

Annual Report & Financial Statements 2021



Royal
Astronomical
Society

Royal Astronomical Society

Patron

Her Majesty The Queen

Trustees

Council Members who served during 2021

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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)

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Dr Hannah Dalgleish (Councillor, A, University of Oxford/University of Namibia)

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Prof. Lyndsay Fletcher (Senior Secretary, G, until May 2021, University of Glasgow)

Dr Claire Foulon (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)

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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

Astronomical 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

Registered and Principal Office

Burlington House

Piccadilly

London

W1J 0BQ

Charity registration number

226545

Auditor

Buzzacott LLP

130 Wood Street

London

EC2V 6DL

Bankers

HSBC Bank plc

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

Newton Investment Management Ltd

The Bank of New York Mellon Centre

160 Queen Victoria Street

London

EC4V 4LA

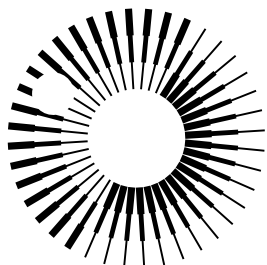
Solicitors

Bristows

3 Lincoln's Inn Fields

London

WC2A 3AA



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Leading
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Drawn to Astronomy

Great
Minds
Discover
Neptune

1846

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Pioneer of Photography

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)

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.

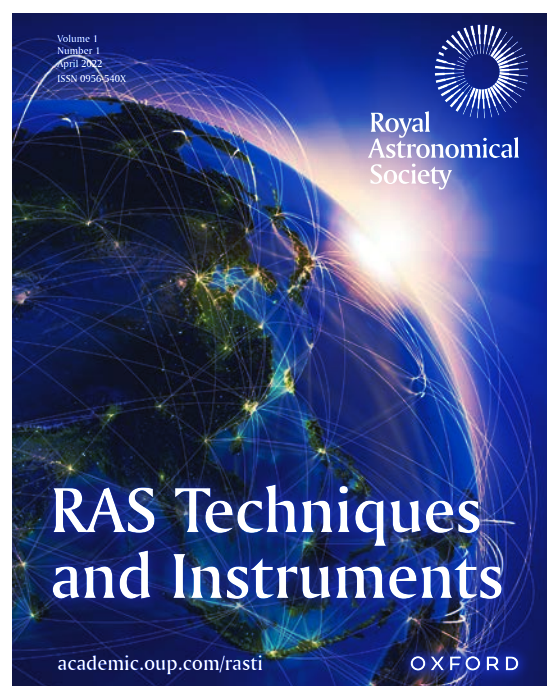
MNRAS publishes the results of original research in astronomy and astrophysics, including work which is observational, theoretical or concerned with astronomical instrumentation and software. *GJI* publishes articles on all aspects of theoretical, computational, applied and observational geophysics. *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

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

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 Gwartz, 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

**204 FELLOWS
ATTENDED
THE VIRTUAL
AGM IN 2021**

interpret data from the new generation of facilities

Novel astrophysical probes of dark matter

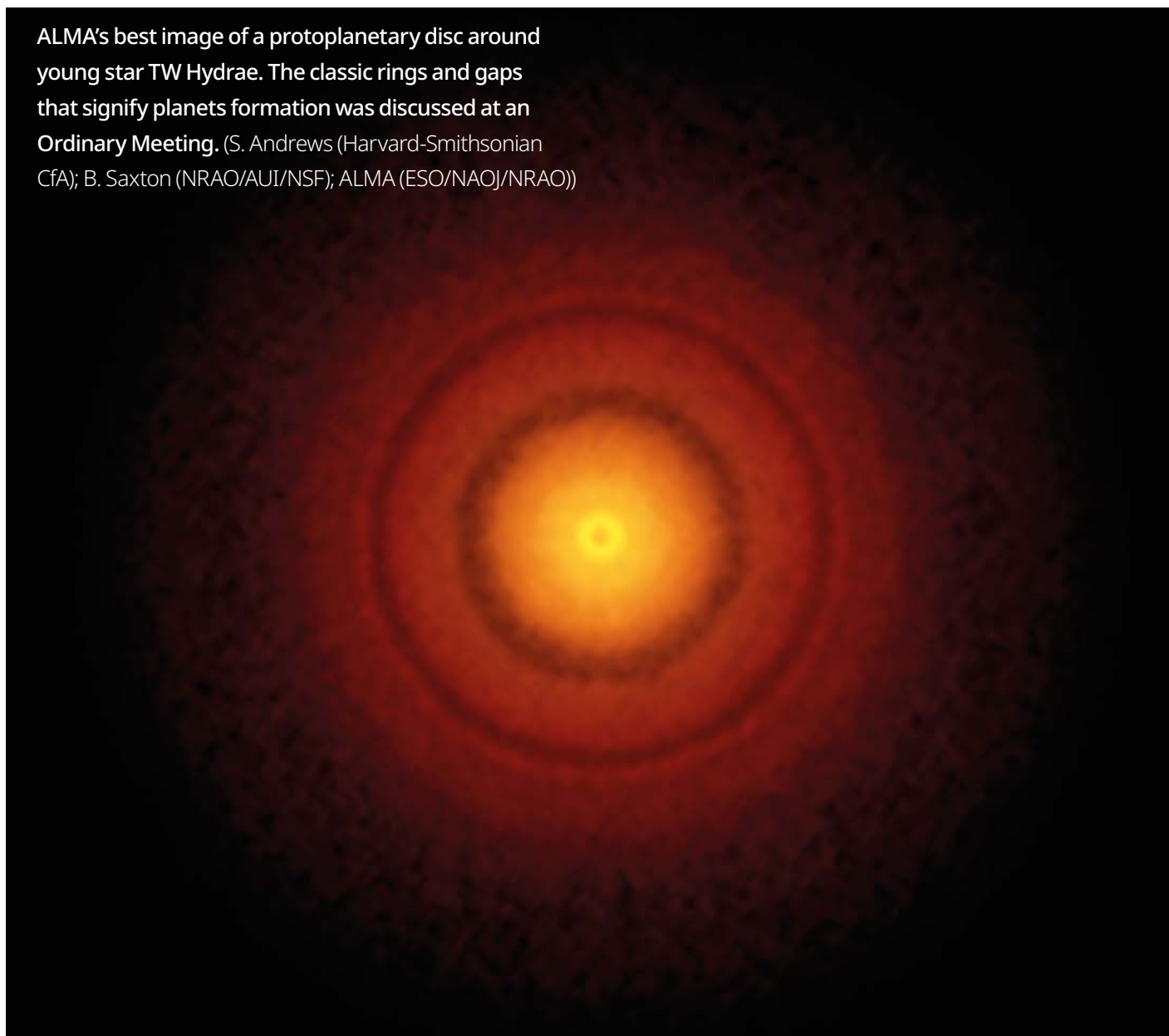
Space weather and the solid Earth: the hazard to technology at the Earth's surface

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

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

**1149 PEOPLE
ATTENDED
ORDINARY
MEETINGS
IN 2021**

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,

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.

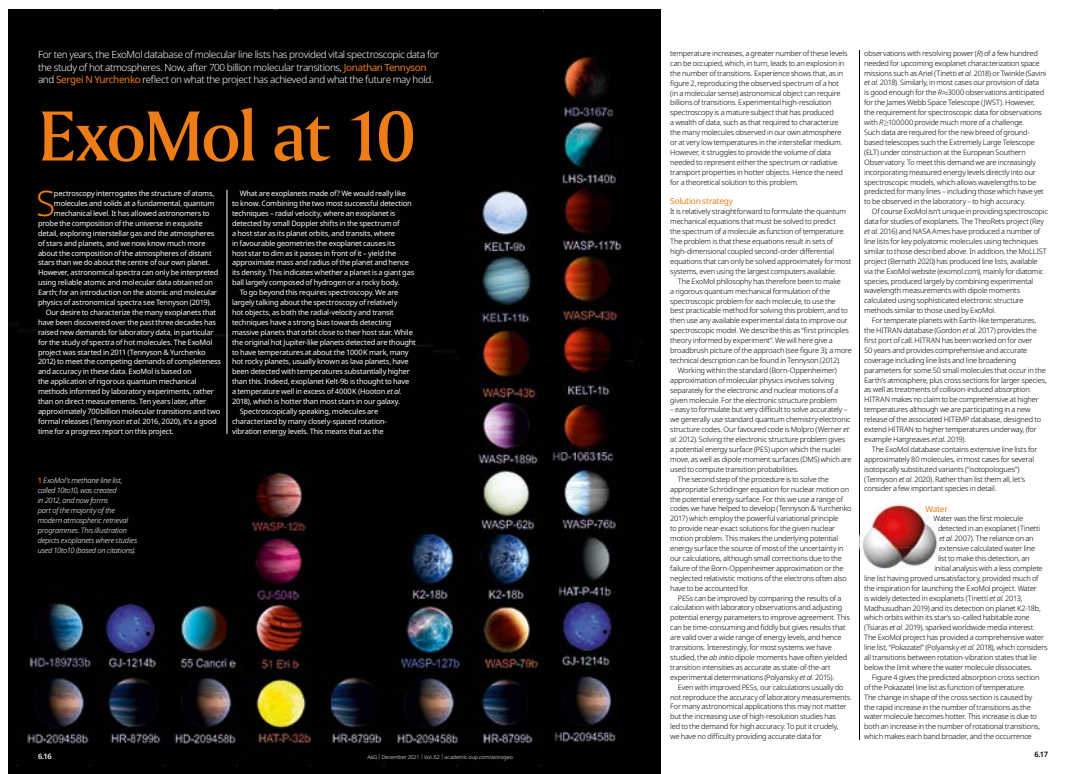
The Society hosted the 9th conference on Library and Information Services in Astronomy (LISA IX) from 14–18 June. This



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



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 243283 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



RAS policy work included the impact of satellite megaconstellations (T Hansen/IAU OAE/CC by 4.0)

The RAS's membership magazine A&G has been published in its current format now for 25 years

243283 A&G ARTICLES DOWNLOADED IN 2021

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

230 PEOPLE TOOK PART IN EVENTS RUN BY THE RAS EARLY CAREERS NETWORK

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*.

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)

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

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

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

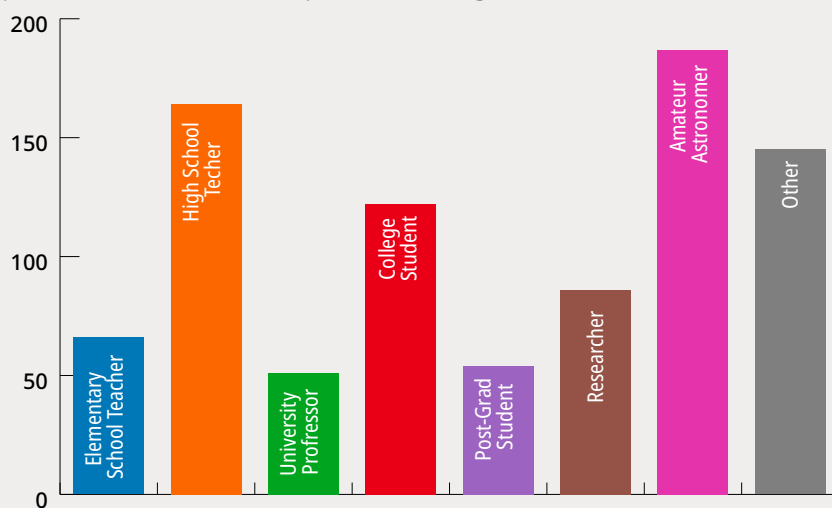
Global Hands-On Universe conference

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 landslides 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

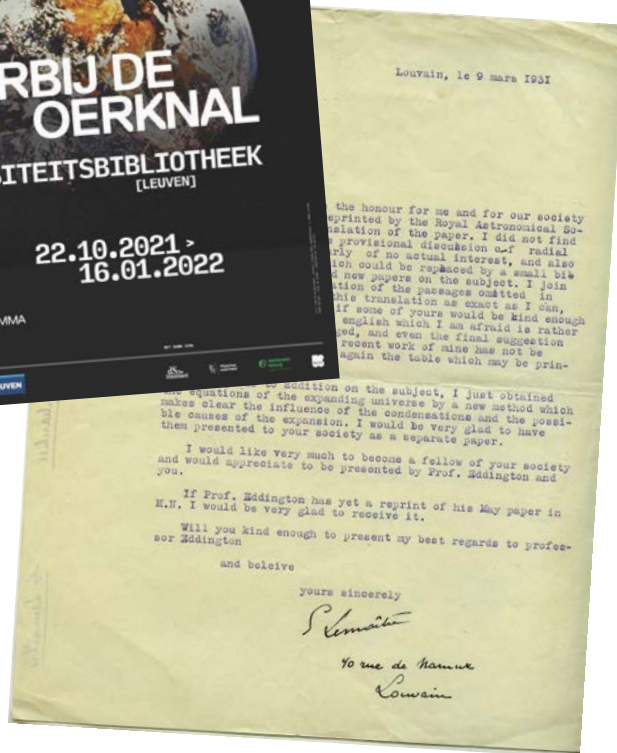
At the end of the year the Society released its digital bicentenary timeline, highlighting key events in our history over the past 200 years. Paper concertinas of the timeline were distributed to Fellows with their copies of *A&G*, and we set up a



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

**RAS TWEETS
RECEIVED
13,331 LIKES
IN 2021**

bicentenary timeline, as well as the very popular invitation to register for the 'Weird and Wonderful World of Uranus'.

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

155,860
PEOPLE HAVE
DIRECTLY
ENGAGED
WITH
RAS200
PROJECTS.

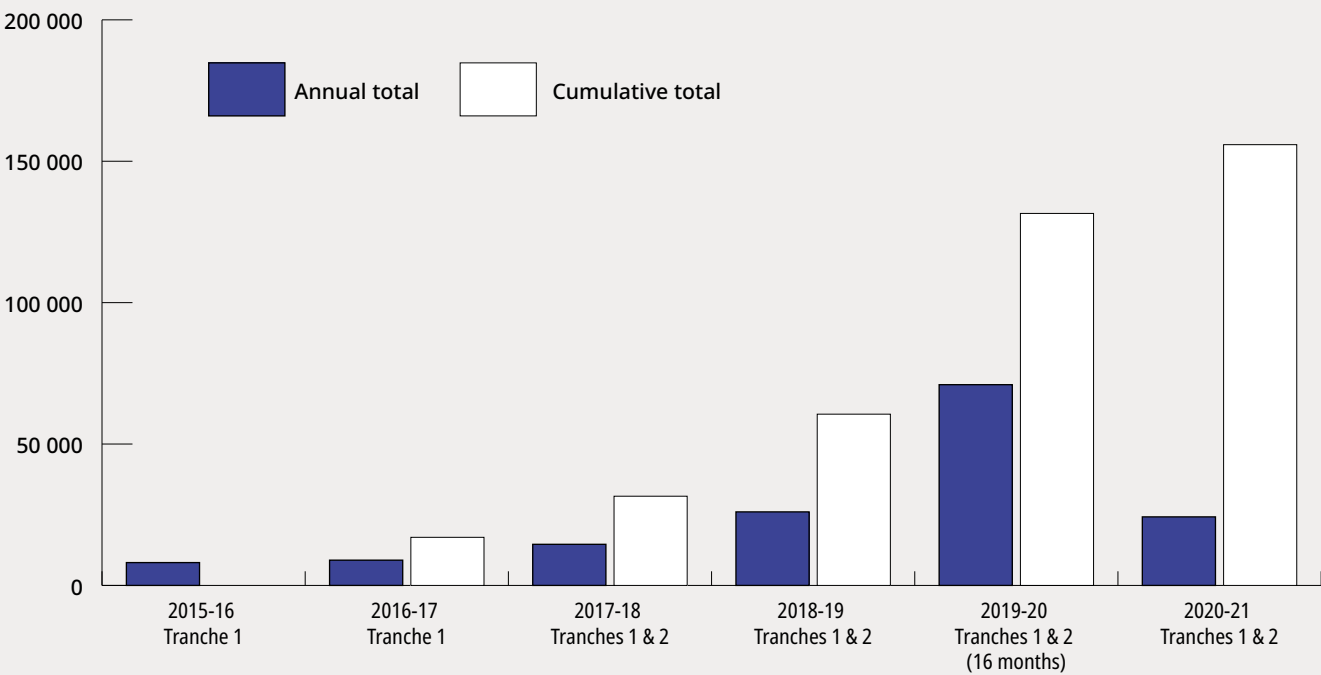
astronomy, the dark universe, the multiverse, the magnetic universe and dark matter. We held a survey in November with a good response rate of 16%, including some very positive feedback and useful suggestions. None of the usual visits were possible, as a result of pandemic restrictions.

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

Making Space continued their RAS200 programme of science and arts in Galway

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.

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,



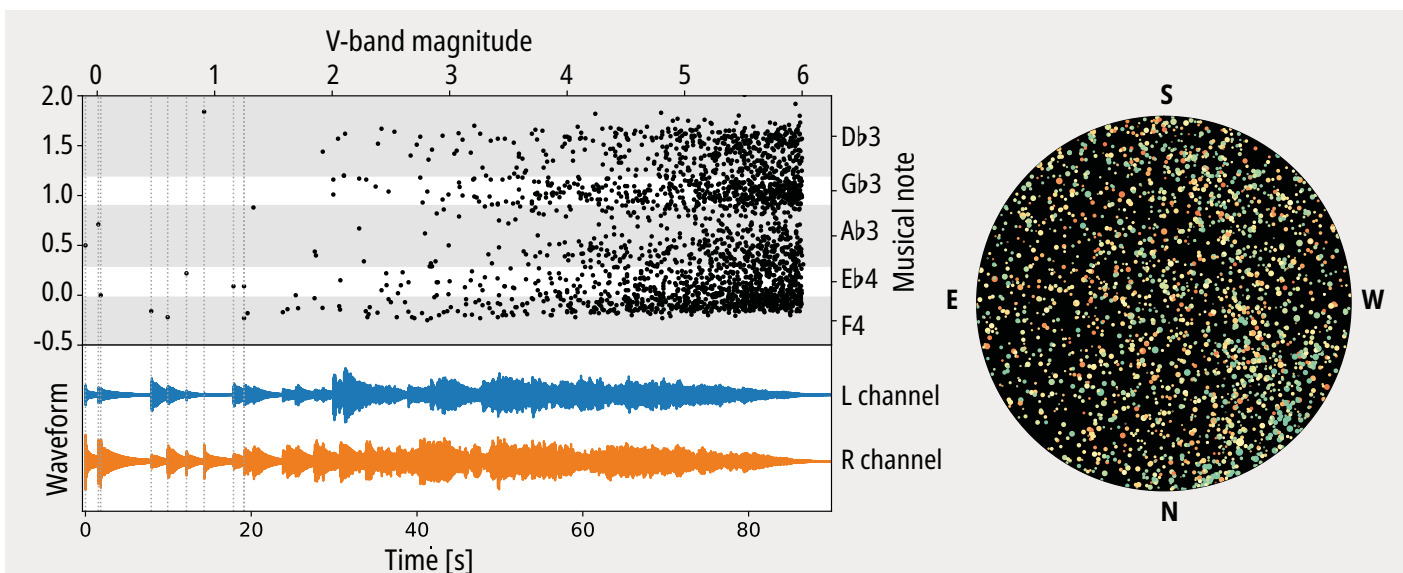


Diagram showing the sonification of stars 'appearing' after sunset in different parts of the sky.

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))

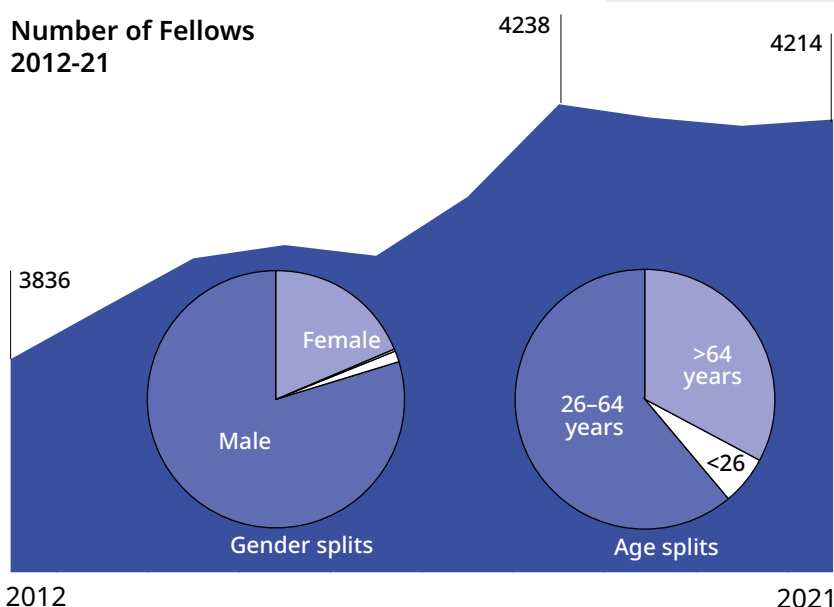
Membership

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

**Number of Fellows
2012-21**



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

The RAS is making plans for 2022 and the future by:

- Setting objectives for our activities
- Identifying specific goals for 2022



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.

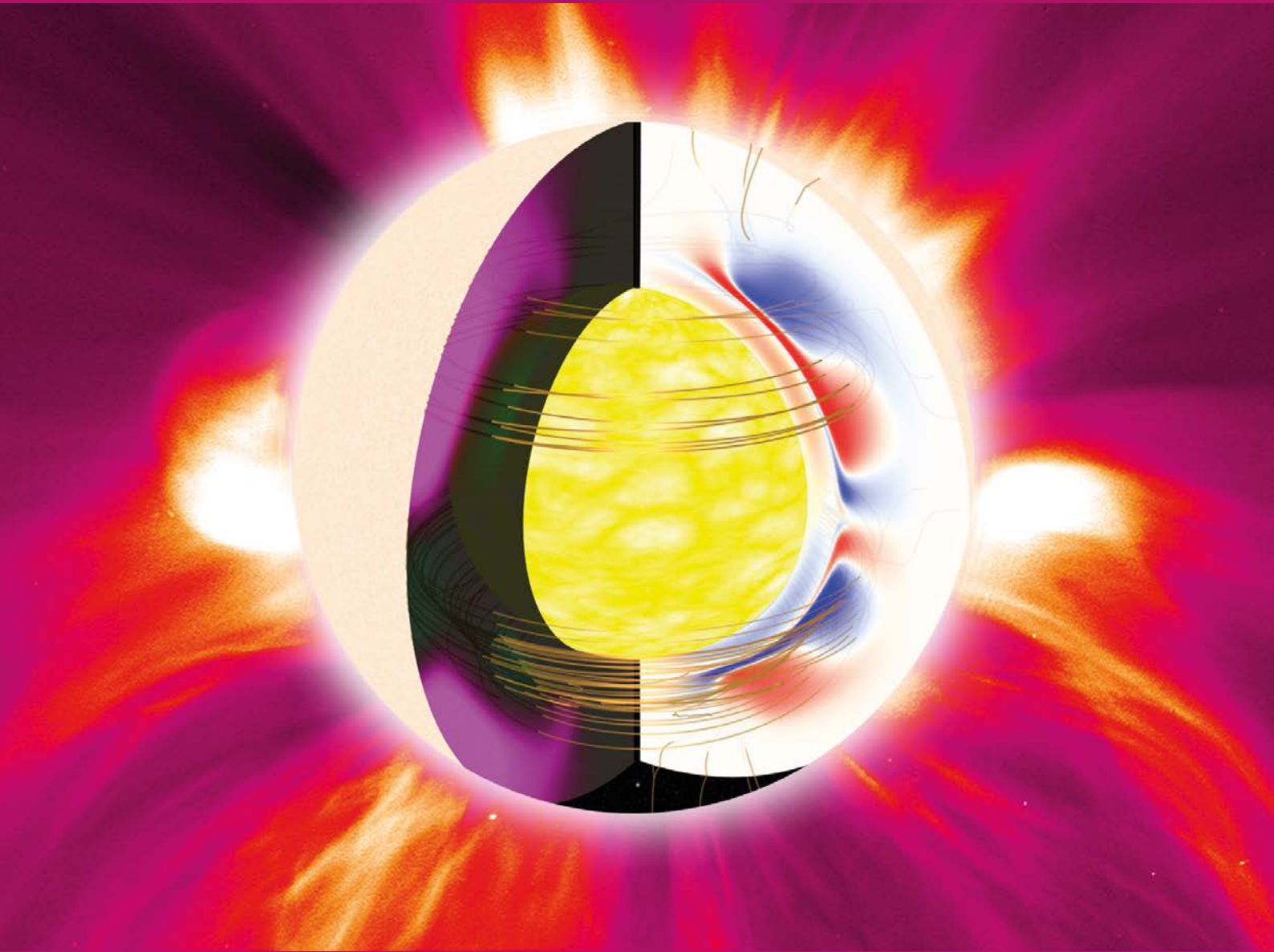
Bicentenary Timeline in Burlington House

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

Regulations and procedures of the Society:

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

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.

Fundraising

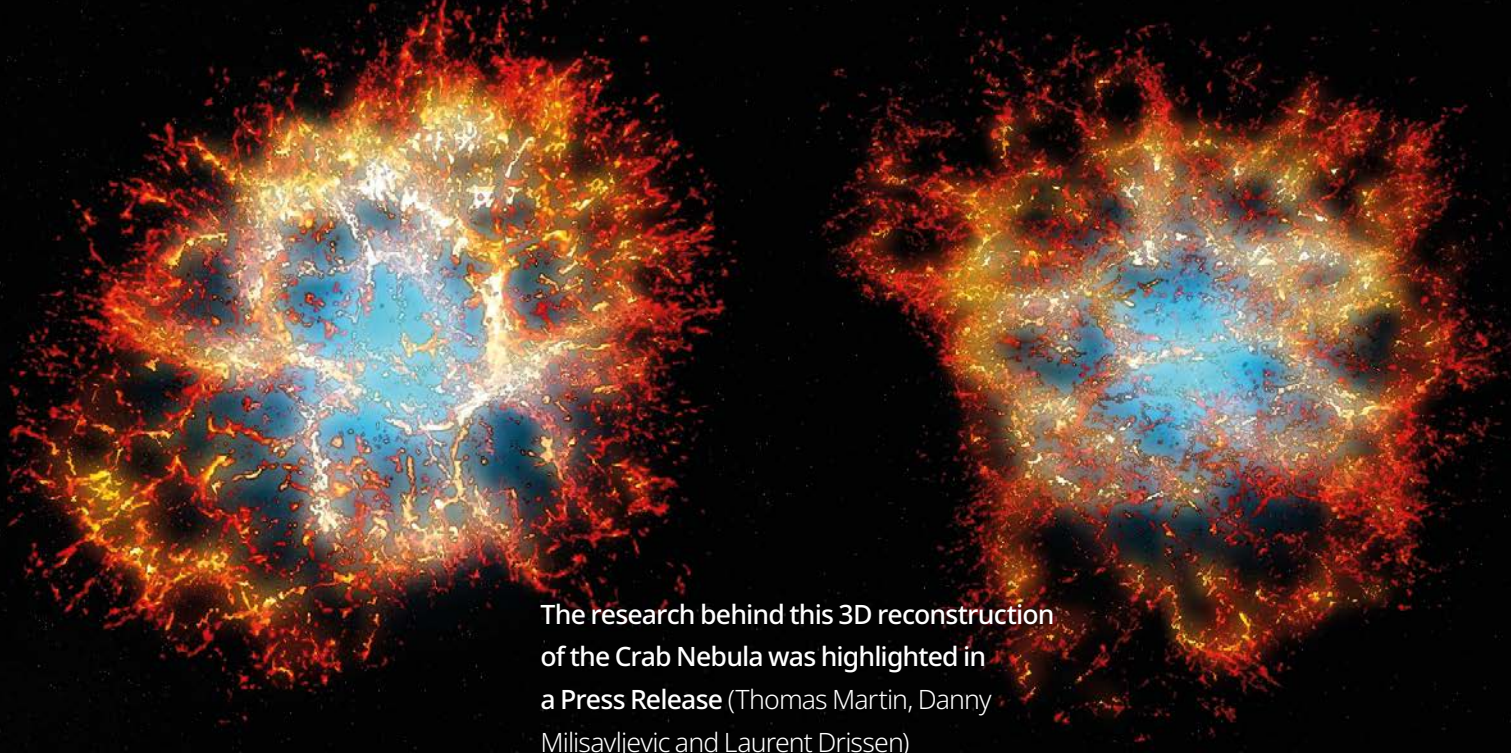
The Society is not currently fundraising actively, but if it does so in future it will comply with best practice as outlined by the Charity Commission, and also in compliance with GDPR. The Society offers information and guidance about leaving a legacy to the RAS on the website.

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

Mars Opposition



2016

Images of Mars under
clear conditions (left) and
during the 2018 Global
Dust Storm (right).
(NASA / ESA / STScI)



2018

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 equipment4 years
- Leasehold Improvements 20 years
- Plant and machinery10 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
	<u>795,109</u>	<u>11,420</u>	<u>(60,848)</u>	<u>(1,683)</u>	<u>—</u>	<u>743,998</u>

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 des- ignation £	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 des- ignation £	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 £'000	2020 £'000	2019 £'000	2018 £'000	2017 £'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

Royal Astronomical Society

Burlington House

Piccadilly

London W1J 0BQ

+44 (0)20 7734 4582 or

+44 (0)20 7734 3307

ras.ac.uk