is £2,383,859 (2023 – £2,200,545).

Transactions involving trustees are also disclosed in note 10.



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ROYAL ASTRONOMICAL SOCIETY

England & Wales - Charity number 226545

Accounts



Annual Report & Financial Statements 2023

Royal Astronomical Society

Royal Astronomical Society

Trustees

Council Members who served during 2023

Prof. Mike Edmunds (President, University of Cardiff)
Prof. Mike Lockwood (President-Elect from May 2023, University of Reading)

Dr Mandy Bailey (Senior Secretary, A, until May 2023 Open University)
Dr Jo Barstow (Councillor, A, Open University)
Dr Nigel M Berman (Treasurer, A, until September 2023)
Prof. Mike Cruise (Interim Treasurer, A, from September 2023, University of Birmingham)
Dr Alan Cayless (Councillor A from May 2023, Open University, retired)
Prof. Phil Charles (Councillor, A, until May 2023, University of Southampton)
Prof. Andrew Curtis (Vice-President, G, from May 2023, University of Edinburgh)
Dr Hannah Dalgleish (Councillor, A, until May 2023, University of Oxford/Armagh Observatory and Planetarium)
Prof. Stephen Eales (Vice President, A, University of Cardiff)
Dr Imogen Gingell (Councillor G from May 2023, University of Southampton)
Prof. James Hammond (Secretary, G, from May 2023, Birkbeck College)
Dr Olivia Keenan (Councillor, A, King's College London)
Prof. Mark Lester (Secretary, G, until May 2023, Senior Secretary from May 2023, University of Leicester)
Dr Matthew Middleton (Vice-President, A, from May 2023, University of Southampton)
Prof. Steven Miller (Councillor, G, University College London)
Dr Arvind Parmar (Councillor, A, until May 2023, European Space Agency)
Prof. Nick Rawlinson (Vice-President, G, University of Cambridge)
Prof. Ian Robson (Vice-President, A, until May 2023, University of Edinburgh, STFC)
Dr Jasmine Kaur Sandhu (Councillor, G, University of Leicester)
Prof. Caroline Smith (Councillor, G, Natural History Museum)
Dr Colin Snodgrass (Councillor, G, until May 2023, University of Edinburgh)
Dr Ashley Spindler (Councillor, A, from May 2023, University of Hertfordshire)
Mrs Patricia Tomkins (Councillor, A)
Dr Sheona Urquhart (Secretary, A, Open University)
Prof. Clare Watt (Vice President, G, Northumbria University)
Prof. Derek Ward-Thompson (Councillor, A, from May 2023, University of Central Lancashire)
Prof. Belinda Wilkes (Councillor, A, University of Bristol)
Prof. Silvia Zane (Councillor, A, University College London)

- Note: 'A' signifies all areas of astronomy and astrophysics; 'G' covers geophysics, solar-terrestrial physics and planetary sciences.

Senior staff

Executive Director: Philip Diamond
Deputy Executive Director: Dr Robert Massey

Registered and Principal Office

Burlington House
Piccadilly
London
W1J 0BQ

Charity registration number

226545

Auditor

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London
EC2V 6DL

Bankers

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West End Corporate Banking Centre
70 Pall Mall
London
SW1Y 5EZ

National Westminster Bank
St James' & Piccadilly Branch
PO Box 2 DG
208 Piccadilly
London
SWJ 9HE

Investment managers

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The Bank of New York Mellon Centre
160 Queen Victoria Street
London
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Solicitors

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Our Mission & Values

Our Mission Statement

The Royal Astronomical Society supports and connects astronomers and geophysicists, in the UK and globally, throughout their careers. We assist them to sustain and advance the rigorous scientific study of the origins and evolution of our own planet and the whole wider cosmos. We promote a better understanding of the relevance and value of our subjects throughout all society, from inspiration for young people to advice to government.

Our Values

We are a supportive community

We are passionately curious about the universe, and recognise the importance of mutual support in its study. We are custodians of the past, learning from the history of our sciences but looking to apply our knowledge for the future. We promote the need for vital research support, for appropriate collaboration and scrutiny, and for the sharing of methods and results.

We share our expertise in astronomy and geophysics

We are a respected, independent, self-governing organisation, free to speak frankly on behalf of our members, the science and the profession. For over 200 years, we have been a credible, independent source of the latest scientific discoveries in the field. Within our resource limitations, we willingly provide professional advice on all aspects of our subjects.

We are an inclusive and welcoming Society

We celebrate and encourage diversity, understanding that every individual is unique and recognising and appreciating our individual differences. We will provide an inclusive environment where every member of the Society is welcome and supported, and acts with respect to all other members.

We play our role in understanding and protecting our environment

We care about the future of humanity, the sustainability of our planet and the impact of our activities. We seek to understand our role in the wider universe and use our knowledge and expertise to the benefit of humankind.

Welcome From Our President

It is a pleasure to introduce the Annual Report of the Royal Astronomical Society for 2023, and to start with Fellows of the Society who were recognised in the 2023 New Year Honours list. Congratulations to Prof Gillian Wright CBE, director of the UK Astronomy Technology Centre, Libby Jackson OBE, of the UK Space Agency, Prof Terry Moore OBE of the University of Nottingham and Sir Brian May CBE.

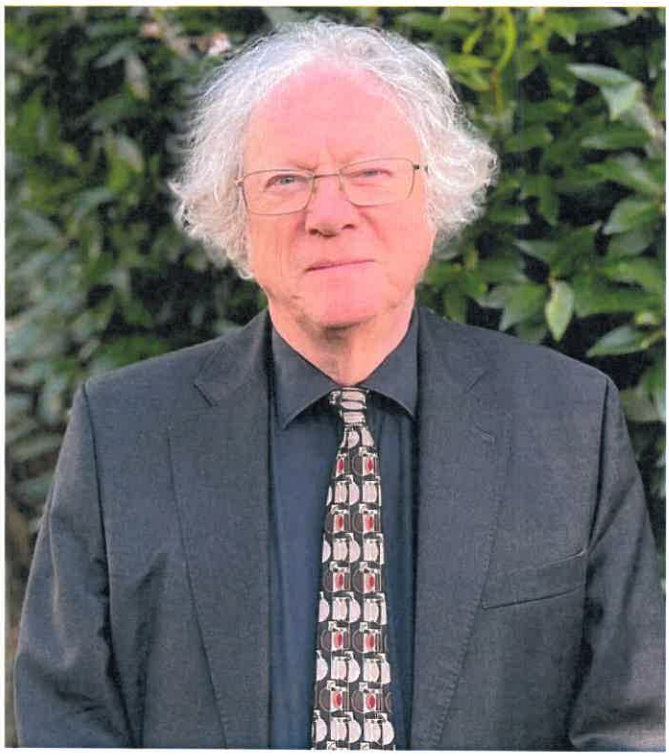
In 2023 the Society continued its excellent programme of scientific meetings, bringing a wide range of outstanding speakers to keep Fellows in touch with developments in their fields of interest. The hybrid format is a permanent feature of these meetings. We have now changed the name of our Ordinary meetings to A and G Highlights, which we feel better describes the nature of these meetings.

The National Astronomy Meeting in Cardiff this year was a great success. We were honoured to have the First Minister of Wales, the Rt Hon Mark Drakeford MS, give an inspirational welcome. He was characteristically on top of his brief, which perhaps cannot be said of all our political leaders.

In April Prof Gillian Wright was presented with the Caroline Herschel Medal from the Royal Astronomical Society and the German Astronomical Society. The ceremony was generously hosted by Miguel Berger, the German Ambassador to the UK, at his London home. Gillian is the first UK winner of this medal, and it was a pleasure to congratulate her in person.

Towards the end of the year, we held the first John Brown Memorial Lecture, honouring the esteemed late Astronomer Royal for Scotland and tireless supporter of the RAS. The University of Glasgow kindly hosted this fitting tribute to John's lifelong work at the interface between astronomy and the arts.

The Society continues to advocate on behalf of our communities. In September, the Parliamentary Science Innovation and Technology Committee launched an inquiry into the potential of UK Astronomy. The invitation to submit to the inquiry began with the words "Astronomy matters because it seeks to answer fundamental questions about the origins and evolution of the universe". It is gratifying



and, I would suggest, a testament to our work over many years, that what matters to us, also matters to those in the corridors of power.

At our December Council meeting the Trustees approved our strategy, which outlines objectives in five priority areas: meeting the needs of our members, education and outreach, library and heritage, publishing, and collaboration with external partners. Work has already begun. At a seminar to mark the completion of the very successful outreach programme RAS200, we heard how we and our partner organisations had benefitted. What we have learned is already informing our outreach strategy.

In March 2024, after many negotiations, I signed an agreement that secures our home in Burlington House on a 999-year lease. We now have stability, but also new responsibilities, including the upkeep of the building, and enhanced outreach for our Society and with our neighbours in Burlington House, in the future. Our work in this and in everything we do will succeed only with the willing support of our Council, committees, the RAS staff and our Fellows.

Prof Michael G Edmunds
President of the RAS 2023

Objectives

The RAS exists to advance, and to record the history of, our understanding of the Earth, the solar system, the stars and galaxies, and the nature of the universe. It does this by promoting astronomy and geophysics, interdisciplinary sciences that encompass and further our understanding of physics, chemistry, mathematics, biology, engineering and computer science to answer deep questions about the origin and fate of the cosmos, and people's place in it. Through this, the Society contributes to the growth and dissemination of knowledge and thereby fulfils its charitable objective of serving the public interest.

The Society refers to the Charity Commission's general guidance on Public Benefit when reviewing its aims and objectives and in planning future activities. These disclosures comply with the Charities Act 2011.

Our objectives for 2023 fell within two broad areas: advancing understanding and sharing knowledge. The organisation of the Society supports these goals.

During 2023, the RAS developed an overarching strategy for the next five years, and identified five key areas for development.

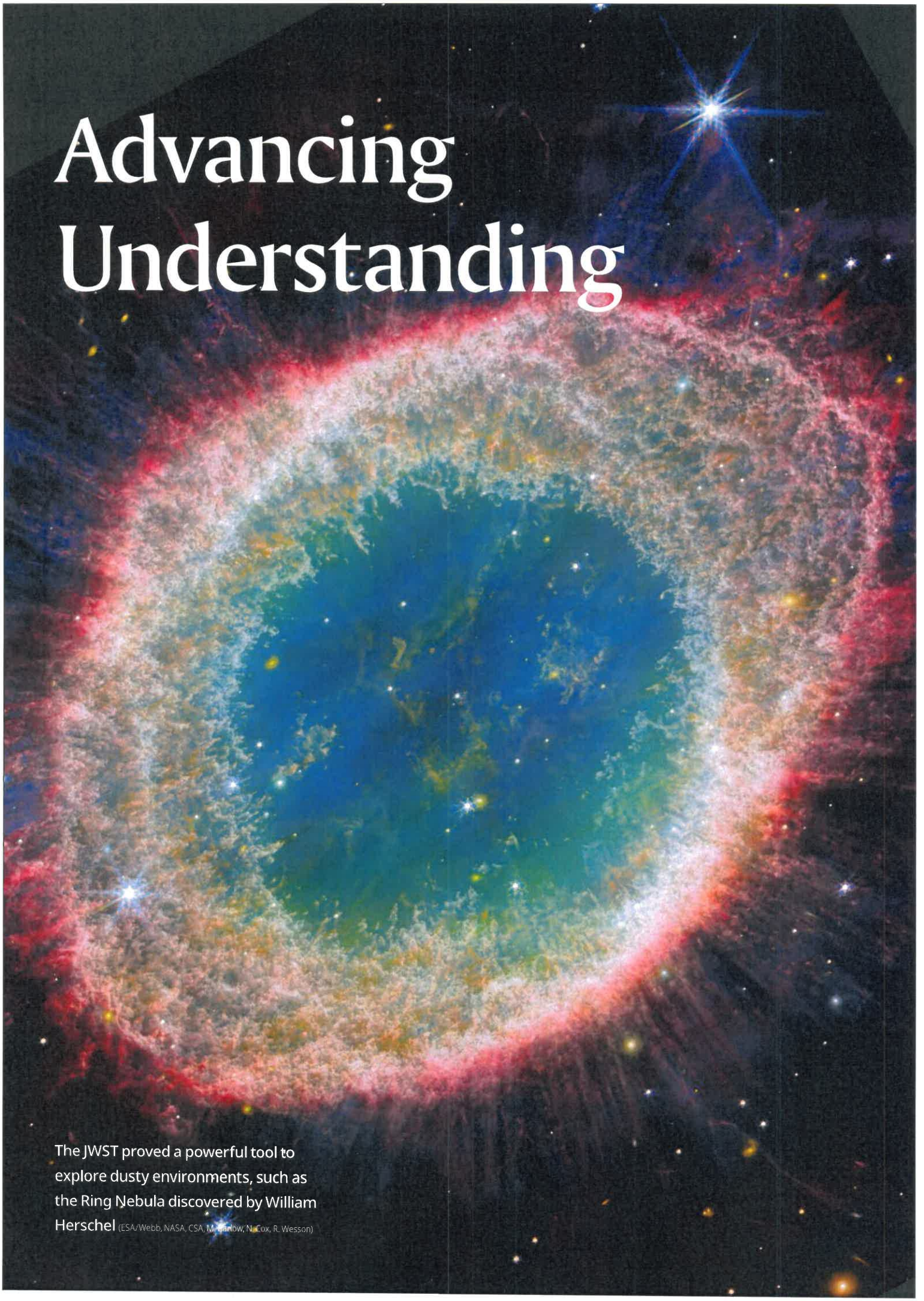
The Society's principal objectives are to:

- publish high-quality peer-reviewed journals;
- support students and early-career scientists through research fellowships and grants;
- recognise achievement through medals and prizes;
- maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures;
- sustain our Library and Archive service;
- continue our political engagement;
- maintain our programme of education and outreach activity, including Friends of the RAS;
- promote the work of the Society and Fellows in the media and on social media;
- build our outreach work with other Courtyard Societies.

In 2023 the Society worked, in addition, on:

- supporting and developing the Early Career Network;
- ensuring that the RAS nurtures, supports and improves diversity and inclusivity within its core community;
- increasing both the engagement and satisfaction of our Fellows;
- reviewing the RAS and Norman Lockyer Fellowship Schemes with a view to ensuring maximum impact;
- increasing the involvement of RAS Fellows in education and outreach activities;
- ensuring our subscription rates are fair, equitable and in line with modern best practice;
- achieving maximum impact from the library, archive and object collections, within available resources;
- increasing the impact, reach and focus of our public engagement activities by prioritising events targeted at under-served communities.

Advancing Understanding



The JWST proved a powerful tool to explore dusty environments, such as the Ring Nebula discovered by William Herschel (ESA/Webb, NASA, CSA, M. Barlow, N. Cox, R. Wesson)

Journals

The Society's journal portfolio consists of three peer-reviewed, scholarly publications: *Monthly Notices of the Royal Astronomical Society (MNRAS)*, *Geophysical Journal International (GJI)* and *RAS Techniques and Instruments (RASTI)*.

MNRAS is one of the world's leading astronomy journals and publishes articles in astronomy and astrophysics, including work which is observational, theoretical or concerned with astronomical instrumentation and software. The *MNRAS* editorial board of 26 scientific editors continues to be led by Prof David Flower as Editor-in-Chief. In 2023 MNRAS received 5045 submissions, published 4241 papers, and had 5,324,975 downloads. Its two-year impact factor for 2022 was 4.8.

GJI is an international journal publishing primary research articles on all aspects of theoretical, computational, experimental, applied and observational geophysics. The Editor-in-Chief, Prof Joerg Renner leads an editorial board of 33 scientific editors. In 2023 *GJI* received 1152 submissions, published 617 papers, and had 1,850,903 downloads. Its two-year impact factor for 2022 was 2.8.

The RAS's newest journal, RASTI, published it second volume in 2023. RASTI is broad in scope and encourages submission of papers that cover topics in both astronomy and geophysics, ranging from instrumentation, data science, machine learning, software, and numerical and statistical methods. The editorial board, led by Prof Jonathan Tennyson, consists of 15 academics appointed to ensure RASTI maintains the high editorial standards set by MNRAS and GJI. During 2023, RASTI received 73 submissions, published 56 articles and had 17,245 downloads.

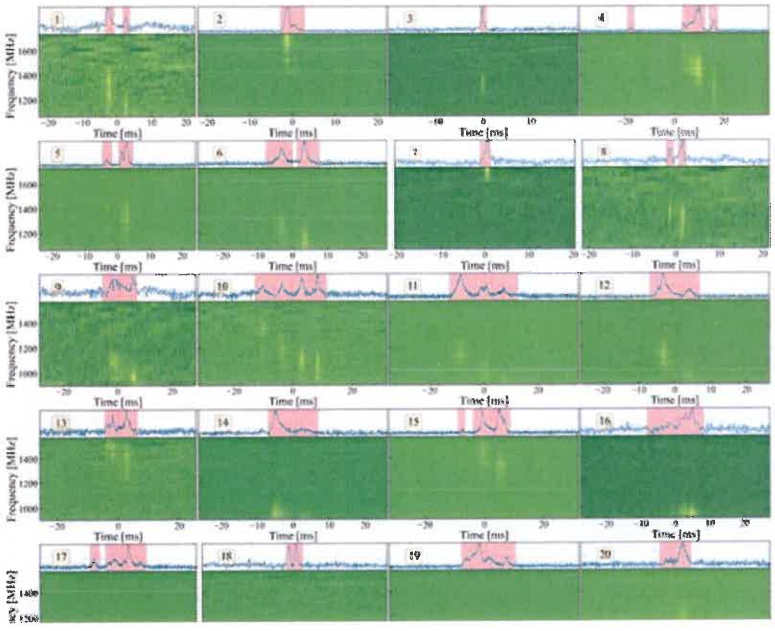
All three journals are published in partnership with Oxford University Press (OUP). OUP will remain the Society's publishing partner for the next five years until the end of 2028.

RASTI is a fully Open Access (OA) title which means authors pay an Article Processing Charge (APC) for publication. The payment of APCs allows worldwide access to the scholarly research in *RASTI*, removing barriers to readership and reuse.

MNRAS and *GJI* continued to be published as 'hybrid' journals during 2023 whereby OUP sells institutional subscriptions to the journals, at the same time as offering optional OA publication. The transition to fully OA for both *MNRAS* and *GJI* began on 1 October 2023. All papers accepted in late 2023, to be published in 2024 volumes of *MNRAS* and

The RAS is committed to advancing understanding of our sciences by:

- Publishing journals
- Supporting scientists financially with fellowships and grants
- Organising scientific meetings
- Recognising excellence through awards
- Running a Library and Archive for research
- Producing a magazine for our members
- Advocating for the community with government
- Promoting diversity in our community
- Supporting early-career researchers



Below: *A novel repeating fast radio burst with a distinctive frequency drop reported in* Monthly Notices of the Royal Astronomical Society. (Sofia Z. Sheikh et al., SETI Institute)

GJI, were processed as OA papers with Creative Commons licences.

Two part-time publishing managers manage the RAS journal team, and eight assistant editors oversee the administration of the peer review process. The peer review process on *RASTI* is provided by OUP. In April, the journal team, editors-in-chief and OUP presented their annual reports to the RAS Publications Management Committee.

There was an increase in journal marketing in 2023 to promote the move to OA. OUP organised marketing that included 'Why Publish?' webpages, calls for papers, online adverts, email campaigns, high-impact article collections and booths at the American Astronomical Society, European Geophysical Union and American Geophysical Union Conferences. The RAS also exhibited at the European Astronomical Society Annual Meeting and the International Union of Geodesy and Geophysics General Assembly. At the National Astronomy Meeting (NAM) at Cardiff University OUP promoted the journal portfolio alongside the RAS. Also at NAM, the journal team ran two workshops for early-career researchers. In October, an online publishing workshop was held for early-career researchers from the Chinese Academy of Sciences. The journals were actively promoted on the RAS social media platforms primarily on X (@RAS_Journals), and supported author press releases with the RAS Communications Team.

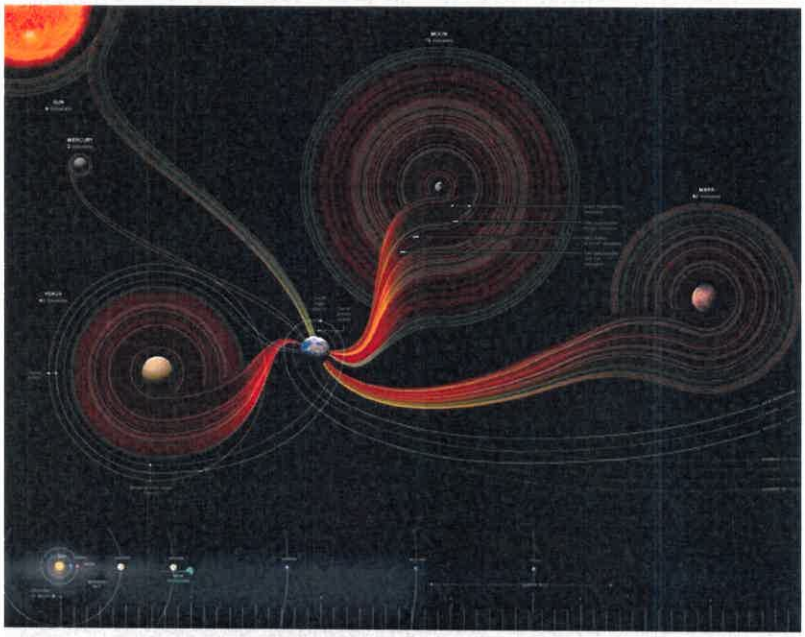
The virtual collection series of the 100 most influential geophysics papers published by the Society published a further 10 collections of *GJI* papers selected by the *GJI* editors, with each collection introduced by different editors. The winners of the *GJI* Student Award for the best paper by an early career scientist were Lauren S Abrahams and Quentin Nicolas, who each received a certificate and cash prize.

Further details on the RAS journals, the editors and editorial boards can be found on our website at ras.ac.uk/journals

Research Fellowships and grants

The RAS grants, research fellowships and awards support research, education and outreach activities. 109 grants, fellowships and awards, totalling £252,511

Grant for instrumentation



With a history of planetary exploration now going back decades, there is always pressure to make the most of the archive of data records. An RAS grant made it possible for PhD student George Xystouris of Lancaster University to visit the Laboratory for Atmospheric and Space Physics (LASP) in Boulder, Colorado from September to December 2023 in order to reanalyse, recalibrate, and archive data from Voyager 2 Plasma Science (PLS) experiment for Uranus and Neptune. Voyager PLS data from the Jupiter flybys in 1979 had already been recalibrated and the project involved applying a similar process for the outer planets. The visit allowed George to work with researchers who had been involved in building the PLS and in working on the software during and after the flybys, gaining valuable insights; he plans to publish the methodology and results.

(2022 – £178,412) were awarded to institutions and 37 grants, medals and awards totalling £20,683 (2022 – £28,066) were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £35,365 (2022 - £32,000). The 2023 Norman Lockyer Fellowship totalled £57,000. Adjustments to other grants resulted in credits to expenditure totalling £21,768 (2022 – £54,180).
A full list of all grantees and analysis can be found on the Society's website.

The Norman Lockyer Research Fellowship

In 2023 the Norman Lockyer Research Fellowship was awarded to Dr Christopher Osborne (University of Glasgow) to work on 'Unifying Solar Non-Equilibrium Radiative Transfer and Magnetohydrodynamic Models'.

The RAS Research Fellowship

The RAS Fellowship was held by Dr Rebecca Smethurst (University of Oxford), working on 'Co-evolution cracked: the contribution of non-merger processes to supermassive black hole growth'.

THE RAS AWARDED £252,511 IN GRANTS, FELLOWSHIPS & AWARDS TO INSTITUTIONS



Below: *Meteorites and other pristine samples from the outer solar system were the focus of a Specialist Discussion Meeting*
(The Trustees of the Natural History Museum)

Scientific meetings

The Society held 15 Specialist Discussion Meetings in 2023, attended by 1012 people, 44% in person and 56% online.

Abiotic baselines in astrobiology

New generation multi-dimensional (2D/3D) and **multi-scale modelling of solar flares**; from reconnection to particle energisation and beyond

Towards a **consistent and coherent strategy for RAS outreach, engagement and education activities**

Harvesting **spectroscopic and time series data** with machine learning and artificial intelligence

Solar control of energy transport and deposition in the terrestrial magnetosphere-ionosphere system

Evidence for **supermassive black hole binaries**

Understanding **solar system evolution** using outer solar system samples

Radio frequency systems in astronomy, space science and ionospheric physics

Impact Earth! **protecting the UK and further afield from impacts by near Earth objects**

Geomagnetic twin satellites MSS-1: progress and future plans

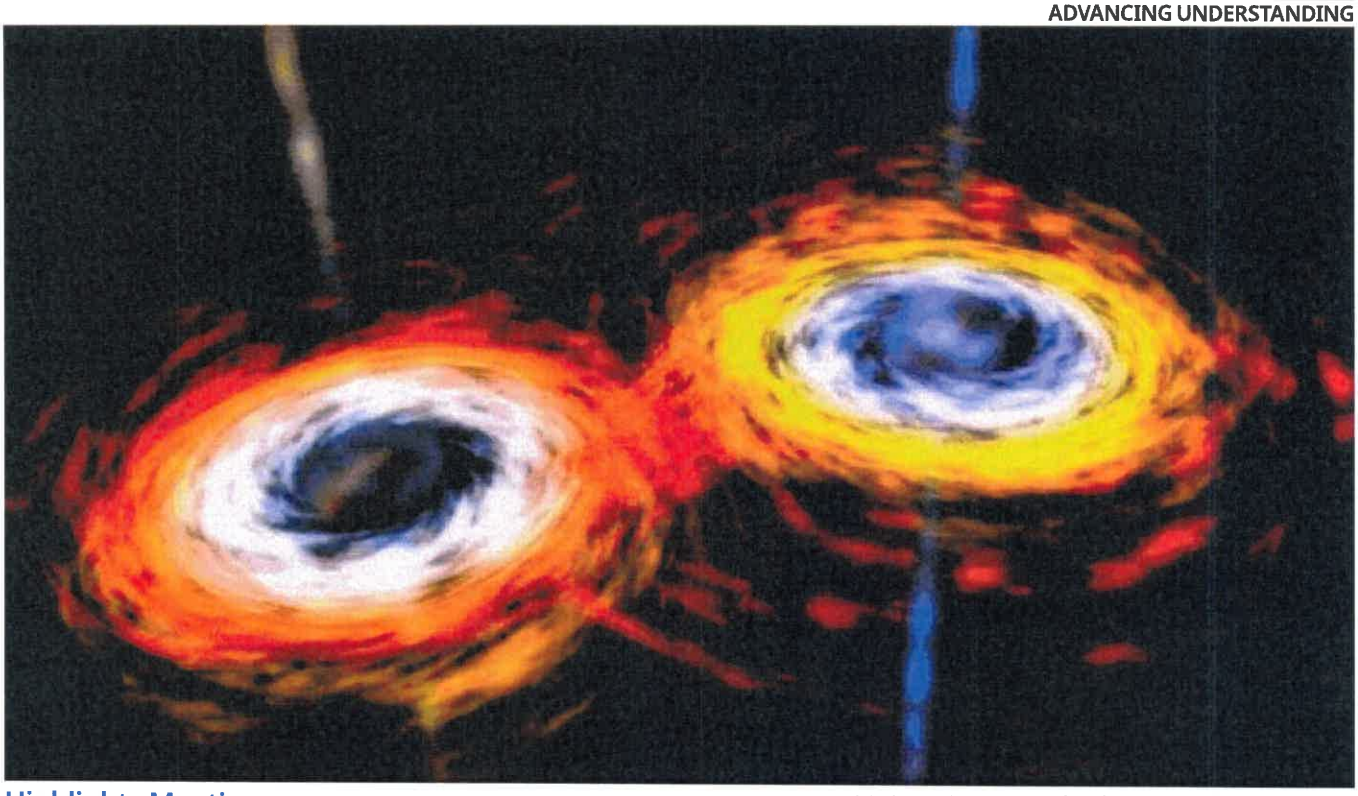
Exploring a **High-resolution Stabilised Spectroscopy Telescope Network**

New eyes on the cold universe: **star formation in the Milky Way and beyond** in the era of JWST and ALMA

Coronal condensations: formation, evolution, and energy transport

Science opportunities enabled by next-generation **gravitational-wave observatories**

Halfway for Halley. **Current and future horizons in cometary science**



Above: *Multimessenger astronomy came to the fore at a Specialist Discussion Meeting on the search for supermassive black hole binaries* (NASA/Tumblr)

Highlights Meetings

The RAS held five Ordinary Meetings from January until May; from October the name for these meetings changed to A&G Highlights Meetings for the remaining three of the year. 1165 people attended over the year, 43% in person and 57% online. The following presented at the meetings:

Prof Joop Schaye (Leiden University) Cosmological simulations of galaxy formation – RAS Group Award

Prof Alan Fitzsimmons (Queen's University Belfast) Small body impacts across the galaxy – George Darwin Lecture

Prof Eleri Pryce (Aberystwyth University) Extending astronomy outreach through Eisteddfodau in Wales

Prof Andy Newsam (Liverpool John Moores University) Access to the universe for all

Dr Ashley King (UK Fireball Alliance, Natural History Museum) The fall, recovery, and analysis of the Winchcombe Meteorite – RAS Group Award

Dr Yuan-Sen Ting (Australian National University) From high-redshift precursors to present-day galaxies: a new frontier in astronomy with graph neural networks

Dr Nicholeen Viall (NASA/Goddard Space Flight Center) The grand challenge questions of solar wind physics

Dr Mark Clampin (Science Mission Directorate, NASA) Overview of the NASA Astrophysics Program

Prof Rhodri Davies (Australian National University) Linking intra-plate volcanism to underlying mantle dynamics – Harold Jeffreys Lecture 2021

Prof Mike Edmunds (University of Cardiff) The mechanical universe – the 2023 Presidential Address

Dr Tim Lichtenberg (ETH Zurich) Molten exoplanets as a window into the earliest Earth – Winton Award

Dr Oliver Allanson (University of Exeter) Understanding the Earth's radiation belts: our local, superscale, relativistic particle accelerator – Fowler Award

Dr Annelies Mortier (University of Birmingham) Weighing exoplanets through a telescope network

Dr Beatriz Sanchez-Cano (University of

Leicester) Mars' ionosphere: from our current knowledge to the future of Mars exploration – Fowler Award

Dr Elizabeth Watkins (University of Manchester) Characterising superbubble populations and their energetics in nearby galaxies using JWST and ALMA

Prof Marina Galand (Imperial College London) Revealing plasma interactions under auroral skies in the solar system – James Dungey Lectureship

Dr Daniel Belteki (Science Museum) The making of an observatory: the early years of the Cambridge Observatory – RAS Diary Talk

Prof Rob Fender and **Prof Ian Heywood** (University of Oxford) MeerKAT – RAS Group Award

Dr David Hosking (Princeton Center for Theoretical Studies/Gonville & Caius College, Cambridge) Are cosmic voids filled with reconnecting magnetic fields from the early universe? – Michael Penston Thesis Prize

National Astronomy Meeting 2023

The National Astronomy Meeting held with meetings of UK Solar Physics and MIST at the University of Cardiff had one of the largest attendances in its history. Some 920 people attended over the week, with 120 taking part online; that's more than 650 people registered each day. The meeting had specialist sessions grouped into themes, each spread over two days, under the broad banner of 'Origins'. There were also a range of plenary lectures from distinguished speakers, including Richard Mushotzky of the University of Maryland, winner of the 2022 American Astronomical Society Henry Norris Russell prize. Regular NAM features included community lunches, poster prizes and the conference dinner celebrating the winners of RAS Medals and Awards.



Above: *The 2023 Group Achievement Award went to the MeerKAT consortium* (South African Radio Astronomy Observatory (SARAO))

THE NATIONAL ASTRONOMY MEETING HAD ONE OF THE LARGEST ATTENDANCES IN ITS HISTORY

2023 Medals and Awards

Gold Medal in Astronomy Prof John Peacock, University of Edinburgh

Gold Medal in Geophysics Prof Timothy N Palmer, University of Oxford

Herschel Medal Prof Heino Falcke (Radboud University, the Netherlands, and Max Planck Institute for Radio Astronomy in Bonn, Germany)

Eddington Medal Dr Monika Moscibrodzka (Radboud University, the Netherlands)

Chapman Medal Prof Nicholas Achilleos (University College London)

Price Medal Dr Rhian Jones (University of Manchester, UK)

Jackson-Gwilt Medal Prof Roberto Abraham (University of Toronto, Canada) and Prof Pieter van Dokkum (Yale University, USA)

Agnes Mary Clerke Medal Prof Jim Bennett (Linacre College, Oxford)

Annie Maunder Medal Black In Astro team led by Ashley Walker: Caprice Phillips, Dr Ronald Gamble Jr, AJ Link, Esq., KeShawn Ivory, Cheyenne Polius,

Bryné Hadnott, Dakotah Tyler, Robert Washington III and Naia Butler-Craig

Primary Education Award Inga Helmecke (Europa School UK)

Secondary Education Award Dr David Boyce (Uppingham School, Uppingham)

Higher Education Award Dr Ravindra T Desai (Imperial College, London)

Award for Service in Astronomy Charles Barclay

Winton Award (Astronomy) Dr Alexandra Amon (University of Cambridge)

Winton Award (Geophysics) Dr Ravindra T Desai (Imperial College, London)

Fowler Award (Astronomy) Dr Christopher Berry (University of Glasgow)

Fowler Award (Geophysics) Dr Oliver Allanson (University of Exeter)

Group Achievement Award (Astronomy) The MeerKAT team

James Dungey Lecture Prof Marina Galand (Imperial College, London, UK)

George Darwin Lecture Dr Dominic Bowman (KU Leuven, the Netherlands)

Honorary Fellows Prof Erik Høg (Niels Bohr Institute, Copenhagen, Denmark); Dr Premana Premadi (Director of the Bosscha Observatory and Bandung Institute of Technology, Indonesia); Dr Rita Sambruna (NASA Goddard Space Flight Center, USA)

The Caroline Herschel Medal

The Caroline Herschel Medal was awarded to Prof Gillian Wright CBE FRSE, long-standing European Principal Investigator of the Mid-Infrared Instrument (MIRI) on the JWST and director of the UK Astronomy Technology Centre in Edinburgh. Prof Wright, the first UK recipient of the award, received the medal and citation in a ceremony on 13 April 2023 at the residence of the German Ambassador, Miguel Berger.

The new prize was launched in 2021 by the UK Government in honour of former German Chancellor Angela Merkel. It commemorates astronomer Caroline Herschel (1750–1828), who, with her brother William, revised and greatly improved catalogues of stars, clusters and nebulae, and herself discovered eight comets. The medal recognises both her legacy and the deep and enduring scientific links between Germany and the UK. The award recognises outstanding research by women astrophysicists and is awarded in Germany and the UK in alternate years.

Student Prizes

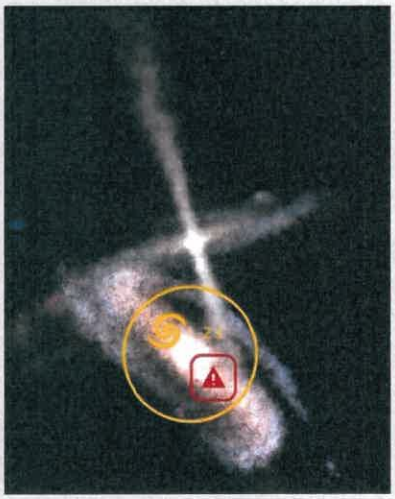
The RAS awards prizes for the best PhD theses submitted during 2022 in the fields of astronomy and astrophysics (the Michael Penston Prize), geophysics and planetary science (the Keith Runcorn Prize), and instrumentation (the Patricia Tomkins Prize). There is also an annual Patricia Tomkins Prize for undergraduate work in instrumentation.

Dr David Hosking (Princeton University, USA) won the Michael Penston Prize for

Below: *Prof Gillian Wright, recipient of the Caroline Herschel Medal* (RAS/L. Laird)



Undergraduate bursaries



The RAS helped to fund the composition of music for the game Astera Evolution

The RAS funds research placements of 6-8 weeks for undergraduates, giving them hands-on experience of research and the necessary technical skills. The 13 projects this year included: mapping the cosmic web using 55000 galaxies at the University of Nottingham; tracking differences between solar cycles; simulating structure above sunspots; modelling structure within flares; simulating accretion disks around black holes; studying the contribution of women to 17th century astronomical calendars and almanacks; a search for images of a low surface-brightness stellar stream; experimenting with ways to overcome radio frequency interference; measurement of remanent magnetism in rocks form during a possible geomagnetic reversal; the Brazilian branch of the Liverpool Astronomical Society; the role of modest ground-based telescopes in asteroseismology; and composing music for the game Astera Evolution, based on the Astera galaxy simulation project. Comments from the students focused on the value of practical experience with both astronomical and geophysical data, but also with software and coding – and of their positive experience of the skills needed for the research environment.

his thesis at the University of Oxford: 'The decay of MHD turbulence and the primordial origin of magnetic fields in cosmic voids'. Runners-up were Dr Nora Eisner (University of Oxford) for 'People Powered Planet Hunting with TESS' and Dr Andrew Mummery (also Oxford) for 'Tidal Disruption Events with a Time Dependent Theory of Relativistic Accretion Disks'.

Dr Peter Stephenson (University of Arizona) won the Keith Runcorn Thesis Prize for his Imperial College thesis entitled: 'Origin, evolution and impact of electrons at comet 69P'. Dr James Ward (University of Leeds) was the runner-up for 'Analysis of Mantle Heterogeneity through Array Observations of Multipathing and its Expansion to a Global Scale'.

Dr Daniel Mortimer (University of Exeter) won the Patricia Tomkins Thesis Prize for his University of Cambridge thesis: 'Designing a beam combiner for faint limiting magnitudes in optical interferometry'.

In addition, the Patricia Tomkins Undergraduate Prize was awarded in 2023. Brad Lewis of Liverpool John Moores University won the award for his work creating a system to characterise atmospheric turbulence close to ground level, for the New Robotic Telescope.

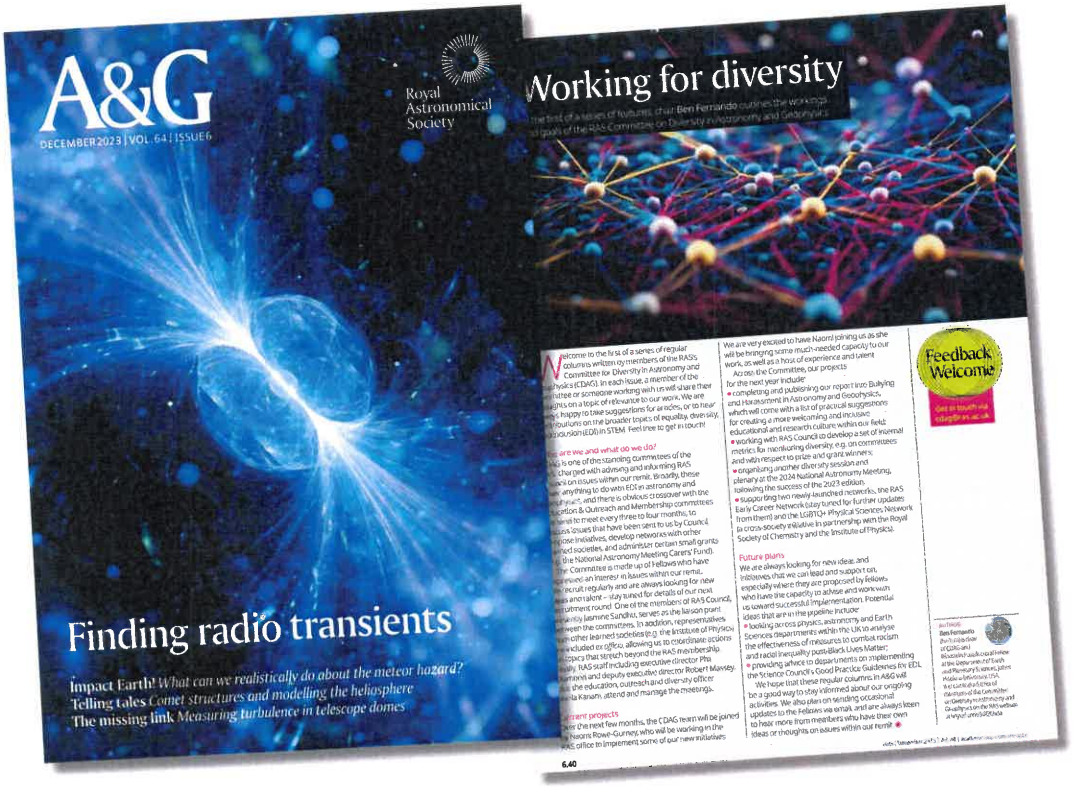
Library and archives

Library research visits to consult the Society's archives, photographs, book and journal collections are back at pre-pandemic levels, with 107 visits by Fellows and Friends of the RAS and 79 by external researchers. Library staff handled 173 research enquiries remotely.

2023 saw the publication of a book chapter on some of the oldest books in the RAS Library collection: Prosser, S (2023). "Chapter 10 An Astronomer's Incunabula: The Library of Edmond Herbert Grove-Hills". In Spotlights on Incunabula. Leiden, The Netherlands: Brill. doi.org/10.1163/9789004681378_012

Our membership magazine

A&G continued to share news of scientific progress, outreach, achievements and awards – with some 200 news items over the year – and a more in-depth exploration of current research with 42 longer feature articles, including reports from RAS Specialist Discussion Meetings and the National Astronomy Meeting in Cardiff. A total of 174,364 downloads demonstrates the widespread online engagement



WE WERE DELIGHTED TO HAVE AN ARTICLE FROM OUR OLDEST AUTHOR... SO FAR!

with the magazine. Highlights include an in-depth exploration of Betelgeuse, a star that has been especially variable of late, a taste of the exploration of Mercury by the Bepi-Colombo mission from our outgoing president, and discussion of the transition of all our journals to Open Access publishing. We were also delighted to have an article from our oldest author so far: in 2023 Prof Francis Graham-Smith celebrated his 100th birthday and gave A&G his account of pulsar science, from the first detections through to current observations and the future. It's a treat to hear from someone whose career has been at the centre of things and whose interests remain current. That his overview sat alongside an appeal to ensure better monitoring of the pulsars and other radio transients that will be discovered by the next generation of radio telescopes gives a snapshot of the breadth of research interests among the RAS Fellowship. Last but not least, the Editor thanks Fellows for their readiness to write for the magazine and share their work across the Society; the whole RAS network benefits.

Political engagement

The Society continues its work in public policy, initially addressing the delayed association to Horizon Europe, which eventually took place in September. We welcomed the agreement, which meant that UK research groups could apply for European Research Fund support from January 2024.

The Society submitted written evidence to the House of Lords Science and Technology Committee inquiry into Light Pollution and Human Health and to the Commons Science and Technology Committee inquiry into UK Astronomy.

Light pollution continued to be an area of concern. The Society gave evidence to a Greater London Assembly Environment Committee inquiring into light and noise pollution. The Mayor of London later refused planning permission for the MSG Sphere, a large and internally illuminated dome-shaped entertainment venue in the Olympic Park area.

The Society provides the secretariat for the All-Party Parliamentary Group for Dark Skies, and hosted a meeting

in October with specialists from Buglife and the University of Plymouth (covering the impact of light pollution on marine life). At the instigation of the RAS, group members wrote to ministers regarding protection of dark skies in planning policy and supported an Early Day Motion on International Dark Sky Week. The co-chair (Sir Peter Bottomley MP) also wrote on our behalf to Steve Reed MP, the new Shadow Secretary of State for the Department of Environment, Food and Rural Affairs. In January the Society convened a one-day conference with the UK Space Agency on this topic, with speakers from the Agency, the Department for Science, Innovation and Technology, OneWeb, OfCom and CPRE.

The RAS continues as a contributing member of the International Astronomical Union Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference, with representation in its Policy Hub. Working with the IAU, we successfully lobbied the UK delegation to the G7 Science and Technology Minister's summit in Sendai to endorse a statement that recognised space sustainability including dark and quiet skies. In July the Society assisted with the drafting of and signed the Memorandum of Principles for the new Earth Space Sustainability Initiative.

Diversity

A working group was formed in order to create actions and recommendations based on the report and data collected in 2021 on Bullying and harassment in astronomy and geophysics. A report including actions and recommendations is in preparation.

A new Chair was appointed to the RAS Committee on Diversity in Astronomy and Geophysics and a part-time Equality, Diversity and Inclusion support officer has been contracted. The Chair will share the committee's work with Fellows through regular reports in *A&G*.

TRAINING FOR RAS STAFF IN 2023 INCLUDED BRITISH SIGN LANGUAGE AND DEAF AWARENESS

Training for RAS staff in 2023 included British Sign Language and deaf awareness; staff have also given allyship training for the Science and Technology Facilities Council and Lancaster University, and diversity talks for ESTEC, ESA and MIST.

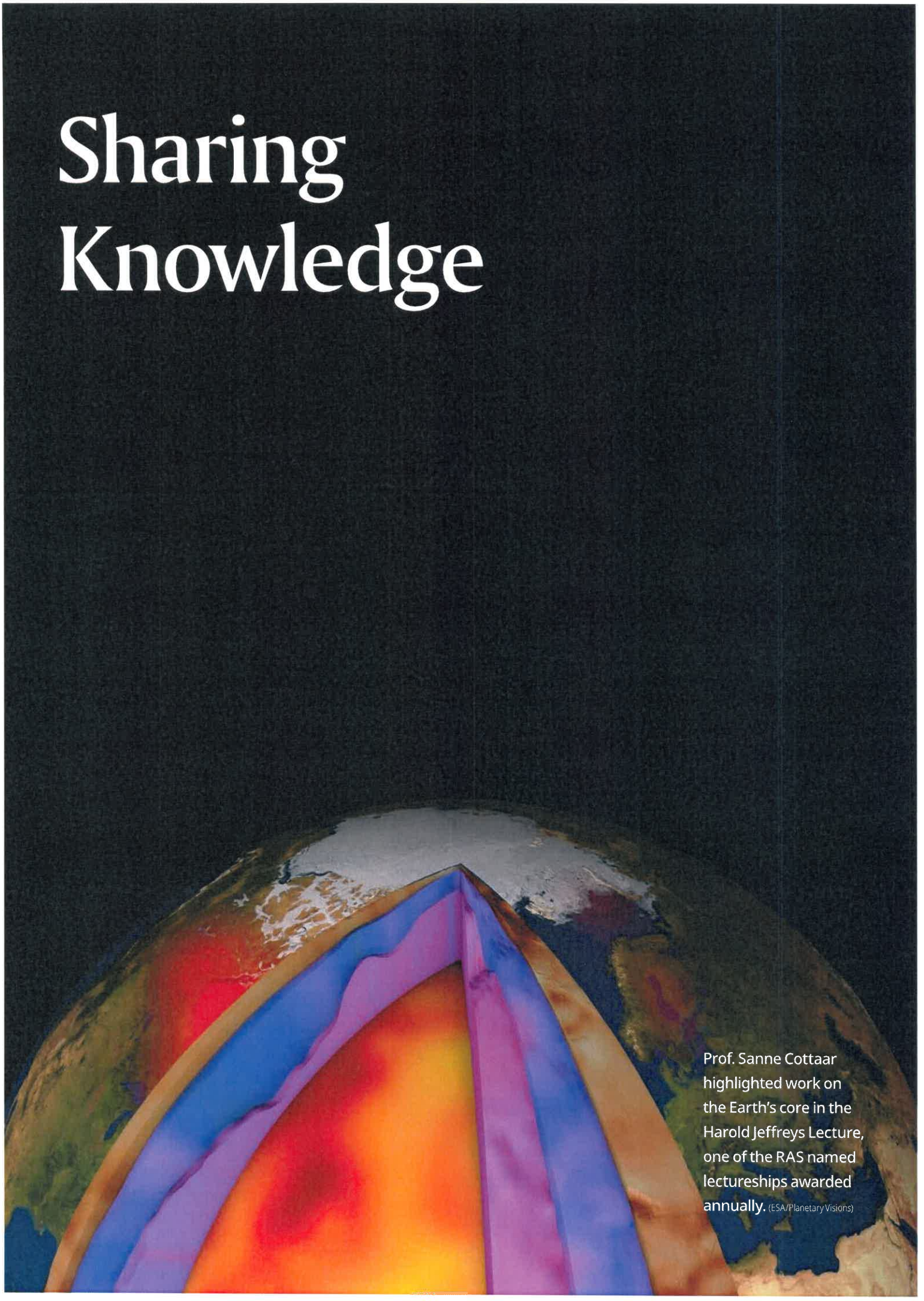
The RAS is once again working with the Institute of Physics and the Royal Society of Chemistry to support LGBT+ scientists. The Society is also now a member of the Business Disability Forum and the Forum for the Tackling of Bullying and Harassment.

Early Career Network

At the National Astronomy Meeting in Cardiff, the Early Career Network Committee organised a career panel, exploring the different opportunities open to those starting out on careers in astronomy and geophysics. Exemplifying academic career paths, two of the panellists were Rebecca Bowler, at the University of Manchester, and Tana Joseph, at the University of Amsterdam. From industry were Tim Waskett, who does statistical research for Liverpool FC, and David Nutter of EDF. After all of the panellists had introduced themselves, there was a question-and-answer session, allowing attendees to seek the panel's advice on the course of their careers.

For many early-career researchers who started during the pandemic, there have been limited opportunities to meet others in their position, and to forge the connections which will sustain them throughout their careers. For that reason, also at NAM, the Committee hosted a networking lunch, which enabled ECRs to establish new relationships, and successfully elicited many questions and much discussion.

Sharing Knowledge



Prof. Sanne Cottaar highlighted work on the Earth's core in the Harold Jeffreys Lecture, one of the RAS named lectureships awarded annually. (ESA/Planetary Visions)

Education and outreach events

The RASreach event for science communicators took place at Glasgow Science Centre early in 2023 with 60 people attending in person and more than 300 taking part online. RAS staff delivered Connecting the Dots constellation workshops to mark British Science Week, for the Courtyard Societies' Coronation Late event on the eve of the King's coronation in May, during the Open House event in September and in partnership with West Yorkshire Astronomy Society in November; more than 200 people built electrical circuits – initially inspired by the theme of British Science Week – that lit up constellations depicted in Urania's Mirror, a gem from the RAS archives.

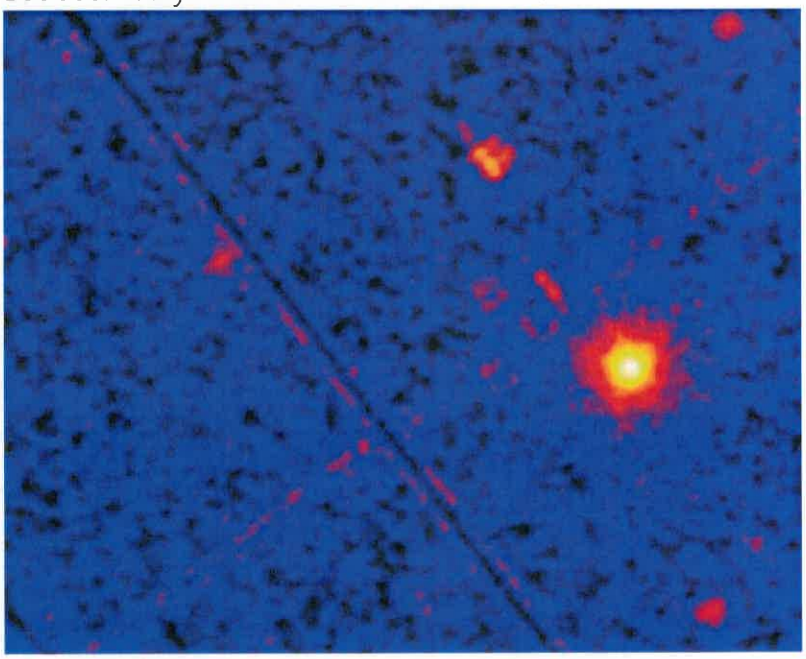
School visits continued, with more than 1000 children participating in assemblies about space across primary schools, and approximately 100 participating in workshops about space and careers in secondary schools. In addition, a World Space Week primary event took place in Blackburn with an assembly for 300 secondary school students and an online session with 40 children at a school in Ghana, Africa. Staff are teaching GCSE Astronomy in schools in London and northwest England, with 30 students planning to take the exam in 2024.

The Society disseminates knowledge to students, the press and the wider public by:

- Organising education and outreach events
- Arranging a programme of Public Lectures
- Exploiting the resources of the Library and Archives
- Promoting research in the media and social media
- Supporting the Friends of the RAS
- Working with specialist partners through RAS200
- Working with the Courtyard Societies as a cultural hub



Above: *An RAS Public Lecture considered what JWST is telling us about the solar system. This is a JWST image of Europa* (NASA, ESA, K. Sahu (STScI))



Above: *Powerful X-ray emission was discovered from quasar J1144 by researchers combining data from four space-based observatories, and reporting their results in* Monthly Notices of the Royal Astronomical Society. (ESA/XMM-Newton/Dr Elias Kammoun)

A day-long livestream in partnership with Northumbria University and the University of Leicester proved to be so successful that the same team ran another session a few days later, to include the most-up-to-date observations. During 'Eyeing the Ionosphere', the team of researchers shared their live observations as NASA's Juno spacecraft passed behind Jupiter, and their observations of Jupiter with the JWST. 150 people joined the livestream over two days and there have been more than 1000 views on the RAS YouTube channel.

RAS staff supported education and outreach events associated with the National Astronomy Meeting in Cardiff, including the Celebration Space Community event and the Astro Pop-up stall in St David's Dewi Sant shopping centre, with activities and a Space Quest scavenger hunt for 12 space posters.

The RAS has also initiated a partnership programme with STEM Ambassadors to recognise the outreach undertaken by our members. Almost 300 Fellows are now registered with us as STEM Ambassadors.

Public lectures

The Society presented seven public lectures during 2023, offering in-person and online options and moving through

the year back to lunchtime and evening presentations. 1313 people attended in total; 26% in person and 74% online. The public lectures have so far been viewed more than 4000 times on the RAS YouTube channel.

Mark Wrigley Education and disruption: outreach, telescopes, tinkering and gumption.

Jennifer G A Donohue Rebooting and hacking space ageing in exploration using the 'Space Age Pathways'.

Dr Alexandra Amon Unveiling the dark universe with the Dark Energy Survey (Caroline Herschel Prize Lecture).

Dr Robert Massey A cluttered and noisy sky

Dr Iris van Zelst Venus: cloudy with a chance of earthquakes

Prof Haley Gomez Ashes to ashes, dust to dust: a search for the stolen starlight

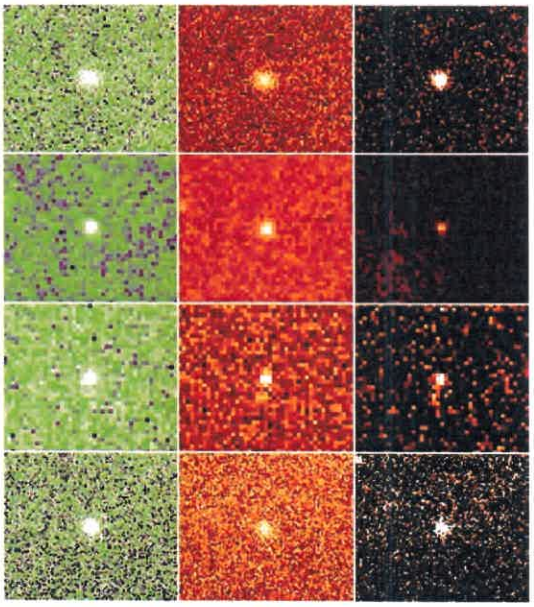
Dr Naomi Rowe-Gurney Our solar system from JWST: The first two years

John Brown Memorial Lecture

The Society held the inaugural John Brown Memorial Lecture, hosted by the University of Glasgow, celebrating the life and work of Astronomer Royal for Scotland, Prof John Brown. Prof Randall Stevenson of the University of Edinburgh spoke on 'Celestial visitants – comets and culture in the 19th century and beyond', focusing on the extraordinary number of striking comets and their impact in wider culture, including the writings of Thomas Hardy. Poet Rab Wilson, co-author with Brown of the book 'Our Big Braw Cosmos' also addressed the audience of colleagues, friends and family of the late professor.

Library and Archive outreach

This year we returned to the single-day format for the annual Open House event. On Saturday 16 September, Burlington House was open to the public with four children's 'Connecting the Dots' activity sessions, and 11 tours attended by 267 people. We had more visitors in one day than during the nine-day series of events that took place in 2022. Spectrum Drama actors playing the roles of Caroline Herschel and Isaac Newton were complemented by special library displays, the RAS bicentenary quilt, and tours led by RAS staff and Open House volunteers. A replica of the Pearson Orrery made by Peter Rigby and recently donated by him to the RAS was on display.



Right: *Surprisingly red Neptunian Trojans were the subject of an RAS press release in March, based on research published in* Monthly Notices of the Royal Astronomical Society. (Dr Bryce Bolin)

Funding school astronomy in rural India

RAS grant funding supported astronomy in schools in rural East Rukum, India. Astronomy workshops and an observing session in October 2023 took 'astro-kits' to students from 12 local schools. Local communities were also involved. The team led from Pokhara Astronomical Society demonstrated the use of clinometers, sundials, star wheels and star clocks in the astro-kits, and distributed telescopes to all the schools involved. They trained teachers and some of the students to use the telescopes and left each school with a video tutorial and more astro-kit equipment. The team reached 2000 people – aged between 13 and 50 – from varied geographical and ethnic backgrounds, 100% of whom were excited about having a telescope in their local school.









We hosted a further 416 visitors during 13 group visits and other library-centred events, ranging from Open Age and RAS200 project partners, to children and families taking part in British Science Week and the Coronation Courtyard Late in May. As in previous years, displays of archive and rare book materials suggested by Fellows and visiting speakers were put together to complement public lectures, Specialist Discussion Meetings, A&G Highlights talks and other scientific conferences.

Library and archive-related events which took place offsite included exhibiting a letter by Georges Lemaître during a lecture by Thomas Hertog at the Royal Institution, and displaying the RAS Bicentenary Quilt at the Royal Society's Space Late. Lectures on the Herschel archives were delivered to astronomical societies in Milton Keynes and Luton, and online to the Open University Space Society.

Above: *For Open House 2023, staff (with Caroline Herschel and Isaac Newton from Spectrum Drama) welcomed visitors to Burlington House with children's activities, Library displays and the RAS Bicentenary Quilt.* (RAS)

The team behind the popular 'Objectivity' YouTube channel returned to make additional videos about interesting objects in the RAS collections. Videos released so far this year feature John Russell's Selenographia and pastel drawings of the Moon, works by Galileo Galilei, and the RAS Bicentenary Quilt (the full playlist is available here: tinyurl.com/3cea6um5)

We provided a live display of relevant library and archive material to support 'Eyeing the Ionosphere': a six-hour observation of Jupiter using Juno and

JWST. We included some of the earliest drawings of the Great Red Spot, and diagrams of Jupiter and its four brightest satellites in Galileo Galilei's *Sidereus* Nuncius (tinyurl.com/y7rrypcv). There were 275 attendees during the livestream, and the YouTube recording has been seen over 500 times so far.

RAS200

The bicentenary outreach project RAS200: Sky & Earth concluded in February with a meeting for all our partners followed by a reception at the Royal Institution in London. The final evaluation report from Jenesys gave an idea of the reach of the project: some 220,000 people had a direct engagement with astronomy and geophysics through these 12 projects. That figure includes those attending an event, workshop or presentation, as well as those staff of our partner organisations trained to deliver information about our sciences, and those watching events online. The audience included those already interested in our subjects, and those with no prior knowledge or interest. And the partner organisations the RAS worked with meant that we engaged with isolated adults, carers, prison inmates, refugees, and young people outside formal education, among others.

The success of the partnership model used in RAS200 and, especially, the value of systematic evaluation of the impact of different aspects of outreach through the different programmes, has been a benefit of the project for the RAS. Future outreach activities will use a similar approach, making the most of our resources.

RAS in the media

In 2023 the Society issued 37 press releases comprising papers published in *Monthly Notices of the Royal Astronomical Society* (*MNRAS*), scientific presentations at the National Astronomy Meeting (NAM) in Cardiff, and announcements such as our awards and medals.

The releases with the highest impact included the NAM stories on ancient stars in the heart of the Milky Way, solar shooting stars, sandwich planets and a black hole 'switch on'. NAM releases alone resulted in at least 296 media articles and interviews. *MNRAS* releases on the discovery of an ultramassive black hole in March, the "largest cosmic explosion ever seen" in a paper in May, and the largest ever cosmological computer simulation in October were among the more successful this year. These resulted in more than 180 media articles.

Stories related to our press releases and events appeared in national and local

Sharing STEM enthusiasm through astronomy

The RAS supported STEM education in South Africa through grant funding for the MPASS Summer School for high school students in STEM and astronomy, based at Magwagwaza High School in Acornhoek, South Africa. This 3-week school in which students learnt maths physics and chemistry included an introduction to astronomy from university students who were themselves graduates of MPASS summer schools in the past. The grant supported catering and supplies for students and tutors, and tutors' stipends, making the event possible. Students reported that they felt more positive about STEM in general, and astronomy in particular, after the school.



Below: *Online workshops for Fellows registered as STEM Ambassadors offered support to our members*

newspapers and news outlets, radio and TV broadcasts, such as the *Daily Mail*, *Telegraph*, *Guardian*, *Daily Star*, Sky, BBC, ITN, *Metro*, space.com, *IfL Science*, Forbes, *Astronomy Now*, Sky at Night and CNN.

RAS staff and trustees gave 25 radio and TV interviews over the course of the year, with at least one syndicated to an estimated 400 local radio stations.

The RAS has accounts on the social media platforms Facebook, LinkedIn, Instagram, Bluesky, Threads, Mastodon (on the Astrodon server) and X. By the end of 2023 we had 13800 followers on LinkedIn, around 11800 in Instagram, 54200 on X and 18500 on Facebook. We have some, but far fewer, followers on the newer social media channels.

Social media engagement sometimes but not always aligns with interest from media outlets. For example, in 2023 an X post on the largest black hole was retweeted 146 times, while on the same platform the announcement of our journals' move to Open Access publishing gathered 240000 impressions, but no conventional media coverage. The countries with the largest numbers of our followers on Facebook and Instagram are the UK itself, the United States, India and Brazil.

The RAS podcast

The Supermassive podcast enjoyed continued success, with the number of listens reaching 1.25 million by the autumn. Nearly 40% of its listeners are women, and it has a fairly even distribution of listeners by age, peaking between 35 and 44 years old. More than a fifth of listeners are older than 65 years old, and almost all listeners stay with the podcast from start to finish.

Friends of the RAS

The Friends of the RAS had a full programme of lectures this year.

NEARLY 40% OF THE SUPER-MASSIVE PODCAST'S LISTENERS ARE WOMEN

Sean McMahon False biosignatures on Mars?
Ian Robson The Pluto story
Gavin Dalton WEAVE – the WHT's new widefield spectroscopy facility
Lauren Rhodes Radio transients: studying the most powerful explosions in the universe.
Nicolas Laporte The quest for Cosmic Dawn: new insights from the JWST
Emma Chapman First stars and sensationalism: Early universe research in the James Webb Space Telescope era
Ziri Younsi Peering at the edge of space and time
Tim Horbury The Sun up close; results from the Solar Orbiter mission
Cyrielle Opitom DART – a great success for NASA's first planetary defence mission.

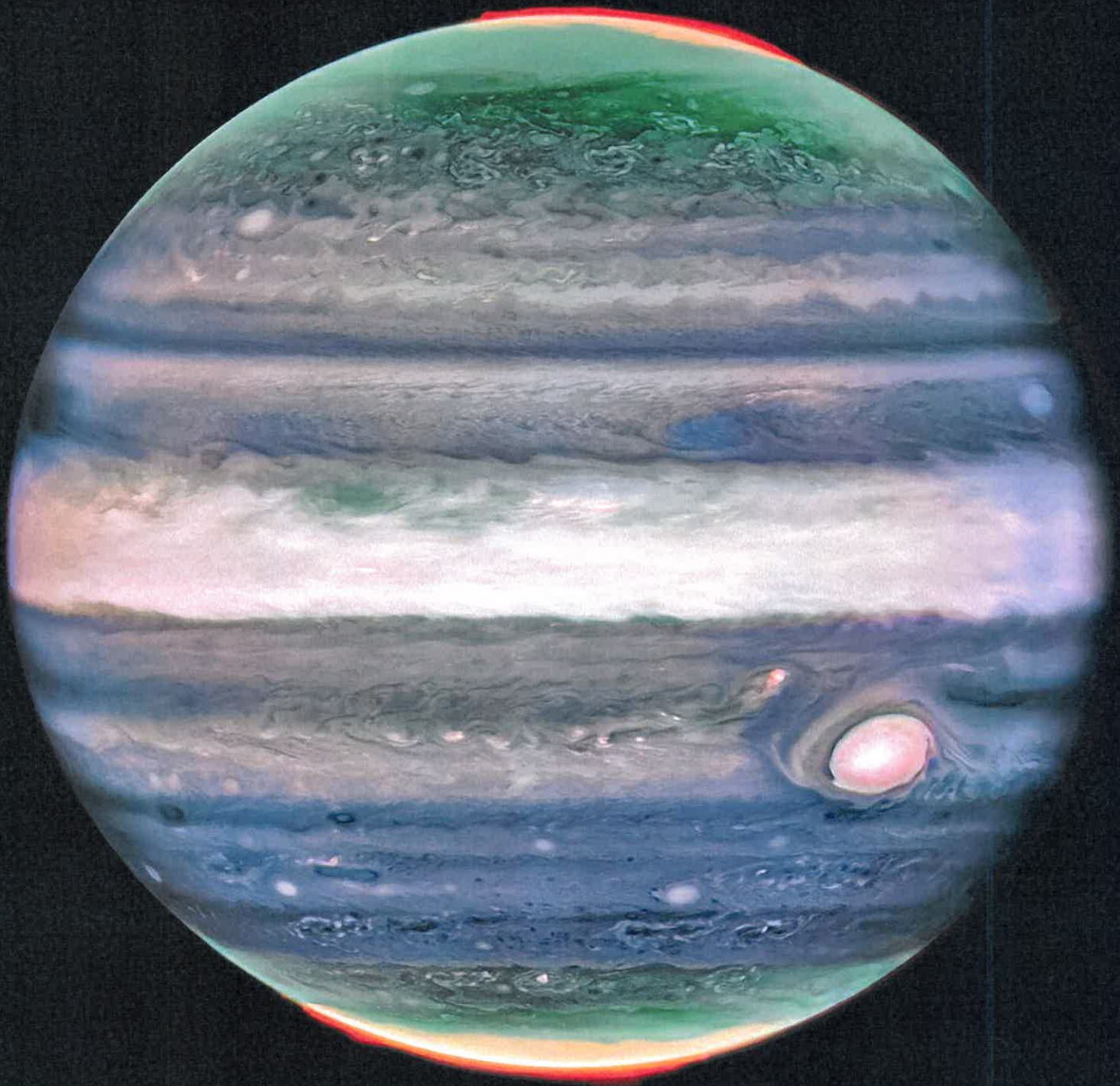
Burlington House Courtyard Societies

The RAS joined other courtyard societies for several events this year. With other Courtyard Societies, we took part in the Courtyard Coronation Late event on the eve of the King's Coronation, offering a crown themed Connecting the Dots session and tours of the Library. We also joined other Courtyard Societies at the annual Open House event on Saturday 16 September, offering children's 'Connecting the Dots' activity sessions, tours and special library displays.



Below: *Connecting the Dots, a new children's activity developed for British Science Week; 150 people made light-up constellation cards based on archive materials.*

Our Organisation



Jupiter, as seen by the JWST's NIRCam, featured in an education and outreach livestream (NASA, ESA, CSA, STScI, R. Hueso, I. de Pater, T. Fouchet, L. Fletcher, M. Wong, Joseph DePasquale)

Membership

In 2023 the RAS had 4282 Fellows, 157 of whom were Honorary Fellows; 20% were female, and 78% male and under 2% of Fellows did not specify. 33% were aged 65 and over and 6% were 25 and under. Most Fellows, 75%, lived in the UK, with 9% based in Europe and 16% in the rest of the world.

Our objectives

The organisation of the RAS supported our objectives during 2023 by: Developing an overarching strategy for the next five years, together with identifying five key areas for development.

Our strategy

We will continue our current valuable activities:

- Providing a **learned and professional membership Society**
- Holding regular **scientific meetings**
- **Publishing**, in journals and more widely
- Giving **policy advice** to government
- Awarding **grants and medals**
- Providing **education and outreach** activities
- Curating **our heritage**.

In addition we will develop these areas:

- Meeting the needs of **our members** and improving how we communicate with them.
- Providing **inspirational** programmes in astronomy and geophysics **education and outreach**
- Achieving **maximum impact from the library**, archive and object collections.
- Publishing **high quality research**, accessible to all
- Exploring and nurturing **partnerships for collaboration and influence**.

Our actions

During 2023, the Society began to implement the Strategy throughout its activities. The President sought and received input from Fellows on the development of the RAS Strategy at the National Astronomy Meeting.

We took action to further support and develop the Early Career Network.

In order for the RAS to nurture, support and improve diversity and inclusivity within its core community, the Committee on Diversity in Astronomy and Geophysics agreed a new Chair, Dr Ben Fernando, and the society contracted an additional staff member to support the Committee's work. The RAS also carried out a survey of the demographics and research interests of the UK astronomy and geophysics communities, seeking input over the period from spring to autumn of 2023.

> WE PLAN TO INCREASE THE REACH OF OUR ACTIVITIES BY PRIORITISING EVENTS TARGETED AT UNDER-SERVED COMMUNITIES

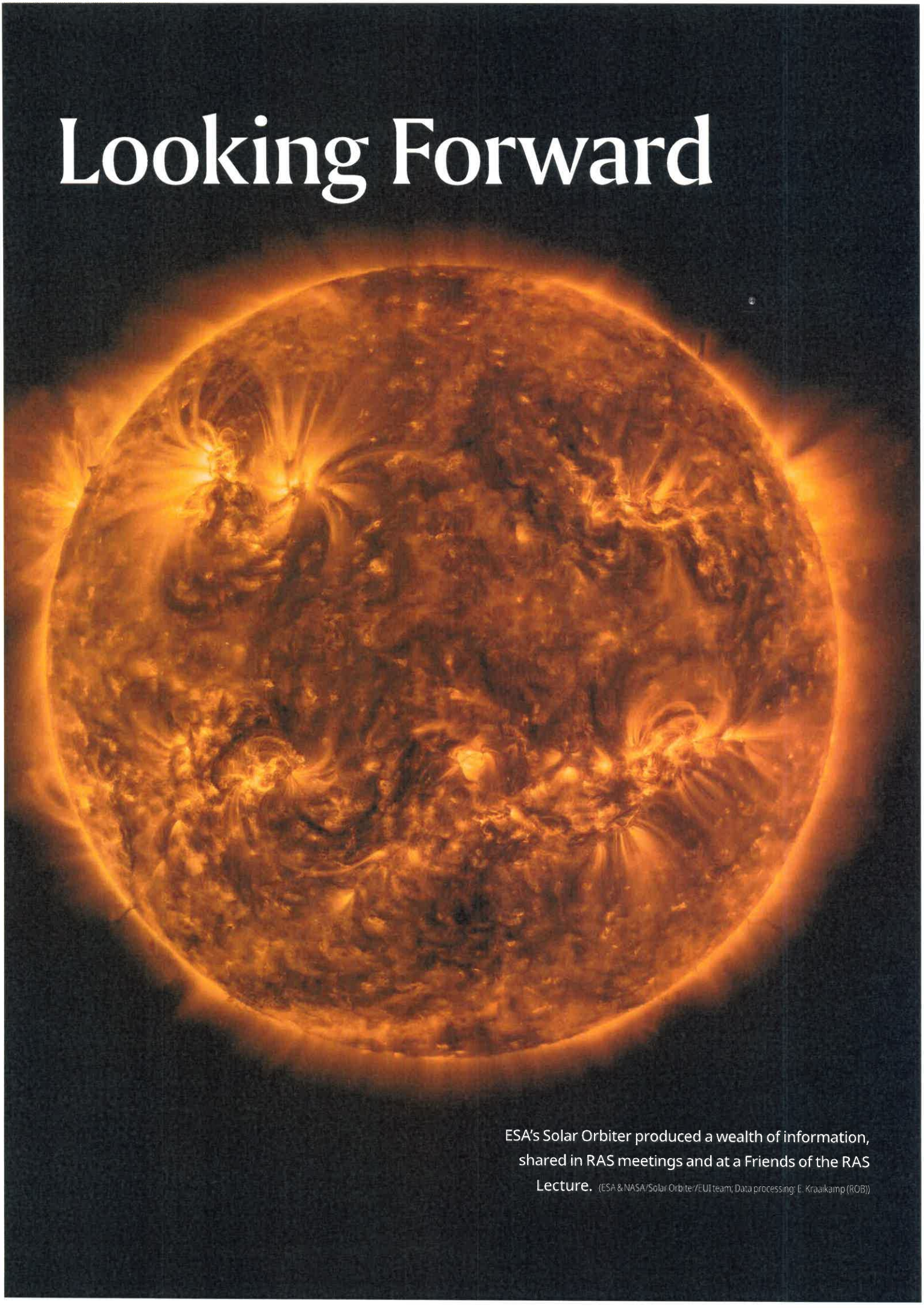
We have put in place plans to increase the impact, reach and focus of our public engagement activities by prioritising events targeted at under-served communities.

The RAS now encourages Fellows working in outreach to register as STEM Ambassadors and has run online events to support them.

We have been exploring how to achieve maximum impact from the library, archive and object collections, within available resources, considering the best approaches to digitisation of our collections and catalogues.

At the 2023 AGM we agreed a number of resolutions to update our subscriptions policies.

Looking Forward



ESA's Solar Orbiter produced a wealth of information, shared in RAS meetings and at a Friends of the RAS Lecture. (ESA & NASA/Solar Orbiter/EUI team; Data processing: E. Kraaikamp (ROB))

Objectives for 2024

The Society will:

- publish high-quality peer-reviewed journals;
- support students and early-career scientists through research fellowships and grants;
- recognise achievement through medals and prizes;
- maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures;
- sustain our Library and Archive service;
- continue our political engagement;
- maintain our programme of education and outreach activity, including Friends of the RAS;
- promote the work of the Society and Fellows in the media and on social media;
- build our outreach work with other Courtyard Societies.

In addition, in 2024 and following years, the Society will:

- Publish its strategy
- Take action to develop the five key areas identified in the strategy

Events since the year end

Sealing our future at Burlington House

In March 2024, after protracted negotiations, the RAS President signed an agreement that secures our occupation of Burlington House on a 999-year lease. With the agreement comes stability, but also new responsibilities, including the upkeep of the building, and future activities including enhanced outreach for the Society itself and with our neighbours.



Above: *Dr Linda Tacconi, recipient of the Caroline Herschel Medal, 2024*

Caroline Herschel Medal 2024

The Caroline Herschel Medal celebrating an outstanding woman astrophysicist has been awarded to Dr Linda Tacconi, of the Max Planck Institute for Extraterrestrial Physics (MPE) in Garching, Germany.

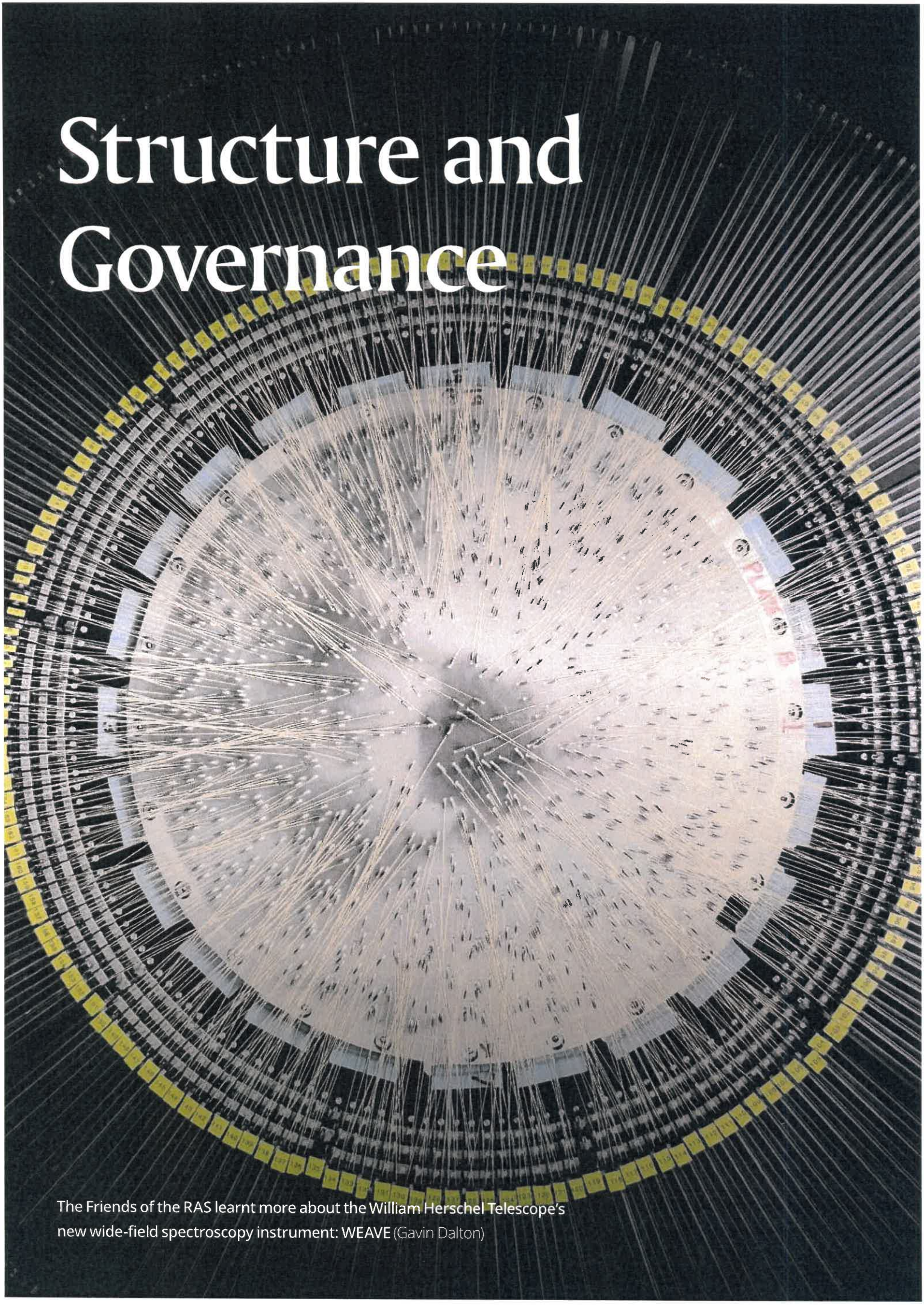
The Life Scientific

Burlington House was the setting for an episode of the Radio 4 programme featuring our President, Prof Mike Edmunds, and an audience of guests. Presenter (and physicist) Jim Al-Khalili joined the President and guests at a reception after the recording.

Below: *An agreement has been reached to make Burlington House the home of the RAS for the next six neptunian years*



Structure and Governance



The Friends of the RAS learnt more about the William Herschel Telescope's new wide-field spectroscopy instrument: WEAVE (Gavin Dalton)

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in 2015. The objectives, charters and byelaws are detailed on the Society's website ras.ac.uk.

The control of the Society rests with the General Meeting of Fellows. Subject to that, direction and management are the responsibility of the Council (as the Trustees of the charity). The Council consists of a President, a Treasurer and three Secretaries together with four Vice-Presidents and 12 Councillors. In addition, the President-Elect attends Council for one year prior to taking up the post.

Trustee recruitment and appointment

Annually, the full membership of the Society is asked to nominate themselves or other members of the Society to available positions on Council. A nomination must be supported by two other members of the Society. Council approves the ballot list and this together with a narrative on each candidate is sent to the full membership for their consideration prior to casting their votes. We moved to fully electronic voting and an online AGM in 2020 in line with Covid-19 restrictions; we will continue with solely online voting in future. Members of the Council are elected by ballot at the AGM, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

- President, two years
- Vice-Presidents, two years
- Treasurer and Secretaries, five years
- Councillors, three years.

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to complete a conflict-of-interest declaration and to sign a Trustee declaration form. Trustees have the opportunity to attend training, where appropriate; for example, on The Governance Code.

Regulations and procedures of the Society:

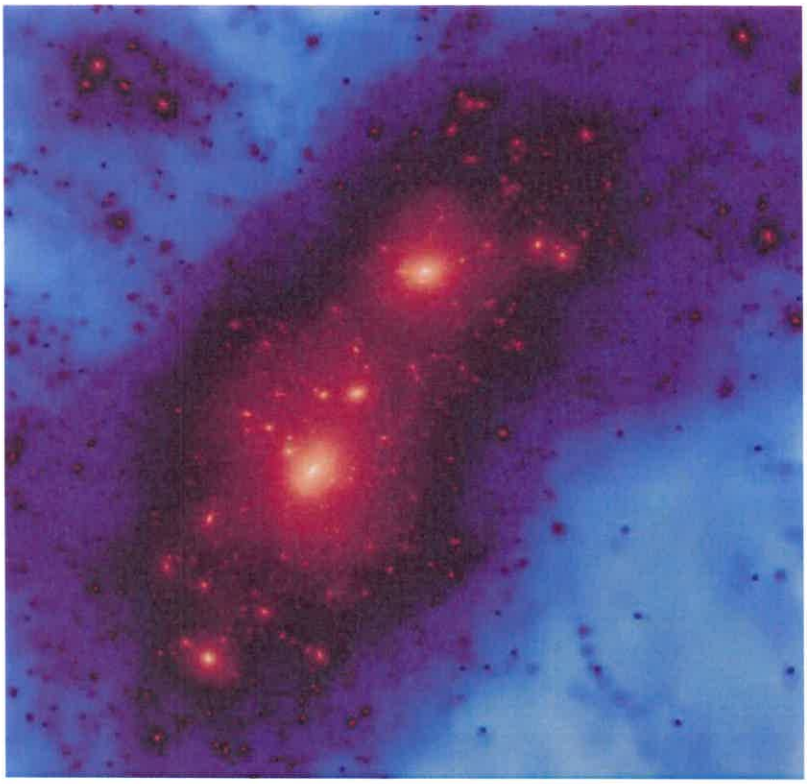
- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- Organisational structure
- Risks

Fundraising

The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

Organisational structure

The RAS Council normally meets six times during the year and its function is to direct, on behalf of the Society, all the affairs and business of the Society. Council appoints standing committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, Remuneration, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and *ad hoc* committees (e.g. Awards) to forward its objectives. It appoints the managing editors and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society*, *Geophysical Journal International*, and *RAS Techniques and Instruments*, who provide their services, as does the Treasurer, for an honorarium. The Society has formal associations with a number of organisations having shared interests, and



Above: *Structure formation in the early universe from the large FLAMINGO simulation featured in a press release* (Virgo Consortium)

has less-formal arrangements with several other bodies. These include:

- The British Geophysical Association, jointly sponsored by the RAS and the Geological Society of London to represent solid-Earth geophysicists whose interests fall within the remits of both parent societies
- The Paneth Meteorite Fund that the Society administers under the direction of the Paneth Fund Trustees
- The Society is the UK national member organisation of the International Astronomical Union and the European Astronomical Society and is represented on the UK Panel of the International Union of Radio Science
- The Society is represented on a number of organisations including the Science Council, the Parliamentary and Scientific Committee and the Campaign for Science and Engineering

The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories and science centres, use of the Society's Library, as well as a reduced subscription to the Society's members' magazine *A&G*.

RIGOROUS PEER REVIEW IS USED TO MAINTAIN THE QUALITY OF THE THREE JOURNALS

Risks

The principal risks and uncertainties identified by the Trustees are:

- Maintenance of the quality of, and income from, publications (a significant income stream of >60%) having transitioned to Open Access publishing
- Affordability of the rent and service charges in place in 2023 for the premises at Burlington House; these have changed with the agreement of new lease terms (see note 17 p57).

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is exposed and the systems that have been established to manage those risks. In regard to the most significant risks:

- The Society insists that rigorous peer review is used to maintain the quality of the three journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.
- Maintenance of the (listed) premises is ensured by regular repair and refurbishment.

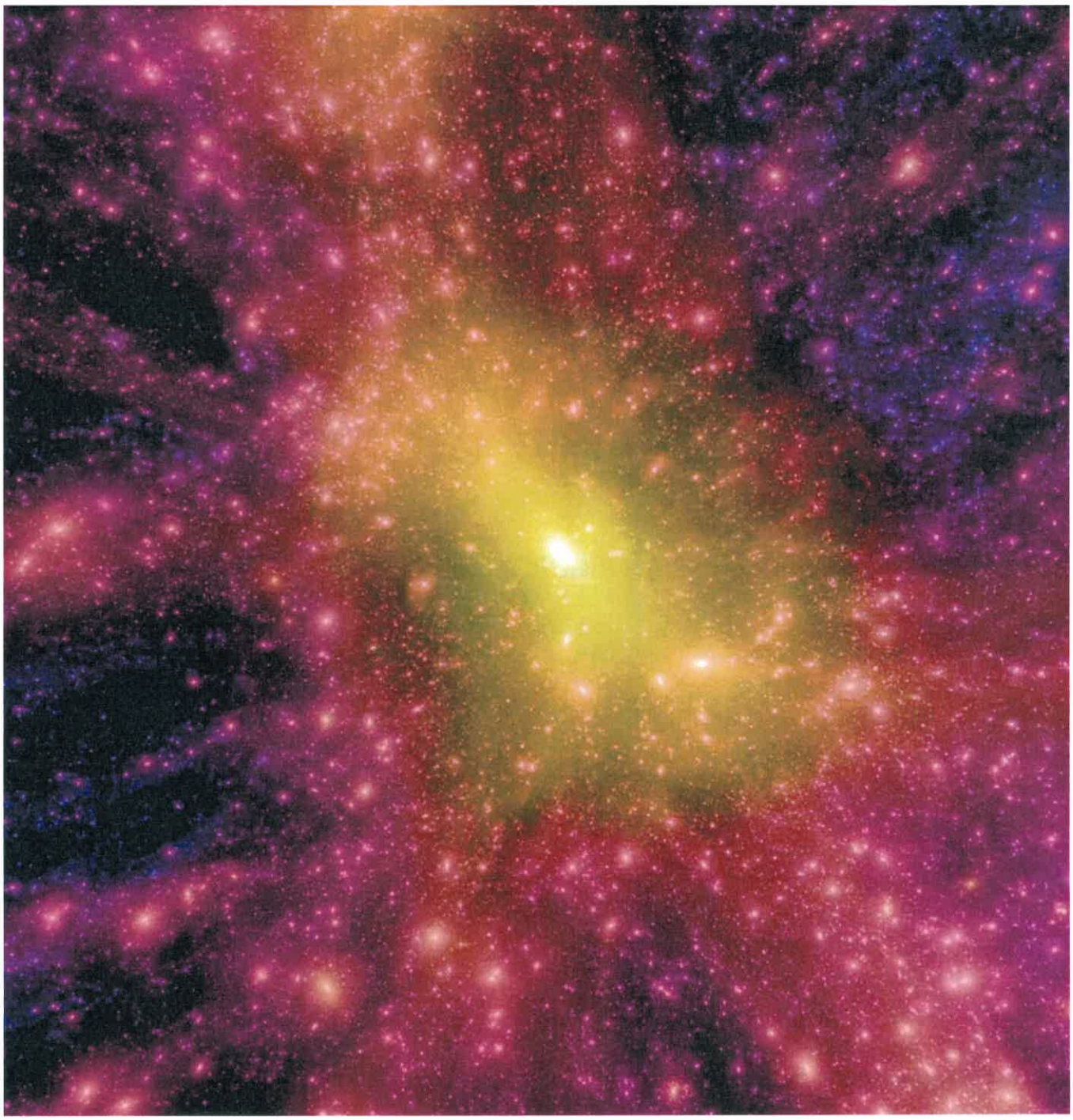
Other key risks identified and their mitigation measures include:

- Maintenance of the size of the membership (by regular review of services and subscriptions and

outreach activities to potential new members)

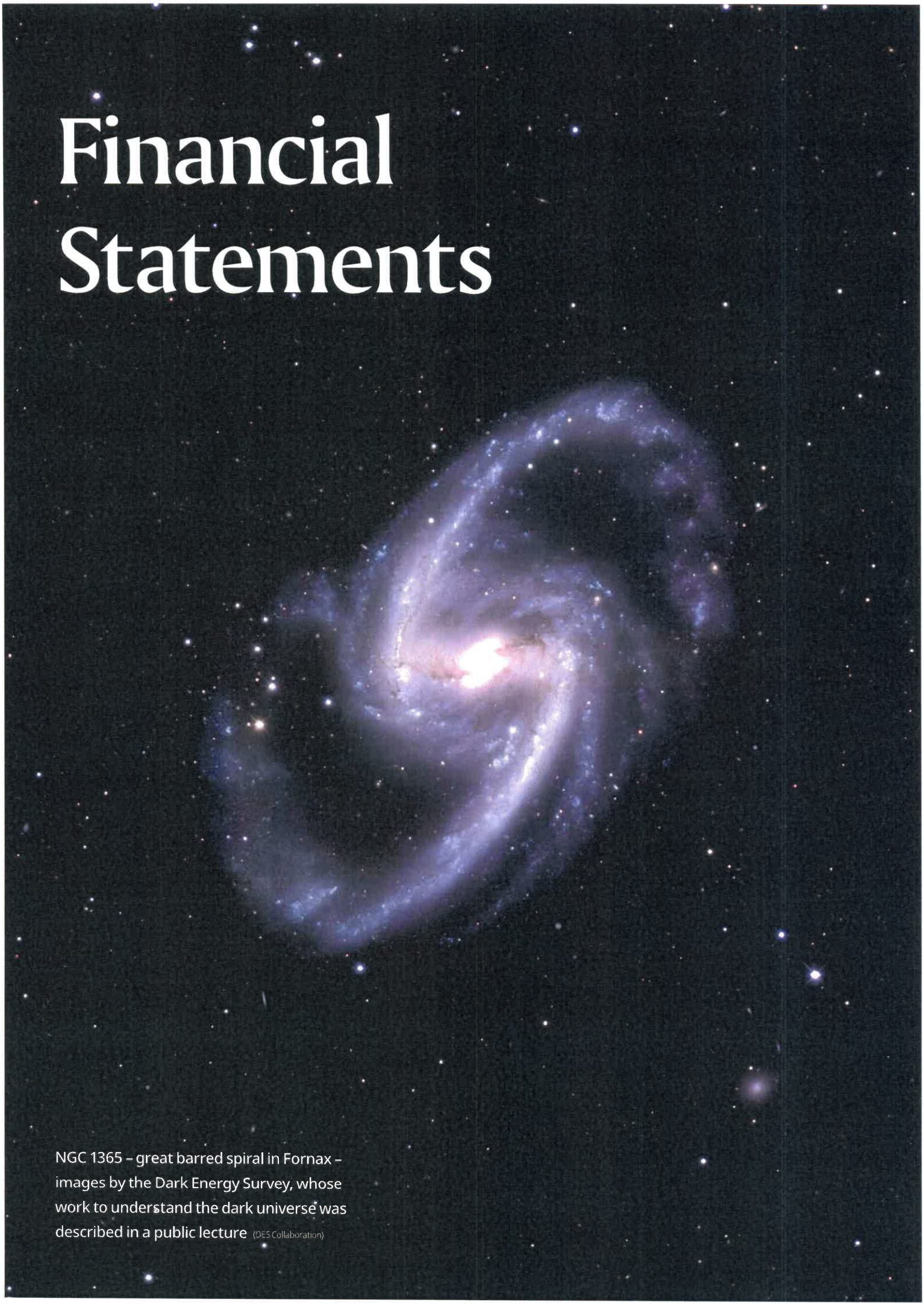
- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

The Trustees consider the fluctuations in investment fund values and variability of investment returns to be a risk for the Society. The fund, Newton Growth and Income Fund for Charities, is actively and expertly managed and administered by Newton Investment Management who were reappointed after a competitive tender. Funds are invested in a diverse portfolio comprising mainly equities and bonds. This managed strategy mitigates fluctuations in fund values and seeks opportunities for fund growth and income. The Trustees consider this approach mitigates the subsequent exposure to any investment risk.



Below: *Results of the large Flamingo cosmological simulation were published in* Monthly Notices of the Royal Astronomical Society (Dr Stuart McAlpine)

Financial Statements



NGC 1365 – great barred spiral in Fornax – images by the Dark Energy Survey, whose work to understand the dark universe was described in a public lecture (DES Collaboration)

FINANCIAL REVIEW

The Society's total funds increased from £23,477,081 to £25,823,874 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art) which totalled £9,470,879 (2022 – £9,470,879). Income increased to £7,082,695 (2022 – £5,280,990) due to increased income from publishing and investments. Publishing income increased by £1,631,120, significantly increased by the renewal of the contract with Oxford University Press. The Society's expenditure increased to £5,276,132 (2022 – £4,733,200) which is mainly due to a full return to pre Covid-19 activities.

Policy on reserves

The reserves policy aims to maintain adequate financial cover for the main risks to the Society and provide in the normal way for an efficient winding-up if that ever became necessary. Working cash reserves are maintained so the Society does not rely on realisation of investments gains, or capital invested. The total funds amounted to £25,823,874 of which £9,470,879 are held in heritage assets, leaving funds of £16,352,995 (2022 – £14,006,202) to cover the main risks and the operational needs of a going concern. The requirement for significant reserves falls into two areas:

- The need to have contingency plans in place to maintain publication income now that, from 2024, the two main journals, Monthly Notices of the Royal Astronomical Society and Geophysical Journal International, are fully Open Access.
- The need to make some provision for substantial increases in the cost of our accommodation. In March 2024 it was agreed, (after a full discussion by the trustees and subject to contract), with the Department for Levelling Up, Housing and Communities (DLUHC) to purchase a 999 year lease, alongside four other Courtyard Societies, at a peppercorn rent thereby giving greater certainty to the future of the premises but making the Society liable for the costs of backlog maintenance, environmental improvements and greater accessibility.

The Accommodation and Building funds are detailed in note 17, page 57, along with the other Designated funds.

The Open Access Fund and the Burlington House Fund are currently maintained at high levels to support any significant changes to the Society's operations and the General Fund is available to provide further financial support if either of these risks materialise. The General Fund is also available, should it ever be needed, to enable an orderly winding up of the Society. At present the free reserves of the Society, defined as unrestricted, undesignated funds, excluding tangible fixed assets, are £7,659,982 (2022 – £7,028,151) and these would allow operation of the Society for at least 16 months if publishing were continued and expenditure incurred during that period and 42 months if publishing were halted. The trustees are satisfied that the current level of reserves is appropriate given the risks and uncertainties outlined above.

It has been the policy of the Society to fund grant activity from the Research and Grants fund, which is now included in the balance of designated reserves.

Investment policy

Investments are held with BNY Mellon Charities Fund: Newton Growth and Income Fund for Charities, with the aim of generating capital growth and income over the medium to long term, with actively managed assets held in global equities and fixed income securities. Surplus cash is held in the COIF Charities

Deposit Fund with CCLA Investment Management, which provides a high level of capital security, interest, and liquidity. The Fund has an actively managed diversified portfolio of sterling denominated money market deposits and instruments. Income and gains from these investments contribute to fund the Society's charitable activities. Investment performance is monitored by the accountant, treasurer, finance committee and Council.

The trustees, by resolution, adopted a total returns approach to the invested endowment funds in accordance with the requirements of the Charity Commission believing that this approach is in the best interests of the Society. The fund reconciliation is disclosed in note 12. This approach was applied from 1 January 2015 when the value of the endowment funds at that date of £1,652,682 was used as a proxy for the original value of the endowment funds. In adopting this policy, permanent endowment funds will not be permitted to fall below the original value of £1,652,682. The trustees aim to maintain the real value of the permanent endowment as a measure against the movements in the retail prices index. This was 5.2% for the year (2022 – 13.50%). No transfers to the restricted funds were made during the year, (2022 – nil).

Grant making policy

The RAS has for many years provided small grants to support the community in activities not funded by the research councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to experience working in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

In addition to these grants to individuals the Society funds a series of fellowships to promote the careers of the highest quality young postdoctoral scientists. These currently include RAS Fellowships (on any subject) and the Norman Lockyer Fellowship (on an astronomical topic, including solar system and planetary science). The Norman Lockyer Fellow is funded from an endowment fund set up for that purpose.

A further activity funded by the Society is the award of medals to recognise the highest quality work in various categories. These awards are proposed to Council by a separate awards panel and no awards are made to serving councillors.

The grants, fellowships and awards are funded from several sources including the restricted and endowment funds invested with Newton Investment Management. The income and gains from these investments and interest from the CCLA COIF Charities Deposit Fund, are used to support the grants expenditure in accordance with the bequests.

The grants panel deliberates twice a year and further grants are awarded by the Education and Outreach Committee. 176 applications were received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

Information relating to RAS200 can be found on page 21.

FINANCIAL REVIEW (CONTINUED)

Key management personnel

The key management personnel of the charity in charge of directing and controlling, running and operating the charity are the trustees, the Executive Director and the Deputy Executive Director; the latter two are employees. They are assisted by the Accountant, a further five managerial level officers and other staff.

Council ensures that the Society carries out a salary comparison exercise every 3-5 years. The comparability study compares the staff salaries to other similar external positions to reassure the trustees that the levels of remuneration are appropriate. The last comparison exercise was carried out in 2023 and the newly created Remuneration Committee started the process of a full review in January 2024.

The Society does not have a performance related pay scheme. The trustees set up the Remuneration Committee to advise on the appropriate level of salary increase in response to the cost of living increases for all staff.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has two deferred members only and nine annuitants. The Society operates a defined contribution group personal pension scheme for current staff.

Legacies and donations

The Society encourages Fellows to include donations to the Society in their wills and receives donations during the year from Fellows and members of the public. During the year the Society received donations of £2,167 (2022 - £4,009) and legacies of £10,000 (2022- £12,324).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5 million. The Society does not regard these as assets which can be converted to their cash value, except in the most dire circumstances.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. Where a valuation is available for additions to the collection, this is reflected in the financial statements. A valuation will always be obtained for additions that are financially material to the whole collection

Investment performance

The Newton Growth and Income fund for Charities provided a yield of 2.32% and a total return gross of 9.21% in the year. Annual management charges of 0.6% are taken from the capital of the fund. Interest from the COIF Charities Deposit Fund yielded 4.4%. Performance of the fund managers is kept under continual review.

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The trustees are responsible for preparing the Trustees' report and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The law applicable to charities in England and Wales requires the trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of the income and expenditure of the charity for that period. In preparing these financial statements, the trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102);
- make judgments and estimates that are reasonable and prudent;
- state whether applicable United Kingdom

Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements;

- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in operation.

The trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and the provisions of the Royal Charter and Bye Laws. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities. The trustees are responsible for the maintenance and integrity of the charity and financial information included on the charity's website.
The Council of the Society believes that it has carried out these requirements.

AUDITORS

A resolution to appoint Buzzacott for 2024 will be proposed at the Annual General Meeting.

Approved by the Council and signed on its behalf by:

Prof. Michael G Edmunds
President
Date: 10 May 2024

INDEPENDENT AUDITOR'S REPORT TO THE TRUSTEES OF ROYAL ASTRONOMICAL SOCIETY

Opinion

We have audited the financial statements of Royal Astronomical Society (the 'charity') for the year ended 31 December 2023, which comprise the statement of financial activities, the balance sheet, the statement of cash flows, the principal accounting policies and the notes to the financial statements. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland' (United Kingdom Generally Accepted Accounting Practice).

In our opinion, the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2023 and of its income and expenditure for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Conclusions relating to going concern

In auditing the financial statements, we have concluded that the trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue.

Our responsibilities and the responsibilities of the trustees with respect to going concern are described in the relevant sections of this report.

Other information

The trustees are responsible for the other information. The other information comprises the information included in the annual report and financial statements other than the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether there is a material misstatement in the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

Matters on which we are required to report by exception

We have nothing to report in respect of the following matters in relation to which the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the trustees' annual report is inconsistent in any material respect with the financial statements; or

- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Responsibilities of trustees

As explained more fully in the trustees' responsibilities statement, the trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the trustees either intend to liquidate the charity or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud is detailed below.

Our approach to identifying and assessing the risks of material misstatement in respect of irregularities, including fraud and non-compliance with laws and regulations, was as follows:

- the engagement partner ensured that the engagement team collectively had the appropriate competence, capabilities and skills to identify or recognise non-compliance with applicable laws and regulations;
- we identified the laws and regulations applicable to the charity through discussions with management, and from our knowledge and experience of the sector;
- we focused on specific laws and regulations which we considered may have a direct material effect on the financial statements or the operations of the charity, including the Charities Act 2011, data protection legislation, anti-bribery, employment, pensions and health and safety legislation;
- we assessed the extent of compliance with the laws and regulations identified above through making enquiries of management; and
- identified laws and regulations were communicated within the audit team regularly and the team remained alert to instances of non-compliance throughout the audit.

We assessed the susceptibility of the charity's financial statements to material misstatement, including obtaining an understanding of how fraud might occur, by:

- making enquiries of management and those charged with governance as to where they considered there was susceptibility to fraud, their knowledge of actual, suspected and alleged fraud; and
- considering the internal controls in place to mitigate risks of fraud and non-compliance with laws and regulations.

To address the risk of fraud through management bias and override of controls, we:

- performed analytical procedures to identify any unusual or unexpected financial relationships;
- tested journal entries to identify unusual financial transactions;
- tested authorisation controls during substantive testing of expenditure;

- assessed whether judgements and assumptions made were indicative of potential bias; and
- investigated the rationale behind significant or unusual financial transactions.

In response to the risk of irregularities and non-compliance with laws and regulations, we designed procedures which included, but were not limited to:

- agreeing financial statement disclosures to underlying supporting documentation;
- reading the minutes of meetings of those charged with governance; and
- enquiring of management and those charged with governance as to actual and potential litigation and claims.

There are inherent limitations in our audit procedures described above. The more removed that laws and regulations are from financial transactions, the less likely it is that we would become aware of non-compliance. Auditing standards also limit the audit procedures required to identify non-compliance with laws and regulations to enquiry of the trustees and other management and the inspection of regulatory and legal correspondence, if any.

Material misstatements that arise due to fraud can be harder to detect than those that arise from error as they may involve deliberate concealment or collusion.

A further description of our responsibilities for the audit of the financial statements is located on the Financial Reporting Council's website at www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditor's report.

Use of our report

This report is made solely to the charity's trustees, as a body, in accordance with section 144 of the Charities Act 2011 and with regulations made under section 154 of that Act. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's trustees as a body, for our audit work, for this report, or for the opinions we have formed.

Buzzacott LLP
10 May 2024
Registered Auditor
130 Wood Street
London
EC2V 6DL

Buzzacott LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2023

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2023 Total funds £	2022 Total funds £
Income						
Donations and legacies	1	**11,176**	**991**	—	**12,167**	16,333
Other trading activities		**13,181**	—	—	**13,181**	9,309
Investment income	2	**299,888**	**17,905**	**111,797**	**429,590**	252,030
Charitable activities	3	**6,627,757**	—	—	**6,627,757**	5,003,318
Total income		**6,952,002**	**18,896**	**111,797**	**7,082,695**	5,280,990
Expenditure						
Raising funds		**19,615**	—	—	**19,615**	42,313
Charitable activities	5	**5,192,332**	**64,185**	—	**5,256,517**	4,690,887
Total expenditure		**5,211,947**	**64,185**	—	**5,276,132**	4,733,200
Net income (expenditure) before investment gains and losses		**1,740,055**	**(45,289)**	**111,797**	**1,806,563**	547,790
Net gains (losses) on investments	12	**372,759**	**23,119**	**144,352**	**540,230**	(717,182)
Net income (expenditure) for the year and net movement in funds		**2,112,814**	**(22,170)**	**256,149**	**2,346,793**	(169,392)
Reconciliation of funds:						
Total funds brought forward at 1 January 2023		**20,494,288**	**1,058,292**	**1,924,501**	**23,477,081**	23,646,473
Total funds carried forward at 31 December 2023		**22,607,102**	**1,036,122**	**2,180,650**	**25,823,874**	23,477,081

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 47 to 61 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2022

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2022 Total funds £
Income					
Donations and legacies	1	13,101	3,232	—	16,333
Other trading activities		9,309	—	—	9,309
Investment income	2	174,271	10,623	67,136	252,030
Charitable activities	3	5,003,318	—	—	5,003,318
Total income		5,199,999	13,855	67,136	5,280,990
Expenditure					
Raising funds		42,313	—	—	42,313
Charitable activities	5	4,687,107	3,780	—	4,690,887
Total expenditure		4,729,420	3,780	—	4,733,200
Net income before investment losses		470,579	10,075	67,136	547,790
Net losses on investments	12	(494,856)	(30,371)	(191,955)	(717,182)
Net expenditure for the year and net movement in funds		(24,277)	(20,296)	(124,819)	(169,392)
Reconciliation of funds:					
Total funds brought forward at 1 January 2022		20,518,565	1,078,588	2,049,320	23,646,473
Total funds carried forward at 31 December 2022		20,494,288	1,058,292	1,924,501	23,477,081

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 47 to 61 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2023

	Notes	2023 £	2023 £	2022 £	2022 £
Fixed assets					
Tangible assets					
. Heritage assets	11	**9,470,879**		9,470,879	
. Other assets	11	**482,016**		570,167	
Investments	12	**9,696,013**		9,155,783	
			19,648,908		19,196,829
Current assets					
Debtors	13	**1,052,260**		1,141,492	
Cash at bank and in hand		**7,415,452**		4,853,609	
		8,467,712		5,995,101	
Creditors: amounts falling due within one year	14	**(2,228,747)**		(1,643,346)	
Net current assets			**6,238,965**		4,351,755
Total assets less current liabilities			**25,887,873**		23,548,584
Creditors: amounts falling due after one year	14		**(63,999)**		(71,503)
Total net assets			**25,823,874**		23,477,081
The funds of the charity					
Endowment funds	15		**2,180,650**		1,924,501
Restricted income funds	16		**1,036,122**		1,058,292
Unrestricted income funds					
. Designated funds	17	**14,870,434**		13,385,888	
. General funds		**7,736,668**		7,108,400	
			22,607,102		20,494,288
			25,823,874		23,477,081

The financial statements were approved by Council on 10 May 2024 and signed on its behalf by

Prof. Michael G Edmunds
President

The notes on pages 47 to 61 form part of these financial statements

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2023

	Notes	2023 £	2022 £
Cash flow from operating activities			
Net cash provided by operating activities	A	**2,169,313**	191,163
Cash inflow from investing activities			
Dividends and interest from investments		**429,590**	252,030
Purchase of tangible fixed assets		**(37,060)**	(36,153)
Net cash provided by investing activities		**392,530**	215,877
Change in cash and cash equivalents in the year		**2,561,843**	407,040
Cash and cash equivalents at 1 January 2023	B	**4,853,609**	4,446,569
Cash and cash equivalents at 31 December 2023	B	**7,415,452**	4,853,609

NOTES TO THE STATEMENT OF CASH FLOWS FOR THE YEAR TO 31 DECEMBER 2023

A Reconciliation of net movement in funds to net cash flow from operating activities

	2023 £	2022 £
Net movement in funds (as per the statement of financial activities)	**2,346,793**	(169,392)
Adjustments for:		
Depreciation charge	**125,211**	122,311
Net (gains) losses on investments	**(540,230)**	717,182
Dividends and interest from investments	**(429,590)**	(252,030)
Decrease (increase) in debtors	**89,232**	(28,638)
Increase (decrease) in creditors	**577,897**	(198,270)
Net cash provided by operating activities	**2,169,313**	191,163

B Analysis of cash and cash equivalents

	2023 £	2022 £
Total cash and cash equivalents: Cash at bank and in hand	**7,415,452**	4,853,609

C Reconciliation of net funds

	1 January 2023 £	Cash flows £	31 December 2023 £
Cash and cash equivalents	4,853,609	2,561,843	**7,415,452**

PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted, judgements and key sources of estimation uncertainty in the preparation of the financial statements are laid out below.

Basis of preparation

These financial statements have been prepared for the year to 31 December 2023.

The financial statements have been prepared under the historical cost convention with items recognised at cost or transaction value unless otherwise stated in the relevant accounting policies below or the notes to these financial statements.

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (Charities SORP) the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) and the Charities Act 2011.

The charity constitutes a public benefit entity as defined by FRS 102.

The financial statements are presented in sterling and are rounded to the nearest pound.

Critical accounting estimates and areas of judgement

Preparation of the financial statements requires the trustees and management to make significant judgements and estimates.

The items in the financial statements where these judgements and estimates have been made include:

- the liability for multi-year grant commitments; and
- the useful economic life of tangible fixed assets.

Assessment of going concern

The trustees have assessed whether the use of the going concern assumption is appropriate in preparing these financial statements. The trustees have made this assessment in respect of a period of at least one year from the date of approval of these financial statements.

The trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased costs for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk, that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves Policy in the Trustees' report provides more detail.

The trustees have also considered the continuing impact of the Russian invasion of Ukraine. The Newton Growth and Income Fund for Charities has little or no exposure to Russian or Ukraine and subsequent interest rate rises during the year increased income significantly from the CCLA COIF Charities Deposit Fund. The Society's publishing activities are world-wide, but there are no editors based in Russia or Ukraine, and Oxford University Press reports the impact on these publishing activities is minimal. Higher energy costs did not materially impact the Society. The trustees have concluded that there are no other material uncertainties related to events or conditions that may cast significant doubt on the ability of the charity to continue as a going concern.

The most significant areas of judgement that affect items in the financial statements are mentioned above and detail provided in the section on risks in the Trustees' report.

Income recognition

Income is recognised in the period in which the charity has entitlement to the income, the amount of income can be measured reliably and it is probable that the income will be received.

Income comprises donations, investment income, income from the sale of publications, membership subscriptions, and other related income.

Donations, are recognised when the charity has confirmation of both the amount and settlement date. In the event of donations pledged but not received, the amount is accrued for where the

receipt is considered probable. In the event that a donation is subject to conditions that require a level of performance before the charity is entitled to the funds, the income is deferred and not recognised until either those conditions are fully met, or the fulfilment of those conditions is wholly within the control of the charity and it is probable that those conditions will be fulfilled in the reporting period.

Legacies are included in the statement of financial activities when the charity is entitled to the legacy, the executors have established that there are sufficient surplus assets in the estate to pay the legacy, and any conditions attached to the legacy are within the control of the charity.

The Society has a contract with Oxford University Press for the publication of journals, which gives a percentage of the surplus made to 31 December each year to the Society. Although payments are received net, income is recognised in the financial statements on a gross basis which reflects that the Society retains the underlying long term rights. All publication income is accounted for on a receivable basis.

Membership subscriptions are payable in respect of a twelve month period in advance. The unearned portion of income received relating to the period after 31 December is carried forward as deferred income.

Investment income is recognised once the dividend has been declared and notification has been received of the dividend due.

Interest on funds held on deposit is included when receivable and the amount can be measured reliably by the charity; this is normally upon notification of the interest paid or payable by the bank.

Expenditure recognition

Expenditure is recognised as soon as there is a legal or constructive obligation committing the charity to the expenditure. All expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all costs related to the category.

Expenditure on charitable activities includes all costs associated with furthering the charitable purposes of the charity as described in the Trustees' Report.

Grants payable for the support of research or study in any areas of astronomy and geophysics are recognised in the financial statements as soon as the obligation has been authorised by the Grants Committee, which meets twice-yearly (ca. February and August) to allocate funds, the recipient has a reasonable expectation that they will receive a grant and any condition attaching to the grant is outside the control of the Society.

The costs of raising funds consist of room hire expenditure and RAS diaries bought for resale.

Allocation of support and governance costs

Support costs, including governance costs, represent indirect charitable expenditure. In order to carry out the primary purposes of the charity it is necessary to provide support in the form of personnel development, financial procedures, provision of office services and equipment and a suitable working environment.

Governance costs comprise audit fees, legal advice for trustees and costs associated with constitutional and statutory requirements, e.g. cost of trustee meetings and preparing statutory financial statements as well as costs associated with the strategic management of the Society

Support costs are apportioned based on the proportion of floor area occupied by, or proportion of staff time spent on, the activity.

Taxation

The Society is a registered charity and no liability to taxation arises on the results of its activities as applied for charitable purposes, with the exception of investment income, which is taxed at source.

Operating leases

Rentals under operating leases are charged to the statement of financial activities on a straight-line basis over the term of the lease.

Pension costs

The Society operates two pension schemes for employees and former employees. The assets of the schemes are held separately from those of the Society.

The Society operates a defined benefit pension

scheme for former employees, who joined its service before 1 January 2002, providing benefits based upon final pensionable earnings. Royal London manages the pension scheme, with the investments held by Royal London.

The latest actuarial valuation shows a pension surplus which is not recognised on the balance sheet as an asset because it is not available to the Society by way of reduced future contributions.

Actuarial gains and losses arising from new valuations and from updating valuations to the balance sheet date are recognised in the statement of financial activities as other recognised gains and losses.

The Society has established a second pension scheme (a defined contribution scheme) for employees who began service with the Society after 1 January 2002. The amount charged in the statement of financial activities in respect of the defined contribution pension scheme is the contributions payable in the year.

Heritage assets

Heritage assets are included in the financial statements at a historic valuation which is being treated as deemed cost. There are two main classes of heritage assets that the Society possesses, which are:

- Rare Books and Manuscripts
- Fine Art and Collectibles – Historic books, portraits, busts, instruments and antique furniture.

The Society's rare book and manuscript collection is reported in the balance sheet at a valuation by Christies in 1996, with a number of items re-valued by B Quaritch Limited in 2011. The valuation basis was High Auction Estimate.

The Society's fine art and collectibles are reported in the balance sheet at a valuation by Bonhams in 1992, including index linking, with a number of items revalued by Bonhams in 2011.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. The Society would only obtain a valuation of the donation, if it was deemed to materially affect the overall value of the heritage asset portfolio.

Depreciation is not charged on heritage assets due to immateriality based on their extremely long useful lives and high residual values.

Other tangible fixed assets

The Society capitalises tangible fixed assets with a cost greater than £250 and an estimated useful life over one year.

Tangible fixed assets are depreciated on cost on a straight line basis from the date of acquisition over their expected useful lives as follows:

- Telephone and security system and computer equipment..... 4 years
- Leasehold Improvements ..... 20 years
- Plant and machinery .....10 years

Investments

Listed investments are a form of basic financial instrument and are initially recognised at their transaction value and subsequently measured at their fair value as at the balance sheet date using the closing quoted market price.

Realised gains (or losses) on investment assets are calculated as the difference between disposal proceeds and their opening carrying value or their purchase value where the investment is acquired subsequent to the first day of the financial year. Unrealised gains and losses are calculated as the difference between the fair value at the year end and their carrying value at that date. Realised and unrealised investment gains (or losses) are combined in the statement of financial activities and are credited (or debited) in the year in which they arise.

Debtors

Debtors are recognised at their settlement amount, less any provision for non-recoverability. Prepayments are valued at the amount prepaid.

Cash at bank and in hand

Cash at bank and in hand represents such accounts and instruments that are available on demand or have a maturity of less than three months from the date of acquisition.

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as

a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt.

Fund structure

Endowment funds comprise assets which normally must be held as capital. The income arising therefrom is used to support specific activities determined in accordance with the wishes of the donor.

Restricted funds comprise monies raised for, or their use restricted to, a specific purpose, or contributions subject to donor imposed conditions.

Designated funds represent monies set aside out of unrestricted funds and designated by the trustees for a specific purpose.

Unrestricted funds represent those monies which are freely available for application towards achieving any charitable purpose that falls within the Society's charitable objects.

1. Donations and legacies

	Unrestricted funds £	Restricted funds £	2023 Total funds £	Unrestricted funds £	Restricted funds £	2022 Total funds £
Donations	**1,176**	**991**	**2,167**	1,009	3,000	4,009
Legacies	**10,000**	—	**10,000**	12,092	232	12,324
Total funds	**11,176**	**991**	**12,167**	13,101	3,232	16,333

2. Investment income

	Unrestricted funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Income from listed investments	**155,914**	**9,670**	**60,379**	**225,963**
Bank interest	**143,974**	**8,235**	**51,418**	**203,627**
2023 Total funds	**299,888**	**17,905**	**111,797**	**429,590**

	Unrestricted funds £	Restricted funds £	Endowment funds £	2022 Total funds £
Income from listed investments	141,776	8,703	55,000	205,479
Bank interest	32,495	1,920	12,136	46,551
2022 Total funds	174,271	10,623	67,136	252,030

3. Income from charitable activities

	Unrestricted funds	
	2023 £	2022 £
Publications (note 4)	**6,209,917**	4,578,797
Membership	**370,606**	369,762
Scientific meetings	**30,225**	27,958
Public policy	**731**	2,105
Library	**3,492**	4,677
Educational	**210**	543
Other	**12,576**	19,476
Total funds	**6,627,757**	5,003,318

4. Publications

	2023 £	2022 £
Income (see note)		
Monthly Notices of the Royal Astronomical Society	**4,758,987**	3,437,288
Geophysical Journal International	**1,278,672**	1,046,550
Astronomy & Geophysics	**106,360**	81,118
Royal Astronomical Society Techniques & Instruments	**60,032**	7,518
Other	**5,866**	6,323
	6,209,917	4,578,797
Expenditure		
Monthly Notices of the Royal Astronomical Society	**2,735,624**	2,447,568
Geophysical Journal International	**686,333**	699,828
Astronomy & Geophysics	**187,045**	168,291
Royal Astronomical Society Techniques & Instruments	**56,020**	20,959
Other	**5,982**	33,714
	3,671,004	3,370,360

Publications income includes additional income due to the renewal of the publishing agreement with Oxford University Press

5. Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2023 £	Direct costs £	Support costs £	2022 £
Publications (note 4)	**3,196,294**	**474,710**	**3,671,004**	2,948,115	422,245	3,370,360
Scientific meetings	**96,917**	**229,999**	**326,916**	95,751	204,579	300,330
Membership	**10,377**	**54,618**	**64,995**	8,842	48,582	57,424
Educational	**343,340**	**93,225**	**436,565**	147,795	80,590	228,385
RAS 200	**18,602**	**3,000**	**21,602**	86,930	5,000	91,930
Library	**104,699**	**445,004**	**549,703**	102,583	395,822	498,405
Public policy	**94,379**	**91,353**	**185,732**	62,796	81,257	144,053
	3,864,608	**1,391,909**	**5,256,517**	3,452,812	1,238,075	4,690,887

Grants, fellowships and awards in support of research are principally included under Educational and RAS 200 above to reflect the responsibilities for the management and administration of grants. 109 grants, fellowships and awards, totalling £252,511 (2022 – £178,412) were awarded to institutions and 37 grants, medals and awards totalling £20,683 (2022 – £28,066) were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £35,365 (2022 – £32,000). The 2023 Norman Lockyer Fellowship totalled £57,000. Adjustments to other grants resulted in credits to expenditure totalling £21,768 (2022 – £54,180).

Total grant making support costs were £36,000 (2022 – £35,000). A full list of all grantees and analysis can be found on the Society's website. All expenditure on charitable activities is unrestricted except for £64,185 (which is entirely included within the educational category) which is restricted (2022 – £3,780).

6. Support costs

Support costs analysed by function are as follows:

	2023 £	2022 £
Executive	**144,233**	124,102
Finance	**100,298**	96,280
Facilities	**112,288**	99,890
Membership	**47,534**	41,625
IT	**154,975**	84,202
Policy, development and press	**118,719**	107,819
Burlington House	**173,584**	168,808
Other	**379,035**	362,237
Governance (note 7)	**161,243**	153,112
	1,391,909	1,238,075

Staff time (based on a review of staff time apportionment) and floor area, are used as bases of apportioning support costs over charitable activities.

7. Governance costs

	2023 £	2022 £
Auditor's remuneration (note 8)	**25,510**	24,100
Trustees' and Committee costs	**41,235**	18,921
AGM expenses	**4,330**	9,107
Staff time and other expenses	**90,168**	100,984
	161,243	153,112

8. Net income (expenditure) for the year

This is stated after charging:

	2023 £	2022 £
Depreciation	**125,211**	122,311
Auditor's remuneration:		
. Charity audit	**19,600**	17,500
. Pension scheme audit	**5,160**	5,850
. Other services	**750**	750
Operating lease rentals		
. Office equipment	**10,830**	7,449

9. Staff costs and remuneration of key management personnel

	2023 £	2022 £
Wages and salaries	**1,035,906**	972,010
Social security costs	**110,409**	106,197
Pension costs (see note 20)		
. Stakeholder pension scheme	**86,248**	82,315
. Death in service contributions	**8,469**	6,924
	1,241,032	1,167,446

During the year one employee earned between £90,000 and £100,000 (2022 -no employee) no employee of the Society earned between £80,000 and £90,000 (2022 – one employee), one employee earned between £70,000 and £80,000 (2022 – one employee) and one employee earned between £60,000 and £70,000 (2022 – one employee). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £24,080 (2022 – £21,980).

The average number of employees was 23 (Administration 6, Outreach 2, Editorial 10, Library 2, House 1, Press & Policy 2) (2022 – 24). The key management personnel of the charity in charge of directing and controlling, running and operating the charity on a day to day basis comprise the trustees and the Executive and Deputy Executive Directors. The total remuneration (including taxable benefits and employer's pension and national insurance contributions) of the key management personnel for the year was £222,491 (2022 - £202,413).

10. Transactions with trustees

The trustees receive reimbursement for travel expenses incurred in attending meetings. The amount reimbursed during the year for 22 trustees was £23,891 (2022 – £11,561). Remuneration of £11,510 was paid to two trustees during 2023 (2022 – £6,292 to one Trustee). By agreement with the Charity Commissioners (dated 14 June 2004, case No. 299189, Sealing No. 344/04) the Treasurer is paid an Honorarium. This is formally approved each year by Council.

Grants Made to Councillors

The following grants were made to Councillors during the year as part of the RAS grant awarding process. The recipients had no influence or part in the decisions on the award of these grants. For the most part the grant holders were not the main personal beneficiaries as the support was directly received by their students or meeting attendees. Excluding Councillors from the grants round completely is not seen as a satisfactory policy. It would strongly dissuade members from standing for election as Councillors and would be at variance with the accepted practice in Research Councils where members of grants panels are not excluded from applying. The process of grant review and award fully complies with the Nolan Principles and closely follows Government Research Council practice.

The grants were:

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of trustees as the Society).
- F A Paneth Meteorite Collection as disclosed in note 22. Dr Nigel Berman, Treasurer, was a trustee, and Prof A M Cruise, Treasurer, is a trustee.
- A £1,000 P Tomkins Thesis Prize and a £500 P Tomkins Undergraduate Prize were awarded during the year. Patricia Tomkins is a trustee.
- The Society awarded funding of £4,000 to the British Geophysical Association (BGA). BGA Committee members Prof James Hammond and Prof Andrew Curtis are trustees.

11. Tangible fixed assets

a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	**Total £**
At 1 January 2023 and 31 December 2023	4,951,500	4,519,379	**9,470,879**

Fine art and collectible additions of £30,000 were recorded in 2020. There were no other additions in the last five years.

The rare book collection is preserved by storing in an air-conditioned, temperature-controlled environment; the fine art and collectibles are also continually preserved in order to maintain their values.

Certain heritage assets are on public display at exhibitions. The Society's Librarian controls access to those heritage assets which are kept at Burlington House.

b) Other assets

	Leasehold improve-ments £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	**Total £**
Cost					
At 1 January 2023	1,879,422	38,360	339,459	9,994	**2,267,235**
Additions	9,057	515	27,488	—	**37,060**
At 31 December 2023	**1,888,479**	**38,875**	**366,947**	**9,994**	**2,304,295**
Depreciation					
At 1 January 2023	1,388,536	21,071	287,461	—	**1,697,068**
Charge for the year	94,613	3,879	26,719	—	**125,211**
At 31 December 2023	**1,483,149**	**24,950**	**314,180**	—	**1,822,279**
Net book values					
At 31 December 2023	**405,330**	**13,925**	**52,767**	**9,994**	**482,016**
At 31 December 2022	490,886	17,289	51,998	9,994	**570,167**

12. Investments

	2023 Total funds £	2022 Total funds £
Market value at 1 January 2023	**9,155,783**	9,872,965
Net unrealised investment gains (losses)	**540,230**	(717,182)
Market value at 31 December 2023	**9,696,013**	9,155,783
Historical cost as at 31 December 2023	4,917,081	4,917,081

Investments comprise BNY Mellon: Newton Growth and Income Fund for Charities

The permanent endowment fund investments and movements in the unapplied total return are set out below.

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2023	**1,652,682**	**271,819**	**1,924,501**
Add: Total return			
. Investment income		**111,797**	**111,797**
. Net gains on listed investments		**144,352**	**144,352**
		256,149	**256,149**
At 31 December 2023		**527,968**	**2,180,650**

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2022	1,652,682	396,638	2,049,320
Add: Total return			
. Investment income		67,136	67,136
. Net losses on listed investments		(191,955)	(191,955)
		(124,819)	(124,819)
At 31 December 2022	1,652,682	271,819	1,924,501

When adopting total applied return with effect from 1 January 2015, in the absence of reliable records of the original donations, the trustees considered that the market values of the investments as recorded as at 1 January 2015 were appropriate to be considered as the initial value of the trust for investment. Since that figure sets the baseline below which disposals may not be made, taking a higher value than the actual original donations was considered to be prudent.

The trustees have resolved that they wish to maintain the real value of the permanent endowment using the retail price index as a measure. No transfers to the restricted funds were made in the year (2022 – £nil).

13. Debtors

	2023 £	2022 £
Trade debtors	**5,346**	8,492
Prepayments and accrued income	**1,046,255**	1,107,943
Other debtors	**659**	25,057
	1,052,260	1,141,492

14. Creditors

a) Amounts falling due within one year

	2023 £	2022 £
Trade creditors	**28,486**	26,128
Accruals	**107,788**	234,353
Grants payable	**168,647**	71,503
Tax and social security	**552,937**	208,691
Deferred income	**1,299,417**	1,038,917
Other creditors	**71,472**	63,754
	2,228,747	1,643,346

b) Amounts falling due after more than one year

	2023 £	2022 £
Grants payable	**63,999**	71,503

c) Deferred income

	2023 £	2022 £
Balance as at 1 January 2023	**1,038,917**	1,039,016
Released to income	**(1,038,917)**	(1,039,016)
Income received from Fellows in advance	**47,428**	56,540
Publications income received in advance	**1,250,000**	950,000
Other income received in advance	**1,989**	32,377
Balance as at 31 December 2023	**1,299,417**	1,038,917

15. Endowment funds

	1 January 2023 £	Income £	Investment gains £	31 December 2023 £
Research and Grants funds:				
. Sir Norman Lockyer fund	**1,488,797**	**86,486**	**111,671**	**1,686,954**
. Other funds	**149,304**	**8,673**	**11,199**	**169,176**
	1,638,101	**95,159**	**122,870**	**1,856,130**
Benevolent fund	**93,711**	**5,444**	**7,028**	**106,183**
Library fund	**44,512**	**2,586**	**3,339**	**50,437**
Lectures & Awards fund	**148,177**	**8,608**	**11,115**	**167,900**
	1,924,501	**111,797**	**144,352**	**2,180,650**

	1 January 2022 £	Income £	Investment losses £	31 December 2022 £
Research and Grants funds:				
. Sir Norman Lockyer fund	1,585,356	51,937	(148,496)	1,488,797
. Other funds	158,988	5,208	(14,892)	149,304
	1,744,344	57,145	(163,388)	1,638,101
Benevolent fund	99,789	3,269	(9,347)	93,711
Library fund	47,399	1,553	(4,440)	44,512
Lectures & Awards fund	157,788	5,169	(14,780)	148,177
	2,049,320	67,136	(191,955)	1,924,501

16. Restricted income funds

	1 January 2023 £	Income £	Expenditure £	Investment gains £	31 December 2023 £
Research & Grants fund	**781,837**	**8,994**	**(61,300)**	**11,613**	**741,144**
Benevolent fund	**41,815**	**—**	**(218)**	**—**	**41,597**
Library fund	**48,517**	**1,488**	**—**	**1,921**	**51,926**
Education fund	**127,789**	**8,414**	**(1,000)**	**9,585**	**144,788**
Lectures & Awards fund	**58,334**	**—**	**(1,667)**	**—**	**56,667**
	1,058,292	**18,896**	**(64,185)**	**23,119**	**1,036,122**

16. Restricted income funds (continued)

	1 January 2022 £	Income £	Expenditure £	Investment gains £	31 December 2022 £
Research & Grants fund	788,269	8,468	70	(14,970)	781,837
Benevolent fund	42,527	—	(712)	—	41,815
Library fund	50,178	894	—	(2,555)	48,517
Education fund	137,142	4,493	(1,000)	(12,846)	127,789
Lectures & Awards fund	60,472	—	(2,138)	—	58,334
	1,078,588	13,855	(3,780)	(30,371)	1,058,292

The Restricted Funds are consolidated into five groups to serve the Council's priorities and address modern needs: Research & Grants, Benevolent, Library, Education and Lectures & Awards.

A detailed fund summary can be found on the RAS website.

The restricted funds were classified to either Restricted (R), Endowment (E), Designated (D), or General (G) funds as indicated below:

Research & Grants fund

E AG Stillhamer Trust Fund (1937)
D EW Brown Trust Fund (1939)
E Plummer Bequest (1946)
G General
R Victor Nadarov Fund (1950)
E Sir Norman Lockyer Memorial Trust (1990)
R Hosie Bequest (2000)
D Mrs. J.M Jelley-Freeman Bequest (2000)
D CAG Bearpark Trust (2000)
R Patricia Tomkins Fund (2011)
G Special Purposes Fund
E E A Milne Travel Fund (2013)
R R Potter Research Fund (2017)
R Osmaston Fund (2020)

Benevolent fund

E Lee & Jansen Trust Fund (1834/1879)
E Gerald Merton Fund (1986)
G Donald R. Barber Fund (2001)

Library fund

E Turnor Fund and Horrocks Memorial Fund (1853/1876)
E Harry Watson Memorial Fund (1923)
E Warin Bushell Fund (1964)
E Gaythorp Bequest (1969)
E Ian Ridpath Conservation Fund (2006)
R Dewhurst Fund (2013)

Education fund

R Newbigen Fund (1990)
R Michael Penston Memorial Fund (1991)
R Sir William Hunter McCrea Memorial Fund (2000)
R Paul Ruffle Memorial Fund (2014)
D Education Committee

Lectures & Awards fund

E Hannah Jackson-Gwilt Trust Fund (1861/1893)
E George Darwin Lectureship Fund (1926)
E George Darwin Support Fund
D AS Eddington Commemoration Fund (1948)
E Harold Jeffreys Lectureship Fund (1962)
E AT Price Medal Fund (1999)
E Gerald Whitrow Memorial Lecture Fund (2001)
E Fowler Prizes Fund (2004)

17. Designated funds

	1 January 2023 £	New designations £	Utilised/ released £	31 December 2023 £
Accommodation fund	**1,500,000**	**1,500,000**	—	**3,000,000**
Burlington House fund	**458,823**	—	**(94,613)**	**364,210**
Heritage Asset fund	**9,470,879**	—	—	**9,470,879**
Building fund	**1,405,635**	**94,613**	—	**1,500,248**
Open Access fund	**392,596**	—	**(7,499)**	**385,097**
RAS 200	**55,503**	—	**(55,503)**	—
Research and grants fund	**102,452**	**47,548**	—	**150,000**
Total designated funds	**13,385,888**	**1,642,161**	**(157,615)**	**14,870,434**

17. Designated funds (continued)

	1 January 2022 £	New designation £	Utilised/ released £	31 December 2022 £
Accommodation fund	1,000,000	500,000	—	1,500,000
Burlington House fund	552,836	—	(94,013)	458,823
Heritage Asset fund	9,470,879	—	—	9,470,879
Building fund	1,311,622	—	94,013	1,405,635
Open Access fund	392,596	—	—	392,596
RAS 200	142,433	—	(86,930)	55,503
Research and grants fund	122,661	—	(20,209)	102,452
Total designated funds	12,993,027	500,000	(107,139)	13,385,888

(i) Accommodation fund

This fund represents the requirement for accommodation at Burlington House or elsewhere. In 2024, after a full discussion by the trustees, it was agreed to sign a Heads of Terms Agreement with the Department for Levelling Up, Housing and Communities (DLUHC) to purchase a 999 year lease at a peppercorn rent. This fund will subsequently enable this acquisition and the total outlay is in the region of £4,400,000 over ten years.

(ii) Burlington House fund

In 2006-7, the Society executed a refurbishment project on the interior of the apartments. Expenditure incurred on the project has been capitalised and designated as the Burlington House fund. With the prospective change of the lease, further internal renovation of the building may be necessary.

(iii) Heritage Asset fund

A fund has been established to include the Society's heritage assets to recognise that there is no intention to dispose of these assets and the amount is not readily available to meet expenditure.

(iv) Building fund

The repairs and maintenance of the exterior of the building, its insurance and some security costs are currently carried out by the landlord for all the occupants and a proportion recharged to the Society. The prospective change of the lease will place the liability for backlog maintenance, environmental regulation compliance and accessibility improvements on the Society using these funds. The Finance Committee will recommend how much more to accumulate in this fund and at what rate. The timescale for expenditure is difficult to forecast but in principle could start within two years. Current estimates are in the region of £3,000,000 to £4,000,000.

(v) Open Access fund

A fund has been established to provide against the risk of the possible loss of income from publishing due to the adoption of Open Access. The timescale for expenditure is difficult to forecast but could in principle start within five years.

(vi) RAS 200

The original fund balance of £1,000,000 was the total committed grant expenditure for RAS 200. RAS 200 grant expenditure was being charged to this fund from 2015 to 2023.

(vii) Research and grants fund

This represents those funds to be used for research and grants.

18. Analysis of net assets between funds

Fund balances at 31 December 2023 are represented by:

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2023 Total funds £
Tangible assets					
. Heritage assets	—	**9,470,879**	—	—	**9,470,879**
. Other fixed assets	**76,686**	**405,330**	—	—	**482,016**
Investments	**4,343,369**	**2,135,872**	**1,036,122**	**2,180,650**	**9,696,013**
Current assets					
. Debtors	**1,052,260**	—	—	—	**1,052,260**
. Cash at bank and in hand	**4,358,452**	**3,000,000**	**57,000**	—	**7,415,452**
Current liabilities	**(2,094,099)**	**(77,648)**	**(57,000)**	—	**(2,228,747)**
Non-current liabilities	—	**(63,999)**	—	—	**(63,999)**
Total net assets	**7,736,668**	**14,870,434**	**1,036,122**	**2,180,650**	**25,823,874**

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2022 Total funds £
Tangible assets					
. Heritage assets	—	9,470,879	—	—	9,470,879
. Other fixed assets	80,249	489,918	—	—	570,167
Investments	4,320,008	1,852,982	1,058,292	1,924,501	9,155,783
Current assets					
. Debtors	1,141,492	—	—	—	1,141,492
. Cash at bank and in hand	3,098,990	1,752,189	2,430	—	4,853,609
Current liabilities	(1,532,339)	(108,577)	(2,430)	—	(1,643,346)
Non-current liabilities	—	(71,503)	—	—	(71,503)
Total net assets	7,108,400	13,385,888	1,058,292	1,924,501	23,477,081

19. Leasing commitments

At 31 December 2023, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

Office equipment	**2023 £**	2022 £
Amounts payable within one year	**6,390**	7,134
Amounts payable between two and five years	**20,188**	5,105
	26,578	12,239

20. Pension schemes

A qualified actuary carried out a triennial review of the defined benefit scheme as at 1 January 2022; the actuarial valuation showed that the market value of the Scheme's assets was £1,009,000 which represents 124% of the benefits that accrued to members after allowing for expected future increases in earnings. The actuary has calculated that no contributions are payable from 1 January 2016.

20. Pension schemes (continued)

Pension costs comprise £86,248 (2022 – £82,315) in respect of the defined contribution scheme and £8,469 (2022 – £6,924) in respect of Death in Service contributions.

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS 102 purposes, at 31 December 2023, shows a pension surplus of £473,000 (2022 – £507,000) which cannot be recognised as this is not available to the Society by way of reduced future contributions.

The amounts recognised in the balance sheet are as follows:

	2023 £'000	2022 £'000
Present value of funded obligations	**(121)**	(259)
Fair value of scheme assets	**594**	766
Surplus not recognised	**(473)**	(507)
Surplus in scheme at end of the year and available to the Society	**—**	—

Changes in the present value of the defined benefit obligations are as follows:

	2023 £'000	2022 £'000
Opening defined benefit obligation	**259**	537
Interest cost	**9**	11
Re-measurement arising from changes in assumptions and experience	**51**	(198)
Benefits paid	**(198)**	(91)
Closing defined benefit obligation	**121**	259

Changes in fair value of scheme assets are as follows:

	2023 £'000	2022 £'000
Opening scheme assets	**766**	1,009
Interest Income	**34**	21
Actual return on plan assets, excluding interest income	**(8)**	(173)
Benefits paid	**(198)**	(91)
Closing scheme assets	**594**	766

The amounts recognised in other recognised gains and losses are as follows:

	2023 £'000	2022 £'000
Remeasurement of defined benefit obligation	**51**	(198)
Return on plan assets	**8**	173
Effect of surplus restriction	**(59)**	25
Total	**—**	—

The actual return on scheme assets was £26,000 (2022 – negative £152,000).

20. Pension schemes (continued)

Retirement benefits disclosure under FRS102 (continued)

The major categories of scheme assets as a percentage of total scheme assets are as follows:

	Fair value of scheme assets	
	2023	2022
	%	%
Equities	**1**	21
Bonds	**1**	9
Property	**—**	5
Cash	**6**	10
Gilts	**92**	55
	100	100

Principal actuarial assumptions at the balance sheet date (expressed as a weighted average):

	2023	2022
	%	%
Discount rate at 31 December	**4.7**	4.9
Retail Prices Index	**3.0**	3.1
Consumer Prices Index	**2.4**	2.5
Increases in deferment	**2.4**	2.5
Future pension increases – pension earned before 6 April 1997	**0.0**	0.0
Future pension increases – pension earned on or after 6 April 1997	**3.0**	3.1

The current mortality rate assumptions include sufficient allowance for future improvements in mortality rates. The assumed life expectancy for a pensioner retiring at 65 on the balance sheet date is:

	2023	2022
Retiring now		
Male	**19.6**	20.2
Female	**21.8**	22.2
Retiring in 20 years		
Male	**20.9**	21.4
Female	**23.2**	23.7

Amounts for the current and previous four periods are as follows:

Defined benefit pension scheme:

	2023	2022	2021	2020	2019
	£'000	£'000	£'000	£'000	£'000
Defined benefit obligations	**121**	259	537	548	488
Scheme assets	**594**	766	1,009	916	911
Surplus	**473**	507	472	368	423

21. Grants committed

Grants, principally fellowships and travel and research grants to the value of £285,250 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2022 – £281,500). These grants were not approved or communicated to the recipients until after the year end and therefore have not been accounted for in the year ended 31 December 2023.

22. Connected Charities and related party transactions

Since 2001, the Society has been the administration agent for the trustees of FA Paneth Meteorite Collection, a charity connected to the Royal Astronomical Society. The Paneth trustees decided that its income should support research in Cosmochemistry by graduate and postdoctoral students. The accumulated net expenditure of £50,908 (2022 – £50,789), is included in Other Creditors. Grants awarded in 2023 totalled £10,800 (2022 - £5,920). Total income was £11,399 (2022 - £10,365).

The Society also administers the Sir Norman Lockyer Memorial Trust, (charity registration number 900135). By agreement with the Charity Commission the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836-1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2016, 2019, 2022 etc. for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. During the year The Norman Lockyer Fellowship funded one fellowship. Expenditure for the year amounted to £57,000 (2022 - £nil). The fund balance, including the unspent balance in the restricted fund is £2,200,545 (2022 – £2,059,388).

Transactions involving trustees are also disclosed in note 10.

23. Post balance sheet event

In March 2024, an agreement was signed that secures occupation of Burlington House on a 999 year lease.



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ROYAL ASTRONOMICAL SOCIETY

England & Wales - Charity number 226545

Accounts



Annual Report & Financial Statements 2022

"Cosmic Cliffs" in the Carina Nebula/NASA, ESA, CSA, STScI

Royal Astronomical Society

Royal Astronomical Society

Patron

Her Majesty The Queen remained our Patron until her death in September 2022

Trustees

Council Members who served during 2022

Prof. Emma Bunce (President until May 2022, G, University of Leicester)

Prof. Mike Edmunds (President from May 2022, A, University of Cardiff)

Dr Megan Argo (Vice-President, A, until May 2022, University of Central Lancashire)

Dr Mandy Bailey (Senior Secretary, A, Open University)

Dr Jo Barstow (Councillor, A, Open University)

Dr Nigel M Berman (Treasurer, A)

Prof. Phil Charles (Councillor, A, University of Southampton)

Dr Hannah Dalgleish (Councillor, A, University of Oxford/Armagh Observatory and Planetarium)

Prof. Stephen Eales (Vice-President, A, from May 2022, University of Cardiff)

Dr Olivia Keenan (Councillor A, from May 2022, SEPnet)

Prof. Mark Lester (Secretary, G, University of Leicester)

Martin Lunn (Councillor, A until May 2022)

Dr Jane MacArthur (Councillor, G, until May 2022, University of Manchester)

Dr Matthew Middleton (Councillor, A, until May 2022, University of Southampton)

Prof. Steven Miller (Vice-President, G, until May 2022; Councillor, G, from May 2022, University College London)

Dr Arvind Parmar (Councillor, A, European Space Agency)

Prof. Nick Rawlinson (Vice-President, G, University of Cambridge)

Prof. Ian Robson (Vice-President, A, University of Edinburgh)

Dr Jasmine Kaur Sandhu (Councillor, G, Northumbria University)

Prof. Caroline Smith (Councillor, G, Natural History Museum)

Prof. Colin Snodgrass (Councillor, G, University of Edinburgh)

Patricia Tomkins (Councillor, A, from May 2022)

Dr Sheona Urquhart (Secretary, A, Open University)

Prof. Clare Watt (Vice-President, G, from May 2022, Northumbria University)

Prof. Belinda Wilkes (Councillor, A, University of Bristol)

Prof. Silvia Zane (Councillor, A, from May 2022, University College London)

- Note: 'A' signifies all areas of astronomy and astrophysics; 'G' covers geophysics, solar-terrestrial physics and planetary sciences.

Senior staff

Executive Director: Philip Diamond

Deputy Executive Director: Dr Robert Massey

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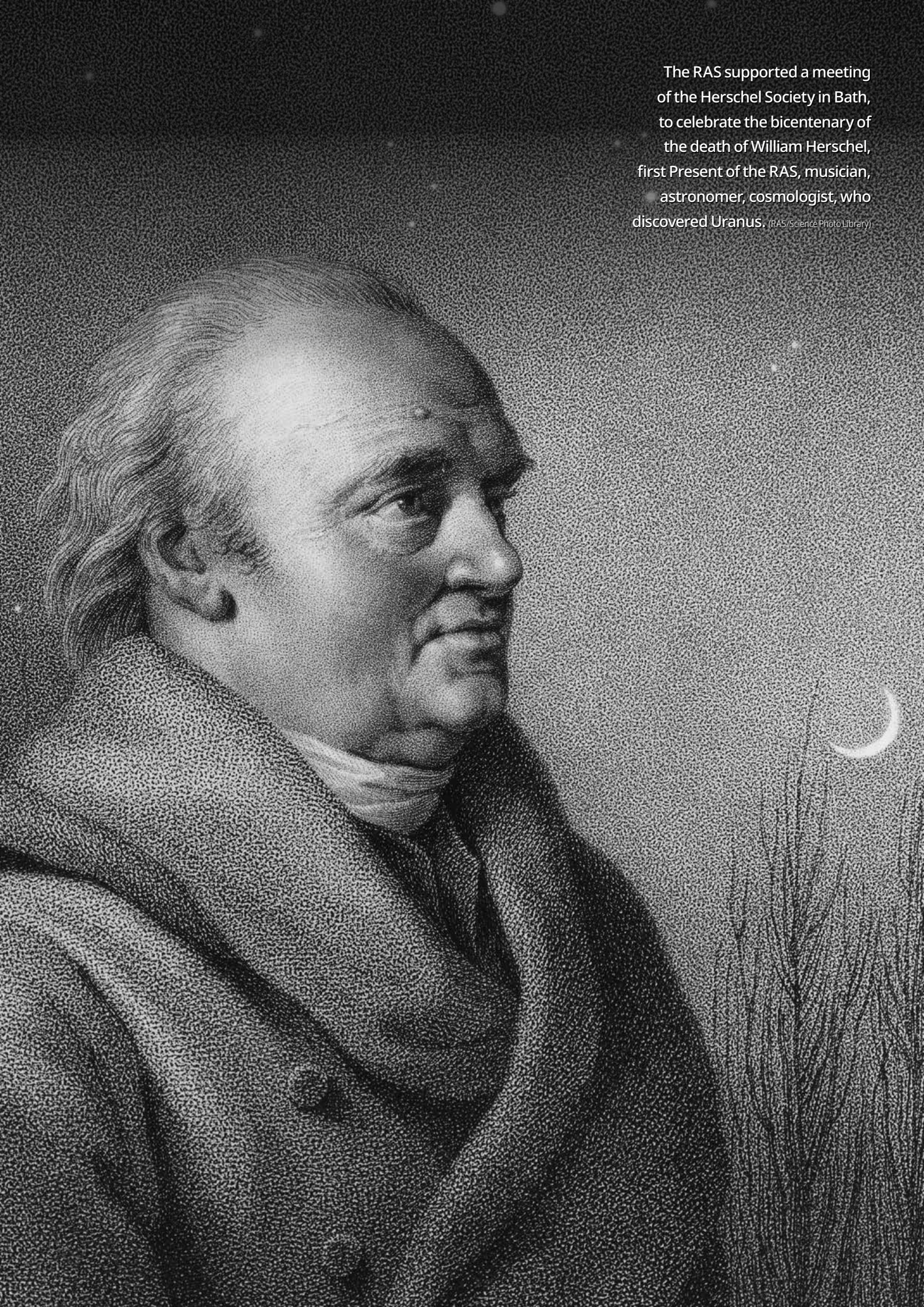
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The RAS supported a meeting of the Herschel Society in Bath, to celebrate the bicentenary of the death of William Herschel, first Present of the RAS, musician, astronomer, cosmologist, who discovered Uranus. (RAS/Science Photo Library)

Welcome From Our President

It is a pleasure to introduce the Annual Report of the Royal Astronomical Society for 2022. We were saddened by the death of our Patron, HM The Queen, and formally offered our condolences to His Majesty the King and the Royal Family.

We were pleased to be able to finally open our doors once again to our Fellows and others, and welcome them to our programme of scientific meetings, held in hybrid mode. Virtual attendance is a bonus, but there is nothing to replace the experience of discussing research face-to-face with colleagues. I thoroughly enjoyed being present at re-convened monthly meetings where well-known researchers carefully laid out the evidence, but were almost despairing at how to push on with the great unknowns of cosmology – just the sort of debate to stimulate progress and inspire the next generation.

I am pleased to say that, after a rigorous tendering exercise we chose to renew our contract with Oxford University Press from the end of 2023. We are excited to continue this successful partnership at a critical time in the evolution of our journals, when the research and publishing landscape is changing fast.

After careful consideration, RAS Council, advised by our publisher, decided that the Society's journals will transition to full open access from January 2024. This decision has been taken to ensure their sustainability and compliance with open access policy mandates in the long term. Removing barriers to access is a major step towards openness, transparency and reproducibility, accelerating scientific discovery and increasing the impact of research. This is an exciting new phase in the journals' history.

I was delighted (and a little relieved) that we were able to hold the National Astronomy Meeting at the University of Warwick in July, the first in-person NAM for three years. The hybrid format allowed virtual attendance, but we were heartened to see that nearly 600 delegates came to Warwick. Particularly gratifying was that many young researchers were there – for many their first in-person conference.

The Society continues to advocate on behalf of our communities. Uncertainty over UK association with the Horizon Europe research fund persisted throughout 2022. At the same time, the increasing impact of satellite constellations on astronomy became clearer. The Society is now a contributing member of the International Astronomical Union Centre for the Protection of the Dark and Quiet Sky from Satellite Constellations.



Prof. Michael G Edmunds

In May, the Society held its first parliamentary reception. The reception allowed us to showcase our sciences to many Lords and MPs, including government ministers and their opposition shadow ministers. First-hand testimony from people who had benefitted from the RAS200 outreach programmes really impressed this distinguished audience.

There is much to be done in the coming months. A priority for us is to secure our long-term residency in Burlington House. We continued to engage with government ministers and civil servants on the terms of our lease, against a turbulent political backdrop. I dearly hope our negotiations will resolve in 2023, but we will be formulating alternative plans to ensure the Society's future is secure whatever the outcome. We are also finalising work on our Strategy, some high-level goals of which are outlined in this report.

We have all lived through challenging times, but our work to advance understanding and share knowledge of our subjects continues undimmed. That endeavour only succeeds, of course, with the willing support of our Council, committees, the RAS staff and our Fellows.

Prof. Michael G Edmunds,
President of the RAS 2022

Objectives

The RAS exists to advance, and to record the history of, our understanding of the Earth, the solar system, the stars and galaxies, and the nature of the universe. It does this by promoting astronomy and geophysics, interdisciplinary sciences that encompass and further our understanding of physics, chemistry, mathematics, biology, engineering and computer science to answer deep questions about the origin and fate of the cosmos, and people's place in it. Through this, the Society contributes to the growth and dissemination of knowledge and thereby fulfils its charitable objective of serving the public interest.

The Society refers to the Charity Commission's general guidance on Public Benefit when reviewing its aims and objectives and in planning future activities. These disclosures comply with the Charities Act 2011.

Our objectives for 2022 fell within two broad areas: advancing understanding and sharing knowledge; the organisation of the Society supports these goals.

The Society's principal objectives are to:

- publish high-quality peer-reviewed journals;
- support students and early-career scientists through research fellowships and grants;
- recognise achievement through its medals and prizes;
- maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures;
- sustain our Library and Archive service;
- continue our political engagement;
- maintain our programme of education and outreach activity, including Friends of the RAS;
- promote the work of the Society and Fellows in the media and on social media;
- build our outreach work with other Courtyard Societies.

In 2022 the Society worked, in addition, on development of a strategy for the next five years that will focus on:

- membership (including Fellowships and grants);
- education and outreach – building on the success of RAS200;
- our library and heritage;
- our accommodation.

Cross-cutting themes to inform the strategy review include:

- diversity and inclusion;
- our digital presence;
- the impact of the pandemic; and
- uncertainty in our long-term location.

Advancing Understanding



An artist's impression of a galaxy in the early universe, one of the environments explored in a Specialist Discussion Meeting focusing on the production and escape of Lyman photons at high and low redshifts. (ESO/M Kornmesser)

Journals

The Society's journal portfolio consists of three peer-reviewed, scholarly publications: *Monthly Notices of the Royal Astronomical Society* (*MNRAS*), *Geophysical Journal International* (*GJI*) and *RAS Techniques and Instruments* (*RASTI*).

MNRAS is one of the world's leading astronomy journals and publishes articles in positional and dynamical astronomy, astrophysics, radio astronomy, cosmology, space research and the design of astronomical instruments. The *MNRAS* editorial board of 26 scientific editors continues to be led by Prof. David Flower as Editor-in-Chief. In 2022 *MNRAS* received 5128 submissions, published 3886 papers, and had 4449336 downloads. Its two-year impact factor for 2021 was 5.235.

GJI is an international journal publishing primary research articles on all aspects of theoretical, computational, experimental, applied and observational geophysics. The editor-in-chief, Prof. Joerg Renner, leads an editorial board of 33 scientific editors. In 2022 *GJI* received 1095 submissions, published 520 papers, and had 1737230 downloads. Its two-year impact factor for 2021 rose to 3.352.

RASTI published its first volume in 2022, leading with an editorial authored by editor-in-chief, Prof. Jonathan Tennyson and deputy editor-in-chief Prof. Anna Scaife. *RASTI* is broad in scope and encourages submission of papers that cover topics in both astronomy and geophysics, across instrumentation, data science, machine learning, software, and numerical and statistical methods. The editorial board, led by Prof. Tennyson, consists of 14 academics appointed to ensure *RASTI* maintains the high editorial standards set by *MNRAS* and *GJI*. During 2022, *RASTI* published seven articles which were downloaded 2385 times.

All three journals are published with Oxford University Press (OUP) and, following a tendering process, OUP was selected to remain the Society's publishing partner for a further term of five years from the end of 2023.

RASTI is a fully Open Access (OA) title; authors pay an Article Processing Charge (APC) for publication. The payment of APCs allows worldwide access to the scholarly research in *RASTI*, removing barriers to readership and reuse. *MNRAS* and *GJI* continued to be published as 'hybrid' journals whereby OUP sells institutional subscriptions to the journals, at the same time as offering OA publication to those authors who wish to, or are mandated by funders to, publish

The RAS is committed to advancing understanding of our sciences by:

- Publishing journals
- Supporting scientists financially with fellowships and grants
- Organising scientific meetings
- Recognising excellence through awards
- Running a Library and Archive for research
- Producing a magazine for our members
- Advocating for the community with government
- Promoting diversity in our community
- Supporting early-career researchers

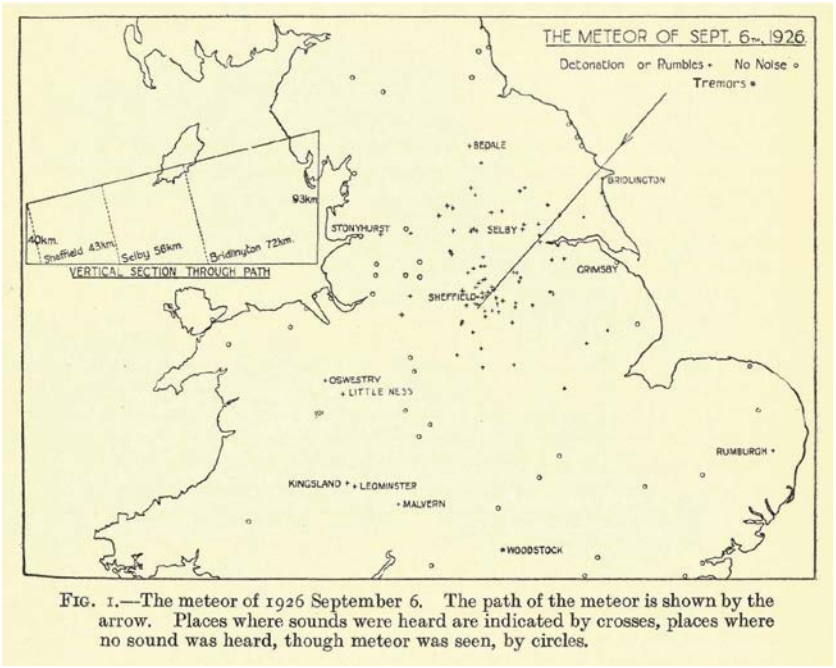


FIG. 1.—The meteor of 1926 September 6. The path of the meteor is shown by the arrow. Places where sounds were heard are indicated by crosses, places where no sound was heard, though meteor was seen, by circles.

The RAS has been publishing on geophysics since 1922; this figure from Whipple (1928) describes observations of a meteor's passage (RAS)



Above: *Professor Jonathan Tennyson and the publishing managers, Liz Baker (left) and Kim Clube, at NAM.* (RAS/Lensi Photography)

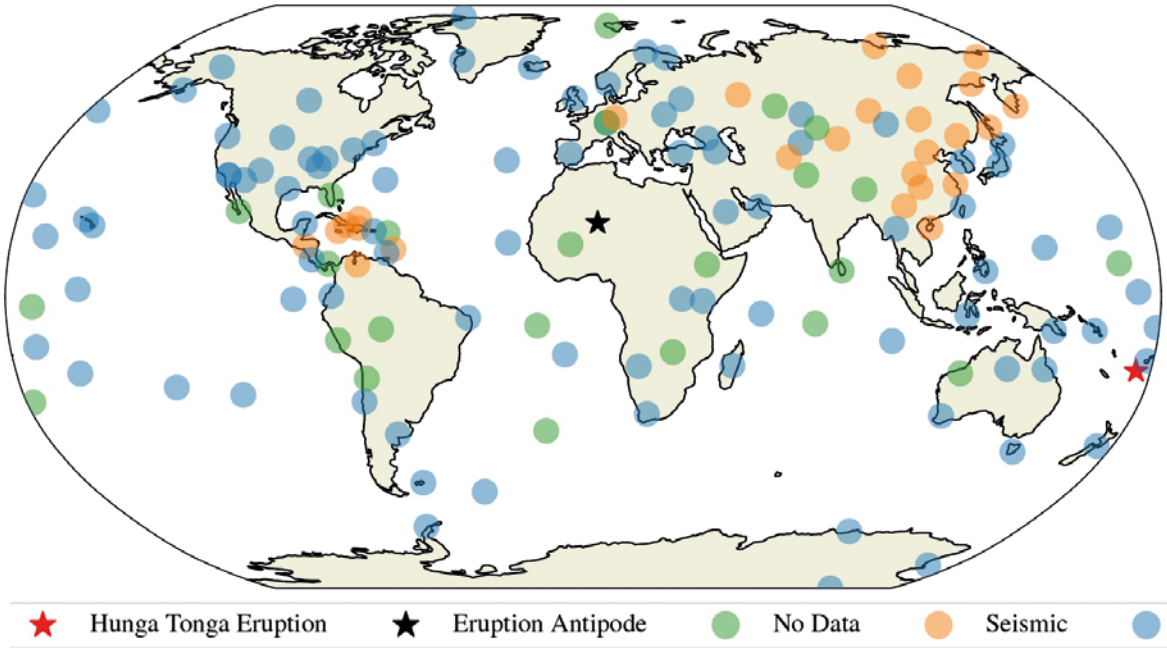
their papers OA. During 2022, 18% of *MNRAS* papers and 22% of *GJI* papers were published OA.

Looking to secure the future of the Society's journal portfolio, during 2022 RAS Council approved the move of *MNRAS* and *GJI* to fully OA publication from January 2024. Articles in all three RAS journals will be free to read from the point of publication, and APCs will replace the subscriptions to *MNRAS* and *GJI*.

The RAS journal team is managed by two part-time publishing managers and the administration of the peer review process is overseen by eight assistant editors. The peer review process on *RASTI* is provided by OUP. In April, the journal team, editors-in-chief and OUP presented their annual reports to the RAS Publications Management Committee.

There was an increase in journal marketing in 2022 primarily through social media (@RAS_Journals), and press releases supported by the RAS Communications Team. OUP marketing included Calls for Papers, online adverts, email campaigns, high-impact article collections and a booth at the American Geophysical Union Conference. OUP also exhibited at the National Astronomy Meeting (NAM) at the University of Warwick alongside the RAS. Also at NAM, the journal team ran a Publications workshop for early career researchers and hosted a celebratory reception to promote the launch of *RASTI*.

One significant milestone in 2022 was the 100-year anniversary of geophysics publishing by the RAS. The year started with three short videos and concluded with the publication of the first of 12 virtual collections of *GJI* papers. Papers for each collection have been selected by the *GJI* editors as being the top 100 most important geophysics papers published by the Society, and each collection is introduced by a different editor. The



The Hunga volcanic eruption was recorded worldwide; Geophysical Journal International *published a special issue bringing together information on this novel explosive activity, combining air pressure variations and seismic signals.* (Image from Ringler *et al.*)

winners of the *GJI* Student Award for the best paper by an early career scientist were Gauthier Guerin, Paul Alberto Jarrin Tamayo, and Solvi Thrastarson, who each received a certificate and cash prize.

For further details on the RAS journals, the editors and editorial boards , see our website at **ras.ac.uk/journals**

Research Fellowships and grants

The RAS grants, fellowships and awards support research, education and outreach activities. 75 grants, fellowships and awards, totalling £178412 (2021: £105878) were awarded to institutions and 40 grants, medals and awards totalling £28066 (2021: £18801) were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £32000 (2021: £735) Adjustments to other grants resulted in credits to expenditure totalling £54180 (2021: £13364). Total grant making support costs were £35000 (2020: £30000). A full list of all grantees and analysis can be found on the Society's website.

THE RAS AWARDED **£178412** IN GRANTS TO INSTITUTIONS

In 2022 the RAS Fellowship was held from October 2022 by Dr Rebecca Smethurst (University of Oxford): 'Co-evolution cracked: the contribution of non-merger processes to supermassive black hole growth'.



Below: *Dr Rebecca Smethurst (University of Oxford) held the RAS Fellowship from October 2022.* (RAS/Lensi Photograpjhy)

Scientific meetings

The Society held 15 Specialist Discussion Meetings during 2022, attended by 1145 people. The meetings were initially held online, but became hybrid from October onwards. NAM was a fully hybrid meeting.

Specialist Discussion Meetings

Global monitoring of geospace

The production and escape of **Lyman photons through time and space**

Sources and **inventory of cosmic dust:** from space to the Earth's surface

Careers and **perspectives in big data astronomy**

Planetary Ultra-Low Frequency Waves: Theory, Modelling and Observations

Future solar and heliospheric **assets for space weather prediction:** instruments, modelling and machine-learning

Exoplanet modelling in the James Webb era II: Terrestrial planets and subneptunes

Forecasting solar energetic particles and associated eruptive events

The new **transient radio sky**

Solid-liquid interactions in **deep planetary interiors**

Formation, evolution and dispersal of **protoplanetary discs**

Exploring **planetary atmospheric processes** from terrestrial worlds to giant planets

JWST commissioning and first science from a UK perspective

Undergraduate research bursaries

The RAS funded 11 undergraduate research bursaries at universities across the UK. Topics explored during the six-week projects this year were: software improvement for solar spectroscopy, young variable stars, gamma ray bursts, solar magnetic field, azimuthal perturbations in MHD, waves in the solar corona, radial velocity systematics, machine learning for gravitational wave sources, electrons surfing electromagnetic waves, and the history of astronomy. The students valued the opportunity to learn independently and in depth, and relished spending time as part of research groups.

Meteor science in the UK

2nd Meeting on progress in **astrophysics with type-1a supernovae** (PATIAS-2)

Ordinary Meetings

1443 people attended Ordinary Meetings in 2022. The meetings were online only at the start of the year, and hybrid from the October meeting onwards.

The following spoke at Ordinary Meetings:

Dr Karen Aplin (University of Bristol) 'The charge of the spheres: sparking studies of the planets' James Dungey Lecture 2021

Dr James Owen (Imperial College London) Fowler (A) Award 'The origin of the exoplanet radius gap'

Dr Julia Stawarz (Imperial College London) Winton (G) Award 'Turbulence-driven magnetic reconnection in collisionless plasmas: new insights from NASA's Magnetospheric Multiscale Mission'

Dr Richard Morton (Northumbria University) Fowler (G) Award 'Revealing the hidden corona with infrared'

1145 PEOPLE ATTENDED SPECIALIST DISCUSSION MEETINGS IN 2022

Supporting diversity in research

RAS grants have helped to fund the annual Conference for Undergraduate Women in Physics for the past eight years. In 2022 it was held jointly by the Universities of Glasgow and Syrathclyde, with more than 100 student participants. RAS funding supported venue hire and support for student accommodation.

The meeting was oversubscribed and the organisers focused on having a diverse group of attendees: more than half identified as LGBT+, 35% as people of colour and 24% with a disability. The conference had a significant impact on how participants saw themselves: 45% believed that they could succeed in a career in physics before the meeting, rising to 70% afterwards. Feedback from attendees included: "Myself and women from the same university have decided to start a society for women and non-binary people in physics as we realised the real lack of representation and socialisation between these groups at our university"; "The talks were great and and the academic panel was amazing"; "I want to educate myself about the issues that BAME people face and what I can do as an ally".

Dr Matt Nicholl (University of Birmingham) Fowler (A) Award and RAS Research Fellowship 'Tidal disruptions of stars by supermassive black holes'

Prof. Giovanna Tinetti (University College London) RAS Eddington Lecture 'A chemical survey of planets in our galaxy'

Dr Sanne Cottaar (University of Cambridge) Harold Jeffreys Lecture 2022 'Geological mapping of the core-mantle boundary: unravelling the mysteries of the deep Earth'

Dr Jennifer Y H Chan (Canadian Institute for Theoretical Astrophysics (CITA) and University of Toronto) Michael Penston Thesis Prize 2020 'Probing the evolving universe with confidence: All-sky radiative transfer and characterisation for cosmic structures'

Prof. Pedro G Ferreira (University of Oxford) Gerald Whitrow Lecture 'Cosmic Ignorance'

Dr Olivia Jones (UK Astronomy Centre, Royal Observatory Edinburgh) 'Early science from JWST'

Dr Licia Ray (Lancaster University) James Dungey Lecture 2022 'Neither here nor there: The coupling between giant planets and their surroundings'

Dr Juan Alday Parejo (The Open University) Keith Runcorn Thesis Prize 2021 'Investigating the isotopic composition of the atmosphere of Mars with the ExoMars Trace Gas Orbiter'

Dr Rebecca Smethurst (University of Oxford) Winton (A) Award and RAS Research Fellow 'The growth of supermassive black holes'

Dr Patricia Fara (University of Cambridge) The RAS Diary Talk 'Herschel 2022: a double anniversary'

National Astronomy Meeting 2022

This year the National Astronomy Meeting, together with the MIST and UK Solar Physics groups, took place in July at the University of Warwick. This was the first face-to-face NAM since 2019 and 750 people attended (600 in person and 150 online). The hybrid aspect of the meeting supported those who did not or could not travel and allowed those who came down with Covid-19 before or during the event to take part, as speakers and delegates. There was a full complement of NAM features, with plenary lectures, including one from Gold Medalist George Efstathiou, specialist lunches, a dedicated outreach programme, a very well-attended poster session and a packed Awards Dinner where we celebrated success across our community.

750 PEOPLE ATTENDED THE 2022 NATIONAL ASTRONOMY MEETING

2022 RAS Medals and Awards

The Society recognises outstanding achievements among early-career researchers as well as celebrating career-long excellence and service to our sciences. These are the recipients of the 2022 RAS awards and medals:

Gold Medal in Astronomy Prof. George P Efstathiou, University of Cambridge

Gold Medal in Geophysics Prof. Richard B Horne, British Antarctic Survey

Herschel Medal Prof. Catherine Heymans, University of Edinburgh

Eddington Medal Prof. Alan Heavens, Imperial College London

Chapman Medal Prof. Sandra Chapman, University of Warwick

Price Medal Professor Hrvoje Tkalčić, Australian National University, Australia

Jackson-Gwilt Medal Dr Frank Eisenhauer, Max Planck Institute for Extraterrestrial Physics, Germany

Annie Maunder Medal Dr Nicolas Bonne, Dr Jennifer Gupta, Dr Coleman Krawczyk, University of Portsmouth

Primary Education Award Rachael Wood, Southfield Primary School

Secondary Education Award Jacob Harding, Sharples School

Higher Education Award Prof. Melvin Hoare, University of Leeds

Award for Service in Astronomy Professor Donald Kurtz, University of Central Lancashire, North-West University, South Africa

Award for Service in Geophysics Prof. Farideh Honary, Lancaster University

Fowler Award (Astronomy) Dr Matt Nicholl, University of Birmingham

Fowler Award (Geophysics) Dr Beatriz Sánchez-Cano, University of Leicester

Winton Award (Astronomy) Dr Rebecca Smethurst, University of Oxford
Winton Award (Geophysics) Dr Tim Lichtenberg, University of Oxford
Group Award in Astronomy The EAGLE simulations team, Durham University, Liverpool John Moores University and Leiden University The Netherlands
Group Award in Geophysics UK Fireball Alliance, Natural History Museum
Harold Jeffreys Lecture Dr Rhodri Davies, The Australian National University, Australia
George Darwin Lecture Professor Alan Fitzsimmons, Queen's University Belfast
James Dungey Lecture Dr Licia Ray, Lancaster University
Gerald Whitrow Lecture Professor Pedro Gil Ferreira, University of Oxford



Honorary Fellows

Dr Morton S Roberts, National Radio Astronomy Observatory, USA
Dr Ashwin Vasavada, Jet Propulsion Laboratory, California Institute of Technology, USA
Professor Kathryn McWilliams, University of Saskatchewan, Canada

Above: *Prof. Dr Eva Grebel, director of the Astronomisches Rechen-Institut, Heidelberg University, Germany, and winner of the inaugural Caroline Herschel Award*
(Prof. Dr Eva Grebel/RAS)

Rob and Cathryn Wilcock, Winchcombe, Gloucestershire

The Caroline Herschel Award

This year saw the celebration of the first Caroline Herschel Award to **Prof. Dr Eva Grebel**, director of the Astronomisches Rechen-Institut, Heidelberg University, Germany. This new prize recognises outstanding research by women astrophysicists in the UK and Germany, and is funded by the UK government. The prize is jointly administered by the RAS and the German Astronomical Society and will be awarded in Germany and the UK in alternate years.

Prof. Dr Grebel has made outstanding contributions to understanding the evolution of galaxies and galactic archaeology, leading research into galaxy evolution and near-field cosmology. She and her group discovered the ultra-faint dwarf galaxies, which provided evidence for the role of dark matter in galaxy formation. She has also pioneered the use of variable stars to understand the 3D structure of our galaxy and its neighbours.

Prof. Dr Grebel's Prize Lecture took place at the German Astronomical Society's annual conference in the University of Bremen in September. She spoke on 'Caroline Herschel, The Hunt for Faint Features and Galactic Archaeology', including a detailed account of Caroline Herschel's life and achievements.

Student Prizes

The RAS awards prizes for the best PhD theses in the fields of astronomy and astrophysics (the Michael Penston Prize), geophysics and planetary science (the Keith Runcorn Prize), and instrumentation (the Patricia Tomkins Prize). There is also a Patricia Tomkins Prize for undergraduate work in

instrumentation. The 2022 thesis prizes go to:

Maria Vincenzi (University of Portsmouth) won the Michael Penston Thesis Prize for her thesis entitled: 'Core-collapse contamination in photometric samples of Type Ia Supernovae'.

Dr Juan Alday Parejo (University of Oxford) won the Keith Runcorn Prize for the best doctoral thesis in geophysics with 'Unravelling the isotopic imprints of martian CO_2 and H_2O using solar occultation observations from the Atmospheric Chemistry Suite onboard ExoMars Trace Gas orbiter'.

Library and Archive

The library was open for two days per week at the beginning of 2022, rising to three days in April, and four days in mid-November, meaning the library was open for about 150 days overall. We hosted 44 visits by external researchers, and 20 by Fellows. By November 2022, Fellows could once more use the library without an appointment. 202 research enquiries were handled through the year.



Above: *Caroline Herschel's notebook, on display in Bath* (Image courtesy of The Herschel Museum of Astronomy – Bath Preservation Trust)

Below: *A&G magazine reflecting our research community* (RAS)

At the Chartered Institute of Library and Information Professionals (CILIP) Rare Books and Special Collections Group conference the Librarian co-presented with book artist Kate Bernstein about her book inspired by the RAS Library, Measuring the Heavens. This is the latest in several outreach talks delivered since the book was created in 2020.

The Librarian presented a talk entitled 'The Herschels in their own words' at the public conference organised by



the Herschel Society to celebrate the bicentenary of William Herschel's death. A new article about RAS Fellow Gertrude Bacon has been added to the Oxford Dictionary of National Biography.

Our membership magazine

A&G continued to document both RAS activities and research progress across RAS sciences, outreach activities and community initiatives. Over the year, 244178 articles were downloaded. Among the news and research reviews highlighted by *A&G* in 2022 was the work of the RAS Early Career Network. The ECN Committee guest-edited and produced articles focused on the concerns of this part of our community, including research by early career researchers. Other highlights included a first-hand account of the hunt for the Winchcombe meteorite, an overview of the meeting marking 200 years since the death of William Herschel, and the launch of the new RAS journal, *RASTI*. *A&G* also marked 50 years since the final Apollo Moon mission, Apollo 17, with a Fellow's account of taking part in the International Youth Science Tour in 1972 – including bumping into Neil Armstrong.

Political engagement

This was a busy year marked by continuing uncertainty about UK association with the Horizon Europe research fund, and the increasing impact of satellite constellations on astronomy, as the number of deployed spacecraft in low-Earth orbit rose above 5000.

The Society gave input to the work by the Campaign for Science and Engineering with BEIS on the design of a 'Plan B' replacement to foster international collaboration in science, should the negotiations to be part of Horizon Europe fail.

The Society responded to a consultation on Diversity and Inclusion in STEM for the Commons Science and Technology Committee, and to the OfCom consultation on the use of the 14GHz band. As a result of the latter, OfCom proposes to offer some protection to the Jodrell Bank and e-MERLIN observatories.

Satellite constellations featured in sessions at the National Astronomy Meeting and the European Astronomical Society, and in an RAS presentation at the GNOSIS conference. The Society is now a contributing member of the International Astronomical Union Centre for the Protection of the Dark and Quiet Sky from Satellite Constellations (we contribute support in kind) and a member of the Centre's policy and community engagement hubs. The Society now also provides the secretariat for the All-Party Parliamentary Group for Dark Skies.

The Society held its first parliamentary reception in May, a postponed event originally intended to celebrate the RAS bicentenary. Some 23 MPs and 15 members of the House of Lords attended. We had speeches from Greg Clark MP, Chi Onwurah MP, Lord Rees of Ludlow and Jon Culshaw, as well as a powerful address from a beneficiary of the RAS200 project in partnership with Bounceback. Attendees also spoke to RAS staff and Trustees about their work, engaged in outreach activities, and used a virtual reality system to explore data from ESA's Gaia mission.

Diversity

The RAS responded to concerns about whether James Webb played a part in discrimination against homosexual men at NASA in the 20th century; Council voted that Society publications should use the acronym JWST only, rather than the full name of the telescope. The Society

5561 PEOPLE CAME TO THE EXHIBITION CELEBRATING WILLIAM HERSCHEL AT THE HERSCHEL MUSEUM IN BATH, **200 YEARS AFTER HIS DEATH**.

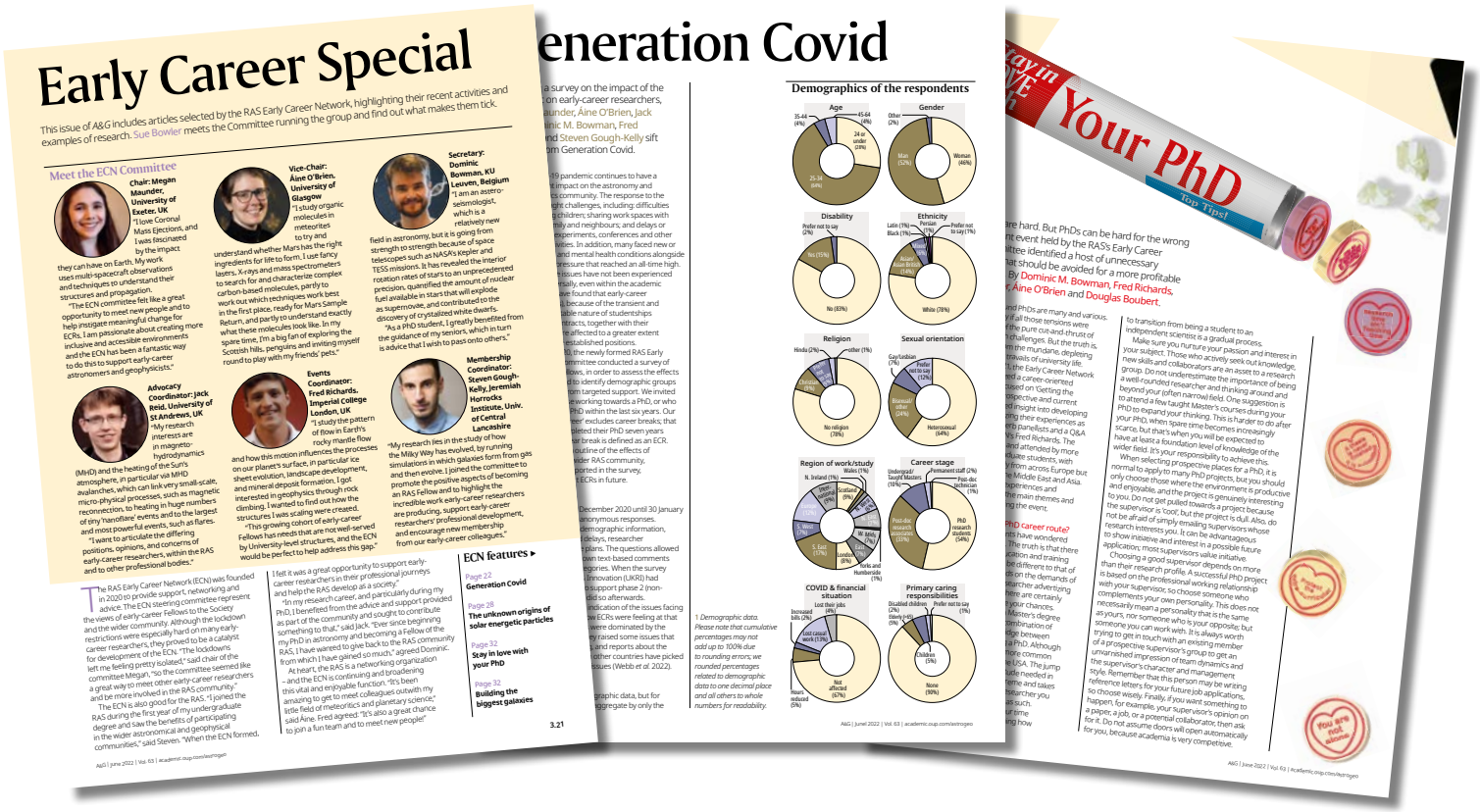
also wrote to the UK Space Agency, ESA and NASA, seeking publication of a NASA investigation into Webb's role; we also raised concerns about how this and other missions were named. Once NASA published their official historian's report on Webb and, via the American Astronomical Society, agreed to pursue a new approach to naming facilities and missions, the Society lifted its bar on the use of 'James Webb Space Telescope'.

RAS staff delivered training in disability confidence, allyship and self-promotion skills online and face-to-face. Audience numbers varied between 18 and 250. The workshop on Allyship given at the National Astronomy Meeting attracted more than 50 delegates – mostly early career researchers – and offered tools and strategies to drive change.

Early Career Network

The Early Career Network (ECN), established in 2020, is being run by and represents the views of Early Career RAS Fellows. The ECN focuses on several areas: building a network of peers, facilitating mentoring opportunities, discussing career options, and developing skills such as writing funding applications. In 2022, the ECN ran events including a dedicated peer-led panel and Q&A session for early career researchers starting their PhDs. They also worked on an Early Career Special Issue of *A&G* that showcased early career research and included the results of the RAS ECN Covid Survey in an article 'Generation Covid'.

The ECN also had a strong presence at NAM 2022, delivering two collaborative sessions focused on Early Career Development and Careers and an Early Career Lunch which were well attended both in person and online. The events included a panel of experts on hand to offer support and practical career advice to participants from across the world. The year has been a great success – and we are looking forward to future events designed to support our community.



Below: *Early Career Network concerns take centre stage in* A&G (RAS)

Sharing Knowledge



The RAS hosted an ESA press briefing at Goonhilly Earth Station in June, on the huge Gaia Data Release 3 (GES)

Education and outreach events

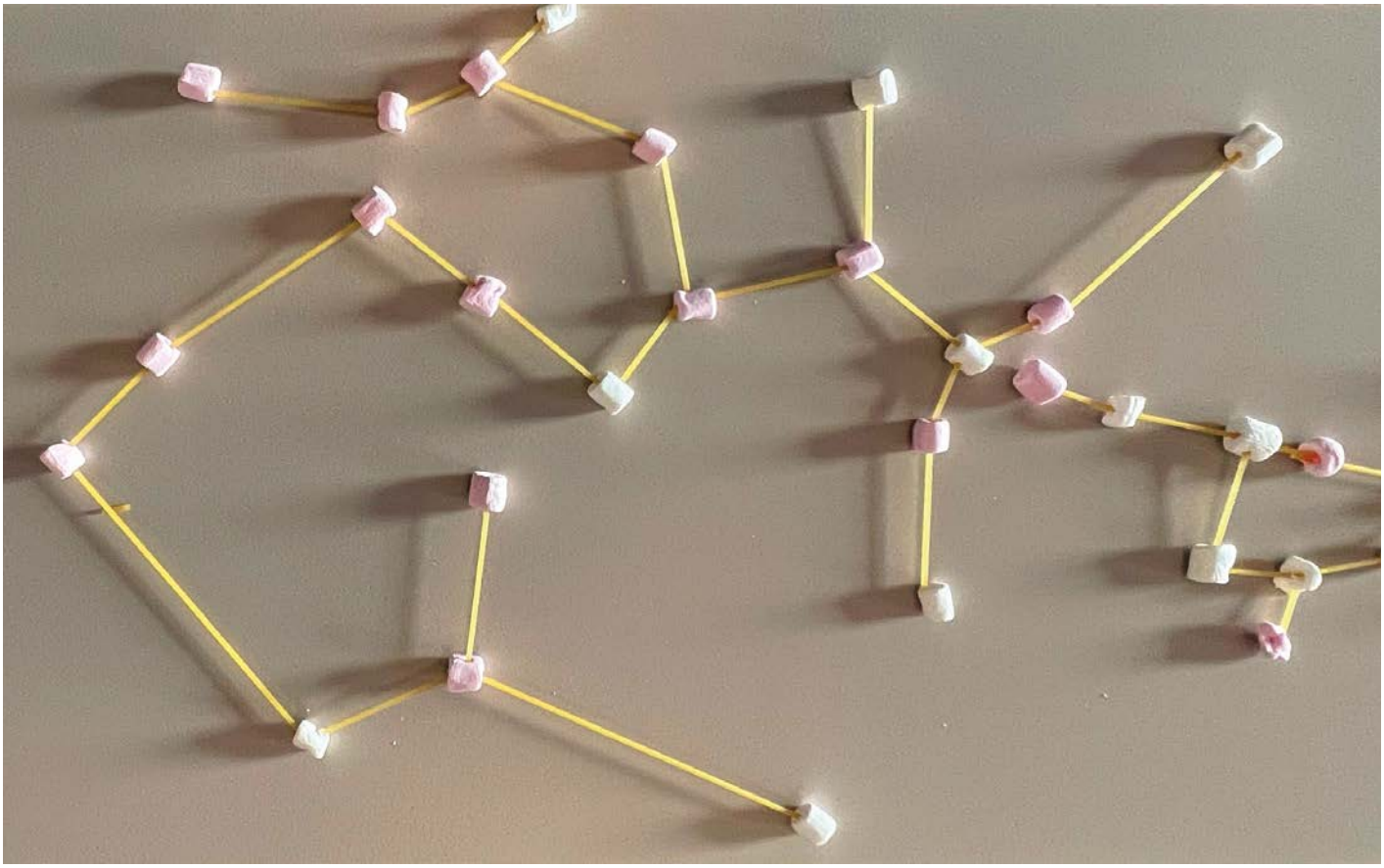
The Society's Education and Outreach activities also moved back to face-to-face events while continuing with hybrid access to reach a broader audience.

In February the spectacular Bicentenary Timeline artwork was installed in Burlington House. This celebration of our origins, heritage and activities over 200 years also has an online presence on Instagram. The Society also contributed to the International Astronomical Union celebration of Women and Girls in Astronomy, providing five videos from leading women astronomers – all RAS Fellows – telling 'Inspiring Stories' about their lives and work. So far these have been viewed around 1500 times. The videos celebrating 100 years of geophysics publishing by the RAS have been viewed 500 times. A YouTube EO highlight was the conversation with author Oliver Jeffers to promote his new book 'Meanwhile Back on Earth', viewed by 290 school classes.

Over the year RAS staff gave keynote talks at the University of Kent, the Cheltenham Science Festival, the Ogden Trust, and the Lancashire Primary Teachers' Conference. They spoke to school students and teachers in London and the northwest of England, including schools' events for British Science Week, the ESERO Space Connections event (75 teachers) and the Interact conference in Cardiff, as well as running sessions at NAM, the European Astronomical Society meeting, and events in settings such as local libraries, reaching several hundred people. Some 65 students are enrolled in GCSE Astronomy classes run by the Society.

The Society disseminates knowledge to students, the press and the wider public by:

- Organising education and outreach events
- Arranging a programme of Public Lectures
- Exploiting the resources of the Library and Archives
- Promoting research in the media and social media
- Supporting the Friends of the RAS
- Working with specialist partners through RAS200
- Working with the Courtyard Societies as a cultural hub



Below: *Marshmallow constellation, one of the outreach activities run by RAS staff in 2022* (RAS/L Offer)

Public lectures

In 2022 the RAS ran seven public lectures, mostly with an audience in Burlington House as well as online. The lectures were attended by 1884 people and had a total of 4000 views online on the RAS YouTube channel.

Katrin Raynor-Evans Exploring astronomy and space through philately – a brief introduction

Áine O'Brien The Winchcombe Meteorite: Looking back on the lockdown meteorite one year on

Dr Jenny Carter Earth versus Sun: a precarious relationship in space

Prof. Elizabeth Tasker How to build a habitable planet

Prof. Martin Rees Space exploration and the search for extraterrestrial life -- with humans and with robots.

Prof. Virginia Trimble and Prof David Weintraub A conversation with the editors of 'The sky is for everyone: women astronomers in their own words'

Dr Henrik Melin New Eyes on The Universe: The James Webb Space Telescope

Library and Archive outreach

The main outreach event for the RAS Library was taking part in Open House 2022 for the first time in three years. Instead of a single day in September, the Society hosted a nine-day series of tours, performances, activities and events, with 300 attendees ranging from school children and members of the public to Fellows and Trustees, allowing people to see the library and its collections related to Lynda Laird's audio-visual installation (e.g. Caroline Herschel's copy of *Atlas Coelestis*), the bicentenary quilt, and the Timeline banner installation.

After a virtual tour for Care for Carers in January, demand for online visits dropped off. In-person visits resumed in



Getting young Eyes on Mars

Eyes on Mars was created by Catherine Regan and Priya Patel, PhD students at the Mullard Space Science Laboratory, University College London, with support from an RAS Education and Outreach grant. They wanted to raise awareness of UK work on Mars exploration among students aged 7–13. Inspired by the UK-built camera onboard the Rosalind Franklin Rover, Catherine and Priya designed an activity where students can make their own filter wheel (above) and use it to conduct science in the environment around them – just like the next Mars rover will!

So far, they have provided free resources for this activity to 29 schools and youth groups, reaching more than 1400 students. The activity packs sent to groups contain the materials needed for participants to make their own filter wheel, as well as the complete lesson plan for demonstrators, alongside activity sheets and stickers. Many participants said that their perceptions of scientists had changed after taking part in Eyes on Mars, and they now believed that this was a career that was accessible to them. (Eyes on Mars)

May, with over 100 visitors taking part in eight tours for groups such as Friends of Imperial College, Open Age, London Amateur Astrophysics Group, the NASA Insight team and a NERC doctoral training programme.

Media and social media

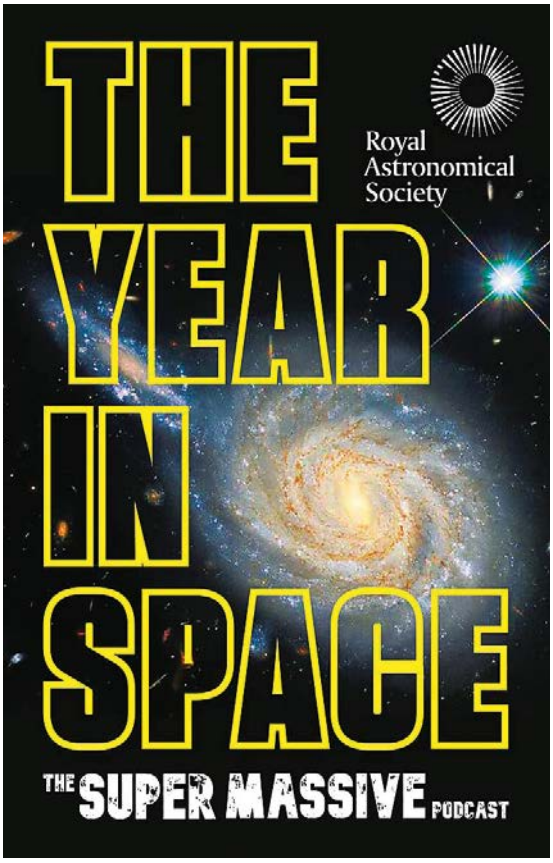
51 press releases were sent out to promote research published in Society journals and presented at our conferences in 2022, as well as our announcements, awards and medals; these led to an estimated 250 articles, at the least. We continue to reach national and international news providers, including all major UK newspapers and broadcast outlets. Highlights included the possibility of a habitable exoplanet orbiting a white dwarf star, the partial solar eclipse in October, and a new record holder for the most distant galaxy yet observed.

The National Astronomy Meeting led to around 100 articles. By happy coincidence, the first James Webb Space Telescope results were announced that week, resulting in 18 radio and TV interviews with conference delegates. *The Sky at Night* filmed a NAM audience reacting to the first images released to the public.

Over the year RAS staff were interviewed and quoted 115 times by press, online, TV and radio outlets, on topics ranging from Moon Trees to the solar eclipse and other astronomical events. The RAS hosted a press conference for third Gaia Data Release, from Goonhilly Earth Station, Cornwall.

Social media channels and YouTube continued to grow in importance. Our Mars opposition post was viewed 2600 times, for example, after a mention and link in a *Daily Mail* article. Our social media followers grew over 2022, particularly on LinkedIn (+196%) and Instagram (+31%). Facebook and Twitter followers grew by 4% and 5% respectively. The RAS created a Mastodon account to establish a presence there. Our most successful tweets were on the opposition of Mars (nearly 77000 impressions) and the partial solar eclipse (168000 impressions).

Right: *The Supermassive podcast team published a spinout book The Year in Space.*



THE SUPER-MASSIVE PODCAST HAS BEEN LISTENED TO MORE THAN **650,000 TIMES**

The Supermassive podcast continues to perform very strongly, regularly the number 1 astronomy podcast in the UK and US charts, and has now been listened to more than 650000 times – 18000 per episode, on average. The largest audience share is in the 25-34 years old age group and, unusually for STEM podcasts, one third of the listeners are women. This year the team published a spinout book *The Year in Space*, a project initiated by the publisher Hachette.

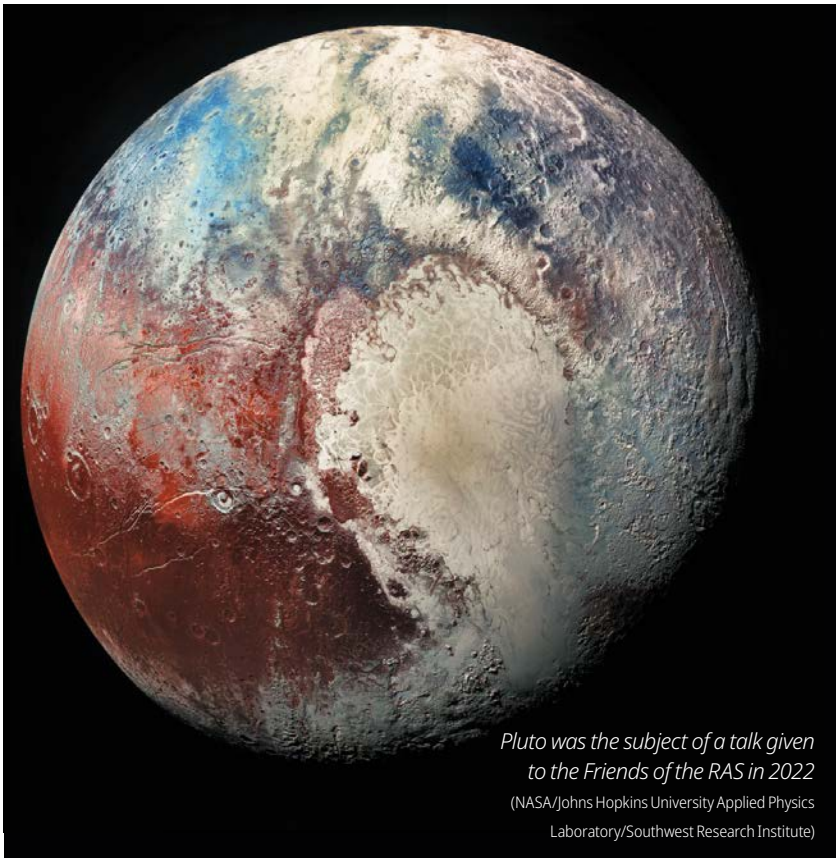
Friends of the RAS

The Friends of the RAS continued to hold lectures online through 2022, with topics including 'Astronomy in an age of



A press release focused on research in *Monthly Notices of the RAS* that used simulations of the origin of gold-rich stars to open a window into the history of the Milky Way

(Simulation: Takayuki Saitoh (Kobe University/Tokyo Tech ELSI), Visualization: Takaaki Takeda (VASA Entertainment Co. Ltd.))



Pluto was the subject of a talk given to the Friends of the RAS in 2022 (NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute)

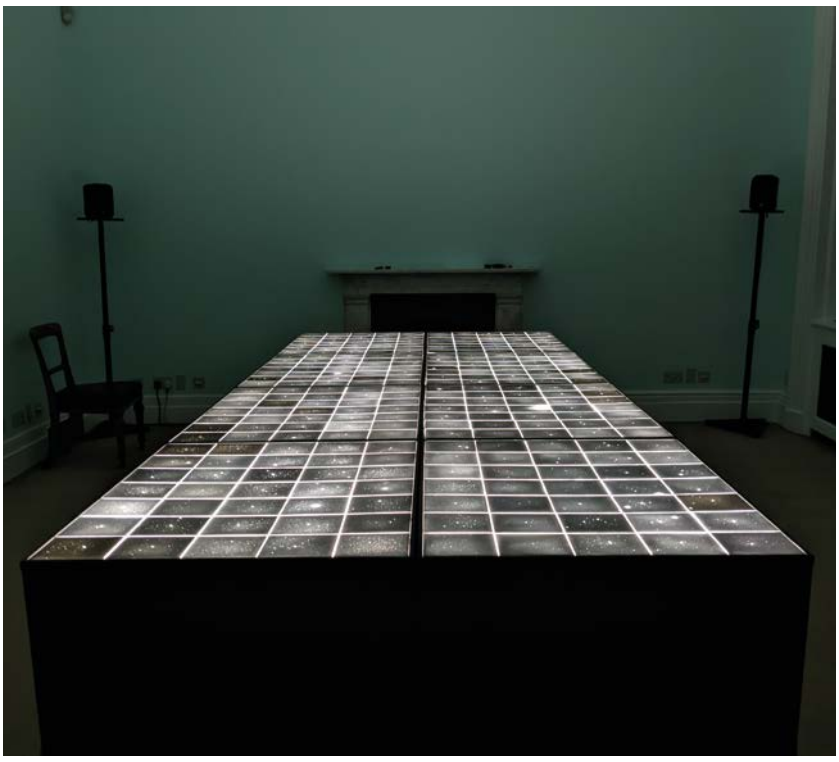
revolutions: the foundation and founders of the Royal Astronomical Society', 'The Pluto Story' and 'The Euclid mission: measuring the geometry of the Universe'. The membership reached 268 in 2022.

RAS200

RAS200: Sky & Earth was planned as a cornerstone of the Society's bicentenary celebrations – an innovative outreach project in which the RAS worked with specialist partner organisations to bring our sciences to wider audiences. The Covid-19 pandemic affected the Society's celebration of the bicentenary; it also meant that many RAS200 partner organisations took longer to complete their projects. The final evaluation report showed that the projects as a whole reached a direct audience of more than 200 000 people. This reflects those who took part in workshops, activities and courses, and attended exhibitions and planetarium shows, for example. RAS200 projects focused on development of individuals – in depth engagement – or increasing the numbers engaging with STEM – breadth of engagement – or both. Through these projects, our partner organisations and the Fellows who worked with them took RAS sciences out to significant new audiences and learned how those sciences could further their objectives: boosting confidence, broadening horizons, enhancing well-being and inspiring learning. RAS200 leaves the Society a legacy of greater social engagement and involvement, and offers lessons for effective future outreach.

Working with Burlington House Courtyard Societies

An installation created by artist Lynda Laird was the focus for outreach activities at the Open House event, in which we joined our fellow Courtyard Societies. This photographic work 'An Imperfect Account of a Comet' arose from the work of Caroline Herschel; speakers and activities for families included a Spectrum Drama actress playing Caroline Herschel.



Above: *At Open House, visitors had the opportunity to examine the installation 'An Imperfect Account of a Comet' by Lynda Laird, using objects observed by Caroline Herschel* (L Laird/RAS)

Our Organisation



The combined solid Earth and atmospheric impacts of the eruption of Hunga volcano, Tonga, in January, were among the largest recorded; a special issue of *Geophysical Journal International* brought aspects of the research together. (ESA Jamie Perera/Midjourney)



The organisation of the RAS supported our objectives during 2022 by:

Developing a strategy for the next five years to focus on:

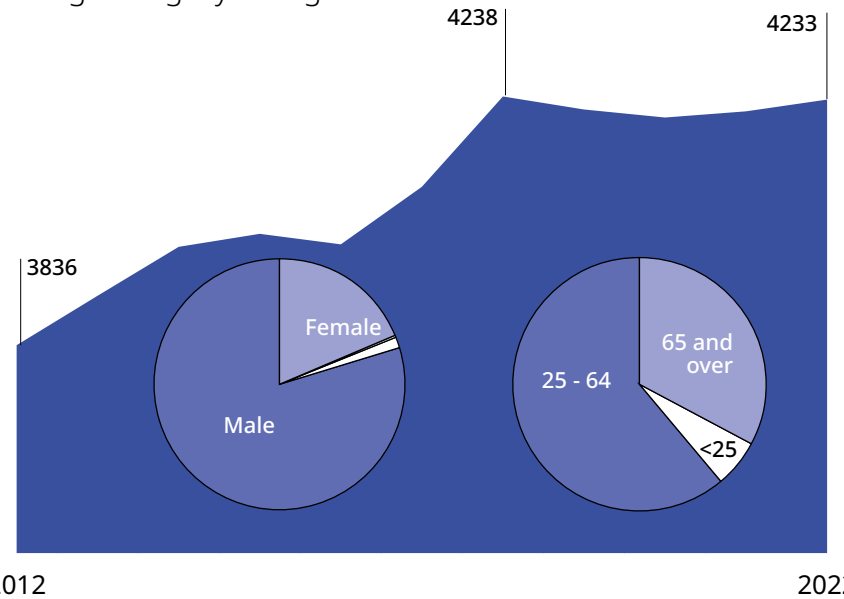
- Membership (including Fellowships and grants)
- Education and outreach – building on the success of RAS200
- Our library and heritage
- Our accommodation.

Cross-cutting themes to inform the strategy review include:

- Diversity and inclusion;
- our digital presence;
- the impact of the pandemic, and
- uncertainty in our long-term location

Membership

In 2022 the RAS had 4233 Fellows of whom 161 were Honorary Fellows. The proportion of women remained at 19%; 30% were aged 65 or over and 5% were under 25 years of age. Most Fellows, 82%, lived in the UK, with 7% based in Europe and 11% in the rest of the world. The number of people elected to fellowship decreased during 2019, 2020 and 2021, but grew slightly during 2022.



Developing RAS strategy

RAS Council convened a number of working groups to cover Membership, Education and Outreach and Library and Heritage. The groups each developed a series of high level objectives for their respective areas and these were discussed in depth at a Council away-day at the Møller Institute in Cambridge in November.

The Education and Outreach working group has consulted the community more widely by organising a Specialist Discussion Meeting in this area (held in February 2023). We intend to consult further with the Fellowship and other stakeholders during 2023.

Looking Forward



The first images were released from the JWST during the National Astronomy Meeting in 2022. (NASA)

Objectives for 2023

The Society will:

- publish high-quality peer-reviewed journals;
- support students and early-career scientists through research fellowships and grants;
- recognise achievement through our medals and prizes;
- maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures;
- sustain our Library and Archive service;
- continue our political engagement;
- maintain our programme of education and outreach, including the Friends of the RAS;
- promote our work and Fellows' work in the media and on social media;
- build our outreach work with other Courtyard Societies.

Our strategic aims for the next five years include:

- supporting and developing the Early Career Network;
- ensuring that the RAS nurtures, supports and improves diversity and inclusivity within its core community;
- working to increase both the engagement and satisfaction of our Fellows;
- reviewing the RAS and Norman Lockyer Fellowship Schemes with a view to ensuring maximum impact;
- increasing the involvement of RAS Fellows in education and outreach activities;
- ensuring our subscription rates are fair, equitable and in line with modern best practice;
- achieving maximum impact from the library, archive and object collections, within available resources;
- increasing the impact, reach and focus of our public engagement activities by prioritising events targeted at under-served communities.

The RAS is making plans for 2023 and the future by:

- Setting objectives to support our strategic aims
- Identifying specific goals over the next five years

Events since the year end

American Astronomical Society Reception in Seattle

In January, the RAS and our publishing partner Oxford University Press hosted a reception in honour of Gold Medal (A) winner Professor George Efstathiou, who gave a plenary lecture at the conference. We were joined by many of our Fellows attending the AAS conference.

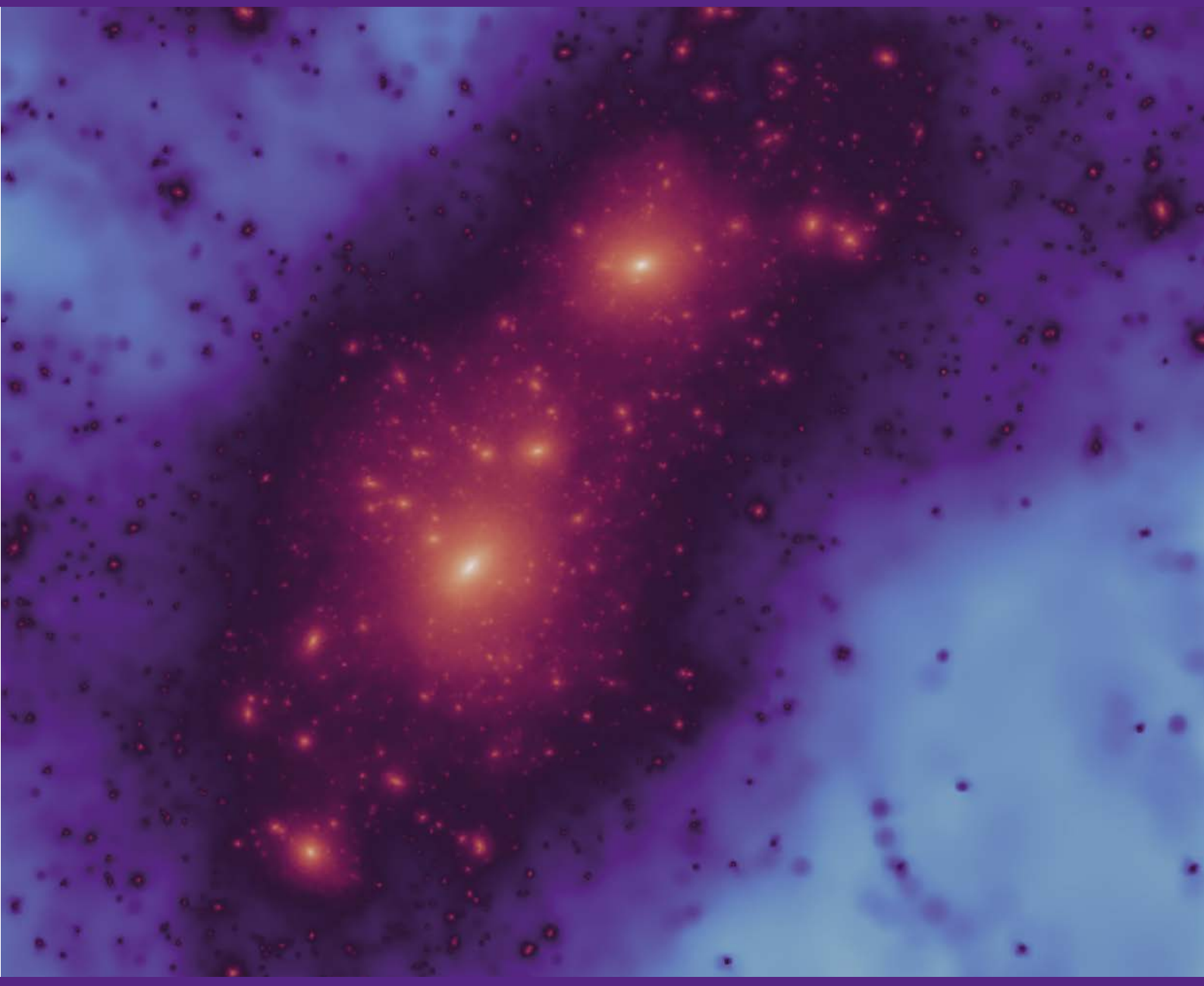
RAS200 meeting and reception

In February, RAS invited its RAS200 partners to a discussion meeting in Burlington House to discuss the outcomes, legacy and benefits to the partners of the initiative to mark its concluding phase. An evening reception was held for the partners and our active participants in the project.

Specialist discussion meeting on Education and Outreach

The RAS strategic working group on Education and Outreach led by its chair, Council member Professor Belinda Wilkes, organised the first Specialist Discussion Meeting devoted to Education and Outreach for some years. The meeting served as a community engagement session on RAS strategy in this area, where practitioners in the field could learn about the conclusions of the RAS's strategic working group and provide feedback and advice. The strategy has been refined as a result of the meeting.

Structure and Governance



Part of the SIBELIUS-DARK simulation, the largest, most accurate model of the universe; a team led from the University of Helsinki, Finland and including researchers from the University of Durham published their results in *Monthly Notices of the RAS*. (Dr Stuart McAlpine)

Governance

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in 2015. The objectives, charters and byelaws are detailed on the Society's website **ras.ac.uk**.

The control of the Society rests with the General Meeting of Fellows. Subject to that, direction and management are the responsibility of the Council (as the Trustees of the charity). The Council consists of a President, a Treasurer and three Secretaries together with four Vice-Presidents and 12 Councillors. In addition, the President-Elect attends Council for one year prior to taking up the post.

Trustee recruitment and appointment

Annually, the full membership of the Society is asked to nominate themselves or other members of the Society to available positions on Council. A nomination must be supported by two other members of the Society. Council approves the ballot list and this together with a narrative on each candidate is sent to the full membership for their consideration prior to casting their votes. We moved to fully electronic voting and an online AGM in 2020 in line with Covid-19 restrictions; we will continue with solely online voting in future. Members of the Council are elected by ballot at the AGM, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

- President, two years
- Vice-Presidents, two years
- Treasurer and Secretaries, five years
- Councillors, three years.

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to complete a conflict of interest declaration and to sign a Trustee declaration form. Trustees have the opportunity to attend training, where appropriate; for example, on The Governance Code. In addition to the induction session organised for new trustees, the Society held two strategy days in October/November for all Council members at the Møller Institute in Cambridge. A workshop on diversity and inclusion facilitated by an external expert was incorporated into the meeting.

Regulations and procedures of the Society:

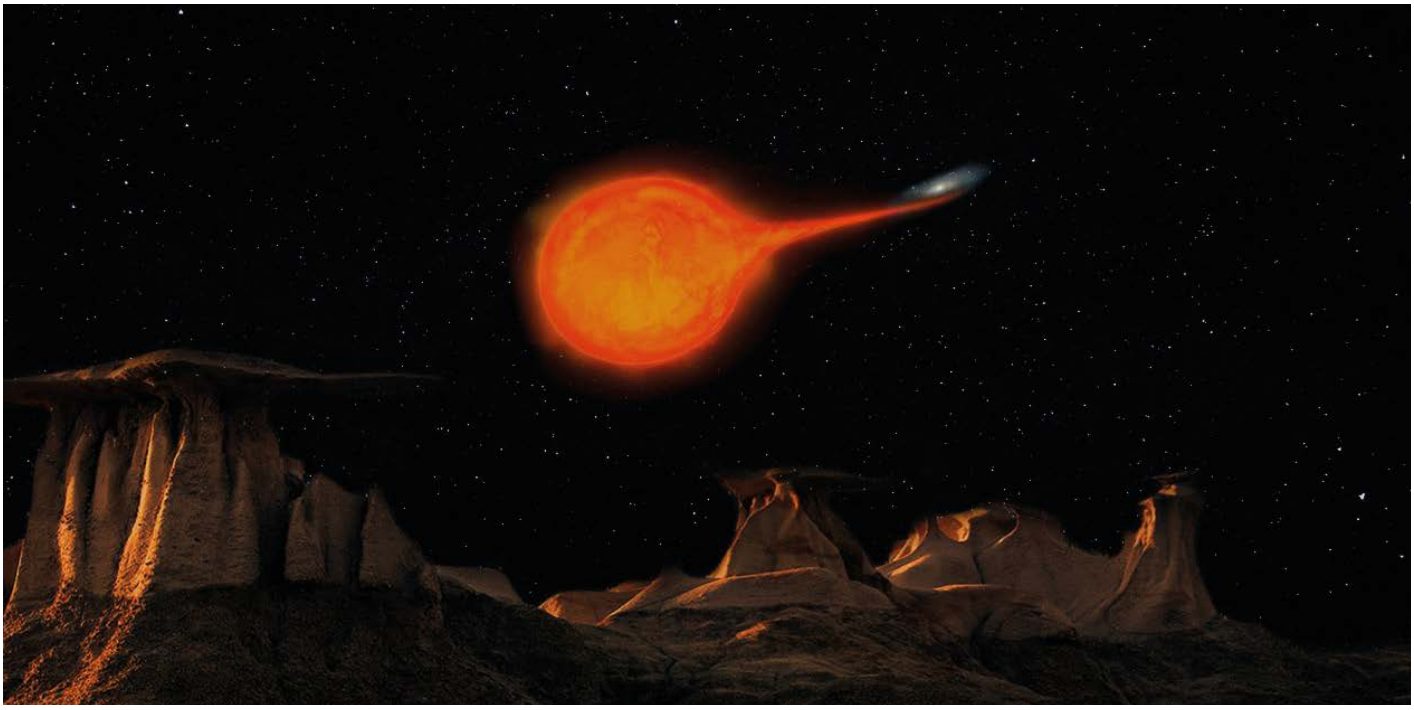
- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- Organisational structure
- Risks

Fundraising

The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

Organisational structure

The RAS Council normally meets six times during the year and its function is to direct, on behalf of the Society, all the affairs and business of the Society. Council appoints standing committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and ad hoc committees (e.g. Awards) to forward its objectives. It appoints the managing editors and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society*,



Above: *Artist's impression of a cataclysmic variable system as if seen from the surface of an orbiting planet; a new method of detecting such stars was the subject of an RAS press release in 2022.*
(Departamento de Imagen y Difusion FIME-UANL/ Lic. Debahni Selene Lopez Morales D.R. 2022)

Geophysical Journal International, and *RAS Techniques and Instruments*, who provide their services, as does the Treasurer, for an honorarium. The Society has formal associations with a number of organisations having shared interests, and has less formal arrangements with several other bodies. These include:

- The British Geophysical Association, jointly sponsored by the RAS and the Geological Society of London to represent solid-Earth geophysicists whose interests fall within the remits of both parent societies
- The Paneth Meteorite Fund that the Society administers under the direction of the Paneth Fund Trustees
- The Society is the UK national member organisation of the International Astronomical Union and the European Astronomical Society and is represented on the UK Panel of the International Union of Radio Science
- The Society is represented on a number of organisations including the Science Council, the Parliamentary and Scientific Committee and the Campaign for Science and Engineering
- The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories and science centres, use of the Society's Library, as well as a reduced subscription to the Society's members' magazine *A&G*.

Risks

The principal risks and uncertainties identified by the Trustees are:

- Maintenance of the quality of, and income from, publications (a significant income stream of >60%)
- Open Access publishing
- Affordability of rent and service charges for the premises at Burlington House

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is exposed and the systems that have been established to manage

those risks. In regards to the most significant risks:

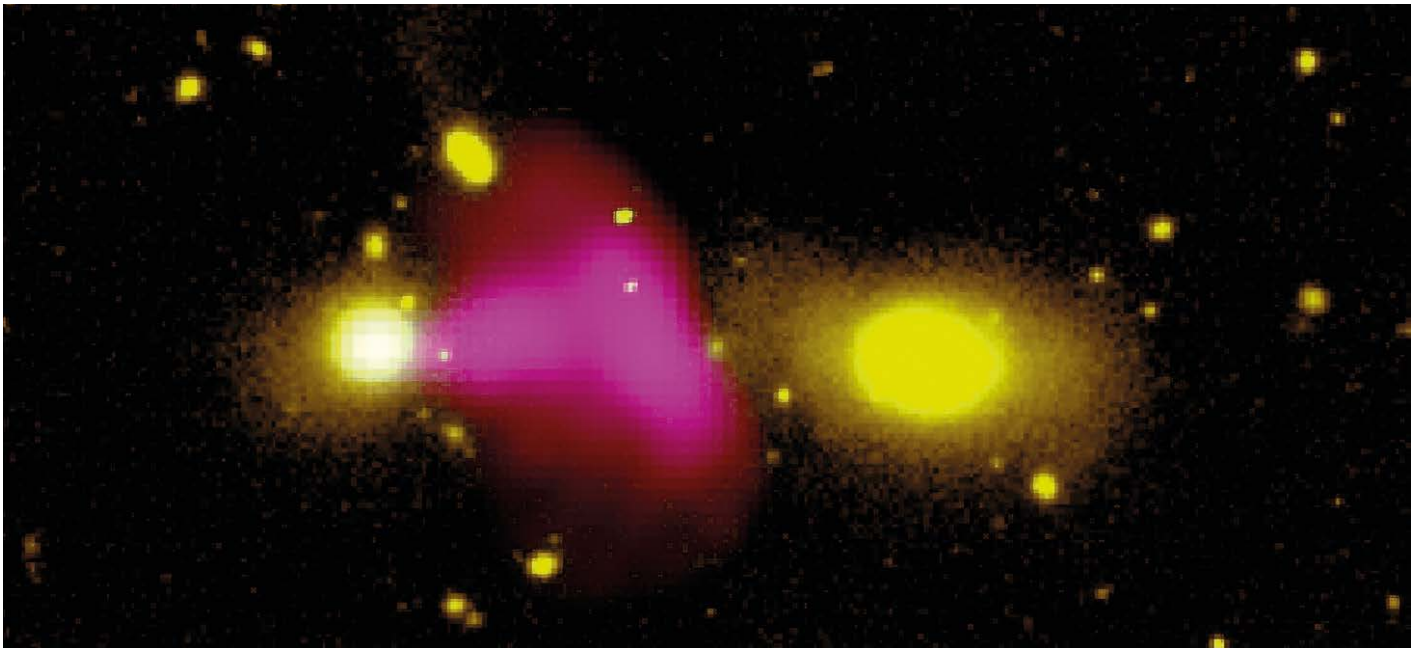
- The Society insists that rigorous peer review is used to maintain the quality of the three journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.
- The uncertainty over future rental charges remains an ongoing concern for the Society. The Society, alongside the other Courtyard Societies, continues to seek a satisfactory resolution with the landlord. The Trustees still hold the view previously stated (Annual Report 2015) that the Society has the resources to cover increases in rental charges over the current lease period. In the meantime, the Society will explore options for alternative accommodation if a satisfactory resolution cannot be achieved.

Other key risks identified and their mitigation measures include:

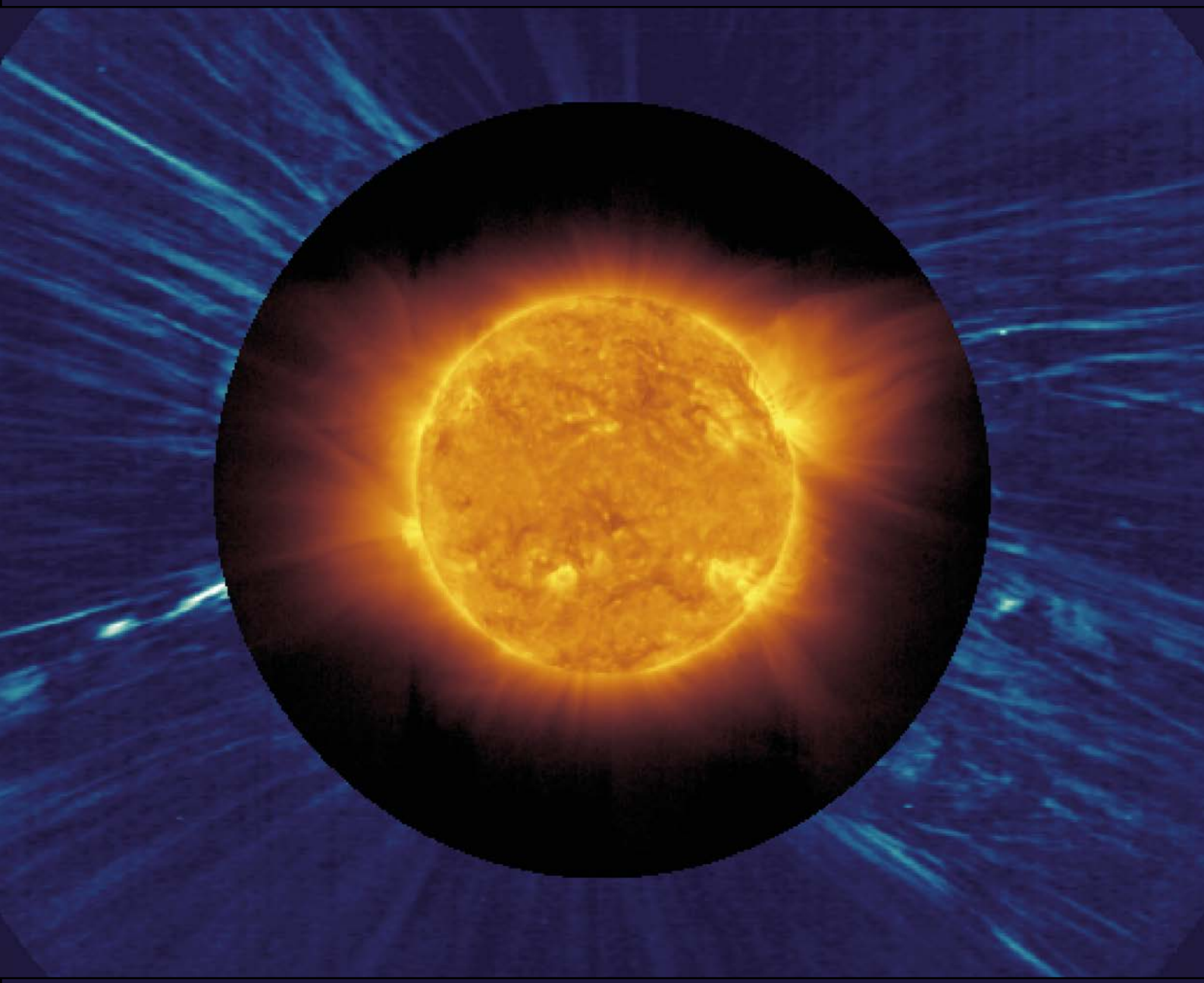
- Maintenance of the (listed) premises (by regular repair and refurbishment)
- Maintenance of the size of the membership (by regular review of services and subscriptions and outreach activites to potential new members)
- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

The Trustees consider the fluctuations in investment fund values and variability of investment returns to be a risk for the Society. The fund, Newton Growth and Income Fund for Charities, is actively and expertly managed and administered by Newton Investment Management who were reappointed after a competitive tender. Funds are invested in a diverse portfolio comprising mainly equities and bonds. This managed strategy mitigates fluctuations in fund values and seeks opportunities for fund growth and income. The Trustees consider this approach mitigates the subsequent exposure to any investment risk.

Below: *A large radio bubble (in pink) from a black hole in a galaxy (in yellow) reaches as far as a companion galaxy, research published in* Monthly Notices of the RAS *and featured in an RAS press release.* (Dr Ananda Hota, GMRT, CFHT, MeerKAT)



Financial Statements



ESA's Solar Orbiter catches a solar switchback; solar activity and its impacts on Earth was discussed at RAS meetings in 2022.

(ESA & NASA/Solar Orbiter/EUI & Metis Teams and D. Telloni et al. (2022))

FINANCIAL REVIEW

The Society's total funds decreased from £23,646,473 to £23,477,081 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art) which totalled £9,470,879 (2021 – £9,470,879). Income increased to £5,280,990 (2021 – £5,236,311) due to increased income from publishing and investments. Publishing income, increased by £162,662. The Society's expenditure increased to £4,733,200 (2021 – £4,455,397) which is mainly due to increased activity enabled by the easing of Covid-19 restrictions, including travel, RAS200 activities and in-person scientific meetings.

Policy on reserves

The reserves policy aims to maintain adequate financial cover for the main risks to the Society and provide in the normal way for an efficient winding-up if that ever became necessary. Working cash reserves are maintained so the Society does not rely on realisation of investments gains, or capital invested. The total funds amounted to £23,477,081 of which £9,470,879 are held in heritage assets, leaving funds of £14,006,202 (2021 – £14,175,594) to cover the main risks and the operational needs of a going concern. The requirement for significant reserves falls into two areas:

- The need to have contingency plans in place to maintain publication income if Open Access regulations threaten the current business model for academic journals; and
- The need to make some provision for either substantial increases in rent, and maintaining the premises, or alternatively, a change in the status of our accommodation. This remains under continual review by the Society and four other Courtyard Societies. The Society's right to remain at Burlington House under the present lease is not in doubt, but whilst the scale of future rent increases has been estimated, there remains uncertainty as to when these increases will slow down or cease. Negotiations continue with the landlord and all long-term options including alternative accommodation will be explored.

The Accommodation fund is detailed in note 17, page 56, along with the other Designated funds.

The Open Access Fund and the Burlington House Fund are currently maintained at high levels to support any significant changes to the Society's operations and the General Fund is available to provide further financial support if either of these risks materialise. The General Fund is also available, should it ever be needed, to enable an orderly winding up of the Society. At 31 December 2022 the free reserves of the Society, defined as unrestricted, undesignated funds, excluding tangible fixed assets, are £7,028,151 (2021 – £7,422,049). The Trustees are satisfied that the current level of reserves is appropriate given the risks and uncertainties outlined above.

It has been the policy of the Society to fund grant activity from the Research and Grants fund, which is now included in the balance of designated reserves.

Investment policy

Investments are held with BNY Mellon Charities Fund: Newton Growth and Income Fund for Charities, with the aim of generating capital growth and income over the medium to long term, with actively managed assets held in global equities and fixed income securities. Surplus cash is held in the COIF Charities Deposit Fund with CCLA Investment Management, which provides a high level of capital security, interest, and liquidity. The Fund has an actively managed

diversified portfolio of sterling denominated money market deposits and instruments. Income and gains from these investments contribute to fund the Society's charitable activities. Investment performance is monitored by the Accountant, Treasurer, Finance Committee and Council.

The Trustees, by resolution, adopted a total returns approach to the invested endowment funds in accordance with the requirements of the Charity Commission believing that this approach is in the best interests of the Society. The fund reconciliation is disclosed in note 12. This approach was applied from 1 January 2015 when the value of the endowment funds at that date of £1,652,682 was used as a proxy for the original value of the endowment funds. In adopting this policy, permanent endowment funds will not be permitted to fall below the original value of £1,652,682. The Trustees aim to maintain the real value of the permanent endowment as a measure against the movements in the retail prices index. This was 13.5% for the year (2021 – 7.5%). No transfers to the restricted funds were made during the year, (2021 – £281,404).

Grant making policy

The RAS has for many years provided small grants to support the community in activities not funded by the research councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to experience working in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

In addition to these grants to individuals the Society funds a series of research fellowships to promote the careers of the highest quality young postdoctoral scientists. These currently include RAS Fellowships (on any subject) and the Norman Lockyer Fellowship (in Solar and Solar Terrestrial Physics). The Norman Lockyer Fellow is funded from an endowment fund set up for that purpose.

A further activity funded by the Society is the award of medals to recognise the highest quality work in various categories. These awards are proposed to Council by a separate awards panel and no awards are made to serving Councillors.

The grants, fellowships and awards are funded from several sources including the restricted and endowment funds invested with Newton Investment Management and the income and gains from these investments and interest from the CCLA COIF Charities Deposit Fund are used to support the grants expenditure in accordance with the bequests.

The Grants Panel deliberates twice a year and further grants are awarded by the Education and Outreach Committee. It comprises the Treasurer (Chair) and the three Secretaries. 107 applications were received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

Information relating to RAS200 can be found on page 22

FINANCIAL REVIEW (continued)

Key management personnel

The key management personnel of the charity in charge of directing and controlling, running and operating the charity are the Trustees, the Executive Director and the Deputy Executive Director; the latter two are employees. They are assisted by the Accountant, a further five managerial level officers and other staff.

Council ensures that the RAS carries out a salary comparison exercise every 3-5 years. The comparability study compares the staff salaries to other similar external positions to reassure the trustees that the levels of remuneration are appropriate. The last comparison exercise was carried out in 2018 with a review planned for 2023.

The Society does not have a performance related pay scheme. The trustees annually consider a salary increase in regards to cost of living that applies to all staff.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has three deferred members only and nine annuitants. The Society operates a defined contribution group personal pension scheme for current staff.

Legacies and donations

The Society encourages Fellows to include donations to the Society in their wills and receives donations during the year from Fellows and members of the public. During the year the Society received donations of £4,009 (2021 - £657) and legacies of £12,324 (2021- £173,030).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5 million. The Society does not regard these as assets which can be converted to their cash value, except in the most dire circumstances.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. Where a valuation is available for additions to the collection, this is reflected in the financial statements. A valuation will always be obtained for additions that are financially material to the whole collection

Investment performance

The Newton Growth and Income fund for Charities provided a yield of 2.2% and a total return gross of -5.4% in the year. Annual management charges of 0.6% are taken from the capital of the fund. Interest from the COIF Charities Deposit Fund yielded 1.2%. Performance of the fund managers is kept under continual review.

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The Trustees are responsible for preparing the Trustees' report and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The law applicable to charities in England and Wales requires the Trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of the income and expenditure of the charity for that period. In preparing these financial statements, the Trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102);
- make judgments and estimates that are reasonable and prudent;
- state whether applicable United Kingdom Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements;

- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in operation.

The Trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and the provisions of the Royal Charter and Bye Laws. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities. The Trustees are responsible for the maintenance and integrity of the charity and financial information included on the charity's website.
The Council of the Society believes that it has carried out these requirements.

AUDITORS

A resolution to appoint Buzzacott for 2023 will be proposed at the Annual General Meeting.
Approved by the Council and signed on its behalf by:

Prof. Michael G Edmunds
President
12 May 2023

INDEPENDENT AUDITOR'S REPORT TO THE TRUSTEES OF ROYAL ASTRONOMICAL SOCIETY

Opinion

We have audited the financial statements of Royal Astronomical Society (the 'charity') for the year ended 31 December 2022, which comprise the statement of financial activities, the balance sheet, the statement of cash flows, the principal accounting policies and the notes to the financial statements. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland' (United Kingdom Generally Accepted Accounting Practice).

In our opinion, the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2022 and of its income and expenditure for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Conclusions relating to going concern

In auditing the financial statements, we have concluded that the trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue.

Our responsibilities and the responsibilities of the trustees with respect to going concern are described in the relevant sections of this report.

Other information

The trustees are responsible for the other information. The other information comprises the information included in the annual report and financial statements other than the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether there is a material misstatement in the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

Matters on which we are required to report by exception

We have nothing to report in respect of the following matters in relation to which the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the trustees' annual report is inconsistent in any material respect with the

financial statements; or
- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Responsibilities of trustees

As explained more fully in the trustees' responsibilities statement, the trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the trustees either intend to liquidate the charity or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud is detailed below.

Our approach to identifying and assessing the risks of material misstatement in respect of irregularities, including fraud and non-compliance with laws and regulations, was as follows:
- the engagement partner ensured that the engagement team collectively had the appropriate competence, capabilities and skills to identify or recognise non-compliance with applicable laws and regulations;
- we identified the laws and regulations applicable to the charity through discussions with management, and from our knowledge and experience of the sector;
- we focused on specific laws and regulations which we considered may have a direct material effect on the financial statements or the operations of the charity, including the Charities Act 2011, data protection legislation, anti-bribery, employment, pensions and health and safety legislation;
- we assessed the extent of compliance with the laws and regulations identified above through making enquiries of management and inspecting legal correspondence; and
- identified laws and regulations were communicated within the audit team regularly and the team remained alert to instances of non-compliance throughout the audit.

We assessed the susceptibility of the charity's financial statements to material misstatement, including obtaining an understanding of how fraud might occur, by:
- making enquiries of management and those charged with governance as to where they considered there was susceptibility to fraud, their knowledge of actual, suspected and alleged fraud; and
- considering the internal controls in place to mitigate risks of fraud and non-compliance with laws and regulations.

To address the risk of fraud through management bias and override of controls, we:
- performed analytical procedures to identify any unusual or unexpected financial relationships;
- tested journal entries to identify unusual financial

transactions;
- tested authorisation controls during substantive testing of expenditure;
- assessed whether judgements and assumptions made were indicative of potential bias; and
- investigated the rationale behind significant or unusual financial transactions.

In response to the risk of irregularities and non-compliance with laws and regulations, we designed procedures which included, but were not limited to:
- agreeing financial statement disclosures to underlying supporting documentation;
- reading the minutes of meetings of those charged with governance; and
- enquiring of management and those charged with governance as to actual and potential litigation and claims.

There are inherent limitations in our audit procedures described above. The more removed that laws and regulations are from financial transactions, the less likely it is that we would become aware of non-compliance. Auditing standards also limit the audit procedures required to identify non-compliance with laws and regulations to enquiry of the trustees and other management and the inspection of regulatory and legal correspondence, if any.

Material misstatements that arise due to fraud can be harder to detect than those that arise from error as they may involve deliberate concealment or collusion.

A further description of our responsibilities for the audit of the financial statements is located on the Financial Reporting Council's website at www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditor's report.

Use of our report

This report is made solely to the charity's trustees, as a body, in accordance with section 144 of the Charities Act 2011 and with regulations made under section 154 of that Act. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's trustees as a body, for our audit work, for this report, or for the opinions we have formed.

Buzzacott LLP

Statutory Auditor
130 Wood Street
London
EC2V 6DL

16 May 2023

Buzzacott LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2022

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2022 Total funds £	2021 Total funds £
Income						
Donations and legacies	1	**13,101**	**3,232**	—	**16,333**	173,687
Other trading activities		**9,309**	—	—	**9,309**	25,691
Investment income	2	**174,271**	**10,623**	**67,136**	**252,030**	203,973
Charitable activities	3	**5,003,318**	—	—	**5,003,318**	4,832,960
Total income		**5,199,999**	**13,855**	**67,136**	**5,280,990**	5,236,311
Expenditure						
Raising funds		**42,313**	—	—	**42,313**	8,157
Charitable activities	5	**4,687,107**	**3,780**	—	**4,690,887**	4,447,240
Total expenditure		**4,729,420**	**3,780**	—	**4,733,200**	4,455,397
Net income before investment gains and losses		**470,579**	**10,075**	**67,136**	**547,790**	780,914
Net (losses) gains on investments	12	**(494,856)**	**(30,371)**	**(191,955)**	**(717,182)**	1,358,192
Net (expenditure) income for the year and net movement in funds		**(24,277)**	**(20,296)**	**(124,819)**	**(169,392)**	2,139,106
Reconciliation of funds:						
Total funds brought forward at 1 January 2022		**20,518,565**	**1,078,588**	**2,049,320**	**23,646,473**	21,507,367
Total funds carried forward at 31 December 2022		**20,494,288**	**1,058,292**	**1,924,501**	**23,477,081**	23,646,473

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing.

The notes on pages 47 to 60 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2021

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2021 Total funds £
Income					
Donations and legacies	1	173,557	130	—	173,687
Other trading activities		25,691	—	—	25,691
Investment income	2	141,139	7,726	55,108	203,973
Charitable activities	3	4,832,960	—	—	4,832,960
Total income		5,173,347	7,856	55,108	5,236,311
Expenditure					
Raising funds		8,157	—	—	8,157
Charitable activities	5	4,440,802	6,438	—	4,447,240
Total expenditure		4,448,959	6,438	—	4,455,397
Net income before investment gains		724,388	1,418	55,108	780,914
Net gains on investments	12	937,152	51,768	369,272	1,358,192
Net income for the year		1,661,540	53,186	424,380	2,139,106
Transfer between funds	12	—	281,404	(281,404)	—
Net movement in funds		1,661,540	334,590	142,976	2,139,106
Reconciliation of funds:					
Total funds brought forward at 1 January 2021		18,857,025	743,998	1,906,344	21,507,367
Total funds carried forward at 31 December 2021		20,518,565	1,078,588	2,049,320	23,646,473

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing.

The notes on pages 47 to 60 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2022

	Notes	2022 £	2022 £	2021 £	2021 £
Fixed assets					
Tangible assets					
. Heritage assets	11	**9,470,879**		9,470,879	
. Other assets	11	**570,167**		656,325	
Investments	12	**9,155,783**		9,872,965	
			19,196,829		20,000,169
Current assets					
Debtors	13	**1,141,492**		1,112,854	
Cash at bank and in hand		**4,853,609**		4,446,569	
		5,995,101		5,559,423	
Creditors: amounts falling due within one year	14	**(1,643,346)**		(1,793,956)	
Net current assets			**4,351,755**		3,765,467
Total assets less current liabilities			**23,548,584**		23,765,636
Creditors: amounts falling due after one year	14		**(71,503)**		(119,163)
Total net assets			**23,477,081**		23,646,473
The funds of the charity					
Endowment funds	15		**1,924,501**		2,049,320
Restricted income funds	16		**1,058,292**		1,078,588
Unrestricted income funds					
. Designated funds	17	**13,385,888**		12,993,027	
. General funds		**7,108,400**		7,525,538	
			20,494,288		20,518,565
			23,477,081		23,646,473

The financial statements were approved by Council on 12 May 2023 and signed on its behalf by

Prof. Michael G Edmunds
President
12 May 2023

The notes on pages 47 to 60 form part of these financial statements

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2022

	Notes	2022 £	2021 £
Cash flow from operating activities			
Net cash provided by operating activities	A	**191,163**	521,526
Cash inflow from investing activities			
Dividends and interest from investments		**252,030**	203,973
Purchase of tangible fixed assets		**(36,153)**	(15,462)
Net cash provided by investing activities		**215,877**	188,511
Change in cash and cash equivalents in the year		**407,040**	710,037
Cash and cash equivalents at 1 January 2022	B	**4,446,569**	3,736,532
Cash and cash equivalents at 31 December 2022	B	**4,853,609**	4,446,569

NOTES TO THE STATEMENT OF CASH FLOWS FOR THE YEAR TO 31 DECEMBER 2022

A Reconciliation of net movement in funds to net cash flow from operating activities

	2022 £	2021 £
Net movement in funds (as per the statement of financial activities)	**(169,392)**	2,139,106
Adjustments for:		
Depreciation charge	**122,311**	122,230
Net losses (gains) on investments	**717,182**	(1,358,192)
Dividends and interest from investments	**(252,030)**	(203,973)
Increase in debtors	**(28,638)**	(264,471)
(Decrease) increase in creditors	**(198,270)**	86,826
Net cash used in operating activities	**191,163**	521,526

B Analysis of cash and cash equivalents

	2022 £	2021 £
Total cash and cash equivalents: Cash at bank and in hand	**4,853,609**	4,446,569

C Reconciliation of net funds

	1 January 2022 £	Cash flows £	31 December 2022 £
Cash and cash equivalents	4,446,569	407,040	**4,853,609**

PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted, judgements and key sources of estimation uncertainty in the preparation of the financial statements are laid out below.

Basis of preparation

These financial statements have been prepared for the year to 31 December 2022.

The financial statements have been prepared under the historical cost convention with items recognised at cost or transaction value unless otherwise stated in the relevant accounting policies below or the notes to these financial statements.

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (Charities SORP) the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) and the Charities Act 2011.

The charity constitutes a public benefit entity as defined by FRS 102.

The financial statements are presented in sterling and are rounded to the nearest pound.

Critical accounting estimates and areas of judgement

Preparation of the financial statements requires the Trustees and management to make significant judgements and estimates.

The items in the financial statements where these judgements and estimates have been made include:

- publication income (see income recognition policy below);
- the useful economic life of tangible fixed assets and non-depreciation of heritage assets; and
- the accrual for Burlington House rent.

Assessment of going concern

The Trustees have assessed whether the use of the going concern assumption is appropriate in preparing these financial statements. The Trustees have made this assessment in respect of a period of at least one year from the date of approval of these financial statements.

The Trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased rental charges for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk, that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the Trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves Policy in the Trustees' report provides more detail.

The Trustees have considered the continuing impact due to Covid-19 on the ability of the Society to continue its charitable activities. During 2022 the threat of Covid-19 declined and face to face meetings were reintroduced from July including NAM, Specialist Discussion and Ordinary Meetings.

The Trustees have also considered the continuing impact of the Russian invasion of Ukraine. The Newton Growth and Income Fund for Charities has little or no exposure to Russian or Ukraine and subsequent interest rate rises during the year increased income significantly from the CCLA COIF Charities Deposit Fund. The Society's publishing activities are world-wide, but there are no editors based in Russia or Ukraine, and Oxford University Press reports the impact on these publishing activities is minimal. Higher energy costs did not materially impact the Society and tariffs were renegotiated to 2024.

The Trustees therefore conclude that the preparation of these financial statements on a going concern basis is justified.

The Trustees have concluded that there are no other material uncertainties related to events or conditions that may cast significant doubt on the ability of the charity to continue as a going concern.

The most significant areas of judgement that affect items in the financial statements are mentioned above and detail provided in the section on risks in the Trustees' report.

Income recognition

Income is recognised in the period in which the charity has entitlement to the income, the amount of income can be measured reliably and it is probable that the income will be received.

Income comprises donations, investment income, income from the sale of publications, membership subscriptions, and other related income.

Donations, are recognised when the charity has confirmation of both the amount and settlement date. In the event of donations pledged but not received, the amount is accrued for where the receipt is considered probable. In the event that a donation is subject to conditions that require a level of performance before the charity is entitled to the funds, the income is deferred and not recognised until either those conditions are fully met, or the fulfilment of those conditions is wholly within the control of the charity and it is probable that those conditions will be fulfilled in the reporting period.

Legacies are included in the statement of financial activities when the charity is entitled to the legacy, the executors have established that there are sufficient surplus assets in the estate to pay the legacy, and any conditions attached to the legacy are within the control of the charity.

The Society has a contract with Oxford University Press for the publication of journals, which gives a percentage of the surplus made to 31 December each year to the Society. Although payments are received net, income is recognised in the financial statements on a gross basis which reflects that the Society retains the underlying long term rights. All publication income is accounted for on a receivable basis.

Membership subscriptions are payable in respect of a twelve month period in advance. The unearned portion of income received relating to the period after 31 December is carried forward as deferred income.

Investment income is recognised once the dividend has been declared and notification has been received of the dividend due.

Interest on funds held on deposit is included when receivable and the amount can be measured reliably by the charity; this is normally upon notification of the interest paid or payable by the bank.

Expenditure recognition

Expenditure is recognised as soon as there is a legal or constructive obligation committing the charity to the expenditure. All expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all costs related to the category.

Expenditure on charitable activities includes all costs associated with furthering the charitable purposes of the charity as described in the Trustees' Report.

Grants payable for the support of research or study in any areas of astronomy and geophysics are recognised in the financial statements as soon as the obligation has been authorised by the Grants Committee, which meets twice-yearly (ca. February and August) to allocate funds, the recipient has a reasonable expectation that they will receive a grant and any condition attaching to the grant is outside the control of the Society.

The costs of raising funds consist of room hire expenditure and RAS diaries bought for resale.

Allocation of support and governance costs

Support costs, including governance costs, represent indirect charitable expenditure. In order to carry out the primary purposes of the charity it is necessary to provide support in the form of personnel development, financial procedures, provision of office services and equipment and a suitable working environment.

Governance costs comprise audit fees, legal advice for trustees and costs associated with constitutional and statutory requirements, e.g. cost of trustee meetings and preparing statutory financial statements as well as costs associated with the strategic management of the Society

Support costs are apportioned based on the proportion of floor area occupied by, or proportion of staff time spent on, the activity.

Taxation

The Society is a registered charity and no liability to taxation arises on the results of its activities as applied for charitable purposes, with the exception of investment income, which is taxed at source.

Operating leases

Rentals under operating leases are charged to the statement of financial activities on a straight-line basis over the term of the lease.

Pension costs

The Society operates two pension schemes for employees and former employees. The assets of the schemes are held separately from those of the Society.

The Society operates a defined benefit pension scheme for former employees, who joined its service before 1 January 2002, providing benefits based upon final pensionable earnings. Royal London manages the pension scheme, with the investments now 100% held by Royal London.

The latest actuarial valuation at 31 December 2022 shows a pension surplus which is not recognised on the balance sheet as an asset because it is not available to the Society by way of reduced future contributions.

Actuarial gains and losses arising from new valuations and from updating valuations to the balance sheet date are recognised in the statement of financial activities as other recognised gains and losses.

The Society has established a second pension scheme (a defined contribution scheme) for employees who began service with the Society after 1 January 2002. The amount charged in the statement of financial activities in respect of the defined contribution pension scheme is the contributions payable in the year.

Foreign currencies

Monetary assets and liabilities denominated in foreign currencies are translated at the rate of exchange ruling at the balance sheet date. Transactions in foreign currencies are recorded at the rate ruling at the date of the transaction. All differences are taken to the statement of financial activities.

Heritage assets

Heritage assets are included in the financial statements at a historic valuation which is being treated as deemed cost. There are two main classes of heritage assets that the Society possesses, which are:

- Rare Books and Manuscripts
- Fine Art and Collectibles – Historic books, portraits, busts, instruments and antique furniture.

The Society's rare book and manuscript collection is reported in the balance sheet at a valuation by Christies in 1996, with a number of items re-valued by B Quaritch Limited in 2011. The valuation basis was High Auction Estimate.

The Society's fine art and collectibles are reported in the balance sheet at a valuation by Bonhams in 1992, including index linking, with a number of items revalued by Bonhams in 2011.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. The Society would only obtain a valuation of the donation, if it was deemed to materially affect the overall value of the heritage asset portfolio.

Depreciation is not charged on heritage assets due to immateriality based on their extremely long useful lives and high residual values.

Other tangible fixed assets

The Society capitalises tangible fixed assets with a cost greater than £250 and an estimated useful life over one year.

Tangible fixed assets are depreciated on cost on a straight line basis from the date of acquisition over their expected useful lives as follows:

- Telephone and security system and computer equipment 4 years
- Leasehold Improvements 20 years
- Plant and machinery 10 years

Investments

Listed investments are a form of basic financial instrument and are initially recognised at their transaction value and subsequently measured at their fair value as at the balance sheet date using the closing quoted market price.

Realised gains (or losses) on investment assets are calculated as the difference between disposal proceeds and their opening carrying value or their purchase value where the investment is acquired subsequent to the first day of the financial year. Unrealised gains and losses are calculated as the difference between the fair value at the year end and their carrying value at that date. Realised and unrealised investment gains (or losses) are combined in the statement of financial activities and are credited (or debited) in the year in which they arise.

Debtors

Debtors are recognised at their settlement amount, less any provision for non-recoverability. Prepayments are valued at the amount prepaid.

Cash at bank and in hand

Cash at bank and in hand represents such accounts and instruments that are available on demand or have a maturity of less than three months from the date of acquisition.

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt.

Fund structure

Endowment funds comprise assets which normally must be held as capital. The income arising therefrom is used to support specific activities determined in accordance with the wishes of the donor.

Restricted funds comprise monies raised for, or their use restricted to, a specific purpose, or contributions subject to donor imposed conditions.

Designated funds represent monies set aside out of unrestricted funds and designated by the trustees for a specific purpose.

Unrestricted funds represent those monies which are freely available for application towards achieving any charitable purpose that falls within the Society's charitable objects.

NOTES TO THE FINANCIAL STATEMENTS

1 Donations and legacies

	Unrestricted funds £	**Restricted funds £**	**2022 Total funds £**	Unrestricted funds £	Restricted funds £	2021 Total funds £
Donations	**1,009**	**3,000**	**4,009**	527	130	657
Legacies	**12,092**	**232**	**12,324**	173,030	—	173,030
Total funds	**13,101**	**3,232**	**16,333**	173,557	130	173,687

2 Investment income

	Unrestricted funds £	**Restricted funds £**	**Endowment funds £**	**2022 Total funds £**
Income from listed investments	**141,776**	**8,703**	**55,000**	**205,479**
Bank interest	**32,495**	**1,920**	**12,136**	**46,551**
2022 Total funds	**174,271**	**10,623**	**67,136**	**252,030**

	Unrestricted funds £	Restricted funds £	Endowment funds £	2021 Total funds £
Income from listed investments	140,726	7,707	54,974	203,407
Bank interest	413	19	134	566
2021 Total funds	141,139	7,726	55,108	203,973

3 Income from charitable activities

	Unrestricted funds	
	2022 £	2021 £
Publications (note 4)	**4,578,797**	4,416,135
Membership	**369,762**	375,992
Scientific meetings	**27,958**	15,228
Public policy	**2,105**	830
Library	**4,677**	2,503
Educational	**543**	2,083
Other	**19,476**	20,189
Total funds	**5,003,318**	4,832,960

4 Publications

	2022 £	2021 £
Income		
Monthly Notices of the Royal Astronomical Society	**3,437,288**	3,276,424
Geophysical Journal International	**1,046,550**	1,046,248
Astronomy & Geophysics	**81,118**	86,703
Royal Astronomical Society Techniques & Instruments	**7,518**	—
Other	**6,323**	6,760
	4,578,797	4,416,135
Expenditure		
Monthly Notices of the Royal Astronomical Society	**2,447,568**	2,435,372
Geophysical Journal International	**699,828**	651,209
Astronomy & Geophysics	**168,291**	189,458
Royal Astronomical Society Techniques & Instruments	**20,959**	—
Other	**33,714**	32,836
	3,370,360	3,308,875

5 Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2022 £	Direct costs £	Support costs £	2021 £
Publications (note 4)	**2,948,115**	**422,245**	**3,370,360**	2,926,637	382,238	3,308,875
Scientific meetings	**95,751**	**204,579**	**300,330**	11,924	185,195	197,119
Membership	**8,842**	**48,582**	**57,424**	7,203	43,979	51,182
Educational	**147,795**	**80,590**	**228,385**	171,284	73,480	244,764
RAS 200	**86,930**	**5,000**	**91,930**	19,285	4,000	23,285
Library	**102,583**	**395,822**	**498,405**	120,874	358,318	479,192
Public policy	**62,796**	**81,257**	**144,053**	69,265	73,558	142,823
	3,452,812	**1,238,075**	**4,690,887**	3,326,472	1,120,768	4,447,240

Grants, fellowships and awards in support of research are principally included under Educational and RAS 200 above to reflect the responsibilities for the management and administration of grants. 75 grants, fellowships and awards, totalling £178,412 (2021 – £105,878) were awarded to institutions and 40 grants, medals and awards totalling £28,066 (2021 – £18,801) were made to individuals. Expenditure supporting an RAS Research Fellowship totalled £32,000 (2021 - £735). Adjustments to other grants resulted in credits to expenditure totalling £54,180 (2021 – £13,364).

Total grant making support costs were £35,000 (2021 - £30,000).

A full list of all grantees and analysis can be found on the Society's website.

All expenditure on charitable activities is unrestricted except for £3,780 (which is entirely included within the educational category) which is restricted (2021 – £6,438).

6 Support costs

Support costs analysed by function are as follows:

	2022 £	2021 £
Executive	**124,102**	123,363
Finance	**96,280**	97,591
Facilities	**99,890**	90,026
Membership	**41,625**	38,901
IT	**84,202**	74,065
Policy, development and press	**107,819**	100,990
Burlington House	**168,808**	151,804
Other	**362,237**	320,696
Governance (note 7)	**153,112**	123,332
	1,238,075	1,120,768

Staff time (based on a review of staff time apportionment) and floor area, are used as bases of apportioning support costs over charitable activities.

7 Governance costs

	2022 £	2021 £
Auditor's remuneration (note 8)	**23,350**	24,000
Trustees' and Committee costs	**18,921**	6,277
AGM expenses	**9,107**	8,353
Staff time and other expenses	**101,734**	84,702
	153,112	123,332

8 Net (expenditure) income for the year

This is stated after charging:

	2022 £	2021 £
Depreciation	**122,311**	122,230
Auditor's remuneration:		
. Charity audit	**17,500**	18,000
. Pension scheme audit	**5,850**	6,000
. Other services	**750**	—
Operating lease rentals:		
. Office equipment	**7,449**	9,347

9 Staff costs and remuneration of key management personnel

	2022 £	2021 £
Wages and salaries	**972,010**	913,672
Social security costs	**106,197**	86,264
Pension costs (see note 20):		
. Stakeholder pension scheme	**82,315**	79,918
. Death in service contributions	**6,924**	4,531
	1,167,446	1,084,385

During the year one employee of the Society earned between £80,000 and £90,000 (2021 – one employee) one employee earned between £70,000 and £80,000 (2021 – no employee) and one employee earned between £60,000 and £70,000 (2021 – one employee). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £ 21,980 (2021 – £14,840).

The average number of employees was 24 (Administration 7, Outreach 2, Editorial 10, Library 2, House 1, Press & Policy 2) (2021 – 24).

The key management personnel of the charity in charge of directing and controlling, running and operating the charity on a day to day basis comprise the Trustees and the Executive and Deputy Executive Directors. The total remuneration (including taxable benefits and employer's pension and national insurance contributions) of the key management personnel for the year was £202,413 (2021 - £187,172).

10 Transactions with Trustees

The Trustees receive reimbursement for travel expenses incurred in attending meetings. The amount reimbursed during the year for 14 Trustees was £11,561 (2021 – £98).

Remuneration of £6,292 was paid to one Trustee during 2022 (2021 – £5,914 to one Trustee). By agreement with the Charity Commissioners (dated 14 June 2004, case No. 299189, Sealing No. 344/04) the Treasurer is paid an Honorarium. This is formally approved each year by Council.

Grants Made to Councillors

The following grants were made to Councillors during the year as part of the RAS grant awarding process. The recipients had no influence or part in the decisions on the award of these grants. For the most part the grant holders were not the main personal beneficiaries as the support was directly received by their students or meeting attendees. Excluding Councillors from the grants round completely is not seen as a satisfactory policy. It would strongly dissuade members from standing for election as Councillors and would be at variance with the accepted practice in research councils where members of grants panels are not excluded from applying. The process of grant review and award fully complies with the Nolan Principles and closely follows Government Research Council practice.

The grants were:

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of trustees as the Society).
- F A Paneth Meteorite Collection as disclosed in note 22. Dr Nigel Berman, Treasurer, is a Trustee and Dr Caroline Smith, Trustee, is Secretary of the F A Paneth Meteorite Collection
- A £1,200 summer undergraduate bursary was awarded to Northumbria University, supervised by Clare Watt who is a Trustee
- A £1,200 summer undergraduate bursary was awarded to the University of Southampton, supervised by Matthew Middleton who is a Trustee.
- £1,000 from the Patricia Tomkins Thesis Prize fund was awarded to University College London. Patricia Tomkins is a Trustee.

11 Tangible fixed assets

a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	**Total £**
At 1 January 2022 and 31 December 2022	4,951,500	4,519,379	**9,470,879**

Fine art and collectible additions of £30,000 were recorded in 2020. There were no other additions in the last five years.

The rare book collection is preserved by storing in an air-conditioned, temperature-controlled environment; the fine art and collectibles are also continually preserved in order to maintain their values.

Certain heritage assets are on public display at exhibitions. The Society's Librarian controls access to those heritage assets which are kept at Burlington House.

b) Other assets

	Leasehold improve-ments £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	**Total £**
Cost					
At 1 January 2022	1,878,405	36,375	316,308	9,994	**2,241,082**
Additions	1,017	1,985	33,151	—	**36,153**
Disposals	—	—	(10,000)	—	**(10,000)**
At 31 December 2022	**1,879,422**	**38,360**	**339,459**	**9,994**	**2,267,235**
Depreciation					
At 1 January 2022	1,294,523	17,235	272,999	—	**1,584,757**
Charge for the year	94,013	3,836	24,462	—	**122,311**
Disposals	—	—	(10,000)	—	**(10,000)**
At 31 December 2022	**1,388,536**	**21,071**	**287,461**	—	**1,697,068**
Net book values					
At 31 December 2022	**490,886**	**17,289**	**51,998**	**9,994**	**570,167**
At 31 December 2021	583,882	19,140	43,309	9,994	656,325

12 Investments

	2022 Total funds £	2021 Total funds £
Market value at 1 January 2022	**9,872,965**	8,514,773
Net unrealised investment (losses) gains	**(717,182)**	1,358,192
Market value at 31 December 2022	**9,155,783**	9,872,965
Historical cost as at 31 December 2022	**4,917,081**	4,917,081

Investments comprise BNY Mellon: Newton Growth and Income Fund for Charities

The permanent endowment fund investments and movements in the unapplied total return are set out below.

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2022	**1,652,682**	**396,638**	**2,049,320**
Add: Total return			
. Investment income		**67,136**	**67,136**
. Net losses on listed investments		**(191,955)**	**(191,955)**
		(124,819)	**(124,819)**
Less:			
. Allocation to income from total return		—	—
At 31 December 2022	**1,652,682**	**271,819**	**1,924,501**

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2021	1,652,682	253,662	1,906,344
Add: Total return			
. Investment income		55,108	55,108
. Net gains on listed investments		369,272	369,272
		424,380	424,380
Less:			
. Allocation to income from total return		(281,404)	(281,404)
At 31 December 2021	1,652,682	396,638	2,049,320

When adopting total applied return with effect from 1 January 2015, in the absence of reliable records of the original donations, the Trustees considered that the market values of the investments as recorded as at 1 January 2015 were appropriate to be considered as the initial value of the trust for investment. Since that figure sets the baseline below which disposals may not be made, taking a higher value than the actual original donations was considered to be prudent.

The Trustees have resolved that they wish to maintain the real value of the permanent endowment using the retail price index as a measure. Transfers to the restricted funds of £nil were made in the year (2021 – £281,404).

13 Debtors

	2022 £	2021 £
Trade debtors	**8,492**	25,987
Prepayments and accrued income	**1,107,943**	1,061,782
Other debtors	**25,057**	25,085
	1,141,492	1,112,854

14 Creditors

a) Amounts falling due within one year

	2022 £	2021 £
Trade creditors	**26,128**	116,601
Accruals	**234,353**	156,938
Grants payable	**71,503**	218,286
Tax and social security	**208,691**	200,918
Deferred income	**1,038,917**	1,039,016
Other creditors	**63,754**	62,197
	1,643,346	1,793,956

b) Amounts falling due after more than one year

	2022 £	2021 £
Grants payable	**71,503**	119,163

c) Deferred income

	2022 £	2021 £
Balance as at 1 January 2022	**1,039,016**	1,054,806
Released to income	**(1,039,016)**	(1,054,806)
Income received from Fellows in advance	**56,540**	60,920
Publications income received in advance	**950,000**	950,000
Other income received in advance	**32,377**	28,096
Balance as at 31 December 2022	**1,038,917**	1,039,016

15 Endowment funds

	1 January 2022 £	Income £	Investment losses £	Transfers £	31 December 2022 £
Research and Grants funds:					
. Sir Norman Lockyer fund	**1,585,356**	**51,937**	**(148,496)**	**—**	**1,488,797**
. Other funds	**158,988**	**5,208**	**(14,892)**	**—**	**149,304**
	1,744,344	**57,145**	**(163,388)**	**—**	**1,638,101**
Benevolent fund	**99,789**	**3,269**	**(9,347)**	**—**	**93,711**
Library fund	**47,399**	**1,553**	**(4,440)**	**—**	**44,512**
Lectures & Awards fund	**157,788**	**5,169**	**(14,780)**	**—**	**148,177**
	2,049,320	**67,136**	**(191,955)**	**—**	**1,924,501**

	1 January 2021 £	Income £	Investment gains £	Transfers £	31 December 2021 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,474,749	42,631	285,670	(217,694)	1,585,356
. Other funds	147,896	4,276	28,648	(21,832)	158,988
	1,622,645	46,907	314,318	(239,526)	1,744,344
Benevolent fund	92,827	2,683	17,981	(13,702)	99,789
Library fund	44,092	1,275	8,541	(6,509)	47,399
Lectures & Awards fund	146,780	4,243	28,432	(21,667)	157,788
	1,906,344	55,108	369,272	(281,404)	2,049,320

16 Restricted income funds

	1 January 2022 £	Income £	Expenditure £	Investment losses £	Transfers £	31 December 2022 £
Research & Grants fund	**788,269**	**8,468**	**70**	**(14,970)**	**—**	**781,837**
Benevolent fund	**42,527**	**—**	**(712)**	**—**	**—**	**41,815**
Library fund	**50,178**	**894**	**—**	**(2,555)**	**—**	**48,517**
Education fund	**137,142**	**4,493**	**(1,000)**	**(12,846)**	**—**	**127,789**
Lectures & Awards fund	**60,472**	**—**	**(2,138)**	**—**	**—**	**58,334**
	1,078,588	**13,855**	**(3,780)**	**(30,371)**	**—**	**1,058,292**

	1 January 2021 £	Income £	Expenditure £	Investment gains £	Transfers £	31 December 2021 £
Research & Grants fund	521,871	3,815	(2,503)	25,560	239,526	788,269
Benevolent fund	29,492	130	(797)	—	13,702	42,527
Library fund	38,703	645	—	4,321	6,509	50,178
Education fund	112,989	3,266	(1,000)	21,887	—	137,142
Lectures & Awards fund	40,943	—	(2,138)	—	21,667	60,472
	743,998	7,856	(6,438)	51,768	281,404	1,078,588

16 Restricted income funds *(continued)*

The Restricted Funds are consolidated into five groups to serve the Council's priorities and address modern needs: Research & Grants, Benevolent, Library, Education and Lectures & Awards.

A detailed fund summary can be found on the RAS website.
The restricted funds were classified to either Restricted (R), Endowment (E), Designated (D), or General (G) funds as indicated below:

Research & Grants fund

E AG Stillhamer Trust Fund (1937)
D EW Brown Trust Fund (1939)
E Plummer Bequest (1946)
G General
R Victor Nadarov Fund (1950)
E Sir Norman Lockyer Memorial Trust (1990)
R Hosie Bequest (2000)
D Mrs. J.M Jelley-Freeman Bequest (2000)
D CAG Bearpark Trust (2000)
R Patricia Tomkins Fund (2011)
G Special Purposes Fund
E E A Milne Travel Fund (2013)
R R Potter Research Fund (2017)
R Osmaston Fund (2020)

Benevolent fund

E Lee & Jansen Trust Fund (1834/1879)
E Gerald Merton Fund (1986)
G Donald R. Barber Fund (2001)

Library fund

E Turnor Fund and Horrocks Memorial Fund (1853/1876)
E Harry Watson Memorial Fund (1923)
E Warin Bushell Fund (1964)
E Gaythorp Bequest (1969)
E Ian Ridpath Conservation Fund (2006)
R Dewhurst Fund (2013)

Education fund

R Newbigen Fund (1990)
R Michael Penston Memorial Fund (1991)
R Sir William Hunter McCrea Memorial Fund (2000)
R Paul Ruffle Memorial Fund (2014)
D Education Committee

Lectures & Awards fund

E Hannah Jackson-Gwilt Trust Fund (1861/1893)
E George Darwin Lectureship Fund (1926)
E George Darwin Support Fund
D AS Eddington Commemoration Fund (1948)
E Harold Jeffreys Lectureship Fund (1962)
E AT Price Medal Fund (1999)
E Gerald Whitrow Memorial Lecture Fund (2001)
E Fowler Prizes Fund (2004)

17 Designated funds

	1 January 2022 £	New designation £	Utilised/ released £	31 December 2022 £
Accommodation fund	**1,000,000**	**500,000**	**—**	**1,500,000**
Burlington House fund	**552,836**	**—**	**(94,013)**	**458,823**
Heritage Asset fund	**9,470,879**	**—**	**—**	**9,470,879**
Building fund	**1,311,622**	**—**	**94,013**	**1,405,635**
Open Access fund	**392,596**	**—**	**—**	**392,596**
RAS 200	**142,433**	**—**	**(86,930)**	**55,503**
Research & Grants fund	**122,661**	**—**	**(20,209)**	**102,452**
Total designated funds	**12,993,027**	**500,000**	**(107,139)**	**13,385,888**

17 Designated funds *(continued)*

	1 January 2021 £	New designation £	Utilised/ released £	31 December 2021 £
Accommodation fund	1,000,000	—	—	1,000,000
Burlington House fund	646,800	—	(93,964)	552,836
Heritage Asset fund	9,470,879	—	—	9,470,879
Building fund	1,217,658	—	93,964	1,311,622
Open Access fund	392,596	—	—	392,596
RAS 200	161,718	—	(19,285)	142,433
RAS 2020	15,000	—	(15,000)	—
Research & Grants fund	122,848	75,000	(75,187)	122,661
Total designated funds	13,027,499	75,000	(109,472)	12,993,027

(i) Accommodation fund
This fund represents the requirement to finance a possible relocation due to the ongoing negotiations concerning the lease at Burlington House.

(ii) Burlington House fund
Under lease agreements signed in 2005 with the Department of Communities and Local Government (previously Office of the Deputy Prime Minister - ODPM), the Society and four others in the Burlington House courtyard secured future occupancy on the basis of paying rent and additionally, being responsible for the external fabric of the building, following a renovation programme, carried out by the ODPM in mid-2006. In 2006-7, the Society executed a refurbishment project on the interior of the apartments. Expenditure incurred on the project has been capitalised and designated as the Burlington House fund.

(iii) Heritage Asset fund
A fund has been established to include the Society's heritage assets to recognise that there is no intention to dispose of these assets and the amount is not readily available to meet expenditure.

(iv) Building fund
The repairs and maintenance of the exterior of the building, its insurance and some security costs are carried out by the landlord for all the occupants and a proportion recharged to the Society. The Building Fund should provide for internal and external maintenance of the building and provide for the possibility, at the end of lease, if necessary, to obtain a building for the Society's use. The Finance Committee will recommend how much more to accumulate in this fund and at what rate. The timescale for expenditure is difficult to forecast but in principle could start within five years.

(v) Open Access fund
A fund has been established to provide against the risk of the possible collapse of the current business model for learned publishing due to various forms of open access. The timescale for expenditure is difficult to forecast but could in principle start within five years.

(vi) RAS 200
The original fund balance of £1,000,000 was the total committed grant expenditure for RAS 200. RAS 200 grant expenditure is being charged to this fund from 2015 to 2023.

(vii) RAS 2020
This represented the estimated expenditure associated with the RAS bicentenary celebrations, associated events and activities.

(viii) Research and Grants fund
This represents those funds to be used for research and grants.

18 Analysis of net assets between funds

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2022 Total funds £
Tangible assets:					
. Heritage assets	—	**9,470,879**	—	—	**9,470,879**
. Other fixed assets	**80,249**	**489,918**	—	—	**570,167**
Investments	**4,320,008**	**1,852,982**	**1,058,292**	**1,924,501**	**9,155,783**
Current assets:					
. Debtors	**1,141,492**	—	—	—	**1,141,492**
. Cash at bank and in hand	**3,098,990**	**1,752,189**	**2,430**	—	**4,853,609**
Current liabilities	**(1,532,339)**	**(108,577)**	**(2,430)**	—	**(1,643,346)**
Non-current liabilities	—	**(71,503)**	—	—	**(71,503)**
Total net assets	**7,108,400**	**13,385,888**	**1,058,292**	**1,924,501**	**23,477,081**

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2021 Total funds £
Tangible assets:					
. Heritage assets	—	9,470,879	—	—	9,470,879
. Other fixed assets	103,489	552,836	—	—	656,325
Investments	5,095,056	1,650,001	1,078,588	2,049,320	9,872,965
Current assets:					
. Debtors	1,112,854	—	—	—	1,112,854
. Cash at bank and in hand	2,860,801	1,567,866	17,902	—	4,446,569
Current liabilities	(1,646,662)	(129,392)	(17,902)	—	(1,793,956)
Non-current liabilities	—	(119,163)	—	—	(119,163)
Total net assets	7,525,538	12,993,027	1,078,588	2,049,320	23,646,473

19 Leasing commitments

At 31 December 2022, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

Office equipment	**2022 £**	2021 £
Amounts payable within one year	**7,134**	6,496
Amounts payable between two and five years	**5,105**	11,601
	12,239	18,097

20 Pension schemes

A qualified actuary carried out a triennial review of the defined benefit scheme as at 1 January 2022; the actuarial valuation showed that the market value of the Scheme's assets was £1,009,000 which represents 124% of the benefits that accrued to members after allowing for expected future increases in earnings. The actuary has calculated that no contributions are payable from 1 January 2016.

Pension costs comprise £82,315 (2021 – £79,918) in respect of the defined contribution scheme and £6,924 (2021 – £4,531) in respect of Death in Service contributions.

20 Pension schemes *(continued)*

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS 102 purposes, at 31 December 2022, shows a pension surplus of £507,000 (2021 – £472,000) which cannot be recognised as this is not available to the Society by way of reduced future contributions.

The amounts recognised in the balance sheet are as follows:

	2022 £'000	2021 £'000
Present value of funded obligations	**(259)**	(537)
Fair value of scheme assets	**766**	1,009
Surplus not recognised	**(507)**	(472)
Surplus in scheme at end of the year and available to the Society	**—**	—

Changes in the present value of the defined benefit obligations are as follows:

	2022 £'000	2021 £'000
Opening defined benefit obligation	**537**	548
Interest cost	**11**	8
Re-measurement arising from changes in assumptions and experience	**(198)**	(19)
Benefits paid	**(91)**	—
Closing defined benefit obligation	**259**	537

Changes in fair value of scheme assets are as follows:

	2022 £'000	2021 £'000
Opening scheme assets	**1,009**	916
Interest Income	**21**	14
Actual return on plan assets, excluding interest income	**(173)**	79
Benefits paid	**(91)**	—
Closing scheme assets	**766**	1,009

The amounts recognised in other recognised gains and losses are as follows:

	2022 £'000	2021 £'000
Remeasurement of defined benefit obligation	**(198)**	(19)
Return on plan assets	**173**	(79)
Effect of surplus restriction	**25**	98
Total	**—**	—

The actual return on scheme assets was negative £152,000 (2021 – positive £93,000).

20 Pension schemes *(continued)*

Retirement benefits disclosure under FRS102 (continued)

The major categories of scheme assets as a percentage of total scheme assets are as follows:

	Fair value of scheme assets	
	2022 %	2021 %
Equities	**21**	25
Bonds	**9**	12
Property	**5**	6
Cash	**10**	8
Gilts	**55**	49
	100	100

Principal actuarial assumptions at the balance sheet date (expressed as a weighted average):

	2022 %	2021 %
Discount rate at 31 December	**4.9**	2.1
Retail Prices Index	**3.1**	3.5
Consumer Prices Index	**2.5**	2.8
Increases in deferment	**2.5**	2.5
Future pension increases – pension earned before 6 April 1997	**0.0**	0.0
Future pension increases – pension earned on or after 6 April 1997	**3.1**	3.5

The current mortality rate assumptions include sufficient allowance for future improvements in mortality rates. The assumed life expectancy for a pensioner retiring at 65 on the balance sheet date is:

	2022	2021
Retiring now		
Male	**20.2**	20.2
Female	**22.2**	22.5
Retiring in 20 years		
Male	**21.4**	21.5
Female	**23.7**	23.9

Amounts for the current and previous four periods are as follows:

Defined benefit pension scheme:

	2022 £'000	2021 £'000	2020 £'000	2019 £'000	2018 £'000
Defined benefit obligations	**259**	537	548	488	461
Scheme assets	**766**	1,009	916	911	823
Surplus	**507**	472	368	423	362

21 Grants committed

Grants, principally fellowships and travel and research grants to the value of £281,500 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2021 – £347,981). These grants were not approved or communicated to the recipients until after the year end and therefore have not been accounted for in the year ended 31 December 2022.

22 Connected Charities and related party transactions

Since 2001, the Society has been the administration agent for the Trustees of FA Paneth Meteorite Collection, a charity connected to the Royal Astronomical Society. The Paneth Trustees decided that its income should support research in Cosmochemistry by graduate and postdoctoral students. The accumulated net expenditure of £50,789 (2021 – £46,772), is included in Other Creditors. Grants awarded in 2022 totalled £5,920 (2021 - £nil). Total income was £10,365 (2021 - £10,261).

The Society also administers the Sir Norman Lockyer Memorial Trust, (charity registration number 900135). By agreement with the Charity Commission the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836-1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2016, 2019, 2022 etc. for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. During the year The Norman Lockyer Fellowship funded no fellowships. Expenditure for the year amounted to £nil, (2021 - £1,003). The fund balance, including the unspent balance in the restricted fund is £2,059,388 (2021 – £2,155,949)

Transactions involving Trustees are also disclosed in note 10.

A £3,000 donation was received from the Patricia Tomkins Foundation. Patricia Tomkins is a Trustee.



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ROYAL ASTRONOMICAL SOCIETY

England & Wales - Charity number 226545

Accounts





Annual Report & Financial Statements 2021



Royal Astronomical Society

Royal Astronomical Society

Patron

Her Majesty The Queen

Trustees

Council Members who served during 2021

Prof. Emma Bunce (President, G, University of Leicester)

Prof. Mike Edmunds (President Elect, A, from May 2021, University of Cardiff)

Prof. Mahesh Anand (Vice-President, G, until May 2021, Open University)

Dr Megan Argo (Vice-President, A, University of Central Lancashire)

Dr Mandy Bailey (Secretary, A, until May 2021, Senior Secretary, A, from May 2021, Open University)

Dr Jo Barstow (Councillor, A, from May 2021, A, Open University)

Dr Nigel M Berman (Treasurer, A)

Prof. William Chaplin (Councillor, G, until May 2021, University of Birmingham)

Prof. Phil Charles (Councillor, A, University of Southampton)

Dr Hannah Dalgleish (Councillor, A, University of Oxford/University of Namibia)

Dr Paul Daniels (Vice-President, A, until May 2021)

Prof. Lyndsay Fletcher (Senior Secretary, G, until May 2021, University of Glasgow)

Dr Claire Foullon (Councillor, G, until May 2021, University of Exeter)

Prof. Lorraine Hanlon (Councillor, A, until May 2021, University College Dublin)

Kevin Kilburn (Councillor, A, until May 2021)

Prof. Mark Lester (Secretary, G, University of Leicester)

Martin Lunn (Councillor, A)

Dr Jane MacArthur (Councillor, G, University of Manchester)

Dr Matthew Middleton (Councillor, A, University of Southampton)

Prof. Steven Miller (Vice-President, G, University College London)

Dr Arvind Parmar (Councillor, A, European Space Agency)

Prof Nick Rawlinson (Vice-President, G, from May 2021 University of Cambridge)

Prof Ian Robson (Vice-President, A, from May 2021, University of Edinburgh, STFC)

Dr Jasmine Kaur Sandhu (Councillor, G, from May 2021, University of Northumbria)

Prof Caroline Smith (Councillor, G, from May 2021, Natural History Museum)

Dr Colin Snodgrass (Councillor, G, University of Edinburgh)

Dr Sheona Urquhart (Councillor, A, until May 2021, then Secretary, A, Open University)

Prof Belinda Wilkes (Councillor, A, from May 2021, Univ of Bristol, Smithsonian Astrophysical Observatory)

- Note: 'A' signifies all areas of astronomy and astrophysics; 'G' covers geophysics, solar-terrestrial physics and planetary sciences.

Senior staff

Executive Director: Philip Diamond

Deputy Executive Director: Dr Robert Massey

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Part of the RAS timeline installation in Burlington House, initiated to celebrate the Society's bicentenary. (RAS/L. Offer)

From Our President

It is a pleasure to introduce the Annual Report of the Royal Astronomical Society for 2021, another exceptional year in which our activities have been substantially limited by Covid–19 precautions. In later parts of the year, we were able to open up our offices at Burlington House in a limited way, as a step towards the fuller range of in-person activities that we are now beginning to re-establish during 2022. Our new mode of operation, however, is expected to encompass digital insights gained in the last couple of years, and we will endeavour to include a hybrid approach to meetings and other activities wherever possible.

Indeed, during 2021 the Society worked largely in the virtual world. Our meetings and public lectures continued to be well-attended, as was the first online National Astronomy Meeting. Our Education and Outreach team have supported home schooling and shared events that gave young people a taste of the excitement of research in our sciences. Sharing the relevance of our research and expertise and enthusing the next generation of astronomers and geophysicists remains central to our vision of the RAS. We have continued to reach broad and diverse audiences despite the restrictions related to Covid.

As we moved into 2022, we had the pleasure of awarding the first Caroline Herschel Medal to Prof. Dr Eva Grebel of Heidelberg University, recognising her as an inspirational and broad-ranging researcher, a leader and a mentor. We join our German colleagues of the Astronomische Gesellschaft in awarding this medal, a government-led initiative to celebrate the long-standing scientific links between our countries.

Our first new journal in 100 years, *RAS Techniques and Instruments,* got off to a flying start, with an experienced editorial board and excellent early submissions. I am pleased that we can meet the need for publications in these important and rapidly expanding fields. The Early Career Network goes from strength to strength, organising meetings specific to the needs of early-career postdoctoral scientists and students undertaking postgraduate research. It has been a particularly challenging time for these groups. The ECN have run a survey that revealed the disproportionate impact of the pandemic on those at the start of a research career.

The RAS also surveyed our wider community about their experiences of bullying and harassment at work and shared the results at the NAM. They told us that there is a problem in our sciences and that people from under-represented groups bear the brunt of it. As a Society I hope that we can lead the way in finding ways to address this unsatisfactory situation in our communities, and that we can encourage others to consider how to eradicate unacceptable behaviour, and to make the work environment and culture more positive and welcoming for everyone.

Towards the end of 2021, we launched our Timeline as a celebration of our bicentenary. This overview of our development into a modern Learned Society is already proving an engaging resource online. We now have a striking installation in Burlington House as a reminder of our heritage, and we hope that you will be able to see it *in situ* as we welcome you all back to Burlington House more frequently.

We are holding our AGM as a hybrid meeting for the first time and we plan to use the same combined approach for other meetings. We hope that by doing so we will keep the benefits of greater accessibility and larger audiences, while adding the indefinable buzz of live meetings. I have been impressed with the work of the whole RAS community – Council, our committees, RAS staff and Fellows – during 2021 and I am confident that we will continue to innovate and grow.

We are now developing a new strategy to define our mission as a Society, our vision for the future, and the values which we work to as we strive to achieve our goals and shape our future work. There is a lot more to be done (including consultation with our members), but by assessing what we do, why and how we do it, we will move forward over the next few years with a clear view of our priorities. My successor Prof. Mike Edmunds will be leading this activity as I come to end of my term of office. We look forward to working effectively with our community to realise this collective vision for *our* Society.

Prof. Emma Bunce, President 2020-22

Objectives

The RAS exists to advance, and to record the history of, our understanding of the Earth, the solar system, the stars and galaxies, and the nature of the universe. It does this by promoting astronomy and geophysics, interdisciplinary sciences that encompass and further our understanding of physics, chemistry, mathematics, biology, engineering and computer science to answer deep questions about the origin and fate of the cosmos, and people's place in it. Through this the Society contributes to the growth and dissemination of knowledge and thereby fulfils its charitable objective of serving the public interest.

The Society refers to the Charity Commission's general guidance on Public Benefit when reviewing its aims and objectives and in planning future activities. These disclosures comply with the Charities Act 2011.

Our objectives for 2021 fell within two broad areas: advancing understanding and sharing knowledge; the organisation of the Society supports these goals.

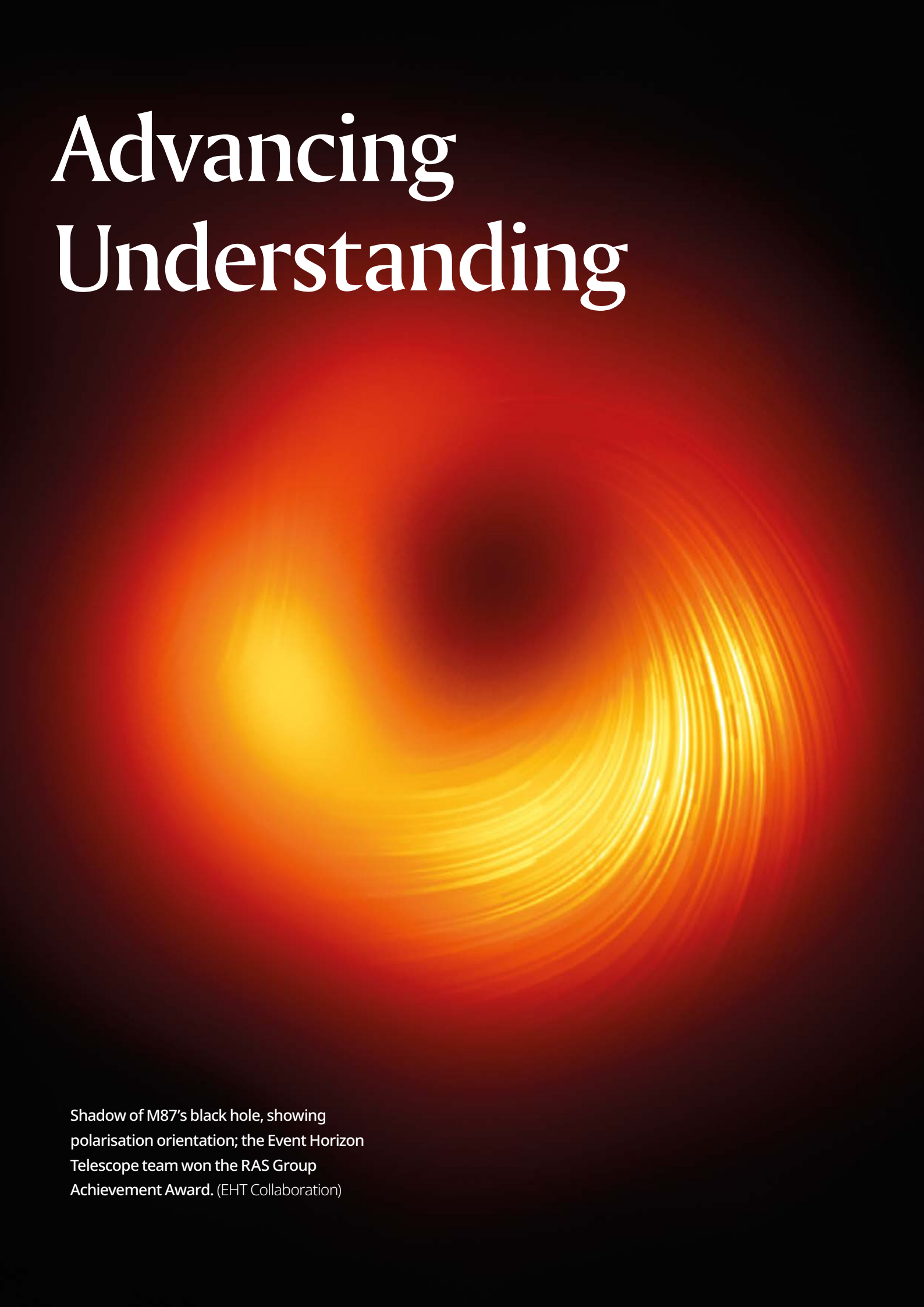
The Society's principal objectives are to:

- Publish high-quality peer-reviewed journals
- Support students and early-career scientists through research fellowships and grants
- Recognise achievement through its medals and prizes
- Maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures
- Sustain our Library and Archive service
- Continue our political engagement
- Maintain our programme of education and outreach activity, including Friends of the RAS
- Promote the work of the Society and Fellows in the media and on social media
- Build our outreach work with other Courtyard Societies.

In 2021, the Society planned, in addition, to:

- Update our demographic survey
- Work towards reducing our carbon footprint
- Make our programme of awards and prizes more open and inclusive
- Build on our experience of online events to give our physical meetings, when they are possible, a greater reach
- Digitise the observation notebooks and working papers of Caroline Herschel
- Continue to seek a sustainable future for the Society in Burlington House.

Advancing Understanding



Shadow of M87's black hole, showing polarisation orientation; the Event Horizon Telescope team won the RAS Group Achievement Award. (EHT Collaboration)

The RAS is committed to advancing understanding of our sciences by:

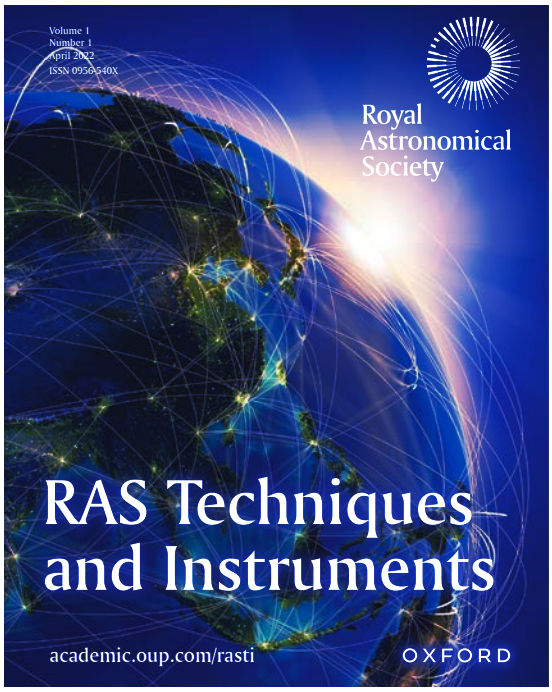
- Publishing journals
- Supporting scientists financially with fellowships and grants
- Organising scientific meetings
- Recognising excellence through awards
- Running a Library and Archive for research
- Producing a magazine for our members
- Advocating for the community with government
- Promoting diversity in our community
- Supporting early-career researchers

Journals

In 2021 the Society launched its first new journal in almost 100 years. *RAS Techniques and Instruments*, known as *RASTI*, is a broad-scope journal covering data science, software, and instrumentation, for both astrophysics and geophysics. It provides a high-quality, specialist home for papers that would otherwise be sent to more general astronomy or geophysics journals, or to specialist journals that do not directly serve these disciplines. The Editor-in-Chief is Prof. Jonathan Tennyson, a distinguished scientist working in the field of optical spectroscopy and theoretical molecular physics. *RASTI* bridges the gap between the Society's other two academic peer-reviewed journals – *Monthly Notices of the Royal Astronomical Society* (*MNRAS*) and *Geophysical Journal International* (*GJI*) – which are world-renowned, and it will follow the same high publication standards of these journals.

MNRAS publishes the results of original research in astronomy and astrophysics, including work which is observational, theoretical or concerned with astronomical instrumentation and software. *GJI* publishes articles on all aspects of theoretical, computational, applied and observational geophysics. *MNRAS* and *RASTI* are available online-only, *GJI* is available both online and in print, and all journals receive submissions from authors worldwide. The peer review process is overseen by an editorial team of 8 assistant editors and the publishing manager. Profiles of all of our scientific editors and editorial team can be found on our website at ras.ac.uk/journals/Editorial-Boards-and-Team

Our subscription business model, for *GJI* and *MNRAS*, means that it is free for authors to publish in these journals unless papers exceed 20 pages in length, in which case there is an excess page charge of £50 per page over the limit. Both *GJI* and *MNRAS* are "hybrid" journals: authors can opt to pay for open access if they wish to make their paper freely available to everyone. In the past, few authors opted to pay for open access because our self-archiving policy allows them to upload their papers to institutional or subject repositories and free public servers. Some content, such as Zooniverse (citizen science project) papers, special issues and *GJI* express letters, are freely available online. In 2021 we saw an increase in the number of open access papers in *GJI* and *MNRAS*, arising from new Read and Publish deals, through which open access



charges are encompassed within the subscription fee that an institution pays to the publisher. The new journal, *RASTI*, operates under the gold open access model where all articles will be free for all to read and re-use under a CC-BY licence.

The impact factor of a journal reflects the frequency with which articles are cited in the scientific literature. In 2021 MNRAS achieved a two-year Impact Factor of 5.287 and there were 4,022,254 article downloads. 4842 articles were submitted and 3920 were published. There are 26 scientific editors and Prof. David Flower continued as Editor-in-Chief. GJI received an Impact Factor of 2.934, published 516 papers, received 1127 submissions and there were 1,811,680 article downloads. Prof. Joerg Renner remained as Editor-in-Chief and there are currently 34 editors.

The annual *MNRAS* editorial board meeting was held in March and the *GJI* board meeting was held in November, both via Zoom. The new *RASTI* editorial board (currently 11 editors) met for the first time, also via Zoom, in September. Annual reports are prepared for these meetings to look at performance and agree plans for the next year. The Publications Management Committee met in April as usual. RAS Members have free online access to the journals. *MNRAS*, *GJI* and *RASTI* are published by Oxford University Press (OUP) who has been our publishing partner since 1 January 2013.

We continue to support early-career researchers in communicating their research effectively by running workshops at conferences, and engage with and support our community through our Journals' Twitter account (@RAS_Journals) which has a growing following. There were three winners of the *GJI* prize for the best student papers in 2021 – Kyle Gwirtz, Simon Lloyd and Bram Vaes - who each received a cash prize and certificate.

Chasing comets – and opportunity



Cyrielle Opitom,
Norman Lockyer Fellow 2021

'I spent most of the first half of 2021 working on observations of the newly discovered and first known active interstellar object, 2I/Borisov. Interstellar objects were not part of my original project, but they provide a unique possibility to study objects formed in very different conditions and see how formation conditions influence the composition of comets. I seized this opportunity to expand the scope of the project. I was part of a team of researchers that observed 2I/Borisov using the 8m VLT in Chile and I led the analysis of the high-resolution observations of the object. This study showed that, despite being formed in a different planetary system, the composition of 2I was surprisingly similar to that of solar system comets.

'The Norman Lockyer Fellowship allowed me to place myself as a leader in the study of interstellar objects, a key step to further our understanding of the link between the composition of planetesimals and their place of formation, and the formation of planetary systems. It also allowed me to take more responsibilities in major future instrumentation projects that will revolutionize our understanding of the evolution of the solar system.'

Research fellowships and grants

In 2021, 57 grants, fellowships and awards totalling £105,878 were made to institutions and 39 grants, fellowships and awards totalling £18,801 were made to individuals.

Expenditure supporting the Norman Lockyer Fellowship totalled £4,505 before adjustments, and one research fellowship ended during its first year contributing to credits to expenditure of £8,778. Adjustments to other grants, RAS200 and the Norman Lockyer Fellowship resulted in credits to expenditure totalling £13,364..

The Society supported one RAS Research Fellowship and the RAS Norman Lockyer Fellowship during 2021:

THE RAS AWARDED **21 BURSARIES** FOR UNDER-GRADUATE RESEARCH PROJECTS.

RAS Fellowship:

Dr Matt Nicholl (University of Birmingham): Superluminous supernovae: a comprehensive observational and theoretical study of Nature's brightest fireworks

RAS Norman Lockyer Fellowship:

Dr Cyrielle Opitom (Royal Observatory Edinburgh): Cometary ices and the role of coma evolution: understanding the impact of coma evolution on comet taxonomies

Scientific meetings

All RAS meetings during 2021 were held online, as a result of Covid-19 precautions.

The usual 16 Specialist Discussion



Artist's impression of the distant quasar P172+18 and its radio jets in the young universe (about 780 million years old) which featured in a Specialist Discussion Meeting. (ESO/M. Kornmesser)

Meetings took place, together with seven Ordinary Meetings and the Annual General Meeting. Audience numbers continued to be high. The postponed 2020 National Astronomy Meeting (NAM) also took place online.

Specialist Discussion Meetings

Space weather energy pathways and implications for impacts

Exoplanet modelling in the James Webb era

Comparative equatorial **thermosphere-ionosphere-magnetosphere coupling**

Quasars and galaxies on the edge of cosmic reionisation: preparing to interpret data from the new generation of facilities

Novel astrophysical probes of dark matter

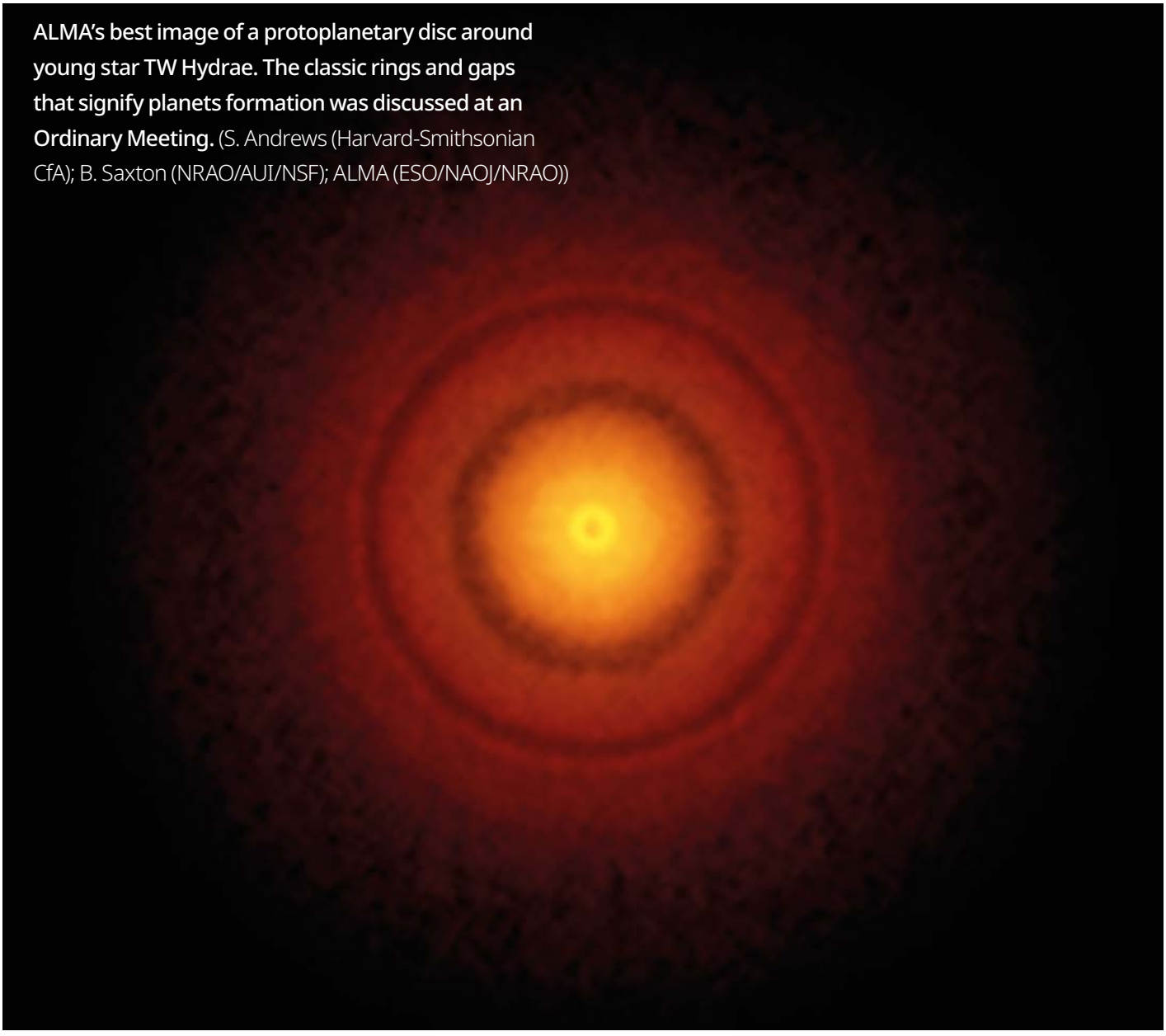
Space weather and the solid Earth: the hazard to technology at the Earth's surface

Is **the study of the CGM** fulfilling its promise of revealing the processes that drive galaxy evolution?

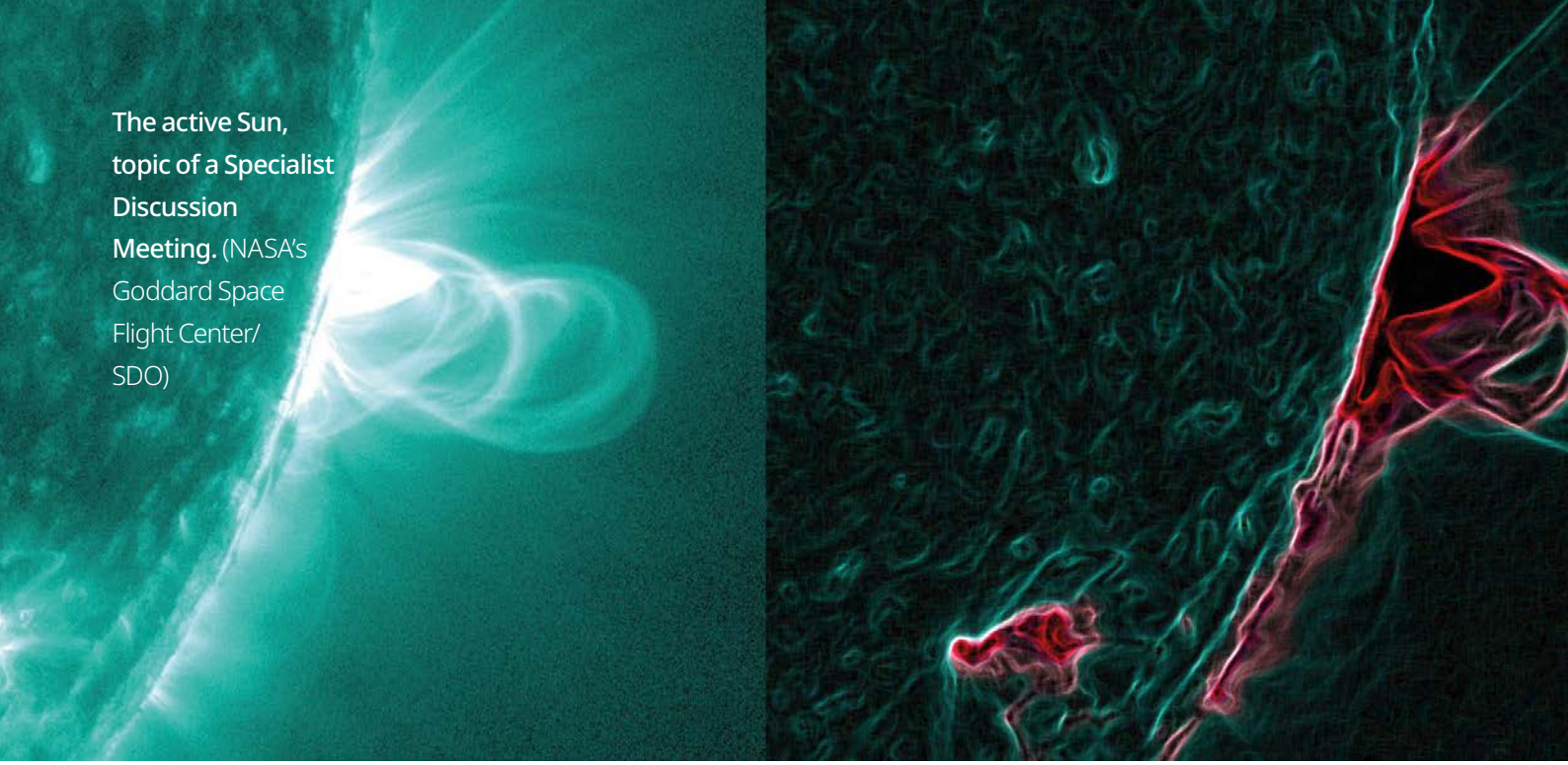
System-scale observations and modelling of solar wind-magnetosphere-ionosphere-thermosphere coupling

MHD oscillations and waves from the photosphere to the corona

204 FELLOWS ATTENDED THE VIRTUAL AGM IN 2021



ALMA's best image of a protoplanetary disc around young star TW Hydrae. The classic rings and gaps that signify planets formation was discussed at an Ordinary Meeting. (S. Andrews (Harvard-Smithsonian CfA); B. Saxton (NRAO/AUI/NSF); ALMA (ESO/NAOJ/NRAO))



The active Sun, topic of a Specialist Discussion Meeting. (NASA's Goddard Space Flight Center/ SDO)

Machine Learning and Artificial Intelligence applied to astronomy 2
Galactic magnetic fields: connecting theory, simulations, and observations
Numerical modelling of **planetary magnetospheres**
UKSEDI – Collaborative study of **Earth's core-mantle boundary** region
The stubborn inconstancy of constants. A meeting in memory of John D Barrow, FRS.
3D structure of **the flare chromosphere**
First results from the **Hydrogen Epoch of Reionization Array**

Ordinary Meetings

The following spoke at Ordinary Meetings in 2021:

Prof. Sarah Matthews (University College London) James Dungey Lecture 2020 'Solar Flares: how are they triggered and where does the energy go?'
Prof. Mansi Kasliwal (Caltech) The 2021 Eddington Lecture 'Our Dynamic Infrared Sky'
Prof. Andrew Pontzen (UCL) The Gerald Whitrow Lecture 'Dwarf galaxies in cosmology'
Dr Tom Collett (University of Portsmouth) RAS Winton 'A' prize 'Measuring the curvature of space time'

1572 PEOPLE ATTENDED SPECIALIST DISCUSSION MEETINGS IN 2021

Heidi Thiemann (Open University) RAS ECN poster prize-winner 'Red novae candidates: An investigation of long-period near-contact giant binaries'
Nuria Jordana (University of Bath) RAS ECN poster prize-winner 'What is the role of the magnetic fields in Gamma-ray bursts (GRBs) outflows? The case of GRB 190114C'
Isobel Romero-Shaw (Monash University) RAS ECN poster prize-winner 'Eccentricity in Gravitational-Wave Transients'
Soheb Mandhai (University of Leicester) RAS ECN poster prize-winner 'Extragalactic wanderers: Migration of compact binaries from their host galaxies'
Shannon Jones (University of Reading) RAS ECN poster prize-winner 'The visual complexity of coronal mass ejections'
Prof. Dr Filippo Fraternali RAS Darwin Lecture 'How galaxies gather their gas'
Dr Alexandra Amon Michael Penston Thesis prize talk 'Shedding light on the Dark Universe with weak lensing'
Dava Sobel 'The Insight of Henrietta Swan Leavitt: Adding Depth to Space'
Dr Cassandra Hall Winton (A) Award winner 'Planet formation, substructure,

and gravitational instability in protoplanetary accretion discs'

Dr Ziri Younsi (UCL) Group Award (A): The Event Horizon Telescope (EHT) team 'The First Image of a Black Hole from the Event Horizon Telescope'

National Astronomy Meeting 2021

The 2021 National Astronomy Meeting at the University of Bath, postponed from 2020, became a fully online meeting as pandemic restrictions continued. It was very successful, with more than 950 registrations and 500 presentations. Delegates came from 42 countries; 75% of them were from the UK. The programme included plenary sessions, research presentations and posters, plus themed lunchtime workshops and presentations; half the plenary speakers were women, and women made up a third of the research presenters. The community session, addressed by leaders from across our sciences, attracted an audience of 274. Delegates could also enjoy the usual array of less formal NAM activities, this year including the RAS Presidential Address, an evening of William Herschel's music, a fireside chat by a virtual fire, a pub quiz and even a sunrise tour of Stonehenge – all virtual. We thank the organisers at the University of Bath – led by Carole Mundell, Cathryn Mitchel and Patricia Schady – and the United Kingdom Research and Innovation's Science and Technology Facilities Council for their support.

2021 RAS Medals and Awards

The Society recognises outstanding achievements among early-career researchers as well as celebrating career-long excellence and service to our sciences. These are the recipients of the 2021 awards and medals:

Gold Medal in Astronomy Prof. Dame Jocelyn Bell Burnell FRS, University of Oxford

Gold Medal in Geophysics Prof. Thorne Lay, University of California Santa Cruz, USA

Herschel Medal Prof. Stephen J Smartt FRS, Queen's University Belfast

Eddington Medal Prof. Hiranya Peiris, University College London and Oskar Klein Centre for Cosmoparticle Physics, Stockholm

Chapman Medal Prof. Ineke de Moortel, University of St Andrews

Price Medal Prof. Emily Brodsky, University of California Santa Cruz, USA

Jackson-Gwilt Medal Dr Floor van Leeuwen, University of Cambridge

Annie Maunder Medal Prof. Robert Walsh, University of Central Lancashire

Patrick Moore Medal Sarah Eames, Sandfield Close Primary School, Leicester

Award for Service in Astronomy Prof. Ian Crawford, Birkbeck, Univ of London

Fowler Award (Astronomy) Dr James Owen, Imperial College, London

Fowler Award (Geophysics) Dr Richard Morton, Northumbria University

Winton Award for Astronomy Dr Cassandra Hall, University of Georgia, USA

Winton Award for Geophysics Dr Julia Stawarz, Imperial College, London

Group Award in Astronomy The Event Horizon Telescope team

Harold Jeffreys Lectureship Dr Sanne Cottaar, University of Cambridge

George Darwin Lectureship Prof. Filippo Fraternali, University of Groningen, The Netherlands

James Dungey Lecture Dr Karen Aplin, University of Bristol

Honorary Fellows

Prof. Tamaz Chelidze Nodia Institute of Geophysics, Tbilisi State University, Georgia

Prof. Walter Mooney US Geological Survey, Menlo Park, California,

1149 PEOPLE ATTENDED ORDINARY MEETINGS IN 2021

Student Prizes

The RAS also awards prizes each year for the best PhD theses in the fields of astronomy and astrophysics (the Michael Penston Prize), geophysics and planetary science (the Keith Runcorn Prize), and instrumentation (the Patricia Tomkins Prize). There is also a Patricia Tomkins Prize for undergraduate work in instrumentation. The thesis prizes awarded in 2021 recognised work completed in 2020.

Dr Jennifer Yik Ham Chan of the University of Toronto won the 2020 Michael Penston Thesis Prize for "All-sky Radiative Transfer and Characterisation for Cosmic Structures".

Dr Thomas Kettlety of the University of Oxford won the 2020 Keith Runcorn Prize for the best doctoral thesis in geophysics for "Microseismic and geomechanical investigation of injection-induced fault reactivation."

Dr Michael Grappone of the University of Liverpool won the Patricia Tomkins Prize for "Prototyping the next generation of versatile paleomagnetic laboratory".

Darcey Bower of the University of Liverpool won the Patricia Tomkins Undergraduate Prize for her project "Building a Magnetic Gradiometer as a Tool for Geophysics Outreach", part of her integrated Masters degree in geology and geophysics.

Library and Archive

Although the Library was closed to visitors early in 2021, the reading room reopened by appointment on Fridays at the end of May 2021 and nearly all slots were booked throughout the year. We received 144 research enquiries (an increase on 2020). The Librarian gave 5 virtual Library tours.

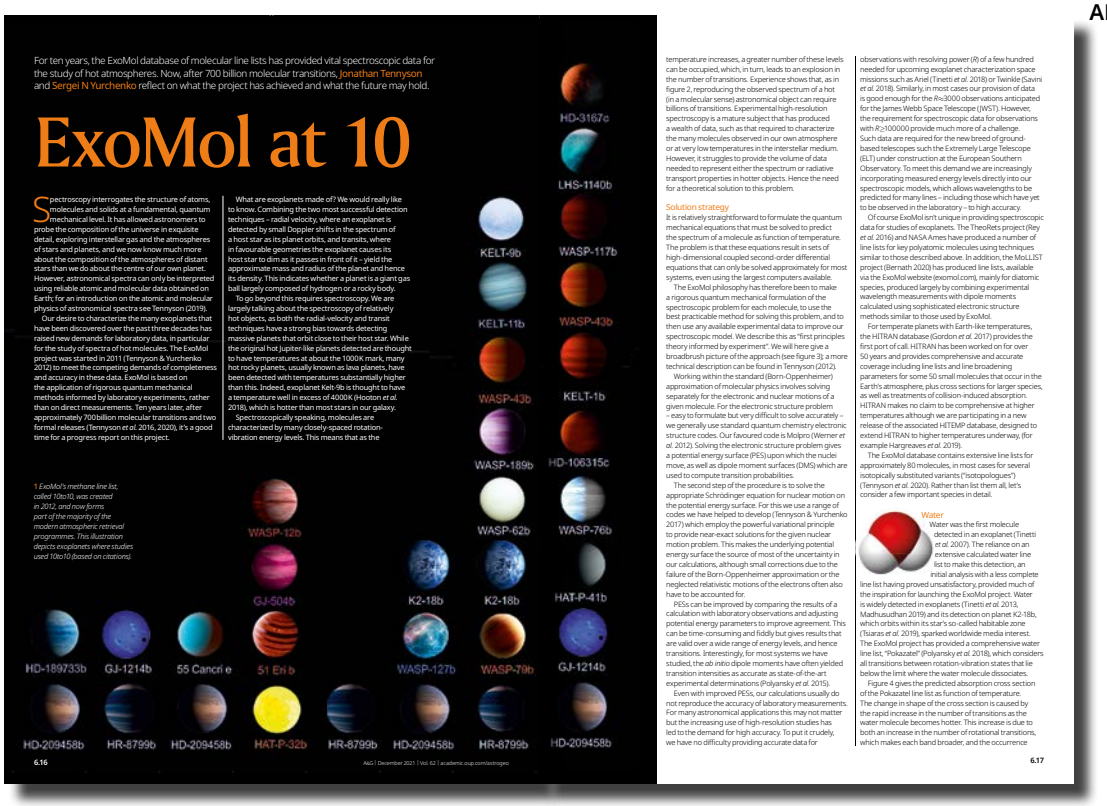
The Society hosted the 9th conference on Library and Information Services in Astronomy (LISA IX) from 14–18 June. This



event, sponsored by EDP Sciences, AAS and IET, was the first online version of a series of scientific meetings for librarians and scientists that aims to provide a platform for discussing the current state and future direction of information maintenance, retrieval, delivery, data preservation, and information literacy. From 14 to 18 June 2021, 50 speakers addressed over 200 delegates on topics as varied as research data management, open science, astronomical heritage, and the future of the profession. Social activities included a special screening of the documentary 'Star Men' followed by a Q&A with its director Alison Rose, and one of the subjects of the documentary, Professor Neville Woolf. There was also a virtual tour of the Library for the LISA IX conference delegates, with 50 attendees. The proceedings will be published in the *Bulletin of the American Astronomical Society*.

Our membership magazine

2021 marked 25 years of publishing our membership magazine in its colourful and engaging form; the first issue of *A&G*



For ten years, the ExoMol database of molecular line lists has provided vital spectroscopic data for the study of hot atmospheres. Now, after 700 billion molecular transitions, Jonathan Tennyson and Sergei N Yurchenko reflect on what the project has achieved and what the future may hold.

ExoMol at 10

Spectroscopy interrogates the structure of atoms, molecules and solids at a fundamental, quantum mechanical level. It has allowed astronomers to probe the composition of the universe in exquisite detail, exploring interstellar gas and the atmospheres of stars and planets, and we now know much more about the composition of the atmospheres of distant stars than we do about the centre of our own planet. However, astronomical spectra can only be interpreted using reliable atomic and molecular data obtained on Earth; for an introduction on the atomic and molecular physics of astronomical spectra see Tennyson (2019).

Our desire to characterize the many exoplanets that have been discovered over the past three decades has raised new demands for laboratory data, in particular for the study of spectra of hot molecules. The ExoMol project was started in 2011 (Tennyson & Yurchenko 2012) to meet the competing demands of completeness and accuracy in these data. ExoMol is based on the application of rigorous quantum mechanical methods informed by laboratory experiments, rather than on direct measurements. Ten years later, after approximately 700 billion molecular transitions and two formal releases (Tennyson *et al.* 2016, 2020), it's a good time for a progress report on this project.

What are exoplanets made of? We would really like to know. Combining the two most successful detection techniques – radial velocity, where an exoplanet is detected by small Doppler shifts in the spectrum of a host star as its planet orbits, and transits, where in favourable geometries the exoplanet causes its host star to dim as it passes in front of it – yield the approximate mass and radius of the planet and hence its density. This indicates whether a planet is a giant gas ball largely composed of hydrogen or a rocky body.

To go beyond this requires spectroscopy. We are largely talking about the spectroscopy of relatively hot objects, as both the radial-velocity and transit techniques have a strong bias towards detecting massive planets that orbit close to their host star. While the original hot Jupiter-like planets detected are thought to have temperatures at about the 1000K mark, many hot rocky planets, usually known as lava planets, have been detected with temperatures substantially higher than this. Indeed, exoplanet Kelt-9b is thought to have a temperature well in excess of 4000K (Hooton *et al.* 2018), which is hotter than most stars in our galaxy.

Spectroscopically speaking, molecules are characterized by many closely-spaced rotation-vibration energy levels. This means that as the temperature increases, a greater number of these levels can be occupied, which, in turn, leads to an explosion in the number of transitions. Experience shows that, as in figure 2, reproducing the observed spectrum of a hot (in a molecular sense) astronomical object can require billions of transitions. Experimental high-resolution spectroscopy is a mature subject that has produced a wealth of data, such as that required to characterize the many molecules observed in our own atmosphere or at very low temperatures in the interstellar medium. However, it struggles to provide the volume of data needed to represent either the spectrum or radiative transport properties in hotter objects. Hence the need for a theoretical solution to this problem.

Solution strategy

It is relatively straightforward to formulate the quantum mechanical equations that must be solved to predict the spectrum of a molecule as function of temperature. The problem is that these equations result in sets of high-dimensional coupled second-order differential equations that can only be solved approximately for most systems, even using the largest computers available.

The ExoMol philosophy has therefore been to make a rigorous quantum mechanical formulation of the spectroscopic problem for each molecule, to use the best practicable method for solving this problem, and to then use any available experimental data to improve our spectroscopic model. We describe this as "first principles theory informed by experiment". We will here give a broadbrush picture of the approach (see figure 3); a more technical description can be found in Tennyson (2012).

Working within the standard (Born-Oppenheimer) approximation of molecular physics involves solving separately for the electronic and nuclear motions of a given molecule. For the electronic structure problem – easy to formulate but very difficult to solve accurately – we generally use standard quantum chemistry electronic structure codes. Our favoured code is Molpro (Werner *et al.* 2012). Solving the electronic structure problem gives a potential energy surface (PES) upon which the nuclei move, as well as dipole moment surfaces (DMS) which are used to compute transition probabilities.

The second step of the procedure is to solve the appropriate Schrodinger equation for nuclear motion on the potential energy surface. For this we use a range of codes we have helped to develop (Tennyson & Yurchenko 2017) which employ the powerful variational principle to provide near-exact solutions for the given nuclear motion problem. This makes the underlying potential energy surface the source of most of the uncertainty in our calculations, although small corrections due to the failure of the Born-Oppenheimer approximation or the neglected relativistic motions of the electrons often also have to be accounted for.

PESs can be improved by comparing the results of a calculation with laboratory observations and adjusting potential energy parameters to improve agreement. This can be time-consuming and fiddly but gives results that are valid over a wide range of energy levels, and hence transitions. Interestingly, for most systems we have studied, the *ab initio* dipole moments have often yielded transition intensities as accurate as state-of-the-art experimental determinations (Polyansky *et al.* 2015).

Even with improved PESs, our calculations usually do not reproduce the accuracy of laboratory measurements. For many astronomical applications this may not matter but the increasing use of high-resolution studies has led to the demand for high accuracy. To put it crudely, we have no difficulty providing accurate data for observations with resolving power (R) of a few hundred needed for upcoming exoplanet characterization space missions such as Ariel (Tinetti *et al.* 2018) or Twinkle (Savini *et al.* 2018). Similarly, in most cases our provision of data is good enough for the R=3000 observations anticipated for the James Webb Space Telescope (JWST). However, the requirement for spectroscopic data for observations with R>100000 provide much more of a challenge. Such data are required for the new breed of ground-based telescopes such the Extremely Large Telescope (ELT) under construction at the European Southern Observatory. To meet this demand we are increasingly incorporating measured energy levels directly into our spectroscopic models, which allows wavelengths to be predicted for many lines – including those which have yet to be observed in the laboratory – to high accuracy.

Of course ExoMol isn't unique in providing spectroscopic data for studies of exoplanets. The TheoRets project (Rey *et al.* 2016) and NASA Ames have produced a number of line lists for key polyatomic molecules using techniques similar to those described above. In addition, the MoLLIST project (Bernath 2020) has produced line lists, available via the ExoMol website (exomol.com), mainly for diatomic species, produced largely by combining experimental wavelength measurements with dipole moments calculated using sophisticated electronic structure methods similar to those used by ExoMol.

For temperate planets with Earth-like temperatures, the HITRAN database (Gordon *et al.* 2017) provides the first port of call. HITRAN has been worked on for over 50 years and provides comprehensive and accurate coverage including line lists and line broadening parameters for some 50 small molecules that occur in the Earth's atmosphere, plus cross sections for larger species, as well as treatments of collision-induced absorption. HITRAN makes no claim to be comprehensive at higher temperatures although we are participating in a new release of the associated HITEMP database, designed to extend HITRAN to higher temperatures underway, (for example Hargreaves *et al.* 2019).

The ExoMol database contains extensive line lists for approximately 80 molecules, in most cases for several isotopically substituted variants ("isotopologues") (Tennyson *et al.* 2020). Rather than list them all, let's consider a few important species in detail.

Water

Water was the first molecule detected in an exoplanet (Tinetti *et al.* 2007). The reliance on an extensive calculated water line list to make this detection, an initial analysis with a less complete line list having proved unsatisfactory, provided much of the inspiration for launching the ExoMol project. Water is widely detected in exoplanets (Tinetti *et al.* 2013, Madhusudhan 2019) and its detection on planet K2-18b, which orbits within its star's so-called habitable zone (Tsiaras *et al.* 2019), sparked worldwide media interest. The ExoMol project has provided a comprehensive water line list, "Pokazatel" (Polyansky *et al.* 2018), which considers all transitions between rotation-vibration states that lie below the limit where the water molecule dissociates.

Figure 4 gives the predicted absorption cross section of the Pokazatel line list as function of temperature. The change in shape of the cross section is caused by the rapid increase in the number of transitions as the water molecule becomes hotter. This increase is due to both an increase in the number of rotational transitions, which makes each band broader, and the occurrence

6.17

1 *ExoMol's methane line list, called 10to10, was created in 2012, and now forms part of the majority of the modern atmospheric retrieval programmes. This illustration depicts exoplanets where studies used 10to10 (based on citations).*

HD-3167c
LHS-1140b
KELT-9b
WASP-117b
KELT-11b
WASP-43b
WASP-43b
KELT-1b
WASP-189b
HD-106315c
WASP-62b
WASP-76b
WASP-12b
GJ-504b
K2-18b
K2-18b
HAT-P-41b
HD-189733b
GJ-1214b
55 Cancri e
51 Eri b
WASP-127b
WASP-79b
GJ-1214b
HD-209458b
HR-8799b
HD-209458b
HAT-P-32b
HR-8799b
HD-209458b
HR-8799b
HD-209458b

6.16

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was published on 1 February 1997. While the interests and concerns of writers are essentially the same now as in 1997, the landscape of RAS sciences has changed as a result of significant advances in technology that have boosted data collection, storage and modelling beyond any expectations. The quality of images has increased in line with this, improving the look of the magazine and allowing authors to share their research more fully. *A&G* is available online; during 2021 243 283 articles were downloaded.

Political engagement

The Society and the Early Career Network took part in the Voice of the Future event in Parliament, asking about the future funding landscape for astronomy and geophysics, in the light of the creation of the Advanced Research and Invention Agency. This event is organised by the Royal Society of Biology, where questions are put to the science minister and their shadow, the chief scientific advisor, and members of the Commons Science and Technology Committee.

Policy work in 2021 focused on diversity in STEM, the impact of satellite constellations on astronomy, sustainability, and resilience during and after the Covid-19 pandemic. The Society responded to the following consultations and inquiries:

- All Party Parliamentary Group on Diversity and Inclusion in STEM inquiry into Equity in the STEM Workforce
- Commons Science and Technology

The RAS's membership magazine *A&G* has been published in its current format now for 25 years

243 283 *A&G* ARTICLES DOWNLOADED IN 2021



RAS policy work included the impact of satellite megaconstellations (T Hansen/IAU OAE/CC by 4.0)

Committee inquiry into UK Space Strategy and UK Satellite Infrastructure
- Commons Science and Technology Committee inquiry into Improving Diversity in STEM
- OfCom consultation on Non-geostationary satellite systems – Licensing updates

Two RAS working groups looked at the impact of satellite constellations on radio and optical astronomy respectively, with representation from observatories, research groups, STFC and the UK Space Agency. Their expertise helped the Society in discussions with the UK government, and with partner organisations including the International Astronomical Union (IAU). The working groups commissioned studies into the impact of low-Earth orbit satellites on astronomical facilities with UK involvement; group members also led a scientific session and a press briefing at the National Astronomy Meeting. At the end of the year the Society joined the new Satellite Impact Action Forum, convened by the Department of Business, Enterprise, Innovation and Skills in order to set UK policy to protect ground-based astronomy. The Society also contributed formally to the successful joint bid by the Square Kilometre Array Observatory and NOIRLab to host the IAU Centre for the Protection of the Dark Sky from Satellite Constellations.

More broadly the RAS signed Science Council letters to Chancellor of the Exchequer Rishi Sunak and Science Minister George Freeman, supporting growth in core research funding in the Spending Review, and in support of a UK and EU agreement on affiliation to the Horizon Europe framework programme.

Promoting diversity

The Society publicised the outcomes of its survey on bullying and harassment in the astronomy and geophysics community at NAM2021; more than 600 people employed in astronomy and geophysics responded. Their responses show that disabled, and Black and minority ethnic, astronomers and geophysicists experienced 40% more episodes of bullying than their non-disabled and White colleagues respectively; women and non-binary people in the field 50% more than men; half of lesbian, gay, bisexual, and queer astronomers and geophysicists had been bullied in the 12 months preceding the survey; and 12% of bisexual astronomers reported that they had been bullied at least once a week. These outcomes were covered on the BBC Radio 4 *Today* programme, and in *Nature* and *Physics World*.

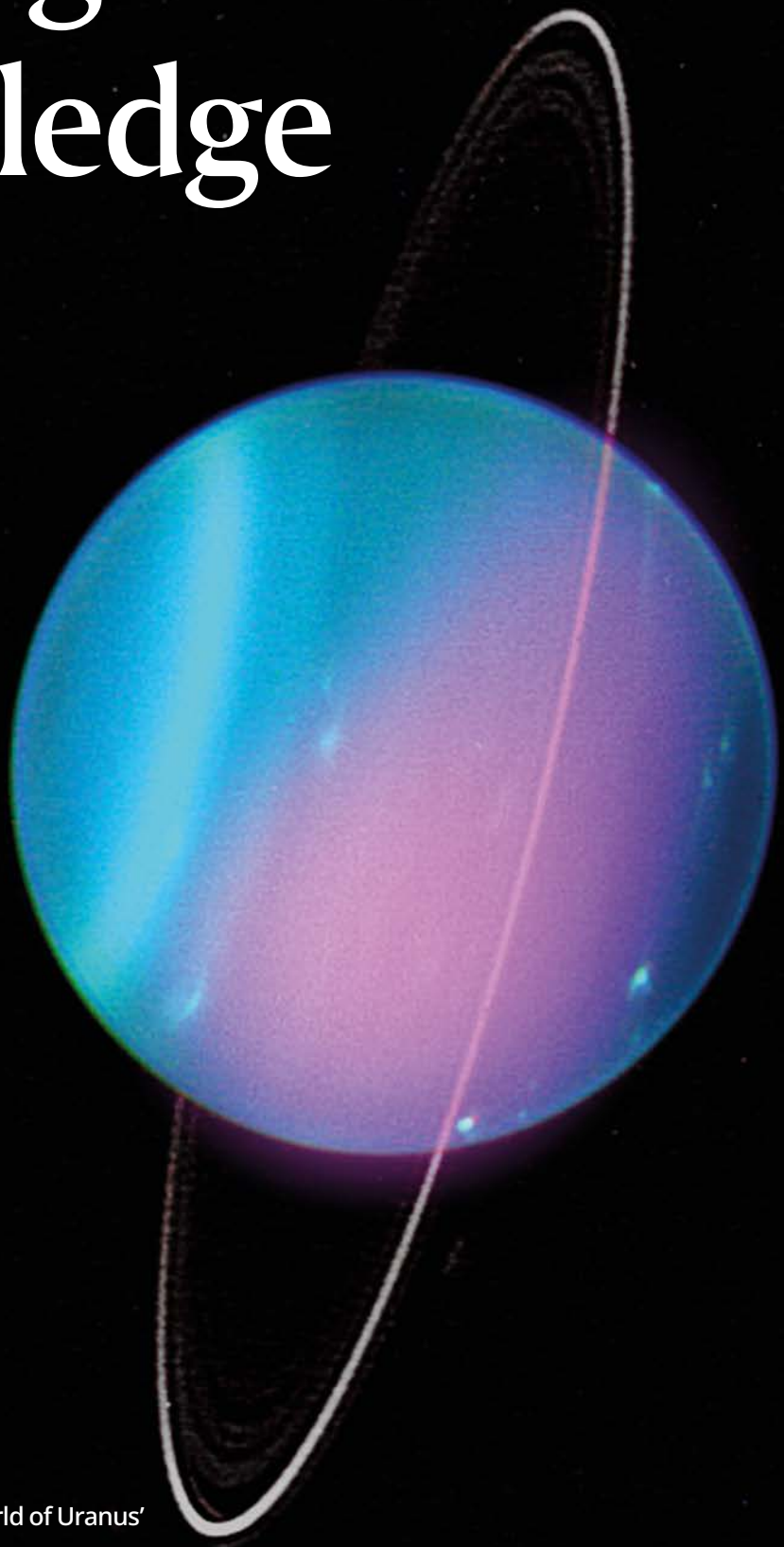
230 PEOPLE TOOK PART IN EVENTS RUN BY THE RAS EARLY CAREERS NETWORK

In August 200 Fellows attended an online webinar on Anti-Racism in Astronomy and Geophysics, the first such event to be hosted by the RAS. Three expert speakers led discussion and provided training for Fellows.

Early Career Network

The Early Career Network (ECN) has an active year, running online career events on the themes of: 'Find your first postdoctoral role', 'Industry and non-academic careers' (a workshop at NAM) and 'Making the most of your PhD'. The ECN also carried out a survey of 140 early-career researchers on the impact of Covid–19 on their research progress and the level of support they received. Initial findings were presented at NAM, including that postgraduate students had insufficient resources such as space and technology for home working; postdoctoral researchers were much less badly affected. At the start of 2021 the RAS President and ECN chair wrote to the CEO of UK Research and Innovation CEO Dame Ottoline Leyser calling for greater support for PhD students to redress this.

Sharing Knowledge



The 'Weird and Wonderful World of Uranus' proved popular with schools. (X-ray: NASA/CXO/University College London/W. Dunn et al; Optical: W.M. Keck Observatory)

The Society disseminates knowledge to students, the press and the wider public by:

- Organising education and outreach events
- Arranging a programme of Public Lectures
- Exploiting the resources of the Library and Archives
- Promoting research in the media and social media
- Supporting the Friends of the RAS
- Working with specialist partners through RAS200
- Working with the Courtyard Societies as a cultural hub

Outreach and education events

The Covid pandemic meant all outreach and education events took place online. Staff ran a virtual programme of 8 public lectures and 13 events for schools and community groups. Recordings of all our public lectures and many other events can be found on the RAS YouTube channel. The public lecture programme attracted more than 10,000 views through Zoom and YouTube

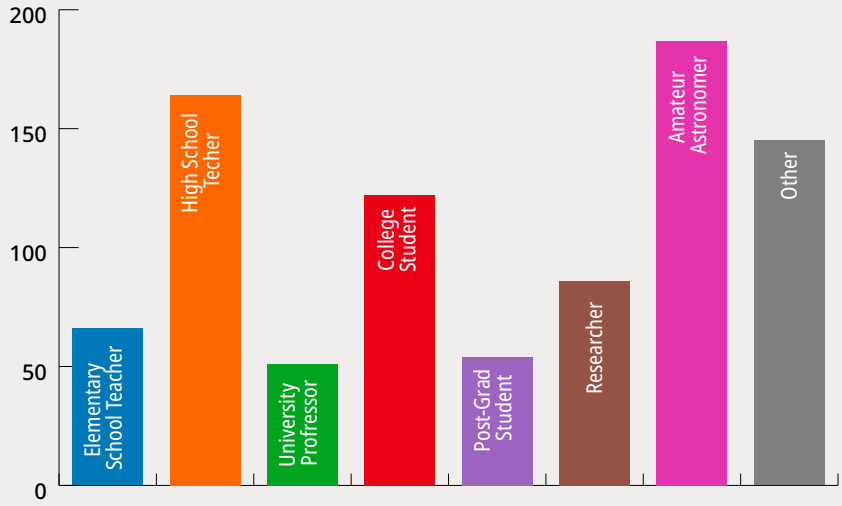
The RAS supported home-education when UK schools were closed during the pandemic by providing dedicated online sessions, including "We Share the Same Moon", with storyteller Cassandra Wye, aimed at Key Stages 1–3 (5–11 years). This had more than 600 views. We took advantage of presenting virtually in order to work in Mexico, giving two talks about Mars to 100 students across 10 secondary school campuses there. We also took part in the day-long STEMFest in Space, which delivered talks to schools in Northumberland. This reached 547 schools in the northeast of England – about half of those in region – and more than 36,000 young people and their teachers took part.

The RAS was also part of live observing events that linked professional astronomers with school students and the wider public. In a collaboration with the University of Leicester for Women in Space Week in October, the 'Weird and Wonderful World of Uranus' ran as a livestream over three days, featuring scientists using the NASA Infrared Telescope Facility on Hawaii to observe the ice giant, and historians of science at the Herschel Museum in Bath. More than 500 people joined the session on Zoom and more than 13,000 have watched it on YouTube. Later that month the RAS linked up with the UK Space Agency and NASA for International Observe the Moon

Global Hands-On Universe conference

The Hands-On Universe (HOU) is an educational program that enables students to investigate the universe while applying tools and concepts from science, maths and technology. RAS Education and Outreach grant support to Dr Gustavo Rojas of the University of Lisbon for the Global Hands-On Universe conference on 23–27 August 2021 paid for the technical staff and licences needed to run the meeting, so that participants did not need to pay a registration fee. As a result, school-teachers and amateur astronomers were notable among the 590 people from 70 countries who took part in 12 sessions of invited talks, oral presentations, workshops and roundtables. The sessions were streamed live and are available on YouTube.

handsonuniverse.org/ghou2021/



Day, in which a series of talks with lunar scientists and writers complemented live observations from an observatory in Cyprus. 125 people attended the Zoom session and a further 750 watched on YouTube.

The Society continued to run a GCSE Astronomy course, with 16 students working virtually from around the UK and Ireland who will take their final exams in June 2022. And the annual prize for a poster submitted by any student taking GCSE Astronomy in 2021 was won by Lucas C E Farley of Marlborough College, Wiltshire, for his poster "Detecting the Geminids Using Radio Waves". Second prize went to Kiran Radway, based at the Royal Greenwich Observatory, London, for his poster "Human Space Colonisation".

Public lectures

Lucinda Offer Paving a path for the human exploration and settlement of Mars

Prof. Lucie Green The Sun's Twisted Mysteries

Dr Becky Smethurst Supermassive Black Holes: The Ultimate Galaxy Killers?

Dr Margarita Segou Earthquake Cross-Talks: From Silence to Continuous Chatter

Dr Giulia Magnarini Mega landsides on Mars, Earth, and the Moon.

Prof. Heino Falcke What's in a shadow? Past, present and future of Black Hole Imaging

Prof. Lewis Dartnell ORIGINS How the Earth shaped human history

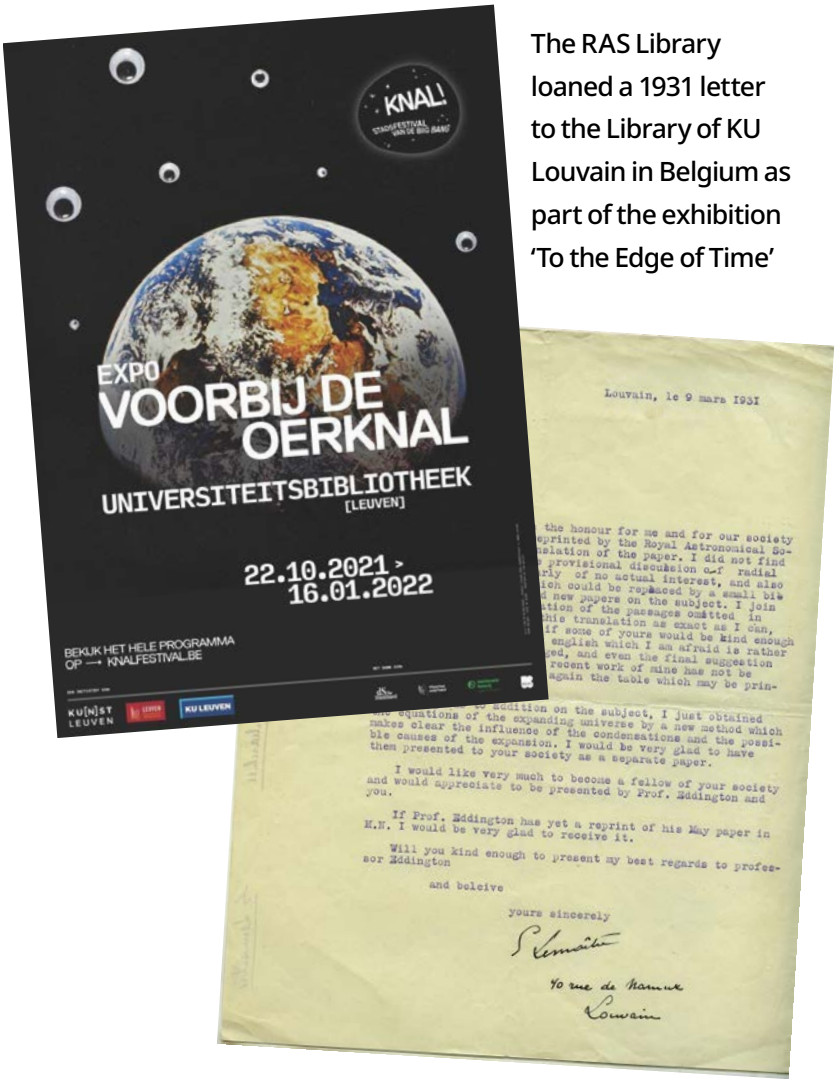
Dr Olivia Jones The James Webb Space Telescope

Library and Archive outreach

At the end of the year the Society released its digital bicentenary timeline, highlighting key events in our history over the past 200 years. Paper concertinas of the timeline were distributed to Fellows with their copies of *A&G*, and we set up a



The final glimpse of the James Webb Space Telescope, subject of a very popular RAS Public Lecture. (Arianespace, ESA, NASA, CSA, CNES)



The RAS Library loaned a 1931 letter to the Library of KU Louvain in Belgium as part of the exhibition 'To the Edge of Time'

dedicated Instagram account to display the material on the RAS website. This uses the social media platform Instagram, which is popular among a young people and offers a chance to share the RAS story with people we might not otherwise reach. The online Timeline has become a useful resource for outreach on social media. It will also become a striking installation in Burlington House, bringing our history alive.

The RAS Library provided access to materials for a BBC Sky at Night programme, and made a special film about maps of Mars for the Geological Society's William Smith Meeting. We also loaned a 1931 letter from the RAS collection to the Library of KU Louvain in Belgium as part of the exhibition 'To the Edge of Time' curated by Hannah Redler Hawes and Thomas Hertog. The letter was from Georges Lemaître to W M Smart, editor of *Monthly Notices*. This is the first overseas loan by the RAS. We also provided high-resolution images of the 1919 eclipse lantern slides from the RAS archives, which the exhibition creators recreated as facsimiles.

The Librarian gave a seminar with book artist Kate Bernstein to 50 people at the turn the page Artists' Book Fair youtu.be/M6D-FMbccT4. The topic was the volume Bernstein created, *Measuring the Heavens*, inspired by the RAS Library and Archive. And in November the Librarian gave a presentation on Caroline Herschel alongside Emily Winterburn, to 52 people, as part of the online Buckinghamshire History Festival (bit.ly/3uAscxF).

Media and social media

In 2021 the RAS issued 19 press releases covering Society news and astronomical events such as the search for Moon trees, the RAS Bullying and Harassment Survey, and the landing of the Perseverance rover on Mars. RAS staff and officers gave 41 press interviews in 2021.

A further 18 press releases highlighted research presented in our journals or at the National Astronomy Meeting. 10 of them covered scientific papers presented at the virtual NAM, leading to at least 306 print and online articles. Our top stories from the meeting were on millimetre-high mountains on neutron stars, planetary magnetic fields buckling as stars die, and the SuperBIT balloon-borne telescope.

Our press releases led to stories in regional, national and international newspapers and magazines and their websites, plus a wide range of online digests, from the Beadworkers Guild Journal to the Weather Channel. Our stories were broadcast on several BBC radio and TV channels, and on international news services such as Sky News.



Inspirational outreach workshops

Kielder Observatory in Northumberland received RAS funding to work with local under-served communities to create outreach materials and activities for their new SPIDER Tanlaw radio telescope. The goal was to create a digital curriculum to overcome barriers to understanding of radio astronomy so everyone can feel equal to using our new radio telescope. A total of 64 people, 38 of them children, took part in five workshops led by artist Mel Bacon; the goal was to find out best how to introduce and explain radio astronomy. The observatory team worked with new partners Sunderland Culture, an organisation with a great track record of authentic and empowering community engagement in Sunderland. The collaboration demonstrated what it is about radio astronomy that resonated with this community, and the creative leadership offered new ways to think about astronomy for the observatory team. The outcome was a clear narrative for resources to support the Tanlaw telescope. The Kielder team also developed an understanding of how to co-create resources with communities that they want to bring to the observatory, something that they plan to build on for other family activities at Kielder.
kielderobservatory.org

On social media, the RAS Twitter account reached 50,000 followers and now has a blue tick, verifying its authenticity. RAS tweets received 13,331 likes and 4,452 retweets over the year, and there were 148,576 visits to our profile. Some of our most popular posts were around the launch of the James Webb Space Telescope, the prospects for the Quadrantids meteor shower and the RAS bicentenary timeline, as well as the very popular invitation to register for the 'Weird and Wonderful World of Uranus'.

RAS TWEETS RECEIVED **13,331 LIKES** IN 2021

The Society reached 1500 followers on Instagram. Particularly popular were posts associated with the public lecture on the James Webb Space Telescope (339 likes) and the launch itself (443 likes), the Event Horizon Telescope public lecture (536 likes), and the International Day of

Girls and Women in Science (462 likes). RAS page followers on LinkedIn almost tripled in 2021 to more than 3000.

The RAS Supermassive podcast produced 12 new episodes over the year on topics from the Big Bang to space junk. We are grateful for sponsorship from the UK Space Agency for episodes on Ice Worlds and Fiery Worlds. Over time the podcast has been listened to more than 235,000 times, with a regular audience of 10,000 or more for each episode. The audience is split male: female in a ratio of 2:1, which is considered good for a science podcast, and is young (two-thirds of listeners under the age of 45, and just over a fifth aged 18–24) and global (a third of listeners in the UK, almost a third in the United States).

Friends of the RAS

The Friends of the RAS held 8 talks – all online – on subjects including geomagnetics, cold molecules and star formation, lunar exploration, Babylonian astronomy, the dark universe, the multiverse, the magnetic universe and dark matter. We held a survey in November with a good response rate of 16%, including some very positive feedback and useful suggestions. None of the usual visits were possible, as a result of pandemic restrictions.

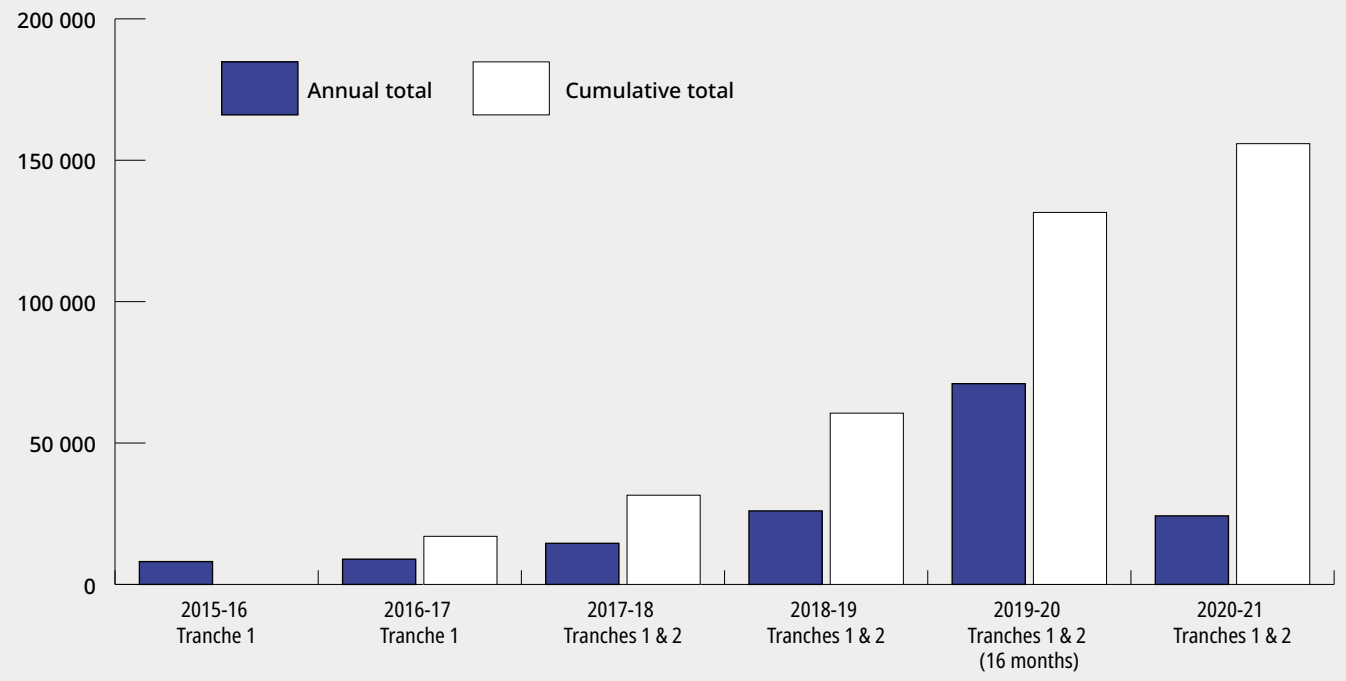
155,860 PEOPLE HAVE DIRECTLY ENGAGED WITH RAS200 PROJECTS.

RAS200: Sky & Earth

The RAS bicentenary outreach projects, in partnership with specialist charities and organisations, started in 2015. Many of them had planned to finish in 2020, but had requested extensions in order to complete their programmes after the restrictions during 2020 and 2021 as a result of the Covid-19 pandemic.

Despite those restrictions on events and gatherings, the RAS200 projects together have reached an audience of 155860 people through direct engagement. This number includes those attending RAS200 events (online and in person), those receiving activity packs in place of live

Estimated audience number directly engaged by RAS200 Projects



activities during the pandemic, staff trained to deliver activities and stakeholders attending conferences about RAS200. It does not include indirect contact via promotional media or social media.

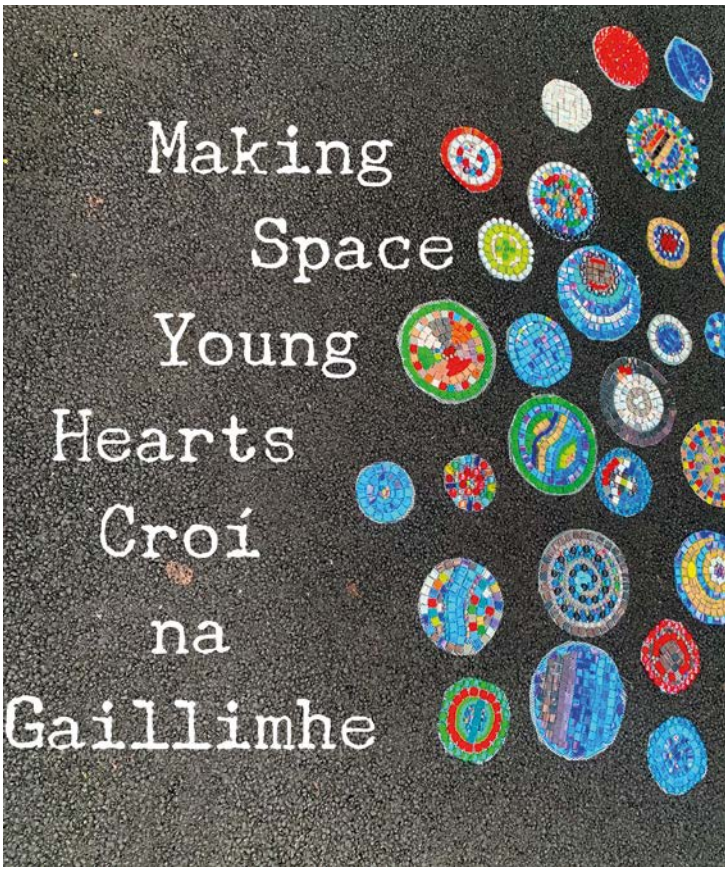
Some groups continued with their activities and meetings, on line and with activity packs such as quizzes. The RAS held an online workshop on the RAS200 Planets 360 show for planetarium presenters, which attracted 91 participants.

Making Space continued their programme of science through the arts in Galway, as part of Croi na Galliamhe's Young Hearts programme to encourage inter-generational communication. They ran Zoom sessions for both the transition year students and an active retirement group, based on weekly 'art packs' to use at home. They also worked with the local aquarium who organised beach safaris that enabled the groups to meet face-to-face. In the autumn we began a new project – mosaics – with face-to-face meetings for the now-vaccinated participants. The group made mosaics on the theme of the planets and the solar system, which will eventually form part of a mural showing activity in Galway during lockdown.

Making Space continued their RAS200 programme of science and arts in Galway

Overall the experience was positive for all concerned. The RAS200 team were delighted with the ease with which the older group, particularly, learned to handle Zoom. The programme addressed some serious issues relating to isolation during lock down – and possibly got across some ideas about astronomy at the same time. As one of the older group said: "The project is something I look for every week as it keeps me going through [the lockdown]".

The National Eisteddfod and Urdd Eisteddfod were not held as live events in 2021, but RAS200 was well represented at the Eisteddfod Amgen 2021, the online alternative event. The team presented four short Welsh programmes on astronomical themes each day for four days. These were collectively entitled Cosmig, with individual recordings on: Cytserau, Y Blaned Mawrth,





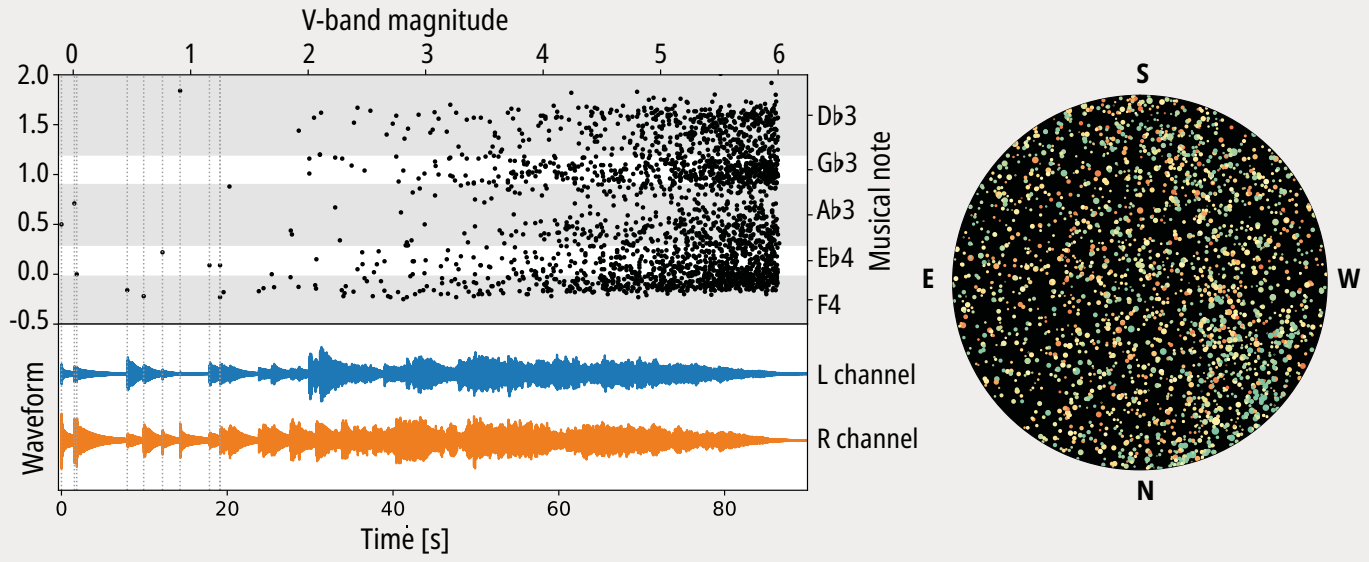


Diagram showing the sonification of stars 'appearing' after sunset in different parts of the sky.

The audible universe

An RAS Education and Outreach Grant has been used to develop a planetarium show about the solar system, using sound to ensure that the show can be enjoyed by people who are blind or visually impaired, whatever their level of vision. The show can also be experienced on a computer screen at home. Chris Harrison (Newcastle University), James Trayford (University of Portsmouth), Leigh Harrison and Nic Bonne (Portsmouth) worked with people with visual impairments and with teachers qualified to teach them, starting with the sounds that best represented stars, Sun, Moon and planets and seeking a balance between scientific accuracy and a pleasing musical result. Their work involved writing new code (STRAUSS) to synthesize sounds and manipulate audio samples, including in ways that mimic orbiting bodies or the position of stars as they appear in the evening sky. The team have produced the freely-available show in English, Spanish and Italian, and plan to develop a series of accessible interactive workshops.

www.audiouniverse.org

Y Blaned Iau and Sêr y Galaethau Pell (Constellations, Mars, Jupiter and Stars of Distant Galaxies). These recordings were professionally produced by the multimedia company Telesgop, who also produced a programme to celebrate 50 years of a science pavilion at National Eisteddfod, which included the RAS200 project.

Bounce Back continued their work with prisoners, in person where possible, and were especially appreciated during Covid–19 restrictions. "We have genuinely found the response to the RAS Explore programme far exceeded our expectations," said Nick Harris, Head of Business and Community Engagement at HMP Brixton. "In HMP Brixton the overwhelming enthusiasm of the prisoners particularly during Covid has been consistent, with requests to do more. In addition, particularly during lockdown, the staff and officers have found it genuinely fascinating and are keen to support it, which is rare."

Working with the Courtyard Societies

In May and June the RAS joined the Linnean Society for 'Burlington House: Lunchtime Scientist'. This was a programme of seven online workshops on the theme of astrobiology in which scientists from industry and academia discussed their work with GCSE science students. Around 100 people attended each event, and there were 2000 views on YouTube.

Our Organisation



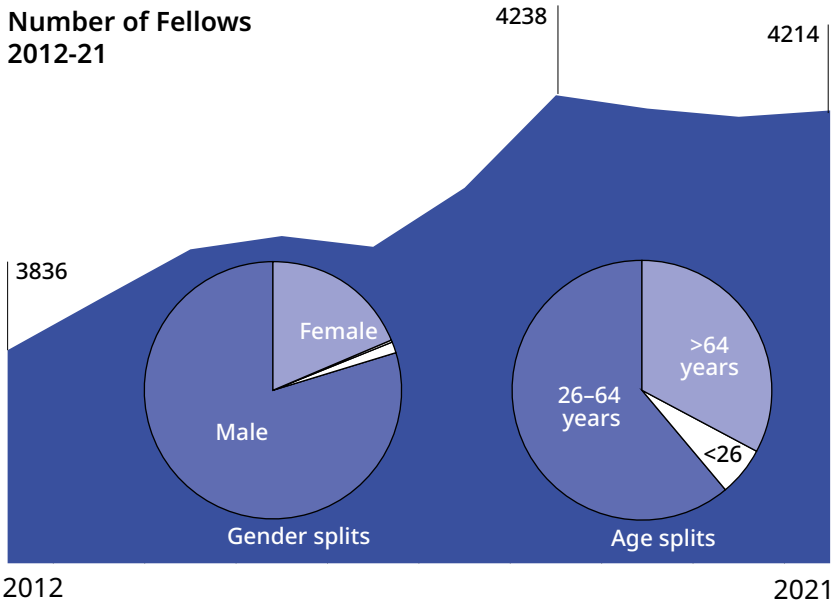
Our Norman Lockyer Research Fellow worked on the evolution of comets.
(NASA / ESA / STScI / D. Jewitt (UCLA))

Membership

In 2021 the RAS had 4214 Fellows, including 160 Honorary Fellows. 19% of the Fellowship were female, 33% were over 65 and 6% aged 25 and under. A quarter of Fellows are based outside the UK.

The organisation of the RAS supported our objectives during 2021 by:

- Addressing the sustainability of our activities
- Working towards a demographic survey
- Exploring options for the Society's accommodation in the future
- Planning for hybrid meetings at Burlington House
- Reviewing the scope and effectiveness of our medals and awards
- Digitising the notebooks of Caroline Herschel



Working towards net zero

Our Sustainability Working Group worked on the development of a net zero policy for RAS carbon emissions, covering Society activity and our external impact. In May we signed the UN Climate Neutral Now declaration committing us to reduce our carbon dioxide emissions by 50% by 2030, and to net zero by 2050.

A Demographic Survey

Work has started on our regular survey of the demographics of our membership, to take place in 2022.

Our Accommodation

In 2021 the Society joined the Geological Society, the Linnaean Society and the Society of Antiquaries in a campaign to persuade government to find a long-term, sustainable solution to the rapidly rising rents being charged to the Courtyard Societies, so they can remain in Burlington House. As a result of the efforts of Fellows, parliamentarians and high profile supporters including Sir David Attenborough and Professor Brian Cox, the Societies have now met with government representatives, and negotiations continue.

Our Future Meetings

The RAS explored requirements for future meetings at Burlington House and online, investing in equipment to make hybrid meetings more successful. It is hoped that providing effective remote participation in meetings will support Fellows who do not wish to travel to London, and enable those living outside the UK to attend; it will also support our sustainability goals.

Medals and Awards

The review of the annual medals and awards led to the introduction of education awards recognising contributions at primary, secondary and tertiary level, with the first awards to be made in 2022. We will be capturing data on the diversity of the nominees.

Caroline Herschel's notebooks

The process of digitising Caroline Herschel's working notebooks got underway, despite delays arising from Covid–19. The aim of this project is to make these important documents available online to scholars worldwide.

Looking Forward



The launch of the James Webb Space Telescope provided the theme for a popular RAS Public Lecture in December (NASA/Chris Gunn)

Objectives for 2022

The Society will:

- Publish high-quality peer-reviewed journals
- Support students and early-career scientists through research fellowships and grants
- Recognise achievement through our medals and prizes
- Maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures
- Sustain our Library and Archive service
- Continue our political engagement
- Maintain our programme of education and outreach, including the Friends of the RAS
- Promote the work of the Society and Fellows in the media and on social media
- Build our outreach work with other Courtyard Societies.

In 2022 the Society will develop a strategy for the next five years that will focus on:

- Membership (including Fellowships and grants)
- Education and outreach – building on the success of RAS200
- Our Library and heritage
- Our accommodation.

Cross-cutting themes to inform the strategy review will include:

- Diversity and inclusion;
- our digital presence;
- the impact of the pandemic, and
- uncertainty in our long-term location

Events since the year end

The Caroline Herschel Medal

This new award was established in 2021 to celebrate longstanding scientific cooperation between the UK and Germany, with an annual prize of £10,000 funded by the UK government in honour of Chancellor Angela Merkel on her retirement. It is administered jointly by the RAS and the German Astronomical Society, who in February announced the inaugural award to Prof. Dr Eva Grebel of Heidelberg University.

The RAS is making plans for 2022 and the future by:

- Setting objectives for our activities
- Identifying specific goals for 2022



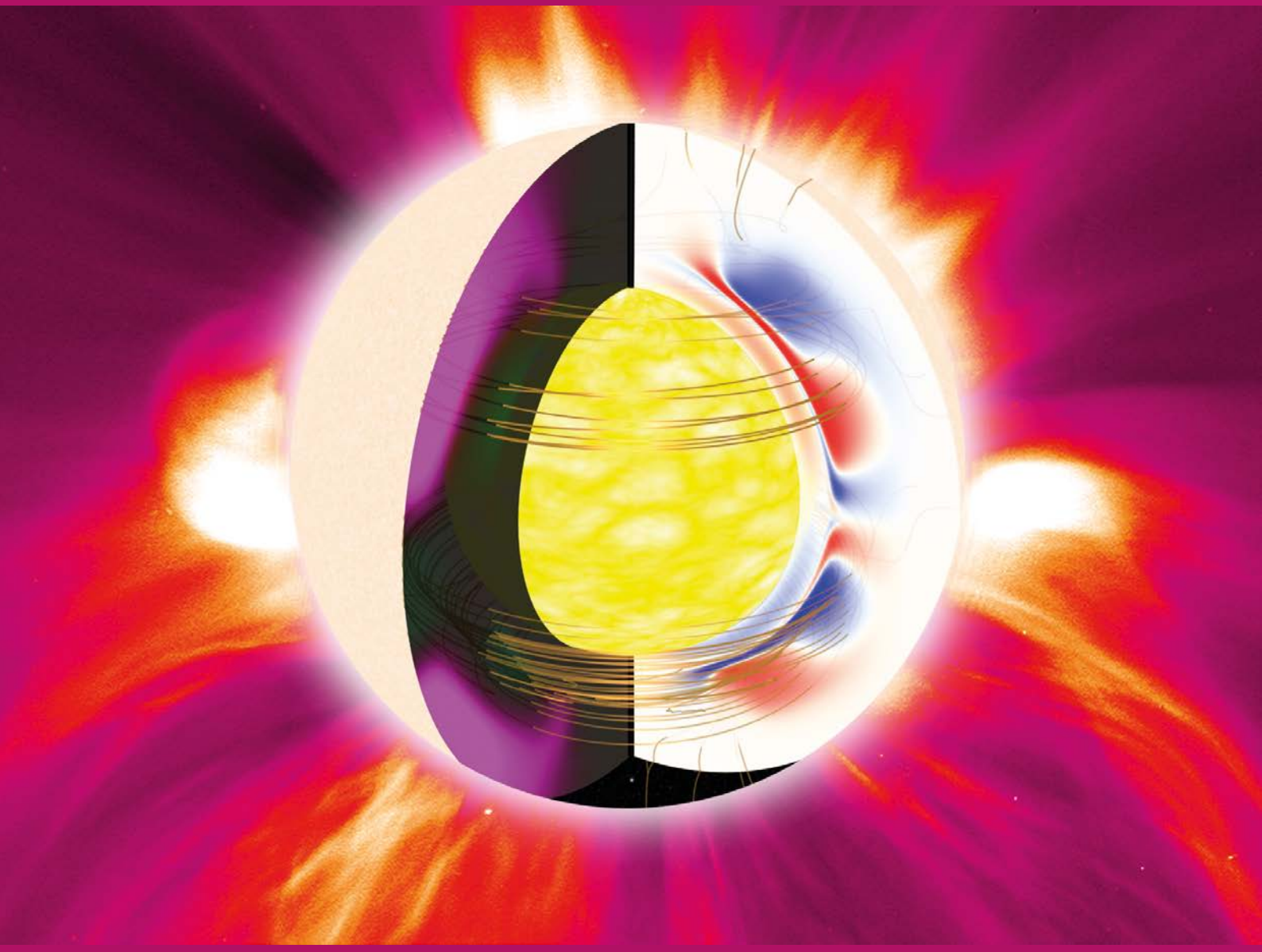
Bicentenary Timeline in Burlington House

The RAS Timeline, already available to explore on the website, has been installed as a spectacular exhibit in the stairwell at Burlington House, showing our progression from a group of London gentlemen to an international community of researchers and scholars.

Strategy working groups

The development of our strategy took concrete form with the establishment of working groups made up of trustees and RAS staff, to discuss aspects of Society work. The groups first met in March and this work will continue.

Structure and Governance



Stellar magnetic fields featured in an RAS press release on stars' mysterious midlife crises (CESSI / IISER Kolkata / NASA-SVS / ESA / SOHO-LASCO)

Governance

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in 2015. The RAS's objectives, charters and byelaws are detailed on the Society's website ras.ac.uk.

The control of the Society rests with the General Meeting of Fellows. Subject to that, direction and management are the responsibility of the Council (as the Trustees of the charity). The Council consists of a President, a Treasurer and three Secretaries together with four Vice-Presidents and 12 Councillors. In addition, the President-Elect attends Council for one year prior to taking up the post.

Trustee recruitment and appointment

Annually, the full membership of the Society is asked to nominate themselves or other members of the Society to available positions on Council. A nomination must be supported by two other members of the Society. Council approves the ballot list and this together with a narrative on each candidate is sent to the full membership for their consideration prior to casting their votes. We moved to fully electronic voting and an online AGM in 2020 in line with Covid-19 restrictions; we will continue with solely online voting in future.

Members of the Council are elected by ballot at the AGM, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

- President, two years
- Vice-Presidents, two years
- Treasurer and Secretaries, five years
- Councillors, three years.

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to complete a conflict of interest declaration and to sign a Trustee declaration form. Trustees have the opportunity to attend training, where appropriate; for example, on The Governance Code. In January 2021 the trustees attended a seminar on Charities and Property given by Hugh Pearce, partner with the law firm Stone King.

Regulations and procedures of the Society:

- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- Organisational structure
- Risks

Fundraising

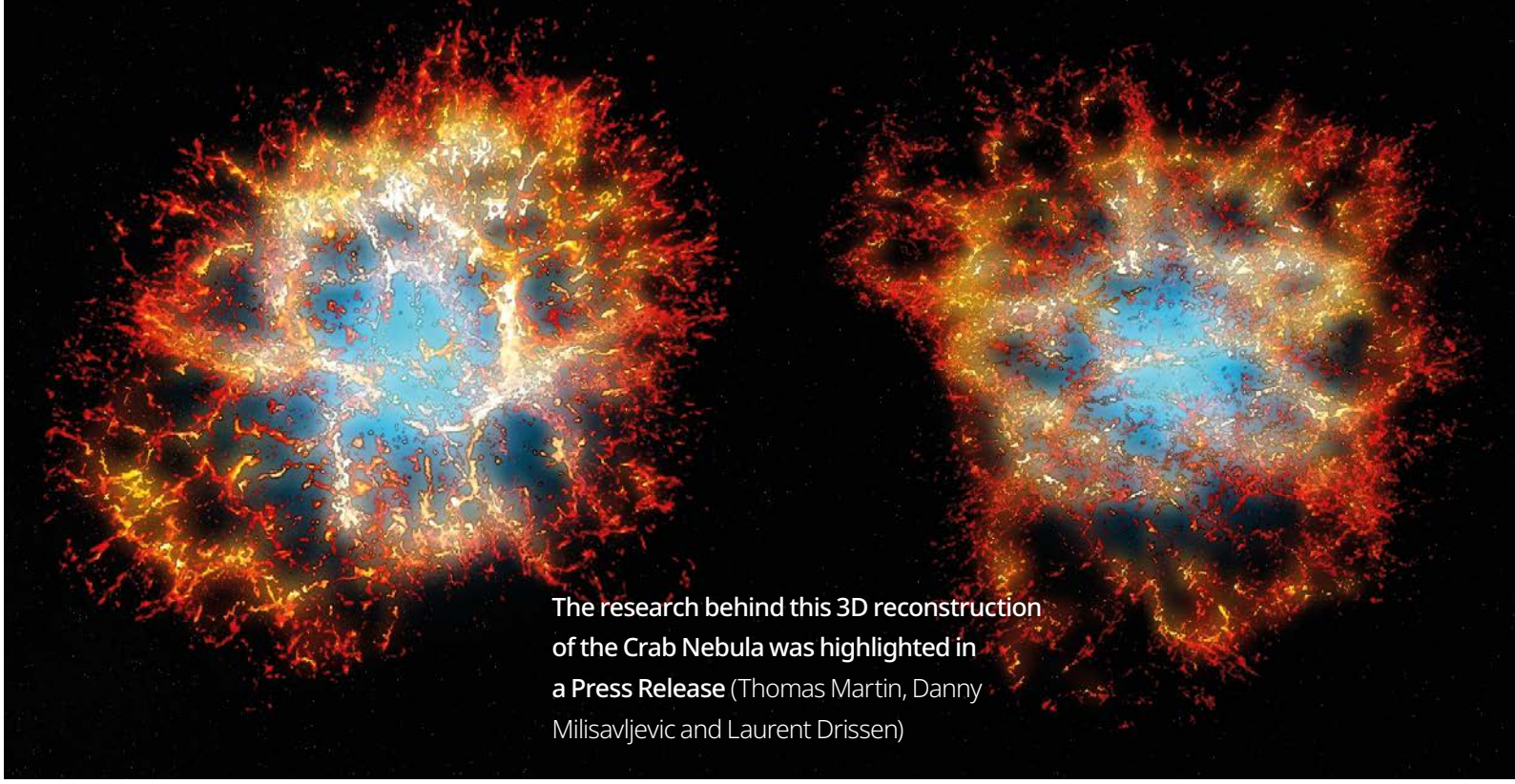
The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

Organisational structure

The RAS Council normally meets six times during the year and its function is to direct, on behalf of the Society, all the affairs and business of the Society. Council appoints standing committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and ad hoc committees (e.g. Awards) to forward its objectives.

It appoints the managing editors and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society*, *Geophysical Journal International*, and *RAS Techniques and Instruments*, who provide their services, as does the Treasurer, for an honorarium.

The Society has formal associations



The research behind this 3D reconstruction of the Crab Nebula was highlighted in a Press Release (Thomas Martin, Danny Milisavljevic and Laurent Drissen)

with a number of organisations having shared interests, and has less formal arrangements with several other bodies. These include:

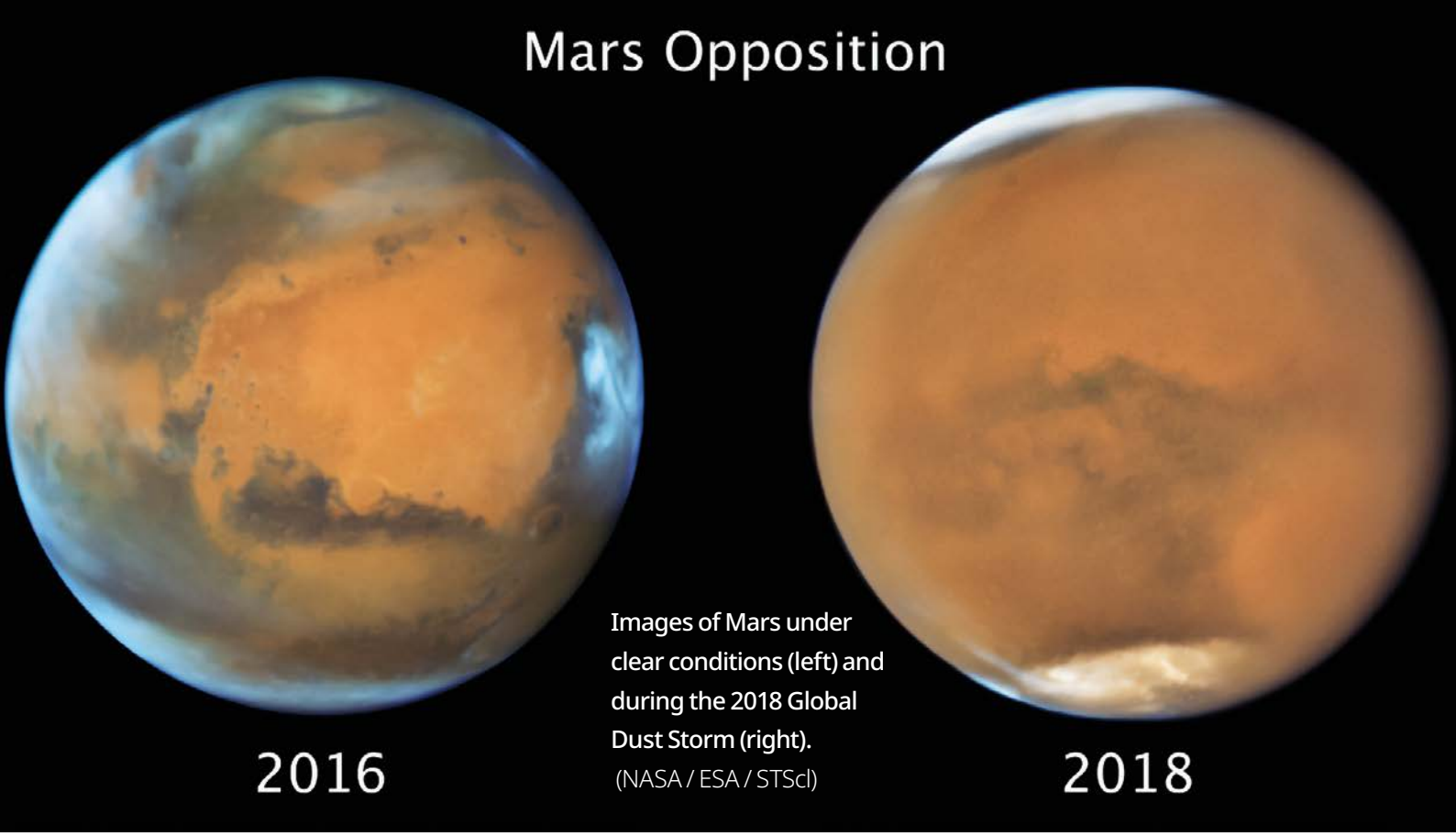
- The British Geophysical Association, jointly sponsored by the RAS and the Geological Society of London to represent solid-Earth geophysicists whose interests fall within the remits of both parent societies
- The Paneth Meteorite Fund that the Society administers under the direction of the Paneth Fund Trustees
- The Society is the UK national member organisation of the International Astronomical Union and the European Astronomical Society and is represented on the UK Panel of the International Union of Radio Science
- The Society is represented on a number of organisations including the Science Council, the Parliamentary and Scientific Committee and the Campaign for Science and Engineering
- The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories and science centres, use of the Society's Library, as well as a reduced subscription to the Society's members' magazine *A&G*.

Risks

The principal risks and uncertainties identified by the Trustees are:

- Maintenance of the quality of, and income from, publications (a significant income stream of >60%)
- Open Access publishing
- Affordability of rent and service charges for the premises at Burlington House
- Covid-19 and its potential impacts on access to the building, Society activities, publishing and investments.

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is exposed and the systems that have been established to manage



Images of Mars under clear conditions (left) and during the 2018 Global Dust Storm (right).
(NASA / ESA / STScI)

those risks. In regards to the three most significant risks:

- The Society insists that rigorous peer review is used to maintain the quality of the three journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.
- The uncertainty over future rental charges remains an ongoing concern for the Society. The Society, alongside the other Courtyard Societies, continues to seek a satisfactory resolution with the landlord. The Trustees still hold the view previously stated (Annual Report 2015) that the Society has the resources to cover increases in rental charges over the current lease period. In the meantime, the Society will explore options for alternative accommodation if a satisfactory resolution cannot be achieved.

Other key risks identified and their mitigation measures include:

- Maintenance of the (listed) premises (by regular repair and refurbishment)
- Maintenance of the size of the membership (by regular review of services and subscriptions and outreach activities to potential new members)
- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

The Trustees consider the fluctuations in investment fund values and variability of investment returns to be a risk for the Society. The fund, Newton Growth and Income Fund for Charities, is actively and expertly managed and administered by Newton Investment Management who were reappointed after a competitive tender. Funds are invested in a diverse portfolio comprising mainly equities and bonds. This managed strategy mitigates fluctuations in fund values and seeks opportunities for fund growth and income. The Trustees consider this approach mitigates the subsequent exposure to any investment risk.

Financial Statements



A 5km-long landslip on the surface of Mars; the Red Planet featured in a Public Lecture. (ESA/Roscosmos/CaSSIS)

FINANCIAL REVIEW

The Society's total funds increased from £21,507,367 to £23,646,473 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art) which totalled £9,470,879 (2020– £9,470,879). Income increased to £5,236,311 (2020– £4,845,401) due to increased income from publishing, legacies and membership. Due to the Covid-19 pandemic the National Astronomy Meeting (NAM) was held online. Publishing income, increased by £198,794. The Society's expenditure decreased to £4,455,397 (2020 – £4,532,478) which is mainly due to the Covid-19 pandemic reducing supports costs including reduced occupancy of Burlington House, online hosting of NAM and reduced grant-making activity. Net investment gains totalled £1,358,192 (2020 – losses of £45,703)

Reserves policy

The reserves policy aims to maintain adequate financial cover for the main risks to the Society and provide in the normal way for an efficient winding-up if that ever became necessary. Working cash reserves are maintained so the Society does not rely on realisation of investments gains, or capital invested. The total funds amounted to £23,646,473 of which £9,470,879 are held in heritage assets, leaving funds of £14,175,594 (2020 – £12,036,488) to cover the main risks and the operational needs of a going concern.

The requirement for significant reserves falls into two areas:

- The need to have contingency plans in place to maintain publication income if Open Access regulations threaten the current business model for academic journals; and
- The need to make some provision for either substantial increases in rent, and maintaining the premises, or alternatively, a change in the status of our accommodation. This remains under continual review by the Society and four other Courtyard Societies. The Society's right to remain at Burlington House under the present lease is not in doubt, but whilst the scale of future rent increases has been estimated, there remains uncertainty as to when these increases will slow down or cease. Negotiations continue with the landlord and all long-term options including alternative accommodation will be explored.

The Accommodation fund is detailed in note 17, page 58, along with the other Designated funds.

The Open Access Fund and the Burlington House Fund are currently maintained at high levels to support any significant changes to the Society's operations and the General Fund is available to provide further financial support if either of these risks materialise. The General Fund is also available, should it ever be needed, to enable an orderly winding-up of the Society. At present the free reserves of the Society, defined as unrestricted, undesignated funds, excluding tangible fixed assets, are £7,422,049 (2020 – £5,713,233) and these would allow operation of the Society for at least 18 months if publishing were continued and expenditure incurred during that period and 50 months if publishing were halted. The Trustees are satisfied that the current level of reserves is appropriate given the risks and uncertainties outlined above.

It has been the policy of the Society to fund grant activity from the Research and Grants fund, which is now included in the balance of designated reserves.

Investment policy

Investments are held with BNY Mellon Charities Fund: Newton Growth and Income Fund for Charities, with the aim of generating capital growth and income over the medium to long term, with actively managed assets held in global equities and fixed income

securities. Surplus cash is held in the COIF Charities Deposit Fund with CCLA Investment Management, which provides a high level of capital security, interest, and liquidity. The Fund has an actively managed diversified portfolio of sterling denominated money market deposits and instruments. Income and gains from these investments contribute to fund the Society's charitable activities. Investment performance is monitored by the Accountant, Treasurer, Finance Committee and Council.

The Trustees, by resolution, adopted a total returns approach to the invested endowment funds in accordance with the requirements of the Charity Commission believing that this approach is in the best interests of the Society. The fund reconciliation is disclosed in note 12. This approach was applied from 1 January 2015 when the value of the endowment funds at that date of £1,652,682 was used as a proxy for the original value of the endowment funds. In adopting this policy permanent endowment funds will not be permitted to fall below the original value of £1,652,682. The Trustees aim to maintain the real value of the permanent endowment as a measure against the movements in the retail prices index. This was 7.5% for the year (2020 – 1.2%). £281,404 of transfers to the restricted funds were made during the year, (2020 – £nil).

Grant-making policy

The RAS has for many years provided small grants to support the community in activities not funded by the Research Councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to experience working in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

In addition to these grants to individuals the Society funds a series of fellowships to promote the careers of the highest quality young postdoctoral scientists. These currently include RAS Fellowships (on any subject) and the Norman Lockyer Fellowship (on an astronomical topic including solar system and planetary science). The Norman Lockyer Fellow is funded from an endowment fund set up for that purpose.

The grants and fellowships and awards are funded from several sources including its restricted and endowment funds invested with Newton Investment Management and the income and gains from these investments are used to support the grants expenditure in accordance with the bequests.

The grants panel deliberates twice a year and further grants are awarded by the Education and Outreach Committee. It comprises the Treasurer (Chair) and the three Secretaries. 109 applications were received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

Awards policy

A further activity funded by the Society is the award of medals to recognise the highest quality work in various categories. The awards are funded from several sources including the restricted and endowment funds invested with Newton Investment Management and the income and gains from these investments are used to support the awards expenditure.

These awards are proposed to Council by separate Awards Panels and no awards are made to serving Councillors. The Awards Panels comprise a Vice-President as chair, Secretary and Fellows. Panel members observe strict rules on conflict of interest, taking no part in decisions where the proposer or the nominee is from the same institution or is a close contact.

FINANCIAL REVIEW (CONTINUED)

Key management personnel

The key management personnel of the charity in charge of directing and controlling, running and operating the charity are the Trustees, the Executive Director and the Deputy Executive Director; the latter two are employees. They are assisted by the Accountant, a further three managerial level officers and other staff.

Council ensures that the RAS carries out a salary comparison exercise every 3-5 years. The comparability study compares the staff salaries to other similar external positions to reassure the Trustees that the levels of remuneration are appropriate. The last comparison exercise was carried out in 2018.

The Society does not have a performance related pay scheme. The Trustees annually consider a salary increase in regards to cost of living that applies to all staff.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has four deferred members only and eight annuitants. The Society operates a defined contribution group personal pension scheme for current staff.

Legacies and donations

The Society encourages Fellows to include donations to the Society in their wills and receives donations during the year from Fellows and members of the public. During the year the Society received donations of £657 (2020 - £34,064) and £173,030 in legacies (2020- £2,000).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5 million. The Society does not regard these as assets which can be converted to their cash value, except in the most dire circumstances.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. The Society would only obtain a valuation if it was deemed to materially affect the overall value of the heritage asset portfolio.

Investment performance

The Newton Growth and Income fund for Charities provided a yield of 2.1% and a total return gross of 19.2% in the year. Annual management charges of 0.6% are taken from the capital of the fund. Interest from the COIF Charities Deposit Fund yielded 0.01%. Performance of the fund managers is kept under continual review.

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The Trustees are responsible for preparing the Trustees' report and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The law applicable to charities in England and Wales requires the Trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of the income and expenditure of the charity for that period. In preparing these financial statements, the Trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102);
- make judgments and estimates that are reasonable and prudent;
- state whether applicable United Kingdom Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in operation.

The Trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and the provisions of the Royal Charter and Bye Laws. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities. The Trustees are responsible for the maintenance and integrity of the charity and financial information included on the charity's website.

The Council of the Society believes that it has carried out these requirements.

AUDITORS

A resolution to appoint Buzzacott for 2022 will be proposed at the Annual General Meeting.

Approved by the Council and signed on its behalf by:

Prof. Emma Bunce
President

Date: 13 May 2022

INDEPENDENT AUDITOR'S REPORT TO THE TRUSTEES OF ROYAL ASTRONOMICAL SOCIETY

Opinion

We have audited the financial statements of Royal Astronomical Society (the 'charity') for the year ended 31 December 2021, which comprise the statement of financial activities, the balance sheet, the statement of cash flows, the principal accounting policies and the notes to the financial statements. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland'(United Kingdom Generally Accepted Accounting Practice).
In our opinion, the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2021 and of its income and expenditure for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Conclusions relating to going concern

In auditing the financial statements, we have concluded that the Trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue.

Our responsibilities and the responsibilities of the trustees with respect to going concern are described in the relevant sections of this report.

Other information

The Trustees are responsible for the other information. The other information comprises the information included in the annual report and financial statements other than the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether there is a material misstatement in the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

Matters on which we are required to report by exception

We have nothing to report in respect of the following matters in relation to which the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the Trustees' annual report is inconsistent in any material respect with the financial statements; or
- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Responsibilities of trustees

As explained more fully in the Trustees' responsibilities statement, the Trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the Trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the Trustees either intend to liquidate the charity or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud is detailed below.

Our approach to identifying and assessing the risks of material misstatement in respect of irregularities, including fraud and non-compliance with laws and regulations, was as follows:

- the engagement partner ensured that the engagement team collectively had the appropriate competence, capabilities and skills to identify or recognise non-compliance with applicable laws and regulations;
- we identified the laws and regulations applicable to the charity through discussions with management, and from our knowledge and experience of the sector;
- we focused on specific laws and regulations which we considered may have a direct material effect on the financial statements or the operations of the charity, including the Charities Act 2011, data protection legislation, anti-bribery, employment, pensions and health and safety legislation;
- we assessed the extent of compliance with the laws and regulations identified above through making enquiries of management and inspecting legal correspondence; and
- identified laws and regulations were communicated within the audit team regularly and the team remained alert to instances of non-compliance throughout the audit.

We assessed the susceptibility of the charity's financial statements to material misstatement, including obtaining an understanding of how fraud might occur, by:

- making enquiries of management and those charged with governance as to where they considered there was susceptibility to fraud, their knowledge of actual, suspected and alleged fraud; and
- considering the internal controls in place to mitigate risks of fraud and non-compliance with laws and regulations.

To address the risk of fraud through management bias and override of controls, we:

- performed analytical procedures to identify any unusual or unexpected financial relationships;
- tested journal entries to identify unusual financial transactions;
- tested authorisation controls during substantive testing of expenditure;
- assessed whether judgements and assumptions made were indicative of potential bias; and
- investigated the rationale behind significant or unusual financial transactions.

In response to the risk of irregularities and non-compliance with laws and regulations, we designed procedures which included, but were not limited to:

- agreeing financial statement disclosures to underlying supporting documentation;
- reading the minutes of meetings of those charged with governance;
- enquiring of management and those charged with governance as to actual and potential litigation and claims; and
- reviewing correspondence with HMRC and the charity's legal advisors.

There are inherent limitations in our audit procedures described above. The more removed that laws and regulations are from financial transactions, the less likely it is that we would become aware of non-compliance. Auditing standards also limit the audit procedures required to identify non-compliance with laws and regulations to enquiry of the Trustees and other management and the inspection of regulatory and legal correspondence, if any.

Material misstatements that arise due to fraud can be harder to detect than those that arise from error as they may involve deliberate concealment or collusion.

A further description of our responsibilities for the audit of the financial statements is located on the Financial Reporting Council's website at www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditor's report.

Use of our report

This report is made solely to the charity's Trustees, as a body, in accordance with section 144 of the Charities Act 2011 and with regulations made under section 154 of that Act. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's Trustees as a body, for our audit work, for this report, or for the opinions we have formed.

Buzzacott LLP
Statutory Auditor
130 Wood Street
London
EC2V 6DL

13 May 2022

Buzzacott LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2021

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2021 Total funds £	2020 Total funds £
Income						
Donations and legacies	1	**173,557**	**130**	—	**173,687**	36,064
Other trading activities		**25,691**	—	—	**25,691**	40,263
Investment income	2	**141,139**	**7,726**	**55,108**	**203,973**	173,890
Charitable activities	3	**4,832,960**	—	—	**4,832,960**	4,595,184
Total income		**5,173,347**	**7,856**	**55,108**	**5,236,311**	4,845,401
Expenditure						
Raising funds		**8,157**	—	—	**8,157**	9,251
Charitable activities	5	**4,440,802**	**6,438**	—	**4,447,240**	4,523,227
Total expenditure		**4,448,959**	**6,438**	—	**4,455,397**	4,532,478
Net income before investment gains and losses		**724,388**	**1,418**	**55,108**	**780,914**	312,923
Net gains (losses) on investments	12	**937,152**	**51,768**	**369,272**	**1,358,192**	(45,703)
Net income for the year		**1,661,540**	**53,186**	**424,380**	**2,139,106**	267,220
Transfer between funds	12	—	**281,404**	**(281,404)**	—	—
Net movement in funds		**1,661,540**	**334,590**	**142,976**	**2,139,106**	267,220
Reconciliation of funds:						
Total funds brought forward at 1 January 2021		18,857,025	743,998	1,906,344	21,507,367	21,240,147
Total funds carried forward at 31 December 2021		**20,518,565**	**1,078,588**	**2,049,320**	**23,646,473**	21,507,367

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 49 to 63 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2020

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2020 Total funds £
Income					
Donations and legacies	1	31,064	5,000	—	36,064
Other trading activities		40,263	—	—	40,263
Investment income	2	121,586	6,420	45,884	173,890
Charitable activities	3	4,595,184	—	—	4,595,184
Total income		4,788,097	11,420	45,884	4,845,401
Expenditure					
Raising funds		9,251	—	—	9,251
Charitable activities	5	4,462,379	60,848	—	4,523,227
Total expenditure		4,471,630	60,848	—	4,532,478
Net income (expenditure) before investment gains and losses		316,467	(49,428)	45,884	312,923
Net losses on investments	12	(31,992)	(1,683)	(12,028)	(45,703)
Net income (expenditure) for the year and net movement in funds		284,475	(51,111)	33,856	267,220
Reconciliation of funds:					
Total funds brought forward at 1 January 2020		18,572,550	795,109	1,872,488	21,240,147
Total funds carried forward at 31 December 2020		18,857,025	743,998	1,906,344	21,507,367

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 49 to 63 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2021

	Notes	2021 £	2021 £	2020 £	2020 £
Fixed assets					
Tangible assets					
. Heritage assets	11	**9,470,879**		9,470,879	
. Other assets	11	**656,325**		763,093	
Investments	12	**9,872,965**		8,514,773	
			20,000,169		18,748,745
Current assets					
Debtors	13	**1,112,854**		848,383	
Cash at bank and in hand		**4,446,569**		3,736,532	
		5,559,423		4,584,915	
Creditors: amounts falling due within one year	14	**(1,793,956)**		(1,712,745)	
Net current assets			**3,765,467**		2,872,170
Total assets less current liabilities			**23,765,636**		21,620,915
Creditors: amounts falling due after one year	14		**(119,163)**		(113,548)
Total net assets			**23,646,473**		21,507,367
The funds of the charity					
Endowment funds	15		**2,049,320**		1,906,344
Restricted income funds	16		**1,078,588**		743,998
Unrestricted income funds					
. Designated funds	17	**12,993,027**		13,027,499	
. General funds		**7,525,538**		5,829,526	
			20,518,565		18,857,025
			23,646,473		21,507,367

The financial statements were approved by Council on 13 May 2022 and signed on its behalf by

Prof. Emma Bunce
President

The notes on pages 49 to 63 form part of these financial statements

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2021

	Notes	2021 £	2020 £
Cash flow from operating activities			
Net cash provided by (used in) operating activities	A	**521,526**	(81,319)
Cash inflow from investing activities			
Dividends and interest from investments		**203,973**	173,890
Purchase of tangible fixed assets		**(15,462)**	(55,852)
Net cash provided by investing activities		**188,511**	118,038
Change in cash and cash equivalents in the year		**710,037**	36,719
Cash and cash equivalents at 1 January 2021	B	**3,736,532**	3,699,813
Cash and cash equivalents at 31 December 2021	B	**4,446,569**	3,736,532

NOTES TO THE STATEMENT OF CASH FLOWS FOR THE YEAR TO 31 DECEMBER 2021

A Reconciliation of net movement in funds to net cash flow from operating activities

	2021 £	2020 £
Net movement in funds (as per the statement of financial activities)	**2,139,106**	267,220
Adjustments for:		
Depreciation charge	**122,230**	121,472
Net (gains) losses on investments	**(1,358,192)**	45,703
Dividends and interest from investments	**(203,973)**	(173,890)
Increase in debtors	**(264,471)**	(185,943)
Increase (decrease) in creditors	**86,826**	(155,881)
Net cash used in operating activities	**521,526**	(81,319)

B Analysis of cash and cash equivalents

	2021 £	2020 £
Total cash and cash equivalents: Cash at bank and in hand	**4,446,569**	3,736,532

C Reconciliation of net funds

	1 January 2021 £	Cash flows £	31 December 2021 £
Cash and cash equivalents	3,736,532	710,037	**4,446,569**

PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted, judgements and key sources of estimation uncertainty in the preparation of the financial statements are laid out below.

Basis of preparation

These financial statements have been prepared for the year to 31 December 2021.

The financial statements have been prepared under the historical cost convention with items recognised at cost or transaction value unless otherwise stated in the relevant accounting policies below or the notes to these financial statements.

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (Charities SORP) the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) and the Charities Act 2011.

The charity constitutes a public benefit entity as defined by FRS 102.

The financial statements are presented in sterling and are rounded to the nearest pound.

Critical accounting estimates and areas of judgement

Preparation of the financial statements requires the Trustees and Management to make significant judgements and estimates.

The items in the financial statements where these judgements and estimates have been made include:

- the liability for multi-year grant commitments;
- the useful economic life of tangible fixed assets; and
- the accrual for Burlington House rent.

Assessment of going concern

The Trustees have assessed whether the use of the going concern assumption is appropriate in preparing these financial statements. The Trustees have made this assessment in respect of a period of at least one year from the date of approval of these financial statements.

The trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased rental charges for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk, that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the Trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves Policy set out in the Financial Review provides more detail.

The Trustees have considered the impact due to Covid-19 on the ability of the Society to continue its charitable activities resulting in the Specialist Discussion Meetings and the National Astronomy meeting being successfully held online. Public meetings were cancelled but the Society hopes to reintroduce these in 2022. Although access to its Burlington House premises was restricted, the core functions of membership, publishing, outreach, some library activities, some grant making, public policy and engagement are continuing without any immediate or material impact on income and cash reserves. Future grant making from the restricted income funds can also continue for up to three years.

The Trustees have also considered the impact of the Russian invasion of Ukraine resulting in falls especially in global equity markets. The Newton Growth and Income Fund for Charities has little or no exposure to Russia or Ukraine and the fund recovered from its initial falls following the invasion. The Society's publishing activities are world-wide, but there are no editors based in Russia or Ukraine, and Oxford University Press reports the impact on these publishing activities is minimal.

The Trustees therefore conclude that the preparation of these financial statements on a going concern basis is justified.

The Trustees have concluded that there are no other material uncertainties related to events or conditions that may cast significant doubt on the ability of the charity to continue as a going concern.

The most significant areas of judgement that affect items in the financial statements are mentioned above and detail provided in the section on risks in the Trustees' report.

Income recognition

Income is recognised in the period in which the charity has entitlement to the income, the amount of income can be measured reliably and it is probable that the income will be received.

Income comprises donations, investment income, income from the sale of publications, membership subscriptions, and other related income.

Donations, are recognised when the charity has confirmation of both the amount and settlement date. In the event of donations pledged but not received, the amount is accrued for where the receipt is considered probable. In the event that a donation is subject to conditions that require a level of performance before the charity is entitled to the funds, the income is deferred and not recognised until either those conditions are fully met, or the fulfilment of those conditions is wholly within the control of the charity and it is probable that those conditions will be fulfilled in the reporting period.

Legacies are included in the statement of financial activities when the charity is entitled to the legacy, the executors have established that there are sufficient surplus assets in the estate to pay the legacy, and any conditions attached to the legacy are within the control of the charity.

The Society has a contract with Oxford University Press for the publication of journals, which gives a percentage of the surplus made to 31 December each year to the Society. Although payments are received net, income is recognised in the financial statements on a gross basis which reflects that the Society retains the underlying long term rights. All publication income is accounted for on a receivable basis.

Membership subscriptions are payable in respect of a twelve month period in advance. The unearned portion of income received relating to the period after 31 December is carried forward as deferred income.

Investment income is recognised once the dividend has been declared and notification has been received of the dividend due.

Interest on funds held on deposit is included when receivable and the amount can be measured reliably by the charity; this is normally upon notification of the interest paid or payable by the bank.

Expenditure recognition

Expenditure is recognised as soon as there is a legal or constructive obligation committing the charity to the expenditure. All expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all costs related to the category.

Expenditure on charitable activities includes all costs associated with furthering the charitable purposes of the charity as described in the Trustees' Report.

Grants payable for the support of research or study in any areas of astronomy and geophysics are recognised in the financial statements as soon as the obligation has been authorised by the Grants Committee, which meets twice-yearly (ca. February and August) to allocate funds, the recipient has a reasonable expectation that they will receive a grant and any condition attaching to the grant is outside the control of the Society.

The costs of raising funds consist of room hire expenditure and RAS diaries bought for resale.

Allocation of support and governance costs

Support costs, including governance costs, represent indirect charitable expenditure. In order to carry out the primary purposes of the charity it is necessary to provide support in the form of personnel development, financial procedures, provision of office services and equipment and a suitable working environment.

Governance costs comprise audit fees, legal advice for trustees and costs associated with constitutional and statutory requirements, e.g. cost of trustee meetings and preparing statutory financial statements as well as costs associated with the strategic management of the Society

Support costs are apportioned based on the proportion of floor area occupied by, or proportion of staff time spent on, the activity.

Taxation

The Society is a registered charity and no liability to taxation arises on the results of its activities as applied for charitable purposes, with the exception of investment income, which is taxed at source.

Operating leases

Rentals under operating leases are charged to the statement of financial activities on a straight-line basis over the term of the lease.

Pension costs

The Society operates two pension schemes for employees and former employees. The assets of the schemes are held separately from those of the Society.

The Society operates a defined benefit pension scheme for former employees, who joined its service before 1 January 2002, providing benefits based upon final pensionable earnings. Royal London manages the pension scheme, with the investments now 100% held by Royal London.

The latest actuarial valuation at 31 December 2021 shows a pension surplus which is not recognised on the balance sheet as an asset because it is not available to the Society by way of reduced future contributions.

Actuarial gains and losses arising from new valuations and from updating valuations to the balance sheet date are recognised in the statement of financial activities as other recognised gains and losses.

The Society has established a second pension scheme (a defined contribution scheme) for employees who began service with the Society after 1 January 2002. The amount charged in the statement of financial activities in respect of the defined contribution pension scheme is the contributions payable in the year.

Foreign currencies

Monetary assets and liabilities denominated in foreign currencies are translated at the rate of exchange ruling at the balance sheet date. Transactions in foreign currencies are recorded at the rate ruling at the date of the transaction. All differences are taken to the statement of financial activities.

Heritage assets

Heritage assets are included in the financial statements at a historic valuation which is being treated as deemed cost. There are two main classes of heritage assets that the Society possesses, which are:

- Rare Books and Manuscripts
- Fine Art and Collectibles – Historic books, portraits, busts, instruments and antique furniture.

The Society's rare book and manuscript collection is reported in the balance sheet at a valuation by Christies in 1996, with a number of items re-valued by B Quaritch Limited in 2011. The valuation basis was High Auction Estimate.

The Society's fine art and collectibles are reported in the balance sheet at a valuation by Bonhams in 1992, including index linking, with a number of items revalued by Bonhams in 2011.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. The Society would only obtain a valuation of the donation, if it was deemed to materially affect the overall value of the heritage asset portfolio.

Depreciation is not charged on heritage assets due to immateriality based on their extremely long useful lives and high residual values.

Other tangible fixed assets

The Society capitalises tangible fixed assets with a cost greater than £250 and an estimated useful life over one year.

Tangible fixed assets are depreciated on cost on a straight line basis from the date of acquisition over their expected useful lives as follows:

- Telephone and security system and computer equipment .....4 years
- Leasehold Improvements ..... 20 years
- Plant and machinery .....10 years

Investments

Listed investments are a form of basic financial instrument and are initially recognised at their transaction value and subsequently measured at their fair value as at the balance sheet date using the closing quoted market price.

Realised gains (or losses) on investment assets are calculated as the difference between disposal proceeds and their opening carrying value or their purchase value where the investment is acquired subsequent to the first day of the financial year. Unrealised gains and losses are calculated as the difference between the fair value at the year end and their carrying value at that date. Realised and unrealised investment gains (or losses) are combined in the statement of financial activities and are credited (or debited) in the year in which they arise.

Debtors

Debtors are recognised at their settlement amount, less any provision for non-recoverability. Prepayments are valued at the amount prepaid.

Cash at bank and in hand

Cash at bank and in hand represents such accounts and instruments that are available on demand or have a maturity of less than three months from the date of acquisition.

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt.

Fund structure

Endowment funds comprise assets which normally must be held as capital. The income arising therefrom is used to support specific activities determined in accordance with the wishes of the donor.

Restricted funds comprise monies raised for, or their use restricted to, a specific purpose, or contributions subject to donor imposed conditions.

Designated funds represent monies set aside out of unrestricted funds and designated by the trustees for a specific purpose.

Unrestricted funds represent those monies which are freely available for application towards achieving any charitable purpose that falls within the Society's charitable objects.

NOTES TO THE FINANCIAL STATEMENTS

1. Donations and legacies

	Unrestricted funds £	**Restricted funds £**	**2021 Total funds £**	Unrestricted funds £	Restricted funds £	2020 Total funds £
Donations	**527**	**130**	**657**	31,064	3,000	34,064
Legacies	**173,030**	**—**	**173,030**	—	2,000	2,000
Total funds	**173,557**	**130**	**173,687**	31,064	5,000	36,064

2. Investment income

	Unrestricted funds £	**Restricted funds £**	**Endowment funds £**	**2021 Total funds £**
Income from listed investments	**140,726**	**7,707**	**54,974**	**203,407**
Bank interest	**413**	**19**	**134**	**566**
2021 Total funds	**141,139**	**7,726**	**55,108**	**203,973**

	Unrestricted funds £	Restricted funds £	Endowment funds £	2020 Total funds £
Income from listed investments	116,763	6,202	44,321	167,286
Bank interest	4,823	218	1,563	6,604
2020 Total funds	121,586	6,420	45,884	173,890

3. Income from charitable activities

	Unrestricted funds	
	2021 £	2020 £
Publications (note 4)	**4,416,135**	4,217,341
Membership	**375,992**	362,860
Scientific meetings	**15,228**	1,445
Public policy	**830**	2,297
Library	**2,503**	3,399
Educational	**2,083**	4,167
Other	**20,189**	3,675
Total funds	**4,832,960**	4,595,184

4. Publications

	2021 £	2020 £
Income		
Monthly notices of the Royal Astronomical Society	**3,276,424**	3,103,852
Geophysical Journal International	**1,046,248**	1,021,726
Astronomy & Geophysics	**86,703**	84,996
Other	**6,760**	6,767
	4,416,135	4,217,341
Expenditure		
Monthly notices of the Royal Astronomical Society	**2,435,372**	2,421,830
Geophysical Journal International	**651,209**	638,652
Astronomy & Geophysics	**189,458**	186,076
Other	**32,836**	22,432
	3,308,875	3,268,990

5. Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2021 £	Direct costs £	Support costs £	2020 £
Publications (note 4)	**2,926,637**	**382,238**	**3,308,875**	2,848,351	420,639	3,268,990
Scientific meetings	**11,924**	**185,195**	**197,119**	17,041	194,273	211,314
Membership	**7,203**	**43,979**	**51,182**	11,259	49,858	61,117
Educational	**171,284**	**73,480**	**244,764**	234,672	53,308	287,980
RAS 200	**19,285**	**4,000**	**23,285**	93,250	4,000	97,250
Library	**120,874**	**358,318**	**479,192**	110,178	370,781	480,959
Public policy	**69,265**	**73,558**	**142,823**	62,321	53,296	115,617
	3,326,472	**1,120,768**	**4,447,240**	3,377,072	1,146,155	4,523,227

Grants, fellowships and awards, in support of research, are principally included under Educational and RAS 200 above to reflect the responsibilities for the management and administration of grants. 57 grants, fellowships and awards – including the Norman Lockyer Fellowship, totalling £105,878 (2020 – £263,091) were made to institutions and 39 grants, fellowships and awards totalling £18,801 (2020 – £20,141) were made to individuals. Expenditure supporting the Norman Lockyer Fellowship totalled £4,505 before adjustments (2020 – £54,000), and one research fellowship ended during its first year contributing to credits to expenditure totalling £8,778 (2020 – £42,642). Adjustments to other grants, RAS200 and the Norman Lockyer Fellowship resulted in credits to expenditure totalling £13,364 (2020 – £34,442).

Total grant making support costs were £30,000 – (2020 £28,000).

A full list of all grantees and analysis can be found on the Society's website.

All expenditure on charitable activities is unrestricted except for £6,438 (which is entirely included within the educational category) which is restricted (2020 – £60,848).

6. Support costs

Support costs analysed by function are as follows:

	2021 £	2020 £
Executive	**123,363**	144,564
Finance	**97,591**	78,739
Facilities	**90,026**	83,858
Membership	**38,901**	34,965
IT	**74,065**	68,396
Policy, development and press	**100,990**	81,089
Burlington House	**151,804**	153,033
Other	**320,696**	324,218
Governance (note 7)	**123,332**	177,293
	1,120,768	1,146,155

Staff time (based on a review of staff time apportionment) and floor area, are used as bases of apportioning support costs over charitable activities.

7. Governance costs

	2021 £	2020 £
Auditor's remuneration (note 8)	**24,000**	25,325
Trustees' and Committee costs	**6,277**	23,914
AGM expenses	**8,353**	7,974
Staff time and other expenses	**84,702**	120,080
	123,332	177,293

8. Net income (expenditure) for the year

This is stated after charging:

	2021 £	2020 £
Depreciation	**122,230**	121,472
Auditor's remuneration:		
. Charity audit	**18,000**	19,250
. Pension scheme audit	**6,000**	6,075
. Other services	**—**	500
Operating lease rentals		
. Office equipment	**9,347**	9,750

9. Staff costs and remuneration of key management personnel

	2021 £	2020 £
Wages and salaries	**913,672**	864,583
Social security costs	**86,264**	89,979
Pension costs (see note 20)		
. Stakeholder pension scheme	**79,918**	72,379
. Death in service contributions	**4,531**	4,172
	1,084,385	1,031,113

During the year one employee of the Society earned between £80,000 and £90,000 (2020 – one employee earned between £70,000 and £80,000) and one employee earned between £60,000 and £70,000 (2020 – one). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £14,840 £ (2020 – £14,395).

The average number of employees was 24 (Administration 7, Outreach 2, Editorial 10, Library 2, House 1, Press & Policy 2) (2020 – 23).

The key management personnel of the charity in charge of directing and controlling, running and operating the charity on a day to day basis comprise the trustees and the Executive and Deputy Executive Directors. The total remuneration (including taxable benefits and employer's pension and national insurance contributions) of the key management personnel for the year was £187,172 (2020 - £182,069).

10. Transactions with Trustees

The trustees receive reimbursement for travel expenses actually incurred in attending meetings. The amount reimbursed during the year for 2 Trustees was £98 (2020 – £6,769).

Remuneration of £5,914 was paid to one Trustee during 2021 (2020 – £6,337 to one Trustee). By agreement with the Charity Commissioners (dated 14 June 2004, case No. 299189, Sealing No. 344/04) the Treasurer is paid an Honorarium. This is formally approved each year by Council.

Grants Made to Councillors

The following grants were made to Councillors during the year as part of the RAS grant awarding process. The recipients had no influence or part in the decisions on the award of these grants. For the most part the grant holders were not the main personal beneficiaries as the support was directly received by their students or meeting attendees. Excluding Councillors from the grants round completely is not seen as a satisfactory policy. It would strongly dissuade members from standing for election as Councillors and would be at variance with the accepted practice in Research Councils where members of grants panels are not excluded from applying. The process of grant review and award fully complies with the Nolan Principles and closely follows Government Research Council practice.

The grants were:

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of trustees as the Society).
- F A Paneth Meteorite Collection as disclosed in note 22. Dr Nigel Berman, Treasurer, is a Trustee and Professor Caroline Smith, Trustee, is Secretary of the F A Paneth Meteorite Collection
- A Summer Research Bursary of £1,200 and a £2,000 grant were awarded to students at the University of Glasgow, supervised by Professor Lyndsay Fletcher, Trustee.

11. Tangible fixed assets

a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	**Total £**
At 1 January 2021 and 31 December 2021	4,951,500	4,519,379	**9,470,879**

Fine art and collectible additions of £30,000 were recorded in 2020.

The rare book collection is preserved by storing in an air-conditioned, temperature-controlled environment; the fine art and collectibles are also continually preserved in order to maintain their values.

Certain heritage assets are on public display at exhibitions. The Society's Librarian controls access to those heritage assets which are kept at Burlington House.

b) Other assets

	Leasehold improvements £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	**Total £**
Cost					
At 1 January 2021	1,878,405	32,244	305,970	9,994	**2,226,613**
Additions	—	4,131	11,331	—	**15,462**
Disposals	—	—	(993)	—	**(993)**
At 31 December 2021	**1,878,405**	**36,375**	**316,308**	**9,994**	**2,241,082**
Depreciation					
At 1 January 2021	1,200,559	13,753	249,208	—	**1,463,520**
Charge for the year	93,964	3,482	24,784	—	**122,230**
Disposals	—	—	(993)	—	**(993)**
At 31 December 2021	**1,294,523**	**17,235**	**272,999**	—	**1,584,757**
Net book values					
At 31 December 2021	**583,882**	**19,140**	**43,309**	**9,994**	**656,325**
At 31 December 2020	677,846	18,491	56,762	9,994	763,093

12. Investments

	2021 Total funds £	2020 Total funds £
Market value at 1 January 2021	**8,514,773**	8,560,476
Net unrealised investment gains (losses)	**1,358,192**	(45,703)
Market value at 31 December 2021	**9,872,965**	8,514,773
Historical cost as at 31 December 2021	**4,917,081**	4,917,081

Investments comprise BNY Mellon: Newton Growth and Income Fund for Charities

The permanent endowment fund investments and movements in the unapplied total return are set out below.

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2021	**1,652,682**	**253,662**	**1,906,344**
Add: Total return			
. Investment income		**55,108**	**55,108**
. Net gains on listed investments		**369,272**	**369,272**
		424,380	**424,380**
Less:			
. Allocation to income from total return		**(281,404)**	**(281,404)**
At 31 December 2021	**1,652,682**	**396,638**	**2,049,320**

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2020	1,652,682	219,806	1,872,488
Add: Total return			
. Investment income		45,884	45,884
. Net losses on listed investments		(12,028)	(12,028)
		33,856	33,856
At 31 December 2020	1,652,682	253,662	1,906,344

When adopting total applied return with effect from 1 January 2015, in the absence of reliable records of the original donations, the trustees considered that the market values of the investments as recorded as at 1 January 2015 were appropriate to be considered as the initial value of the trust for investment. Since that figure sets the baseline below which disposals may not be made, taking a higher value than the actual original donations was considered to be prudent.

The Trustees have resolved that they wish to maintain the real value of the permanent endowment using the retail price index as a measure. Transfers to the restricted funds of £281,404 were made in the year (2020 – £nil).

13. Debtors

	2021	2020
	£	£
Trade debtors	**25,987**	21,988
Prepayments and accrued income	**1,061,782**	799,543
Other debtors	**25,085**	26,852
	1,112,854	848,383

14. Creditors

a) Amounts falling due within one year

	2021	2020
	£	£
Trade creditors	**116,601**	20,017
Accruals	**156,938**	130,466
Grants payable	**218,286**	250,342
Tax and social security	**200,918**	209,549
Deferred income	**1,039,016**	1,054,806
Other creditors	**62,197**	47,565
	1,793,956	1,712,745

b) Amounts falling due after more than one year

	2021	2020
	£	£
Grants payable	**119,163**	113,548

c) Deferred income

	2021	2020
	£	£
Balance as at 1 January 2021	**1,054,806**	1,012,898
Released to income	**(1,054,806)**	(1,012,898)
Income received from Fellows in advance	**60,920**	64,936
Publications income received in advance	**950,000**	950,000
Other income received in advance	**28,096**	39,870
Balance as at 31 December 2021	**1,039,016**	1,054,806

15. Endowment funds

	1 January 2021 £	Income £	Investment gains £	Transfers £	31 December 2021 £
Research and Grants funds:					
. Sir Norman Lockyer fund	**1,474,749**	**42,631**	**285,670**	**(217,694)**	**1,585,356**
. Other funds	**147,896**	**4,276**	**28,648**	**(21,832)**	**158,988**
	1,622,645	**46,907**	**314,318**	**(239,526)**	**1,744,344**
Benevolent fund	**92,827**	**2,683**	**17,981**	**(13,702)**	**99,789**
Library fund	**44,092**	**1,275**	**8,541**	**(6,509)**	**47,399**
Lectures & Awards fund	**146,780**	**4,243**	**28,432**	**(21,667)**	**157,788**
	1,906,344	**55,108**	**369,272**	**(281,404)**	**2,049,320**

	1 January 2020 £	Income £	Investment losses £	Transfers £	31 December 2020 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,448,558	35,496	(9,305)	—	1,474,749
. Other funds	145,269	3,560	(933)	—	147,896
	1,593,827	39,056	(10,238)	—	1,622,645
Benevolent fund	91,179	2,234	(586)	—	92,827
Library fund	43,309	1,061	(278)	—	44,092
Lectures & Awards fund	144,173	3,533	(926)	—	146,780
	1,872,488	45,884	(12,028)	—	1,906,344

The transfer of £281,404 in 2021 from the endowment fund to the restricted income fund was the extraction of investment income from the total return on fixed asset investments.

16. Restricted income funds

	1 January 2021 £	Income £	Expenditure £	Investment gains £	Transfers £	31 December 2021 £
Research & Grants fund	**521,871**	**3,815**	**(2,503)**	**25,560**	**239,526**	**788,269**
Benevolent fund	**29,492**	**130**	**(797)**	—	**13,702**	**42,527**
Library fund	**38,703**	**645**	—	**4,321**	**6,509**	**50,178**
Education fund	**112,989**	**3,266**	**(1,000)**	**21,887**	—	**137,142**
Lectures & Awards fund	**40,943**	—	**(2,138)**	—	**21,667**	**60,472**
	743,998	**7,856**	**(6,438)**	**51,768**	**281,404**	**1,078,588**

16. Restricted income funds (continued)

	1 January 2020 £	Income £	Expenditure £	Investment gains £	Transfers £	31 December 2020 £
Research & Grants fund	573,001	5,212	(55,500)	(842)	—	521,871
Benevolent fund	31,632	—	(2,140)	—	—	29,492
Library fund	38,307	537	—	(141)	—	38,703
Education fund	109,018	5,671	(1,000)	(700)	—	112,989
Lectures & Awards fund	43,151	—	(2,208)	—	—	40,943
	795,109	11,420	(60,848)	(1,683)	—	743,998

The Restricted Funds are consolidated into five groups to serve the Council's priorities and address modern needs: Research & Grants, Benevolent, Library, Education and Lectures & Awards.

A detailed fund summary can be found on the RAS website.

The restricted funds were classified to either Restricted (R), Endowment (E), Designated (D), or General (G) funds as indicated below:

Research & Grants fund

E AG Stillhamer Trust Fund (1937)
D EW Brown Trust Fund (1939)
E Plummer Bequest (1946)
G General
R Victor Nadarov Fund (1950)
E Sir Norman Lockyer Memorial Trust (1990)
R Hosie Bequest (2000)
D Mrs. J.M Jelley-Freeman Bequest (2000)
D CAG Bearpark Trust (2000)
R Patricia Tomkins Fund (2011)
G Special Purposes Fund
E E A Milne Travel Fund (2013)
R R Potter Research Fund (2017)
R Osmaston Fund (2020)

Benevolent fund

E Lee & Jansen Trust Fund (1834/1879)
E Gerald Merton Fund (1986)
G Donald R. Barber Fund (2001)

Library fund

E Turnor Fund and Horrocks Memorial Fund (1853/1876)
E Harry Watson Memorial Fund (1923)
E Warin Bushell Fund (1964)
E Gaythorp Bequest (1969)
E Ian Ridpath Conservation Fund (2006)
R Dewhurst Fund (2013)

Education fund

R Newbigen Fund (1990)
R Michael Penston Memorial Fund (1991)
R Sir William Hunter McCrea Memorial Fund (2000)
R Paul Ruffle Memorial Fund (2014)
D Education Committee

Lectures & Awards fund

E Hannah Jackson-Gwilt Trust Fund (1861/1893)
E George Darwin Lectureship Fund (1926)
E George Darwin Support Fund
D AS Eddington Commemoration Fund (1948)
E Harold Jeffreys Lectureship Fund (1962)
E AT Price Medal Fund (1999)
E Gerald Whitrow Memorial Lecture Fund (2001)
E Fowler Prizes Fund (2004)

17. Designated funds

	1 January 2021 £	New designation £	Utilised/ released £	31 December 2021 £
Accommodation fund	**1,000,000**	—	—	**1,000,000**
Burlington House fund	**646,800**	—	**(93,964)**	**552,836**
Heritage Asset fund	**9,470,879**	—	—	**9,470,879**
Building fund	**1,217,658**	—	**93,964**	**1,311,622**
Open Access fund	**392,596**	—	—	**392,596**
RAS 200	**161,718**	—	**(19,285)**	**142,433**
RAS 2020	**15,000**	—	**(15,000)**	—
Research and grants fund	**122,848**	**75,000**	**(75,187)**	**122,661**
Total designated funds	**13,027,499**	**75,000**	**(109,472)**	**12,993,027**

	1 January 2020 £	New designation £	Utilised/ released £	31 December 2020 £
Accommodation fund	—	1,000,000	—	1,000,000
Burlington House fund	740,764	—	(93,964)	646,800
Heritage Asset fund	9,440,879	30,000	—	9,470,879
Building fund	1,123,694	—	93,964	1,217,658
Open Access fund	393,440	—	(844)	392,596
RAS 200	254,968	—	(93,250)	161,718
RAS 2020	314,858	—	(299,858)	15,000
Research and grants fund	159,110	—	(36,262)	122,848
Total designated funds	12,427,713	1,030,000	(430,214)	13,027,499

(i) Accommodation fund

This fund represents the requirement to finance a possible relocation due to the ongoing negotiations concerning the lease at Burlington House.

(ii) Burlington House fund

Under lease agreements signed in 2005 with the Department of Communities and Local Government (previously Office of the Deputy Prime Minister - ODPM), the Society and four others in the Burlington House courtyard secured future occupancy on the basis of paying rent and additionally, being responsible for the external fabric of the building, following a renovation programme, carried out by the ODPM in mid-2006. In 2006-7, the Society executed a refurbishment project on the interior of the apartments. Expenditure incurred on the project has been capitalised and designated as the Burlington House fund.

(iii) Heritage Asset fund

A fund has been established to include the Society's heritage assets to recognise that there is no intention to dispose of these assets and the amount is not readily available to meet expenditure.

17. Designated funds (continued)

(iv) Building fund

The repairs and maintenance of the exterior of the building, its insurance and some security costs are carried out by the landlord for all the occupants and a proportion recharged to the Society. The Building Fund should provide for internal and external maintenance of the building and provide for the possibility, at the end of lease, if necessary, to obtain a building for the Society's use. The Finance Committee will recommend how much more to accumulate in this fund and at what rate. The timescale for expenditure is difficult to forecast but in principle could start within five years.

(v) Open Access fund

A fund has been established to provide against the risk of the possible collapse of the current business model for learned publishing due to various forms of open access. The timescale for expenditure is difficult to forecast but could in principle start within five years.

(vi) RAS 200

The original fund balance of £1,000,000 was the total committed grant expenditure for RAS 200. RAS 200 grant expenditure is being charged to this fund from 2015 to 2023.

(vii) RAS 2020

This represented the estimated expenditure associated with the RAS bicentenary celebrations, associated events and activities.

(viii) Research and grants fund

This represents those funds to be used for research and grants.

18. Analysis of net assets between funds

Fund balances at 31 December 2021 are represented by:

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2021 Total funds £
Tangible assets					
. Heritage assets	—	**9,470,879**	—	—	**9,470,879**
. Other fixed assets	**103,489**	**552,836**	—	—	**656,325**
Investments	**5,095,056**	**1,650,001**	**1,078,588**	**2,049,320**	**9,872,965**
Current assets					
. Debtors	**1,112,854**	—	—	—	**1,112,854**
. Cash at bank and in hand	**2,860,801**	**1,567,866**	**17,902**	—	**4,446,569**
Current liabilities	**(1,646,662)**	**(129,392)**	**(17,902)**	—	**(1,793,956)**
Non-current liabilities	—	**(119,163)**	—	—	**(119,163)**
Total net assets	**7,525,538**	**12,993,027**	**1,078,588**	**2,049,320**	**23,646,473**

18. Analysis of net assets between funds (continued)

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2020 Total funds £
Tangible assets					
. Heritage assets	—	9,470,879	—	—	9,470,879
. Other fixed assets	116,293	646,800			763,093
Investments	3,753,956	2,110,475	743,998	1,906,344	8,514,773
Current assets					
. Debtors	848,383	—	—	—	848,383
. Cash at bank and in hand	2,615,573	1,013,926	107,033	—	3,736,532
Current liabilities	(1,491,679)	(127,033)	(94,033)	—	(1,712,745)
Non-current liabilities	(13,000)	(87,548)	(13,000)	—	(113,548)
Total net assets	5,829,526	13,027,499	743,998	1,906,344	21,507,367

19. Leasing commitments

At 31 December 2021, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

Office equipment	**2021 £**	2020 £
Amounts payable within one year	**6,496**	6,898
Amounts payable between two and five years	**18,097**	26,133
	24,593	33,031

20. Pension schemes

A qualified actuary carried out a triennial review of the defined benefit scheme as at 1 January 2019; the actuarial valuation showed that the market value of the Scheme's assets was £823,000, which represents 141% of the benefits that accrued to members after allowing for expected future increases in earnings. The actuary has calculated that no contributions are payable from 1 January 2016.

Pension costs comprise £79,918 (2020 – £72,379) in respect of the defined contribution scheme and £4,531 (2020 – £4,172) in respect of Death in Service contributions.

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS 102 purposes, at 31 December 2021, shows a pension surplus of £472,000 (2020 – £368,000) which cannot be recognised as this is not available to the Society by way of reduced future contributions.

20. Pension schemes (continued)

Retirement benefits disclosure under FRS102 (continued)

The amounts recognised in the balance sheet are as follows:

	2021 £'000	2020 £'000
Present value of funded obligations	**(537)**	(548)
Fair value of scheme assets	**1,009**	916
Surplus not recognised	**(472)**	(368)
Surplus in scheme at end of the year and available to the Society	—	—

Changes in the present value of the defined benefit obligations are as follows:

	2021 £'000	2020 £'000
Opening defined benefit obligation	**548**	488
Interest cost	**8**	10
Re-measurement arising from changes in assumptions and experience	**(19)**	50
Closing defined benefit obligation	**537**	548

Changes in fair value of scheme assets are as follows:

	2021 £'000	2020 £'000
Opening scheme assets	**916**	911
Interest Income	**14**	19
Actual return on plan assets, excluding interest income	**79**	(14)
Closing scheme assets	**1,009**	916

The amounts recognised in other recognised gains and losses are as follows:

	2021 £'000	2020 £'000
Remeasurement of defined benefit obligation	**(19)**	50
Return on plan assets	**(79)**	14
Effect of surplus restriction	**98**	(64)
Total	—	—

The actual return on scheme assets was £93,000 (2020 – £5,000).

20. Pension schemes (continued)

Retirement benefits disclosure under FRS102 (continued)

The major categories of scheme assets as a percentage of total scheme assets are as follows:

	Fair value of scheme assets	
	2021	2020
	%	%
Equities	**25**	45
Bonds	**12**	17
Property	**6**	11
Cash	**8**	8
Gilts	**49**	19
	100	100

Principal actuarial assumptions at the balance sheet date (expressed as a weighted average):

	2021	2020
	%	%
Discount rate at 31 December	**2.1**	1.5
Retail Prices Index	**3.5**	3.1
Consumer Prices Index	**2.8**	2.4
Increases in deferment	**2.5**	2.4
Future pension increases – pension earned before 6 April 1997	**0.0**	0.0
Future pension increases – pension earned after 6 April 1997	**3.5**	3.1

The current mortality rate assumptions include sufficient allowance for future improvements in mortality rates. The assumed life expectancy for a pensioner retiring at 65 on the balance sheet date is:

	2021	2020
Retiring now		
Male	**20.2**	20.2
Female	**22.5**	22.4
Retiring in 20 years		
Male	**21.5**	21.5
Female	**23.9**	23.8

Amounts for the current and previous four periods are as follows:
Defined benefit pension scheme:

	2021	2020	2019	2018	2017
	£'000	£'000	£'000	£'000	£'000
Defined benefit obligations	**537**	548	488	461	493
Scheme assets	**1,009**	916	911	823	846
Surplus	**472**	368	423	362	353

21. Grants committed

Grants, principally fellowships and travel and research grants to the value of £347,981 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2020 – £287,819). These grants were not approved or communicated to the recipients until after the year end and therefore have not been accounted for in the year ended 31 December 2021.

22. Connected Charities and related party transactions

Since 2001, the Society has been the administration agent for the trustees of FA Paneth Meteorite Collection, a charity connected to the Royal Astronomical Society. The Paneth trustees decided that its income should support research in Cosmochemistry by graduate and postdoctoral students. The accumulated net expenditure of £46,772 (2020 – £36,916), is included in Other Creditors. Due to the Covid–19 pandemic and no grants were awarded (2020 - £nil). Total income was £10,261 (2020 - £8,439).

The Society also administers the Sir Norman Lockyer Memorial Trust, (charity registration number 900135). By agreement with the Charity Commission the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836-1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2013, 2016, 2019 etc. for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. During the year the Norman Lockyer Fellowship funded two ongoing fellowships. One fellowship ended after the first year and the other completed resulting in expenditure of £4,505 and after adjustments to expenditure, net expenditure of £1,003, (2020 £162,000). The fund balance, including the unspent balance in the restricted fund is £2,155,949 (2020 – £1,828,652)

Transactions involving Trustees are disclosed in note 10.

There are no other related party transactions requiring disclosure.



Royal Astronomical Society

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ROYAL ASTRONOMICAL SOCIETY

England & Wales - Charity number 226545

Accounts



Royal Astronomical Society

Annual Report & Financial Statements 2020

Royal Astronomical Society

Patron
Her Majesty the Queen

Trustees
Council members who served during 2020:

Prof. Emma Bunce (President-Elect until June 2020, President, G, from June 2020, University of Leicester)

Prof. Mike Cruise (President, A, until June 2020, University of Birmingham)

Prof. Mahesh Anand (Vice-President, G, Open University)

Dr Megan Argo (Councillor, A, until June 2020, Vice-President, A, from June 2020, University of Central Lancashire)

Dr Mandy Bailey (Secretary, A, Open University)

Dr Nigel M Berman (Treasurer, A)

Prof. William Chaplin (Councillor, G, University of Birmingham)

Prof. Phil Charles (Councillor, A, from June 2020, University of Southampton)

Dr Hannah Dalgleish (Councillor, A, from June 2020, University of Oxford/University of Namibia)

Dr Paul Daniels (Vice-President, A)

Prof. Lyndsay Fletcher (Senior Secretary, G, University of Glasgow)

Dr Claire Foullon (Councillor, G, University of Exeter)

Dr Stacey Habergham-Mawson (Vice-President, A, until June 2020, Liverpool John Moores)

Prof. Lorraine Hanlon (Councillor, A, University College Dublin)

Kevin Kilburn (Councillor, A)

Prof. Mark Lester (Secretary, G, University of Leicester)

Martin Lunn (Councillor, A)

Dr Jane MacArthur (Councillor, G, University of Manchester)

Dr Matthew Middleton (Councillor, A, University of Southampton)

Prof. Steven Miller (Councillor, G, until June 2020, Vice-President, G, from June 2020, University College London)

Dr Arvind Parmar (Councillor, A, from June 2020, ESA)

Dr Colin Snodgrass (Councillor, G, from June 2020, University of Edinburgh)

Dr Sheona Urquhart (Councillor, A, Open University)

Dr Indhu Varatharajan (Councillor, G, until June 2020, German Aerospace Center, Berlin)

Dr Clare Watt (Councillor, G, until June 2020, University of Reading)

Prof. Anton Ziolkowski (Vice-President, G, until June 2020, University of Edinburgh)

- Note: "A" signifies all areas of astronomy and astrophysics; "G" covers geophysics, solar–terrestrial physics and planetary sciences

Senior staff
Executive Director: Philip Diamond
Deputy Executive Director: Dr Robert Massey

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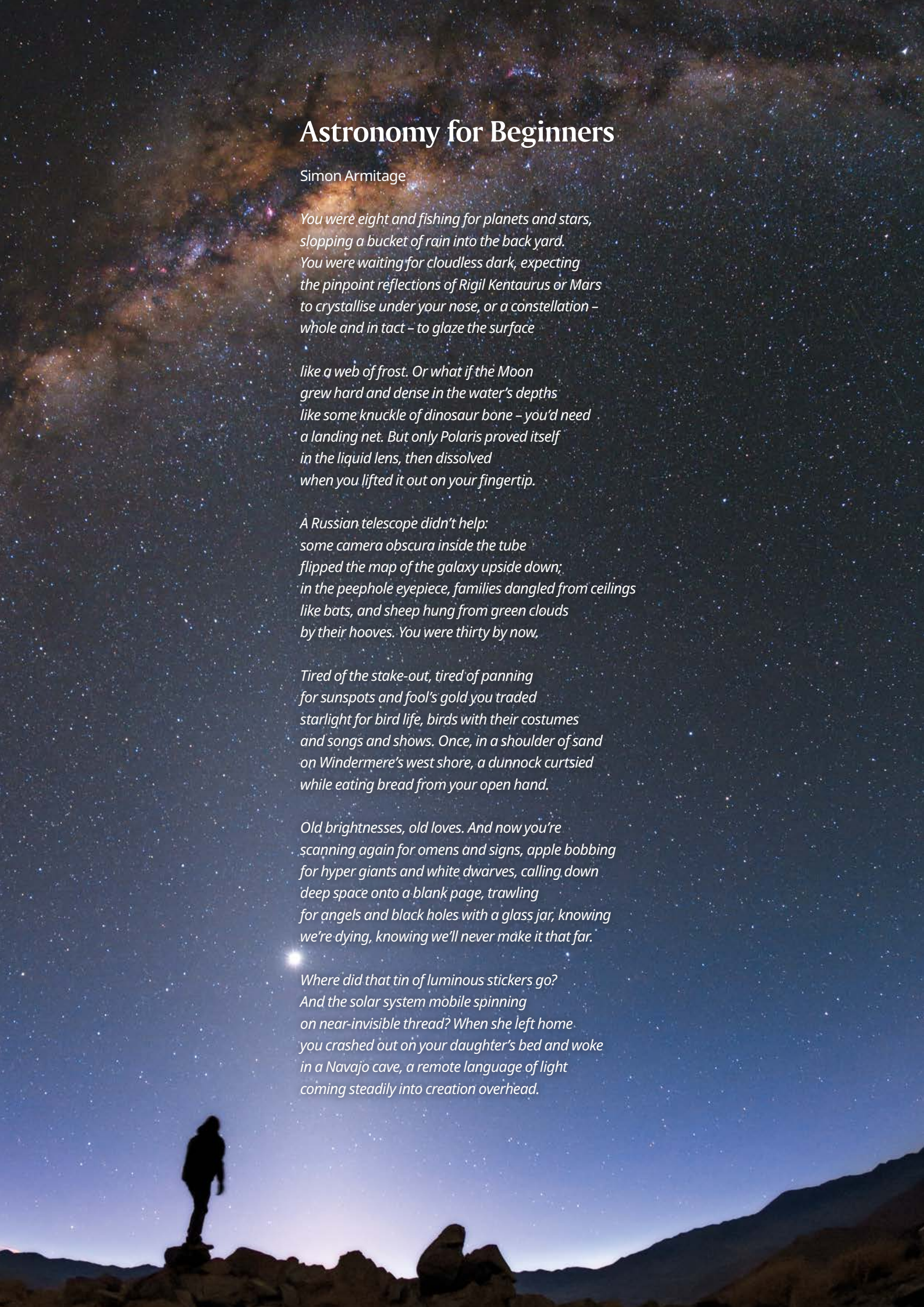
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COVER IMAGE A mosaic of Viking Orbiter images of Mars showing the 2000km long Valles Marineris system. Mars was the focus of National Astronomy Week 2020, supported by the RAS. (NASA/JPL-Caltech)

NEXT PAGE The Milky Way, zodiacal light and airglow from Chile. (ESO/B Tafreshi twanight.org)



Astronomy for Beginners

Simon Armitage

You were eight and fishing for planets and stars,
slopping a bucket of rain into the back yard.
You were waiting for cloudless dark, expecting
the pinpoint reflections of Rigil Kentaurus or Mars
to crystallise under your nose, or a constellation –
whole and in tact – to glaze the surface

like a web of frost. Or what if the Moon
grew hard and dense in the water's depths
like some knuckle of dinosaur bone – you'd need
a landing net. But only Polaris proved itself
in the liquid lens, then dissolved
when you lifted it out on your fingertip.

A Russian telescope didn't help:
some camera obscura inside the tube
flipped the map of the galaxy upside down;
in the peephole eyepiece, families dangled from ceilings
like bats, and sheep hung from green clouds
by their hooves. You were thirty by now.

Tired of the stake-out, tired of panning
for sunspots and fool's gold you traded
starlight for bird life, birds with their costumes
and songs and shows. Once, in a shoulder of sand
on Windermere's west shore, a dunnock curtsied
while eating bread from your open hand.

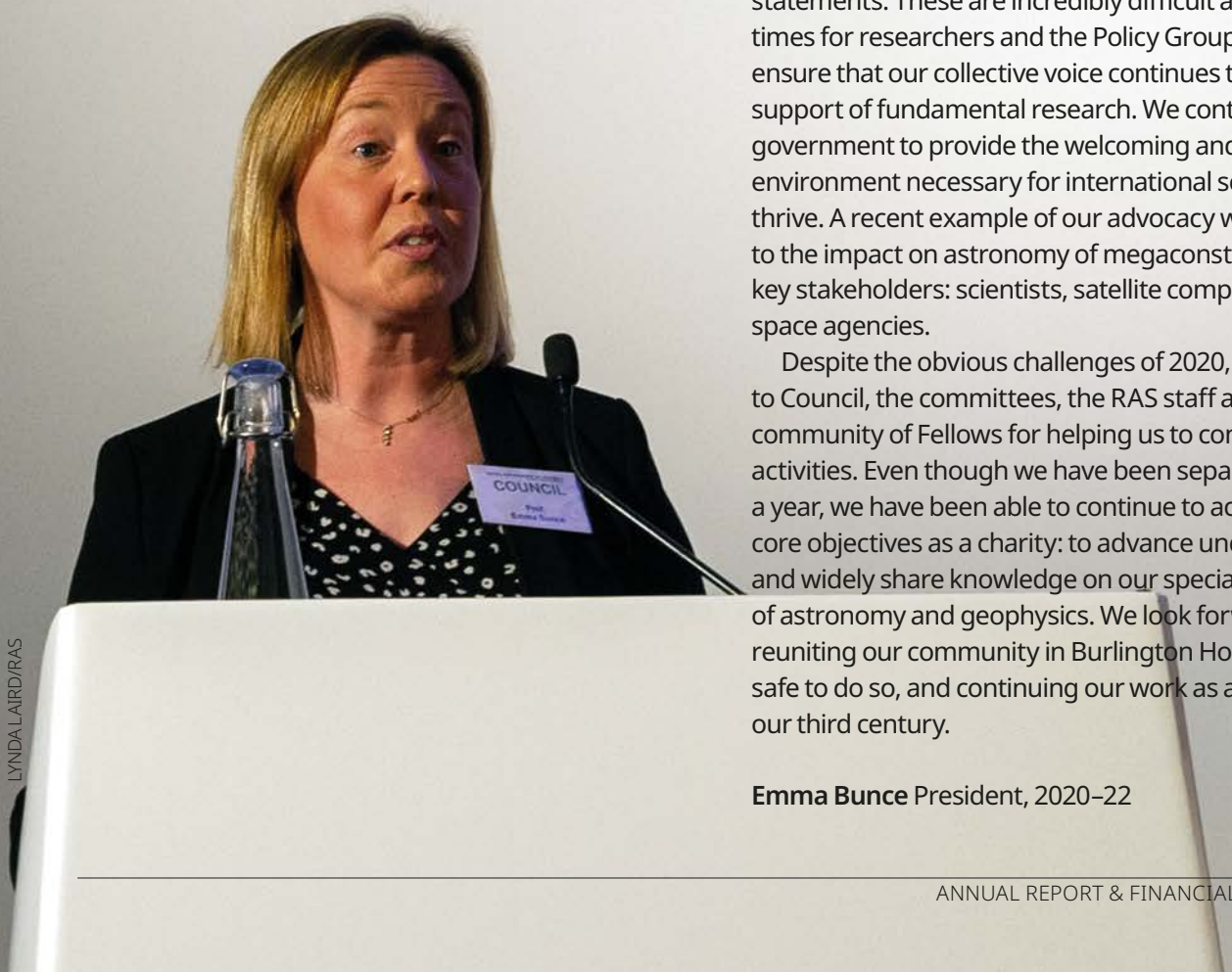
Old brightnesses, old loves. And now you're
scanning again for omens and signs, apple bobbing
for hyper giants and white dwarves, calling down
deep space onto a blank page, trawling
for angels and black holes with a glass jar, knowing
we're dying, knowing we'll never make it that far.

Where did that tin of luminous stickers go?
And the solar system mobile spinning
on near-invisible thread? When she left home
you crashed out on your daughter's bed and woke
in a Navajo cave, a remote language of light
coming steadily into creation overhead.

From Our President

Our *Annual Report* for 2020 is an opportunity to reflect on this exceptional year and outline some plans for the future. The Covid-19 pandemic changed every aspect of our lives during 2020, and it seems likely to continue to affect our daily lives for some time to come. During the first national lockdown last March, the RAS had to react quickly, not only closing Burlington House and providing for staff to work from home, but also regarding our meetings, including Council and, sadly, our bicentenary plans and the National Astronomy Meeting. Council decided to plan for a full season of online provision, to give clarity to organisers and attendees alike. As a result, we have run Council meetings via Zoom to continue our core business, while Ordinary Meetings, Specialist Discussion Meetings and the Bicentenary Public Lectures all moved completely online.

These meetings were very well attended and I have received many emails expressing thanks for them. For me personally they have provided an uplifting highlight and a reminder of the great research in our communities. The change in delivery also provided a more accessible and inclusive option for Fellows outside London – or, indeed, the UK – who cannot normally travel to Burlington House. This is a great improvement and we will continue to provide quality online access in future, as well as returning to face-to-face meetings when it is safe to do so.



LYNDA LAIRD/RAS

Our wonderful outreach and education team delivered online classes to preschool, primary and secondary-age children and families, again reaching far beyond the UK to Cyprus, South Korea, India, Australia, UAE and France.

Despite our concerns regarding the impact of the pandemic, our journals continued to thrive, with ever more papers submitted. We saw a 7% increase in submissions to *GJI* and 10% to *MNRAS*. In addition, we have moved ahead with plans to launch a new journal.

An exciting new venture for the Society in 2020 was the creation of the Early Career Network. This is being run by, and will represent the views of, early-career Fellows. The Early Career Online Poster Exhibition in September was the network's first event, showcasing the work of 270 researchers. I took part in the judging and the quality of research presented was outstanding. The popularity of this inaugural event is an indication that there is a real appetite for this kind of network to support a key part of our community.

The Society has maintained its well-respected contributions to the UK policy debate by means of responses to government consultations and RAS policy statements. These are incredibly difficult and uncertain times for researchers and the Policy Group works to ensure that our collective voice continues to be heard in support of fundamental research. We continue lobbying government to provide the welcoming and supportive environment necessary for international science to thrive. A recent example of our advocacy work relates to the impact on astronomy of megaconstellations with key stakeholders: scientists, satellite companies and the space agencies.

Despite the obvious challenges of 2020, I am grateful to Council, the committees, the RAS staff and our community of Fellows for helping us to continue our activities. Even though we have been separated for over a year, we have been able to continue to achieve our core objectives as a charity: to advance understanding and widely share knowledge on our specialist subjects of astronomy and geophysics. We look forward to reuniting our community in Burlington House when it is safe to do so, and continuing our work as a Society into our third century.

Emma Bunce President, 2020–22

2020: Our Bicentenary

The Society had planned a year of celebrations and special activities for the year of our bicentenary, including a celebratory evening, Bicentenary Public Lectures and a National Astronomy Meeting in our first President William Herschel's home town, hosted by the University of Bath. The Covid-19 pandemic disrupted these plans as well as ordinary Society activities. Some events took place as intended, others were modified or postponed and a few were cancelled. Creative thinking and hard work by RAS staff made sure that the Society's work continued.

Celebration

The year began with an evening celebration at the Langham Hotel in London, introduced by President-Elect Emma Bunce. Some 300 Fellows and guests heard an entertaining address by Astronomer Royal Martin Rees. The evening also featured a poem written for the occasion by Poet Laureate Simon Armitage (see page 4). We were also delighted to receive, from coin and medal specialist Margaret Morris, the very generous gift of the Gold Medal awarded to John Herschel in 1826. We are grateful to have in our collection a tangible link to one of our most significant Fellows.

Executive Director Phil Diamond spoke about the future, talking to people who have benefited from RAS support. Jo Barstow spoke about her RAS Research Fellowship, and Manasvee Saraf described her undergraduate research placement. And Charlotte Grundy of Girlguiding UK, one of our bicentenary projects, spoke about the value of RAS200: Sky & Earth for girls and young women.



RAS Executive Director Philip Diamond shows off the Gold Medal returned to the Society by Margaret Morris.





Above: The Society's new monthly podcast has kept going through the pandemic.

Right: Astronomer Royal and former President of the RAS Martin Rees addressing the audience at the Bicentenary celebration evening in January.



RAS200

RAS200 is the major RAS outreach programme initiated in 2013 to celebrate the Bicentenary. The Society has been working with 12 specialist charities and organisations over the past six years to reach new audiences: more than 130,000 people had engaged with our sciences by the end of 2020. Many of the projects had planned events to celebrate the RAS Bicentenary in 2020 that were cancelled or postponed as a precaution against Covid-19.

Online meetings

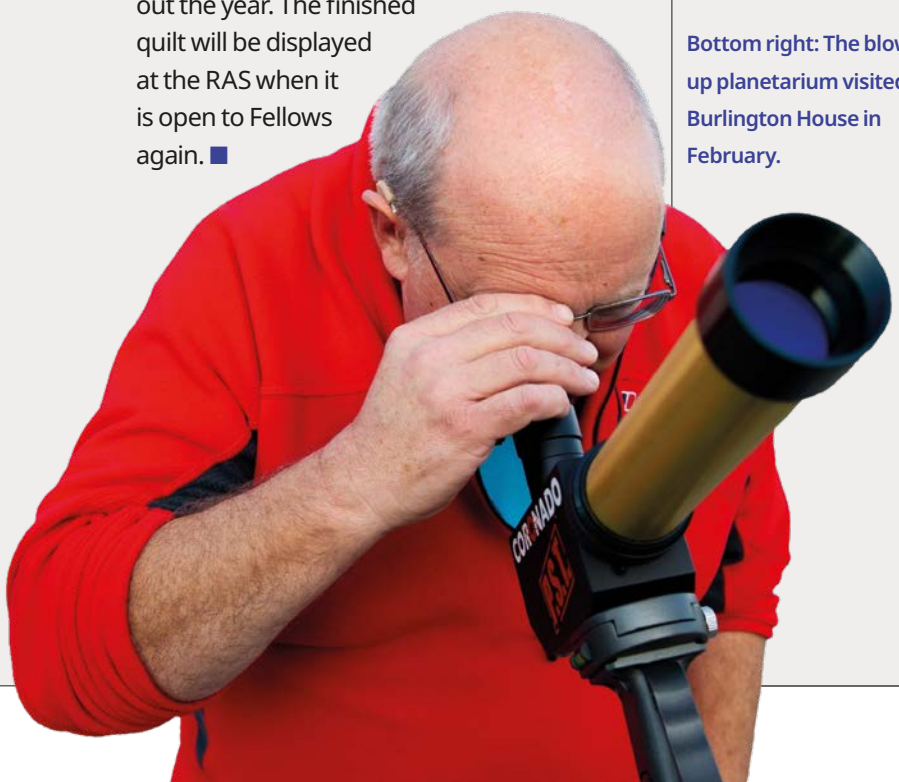
The RAS decided in March 2020 to move all Specialist Discussion Meetings and Ordinary Meetings online for the rest of the academic year. The 2020 National Astronomy Meeting, planned to take place in Bath, was postponed until 2021. Recognising the importance of NAM for early-career scientists, especially, the Society organised a very well received online poster session through the new Early Career Network. The Community Session, a fixture at NAMs in recent years, also took place virtually. We were unable to congratulate the winners of our 2020 medals and awards in person, but we saw them all online at our Virtual Awards Ceremony, hosted by our President.

Prof. Bunce also featured in an episode of *The Life Scientific* on BBC Radio 4 in March,



in which she spoke about the bicentenary of the Society, as well as discussing her life and career in space science.

Other celebratory events planned for the Bicentenary have gone ahead, some in slightly different forms. An inflatable planetarium appeared in the Burlington House courtyard from 15–28 February and more than 2500 people attended the free shows. *The Supermassive Podcast* appeared monthly throughout the year, and the Bicentenary Public Lectures, planned to take place at locations outside London, were instead mostly given online, gaining larger audiences from across the world. The Bicentenary Quilt project, led by the RAS Membership Officer, also became a virtual project with online sewing sessions throughout the year. The finished quilt will be displayed at the RAS when it is open to Fellows again. ■





Left: RAS200 partners Girlguiding UK provided activities and meetings online during lockdown, while Care4Carers (below) focused their efforts on practical supports for their clients.



Right and top right: Two of the completed patches from the RAS Bicentenary Quilt, depicting Jupiter and a solar eclipse.



Right: Most of the planned Bicentenary Public Lectures were moved online.



Bottom right: The blow-up planetarium visited Burlington House in February.

Objectives

The RAS exists to advance, and to record the history of, our understanding of the Earth, the solar system, the stars and galaxies, and the nature of the universe. It does this by promoting astronomy and geophysics, interdisciplinary sciences that encompass and further our understanding of physics, chemistry, mathematics, biology, engineering and computer science to answer deep questions about the origin and fate of the cosmos, and people's place in it. Through this the Society contributes to the growth and dissemination of knowledge and thereby fulfils its charitable objective of serving the public interest.

The Society refers to the Charity Commission's general guidance on Public Benefit when reviewing its aims and objectives and in planning future activities. These disclosures comply with the Charities Act 2011.

Our objectives for 2020 fall within two broad areas: advancing understanding and sharing knowledge; the organisation of the Society supports these goals.

The Society's principal objectives are to:

- Publish high-quality peer-reviewed journals
- Support students and early-career scientists through research fellowships and grants
- Recognise achievement through its medals and prizes
- Maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures
- Sustain our Library and Archive service
- Continue our political engagement
- Maintain our programme of education and outreach activity, including Friends of the RAS
- Promote the work of the Society and Fellows in the media and on social media
- Build our outreach work with other Courtyard Societies.

In 2020, the Society planned, in addition, to:

- Establish a Sustainability Working Group to address the local and wider environmental impact of astronomy, space science and geophysics
- Establish a Property Working Group to explore a range of options for the Society's accommodation in the future
- Launch an Early Career Network to support its young Fellows.

Advancing Understanding



During 2020, the Library supplied materials for an exhibition in Sydney on early colonial astronomy. Augmented reality using an iPad brings Governor Thomas Brisbane's star chart alive. (Created by K Richards, J Harle, M F Valenzuela and WSU students L Parsons, H Chourbaji, N Lamoridan, and M Ly. Photo by J Perera)

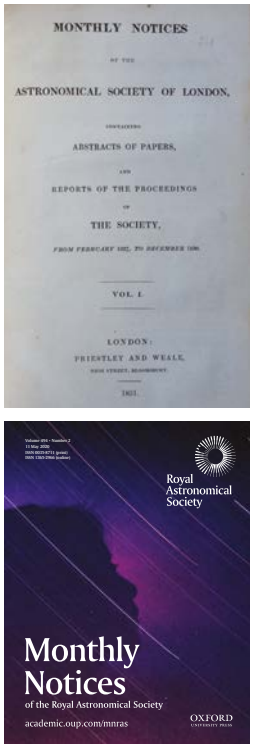
The RAS is committed to advancing understanding of our sciences by:

- Publishing journals
- Supporting scientists financially with fellowships and grants
- Organising scientific meetings
- Recognising excellence through awards
- Running a Library and Archive for research
- Producing a magazine for our members
- Lobbying government
- Promoting diversity in our community
- Supporting early-career researchers

Journals

The Society publishes two academic peer-reviewed journals which are world-renowned: *Monthly Notices of the Royal Astronomical Society* (*MNRAS*) and *Geophysical Journal International* (*GJI*). *MNRAS* publishes the results of original research in astronomy and astrophysics, including work which is observational, theoretical or concerned with astronomical instrumentation and software. *GJI* publishes articles on all aspects of theoretical, computational, applied and observational geophysics. Both journals receive submissions from authors worldwide. The peer-review process is overseen by an editorial team of eight assistant editors and the Publishing Manager, Kim Clube. Profiles of all of our scientific editors and editorial team can be found on our website at ras.ac.uk/journals/Editorial-Boards-and-Team.

The impact factor of a journal reflects the frequency with which articles are cited in the scientific literature. In 2020, *MNRAS* achieved an impact factor of 5.356, there were 3,969,893 article downloads, 5196 articles were submitted and 4208 articles were published. There are 26 scientific editors and Prof. David Flower continued as editor-in-chief. *GJI* received an impact factor of 2.574, published 582 papers in 2020, received 1264 submissions and there were 1,811,851 article downloads. Prof. Joerg Renner remained as editor-in-chief and there are currently 33 editors. Despite the pandemic, both journals saw an increase in submissions in 2020, with *MNRAS* showing a 10% increase compared with 2019, and *GJI* a 7% increase.



The first and the last paper issues of *Monthly Notices*, from 1831 and 2020. It continues in a digital-only format now.

Due to a decrease in the demand for print, *MNRAS* moved to online-only publication in 2020, a year earlier than planned due to the disruption caused by the pandemic. The final paper issue was volume 493, issue 2.

The *MNRAS* annual editorial board meeting was held in March and the *GJI* board meeting was held in October, both via Zoom. This meant a very early 5 a.m. meeting for those editors on the west coast of the USA, and a midnight meeting for those in Australia. Annual reports are prepared for these meetings to look at performance and agree plans for the next year. The Publications Management Committee met in April as usual.

Our subscription business model means that it is free for authors to publish in our journals unless papers exceed 20 pages in length, in which case there is an excess page charge of £50 per page over the limit. The journals are "hybrid" journals as authors can opt to pay for Open Access if they wish to make their paper freely available to everyone. Very few authors opt to pay for Open Access as our self-archiving policy allows them to upload their papers to institutional or subject repositories and free public servers. Some content, such as Zooniverse (citizen science project) papers, special issues and *GJI* Express Letters, are freely available online. Members also have free online access to the journals.

Our journals are published by Oxford University Press (OUP), who have been our publishing partner since 1 January 2013. The journals had new branding and covers in 2020 to mark the Society's bicentenary. New and improved content was added to the website and includes articles written by the editorial team on the history of our journals and on publishing in the future: ras.ac.uk/journals.

We help early-career researchers to communicate their research effectively by running workshops at conferences, and engage with and support our community through our journals' Twitter account (@RAS_Journals), which has a growing following. There were two winners of the *GJI* student prize for best paper in 2020 – Daniele Brandt and Kenny Graham – who received a cash prize and certificate. Their papers are freely available at ras.ac.uk/news-and-press/news/gji-2020-student-author-award-winners-announced.

Research fellowships and grants

59 grants, fellowships and awards – including the Norman Lockyer Fellowship – totalling £263,091 were made to institutes, and 59 grants, fellowships and awards totalling £20,141 were made to individuals. Expenditure supporting the Norman Lockyer Fellowship totalled £54,000, and one research fellowship ended during its final year contributing to credits to expenditure totalling £42,642. Adjustments to other grants resulted in credits to expenditure totalling £34,442.

The Society supported four research fellowships and the RAS Norman Lockyer Fellowship during 2020:

Dr Elisa Chisari (University of Oxford): Accurate astrophysics for the next era of cosmology

Dr Thomas Collett (University of Portsmouth): Fundamental physics with gravitational lensing

Dr Amy Gilligan (University of Aberdeen): When subduction stops: understanding tectonic process in post-subduction settings

Dr Matt Nicholl (University of Edinburgh): Superluminous supernovae: a comprehensive observational and theoretical study of Nature's brightest fireworks

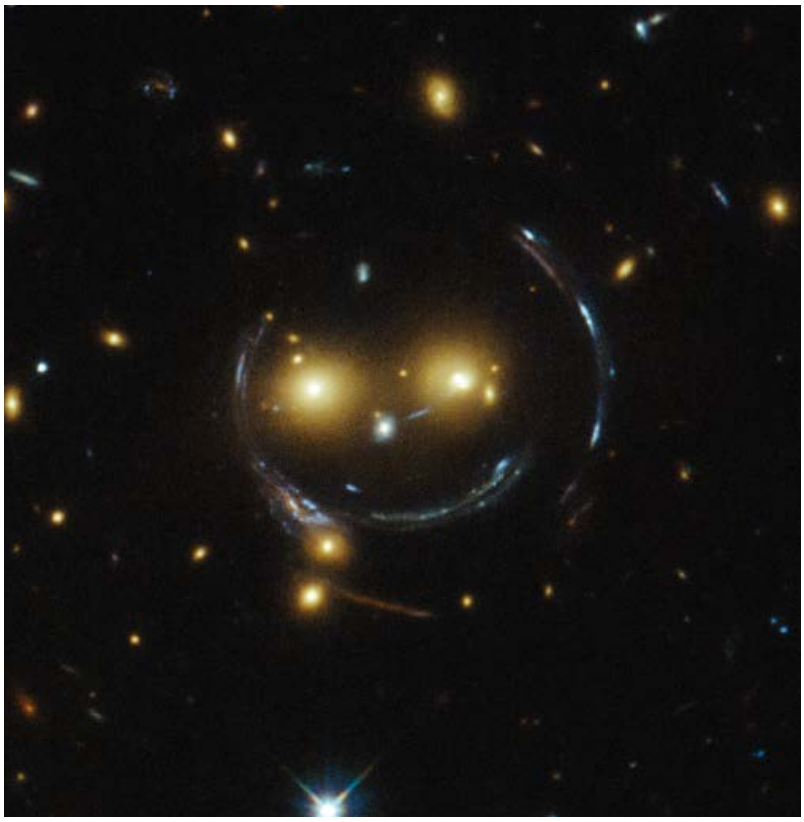
RAS Norman Lockyer Fellowship:

Dr Vinesh Maguire-Rajpaul (University of Cambridge; until September 2020): Transforming the search for Earth-like planets with advanced modelling tools

Dr Cyrielle Opitom (Royal Observatory Edinburgh; from November 2020): Cometary ices and the role of coma evolution: understanding the impact of coma evolution on comet taxonomies

Scientific meetings

The RAS meetings during 2020 were affected by Covid-19 precautions; 11 out of the normal 16 Specialist Discussion Meetings took place, six of them online and one as a hybrid meeting, at Burlington House and online. The remaining SDMs were postponed. Six Ordinary Meetings took place, four of them virtually; the online meetings had larger audiences than typical in Burlington House, with almost 400 at the October meeting. The National Astronomy Meeting (NAM) was postponed until 2021, but the RAS held a community meeting online. RAS President Prof. Emma Bunce chaired the session, with presentations from and a discussion with Prof. Mark Thomson, executive chair of the Science and Technology Facilities Council (STFC), and Dr Graham Turnock, chief executive officer of the UK Space Agency (UKSA). The turnout was larger than normal for the Community Session at NAM, with 382 viewing online and a further 607 on the RAS YouTube channel.



Gravitational lenses such as this one are a happy discovery for astronomers such as RAS Research Fellow Thomas Collett, who uses them to explore fundamental physics. (NASA/ESA)



Vinesh Maguire-Rajpaul, Norman Lockyer Research Fellow: "It's given me freedom to conduct my own programme of astronomical research, and also allowed me to pursue astronomy education research." (Victoria Maguire-Rajpaul)

Specialist Discussion Meetings held in 2020:

Radiation belt modelling in the post Van Allen Probes era

Radiation hydrodynamics: implementation and application

UK Solar System Atmospheres Community Meeting

Galactic disc and halo dynamics towards Gaia EDR3

The near-Sun solar wind at solar minimum

Biosignature identification in habitable martian environments

The new window on transients and variable-star astronomy with the Rubin Observatory

Modelling and observing the lower solar atmosphere: new solutions to old problems

Progress in astrophysics with Type Ia supernovae

Analysis of returned extraterrestrial materials: current capabilities and future opportunities

Exploring the transient universe into the 2030s



Prof. Yvonne Elsworth was awarded the RAS Gold Medal in Geophysics, recognising both her pioneering solar physics research and her service to the scientific community.

Ordinary Meetings held in 2020:

Dr Allan Chapman (Wadham College, University of Oxford): Ancestors and descendants: the RAS and the origins of the British learned society, 200 years on

Prof. Anton Ziolkowski (University of Edinburgh): Understanding the physics of planet Earth

Dr Megan Argo (University of Central Lancashire): The next blink of a cosmic eye: astronomy in the next 200 years

Dr Philippe Escoubet (ESA) *Group Achievement G Award 2019* Cluster: the first mission probing the Sun–Earth connection in 3D

Prof. Jo Bovy (University of Toronto): The Milky Way in the era of large astronomical surveys

Dr Jasmine Sandhu (University College London): Outreach – a postdoc's perspective

Dr Elisa Chisari (Utrecht University): *RAS Research Fellow* Galaxy shapes as a tool for cosmology and galaxy evolution

Dr Peter Wyper (University of Durham): *RAS Research Fellow* Simulations of eruptions from the Sun's corona: what can we learn?

Dr Timothy Craig (University of Leeds): *Winton G Prize 2019* Bending and breaking subducting tectonic plates

Prof. Stuart Bale (University of California, Berkeley): The Parker Solar Probe – the mission and its first results

STFC, UKSA, ESA: RAS Community Meeting

Prof. Ofer Lahav (University College London): *George Darwin Lecture 2020* Darkness visible: AI in cosmological experiments

382 PEOPLE ATTENDED THE RAS COMMUNITY SESSION

Dr Amaury Triaud (University of Birmingham): *Fowler A Award 2020* The ultracool dwarf and the seven planets

Dr Josh Nall (Whipple Museum of the History of Science, University of Cambridge): Calculation and conflict: anniversary reflections on the early history of the RAS

Dr Craig Magee (University of Leeds): *Fowler G Award 2020* Seismic reflection data and space exploration

Prof. Richard A Harrison MBE (chief scientist, RAL Space): Imaging solar coronal mass ejections in the heliosphere: from STEREO to Lagrange

Awards

The Society recognises outstanding achievements among early-career researchers as well as celebrating career-long excellence and service to our sciences. These are the recipients of the 2020 awards and medals:

Gold Medal in Astronomy Prof. Sandra Moore Faber (University of California, Santa Cruz, and the Lick Observatory)

Gold Medal in Geophysics Prof. Yvonne Elsworth (University of Birmingham)

Eddington Medal Prof. Steven Balbus (Oxford University)

Chapman Medal Prof. Cathryn Mitchell (University of Bath)

Herschel Medal Prof. Robert Fender (Oxford University)

Price Medal Dr Philip Livermore (University of Leeds)

Jackson-Gwilt Medal Prof. Roland Bacon (University of Lyon)

Agnes Mary Clerke Medal Dr Michael Hoskin (Churchill College Cambridge)

Annie Maunder Medal Dr Roberto Trotta (Imperial College, London)

Patrick Moore Medal Dr Caroline Neuberg (Fulneck School, Leeds)

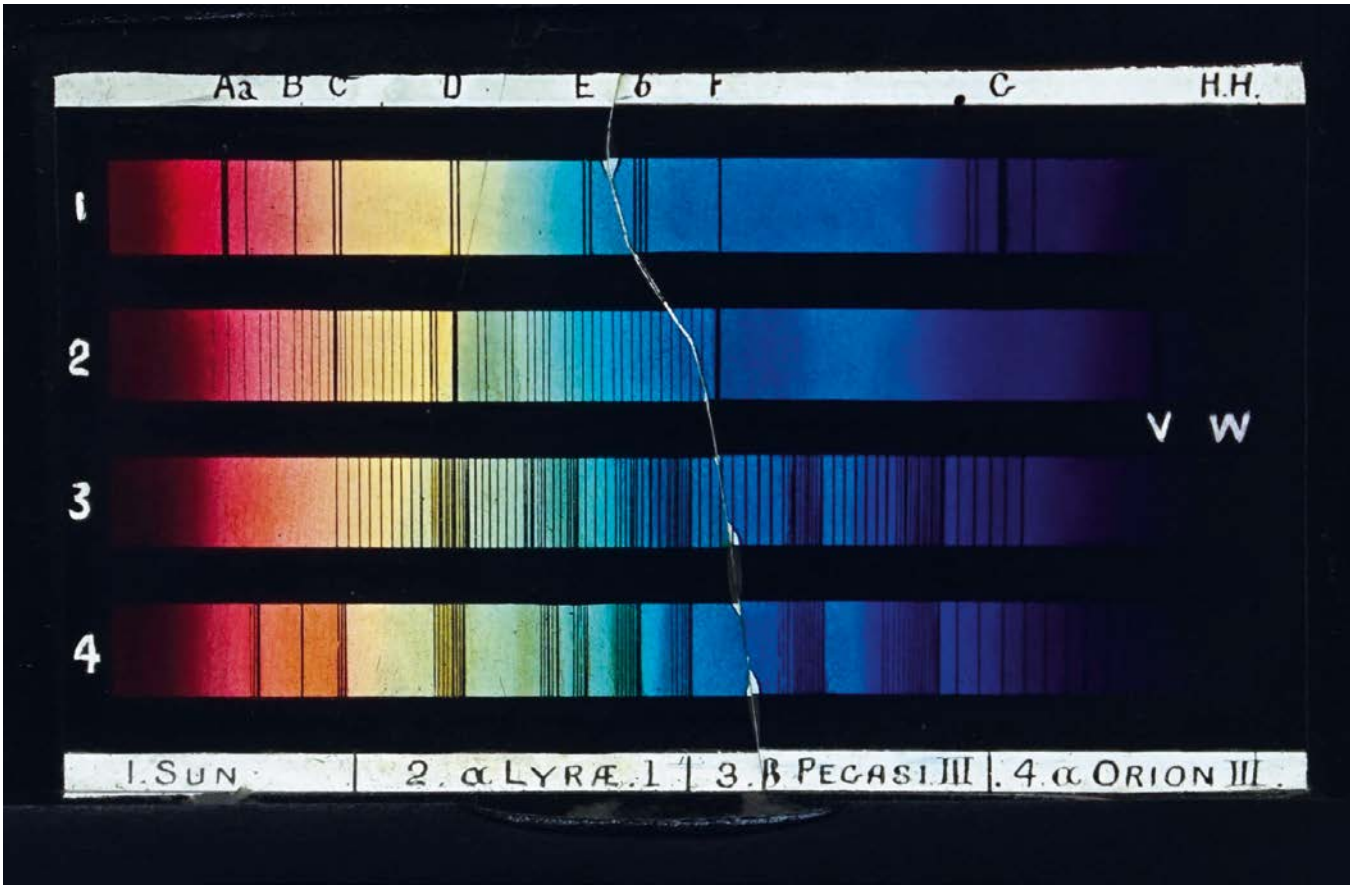
Award for Service to the Astronomy and Geophysics Community Kim Burchell (Science and Technologies Facilities Council)

Fowler Award for Astronomy Dr Amaury Triaud (University of Birmingham)

Fowler Award for Geophysics Dr Craig Magee (University of Leeds)

Winton Award for Astronomy Dr Thomas Collett (University of Portsmouth)

Winton Award for Geophysics Dr Michele



Bannister (Queen's University Belfast)

Group Achievement Award in Astronomy The Astropy Project

Group Achievement Award in Geophysics The Stereo Heliospheric Imagers Team

Gerald Whitrow Lectureship Prof. Andrew Pontzen (University College London)

George Darwin Lecture Prof. Ofer Lahav (University College London)

James Dungey Lecture Prof. Sarah Matthews (Mullard Space Science Laboratory, University College London)

Library and Archive

Burlington House was closed for most of the year, so we saw very few visitors to the Library in 2020. We received over a hundred research enquiries throughout the year, mainly from individual researchers. Some came from broadcasters, including National Geographic and *The Sky at Night*, who used several RAS historical sunspot images in an animated sequence (bbc.co.uk/iplayer/episode/m000kxjy/the-sky-at-night-stars-a-matter-of-life-and-death). Library staff also facilitated research for the National Gallery's *Conversations with God: Jan Matejko's Copernicus* exhibition and provided images for an exhibition on Thomas Brisbane in Australia, among others.

Solar and stellar spectra on a glass lantern slide used by Mary Proctor (1862–1957), one of our first women Fellows. She was a prolific and successful professional lecturer on astronomy, and the author of 16 books. The RAS is cataloguing the thousands of fragile glass slides in its care. (RAS)

MORE THAN **1000 PEOPLE** ATTENDED SPECIALIST DISCUSSION MEETINGS

A seminar with artist Kate Bernstein about her book *Measuring the Heavens* and the RAS Library in general for University of the West of England Centre for Print Research attracted an audience of around 50 (cfpr.uwe.ac.uk/print-in-conversation-artists-in-the-library-21-may-2020).

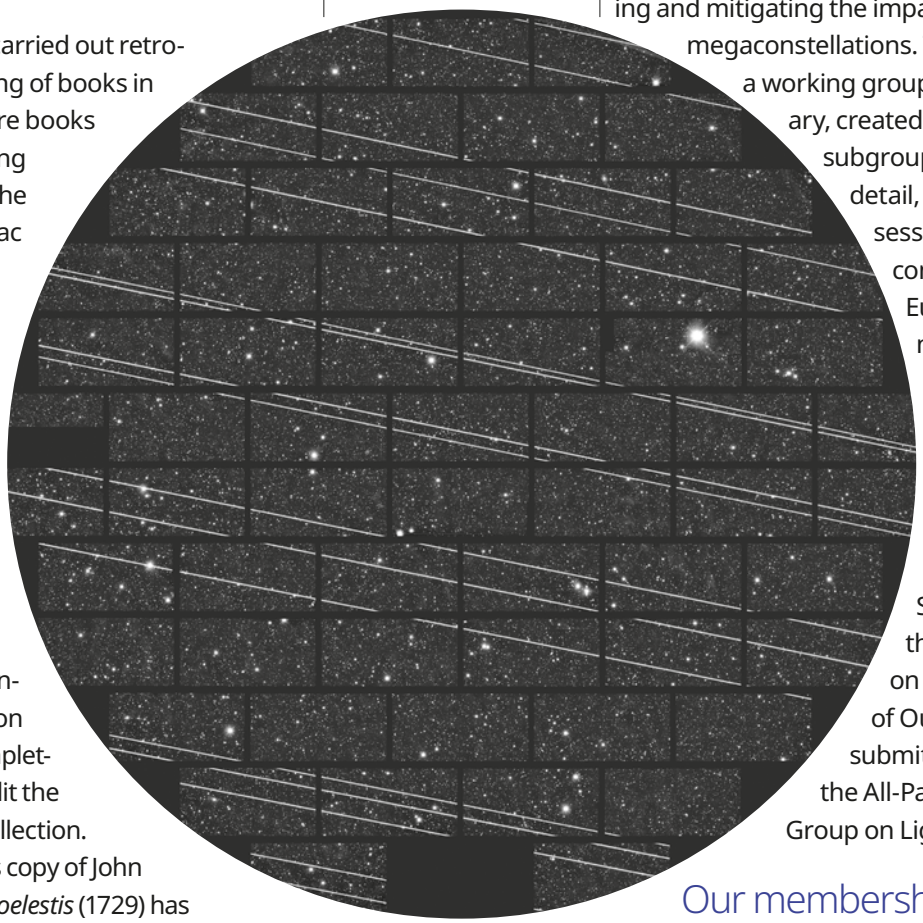
This extraordinary year has also presented an opportunity for behind-the-scenes work. Library staff have made progress with revisions to the catalogue of archives and manuscripts started in 1978. The descriptions have been revised to modern standards, enhanced and added to the Jisc Archives Hub, where they will include consistent information about the creator, and the scope and content of the materials. This remains a work in progress.

Working with Jisc, we have now uploaded all online RAS Library catalogue records to Library Hub Discover, the database of 172 national, academic and specialist library catalogues, where it will be available to the public at some time in the future. This means, for example, that when researchers use the database to find out which libraries in the UK and Ireland hold first editions of Isaac Newton's

Principia Mathematica, our copies will be in the search results.

Staff have also carried out retrospective cataloguing of books in the reserve and rare books collections, including our two copies of the 1687 edition of Isaac Newton's *Principia Mathematica*. This is part of a project to develop online catalogue records.

In spite of the closure of Burlington House, Library staff have continued with environmental monitoring and collection management, completing a project to audit the reserve journals collection. Caroline Herschel's copy of John Flamsteed's *Atlas Coelestis* (1729) has been conserved in preparation for digitisation.



Starlink satellite trails in a 5-minute exposure from the Blanco 4m telescope at the Cerro Tololo Inter-American Observatory in Chile. (NSF's National Optical-Infrared Astronomy Research Lab/CTIO/AURA/DELVE)

Diversity

The Society carried out a survey on harassment and bullying in our community, getting responses from more than 600 people across the astronomy, space science and geophysics sectors.

In May, the RAS formally established the Early Career Network, bringing together undergraduate and postgraduate students, and postdoctoral researchers to give them a stronger voice in the Society. One of its first pieces of work was a highly successful online poster competition, which attracted 272 entries from 47 countries and generated valuable scientific discussion on social media.

Political engagement

The Society responded to the UK parliament Science and Technology Select Committee inquiry into proposals for a new funding agency. In December, the RAS solicited views on diversity in astronomy and geophysics for the All-Party Parliamentary Group on Diversity and Inclusion in STEM.

We continued to work on understanding and mitigating the impact of satellite megaconstellations. The RAS hosted a working group meeting in January, created optical and radio subgroups for technical detail, and co-organised sessions and a press conference at the European Astronomical Society annual meeting.

We also took part in the international development of the Dark and Quiet Skies report for the UN Committee on the Peaceful Uses of Outer Space, and submitted evidence to the All-Party Parliamentary Group on Light Pollution.

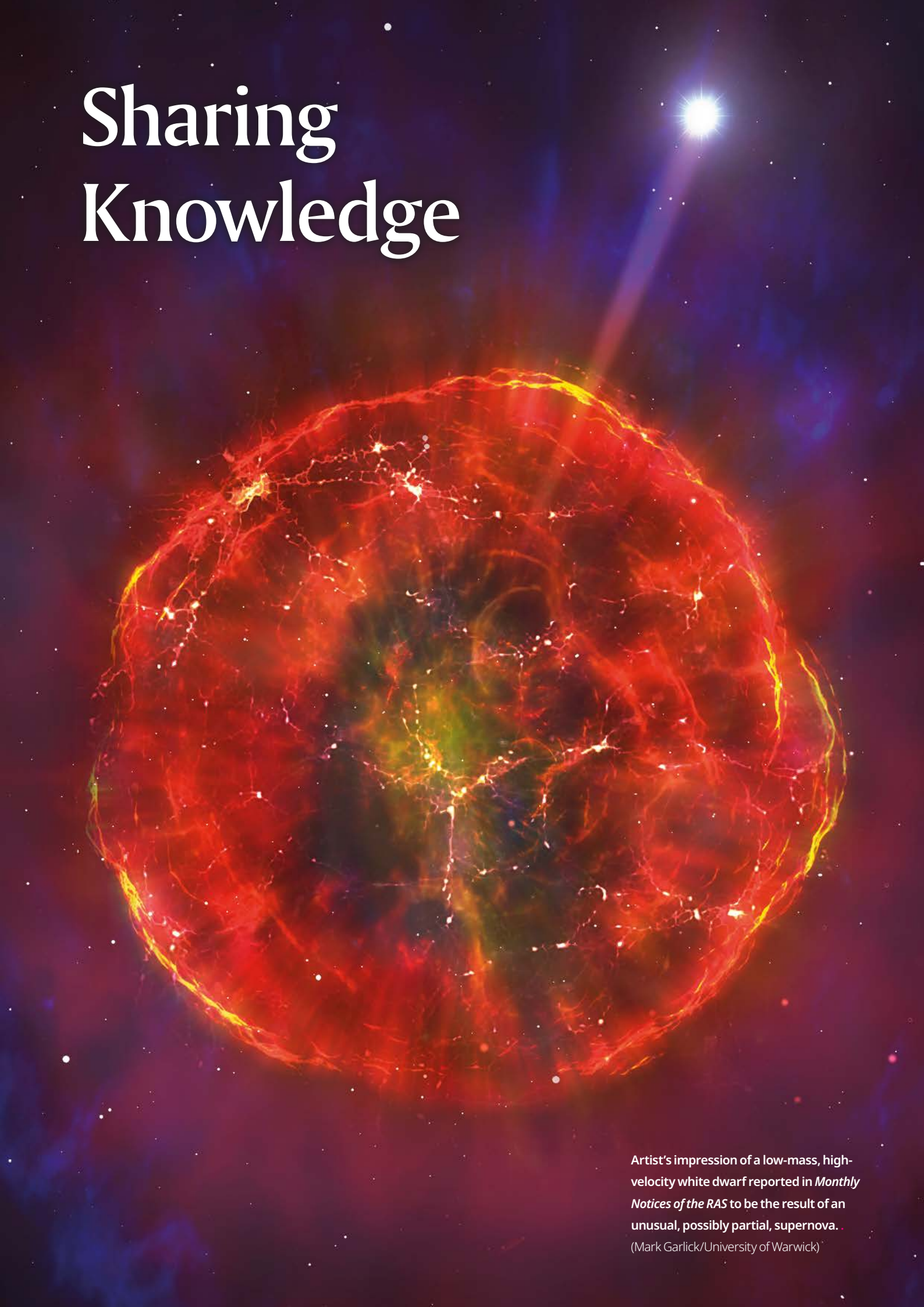
Our membership magazine

From the first issue of 2020, the Society's membership magazine *A&G* had a refreshed design aligned with the new RAS branding. Fellows continue to support the magazine, sharing their work within our community by writing articles and sending in news items. *A&G* published 53 research reviews, reports of RAS meetings and outreach projects, discussion and analysis, as well as some 200 short news items. There were 252,571 downloads of *A&G* articles during the year, of which 205,312 represented "visits with content engagement".

Articles also included reviews focusing on the history and publishing heritage of the Society, accounts of RAS Specialist Discussion Meetings, and achievements of the RAS200 bicentenary projects. It was also a pleasure to highlight the career of distinguished Nigerian radio astronomer Samuel Okoye in October, to coincide with Black History Month. ■



Sharing Knowledge



Artist's impression of a low-mass, high-velocity white dwarf reported in *Monthly Notices of the RAS* to be the result of an unusual, possibly partial, supernova. (Mark Garlick/University of Warwick)

The Society disseminates knowledge to students, the press and the wider public by:

- Organising education and outreach events
- Supporting the Friends of the RAS
- Exploiting the resources of the Library and Archives
- Arranging a programme of Public Lectures
- Working with specialist partners through RAS200
- Promoting research in the media and social media
- Working with the Courtyard Societies as a cultural hub

Education and outreach

The switch to virtual meetings in 2020 brought larger audiences for RAS Public Lectures and events and made it possible for Fellows based outside the UK to take a fuller part in outreach activities.

The RAS ran a number of special bicentenary outreach events. In July, we connected to scientists in Leicester and Hawaii as they used the Infrared Telescope Observatory in Hawaii to make observations of Jupiter when Ganymede and its shadow passed in front of the giant planet. 300 people signed up for the event itself, and the recording was watched more than 11,000 times on YouTube. The event included a presentation using materials from our Library and Archive.

The RAS chaired the steering group for National Astronomy Week 2020, celebrating the close approach of Mars in October with a programme of events and public viewings. Amateur and professional astronomers, broadcasters, writers and artists joined the sessions online, with classes for children, an evening event with a panel of speakers, and live links to observatories around the UK and in Cyprus. An audience of more than 150 people watched each event.

After schools closed to most pupils in March, RAS staff started online classes to support home-schooling. The first tranche of "lockdown learning" ran twice a month for four months, covering early years, primary and secondary, with an average of 70 in each session. With additional views on the RAS YouTube channel, the classes have reached an estimated 2500 people to date.

2500 CHILDREN ATTENDED RAS LOCKDOWN LEARNING CLASSES

In the autumn, RAS staff worked with Kevin Walsh of Westminster School to create online live classes for GCSE Astronomy, bringing together 48 students from across the UK each week. In July, the RAS also joined the UK Space Agency and ESA to present online training on Space Resources for Teachers.

In December, we hosted author Nathan Byron and illustrator Dapo Adeola who presented their children's book *Look Up!*, with a drawing session followed by questions. 500 schools attended and a further 1500 schools watched on YouTube; we estimate that at least 40,000 children took part.

Friends of the RAS

Friends events were affected by the Covid-19 restrictions but after the first lecture of 2020, the rest continued online, with four taking place, one postponed and one cancelled. Around 40 people attended each, on average. Talk topics included "The secret signal hidden in every solar and stellar flare" and "Astronomy in Ancient Egypt". There were 274 members of the Friends by the end of 2020.



This is Rocket, budding young astronaut and star of the book *Look Up!*, which attracted around 2000 schools to an online reading and Q&A.

A cultural hub with other Courtyard Societies

We took part in the "Lunchtime Scientist" sessions run jointly with the other Courtyard Societies, targeting GCSE and A-level pupils and their teachers. These sessions ran online and involved conversations with leading researchers including astro-biologist Jane Greaves, planetary geologist Divya Persaud, and biologist, artist and space researcher Anguelo Vermuelen.

Social media provided an alternative way of marking

key outreach events in our calendar such as Open House, with videos about our building and collections. Even though the Courtyard Societies weren't open to the public, we collaborated on social media both for Open House, and during the rest of the year under the hashtag #CollectionsUnited, a series of tweets showing connections between our collections and societies.

Library outreach

Library materials featured in articles on Sacrobosco's *Sphere* and Copernicus's *De Revolutionibus* in *Popular Astronomy* magazine, and *The Supermassive Podcast* episodes included conversations about our editions of *De Revolutionibus* and Caroline Herschel's copy of Flamsteed's star atlas. We also supported an exhibition at the Herschel Museum in Bath on the work of John Herschel, which opened on 29 February, only to close three weeks later as a consequence of Covid-19 regulations.

Pandemic precautions limited access to the Library in person, but fostered wider online audiences for some events. We collaborated with the Linda Hall Library, a science-focused independent public library in Kansas City, USA, to deliver four hour-long talks. Each event had a live audience of 100–200 people on both sides of the Atlantic, with lively Q&A sessions afterwards. The events were simultaneously streamed on Facebook and the videos each have 600–800 views. Links to the recordings have been uploaded to the Treasures of the RAS section of the website: ras.ac.uk/library/treasures-of-the-ras.

The Library and the history of astronomy featured on Astro Radio's *Lock in at the Locked Inn* show; Annie Maunder and the importance of role models was the focus of a presentation to the Finding Ada conference, with 830 delegates; and we welcomed a virtual Library tour for 20 artists taking part in a virtual residency organised by Mayes Creative and Carolyn Kennett.

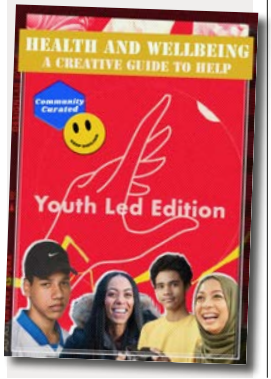
RAS200

RAS200: Sky and Earth, the flagship Society project, saw much of its activity curtailed after the spring of 2020. Some partners did continue their activity, including the Prince's Trust, with week-long sessions for 20 young people, some of whom produced a leaflet (pictured below) including ways astronomy can boost well-being; Girlguiding, whose online engagement included a month of astronomy in November and virtual astronomy sleepovers; and the WEA, with tutor training, eight-week astronomy courses and stand-alone talks. Online courses offered the opportunity for a wider cross-section of Fellows to be involved in these activities; they are also more accessible for many participants.

RAS 200 Sky&Earth

Our projects and lead partners

- Astronomy and Geophysics through the Traditional Culture of Wales *Aberystwyth University*
- Beyond Prison Walls *Bounce Back Foundation*
- Stepping Out: Astronomy Short Breaks for Carers *Care for Carers*
- Cornwall Sea to Stars *Cornwall Sea to Stars*
- Reaching for the Stars *Girlguiding UK*
- Space, Earth and Autism *National Autistic Society*
- The Planets 360 *National Space Centre Creative*
- Geophysics in a Box *National Youth Agency*
- Astronomical Data: from Small and Beautiful to Big and Overwhelming *South African Astronomical Observatory*
- Stars and Space *The Prince's Trust*
- Making Space *University of Ireland Galway*
- Open Your Eyes, Look up to the Skies *Workers' Educational Association*



Public Lectures

In addition to our usual programme of Public Lectures taking place at Burlington House, for 2020 we planned a series of lectures delivered around the UK. As a result of pandemic precautions, from March onwards these were all given virtually. Some of the public engagement events planned to celebrate our bicentenary took place early in 2020. The first Bicentenary Public Lecture – a series planned for venues outside London – took place in Cardiff in January. From March onwards, the remaining talks were given online, and very well received. The online Bicentenary and regular Public Lecture programme saw large audiences, with each event attracting between 250 and 400 people registered, and between 400 and 1700 additional views on YouTube.

The Public Lectures held in 2020:

Prof. Alberto Vecchio (University of Birmingham): Gravitational waves and spacetime fireworks: a new era in astronomy

Anna Nash (Mullard Space Science Laboratory, University College London): ExoMars PanCam and planetary protection

Prof. Andrew Norton (Open University): Exploring the variable star zoo: citizen science and SuperWASP

Prof. Chris Done (University of Durham): Black holes and space science

The Bicentenary Public Lectures held in 2020:

Dr Edward Gomez (Cardiff University): Only a matter of time: is time-travel science or science fiction?

Dr Steven Wilkins (University of Sussex): Happy birthday Hubble

Dr Michelle Collins (University of Surrey): Adventures in galactic archaeology

Rosie Cane (UK Centre for Astrobiology, University of Edinburgh): From microbes to Mars: how can we use bacteria in the search for life beyond the Earth?

Dr Matt Bothwell (Institute of Astronomy, University of Cambridge): Searching for Earth 2.0

Prof. Tim Wright (University of Leeds and director of COMET): Monitoring our hazardous planet from space

Prof. Michele Dougherty (Imperial College London): Cassini spacecraft mission at Saturn

Dr Tana Joseph (University of Amsterdam): Challenging Afro-pessimism: the SKA in Africa

Dr Aprajita Verma (University of Oxford): Rise of a giant: the Extremely Large Telescope

Media and social media

In 2020, the Society issued 16 press releases and RAS staff and officers gave 97 radio, TV and press interviews, commenting on topics including megaconstellations of satellites, diversity and inclusion in astronomy, and the exploration of Mars. The Society also created video content related to, for example, the Lyrids meteor shower, Venus in front of the Pleiades, and Comet NEOWISE, that accrued up to 25,000 views.

For our bicentenary year, the RAS launched its first podcast series, *The Supermassive Podcast*, in association with Boffin Media. By the end of the year it had been downloaded more than 53,000 times, with listeners in 57 countries; it was the fourth most popular astronomy podcast for UK listeners, with women forming a third of its audience, and two-thirds of listeners aged under 35.

RAS 200 PROJECTS HAVE NOW REACHED **131,546 PEOPLE**



Ed Gomez discussing the concept of time travel in his Bicentenary Public Lecture in January. (Olivia Gomez)

The highlight of the year for RAS media engagement was the press briefing on the discovery of phosphine in the atmosphere of Venus and its status as a biosignature. Working with the European Southern Observatory, James Clerk Maxwell Telescope, Jodrell Bank Observatory, the Science and Technology Facilities Council, Imperial College London, the University of Cambridge and the Open University, the briefing was hosted virtually by the Society. Around 250 journalists attended the event, which was broadcast live on YouTube and has now been watched more than 264,000 times; associated media resources attracted 17,000 and 105,000 views respectively. In November, the Society ran a second briefing, this time on the Gaia Early Data Release 3. 150 journalists attended this virtual event, and associated video animations of the solar neighbourhood and of the Large and Small Magellanic Clouds were viewed more than 21,000 times.

All our social media channels grew during 2020: Twitter by 52%; Facebook by 32%; Instagram by 369%; and our LinkedIn page, resurrected in March 2020, now has more than 1000 followers. The Library Twitter account increased engagement by 25%, reaching more than 300,000 impressions. Social media directed viewers to a range of RAS activities, including bicentenary events; the school classes engaged audiences from around the world; and our #lockdownlearning hashtag was adopted widely. In addition, video on social media had a high level of engagement, being collectively viewed more than 400,000 times over the course of the year.

The Society also ran a successful campaign around Black History Month in October, including examples of black astronomers and geophysicists now and in history. Over the month we saw more than one million impressions. On 19 November, the Institute for Historical Research ran "History Day" as an online event for postgraduate researchers, which included a short video tour of our collections. ■

Our Organisation



An audience watching *The Planets 360*, a planetarium show produced for the RAS bicentenary by our RAS200 partners NSC Creative. (NSC Creative)

The organisation of the RAS supported our objectives during 2020 by:

- Addressing the sustainability of our activities
- Exploring options for the Society's accommodation in the future
- Supporting younger Fellows



We have continued to explore options for our future in Burlington House. (Lynda Laird/RAS)

The Fellowship

The RAS had 4204 Fellows at the end of 2020, 166 (4%) of whom were Honorary Fellows. This slight increase on the number in 2019 continues the pattern of steady expansion that has seen the number of Fellows grow by 5% since 2015. A quarter of our Fellows (26%) live outside the UK. 19% of our Fellows are female. 32% of our members were over 65 and 7% under 25.

Our future accommodation

The Society has set up a Property Working Group and continued to seek discussions with our landlords about the future of our accommodation at Burlington House. We have engaged with the other Courtyard Societies.

Sustainability Working Group

This group met to consider the report on the carbon footprint of Society activities commissioned from Alectro. The report highlighted the impact of travel by staff, Trustees and researchers engaged in activities supported by the RAS. The group noted that the change to working and meeting online during the pandemic cut our carbon emissions and demonstrated that online meetings can be successful.

Working remotely

In common with many Fellows, RAS staff worked remotely for most of the year, with only essential visits to Burlington House. Online engagement was higher throughout 2020, on social media and in nominations for Council elections and awards.

The Early Career Network

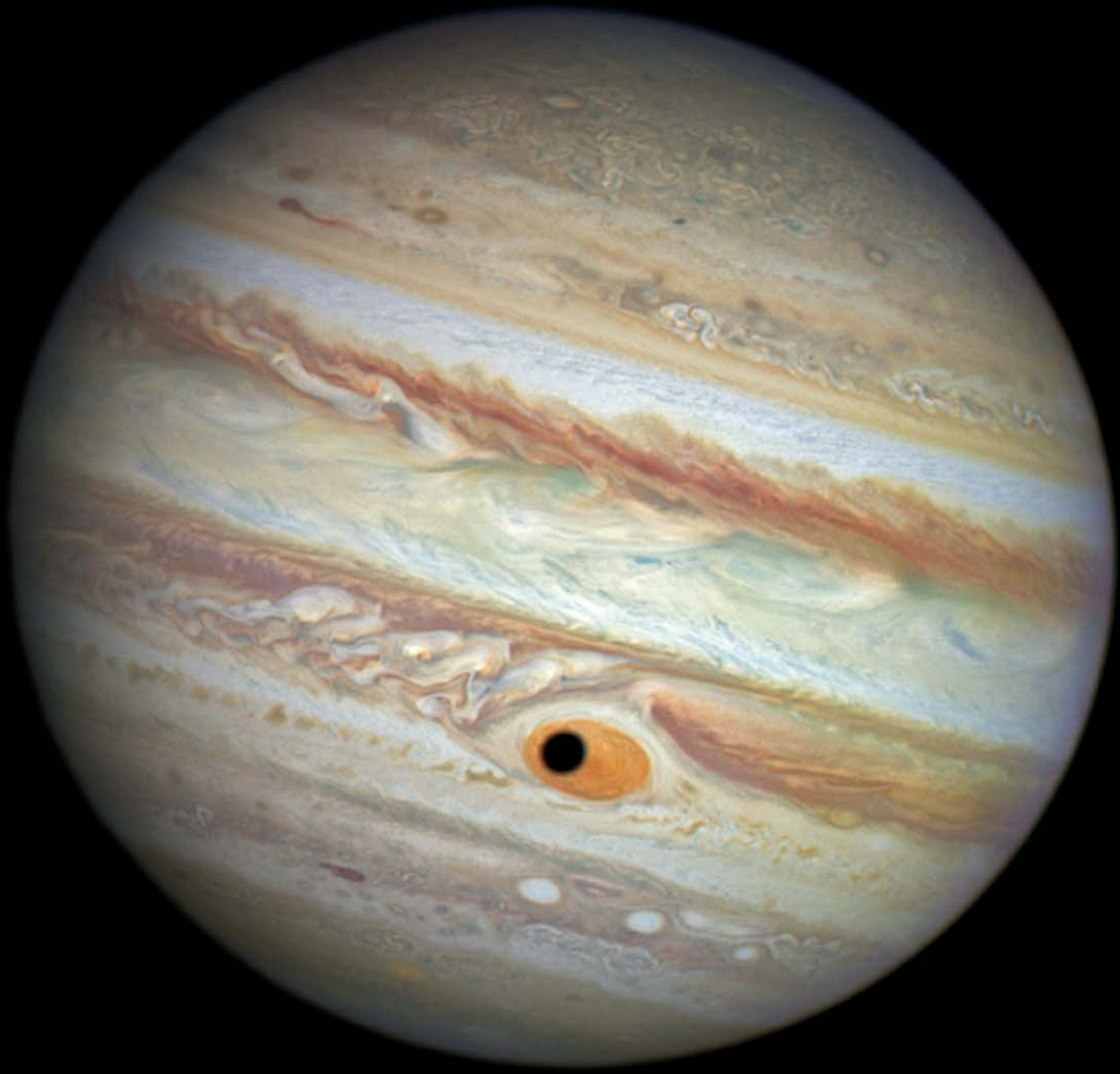
In May, the RAS formally established the Early Career Network (ECN), bringing together undergraduate and postgraduate students, and postdoctoral researchers in order to give them a stronger voice in the Society. ■



Áine O'Brien, a PhD student at the University of Glasgow, was appointed the first chair of the Early Career Network. "As part of its 200th anniversary, RAS Council wanted to celebrate the future, by supporting its early-career Fellows. Given that many early-career researchers (ECRs) have specific needs – in terms of networking, career guidance and mentoring, for example – it was thought the best way for the RAS to help was to form a committee of early-career researchers to provide mutual support and request what they need. One impact of Covid-19 was the loss of conferences, so we ran a free online poster exhibition. I was bowled over by the participation and engagement: there were more than 2000 views of the posters on day one!" The map shows where entries to the poster competition came from (in blue).



Looking Forward



The transit of the moon Ganymede across the face of Jupiter was covered live in July as part of our bicentenary outreach. 11,000 people watched on YouTube. (NASA, ESA, A Simon [Goddard Space Flight Center]. Acknowledgment: C Go and Hubble Heritage Team [STScI/AURA])

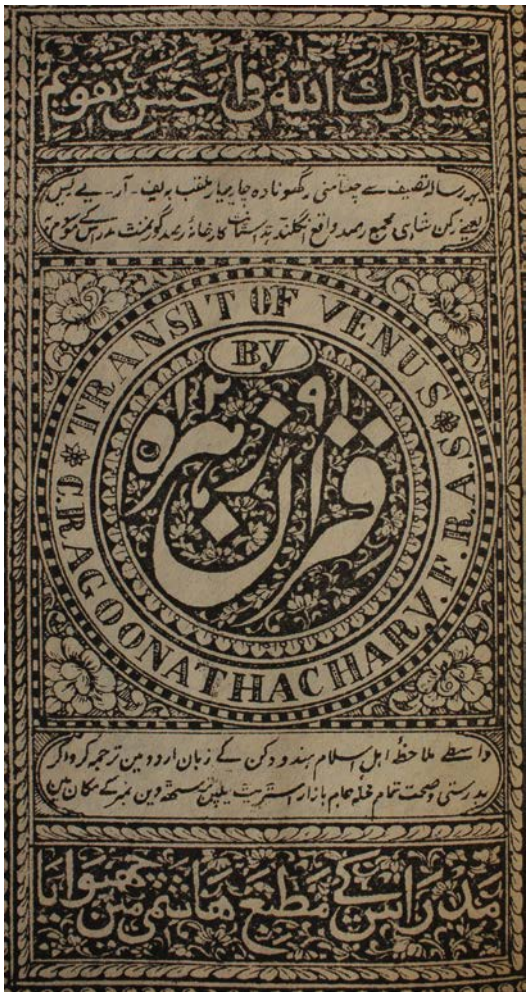
The RAS is making plans for 2021 and the future by:

- Setting objectives for our activities
- Identifying specific goals for 2021

Objectives

The Society will:

- Publish high-quality peer-reviewed journals
- Support students and early-career scientists through research fellowships and grants
- Recognise achievement through our medals and prizes
- Maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures
- Sustain our Library and Archive service
- Continue our political engagement
- Maintain our programme of education and outreach, including the Friends of the RAS
- Promote the work of the Society and Fellows in the media and on social media
- Build our outreach work with other Courtyard Societies.



NAM 2021

The 2020 National Astronomy Meeting had to be postponed; NAM 2021 will be held online.

Right: A cover of covers, reflecting the changing look and breadth of content of *A&G* – or *Astronomy & Geophysics* as it was known when it launched in 1997.

Left: A pamphlet published in three languages by Fellow Chintamanny Ragoonatha Chary in 1872, featured on our forthcoming Timeline. (RAS)

A&G MARKED **25 YEARS** AS THE RAS MEMBERSHIP MAGAZINE



In 2021, the Society will also:

- Launch an Open Access journal
- Update our demographic survey
- Work towards reducing our carbon footprint
- Make our programme of awards and prizes more open and inclusive
- Build on our experience of online events to give our physical meetings, when they are possible, a greater reach
- Digitise the observation notebooks and working papers of Caroline Herschel
- Continue to seek a sustainable future for the Society in Burlington House.

Events since the year end

National Astronomy Meeting 2021 The Society has decided that the 2021 NAM, postponed from 2020, will be held as a virtual event.

A silver anniversary February 2021 saw the publication of the 25th volume of membership magazine *A&G*.

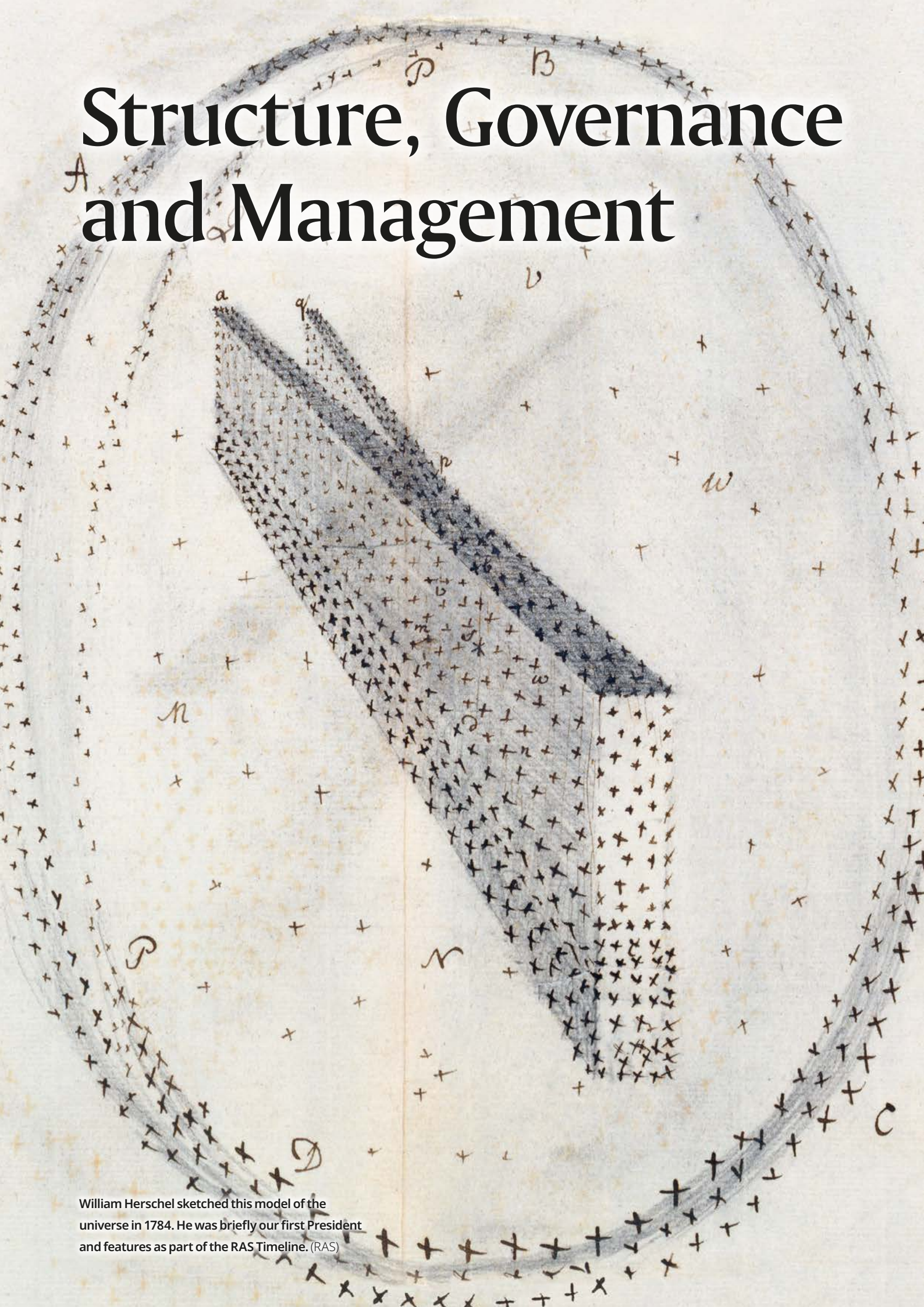
Supporting researchers The Society held a meeting in January 2021 to find out how Covid-19 has affected our research community.

Sustainability The RAS has signed the UN Climate Neutral Now declaration, commiting us to reduce carbon dioxide emissions by 50% by 2030, and to reach net-zero emissions by 2050.

Accommodation We have written to our Fellows to ask for their support and coordinated with other Courtyard Societies about a sustainable future in Burlington House.

Timeline Staff have been completing an online Timeline to mark significant events in the 200 years of the Society. 2021 will see the spectacular installation in Burlington House.

Structure, Governance and Management



William Herschel sketched this model of the universe in 1784. He was briefly our first President and features as part of the RAS Timeline. (RAS)

The regulations and procedures of the Society:

- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- Organisational structure
- Risks

Governance

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in 2015. The RAS's objectives, charters and byelaws are detailed on the Society's website ras.ac.uk.

The control of the Society rests with the General Meeting of Fellows. Subject to that, direction and management are the responsibility of the Council (as the Trustees of the charity). The Council consists of a President, a Treasurer and three Secretaries together with four Vice-Presidents and 12 Councillors. In addition, the President-Elect attends Council for one year prior to taking up the post.

Trustee recruitment and appointment

Annually, the full membership of the Society is asked to nominate themselves or other members of the Society to available positions on Council. A nomination must be supported by two other members of the Society. Council approves the ballot list and this together with a narrative on each candidate is sent to the full membership for their consideration prior to casting their votes. We moved to fully electronic voting and an online AGM in 2020 in line with Covid-19 restrictions; we will continue with solely online voting in future.

Members of the Council are elected by ballot at the Annual General Meeting, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

- President, two years
- Vice-Presidents, two years
- Treasurer and Secretaries, five years
- Councillors, three years.

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to complete a conflict of interest declaration and to sign a Trustee declaration form. Trustees have the opportunity to attend training, where appropriate; for example, on The Governance Code.

2020 SAW INCREASED PARTICIPATION FROM FELLOWS BASED **OUTSIDE THE UK**

Fundraising

The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

Organisational structure

The RAS Council normally meets six times during the year and its function is to direct, on behalf of the Society, all the affairs and business of the Society. Council appoints standing committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and *ad hoc* committees (e.g. Awards) to forward its objectives.

It appoints the managing editors and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society* and *Geophysical Journal International*, who provide their services, as does the Treasurer, for an honorarium.

The Society has formal associations with a number of organisations having shared interests, and has less formal arrangements with several other bodies. These include:

- The British Geophysical Association, jointly sponsored by the RAS and the Geological Society of London to represent solid-Earth geophysicists whose interests fall within the remits of both parent societies
- The Paneth Meteorite Fund that the Society administers under the direction of the Paneth Fund Trustees
- The Society is the UK national member organisation of the International Astronomical Union and the European Astronomical Society and is represented on the UK Panel of the International Union of Radio Science
- The Society is represented on a number of organisations including the Science Council, the Parliamentary and Scientific



Committee and the Campaign for Science and Engineering
- The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories and science centres, use of the Society's Library, as well as a reduced subscription to the Society's members' magazine *A&G*.

Risks

The principal risks and uncertainties identified by the Trustees are:
- Maintenance of the quality of, and income from, publications (a significant income stream of above 60%)
- Open Access publishing
- Affordability of rent and service charges for the premises at Burlington House
- Covid-19 and its potential impacts on access to the building, Society activities, publishing and investments.

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is exposed and the systems that have been established to manage those risks. In regards to the three most significant risks:

The Society insists that rigorous peer review is used to maintain the quality of the two journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.

RAS staff pictured at the bicentenary celebration evening in January.
(Lynda Laird/RAS)

RAS STAFF WORKED LARGELY **FROM HOME** DURING 2020

The uncertainty over future rental charges remains an ongoing concern for the Society. The Society, alongside the other Courtyard Societies, continues to seek a satisfactory resolution with the landlord. The Trustees still hold the view previously stated (*Annual Report 2015*) that the Society has the resources to cover increases in rental charges over the current lease period. In the meantime, the Society will explore options for alternative accommodation if a satisfactory resolution cannot be achieved.

Other key risks identified and their mitigation measures include:
- Maintenance of the (listed) premises (by regular repair and refurbishment)
- Maintenance of the size of the membership (by regular review of services and subscriptions and outreach activities to potential new members)
- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

The Trustees consider the fluctuations in investment fund values and variability of investment returns to be a risk for the Society. The fund, Newton Growth and Income Fund for Charities, is actively and expertly managed and administered by Newton Investment Management who were reappointed after a competitive tender. Funds are invested in a diverse portfolio comprising commodities, equities, bonds and gilts. This managed strategy mitigates fluctuations in fund values and seeks opportunities for fund growth and income. The Trustees consider this approach mitigates the subsequent exposure to any investment risk. ■



Financial Statements



Aurora arise from the connection between the Sun and the Earth, a focus of ESA's Cluster mission, and the subject of a Specialist Discussion Meeting. (ESA/Sara Mazrouei)

FINANCIAL REVIEW

The Society's total funds increased from £21,240,147 to £21,507,367 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art), which totalled £9,470,879 (2019 – £9,440,879). Income increased to £4,845,401 (2019 – £4,679,347) due to increased income from publishing and membership. Due to the Covid-19 pandemic the National Astronomy Meeting (NAM) did not take place. Publishing income increased by £251,303. The Society's expenditure decreased to £4,532,478 (2019 – £4,810,880), which is mainly due to the Covid-19 pandemic reducing support costs due to reduced occupancy of Burlington House, postponing NAM and reducing grant-making activity. Net investment losses totalled £45,703 (2019 – gains of £1,154,287).

Policy on reserves

The reserves policy aims to maintain adequate financial cover for the main risks to the Society and provide in the normal way for an efficient winding-up if that ever became necessary. Working cash reserves are maintained so the Society does not rely on realisation of investments gains, or capital invested. The total funds are now £21,507,367, of which £9,470,879 are held in heritage assets, leaving funds of £12,036,488 (2019 – £11,799,268) to cover the main risks and the operational needs of a going concern.

The requirement for significant reserves falls into two areas:

- The need to have contingency plans in place to maintain publication income if Open Access regulations threaten the current business model for academic journals; and
- The need to make some provision for either substantial increases in rent, and maintaining the premises, or alternatively, a change in the status of our accommodation. This remains under continual review by the Society and four other Courtyard Societies. The Society's right to remain at Burlington House under the present lease is not in doubt, but whilst the scale of future rent increases has been estimated, there remains uncertainty as to when these increases will slow down or cease. Negotiations continue with the landlord and all long-term options including alternative accommodation will be explored. The new Accommodation fund is detailed in note 17, page 50, along with the other Designated funds.

The Open Access fund and the Burlington House fund are currently maintained at high levels to support any significant changes to the Society's operations, and the General Fund is available to provide further financial support if either of these risks materialise. The General Fund is also available, should it ever be needed, to enable an orderly winding up of the Society. At present the free reserves of the Society, defined as unrestricted, undesignated funds, excluding tangible fixed assets, are £5,713,233 (2019 – £6,026,888) and these would allow operation of the Society for at least 15 months if publishing were continued and expenditure incurred during that period and 37 months if publishing were halted. The Trustees are satisfied that the current level of reserves is appropriate given the risks and uncertainties outlined above.

It has been the policy of the Society to fund grant activity from the Research and Grants fund, which is now included in the balance of designated reserves.

Investment policy

Investments are held with BNY Mellon Charities Fund: Newton Growth and Income Fund for Charities, with the aim of generating capital growth and income over the medium to long term, with actively managed assets held in global equities and fixed income securities. Surplus cash is held in the COIF Charities Deposit Fund with CCLA Investment Management, which provides a high level of capital security, interest and liquidity. The Fund has an actively managed diversified portfolio of sterling denominated money market deposits and instruments. Income and gains from these investments contribute to fund the Society's charitable activities. Investment performance is monitored by the Accountant, Treasurer, Finance Committee and Council.

The Trustees, by resolution, adopted a total returns approach to the invested endowment funds in accordance with the requirements of the Charity Commission, believing that this approach is in the best interests of the Society. The fund reconciliation is disclosed in note 12. This approach was applied from 1 January 2015 when the value of the endowment funds at that date of £1,652,682 was used as a proxy for the original value of the endowment funds. In adopting this policy, permanent endowment funds will not be permitted to fall below the original value of £1,652,682. The Trustees aim to maintain the real value of the permanent endowment as a measure against the movements in the retail prices index. This was 1.2% for the year (2019 – 2.2%). No transfers to the restricted funds were made during the year (2019 – £207,695) as the funding levels held were considered adequate to cover commitments in 2021.

Grant-making policy

The RAS has for many years provided small grants to support the community in activities not funded by the Research Councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to

experience working in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

In addition to these grants to individuals, the Society funds a series of fellowships to promote the careers of the highest quality young postdoctoral scientists. These currently include RAS Fellowships (on any subject) and the Norman Lockyer Fellowship (in solar and solar–terrestrial physics). The Norman Lockyer Fellow is funded from an endowment fund set up for that purpose.

A further activity funded by the Society is the award of medals to recognise the highest quality work in various categories. These awards are proposed to Council by a separate awards panel and no awards are made to serving councillors.

The grants, fellowships and awards are funded from a number of sources. The Society has its restricted and endowment funds invested with Newton Investment Management and the income and gains from these investments are used to support the grants expenditure in accordance with the bequests and interest from the COIF Charities Deposit Fund.

The grants panel deliberates twice a year and further grants are awarded by the Education and Outreach Committee. It comprises the Treasurer (chair) and the three Secretaries. 166 applications were received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

Information relating to RAS200 can be found on pages 6 and 17.

Key management personnel

The key management personnel of the charity in charge of directing and controlling, running and operating the charity are the Trustees, the Executive Director and the Deputy Executive Director; the latter two are employees. They are assisted by an Accountant, a further three managerial level officers and other staff.

Council ensures that the RAS carries out a salary comparison exercise every 3–5 years. The comparability study compares the staff salaries to other similar external positions to reassure the Trustees that the levels of remuneration are appropriate. The last comparison exercise was carried out in 2018.

The Society does not have a performance-related pay scheme. The Trustees annually consider a salary increase in regards to cost of living that applies to all staff.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has four deferred members only and eight annuitants. The Society operates a defined contribution group personal pension scheme for current staff.

Legacies and donations

The Society encourages Fellows to include donations to the Society in their wills and receives donations during the year from Fellows and members of the public. During the year the Society received donations of £34,064 (2019 – £8,362) and £2,000 legacies (2019 – £nil).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5 million. The Society does not regard these as assets which can be converted to their cash value, except in the most dire circumstances.

The Society continues to receive donated items periodically. All such donations are gratefully received and appreciated by the Society. Where a valuation is available for additions to the collection, this is reflected in the financial statements. A valuation will always be obtained for additions that are financially material to the whole collection.

Investment performance

The Newton Growth and Income Fund for charities provided a yield of 1.95% and a total return gross of 1.42% in the year. Annual management charges of 0.6% are taken from the capital of the fund. Interest from the COIF Charities Deposit Fund yielded 0.2%. Performance of the fund managers is kept under continual review. The impact of the Covid-19 pandemic reduced dividend income by 27.7%, although by 31 December 2020 the fund had recovered almost all the losses incurred when the Covid-19 pandemic impacted investment markets in March 2020.

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The Trustees are responsible for preparing the Trustees' report and the financial statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The law applicable to charities in England and Wales requires the Trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of the income and expenditure of the charity for that period. In preparing these financial statements, the Trustees are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102);
- make judgements and estimates that are reasonable and prudent;
- state whether applicable United Kingdom Accounting Standards have been followed, subject to any material departures disclosed and explained in the financial statements;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in operation.

The Trustees are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011 and the provisions of the Royal Charter and Bye Laws. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities. The Trustees are responsible for the maintenance and integrity of the charity and financial information included on the charity's website.

The Council of the Society believes that it has carried out these requirements.

AUDITORS

A resolution to appoint Buzzacott for 2021 will be proposed at the Annual General Meeting.

Approved by the Council and signed on its behalf by:

Prof. Emma Bunce
President

Date: 14 May 2021

INDEPENDENT AUDITOR'S REPORT TO THE TRUSTEES OF THE ROYAL ASTRONOMICAL SOCIETY

Opinion

We have audited the financial statements of the Royal Astronomical Society (the 'charity') for the year ended 31 December 2020, which comprise the statement of financial activities, the balance sheet, the statement of cash flows, the principal accounting policies and the notes to the financial statements. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including Financial Reporting Standard 102 'The Financial Reporting Standard applicable in the UK and Republic of Ireland' (United Kingdom Generally Accepted Accounting Practice).

In our opinion, the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2020 and of its income and expenditure for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Conclusions relating to going concern

In auditing the financial statements, we have concluded that the Trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least 12 months from when the financial statements are authorised for issue.

Our responsibilities and the responsibilities of the Trustees with respect to going concern are described in the relevant sections of this report.

Other information

The Trustees are responsible for the other information. The other information comprises the information included in the annual report and financial statements other than the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether there is a material misstatement in the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

Matters on which we are required to report by exception

We have nothing to report in respect of the following matters in relation to which the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the Trustees' annual report is inconsistent in any material respect with the financial statements; or
- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Responsibilities of Trustees

As explained more fully in the Trustees' responsibilities statement, the Trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the Trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern

basis of accounting unless the Trustees either intend to liquidate the charity or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud is detailed below.

Our approach to identifying and assessing the risks of material misstatement in respect of irregularities, including fraud and non-compliance with laws and regulations, was as follows:

- the engagement partner ensured that the engagement team collectively had the appropriate competence, capabilities and skills to identify or recognise non-compliance with applicable laws and regulations;
- we identified the laws and regulations applicable to the charity through discussions with management, and from our commercial knowledge and experience of the sector;
- we focused on specific laws and regulations which we considered may have a direct material effect on the financial statements or the operations of the charity, including the Charities Act 2011 and the financial reporting framework described above;
- we assessed the extent of compliance with the laws and regulations identified above through making enquiries of management and inspecting legal correspondence; and
- identified laws and regulations were communicated within the audit team regularly and the team remained alert to instances of non-compliance throughout the audit.

We assessed the susceptibility of the charity's financial statements to material misstatement, including obtaining an understanding of how fraud might occur, by:

- making enquiries of management as to where they considered there was susceptibility to fraud, their knowledge of actual, suspected and alleged fraud;
- considering the control environment implemented by service organisations, including in publishing; and
- considering the internal controls in place to mitigate risks of fraud and non-compliance with laws and regulations.

To address the risk of fraud through management bias and override of controls, we:

- performed analytical procedures to identify any unusual or unexpected relationships;
- tested journal entries to identify unusual transactions;
- tested authorisation controls during substantive testing of expenditure;
- assessed whether judgements and assumptions made were indicative of potential bias; and
- investigated the rationale behind significant or unusual transactions.

In response to the risk of irregularities and non-compliance with laws and regulations, we designed procedures which included, but were not limited to:

- agreeing financial statement disclosures to underlying supporting documentation;
- reading the minutes of meetings of those charged with governance;
- enquiring of management as to actual and potential litigation and claims; and
- reviewing correspondence with HMRC and the charity's legal advisors.

There are inherent limitations in our audit procedures described above. The more removed that laws and regulations are from financial transactions, the less likely it is that we would become aware of non-compliance. Auditing standards also limit the audit procedures required to identify non-compliance with laws and regulations to enquiry of the Trustees and other management and the inspection of regulatory and legal correspondence, if any.

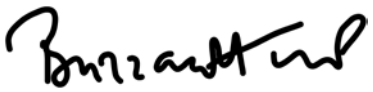
Material misstatements that arise due to fraud can be harder to detect than those that arise from error as they may involve deliberate concealment or collusion.

A further description of our responsibilities for the audit of the financial statements is located on the Financial Reporting Council's website at www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditor's report.

Use of our report

This report is made solely to the charity's Trustees, as a body, in accordance with section 144 of the Charities Act 2011 and with regulations made under section 154 of

that Act. Our audit work has been undertaken so that we might state to the charity's Trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's Trustees as a body, for our audit work, for this report, or for the opinions we have formed.



Date: 14 May 2021

Buzzacott LLP
Statutory Auditor
130 Wood Street
London
EC2V 6DL

Buzzacott LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2020

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2020 Total funds £	2019 Total funds £
Income						
Donations and legacies	1	31,064	5,000	—	36,064	8,362
Other trading activities		40,263	—	—	40,263	47,349
Investment income	2	121,586	6,420	45,884	173,890	248,492
Charitable activities	3	4,595,184	—	—	4,595,184	4,375,144
Total income		4,788,097	11,420	45,884	4,845,401	4,679,347
Expenditure						
Raising funds		9,251	—	—	9,251	15,553
Charitable activities	5	4,462,379	60,848	—	4,523,227	4,795,327
Total expenditure		4,471,630	60,848	—	4,532,478	4,810,880
Net income (expenditure) before investment gains and losses		316,467	(49,428)	45,884	312,923	(131,533)
Net (losses) gains on investments	12	(31,992)	(1,683)	(12,028)	(45,703)	1,154,287
Net income (expenditure) for the year and net movement in funds		284,475	(51,111)	33,856	267,220	1,022,754
Reconciliation of funds:						
Total funds brought forward at 1 January 2020		18,572,550	795,109	1,872,488	21,240,147	20,217,393
Total funds carried forward at 31 December 2020		18,857,025	743,998	1,906,344	21,507,367	21,240,147

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing.
The notes on pages 41 to 54 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2019

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2019 Total funds £
Income					
Donations and legacies	1	3,009	5,353	—	8,362
Other trading activities		47,349	—	—	47,349
Investment income	2	172,093	8,464	67,935	248,492
Charitable activities	3	4,375,144	—	—	4,375,144
Total income		4,597,595	13,817	67,935	4,679,347
Expenditure					
Raising funds		15,553	—	—	15,553
Charitable activities	5	4,681,757	113,570	—	4,795,327
Total expenditure		4,697,310	113,570	—	4,810,880
Net (expenditure) income before investment gains and losses		(99,715)	(99,753)	67,935	(131,533)
Net gains on investments	12	796,458	39,641	318,188	1,154,287
Net income (expenditure)		696,743	(60,112)	386,123	1,022,754
Transfer between funds	15	—	207,695	(207,695)	—
Net movement in funds		696,743	147,583	178,428	1,022,754
Reconciliation of funds:					
Total funds brought forward at 1 January 2019		17,875,807	647,526	1,694,060	20,217,393
Total funds carried forward at 31 December 2019		18,572,550	795,109	1,872,488	21,240,147

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing.
The notes on pages 41 to 54 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2020

	Notes	2020 £	2020 £	2019 £	2019 £
Fixed assets					
Tangible assets					
. Heritage assets	11	**9,470,879**		9,440,879	
. Other assets	11	**763,093**		858,713	
Investments	12	**8,514,773**		8,560,476	
			18,748,745		18,860,068
Current assets					
Debtors	13	**848,383**		662,440	
Cash at bank and in hand		**3,736,532**		3,699,813	
		4,584,915		4,362,253	
Creditors: amounts falling due within one year	14	**(1,712,745)**		(1,864,459)	
Net current assets			**2,872,170**		2,497,794
Total assets less current liabilities			**21,620,915**		21,357,862
Creditors: amounts falling due after one year	14		**(113,548)**		(117,715)
Total net assets			**21,507,367**		21,240,147
The funds of the charity					
Endowment funds	15		**1,906,344**		1,872,488
Restricted income funds	16		**743,998**		795,109
Unrestricted income funds					
. Designated funds	17	**13,027,499**		12,427,713	
. General funds		**5,829,526**		6,144,837	
			18,857,025		18,572,550
			21,507,367		21,240,147

The financial statements were approved by Council on 14 May 2021 and signed on its behalf by

Prof. Emma Bunce
President

The notes on pages 41 to 54 form part of these financial statements

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2020

	Notes	2020 £	2019 £
Cash flow from operating activities			
Net cash used in operating activities	A	**(81,319)**	(719,550)
Cash inflow from investing activities			
Dividends and interest from investments		**173,890**	248,492
Purchase of tangible fixed assets		**(55,852)**	(39,347)
Net cash provided by investing activities		**118,038**	209,145
Change in cash and cash equivalents in the year		**36,719**	(510,405)
Cash and cash equivalents at 1 January 2020	B	**3,699,813**	4,210,218
Cash and cash equivalents at 31 December 2020	B	**3,736,532**	3,699,813

Notes to the statement of cash flows for the year to 31 December 2020

A Reconciliation of net movement in funds to net cash flow from operating activities

	2020 £	2019 £
Net movement in funds (as per the statement of financial activities)	**267,220**	1,022,754
Adjustments for:		
Depreciation charge	**121,472**	113,457
Net (gains) losses on investments	**45,703**	(1,154,287)
Dividends and interest from investments	**(173,890)**	(248,492)
Increase in debtors	**(185,943)**	(107,914)
Decrease in creditors	**(155,881)**	(345,068)
Net cash used in operating activities	**(81,319)**	(719,550)

B Analysis of cash and cash equivalents

	2020 £	2019 £
Total cash and cash equivalents: Cash at bank and in hand	**3,736,532**	3,699,813

C Reconciliation of net funds

	1 January 2020 £	Cash flows £	31 December 2020 £
Cash and cash equivalents	3,699,813	36,719	**3,736,532**

PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted, judgements and key sources of estimation uncertainty in the preparation of the financial statements are laid out below.

Basis of preparation

These financial statements have been prepared for the year to 31 December 2020.

The financial statements have been prepared under the historical cost convention with items recognised at cost or transaction value unless otherwise stated in the relevant accounting policies below or the notes to these financial statements.

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their financial statements in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (Charities SORP) the Financial Reporting Standard applicable in the UK and Republic of Ireland (FRS 102) and the Charities Act 2011.

The charity constitutes a public benefit entity as defined by FRS 102.

The financial statements are presented in sterling and are rounded to the nearest pound.

Critical accounting estimates and areas of judgement

Preparation of the financial statements requires the Trustees and management to make significant judgements and estimates.

The items in the financial statements where these judgements and estimates have been made include:

- the liability for multi-year grant commitments;
- the useful economic life of tangible fixed assets;
- the accrual for Burlington House rent; and
- the impact of Covid-19 on the Society including the use of the going concern basis.

Assessment of going concern

The Trustees have assessed whether the use of the going concern assumption is appropriate in preparing these financial statements. The Trustees have made this assessment in respect of a period of at least one year from the date of approval of these financial statements.

The Trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased rental charges for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk, that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the Trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves Policy on page 28 of the Trustees' report provides more detail.

The Trustees have considered the impact due to Covid-19 on the ability of the Society to continue its charitable activities. Whilst some public, national and scientific meetings have been cancelled or postponed, these activities do not generate surpluses. Although access to its Burlington House premises is restricted, the core functions of membership, publishing, outreach, some library activities, grant making and public policy & engagement are continuing without any immediate or material impact on income and cash reserves. Future grant making from the restricted income funds can also continue for up to three years and the Trustees therefore conclude that the preparation of these financial statements on a going concern basis is justified.

The Trustees have concluded that there are no other material uncertainties related to events or conditions that may cast significant doubt on the ability of the charity to continue as a going concern.

The most significant areas of judgement that affect items in the financial statements are mentioned above and detail provided in the section on risks in the Trustees' report.

With regard to the next accounting period, the year ending 31 December 2021, the most significant areas that affect the carrying value of the assets held by the charity are expected to be the same as for 2020 along with the residual or ongoing impact of Covid-19.

Income recognition

Income is recognised in the period in which the charity has entitlement to the income, the amount of income can be measured reliably and it is probable that the income will be received.

Income comprises donations, investment income, income from the sale of publications, membership subscriptions, and other related income.

Donations, are recognised when the charity has confirmation of both the amount and settlement date. In the event of donations pledged but not received, the amount is accrued for where the receipt is considered probable. In the event that a donation is subject to conditions that require a level of performance before the charity is entitled to the funds, the income is deferred and not recognised until either those conditions are fully met, or the fulfilment of those conditions is wholly within the control

of the charity and it is probable that those conditions will be fulfilled in the reporting period.

Legacies are included in the statement of financial activities when the charity is entitled to the legacy, the executors have established that there are sufficient surplus assets in the estate to pay the legacy, and any conditions attached to the legacy are within the control of the charity.

The Society has a contract with Oxford University Press for the publication of journals, which gives a percentage of the surplus made to 31 December each year to the Society. Although payments are received net, income is recognised in the financial statements on a gross basis which reflects that the Society retains the underlying long term rights. All publication income is accounted for on a receivable basis.

Membership subscriptions are payable in respect of a twelve month period in advance. The unearned portion of income received relating to the period after 31 December is carried forward as deferred income.

Investment income is recognised once the dividend has been declared and notification has been received of the dividend due.

Interest on funds held on deposit is included when receivable and the amount can be measured reliably by the charity; this is normally upon notification of the interest paid or payable by the bank.

Expenditure recognition

Expenditure is recognised as soon as there is a legal or constructive obligation committing the charity to the expenditure. All expenditure is accounted for on an accruals basis and has been classified under headings that aggregate all costs related to the category.

Expenditure on charitable activities includes all costs associated with furthering the charitable purposes of the charity as described in the Trustees' Report.

Grants payable for the support of research or study in any areas of astronomy and geophysics are recognised in the financial statements as soon as the obligation has been authorised by the Grants Committee, which meets twice-yearly (ca. February and August) to allocate funds, the recipient has a reasonable expectation that they will receive a grant and any condition attaching to the grant is outside the control of the Society.

The costs of raising funds consist of room hire expenditure and RAS diaries bought for resale.

Allocation of support and governance costs

Support costs, including governance costs, represent indirect charitable expenditure. In order to carry out the primary purposes of the charity it is necessary to provide support in the form of personnel development, financial procedures, provision of office services and equipment and a suitable working environment.

Governance costs comprise audit fees, legal advice for Trustees and costs associated with constitutional and statutory requirements, e.g. cost of Trustee meetings and preparing statutory financial statements as well as costs associated with the strategic management of the Society

Support costs are apportioned based on the proportion of floor area occupied by, or proportion of staff time spent on, the activity.

Taxation

The Society is a registered charity and no liability to taxation arises on the results of its activities as applied for charitable purposes, with the exception of investment income, which is taxed at source.

Operating leases

Rentals under operating leases are charged to the statement of financial activities on a straight-line basis over the term of the lease.

Pension costs

The Society operates two pension schemes for employees and former employees. The assets of the schemes are held separately from those of the Society.

The Society operates a defined benefit pension scheme for former employees, who joined its service before 1 January 2002, providing benefits based upon final pensionable earnings. Royal London manages the pension scheme, with the investments now 100% held by Royal London.

The latest actuarial valuation at 31 December 2020 shows a pension surplus which is not recognised on the balance sheet as an asset because it is not available to the Society by way of reduced future contributions.

Actuarial gains and losses arising from new valuations and from updating valuations to the balance sheet date are recognised in the statement of financial activities as other recognised gains and losses.

The Society has established a second pension scheme (a defined contribution scheme) for employees who began service with the Society after 1 January 2002. The amount charged in the statement of financial activities in respect of the defined contribution pension scheme is the contributions payable in the year.

Foreign currencies

Monetary assets and liabilities denominated in foreign currencies are translated at the rate of exchange ruling at the balance sheet date. Transactions in foreign currencies are recorded at the rate ruling at the date of the

transaction. All differences are taken to the statement of financial activities.

Heritage assets

Heritage assets are included in the financial statements at a historic valuation which is being treated as deemed cost. There are two main classes of heritage assets that the Society possesses, which are:

- Rare Books and Manuscripts
- Fine Art and Collectibles – Historic books, portraits, busts, instruments and antique furniture.

The Society's rare book and manuscript collection is reported in the balance sheet at a valuation by Christies in 1996, with a number of items re-valued by B Quaritch Limited in 2011. The valuation basis was High Auction Estimate.

The Society's fine art and collectibles are reported in the balance sheet at a valuation by Bonhams in 1992, including index linking, with a number of items revalued by Bonhams in 2011.

The Society continues to periodically receive donated items. All such donations are gratefully received and appreciated by the Society. Where a valuation is available for additions to the collection, this is reflected in the financial statements. A valuation will always be obtained for additions that are financially material to the whole collection.

Depreciation is not charged on heritage assets due to immateriality based on their extremely long useful lives and high residual values.

Other tangible fixed assets

The Society capitalises tangible fixed assets with a cost greater than £250 and an estimated useful life over one year.

Tangible fixed assets are depreciated on cost on a straight line basis from the date of acquisition over their expected useful lives as follows:

- Telephone and security system and computer equipment 4 years
- Leasehold Improvements 20 years
- Plant and machinery 10 years

Investments

Listed investments are a form of basic financial instrument and are initially recognised at their transaction value and subsequently measured at their fair value as at the balance sheet date using the closing quoted market price.

Realised gains (or losses) on investment assets are calculated as the difference between disposal proceeds and their opening carrying value or their purchase value where the investment is acquired subsequent to the first day of the financial year. Unrealised gains and losses are calculated as the difference between the fair value at the year end and their carrying value at that date. Realised and unrealised investment gains (or losses) are combined in the statement of financial activities and are credited (or debited) in the year in which they arise.

Debtors

Debtors are recognised at their settlement amount, less any provision for non-recoverability. Prepayments are valued at the amount prepaid.

Cash at bank and in hand

Cash at bank and in hand represents such accounts and instruments that are available on demand or have a maturity of less than three months from the date of acquisition.

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt.

Fund structure

Endowment funds comprise assets which normally must be held as capital. The income arising therefrom is used to support specific activities determined in accordance with the wishes of the donor.

Restricted funds comprise monies raised for, or their use restricted to, a specific purpose, or contributions subject to donor imposed conditions.

Designated funds represent monies set aside out of unrestricted funds and designated by the Trustees for a specific purpose.

Unrestricted funds represent those monies which are freely available for application towards achieving any charitable purpose that falls within the Society's charitable objects.

NOTES TO THE FINANCIAL STATEMENTS

1 Donations and legacies

	Unrestricted funds £	Restricted funds £	2020 Total funds £	Unrestricted funds £	Restricted funds £	2019 Total funds £
Donations	31,064	3,000	34,064	3,009	5,353	8,362
Legacies	—	2,000	2,000	—	—	—
Total funds	31,064	5,000	36,064	3,009	5,353	8,362

2 Investment income

	Unrestricted funds £	Restricted funds £	Endowment funds £	2020 Total funds £
Income from listed investments	116,763	6,202	44,321	167,286
Bank interest	4,823	218	1,563	6,604
2020 Total funds	121,586	6,420	45,884	173,890

	Unrestricted funds £	Restricted funds £	Endowment funds £	2019 Total funds £
Income from listed investments	160,417	7,858	63,073	231,348
Bank interest	11,676	606	4,862	17,144
2019 Total funds	172,093	8,464	67,935	248,492

3 Income from charitable activities

	Unrestricted funds	
	2020 £	2019 £
Publications (note 4)	4,217,341	3,966,038
Membership	362,860	350,267
Scientific meetings	1,445	40,226
Public policy	2,297	1,262
Library	3,399	8,370
Educational	4,167	6,306
Other	3,675	2,675
Total funds	4,595,184	4,375,144

4 Publications

	2020 £	2019 £
Income		
Monthly Notices of the Royal Astronomical Society	**3,103,852**	2,865,379
Geophysical Journal International	**1,021,726**	1,007,409
Astronomy & Geophysics	**84,996**	86,136
Other	**6,767**	7,114
	4,217,341	3,966,038
Expenditure		
Monthly Notices of the Royal Astronomical Society	**2,421,830**	2,290,130
Geophysical Journal International	**638,652**	663,151
Astronomy & Geophysics	**186,076**	166,790
Other	**22,432**	29,828
	3,268,990	3,149,899

5 Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2020 £	Direct costs £	Support costs £	2019 £
Publications (note 4)	**2,848,351**	**420,639**	**3,268,990**	2,713,442	436,457	3,149,899
Scientific meetings	**17,041**	**194,273**	**211,314**	113,843	201,579	315,422
Membership	**11,259**	**49,858**	**61,117**	9,514	51,733	61,247
Educational	**234,672**	**53,308**	**287,980**	505,670	54,463	560,133
RAS 200	**93,250**	**4,000**	**97,250**	98,405	5,000	103,405
Library	**110,178**	**370,781**	**480,959**	99,165	384,723	483,888
Public policy	**62,321**	**53,296**	**115,617**	66,033	55,300	121,333
	3,377,072	**1,146,155**	**4,523,227**	3,606,072	1,189,255	4,795,327

Grants, fellowships and awards, in support of research, are principally included under Educational and RAS200 above to reflect the responsibilities for the management and administration of grants. 59 grants, fellowships and awards – including the Norman Lockyer Fellowship, totalling £263,091 (2019 – £542,711) were made to institutes, and 59 grants, fellowships and awards totalling £20,141 (2019 – £22,239) were made to individuals. Expenditure supporting the Norman Lockyer Fellowship totalled £54,000 (2019 – £104,000), and one research fellowship ended during its final year contributing to credits to expenditure totalling £42,642 (2019 – £50,000). Adjustments to other grants resulted in credits to expenditure totalling £34,442 (2019 – £2,958).

Total grant-making support costs were £28,000 (2019 – £27,500).

A full list of all grantees and analysis can be found on the Society's website.

All expenditure on charitable activities is unrestricted except for £60,848 (which is almost entirely included within the educational category) which is restricted (2019 – £113,570).

6 Support costs

Support costs analysed by function are as follows:

	2020 £	2019 £
Executive	**144,564**	140,714
Finance	**78,739**	88,689
Facilities	**83,858**	92,285
Membership	**34,965**	34,595
IT	**68,396**	61,032
Policy, development and press	**81,089**	86,078
Burlington House	**153,033**	149,728
Other	**324,218**	347,815
Governance (note 7)	**177,293**	188,319
	1,146,155	1,189,255

Staff time (based on a review of staff time apportionment) and floor area, are used as bases of apportioning support costs over charitable activities.

7 Governance costs

	2020 £	2019 £
Auditor's remuneration (note 8)	**25,325**	24,765
Trustees' and Committee costs	**23,914**	29,845
AGM expenses	**7,974**	10,650
Staff time and other expenses	**120,080**	123,059
	177,293	188,319

8 Net income (expenditure) for the year

This is stated after charging:

	2020 £	2019 £
Depreciation	**121,472**	113,457
Auditor's remuneration:		
. Charity audit	**19,250**	16,025
. Pension scheme audit	**6,075**	5,675
. Other services	**500**	3,065
Operating lease rentals		
. Office equipment	**9,750**	14,156

9 Staff costs and remuneration of key management personnel

	2020 £	2019 £
Wages and salaries	864,583	821,677
Social security costs	89,979	83,870
Pension costs (see note 20)		
. Stakeholder pension scheme	72,379	68,347
. Death in service contributions	4,172	5,493
	1,031,113	979,387

During the year one employee of the Society earned between £70,000 and £80,000 (2019 – one) and one employee earned between £60,000 and £70,000 (2019 – one). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £14,395 (2019 – £14,010).

The average number of employees was 23 (Administration 6, Outreach 1, Editorial 10, Library 2, House 2, Press & Policy 2) (2019 – 22).

The key management personnel of the charity in charge of directing and controlling, running and operating the charity on a day to day basis comprise the Trustees and the Executive and Deputy Executive Directors. The total remuneration (including taxable benefits and employer's pension and national insurance contributions) of the key management personnel for the year was £182,069 (2019 – £176,863).

10 Transactions with Trustees

The Trustees receive reimbursement for travel expenses actually incurred in attending meetings. The amount reimbursed during the year for 13 Trustees was £6,769 (2019 – £16,815).

Remuneration of £6,337 was paid to one Trustee during 2020 (2019 – £5,923 to one Trustee). By agreement with the Charity Commissioners (dated 14 June 2004, case No. 299189, Sealing No. 344/04) the Treasurer is paid an Honorarium. This is uplifted by inflation at the RPI rate and formally approved each year by Council.

Grants made to Councillors

The following grants were made to Councillors during the year as part of the RAS grant awarding process. The recipients had no influence or part in the decisions on the award of these grants. For the most part the grant holders were not the main personal beneficiaries as the support was directly received by their students or meeting attendees. Excluding Councillors from the grants round completely is not seen as a satisfactory policy. It would strongly dissuade members from standing for election as Councillors and would be at variance with the accepted practice in Research Councils where members of grants panels are not excluded from applying. The process of grant review and award fully complies with the Nolan Principles and closely follows Government Research Council practice. The grants were:

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of Trustees as the Society).
- Paneth Meteorite Collection as disclosed in note 22. Dr Nigel Berman, Treasurer, is a Trustee.

11 Tangible fixed assets

(a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	Total £
At 1 January 2020	4,951,500	4,489,379	**9,440,879**
Additions	—	30,000	**30,000**
At 31 December 2020	4,951,500	4,519,379	**9,470,879**

There have been no recorded movements between 2016 and 2019.

The rare book collection is preserved by storing in an air-conditioned, temperature-controlled environment; the fine art and collectibles are also continually preserved in order to maintain their values.

Certain heritage assets are on public display at exhibitions. The Society's Librarian controls access to those heritage assets which are kept at Burlington House.

(b) Other assets

	Leasehold improve-ments £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	Total £
Cost					
At 1 January 2020	1,878,405	30,541	298,992	9,994	**2,217,932**
Additions	—	1,703	24,149	—	**25,852**
Disposals	—	—	(17,171)	—	**(17,171)**
At 31 December 2020	**1,878,405**	**32,244**	**305,970**	**9,994**	**2,226,613**
Depreciation					
At 1 January 2020	1,106,595	10,684	241,940	—	**1,359,219**
Charge for the year	93,964	3,069	24,439	—	**121,472**
Disposals	—	—	(17,171)	—	**(17,171)**
At 31 December 2020	**1,200,559**	**13,753**	**249,208**	—	**1,463,520**
Net book values					
At 31 December 2020	**677,846**	**18,491**	**56,762**	**9,994**	**763,093**
At 31 December 2019	771,810	19,857	57,052	9,994	858,713

12 Investments

	2020 Total funds £	2019 Total funds £
Market value at 1 January 2020	8,560,476	7,406,189
Net unrealised investment (losses) gains	(45,703)	1,154,287
Market value at 31 December 2020	8,514,773	8,560,476
Historical cost as at 31 December 2020	4,917,081	4,917,081

Investments comprise BNY Mellon: Global Growth and Income Fund.
The permanent endowment fund investments and movements in the unapplied total return are set out below.

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2020	1,652,682	219,806	1,872,488
Add: Total return			
. Investment income		45,884	45,884
. Net losses on listed investments		(12,028)	(12,028)
		33,856	33,856
At 31 December 2020	1,652,682	253,662	1,906,344

	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2019	1,652,682	41,378	1,694,060
Add: Total return			
. Investment income		67,935	67,935
. Net gains on listed investments		318,188	318,188
		386,123	386,123
Less:			
. Allocation to income from total return		(207,695)	(207,695)
At 31 December 2019	1,652,682	219,806	1,872,488

When adopting total applied return with effect from 1 January 2015, in the absence of reliable records of the original donations, the Trustees considered that the market values of the investments as recorded as at 1 January 2015 were appropriate to be considered as the initial value of the trust for investment. Since that figure sets the baseline below which disposals may not be made, taking a higher value than the actual original donations was considered to be prudent.

The Trustees have resolved that they wish to maintain the real value of the permanent endowment using the retail price index as a measure. No transfers to the restricted funds were made during the year as the funding levels held were considered adequate to cover commitments in 2021 (2019 – £207,695).

13 Debtors

	2020 £	2019 £
Trade debtors	**21,988**	40,572
Prepayments and accrued income	**799,543**	614,525
Other debtors	**26,852**	7,343
	848,383	662,440

14 Creditors

(a) Amounts falling due within one year

	2020 £	2019 £
Trade creditors	**20,017**	87,265
Accruals	**130,466**	74,371
Grants payable	**250,342**	455,160
Tax and social security	**209,549**	195,918
Deferred income	**1,054,806**	1,012,898
Other creditors	**47,565**	38,847
	1,712,745	1,864,459

(b) Amounts falling due after more than one year

	2020 £	2019 £
Grants payable	**113,548**	117,715

(c) Deferred income

	2020 £	2019 £
Balance as at 1 January 2020	**1,012,898**	1,030,736
Released to income	**(1,012,898)**	(1,030,736)
Income received from Fellows in advance	**64,936**	62,898
Publications income received in advance	**950,000**	950,000
Other income received in advance	**39,870**	—
Balance as at 31 December 2020	**1,054,806**	1,012,898

15 Endowment funds

	1 January 2020 £	Income £	Investment losses £	Transfers £	31 December 2020 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,448,558	35,496	(9,305)	—	1,474,749
. Other funds	145,269	3,560	(933)	—	147,896
	1,593,827	39,056	(10,238)	—	1,622,645
Benevolent fund	91,179	2,234	(586)	—	92,827
Library fund	43,309	1,061	(278)	—	44,092
Lectures and awards fund	144,173	3,533	(926)	—	146,780
	1,872,488	45,884	(12,028)	—	1,906,344

	1 January 2019 £	Income £	Investment gains £	Transfers £	31 December 2019 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,309,838	52,527	246,021	(159,828)	1,448,558
. Other funds	131,427	5,270	24,685	(16,113)	145,269
	1,441,265	57,797	270,706	(175,941)	1,593,827
Benevolent fund	82,489	3,309	15,494	(10,113)	91,179
Library fund	39,183	1,571	7,360	(4,805)	43,309
Lectures and awards fund	131,123	5,258	24,628	(16,836)	144,173
	1,694,060	67,935	318,188	(207,695)	1,872,488

There were no transfers from the endowment fund to the restricted income fund in 2020 (2019 – £207,695).

16 Restricted income funds

	1 January 2020 £	Income £	Expenditure £	Investment losses £	Transfers £	31 December 2020 £
Research & Grants fund	573,001	5,212	(55,500)	(842)	—	521,871
Benevolent fund	31,632	—	(2,140)	—	—	29,492
Library fund	38,307	537	—	(141)	—	38,703
Education fund	109,018	5,671	(1,000)	(700)	—	112,989
Lectures and awards fund	43,151	—	(2,208)	—	—	40,943
	795,109	11,420	(60,848)	(1,683)	—	743,998

	1 January 2019 £	Income £	Expenditure £	Investment gains £	Transfers £	31 December 2019 £
Research & Grants fund	477,679	9,166	(109,300)	19,515	175,941	573,001
Benevolent fund	22,644	—	(1,125)	—	10,113	31,632
Library fund	29,434	716	—	3,352	4,805	38,307
Education fund	89,309	3,935	(1,000)	16,774	—	109,018
Lectures and awards fund	28,460	—	(2,145)	—	16,836	43,151
	647,526	13,817	(113,570)	39,641	207,695	795,109

The restricted funds are consolidated into five groups to serve the Council's priorities and address modern needs: Research & Grants, Benevolent, Library, Education and Lectures & Awards. A detailed fund summary can be found on the RAS website.

The restricted funds were classified to either Restricted (R), Endowment (E), Designated (D), or General (G) funds:

Research & Grants fund
E AG Stillhamer Trust Fund (1937)
D EW Brown Trust Fund (1939)
E Plummer Bequest (1946)
G General
R Victor Nadarov Fund (1950)
E Sir Norman Lockyer Memorial Trust (1990)
R Hosie Bequest (2000)
D Mrs JM Jelley-Freeman Bequest (2000)
D CAG Bearpark Trust (2000)
R Patricia Tomkins Fund (2011)
G Special Purposes Fund
E EA Milne Travel Fund (2013)
R R Potter Research Fund (2017)
R Osmaston Fund (2020)

Library fund
E Turnor Fund and Horrocks Memorial Fund (1853/1876)
E Harry Watson Memorial Fund (1923)
E Warin Bushell Fund (1964)
E Gaythorp Bequest (1969)
E Ian Ridpath Conservation Fund (2006)
R Dewhirst Fund (2013)

Education fund
R Newbigen Fund (1990)
R Michael Penston Memorial Fund (1991)
R Sir William Hunter McCrea Memorial Fund (2000)
R Paul Ruffle Memorial Fund (2014)
D Education Committee

Benevolent fund
E Lee & Jansen Trust Fund (1834/1879)
E Gerald Merton Fund (1986)
G Donald R Barber Fund (2001)

Lectures & Awards fund
E Hannah Jackson-Gwilt Trust Fund (1861/1893)
E George Darwin Lectureship Fund (1926)
E George Darwin Support Fund
D AS Eddington Commemoration Fund (1948)
E Harold Jeffreys Lectureship Fund (1962)
E AT Price Medal Fund (1999)
E Gerald Whitrow Memorial Lecture Fund (2001)
E Fowler Prizes Fund (2004)

17 Designated funds

	1 January 2020 £	New designation £	Utilised/ released £	31 December 2020 £
Accommodation fund	—	1,000,000	—	1,000,000
Burlington House fund	740,764	—	(93,964)	646,800
Heritage Asset fund	9,440,879	30,000	—	9,470,879
Building fund	1,123,694	—	93,964	1,217,658
Open Access fund	393,440	—	(844)	392,596
RAS 200	254,968	—	(93,250)	161,718
RAS 2020	314,858	—	(299,858)	15,000
Research and grants fund	159,110	—	(36,262)	122,848
Total designated funds	12,427,713	1,030,000	(430,214)	13,027,499

	1 January 2019 £	New designation £	Utilised/ released £	31 December 2019 £
Burlington House fund	834,728	—	(93,964)	740,764
Heritage Asset fund	9,440,879	—	—	9,440,879
Building fund	1,029,730	—	93,964	1,123,694
Open Access fund	400,000	—	(6,560)	393,440
RAS 200	353,373	—	(98,405)	254,968
RAS 2020	389,459	—	(74,601)	314,858
Research and grants fund	116,769	173,335	(130,994)	159,110
Total designated funds	12,564,938	173,335	(310,560)	12,427,713

(i) Accommodation fund

This new fund represents the requirement to finance a possible relocation due to the uncertainties concerning the lease at Burlington House.

(ii) Burlington House fund

Under lease agreements signed in 2005 with the Department of Communities and Local Government (previously Office of the Deputy Prime Minister – ODPM), the Society and four others in the Burlington House courtyard secured future occupancy on the basis of paying rent and, additionally, being responsible for the external fabric of the building following a renovation programme carried out by the ODPM in mid-2006. In 2006–07, the Society executed a refurbishment project on the interior of the apartments. Expenditure incurred on the project has been capitalised and designated as the Burlington House fund.

(iii) Heritage Asset fund

A fund has been established to include the Society's heritage assets to recognise that there is no intention to dispose of these assets and the amount is not readily available to meet expenditure.

(iv) Building fund

The repairs and maintenance of the exterior of the building, its insurance and some security costs are carried out by the landlord for all the occupants and a proportion recharged to the Society. The Building fund should provide for internal and external maintenance of the building. The Finance Committee will recommend how much more to accumulate in this fund and at what rate. The timescale for expenditure is difficult to forecast but in principle could start within five years.

(v) Open Access fund

A fund has been established to provide against the risk of the possible collapse of the current business model for learned publishing due to various forms of Open Access. The timescale for expenditure is difficult to forecast but could in principle start within five years.

(vi) RAS200

The original fund balance of £1,000,000 was the total committed grant expenditure for RAS200. RAS200 grant expenditure is being charged to this fund from 2015 to 2022.

(vii) RAS 2020

This represents the estimated expenditure associated with the RAS bicentenary celebrations, associated events and activities.

(viii) Research and grants fund

This represents those funds to be used for research and grants.

18 Analysis of net assets between funds

Fund balances at 31 December 2020 are represented by:

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2020 Total funds £
Tangible assets					
. Heritage assets	—	9,470,879	—	—	9,470,879
. Other fixed assets	116,293	646,800			763,093
Investments	3,753,956	2,110,475	743,998	1,906,344	8,514,773
Current assets					
. Debtors	848,383	—	—	—	848,383
. Cash at bank and in hand	2,615,573	1,013,926	107,033	—	3,736,532
Current liabilities	(1,491,679)	(127,033)	(94,033)	—	(1,712,745)
Non-current liabilities	(13,000)	(87,548)	(13,000)	—	(113,548)
Total net assets	5,829,526	13,027,499	743,998	1,906,344	21,507,367

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2019 Total funds £
Tangible assets					
. Heritage assets	—	9,440,879	—	—	9,440,879
. Other fixed assets	117,949	740,764	—	—	858,713
Investments	4,318,597	1,574,282	795,109	1,872,488	8,560,476
Current assets					
. Debtors	662,440	—	—	—	662,440
. Cash at bank and in hand	2,632,692	1,000,001	67,120	—	3,699,813
Current liabilities	(1,536,303)	(261,036)	(67,120)	—	(1,864,459)
Non-current liabilities	(50,538)	(67,177)	—	—	(117,715)
Total net assets	6,144,837	12,427,713	795,109	1,872,488	21,240,147

19 Leasing commitments

At 31 December 2020, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

Office equipment	2020 £	2019 £
Amounts payable within one year	6,898	9,293
Amounts payable between two and five years	26,133	26,134
	33,031	35,427

20 Pension schemes

A qualified actuary carried out a triennial review of the defined benefit scheme as at 1 January 2019; the actuarial valuation showed that the market value of the scheme's assets was £823,000, which represents 141% of the benefits that accrued to members after allowing for expected future increases in earnings. The actuary has calculated that no contributions are payable from 1 January 2016.

Pension costs comprise £72,379 (2019 – £68,347) in respect of the defined contribution scheme and £4,172 (2019 – £5,493) in respect of Death in Service contributions.

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS102 purposes, at 31 December 2020, shows a pension surplus of £368,000 (2019 – £423,000), which cannot be recognised as this is not available to the Society by way of reduced future contributions. The amounts recognised in the balance sheet are as follows:

	2020 £'000	2019 £'000
Present value of funded obligations	(548)	(488)
Fair value of scheme assets	916	911
Surplus not recognised	(368)	(423)
Surplus in scheme at end of the year and available to the Society	—	—

Changes in the present value of the defined benefit obligations are as follows:

	2020 £'000	2019 £'000
Opening defined benefit obligation	488	461
Interest cost	10	13
Re-measurement arising from changes in assumptions and experience	50	14
Closing defined benefit obligation	548	488

Changes in fair value of scheme assets are as follows:

	2020 £'000	2019 £'000
Opening scheme assets	911	823
Interest Income	19	24
Actual return on plan assets, excluding interest income	(14)	64
Closing scheme assets	916	911

The amounts recognised in other recognised gains and losses are as follows:

	2020 £'000	2019 £'000
Remeasurement of defined benefit obligation	50	14
Return on plan assets	14	(64)
Effect of surplus restriction	(64)	50
Total	—	—

The actual return on scheme assets was £5,000 (2019 – £88,000).
The major categories of scheme assets as a percentage of total scheme assets are as follows (fair value):

	2020 %	2019 %
Equities	45	41
Bonds	17	21
Property	11	13
Cash	8	8
Gilts	19	17
	100	100

Principal actuarial assumptions at the balance sheet date (expressed as a weighted average):

	2020 %	2019 %
Discount rate at 31 December	1.5	2.1
Retail Prices Index	3.1	3.2
Consumer Prices Index	2.4	2.3
Increases in deferment	2.4	2.3
Future pension increases – pension earned before 6 April 1997	0.0	0.0
Future pension increases – pension earned after 6 April 1997	3.1	3.2

The current mortality rate assumptions include sufficient allowance for future improvements in mortality rates. The assumed life expectancy for a pensioner retiring at 65 on the balance sheet date is:

	2020	2019
Retiring now		
Male	20.2	20.1
Female	22.4	22.3
Retiring in 20 years		
Male	21.5	21.4
Female	23.8	23.7

Amounts for the current and previous four periods are as follows (defined benefit pension scheme):

	2020 £'000	2019 £'000	2018 £'000	2017 £'000	2016 £'000
Defined benefit obligations	548	488	461	493	426
Scheme assets	916	911	823	846	795
Surplus	368	423	362	353	369

21 Grants committed

Grants, principally fellowships and travel and research grants to the value of £287,819 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2019 – £405,748). These grants were not approved or communicated to the recipients until after the year end and therefore have not been accounted for in the year ended 31 December 2020.

22 Connected Charities and related party transactions

Since 2001, the Society has been the administration agent for the Trustees of FA Paneth Meteorite Collection, a charity connected to the Royal Astronomical Society. The Paneth Trustees decided that its income should support research in cosmochemistry by graduate and postdoctoral students. The accumulated net expenditure of £36,916 (2019 – £28,477), is included in Other Creditors. Due to the Covid-19 pandemic, no grants were awarded (2019 – £10,573). Total income was £8,439 (2019 – £11,670).

The Society also administers the Sir Norman Lockyer Memorial Trust, (charity registration number 900135). By agreement with the Charity Commission, the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836–1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2013, 2016, 2019 etc for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. The Norman Lockyer Fellowship is currently funding a three-year fellowship from October 2020, totalling £162,000. The fund balance, including the unspent balance in the restricted fund, is £1,828,652 (2019 – £1,856,461).

Transactions involving Trustees are disclosed in note 10.

There are no other related party transactions requiring disclosure.



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