

Royal
Astronomical
Society

Annual Report & Financial Statements 2019

Royal Astronomical Society

Patron

Her Majesty the Queen

Trustees

The Council members who served during 2019 were:

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Prof. Emma Bunce (President-elect, G, from May 2019, University of Leicester)

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Dr Mandy Bailey (Secretary, A, Open University)

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Prof. Steven Miller (Councillor, G, University College London)

Dr Sheila Peacock (Councillor, G, until May 2019, AWE Blacknest)

Prof. Giovanna Tinetti (Councillor, A, until May 2019, University College London)

Dr Sheona Urquhart (Councillor, A, from May 2019, Open University)

Dr Indhu Varatharajan (Councillor, G, from May 2019)

Prof. Mike Watson (Councillor, A, until May 2019, University of Leicester)

Dr Clare Watt (Councillor, G, University of Reading)

Prof. Anton Ziolkowski (Vice-President, G, University of Edinburgh)

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

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Deputy Executive Director: Robert Massey

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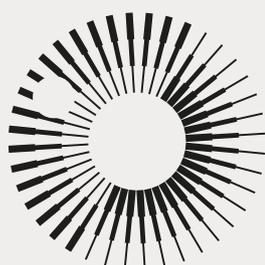
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COVER IMAGE Spiral galaxy M51, the Whirlpool Galaxy. Dr James Geach delivered a Public Lecture on “The formation and evolution of galaxies: a 14 billion year story” in March. (NASA, ESA, S Beckwith [STScI] and Hubble Heritage Team [STScI/AURA])

Startrails over the Leviathan in Birr Castle Demesne.
In January, Prof. Peter Gallagher delivered a Public
Lecture entitled "Tuning in to the radio universe
from Birr Castle". (Luis Alberto Cañizares)



From Our President

This Annual Report of the Royal Astronomical Society provides an opportunity to report on our achievements from the past year, 2019, and to outline our plans for the future.

In the two centuries since the Society's foundation in 1820, the science of astronomy has altered radically, with the new wavebands of radio, infrared, ultraviolet, X-rays and gamma rays all contributing to our knowledge of the universe and its contents. Despite these revolutions in our science, the Society makes the same fundamental contribution as it did in the past: it publishes scientific papers as a means of sharing information and ideas around the world, organises regular scientific meetings where new results are presented and debated, and awards grants and medals to those deserving of support and recognition, although the scale and method of delivery has altered considerably in recent years.

Since its inception, the RAS has been proud to use a depiction of William Herschel's great 40-foot telescope as its logo and this is recognised worldwide. Looking forward to the next 200 years, RAS Council has sought views on a more modern image to express our values and activities, as other learned societies have done, and we launched our new logo at our bicentenary celebration at the Langham Hotel in London on 23 January 2020. We will continue to have an image of the Herschel telescope as the Society seal to be used on very formal occasions reflecting our distinguished heritage, while our new logo reflects an image of the very positive future of our science.

Our Fellows are fundamental to our success; this year we have started a Policy Group, drawing expertise from among the Fellowship to shape the information we provide to government and funding bodies. Looking to the future, in order to meet the needs of Fellows at the start of their careers, we are launching an Early Careers Network. This Network will allow us to hear directly from the next generation of researchers as to how best to support them. This initiative is being led by my successor, Prof. Emma Bunce.



LYNDA LAIRD/RAS

At the time of writing, I have heard the very sad news that Prof. Margaret Burbidge has died at the age of 100. Margaret was a member of the Society for 80 years. She was a global leader in astrophysics. She was lead author with William Fowler, Fred Hoyle and her husband Geoffrey Burbidge on the 1957 seminal paper of stellar nucleosynthesis – the formation of elements through nuclear reactions in the core of stars. In 2005, she received the Gold Medal of the Society.

Unfortunately, the Covid-19 pandemic has meant that we have had to put on hold many of the exciting events we had planned for 2020. We are adapting and having to learn new ways to support our community. I have no doubt that, with the support of our Trustees, members, volunteers and staff, we will emerge from this crisis stronger than ever.

Mike Cruise President, 2018–2020

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.

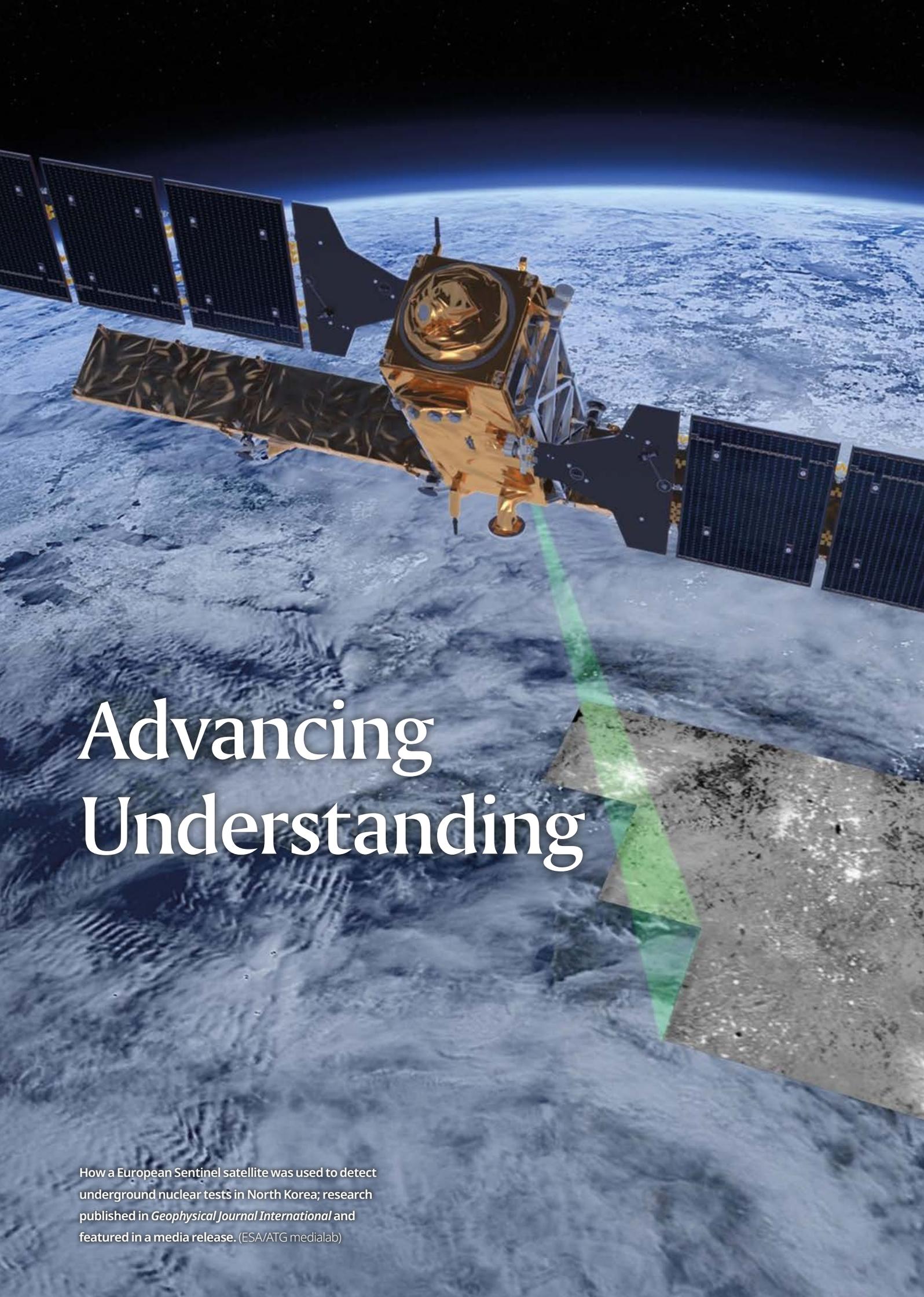
Our objectives fall within two broad areas: advancing understanding and sharing knowledge; the organisation of the Society supports these goals.

The Society's principal objectives for 2019 were to:

- continue to publish high-quality peer-reviewed journals on astronomy and geophysics
- sustain its support of students and early-career scientists through research fellowships and grants
- continue to recognise achievement by the award of medals and prizes
- maintain a high-quality programme of research meetings, including the National Astronomy Meeting, and public lectures
- sustain our Library and Archive service
- continue political engagement to make the case for sustained and significant public funding of astronomy and geophysics research
- maintain our programme of education and outreach activity, 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 as part of a cultural hub with the other Courtyard Societies.

In 2019 the Society would further:

- review the code of conduct for effectiveness, and provide a statement of Society values
- monitor and provide input to the Trustees on how best to respond to the Open Access publishing policy agenda
- prepare the case for introducing a youth membership scheme aimed at school-level membership and interfacing with amateur societies
- prepare the case for introducing merchandising activity
- enhance the benefits and support we offer to younger members
- review our committee structures
- set up a group of early-career members to support our policy work
- respond to concerns we have about our accommodation in Burlington House.



Advancing Understanding

How a European Sentinel satellite was used to detect underground nuclear tests in North Korea; research published in *Geophysical Journal International* and featured in a media release. (ESA/ATG medialab)

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

- publishing journals
- supporting scientists financially with fellowships and grants
- organising scientific meetings
- recognising excellence through awards
- running a Library and Archive for research
- producing a magazine for our members
- lobbying government
- promoting diversity in our community.



Journals

The Society publishes two academic peer-reviewed journals that are world-renowned: *Monthly Notices of the Royal Astronomical Society (MNRAS)* and *Geophysical Journal International (GJI)*. *MNRAS* publishes the results of original research in astronomy and astrophysics, including work which is observational, theoretical or concerned with astronomical instrumentation and software. *GJI* publishes articles on all aspects of theoretical, computational, applied and observational geophysics. Both journals receive submissions from authors worldwide. The peer-review process is overseen by an editorial team of seven assistant editors and the editorial office manager. Profiles of all of our editors and editorial team can be found on our website at ras.ac.uk/journals/Editorial-Boards-and-Team.

The impact factor of a journal reflects the frequency with which articles are cited in the scientific literature. In 2019, *MNRAS* achieved an impact factor of 5.231 (a 0.7% increase on the previous year), there were 3,983,673 article downloads, 4711 articles were submitted and 3769 articles were published. There are 26 editors including the editor-in-chief, Prof. David Flower.

GJI achieved an impact factor of 2.777 in 2019 (a 9.8% increase on the previous year), published 561 papers, received 1180 submissions and there were 1,566,612 article downloads. In 2019, we published a *GJI* special issue of papers from the 16th Symposium of the Study of the Earth’s Deep Interior (SEDI). Prof. Joerg Renner remained as editor-in-chief and there are currently 30 editors.

The *MNRAS* annual editorial board meeting was held in April in London, and the *GJI* board meeting was held in December during the AGU

RAS Librarian Siân Prosser in front of bound copies of *Monthly Notices in the Library*; the journal published 3769 papers in 2019.

(Lynda Laird/RAS)

meeting in San Francisco. 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, and editorial office staff worked as part of the Publications Strategy Working Group.

Authors do not pay to publish in our journals, although there is a page charge for *MNRAS* papers of more than 20 pages. The journals are “hybrid” journals: authors can opt to pay for Open Access if they wish. Very few authors do so 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, is freely available online. RAS members also have free online access.

We continue to support early-career researchers in communicating their research effectively by running workshops at conferences. Journal staff and the editor-in-chief of *MNRAS* delivered a workshop for authors and referees at the National Astronomy Meeting in July. To further engage with and support our community, we run a Twitter account (@RAS_Journals), which had more than 600 followers at the end of 2019 and has introduced *MNRAS* and *GJI* to a wide audience. Focusing on the National Astronomy Meeting and Peer Review Week, with tips for authors and reviewers, plus information from our Editorial Boards brought the RAS journals to large numbers of Twitter accounts: 55,600 in July, for example.

There were two winners of the *GJI* student prize for the best paper in 2019 – Matthew Maitra and Serge Sambolian – who both received a cash prize and certificate. Their papers were also made freely available.

NEARLY FOUR MILLION DOWNLOADS FROM MONTHLY NOTICES

Research fellowships and grants

129 grants, research fellowships and awards totalling £542,711 were made to institutes, and 43 grants, fellowships and awards totalling £22,239 to individuals. Expenditure supporting the Norman Lockyer Fellowship totalled £104,000. Details of all grants awarded can be found on the Society website.

The Society supported six Research Fellowships and the RAS Norman Lockyer Fellowship during 2019:

Dr Elisa Chisari (University of Oxford): Accurate astrophysics for the next era of cosmology

Dr Joanna Eberhardt (née Barstow) (UCL):

Nature vs nurture: the effect of stellar irradiation on atmospheric evolution

Dr Amy Gilligan (University of Aberdeen):

When subduction stops: understanding tectonic process in post-subduction settings

Dr Matt Nicholl (University of Edinburgh):

Superluminous supernovae: a comprehensive observational and theoretical study of Nature's brightest fireworks

Dr Ben Rozitis (Open University): Probing solar system processes using extreme asteroids

Dr Peter Wyper (Durham University): Explaining the onset of explosive magnetic reconnection in the solar corona and its links to the generation of solar energetic particles

RAS Norman Lockyer Fellowship:

Dr Vinesh Maguire-Rajpaul (University of Cambridge): Transforming the search for Earth-like planets with advanced modelling tools

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 2019 awards and medals:

Gold Medal for Astronomy Prof. Robert Kennicutt FRS (University of Texas A&M)

Gold Medal for Geophysics Prof. Margaret Kivelson (University of California Los Angeles)

Eddington Medal Prof. Bernard Schultz (University of Cardiff and Max Planck Institute for Gravitational Physics)

Chapman Medal Dr Tom Stallard (University of Leicester)

Herschel Medal Prof. Nial Tanvir (University of Leicester)

THE RAS
MADE
GRANTS,
RESEARCH
FELLOWSHIPS
AND AWARDS
OF **£564,590**

Prof. Margaret Kivelson on her way to receive the 2019 Gold Medal at the awards dinner during the National Astronomy Meeting in Lancaster.

(Lynda Laird/RAS)

Price Medal Prof. Catherine Johnson (University of British Columbia)

Jackson-Gwilt Medal Prof. Anna Scaife (University of Manchester)

Fowler Award for Astronomy Dr Baojiu Li (University of Durham)

Fowler Award for Geophysics Dr Ingo Waldmann (University College London)

Winton Award for Astronomy Dr Blake Sherwin (University of Cambridge)

Winton Award for Geophysics Dr Timothy Craig (University of Leeds)

Group Achievement Award in Astronomy Galaxy Zoo Team

Group Achievement Award in Geophysics The Cluster Science and Operations teams

Service Award for Astronomy Prof. Donald York (University of Chicago)

Service Award for Geophysics Prof. Kathy Whaler (University of Edinburgh)

Patrick Moore Medal for Education Angela Bentley

Annie Maunder Medal Dr Sarah Crowther (University of Manchester)

George Darwin Lecture Prof. Christine Done (University of Durham)

Harold Jeffreys Lecture Prof. Francis Nimmo (University of California in Santa Cruz)

James Dungey Lecture Dr Mark Clilverd (British Antarctic Survey)

Honorary Fellowships

Prof. Dr Sierd Cloetingh (Utrecht University)
Dr Glenn Orton (NASA Jet Propulsion Laboratory, USA)

Prof. Ralf Bender (Max-Planck Institute for Extra-terrestrial Physics)



Quenching galaxies and the search for evidence of AGN feedback

Prof. Peter Coles (Maynooth University, Ireland):
Lights all askew in the heavens: the 1919 eclipse expeditions

Prof. Mike Cruise (University of Birmingham):
Presidential Address 2019
The gravitational wave spectrum

Dr Rebekah Higgitt (University of Kent):
RAS Diary talk Expeditionary astronomers: the 1769 transit of Venus and British voyages of scientific exploration

Dr David Jones (Instituto de Astrofísica de Canarias, Spain): Common envelope evolution: from binary star chrysalis to cosmic butterfly

Dr Ryan Zeigler (NASA Johnson Space Center, USA): NASA and the Moon: from Apollo to Artemis

Dr Robert Massey (RAS) and **Dr Alexandra Loske** (Royal Pavilion, Brighton):
Moon: art, science, culture

Prof. Mark Clilverd (British Antarctic Survey):
James Dungey Lecture 2019
Energetic particle precipitation and its effects on the upper atmosphere and climate

Prof. Chris Done (University of Durham):
George Darwin Lecture 2019
Black holes: Einstein's gravity and rocket science

Prof. Ken Pounds (University of Leicester):
The origins of X-ray astronomy in the UK

Eimear M Gallagher (RAL Space/Nottingham Trent University): *Patricia Tomkins Undergraduate Prize 2018* CHARMing: developing an astronomical heterodyne receiver for the Large Millimetre Telescope

Dr Ingo Waldman (University College London):
RAS G Fowler Award 2018 Characterising exoplanet atmospheres with artificial intelligence

Prof. Chris Lintott (Oxford University):
RASA Group Achievement Award 2019
Wonders of the Galaxy Zoo: morphological studies with a crowd

Library and Archive

The Library continued to support scholarship by hosting 213 research visits from Fellows, Friends and external researchers, from undergraduate students to established academics, artists, museum curators and independent researchers. These visits were to consult the specialist,



Author Mark Holborn at the RAS discussing John Herschel's 1838 negative of his father's 40-foot telescope structure.

(Lynda Laird/RAS)

up-to-date reference library and the unique and distinctive archive, rare book and photograph collections. Many of these primary materials will feature in books, articles, exhibitions, websites and research-led teaching materials. Researchers travelled from around the world to access the Society's collections, but the Librarian also fielded more than 300 remote research enquiries, received via email, phone, post and social media.

The Librarian has continued to publicise the collection by taking part in conferences, talking about the first women to work in the Society's library at the Library and Information History Group conference at John Rylands Library in Manchester, and delivering a talk to the BAA History Section about using the RAS Library and other collections for research in astronomical history.

1356 PEOPLE VISITED THE LIBRARY



Sharing Knowledge

Artist's impression of a giant flare discovered on a tiny star, raising questions about how stars store energy – and the consequences of such flares for orbiting planets. The research was published in *Monthly Notices*. (Mark A Garlick/University of Warwick)

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

- organising education and outreach events
- supporting the Friends of the RAS
- exploiting the resources of the Library and Archives
- arranging a programme of Public Lectures
- working with specialist partners through RAS200
- promoting research in the media and social media
- working with other Courtyard Societies as a cultural hub.



Education and outreach

The Society continued its programme of public engagement, working with schools, voluntary sector organisations, and public sector bodies including the Science and Technology Facilities Council (STFC) and the UK Space Agency. Public engagement events – addressing a total of 10,600 people – included school visits, group visits to the RAS, an event at the Science Museum, International Women’s Day at the US Embassy, a weblink talk with a school in Turkey, a talk at the Grand Iftar feast in Bristol, the City Leadership Programme and sessions with dementia patients. Both education and outreach officers renewed their designation as Space Champions, working with the European Space Education Resource Office to train primary teachers. And the RASReach meeting in Newcastle attracted 123 people to share best practice in public engagement.

Using an STFC grant, we managed the second phase of the AstroBoost project to upskill amateur astronomy groups to deliver outreach work focused on the James Webb Space Telescope. The project worked with 970 people across 21 local societies, and created a suite of online resources. The Society also co-managed the UK arm of the International Astronomical Union exoworld naming competition, which saw around 15,000 entries. The winners from the Isle of Man used the Manx language to name a star “Gloas” (to shine) and its planet “Cruinlagh” (to orbit).

The Society once again supported the UK Space Conference in Newport in September,

Education and Outreach Officer Lucinda Offer making a “comet” at the Open House event in September. (Lynda Laird/RAS)

working with schools at the conference and chairing sessions. The conference had a record attendance of 2000 people from industry, academia, education and the third sector. Highlights included sessions on the global future of the space sector, and how to inspire the next generation of scientists and engineers.

The RAS ran public and school events marking the centenary of the confirmation of Einstein’s general theory of relativity. There was an immersive theatre experience on 29 and 31 May (London History Day) to mark the centenary of the 1919 solar eclipse, and a panel event on 6 November which featured four speakers (authors and academics) and included a visit to the Library beforehand. This event was kindly sponsored by Mark Shuttleworth, open-source entrepreneur and South Africa’s first astronaut.

Friends of the RAS

The Friends of the RAS scheme allows members of the public with an interest in astronomy or geophysics to support the Society’s work, and to have opportunities through the Society to find out more about our sciences. There were 215 Friends of the RAS by the end of 2019. Marcus Hope, the volunteer leader of the Friends programme, provided an impressive programme of lectures, including “Who won the space race? The thriller that John Le Carré didn’t write...”, “The formation of stars” and “Comet Interceptor”.

Library and Archive outreach

A total of 1356 people visited the Library in 2019, more than 1000 of them during the events above, or as a result of Public Lectures and the

15,000 UK ENTRIES TO THE IAU COMPETITION TO NAME AN EXOWORLD

20 group visits organised for schoolchildren, undergraduate and postgraduate students, neighbouring organisations, and delegates to scientific meetings taking place at Burlington House. More than 100 books, manuscripts and objects from the Society's collections were displayed to visitors during the course of the year.

At the Courtyard Late event in July, we showcased the new publication *Sun and Moon* by Mark Holborn, which features historical photographs from the RAS collections. The author spoke about his book, written to mark the anniversary of the first Moon landing by Apollo 11 in July 1969, and the 40th anniversary of NASA's geological survey of the moon, with its extraordinary cartography. We were also pleased to welcome visitors during the Open House heritage buildings event on 22 September.

The work of Library staff on the project to sort, catalogue and rehouse the glass plate negatives uncovered some rare footage showing the first film of a solar eclipse from 1900. Library staff partnered with the British Film Institute to digitise it and put it online, both on the BFI's digital collection and on YouTube, where it has now been watched more than 300,000 times, thanks in great part to phenomenal press interest.

In 2019, the Society made a record number of loans from the Library and Archives to exhibitions in museums and galleries. In January, Caroline Herschel's first comet observation notebook and annotated star atlas, together with a letter from Mary Somerville, were loaned to Turner Contemporary, Margate, as part of a major retrospective of the work of Katie Paterson, entitled "A Place That Exists Only in Moonlight". 115,126 people visited this exhibition.

From March 2019 to January 2020, works by William and John Herschel featured as part of the Herschel Museum's exhibition "Invisible Light: William Herschel and Infrared". In July 2019, the Society lent a selection of maps, books and drawings to the National Maritime Museum, which was celebrating the 50th anniversary of the Moon landing with a major and popular new exhibition "The Moon".

1979 PEOPLE ATTENDED THE PUBLIC LECTURES



Showing off pieces of meteorite. (Lynda Laird/RAS)

Sir Isaac Newton popped in to Burlington House to help explain the concept of gravity. (Lynda Laird/RAS)

Public Lectures

The Public Lectures arranged by the RAS have again proved extremely popular, with tickets selling out at both the lunchtime and evening events; the talks are also recorded and made freely available on the RAS website. The talks given were:

Prof. Peter Gallagher (Trinity College Dublin):

Tuning in to the radio universe from Birr Castle

Prof. Jenny Collier (Imperial College London):

Brexit 1.0: The making of "Island Britain"

Prof. James Geach (University of Hertfordshire): The formation and evolution of galaxies: a 14 billion year story

Prof. Paul Crowther (University of Sheffield): Massive stars

Prof. Emma Bunce (University of Leicester): "Oceans, ices and fire" – moons of Jupiter

Dr Wanda Díaz-Merced (South African Astronomical Observatory): Sonifying the cosmos

Prof. Richard Hechter (University of Manitoba, Canada): *Joint IoP/RAS Lecture* Connecting with people: developing unity and understanding under the night sky

Dr Stephen Wilkins (University of Sussex):

Origins of the periodic table

Dr Sarah Crowther (University of Manchester):

Moon, meteorites and more...

Dr Anna Lisa Varri (University of Edinburgh):

The Caroline Herschel Lecture 2019 Small stellar systems, big astrophysical questions.



Projects such as the performances and commissions at the National and Urdd Eisteddfods, the National Space Centre Creative's *The Planets* 360 planetarium show, Girlguiding's space activities, and community projects such as those in Galway, Cornwall and at the South African Astronomical Observatory are bringing our sciences to large numbers of people; for example:

EISTEDDFODS

2000 COMPETITORS ENTERED 11 ARTS COMPETITIONS WITH ASTRONOMY AND GEOPHYSICS THEMES

GIRLGUIDING

2200 GIRLS TOOK PART IN ASTRONOMY- AND SPACE- THEMED ACTIVITIES

GALWAY INTERNATIONAL ARTS FESTIVAL 2019

7000 PEOPLE VISITED AN ASTRONOMY-THEMED ART EXHIBITION

CORNWALL SEA TO STARS

2900 PEOPLE SAW DISPLAYS AT 22 EVENTS

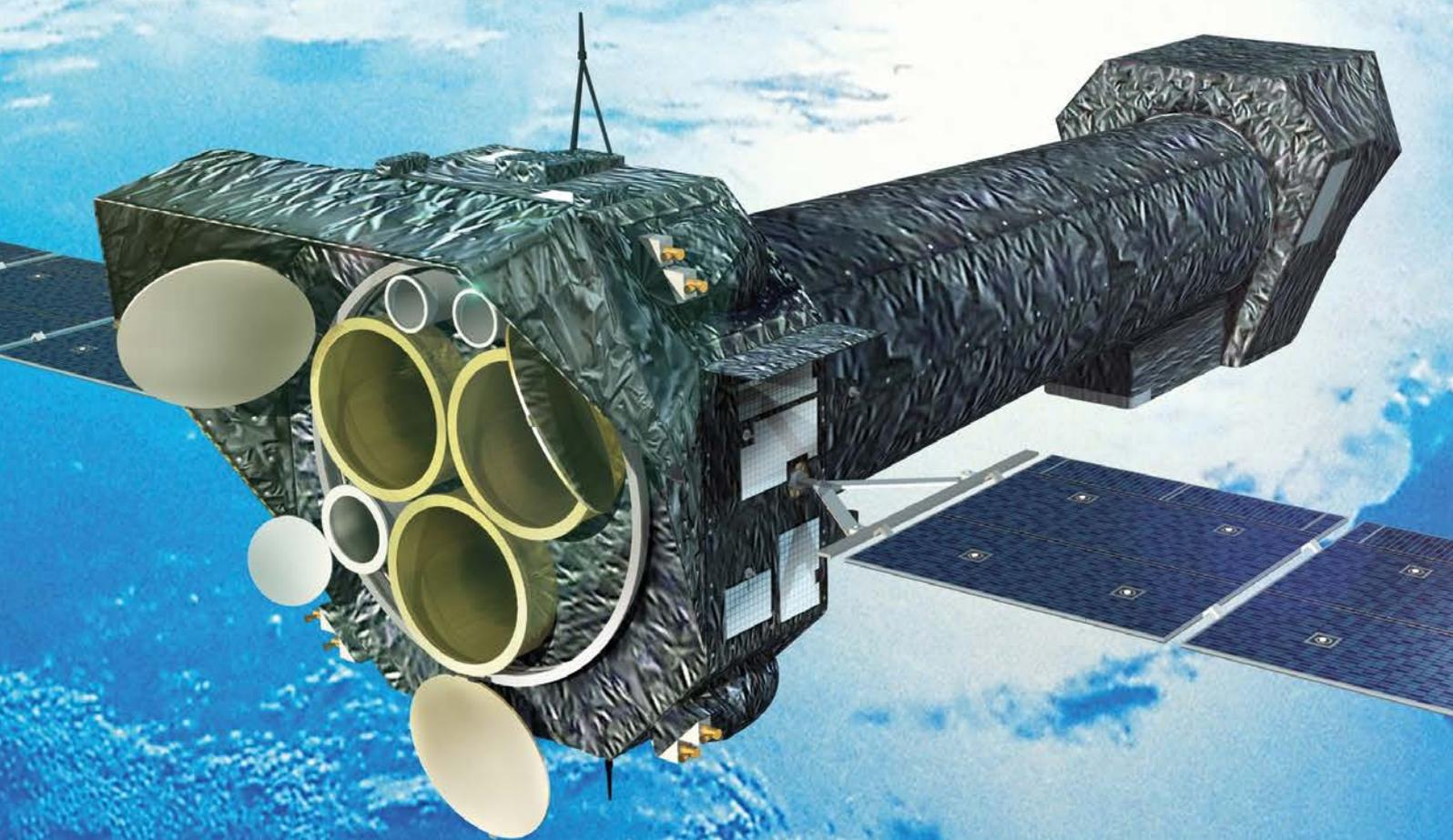
Top and middle: The new "Space" badge, already awarded to 1706 girls, and Brownies at Burlington House.

(Lynda Laird/RAS)

Bottom: A spectrum of ages collaborated on a spectrum of colours in Galway. (Making Space)



Our Organisation



ESA's XMM-Newton is the most sensitive X-ray telescope ever built. It was the subject of the Specialist Discussion Meeting "X-ray astrophysics from XMM-Newton to Athena: the heritage of XMM and opportunities of Athena". (ESA/D Ducros)

The organisation of the RAS supported our objectives by:

- consolidating plans for the bicentenary in 2020
- reviewing our ethos and committee structure
- considering the needs of younger Fellows
- developing our website.

The Fellowship

The RAS had 4271 Fellows at the end of 2019, 173 of whom were Honorary Fellows. This slight increase on the number in 2018 continues the pattern of steady expansion that has seen the number of Fellows grow by 11% since 2013. A quarter of our Fellows (26%) live outside the UK. 19% of our Fellows are female. 32% of our members were over 65 and 7% under 25.

Merchandise

Representatives of the Society met with merchandising consultants to explore licensing opportunities as a future additional income stream. Further to this meeting, the Council of the Society will be asked to approve an initial investment to contract an experienced licensing agency to research the Society's archive and deliver a report outlining the opportunities in terms of product type, identify initial licensing partners and quantify the potential income.

Supporting young Fellows

A questionnaire has been developed for Fellows, asking for specific suggestions on changes the Society could make to better support early-career researchers. The analysis of the survey will form the basis of a report, outlining proposals for the consideration of Council. The

**11% GROWTH
IN MEMBERS
SINCE 2013**

A sewing bee at Burlington House as part of a quilting project to mark the bicentenary.

(Lynda Laird/RAS)

Society will launch an Early Careers Network in its bicentenary year. The initiative will be supported by President-elect Prof. Emma Bunce.

Policy group

In the summer, the Society created a new Policy Group, inviting Fellows to share their expertise to better shape our political engagement.

Code of Conduct

A Working Group on the RAS Code of Conduct was established at the 2018 Council Away Days. RAS Senior Secretary Prof. Lyndsay Fletcher and Councillors Prof. Steve Miller and Dr Sheila Peacock were appointed to this group. Their first proposal was finalised in 2019, but the Society delayed approval of the new code until some ongoing disciplinary issues have been resolved. Outside experts have been contracted to review the revised code in light of these issues. A revised code will be presented to Council in 2020 with a view to adoption and dissemination to Fellows thereafter.

Open Access publishing

The Publications Strategy Working Group was established by Council at its 2018 Away Day to review the future direction of the Society's journals and strategic issues in publishing. An interim report was produced in 2019. Open Access (OA) already represents a substantial fraction of the literature, and it is clear that it will grow in importance in some areas of scientific communication. The report recommended that the Society must engage actively to retain influence and leadership. A major driver of the growth of Open Access has been research funder policies and mandates which, until now, have worked with all commonly used models of OA publishing. A new mandate, "Plan S", has been launched by a coalition of funders and agencies (including UKRI). This would require OA publication of all funded research from January 2021 and would not permit widely used "hybrid" OA models, together with other stringent conditions. This constitutes a significant risk to RAS journals. The report therefore focused on recommendations to enable the journals to comply with Plan S in the short term to protect the Society's core assets, accompanied by recommendations for longer-term strategic developments to position it for the future.





Looking Forward

An artist's impression of the jet launched by a supermassive black hole, which inflates lobes of very hot gas that are distorted by the cluster weather. Used in a media release to publicise an article in *Monthly Notices*.
(Institute of Astronomy, University of Cambridge)

The RAS is making plans for 2020 and the future by:

- setting objectives for our activities
- identifying specific goals for 2020.

Objectives

The Society will:

- Publish its high-quality peer-reviewed journals
- Support students and early-career scientists through research fellowships and grants
- Recognise achievement through its medals and prizes
- Maintain high-quality research meetings, including the National Astronomy Meeting, and Public Lectures
- Sustain our Library and Archive service
- Continue our political engagement
- Maintain our programme of education and outreach activity, including Friends of the RAS
- Promote the work of the Society and Fellows in the media and on social media
- Build our outreach work with other Courtyard Societies.

In 2020, the Society will:

- Establish a Sustainability Working Group to address the local and wider environmental impact of astronomy, space science and geophysics
- Establish a Property Working Group to explore a range of options for the Society's accommodation in the future
- Launch an Early Careers Network to support its young Fellows.

Events since the year end

Reception. On the evening of 23 January 2020, the Society held a reception at the Langham Hotel in London to celebrate its bicentenary. The evening included addresses from President-elect Emma Bunce and Astronomer Royal Martin Rees, a poem from Poet Laureate Simon Armitage and interviews with recipients of RAS funding.



Royal Astronomical Society



Elements of the bicentenary celebrations: the new logo, some of the new stamps, and attendees at the evening reception.

(Lynda Laird/RAS)

A highlight was the donation of John Herschel's 1826 Gold Medal to the Society by noted coin and stamp collector Margaret Morris.

A new look for the Society. For 200 years the RAS has been proud to use a depiction of William Herschel's great 40-foot telescope as its logo – something that is recognised worldwide. Looking forward to the next 200 years, RAS Council has sought a more modern image to express our values and activities; we launched our new logo at our bicentenary celebration on 23 January.

The new symbol takes its inspiration from several sources: our motto, "Let whatever shines be observed"; the vision and discovery that characterises two centuries of study; and our work with both astronomers and geophysicists. Stepped spokes are repeated and rotated to form a symbol that can be interpreted in multiple ways – a stylised eye or a planet with an orbiting moon – reflecting the many different sides of the Society's work.

We will continue to have an image of the Herschel telescope as the Society seal to be used on very formal occasions reflecting our distinguished heritage, while our new logo reflects an image of the positive future of our science.

Bicentenary stamps. On 4 February 2020, the Royal Mail issued "Visions of the Universe", a set of eight postage stamps marking the 200th anniversary of the foundation of the RAS.

The stamps, created by artist Robert Ball in collaboration with the RAS, feature illustrations of eight phenomena discovered or investigated by UK astronomers and geophysicists over the past two centuries. The set includes the Cat's Eye Nebula, geysers on Saturn's moon Enceladus, pulsars, black holes, Jupiter's aurora, gravitational lensing, comet 67P and the Cygnus A galaxy. Alongside the stamps are special presentation packs signed by RAS President Prof. Mike Cruise.

Covid-19 precautions

In line with government advice, the Society closed Burlington House and cancelled or postponed meetings from mid-March onwards. RAS staff worked from home and the Society continued meetings and outreach activities online where possible.



Structure, Governance and Management

A large, complex, tadpole-shaped galaxy structure composed of numerous blue and white stars, set against a dark background. The galaxy has a dense, irregular core with a long, thin tail extending downwards and to the left. The stars are scattered throughout the structure, with a higher concentration in the core and tail.

This tadpole-shaped disrupted galaxy arose from a collision of two galaxies with a dwarf galaxy, resulting in the unusually long tail; the whole structure is a million light years across. An international team published a study of complex groups of galaxies in *Monthly Notices*. (N Brosch/Tel Aviv University)

The regulations and procedures of the Society:

- Society governance
- Trustee recruitment and appointment
- Trustee induction and training
- organisational structure
- risks.

Governance

The Royal Astronomical Society was founded in 1820 and is incorporated by Royal Charter and managed according to byelaws that were revised at the Annual General Meeting in May 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. Voting can be done electronically, by post or in person at the Annual General Meeting.

Members of the Council are elected by ballot at the Annual General Meeting, for the following normal and maximum terms of office, as set out in the byelaws. In summary:

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

Trustee induction and training

New members of Council attend a Trustee induction programme before their first Council meeting. All members of Council are asked to



The entrance to the Society's apartments in Burlington House.

(Mike Peel, mikepeel.net)

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 2018.

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



RAS Executive Director Philip Diamond speaking at the bicentenary celebration dinner.

(Lynda Laird/RAS)

committees (Publications Management, Editorial [for each journal], Outreach and Education, Finance, International, Membership, Library, Astronomical Heritage, Diversity in Astronomy and Geophysics) and *ad hoc* committees (e.g. Awards) to forward its objectives.

It appoints the managing editors and editors of the Society's research journals, *Monthly Notices of the Royal Astronomical Society* and *Geophysical Journal International*, who provide their services, as does the Treasurer, for an honorarium.

The Society has formal associations with a number of organisations having shared interests, and has less formal arrangements with several other bodies. These include:

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

RAS President Mike Cruise presents previous president Kathy Whaler with the Society's award for services to geophysics.

(Lynda Laird/RAS)



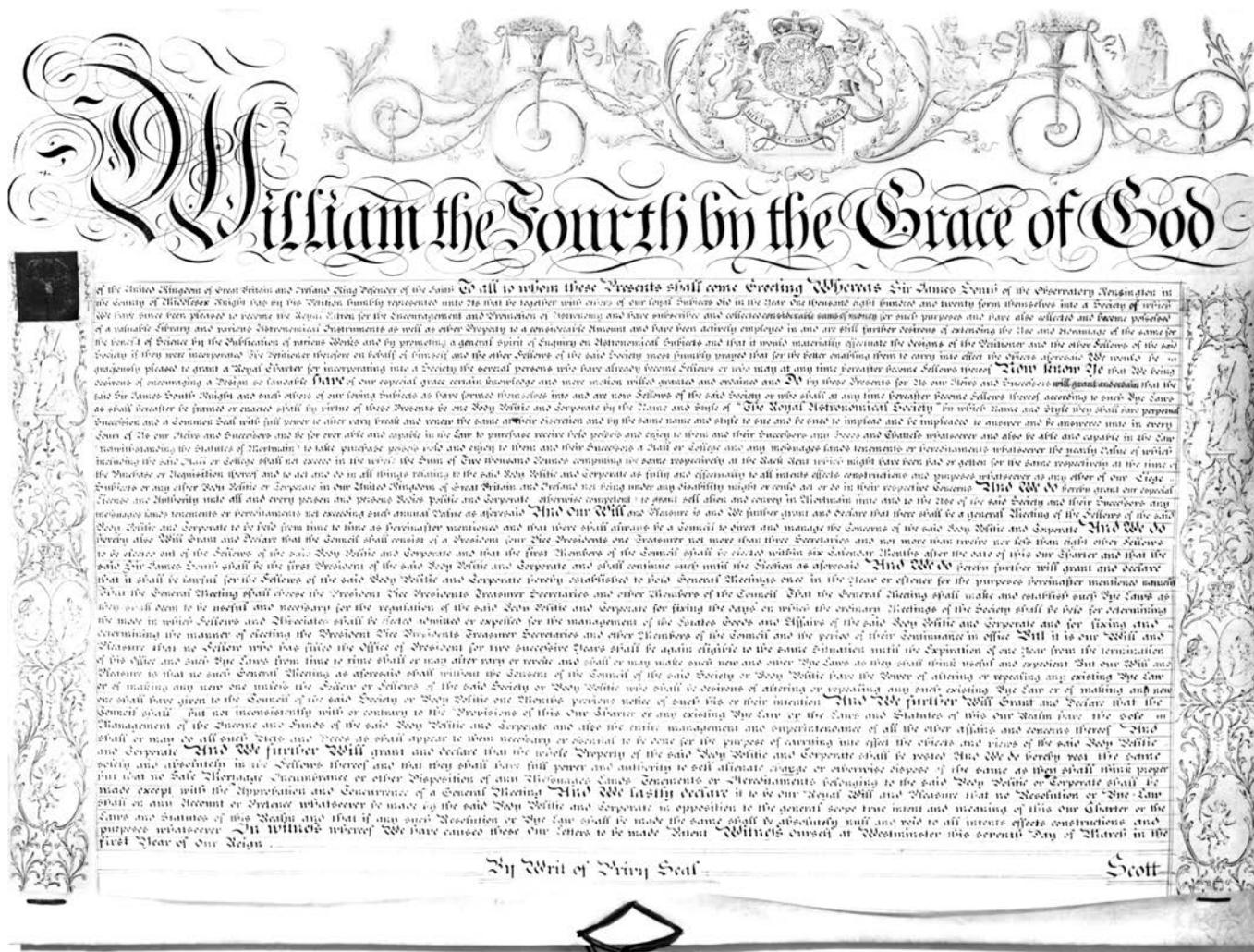
- The Society recognises the appeal of astronomy and geophysics to the general public by offering annual membership to Friends of the RAS for a small fee. Friends' benefits include a series of Friends-only lectures, as well as priority seating for the Society's popular Public Lectures, visits to observatories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

Risks

The principal risks and uncertainties identified by the Trustees are:

- Maintenance of the quality of, and income from, publications (a significant income stream of above 60%)
- Open Access publishing
- Affordability of rent and service charges for the premises at Burlington House.

The Finance Committee regularly reviews the Society's risk register and the Council annually reviews the major risks to which the Society is



exposed and the systems that have been established to manage those risks. In regards to the three most significant risks:

The Society insists that rigorous peer review is used to maintain the quality of the two journals and thereby the demand by authors and readers for the highly successful publications and, with the publishers, ensures that it adopts a robust business model for production and sales.

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)



The Royal Charter granted to the Society by King William IV in 1831.

(RAS/SPL)

- Maintenance of the size of the membership (by regular review of services and subscriptions and outreach activities to potential new members)
- The implementation of a broad range of statutory regulation, for example GDPR (using expert external assistance where necessary).

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

Financial Statements



Geologist Harrison H Schmitt, Apollo 17 lunar module pilot, collects lunar rake samples during the mission's first spacewalk. Dr Sarah Crowther delivered a Public Lecture on "Moon, meteorites and more...". (NASA)

FINANCIAL REVIEW

The Society's total funds increased from £20,217,393 to £21,240,147 during the year, both figures including a large contribution from the Society's heritage assets (rare books, clocks, telescopes and fine art) which totalled £9,440,879 (2018 – £9,440,879). Income increased to £4,679,347 (2018 – £4,483,919) due to increased income from investments, publishing and membership. Publishing income increased by £143,703. The Society's expenditure increased to £4,810,880 (2018 – £4,568,409) which is mainly due to increased support costs driven by higher Burlington House rent, staffing costs, RAS2020 costs, increased publications costs and regulatory, legal and compliance costs. Net investment gains totalled £1,154,287 (2018 – losses of £318,747).

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 are now £21,240,147, of which £9,440,879 are held in heritage assets, leaving funds of £11,799,268 (2018 – £10,776,514) 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 has come under continuing 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 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 £6,144,837 (2018 – £5,310,869) and these would allow operation of the Society for at least 15 months if publishing were continued and expenditure incurred during

that period, and 35 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 2.2% for the year (2018 – 2.7%). £207,695 (2018 – £nil) was transferred to the restricted funds in the current year, this being the surplus in excess of the retail prices index movement in the fund due to investment gains and income. This decision was made prior to the impact of the coronavirus pandemic (Covid-19) on world stock markets, resulting in the endowment funds falling close to or slightly below their original value. However, the balance in the restricted funds will allow for continuing grant-making activity with funding for almost three years, without any additional transfer requirements. During this time it is hoped the investment markets will recover.

Grant-making policy

The RAS has for many years provided small grants to support the community in activities not funded by the research councils. Primarily these have been awarded to help students at the start of their careers, either with funding for summer bursaries enabling them to experience working

in a research environment while still an undergraduate, or to enable PhD students to present work at research conferences. The RAS has also supported scientific meetings in the UK, especially those held outside London. These broad categories of support have been discussed many times at Council and serve the purpose of encouraging entrants to the profession and extending the activities of the Society to members and the public outside London.

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

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

The grants, fellowships and awards are funded from two sources. The Society has its restricted and endowment funds invested with Newton Investment Management and the income and gains from these investments are used to support the grants expenditure in accordance with the bequests.

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. About 220 applications are received for the two deadlines in February and in August. Panel members observe strict rules on conflict of interest, taking no part in decisions on grant applications from their home institutions. In addition, it is usual for panel members to absent themselves from discussions on grant applications from scientists with whom they have had recent close contact, such as research students supervised in the past five years.

Information relating to RAS200 can be found on pages 16 to 18.

Key management personnel

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

Council ensures that the RAS carries out a salary comparison exercise every 3–5 years. The comparability study compares the staff salaries to other similar external positions to reassure the Trustees that the levels of

remuneration are appropriate. The last comparison exercise was carried out in 2018.

The Society does not have a performance-related pay scheme. The Trustees annually consider a salary increase in regards to cost of living that applies to all staff.

Pension scheme

The Society's defined benefit pension surplus and its accounting treatment is explained in note 20 of these financial statements. This scheme is closed to new members and has four deferred members only and 10 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 sporadic donations during the year from Fellows and members of the public. During the year the Society received donations of £8,362 (2018 – £2,723) and no legacies (2018 – £nil).

Heritage assets

The Society's collection of rare books, fine art, telescopes and clocks was valued in 2011 at approximately £9.5million. 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 of the donation 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 2.7% and a total return gross of 19.1% 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 0.6%. Performance of the fund managers is kept under continual review. The post balance sheet impact of the Covid-19 pandemic is disclosed in the above Investment Policy.

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

Opinion

We have audited the financial statements of Royal Astronomical Society (the 'charity') for the year ended 31 December 2019, 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 2019 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.

Emphasis of matter – effects of Covid-19

We draw attention to the Trustees' report, the accounting policies and notes 12 and 23 to the financial statements, which describe the impact of Covid-19 on the charity, including its investments and the total return policy for endowment funds.

Our opinion is not modified in respect of this matter.

Conclusions relating to going concern

We have nothing to report in respect of the following matters in relation to which the ISAs (UK) require us to report to you where:

- the Trustees' use of the going concern basis of accounting in the preparation of the financial statements is not appropriate; or
- the Trustees have not disclosed in the financial statements any identified material uncertainties that may cast significant doubt about the charity's ability to continue to adopt the going concern basis of accounting for a period of at least 12 months from the date when the financial statements are authorised for issue.

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.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2019

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2019 Total funds £	2018 Total funds £
Income						
Donations and legacies	1	3,009	5,353	—	8,362	2,723
Other trading activities		47,349	—	—	47,349	65,230
Investment income	2	172,093	8,464	67,935	248,492	221,975
Charitable activities	3	4,375,144	—	—	4,375,144	4,193,991
Total income		4,597,595	13,817	67,935	4,679,347	4,483,919
Expenditure						
Raising funds		15,553	—	—	15,553	16,833
Charitable activities	5	4,681,757	113,570	—	4,795,327	4,551,576
Total expenditure		4,697,310	113,570	—	4,810,880	4,568,409
Net (expenditure) income before investment gains and losses		(99,715)	(99,753)	67,935	(131,533)	(84,490)
Net gains (losses) on investments	12	796,458	39,641	318,188	1,154,287	(318,747)
Net income (expenditure)		696,743	(60,112)	386,123	1,022,754	(403,237)
Transfer between funds	15	—	207,695	(207,695)	—	—
Net movement in funds		696,743	147,583	178,428	1,022,754	(403,237)
Reconciliation of funds:						
Total funds brought forward at 1 January 2019		17,875,807	647,526	1,694,060	20,217,393	20,620,630
Total funds carried forward at 31 December 2019		18,572,550	795,109	1,872,488	21,240,147	20,217,393

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 40 to 53 form part of these financial statements.

STATEMENT OF FINANCIAL ACTIVITIES YEAR TO 31 DECEMBER 2018

	Notes	Unrestricted funds £	Restricted funds £	Endowment funds £	2018 Total funds £
Income					
Donations and legacies	1	2,333	390	—	2,723
Other trading activities		65,230	—	—	65,230
Investment income	2	156,053	7,368	58,554	221,975
Charitable activities	3	4,193,991	—	—	4,193,991
Total income		4,417,607	7,758	58,554	4,483,919
Expenditure					
Raising funds		16,833	—	—	16,833
Charitable activities	5	4,544,764	6,812	—	4,551,576
Total expenditure		4,561,597	6,812	—	4,568,409
Net (expenditure) income before investment losses		(143,990)	946	58,554	(84,490)
Net losses on investments	12	(223,123)	(10,688)	(84,936)	(318,747)
Net expenditure and net movement in funds		(367,113)	(9,742)	(26,382)	(403,237)
Reconciliation of funds:					
Total funds brought forward at 1 January 2018		18,242,920	657,268	1,720,442	20,620,630
Total funds carried forward at 31 December 2018		17,875,807	647,526	1,694,060	20,217,393

All gains and losses for the year are recognised in the above statement. All activities are classed as continuing. The notes on pages 40 to 53 form part of these financial statements.

BALANCE SHEET 31 DECEMBER 2019

	Notes	2019 £	2019 £	2018 £	2018 £
Fixed assets					
Tangible assets					
. Heritage assets	11	9,440,879		9,440,879	
. Other assets	11	858,713		932,823	
Investments	12	8,560,476		7,406,189	
			18,860,068		17,779,891
Current assets					
Debtors					
Cash at bank and in hand	13	662,440		554,526	
		3,699,813		4,210,218	
		4,362,253		4,764,744	
Creditors: amounts falling due within one year	14	(1,864,459)		(2,211,595)	
Net current assets			2,497,794		2,553,149
Total assets less current liabilities					
			21,357,862		20,333,040
Creditors: amounts falling due after one year					
	14		(117,715)		(115,647)
Total net assets			21,240,147		20,217,393
The funds of the charity					
Endowment funds					
Restricted income funds	15	1,872,488		1,694,060	
Unrestricted income funds	16	795,109		647,526	
. Designated funds					
. General funds	17	12,427,713		12,564,938	
		6,144,837		5,310,869	
			18,572,550		17,875,807
			21,240,147		20,217,393

The financial statements were approved by Council on 22 May 2020 and signed on its behalf by

Prof. Emma Bunce
President-elect

The notes on pages 40 to 53 form part of these financial statements.

STATEMENT OF CASH FLOWS YEAR TO 31 DECEMBER 2019

	Notes	2019 £	2018 £
Cash flow from operating activities			
Net cash used in operating activities	A	(719,550)	(130,280)
Cash inflow from investing activities			
Dividends and interest from investments		248,492	221,975
Purchase of tangible fixed assets		(39,347)	(14,838)
Net cash provided by investing activities		209,145	207,137
Change in cash and cash equivalents in the year		(510,405)	76,857
Cash and cash equivalents at 1 January 2019	B	4,210,218	4,133,361
Cash and cash equivalents at 31 December 2019	B	3,699,813	4,210,218

Notes to the statement of cash flows for the year to 31 December 2019

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

	2019 £	2018 £
Net movement in funds (as per the statement of financial activities)	1,022,754	(403,237)
Adjustments for:		
Depreciation charge	113,457	113,945
Net (gains) losses on investments	(1,154,287)	318,747
Dividends and interest from investments	(248,492)	(221,975)
Increase in debtors	(107,914)	(13,355)
(Decrease) increase in creditors	(345,068)	75,595
Net cash used in operating activities	(719,550)	(130,280)

B Analysis of cash and cash equivalents

	2019 £	2018 £
Total cash and cash equivalents: Cash at bank and in hand	3,699,813	4,210,218

C Reconciliation of net funds

	1 January 2019 £	Cash flows £	31 December 2019 £
Cash and cash equivalents	4,210,218	(510,405)	3,699,813

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 2019.

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

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

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

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

Critical accounting estimates and areas of judgement

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

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

- the liability for multi-year grant commitments;
- the useful economic life of tangible fixed assets;
- the accrual for Burlington House rent; and
- the impact of Covid-19 on the Society including the use of the going concern basis.

Assessment of going concern

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

The Trustees are fully cognisant of the risks that the Society is carrying such as the uncertainty and risks of increased rental charges for the accommodation in Burlington House, the possible risk posed by Open Access and a possible impact on the business model that relies on the publishing income and also of a low probability, albeit high impact risk,

that the quality and success of the Society's publications will decrease.

Whilst recognising these risks the Trustees are content that the Society has strategies in place to manage them and are of the opinion that the Society has adequate free reserves and therefore sufficient resources to meet its liabilities as they fall due. The Reserves policy on page 28 of the Trustees' report provides more detail.

The Trustees have considered the impact due to Covid-19 on the ability of the Society to continue its charitable activities. While some public, national and scientific meetings have been cancelled or postponed, these activities do not generate surpluses. Although access to its Burlington House premises is restricted, the core functions of membership, publishing, outreach, some library activities, grant-making, and public policy 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 and the Trustees therefore conclude that the preparation of these financial statements on a going concern basis is justified.

The Trustees have concluded that there are no other material uncertainties related to events or conditions that may cast significant doubt on the ability of the charity to continue as a going concern.

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

With regard to the next accounting period, the year ending 31 December 2020, the most significant areas that affect the carrying value of the assets held by the charity are expected to be the same as for 2019 along with the residual or ongoing impact of Covid-19.

Income recognition

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

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

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

Heritage assets

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

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

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

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

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

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

Other tangible fixed assets

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

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

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

Investments

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

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

Debtors

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

Cash at bank and in hand

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

Creditors and provisions

Creditors and provisions are recognised when there is an obligation at the balance sheet date as a result of a past event, it is probable that a transfer of economic benefit will be required in settlement, and the amount of the settlement can be estimated reliably. Creditors and provisions are recognised at the amount the charity anticipates it will pay to settle the debt.

Fund structure

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

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

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

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

NOTES TO THE FINANCIAL STATEMENTS

1 Donations and legacies

	Unrestricted funds £	Restricted funds £	2019 Total funds £	Unrestricted funds £	Restricted funds £	2018 Total funds £
Donations	3,009	5,353	8,362	2,333	390	2,723
Total funds	3,009	5,353	8,362	2,333	390	2,723

2 Investment income

	Unrestricted funds £	Restricted funds £	Endowment funds £	2019 Total funds £
Income from listed investments	160,417	7,858	63,073	231,348
Bank interest	11,676	606	4,862	17,144
2019 Total funds	172,093	8,464	67,935	248,492

	Unrestricted funds £	Restricted funds £	Endowment funds £	2018 Total funds £
Income from listed investments	149,319	7,153	56,844	213,316
Bank interest	6,734	215	1,710	8,659
2018 Total funds	156,053	7,368	58,554	221,975

3 Income from charitable activities

	Unrestricted funds	
	2019 £	2018 £
Publications (note 4)	3,966,038	3,822,335
Membership	350,267	317,144
Scientific meetings	40,226	27,540
Public policy	1,262	453
Library	8,370	10,944
Educational	6,306	12,900
Other	2,675	2,675
Total funds	4,375,144	4,193,991

4 Publications

	2019 £	2018 £
Income		
Monthly notices of the Royal Astronomical Society	2,865,379	2,762,266
Geophysical Journal International	1,007,409	964,533
Astronomy & Geophysics	86,136	89,020
Other	7,114	6,516
	3,966,038	3,822,335
Expenditure		
Monthly notices of the Royal Astronomical Society	2,290,130	2,197,417
Geophysical Journal International	663,151	661,170
Astronomy & Geophysics	166,790	173,120
Other	29,828	19,290
	3,149,899	3,050,997

5 Expenditure on charitable activities

Expenditure on charitable activities is analysed as follows:

	Direct costs £	Support costs £	2019 £	Direct costs £	Support costs £	2018 £
Publications (note 4)	2,713,442	436,457	3,149,899	2,656,007	394,990	3,050,997
Scientific meetings	113,843	201,579	315,422	93,459	182,427	275,886
Membership	9,514	51,733	61,247	17,162	46,818	63,980
Educational	505,670	54,463	560,133	474,302	49,813	524,115
RAS 200	98,405	5,000	103,405	81,343	4,000	85,343
Library	99,165	384,723	483,888	97,863	348,172	446,035
Public policy	66,033	55,300	121,333	55,174	50,046	105,220
	3,606,072	1,189,255	4,795,327	3,475,310	1,076,266	4,551,576

Grants, fellowships and awards, in support of research, are principally included under Educational and RAS200 above to reflect the responsibilities for the management and administration of grants. 129 grants, fellowships and awards totalling £542,711 (2018 – £458,814) were made to institutes and 43 grants, fellowships – including the Norman Lockyer Fellowship – and awards totalling £22,239 (2018 – £23,246) were made to individuals. Expenditure supporting the Norman Lockyer Fellowship totalled £104,000 (2018 – nil), and one research fellowship ended after year two resulting in credits to expenditure totalling £50,000 (2018 – £4,928). Adjustments to other grants resulted in credits to expenditure totalling £2,958 (2018 – £1,250).

Total grant-making support costs were £27,500 (2018 – £25,000).

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 £113,570 (which is almost entirely included within the educational category), which is restricted (2018 – £6,812).

6 Support costs

Support costs analysed by function are as follows:

	2019 £	2018 £
Executive	140,714	133,137
Finance	88,689	68,106
Facilities	92,285	85,417
Membership	34,595	31,382
IT	61,032	56,209
Policy, development and press	86,078	72,875
Burlington House	149,728	147,616
Other	347,815	343,917
Governance (note 7)	188,319	137,607
	1,189,255	1,076,266

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

	2019 £	2018 £
Auditor's remuneration (note 8)	24,765	21,150
Trustees' and Committee costs	29,845	30,668
AGM expenses	10,650	4,948
Staff time and other expenses	123,059	80,841
	188,319	137,607

8 Net income (expenditure) for the year

This is stated after charging:

	2019 £	2018 £
Depreciation	113,457	113,945
Auditor's remuneration:		
. Charity audit	16,025	15,000
. Pension scheme audit	5,675	4,000
. Other services	3,065	2,150
Operating lease rentals		
. Office equipment	14,156	12,878

9 Staff costs and remuneration of key management personnel

	2019 £	2018 £
Wages and salaries	821,677	810,378
Social security costs	83,870	77,667
Pension costs (see note 20)		
. Stakeholder pension scheme	68,347	63,820
. Death in service contributions	5,493	5,985
	979,387	957,850

During the year one employee of the Society earned between £70,000 and £80,000 (2018 – one) and one employee earned between £60,000 and £70,000 (2018 – one). Employer contributions to the stakeholder pension scheme for employees earning over £60,000 were £14,010 (2018 – £13,635).

The average number of employees was 22 (Administration 6, Outreach 1, Editorial 9, Library 2, House 2, Press & Policy 2) (2018 – 21).

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 £176,863 (2018 – £171,644).

10 Transactions with Trustees

The Trustees receive reimbursement for travel expenses actually incurred in attending meetings. The amount reimbursed during the year for 25 Trustees was £16,815 (2018 – £14,119).

Remuneration of £5,923 was paid to one Trustee during 2019 (2018 – £5,691 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 of £5,300 per year, uplifted by inflation at the RPI rate and formally approved each year by Council.

Grants made to Councillors

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

- Sir Norman Lockyer Memorial Trust as disclosed in note 22 (which shares the same board of Trustees as the Society).
- Paneth Meteorite Collection as disclosed in note 22. Dr Nigel Berman, Treasurer, is a Trustee.
- Searching for evidence for non-thermal ions in the chromosphere of solar flares, supervised by Prof. Lyndsay Fletcher, University of Glasgow, Councillor and Secretary, bursary, £1,200 (2018 – £1,200).

Other support funding made to Councillors

- Dr Sheila Peacock, Councillor, is also a committee member of the British Geophysical Association which received funding of £4,000, (2018 – £4,000).

11 Tangible fixed assets

(a) Heritage assets

	Rare books and manuscripts £	Fine art and collectibles £	Total £
At 1 January 2019 and at 31 December 2019	4,951,500	4,489,379	9,440,879

In 2015 net disposals for rare books and manuscripts (£100,000) and fine art and collectibles (£48,870) were made. There have been no other recorded movements between 2015 and 2019.

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

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

(b) Other assets

	Leasehold improve- ments £	Plant and machinery £	Telephone, security & computer equipment £	Past Presidents' Portraits £	Total £
Cost					
At 1 January 2019	1,878,405	25,429	275,998	9,466	2,189,298
Additions	—	5,112	33,707	528	39,347
Disposals	—	—	(10,713)	—	(10,713)
At 31 December 2019	1,878,405	30,541	298,992	9,994	2,217,932
Depreciation					
At 1 January 2019	1,012,631	7,920	235,924	—	1,256,475
Charge for the year	93,964	2,764	16,729	—	113,457
Disposals	—	—	(10,713)	—	(10,713)
At 31 December 2019	1,106,595	10,684	241,940	—	1,359,219
Net book values					
At 31 December 2019	771,810	19,857	57,052	9,994	858,713
At 31 December 2018	865,774	17,509	40,074	9,466	932,823

12 Investments

	2019 Total funds £	2018 Total funds £
Market value at 1 January 2019	7,406,189	7,724,936
Net unrealised investment gains/(losses)	1,154,287	(318,747)
Market value at 31 December 2019	8,560,476	7,406,189
Historical cost as at 31 December 2019	4,917,081	4,917,081

Investments comprise BNY Mellon: Global Growth and Income Fund.

One consequence of the Covid-19 pandemic has been that world stock markets have experienced significant volatility and falls since the balance sheet date. It is estimated that the market value of investments has reduced by £1,074,000, or 12.5%, as at 15 May 2020.

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 2019	1,652,682	41,378	1,694,060
Add: Total return			
. Investment income		67,935	67,935
. Net gains on listed investments		318,188	318,188
		386,123	386,123
Less:			
. Allocation to income from total return		(207,695)	(207,695)
At 31 December 2019	1,652,682	219,806	1,872,488
	Trust for investment £	Unapplied total return £	Total endowment £
At 1 January 2018	1,652,682	67,760	1,720,442
Add: Total return			
. Investment income		58,554	58,554
. Net losses on listed investments		(84,936)	(84,936)
		(26,382)	(26,382)
At 31 December 2018	1,652,682	41,378	1,694,060

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. Due to the net reduction in the fund value, no transfers to the restricted funds were made in 2018. £207,695 was transferred to the restricted funds in 2019, with this decision being made before the impact of Covid-19 became apparent. As a result of the fall in investment values since the balance sheet date noted above, the value of the endowment fund is close to or lower than the trust for investment, precluding further allocations to income. The balance in the restricted income fund can sustain grant-making for nearly three years without further transfers from the endowment fund, during which time it is anticipated that the permanent endowment fund investments will recover from the falls experienced during the outbreak.

13 Debtors

	2019 £	2018 £
Trade debtors	40,572	42,769
Prepayments and accrued income	614,525	504,757
Other debtors	7,343	7,000
	662,440	554,526

14 Creditors

(a) Amounts falling due within one year

	2019 £	2018 £
Trade creditors	87,265	25,810
Accruals	74,371	435,292
Grants payable	455,160	479,735
Tax and social security	195,918	204,040
Deferred income	1,012,898	1,030,736
Other creditors	38,847	35,982
	1,864,459	2,211,595

(b) Amounts falling due after more than one year

	2019 £	2018 £
Grants payable	117,715	115,647

(c) Deferred income

	2019 £	2018 £
Balance as at 1 January 2019	1,030,736	1,019,288
Released to income	(1,030,736)	(1,019,288)
Income received from Fellows in advance	62,898	80,736
Publications income received in advance	950,000	950,000
Balance as at 31 December 2019	1,012,898	1,030,736

15 Endowment funds

	1 January 2019 £	Income £	Investment gains £	Transfers £	31 December 2019 £
Research and Grants funds:					
. Sir Norman Lockyer fund	1,309,838	52,527	246,021	(159,828)	1,448,558
. Other funds	131,427	5,270	24,685	(16,113)	145,269
	1,441,265	57,797	270,706	(175,941)	1,593,827
Benevolent fund	82,489	3,309	15,494	(10,113)	91,179
Library fund	39,183	1,571	7,360	(4,805)	43,309
Lectures and awards fund	131,123	5,258	24,628	(16,836)	144,173
	1,694,060	67,935	318,188	(207,695)	1,872,488

	1 January 2018 £	Income £	Investment losses £	31 December 2018 £
Research and Grants funds:				
. Sir Norman Lockyer fund	1,330,237	45,273	(65,672)	1,309,838
. Other funds	133,475	4,542	(6,590)	131,427
	1,463,712	49,815	(72,262)	1,441,265
Benevolent fund	83,772	2,852	(4,135)	82,489
Library fund	39,793	1,355	(1,965)	39,183
Lectures and awards fund	133,165	4,532	(6,574)	131,123
	1,720,442	58,554	(84,936)	1,694,060

The transfer of £207,695 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 2019 £	Income £	Expenditure £	Investment gains £	Transfers £	31 December 2019 £
Research & Grants fund	477,679	9,166	(109,300)	19,515	175,941	573,001
Benevolent fund	22,644	—	(1,125)	—	10,113	31,632
Library fund	29,434	716	—	3,352	4,805	38,307
Education fund	89,309	3,935	(1,000)	16,774	—	109,018
Lectures and awards fund	28,460	—	(2,145)	—	16,836	43,151
	647,526	13,817	(113,570)	39,641	207,695	795,109

	1 January 2018 £	Income £	Expenditure £	Investment losses £	31 December 2018 £
Research & Grants fund	481,545	3,643	(2,225)	(5,284)	477,679
Benevolent fund	23,927	—	(1,283)	—	22,644
Library fund	29,712	617	—	(895)	29,434
Education fund	91,320	3,498	(1,000)	(4,509)	89,309
Lectures and awards fund	30,764	—	(2,304)	—	28,460
	657,268	7,758	(6,812)	(10,688)	647,526

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 Jelly-Freeman Bequest (2000)
- D** CAG Bearpark Trust (2000)
- R** Patricia Tomkins Fund (2011)
- G** Special Purposes Fund
- E** EA Milne Travel Fund (2013)
- R** R Potter Research Fund (2017)

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 2019 £	New designation £	Utilised/ released £	31 December 2019 £
Burlington House fund	834,728	—	(93,964)	740,764
Heritage Asset fund	9,440,879	—	—	9,440,879
Building fund	1,029,730	—	93,964	1,123,694
Open Access fund	400,000	—	(6,560)	393,440
RAS 200	353,373	—	(98,405)	254,968
RAS 2020	389,459	—	(74,601)	314,858
Research and Grants fund	116,769	173,335	(130,994)	159,110
Total designated funds	12,564,938	173,335	(310,560)	12,427,713

	1 January 2018 £	New designation £	Utilised/ released £	31 December 2018 £
Burlington House fund	928,692	—	(93,964)	834,728
Heritage Asset fund	9,440,879	—	—	9,440,879
Building fund	935,766	—	93,964	1,029,730
Open Access fund	400,000	—	—	400,000
RAS 200	434,716	—	(81,343)	353,373
RAS 2020	—	400,000	(10,541)	389,459
Research and Grants fund	272,936	—	(156,167)	116,769
Total designated funds	12,412,989	400,000	(248,051)	12,564,938

(i) 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.

(ii) 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.

(iii) 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.

(iv) 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.

(v) RAS200

The original fund balance of £1,000,000 was the total committed grant expenditure for RAS200. RAS200 grant expenditure is being charged to this fund from 2015 to 2022.

(vi) RAS2020

This represents the estimated expenditure associated with the RAS bicentenary celebrations, associated events and activities.

(vii) Research and Grants fund

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

18 Analysis of net assets between funds

Fund balances at 31 December 2019 are represented by:

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2019 Total funds £
Tangible assets					
. Heritage assets	—	9,440,879	—	—	9,440,879
. Other fixed assets	117,949	740,764	—	—	858,713
Investments	4,318,597	1,574,282	795,109	1,872,488	8,560,476
Current assets					
. Debtors	662,440	—	—	—	662,440
. Cash at bank and in hand	2,632,692	1,000,001	67,120	—	3,699,813
Current liabilities	(1,536,303)	(261,036)	(67,120)	—	(1,864,459)
Non-current liabilities	(50,538)	(67,177)	—	—	(117,715)
Total net assets	6,144,837	12,427,713	795,109	1,872,488	21,240,147

	General funds £	Designated funds £	Restricted funds £	Endowment funds £	2018 Total funds £
Tangible assets					
. Heritage assets	—	9,440,879	—	—	9,440,879
. Other fixed assets	98,095	834,728	—	—	932,823
Investments	3,557,032	1,507,571	647,526	1,694,060	7,406,189
Current assets					
. Debtors	554,526	—	—	—	554,526
. Cash at bank and in hand	3,122,359	1,059,982	27,380	497	4,210,218
Current liabilities	(1,971,143)	(212,575)	(27,380)	(497)	(2,211,595)
Non-current liabilities	(50,000)	(65,647)	—	—	(115,647)
Total net assets	5,310,869	12,564,938	647,526	1,694,060	20,217,393

19 Leasing commitments

At 31 December 2019, the charity had total future minimum commitments in respect of non-cancellable operating leases as follows:

	2019 £	2018 £
Office equipment		
Amounts payable within one year	9,293	11,824
Amounts payable between two and five years	26,134	5,240
	35,427	17,064

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 £68,347 (2018 – £63,820) in respect of the defined contribution scheme and £5,493 (2018 – £5,985) in respect of Death in Service contributions.

Retirement benefits disclosure under FRS102

The actuarial valuation for FRS 102 purposes, at 31 December 2019, shows a pension surplus of £423,000 (2018 – £362,000) which cannot be recognised as this is not available to the Society by way of reduced future contributions.

The amounts recognised in the balance sheet are as follows:

	2019 £'000	2018 £'000
Present value of funded obligations	(488)	(461)
Fair value of scheme assets	911	823
Surplus not recognised	(423)	(362)
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:

	2019 £'000	2018 £'000
Opening defined benefit obligation	461	493
Interest cost	13	12
Remeasurement arising from changes in assumptions and experience	14	(44)
Closing defined benefit obligation	488	461

Changes in fair value of scheme assets are as follows:

	2019 £'000	2018 £'000
Opening scheme assets	823	846
Interest Income	24	21
Actual return on plan assets, excluding interest income	64	(44)
Closing scheme assets	911	823

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

	2019 £'000	2018 £'000
Remeasurement of defined benefit obligation	14	(44)
Return on plan assets	(64)	44
Effect of surplus restriction	50	—
Total	—	—

The actual return on scheme assets was £88,000 (2018 – £23,000).

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

	Fair value of scheme assets	
	2019 %	2018 %
Equities	41	40
Bonds	21	19
Property	13	15
Cash	8	8
Gilts	17	18
	100	100

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

	2019 %	2018 %
Discount rate at 31 December	2.1	2.9
Retail Prices Index	3.2	3.4
Consumer Prices Index	2.3	2.5
Increases in deferment	2.3	2.5
Future pension increases – pension earned before 6 April 1997	0.0	0.0
Future pension increases – pension earned after 6 April 1997	3.2	3.4

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:

	2019	2018
Retiring now		
Male	20.1	21.8
Female	22.3	23.7
Retiring in 20 years		
Male	21.4	22.8
Female	23.7	24.9

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

Defined benefit pension scheme:

	2019 £'000	2018 £'000	2017 £'000	2016 £'000	2015 £'000
Defined benefit obligations	488	461	493	426	301
Scheme assets	911	823	846	795	721
Surplus	423	362	353	369	420

21 Grants committed

Grants, principally fellowships and travel and research grants to the value of £405,748 have been committed for future payment, subject to certain conditions, specified by the Society, having been met (2018 – £715,000). 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 2019.

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 £28,477 (2018 – £27,380), is included in Other Creditors. Eight grants were awarded totalling £10,573 (2018 – £9,495). Total income was £11,670 (2018 – £10,761).

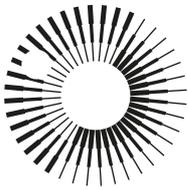
The Society also administers the Sir Norman Lockyer Memorial Trust (charity registration number 900135). By agreement with the Charity Commission, the Society includes the following information within these financial statements. Each charity remains a separate legal entity. The Norman Lockyer Fellowship is awarded to enable an outstanding researcher to devote the majority of their time to research on an astronomical topic, including solar system and planetary science. They are named after Sir Norman Lockyer (1836–1920), pioneering solar astronomer and discoverer of helium. The fellowship is available every three years, with applications sought in the years 2013, 2016, 2019 etc for fellowships starting in the following year. The fellowship is open to those who hold a doctorate from a recognised institution of higher education at the time of taking up the award. Applicants must normally be 30 years of age or younger on 1 October of the year of appointment. The Society funds Fellows between spine points 30 and 36 (inclusive) on the UCU HE Framework single pay spine. The Norman Lockyer Fellowship is currently funding a three-year fellowship from October 2017, totalling £156,000. The fund balance, including the unspent balance in the restricted fund is £1,856,461 (2018 – £1,662,552).

Transactions involving Trustees are disclosed in note 10.

There are no other related party transactions requiring disclosure.

23 Post balance sheet events

The impact of the Covid-19 pandemic has been considered by the Trustees as set out on pages 22 and 28 of the Trustees' report, in the accounting policies and in note 12 to the financial statements.



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