Royal Astronomical Society

RAS 200

Sky&Earth




Report of the Royal Astronomical Society's bicentennial programme of outreach and engagement

Acknowledgements

RAS200 has involved the collaboration of a large number of RAS fellows, staff members, evaluators and outside experts.

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Engaging diverse partners and diverse audiences with astronomy and geophysics: a new approach to public engagement

Contents

Executive summary

The Royal Astronomical Society's RAS200 outreach and engagement scheme directly reached over 220 000 participants at a cost of around £1 million, taken from the Society's reserves. RAS200 was part of the RAS bicentennial programme, aiming to embed astronomy and geophysics more widely in society and to leave a lasting legacy of social partnership.

RAS200 responded to bottom-up proposals from communities, charities, universities and individuals, and exposed a huge demand for such outreach and engagement activities – overall, some 150 proposals were received in two calls (2015 and 2017). Between 2015 and 2022 RAS200 funded 12 projects working with partners to engage individuals and communities not traditionally involved with the sciences of astronomy and geophysics.

For the Society, the scheme was overseen by the RAS200 Steering Group. It was evaluated throughout the lifetime of the individual projects by Jenesys Associates. Continuous formative and summative evaluation of individual projects and the RAS200 Steering Group itself enabled the Society to manage all aspects of the scheme effectively, but with a 'light touch', intervening only where assistance was needed.

The scheme reached a diverse range of public audiences, spanning ages, geographic distribution and background. Some audiences had little to no previous astronomy and geophysics exposure, whereas others had considerable prior interest. The funded project partners included those engaging with prison inmates, refugees, carers, young people outside of formal education, women and girls, and geographically remote audiences.

Two key features were identified in underpinning the achievement of reaching diverse audiences: substantial long-term funding for 12 very different types of projects, and supporting in-depth and wide breadth forms of engagement. Participant outcomes included: enjoyment, creativity and inspiration, knowledge and understanding, and enhancement of attitudes and values. There were positive outcomes for wellbeing, self-confidence and self-esteem.

Impact on the funded organisations included learning outcomes and development opportunities, funding impacts including leveraging matching funding, and creating legacy resource materials and partnerships. While some projects had to delay their work during the COVID lockdowns of 2020-21, others used the restrictions to enhance online activities.

In addition to the audiences and project partners, the RAS as a whole and its individual members benefitted from the project. The ongoing benefits to the RAS and RAS Fellows are widespread, from an emerging new education and outreach strategy based on learning from RAS200, to a more coherent method for engaging with our Fellows and advertising and training for outreach opportunities.

The success of the project confirmed the mass appeal of astronomy and geophysics, and highlighted the accessibility, and accessibility issues, of the subjects. Astronomy and geophysics are highly suitable for engaging new audiences, specifically when presented by trusted organisations in user-friendly formats.

Introduction

In 2013 the Royal Astronomical Society trustees – its Council – conceived an idea called 'Astonishing Astronomy and Glorious Geophysics' which was set to be a £1 million outreach project aimed at engaging in astronomy and geophysics projects with groups with which the RAS had not previously been involved.

The investment was made in preparation for the Society commemorating its 200th anniversary in 2020, and the long-term plan was a celebration of astronomy and geophysics and an intention of supporting "projects that promote understanding, discussion and dialogue around astronomy and geophysics in diverse sections of the community".

The Society wanted to create grassroots projects that could extend the appeal of the organisation into new areas of the wider society. It wanted a legacy of embedding astronomy and geophysics that ensured these sciences retained their appeal, inspiring people from all walks of life, and setting the RAS on a new course for the next 200 years, as an outward looking, diverse organisation.

The stated aims for the programme were:

- To have a lasting impact beyond 2020 and inspire a new generation to broaden their interest in science, technology, engineering, maths and medicine (STEMM).
- To go "where no outreach project has gone before", engaging people from diverse backgrounds.
- To harness the shared ambitions of world-leading researchers and national, local and community organisations.

Fast forward 10 years and the project celebrated its close, delayed due to the COVID pandemic, finishing officially on 9th February 2023. In that time grants were awarded to 12 partners, spending almost £900k between 2015 and 2022, spanning the UK, Ireland and even South Africa. The *direct* reach was in excess of 220 000 people, but the indirect reach is immeasurable, and may have a longer-term impact that the Society simply could not have imagined. In addition to the eight years of evaluated projects, the RAS also looks forward to a future of legacy projects, partnerships, and newly forged friendships, all thanks to the transformative properties of astronomy and geophysics.

Background & application process

In 2013 £1 million from RAS reserves was earmarked for outreach and engagement projects, in a unanimous decision by RAS trustees as a marker event for the 200th anniversary in 2020. A Steering Group was created from trustees, outreach professionals and academics, and Prof Steve Miller from UCL was appointed the Chair of the Group. The official launch of Astonishing Astronomy and Glorious Geophysics was in May 2014, with a swift rebranding to RAS200: Sky and Earth. The first few months of the project included consultations with astronomy and geophysics communities and a national stakeholder meeting held at the RAS premises in London in July 2014. In September 2014, Dr Sheila Kanani was appointed as RAS Education, Outreach and Diversity Officer, and staff lead for RAS200.

How did we get past the usual suspects communicating with the usual suspects? Historically the RAS has partnered and worked with our members, styled Fellows, university academics, students, other learned societies and similar organisations, and amateur astronomy organisations. We were aware that we would need the astronomy and geophysics expertise and support from these groups, but we needed to find diverse partners for this project to be successful.

In autumn 2014 then again in autumn 2016 members of the Steering Group and RAS staff travelled around the UK conducting the town hall-style meetings in key locations to spread the word to RAS Fellows and stakeholders, during which we asked for local networks and organisations to host the meetings. We also used social media, emailing charities and advertising through university points of contact to urge groups to put in an application. We conducted 24 town hall meetings in total, covering UK and Ireland, from the Isle of Man to Northumberland, Belfast, Cornwall and Galway. Evidence suggests that this method of reaching out was successful, as applications were received from each of the town hall areas, and of the 24 locations, at least seven were offered funding for their projects.

December 2014 saw the first tranche of applications open. The application process was two stages, with a short outline proposal followed by a longer full proposal for successful outline proposal stage applications. The first tranche of project winners was announced in May 2015, and the second half in May 2017.

Over 150 applications were submitted in total, with a clear spread across the UK and Ireland, and some international applications. Clusters of applications around town hall meeting locations were apparent, and most of the applications came from big cities such as London and York. Five out of 92 applications in the first tranche were international, spanning as far as Sri Lanka and South Africa.

Applications reflected 20 main themes. In no particular order, these were:

1. Peer-to-peer learning

2. Projects to bring astronomy and geophysics to poorly served communities, or to visit special sites, such as dark skies sites

3. Outdoor activities at, for example, music festivals and on beaches

4. Using IT technologies such as Zooniverse spin-offs and cubesats

5. Working with community groups dealing with, for example, youth centres and prisoners and their families

6. Working for awards and badges with the scouting movement or Duke of Edinburgh scheme

7. Using simple geophysical equipment (seismometers, magnetometers) in community settings

8. Working with special educational needs groups

9. Individual family projects

10. Art and creative writing projects

11. "Minority" language projects

12. Theatre and cabaret shows

13. Specific creative music projects

14. International link-ups and projects outside of the UK and Ireland

15. Projects in areas of specific geological interest

16. Projects involving ancient cultures, including archaeo-astronomy

17. Careers advice

18. Residential events for underserved groups and communities

19. Media production

20. Adult education.

More information on the material released during the application process is given in Appendix 1.

Given the wide range of projects proposed, it was clear that the RAS needed to draw on a wide range of expertise from its Fellowship and outside. A Steering Group for the programme had been established early on, making use of Members of RAS Council and some of the Society's other Committees. But a Selection Panel of around 12, with a small minority of Steering Group members, was set up to give more independent advice.

Projects were expected to last for five years, cost about £100 000 each and to leave a lasting legacy, in terms of people affected, resources developed and closer involvement with the RAS itself.

Two rounds of applications were invited, each with about £500 000 available: the 2014 call was for projects to start in autumn 2015, and the 2016 call for projects to start in autumn 2017. The first call brought 92 outline proposals, which were cut down to around 20 invited to make a full application. Projects were expected to last for five years, cost about £100 000 each and to leave a lasting legacy, in terms of people affected, resources developed and closer involvement with the RAS itself. Six projects were funded. Most of the 92 original applications were of very high quality, but some – such as those requesting funding to build local observatories – were considered to be outside of the scope and affordability of RAS200.

The second call elicited 61 applications, some of which were updates of the 20 that had made it through to the second round in 2014/15 without being awarded any funding. By this time, the community had a clearer idea as to what RAS200 would fund and some ideas put forward in 2014/15 were not represented in the second round initial applications. Again the 61 were cut down to a shortlist of around 20 and a further six were funded.

One lesson from the two calls for funding was that there was a great appetite amongst RAS Fellows and groups that wanted to be associated and involved with the Society for outreach, engagement and social involvement in astronomy and geophysics. Although these sciences may not have the immediate social and welfare impacts of those subject such as bio-medicine and engineering, it was, and still is, clear that the sciences covered by the RAS have great purchase amongst the wider public in terms of general interest, inspiration and wellbeing that goes far beyond the professional scientific communities

The RAS was responsible for all aspects of the project management of RAS200, which included financial monitoring and approval of payments to each of the projects, as specified in an 'RAS200 Grant Conditions Letter' issued to each project on award of funding (as opposed to a contract). The RAS had its own final reporting requirements on completion of grants, which were separate from the evaluation and specified in the 'RAS200 Grant Conditions Letter' as: a Final Expenditure Statement and a Final Report (described in the Letter as "In addition to any requests for reporting made by the external evaluators.") due three months after the end date of the project to trigger final payment.

Project winners

The RAS awarded 12 RAS200 grants in total, against which a total of £875,160 was paid out. The first tranche of RAS200 funding was announced in May 2015 when five projects, of five years' duration, were each awarded a grant of around £90k to £100k. A sixth project was awarded £10k to aid access to the other RAS200 projects for autistic people. All these projects were based in the UK. The five projects were Care 4 Carers (C4C), University of Aberystwyth (Welsh Culture), The Prince's Trust (PT), NSC Creative Ltd (NSC) and Workers Education Association (WEA). The sixth project was the National Autistic Society (NAS).

A second tranche of funding was announced in 2017. Three projects were each awarded a grant of £95k with plans to be of four- to five-years' duration, two of these were awarded to UK-based organisations and one to University of Galway, Ireland. Three projects were each awarded a grant of between £25k and £35k (part-funded applications), two were UK-based and one grant was awarded to the South African Astronomical Observatory. The three full award winners were Bounce Back Foundation (BB), Girlguiding (GG) and National University of Ireland Galway (Galway). Cornwall Sea 2 Stars (CS2S), National Youth Agency (NYA) and the South African Astronomical Observatory (SAAO) were awarded part-funded grants.

Three projects were given additional funds (CS2S, SAAO, BB); three projects were not able to spend the full amount allocated to them at the start of their tranche (Galway and Welsh Culture underspent due to the COVID pandemic, and WEA were allocated a reduced amount based on a revised delivery plan) and one was initially allocated £40 000 for two years then a further £60 000 for the following three years, giving a total of £100 000 across five years (C4C).

NAS - Space, Earth and Autism

A pilot access project to support people with spectral needs to access the other RAS200 projects.

£10,000

BB – Beyond Prison Walls

Activities delivered primarily in London prisons to engage adult prisoners and their family members.

£100,000

WEA - Open Your Eyes, Look up to the Sky

Engaging with hard-to-reach groups through grass-roots events and new STEM curricula courses.

£93,550

Galway – Making Space

Working with arts organisations to engage under- represented groups in the Western Seaboard region of Ireland with astronomy.

£81,187

NSCC - The Planets360

A full-dome, immersive, modular-format planetarium show based around Holst's Planet Suite and available to all UK planetaria license free.

£100,000

GG – Reaching for the Stars

Activities to engage girls and young women aged five to 25yrs with astronomy.

£95,000

PT - Stars & Space

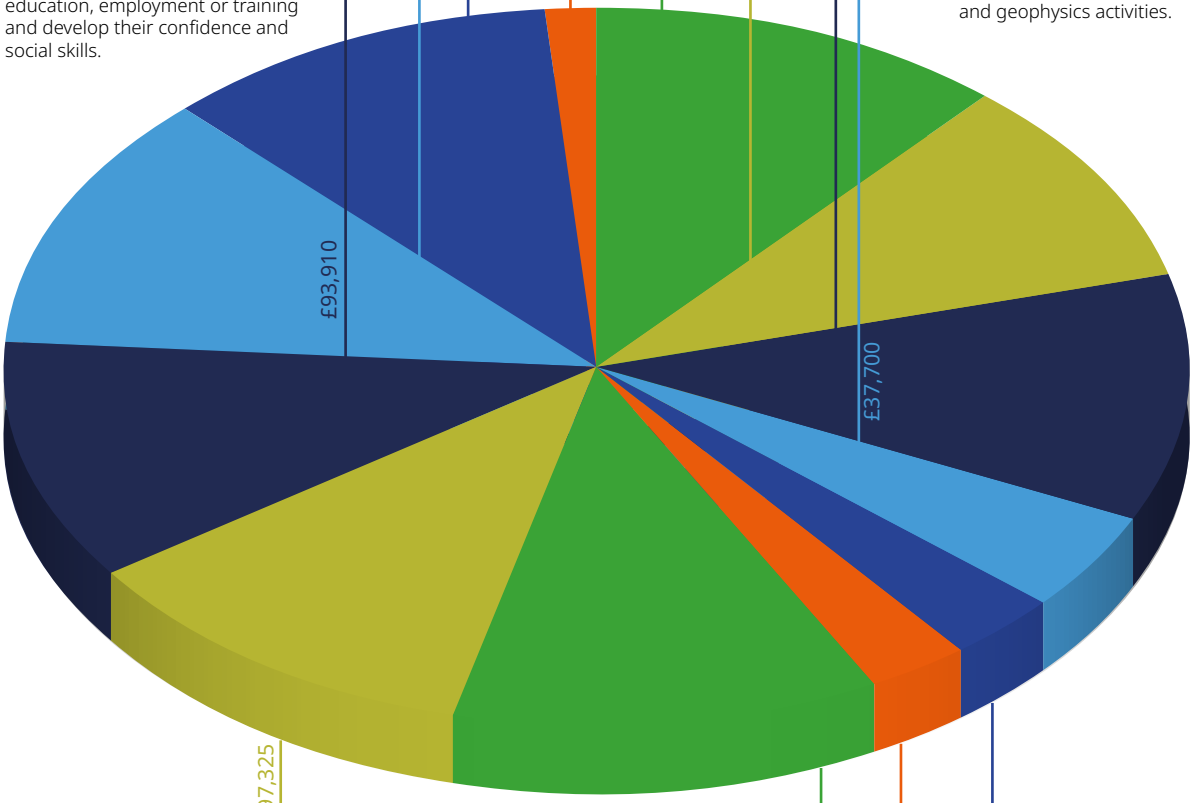
Training courses and programmes to engage young people not in education, employment or training and develop their confidence and social skills.

£93,910

CS2S – Cornwall Sea to Stars

A mobile trailer touring Cornwall engaging audiences with astronomy and geophysics activities.

£37,700



£97,325

Welsh Culture – Astronomy and Geophysics through the Traditional Culture of Wales

Activities led by experts in the arts supported by scientists that delivered performances, installations, competitions and compositions at the National and Urdd (youth) Eisteddfodau of Wales.

£100,000

C4C - Stepping out: Astronomy Short Breaks for Carers

Astronomy-themed residential and day breaks for carers in Scotland.

£25,000

NYA – Geophysics in a Box

A three-way partnership between NYA, Leicester City Community Trust and National Space Academy to engage 9 – 14-year-olds in school and community groups and their teachers/leaders with geophysics.

£25,000

SAAO - Astronomical Data: from Small and Beautiful to Big and Overwhelming

An exhibition on astronomical data from ancient to modern times based in Cape Town.

Evaluation

Soon after the first tranche projects were announced, it was discussed during a grants panel meeting that it would be imperative to appoint an external evaluation team that could follow the project winners from beginning to end. Jenesys Associates were hired in 2015 for a meta-level evaluation programme; there to evaluate the programme as a whole. The evaluation aims were:

1. To monitor the demographic profile of and impact on audience reach;

2. To see how and to what extent each project's aims have been met;

3. To assess if and how the individual projects' outcomes contribute to the RAS outreach and public engagement programme.

Reporting periods and processes varied on which year of their project the partners were in, funding status, and ultimately, due to the COVID pandemic. There were annual written reports, annual interviews, project observation visits and audience interviews. The evaluation team also carried out RAS meeting observations, interviews with Fellows, interviews with partner organisations and RAS staff. Over the course of the project, the evaluation team were also asked to examine the involvement of RAS Fellows in the programme, as part of aim three above. Fellows' involvement was studied in depth in year four and year six, and views about the programme from other organisations were obtained in depth in year six, including suggestions and opportunities for the RAS to disseminate the outcomes from RAS200 within the STEM engagement sector. Financial monitoring wasn't part of the scope of the evaluation, as the RAS was responsible for those aspects of the project, where project management, including approval of payments on receipt of invoice, was the responsibility of the RAS staff project lead and accountant. Jenesys submitted annual evaluation reports to the RAS which can be read upon request to the RAS.

Audience reach and impact

A total of circa 220 000 people were reached across all projects, directly, between September 2015 and December 2022.

This figure is calculated from the evaluation of all the projects and is based on:

- Attendance at RAS200-funded in-person and online events, including workshops, courses, talks, performances, and visits;
- Numbers of downloads of online self-led activities and resources;
- Numbers of physical resources, such as art or craft postal packs, distributed in place of events as a response to the COVID-19 pandemic;
- Project lead organisations' staff or team members, e.g., trainers, tutors, or youth leaders, who received training about delivering astronomy and geophysics content;
- Professionals engaged through conference presentations, etc;
- Estimated numbers for engagements with RAS200 activities at public events run by others, e.g., festivals, exhibitions, open days, country shows.

It is difficult to estimate the indirect reach via media broadcasts and articles as views, downloads and audience numbers were not recorded. Social media follows and impressions are not included in the total direct audience figure because they would refer to social media programmes for an entire organisation and not just the RAS200 elements, and the impact or reach of social media was not specifically evaluated by projects, therefore cannot be directly validated or attributed to RAS200.

Types of engagement

Collectively, the projects reached a diverse range of audiences, spanning formal education, informal groups, families and the general public, all age ranges, a wide geographic distribution, gender, socioeconomic background and science capital, interest, culture, disabilities, access, education and beliefs. Audiences had a range of prior astronomy and geophysics knowledge, from none at all, to having previous interest enough to participate in previous astronomy events. Importantly, the RAS engaged with groups that we traditionally had not attempted to, or managed to, reach for various reasons. Specific groups that we were able to reach for the first time included isolated adults, carers, prison inmates, refugees, and young people who are unable to be in formal education.

The types of engagement were enhanced by the focus on specific audiences, and the expertise in their audience of the funded organisations. Two key features of RAS200 underpinned these achievements:

1. Funding a variety of different projects (see five categories below).

2. Supporting deep and broad forms of audience engagement.

Category	Project	Characteristics
STEM embedded in cultural activities	Welsh Culture, Galway	Science activities embedded in established cultural events with large audiences. Collaborations with major cultural organisations. Media partnerships.
STEM extending organisations' audience reach	BB, C4C, NAS, NYA	Funded organisations extending their reach via delivery of STEM to particular audience groups. Enhanced offerings for specific audience groups. Outputs often co-created with audiences.
STEM contributing to existing nationwide programmes	GG, NAS, PT, WEA	STEM activities incorporated into well-established, trusted and valued programmes of activity. Funded organisations have national (UK-wide) reach and national profile. Organisations with substantial national publicity and promotion.
Geographically-specific STEM outreach	CS2S	Visits to geographically distinct audiences, including non-STEM events, STEM events and schools.
Creating STEMM content	NSCC, SAAO	Funding used to produce STEMM engagement resources – planetarium show and exhibition. Audience engagement is passive rather than interactive.

As well as the different types of engagement, RAS200 projects provided broad and deep engagement delivering different general outcomes. Sometimes, one project could offer both in-depth and breadth engagement – supporting individuals and increasing the numbers of people engaging.

Focus	Engagement approach	General Outcomes
In-depth engagement: BB, C4C, Welsh Culture, Galway, GG, NAS, NYA, PT, WEA	Repeated engagement via audience-specific events and activities led by experts in a particular audience group's context, needs and concerns. Science may be being used as a 'background' enabler.	Positive social or emotional impacts - e.g., increased confidence, reduced feelings of isolation, inspiration to be more ambitious - in addition to improved attitudes and increased understanding about STEM for defined, specific audience groups. Greater community interaction.
Breadth engagement: CS2S, Welsh Culture, Galway, GG, NSCC, SAAO	Activities target 'general' public audiences and may be promoted via third parties and/ or delivered at events run by third- party organisations.	Increased awareness and appreciation of STEM (specifically astronomy and geophysics) amongst a wide range of public audiences.

Audience outcomes

Audience outcomes were gleaned from feedback documented in evaluation reports, interviews and feedback obtained directly during observational visits. Each project had its own intended outcomes, but evaluation analysis of the RAS200 programme as a whole demonstrated impact in all Generic Learning Outcomes (GLO) categories. These are: knowledge and understanding, skills, attitude and values, enjoyment, inspiration and creativity, and activity behaviour and progression. There was particularly strong evidence of impact in 'enjoyment, inspiration and creativity', 'knowledge and understanding' and 'attitudes and values'.

Enjoyment, inspiration and creativity

The evidence demonstrates that RAS200 funding was used to develop and deliver creative, inspirational and engaging experiences that were enjoyable for all the audience groups reached by the programme. The key reasoning behind this accomplishment is due to the fact that the funded organisations had a deep-rooted and skilled understanding of their own audiences, matching activities with personal expectations and priorities, and ensuring the programmes were relevant to their audiences. The RAS team could bring in the astronomy and geophysics knowledge, but the funded organisations were the key to the success of this particular outcome. The activities were hands-on and interactive, which appealed to all age groups, and compared favourably to formal education experiences.

People were keen to enjoy the beauty aspect of the science, particularly resulting from the intersection of the arts with astronomy, which allowed people to connect on a different level with the activities. This included interacting in an emotional way – not often thought to coexist with the stereotypical rigidity of STEM. People were inspired by connecting the beauty of art or music created to represent astronomy, or used to present astronomy to them. The audiences who experienced stargazing or a dark sky environment, sometimes for the first time, found that the beauty of these environments was an important factor in their enjoyment of them.

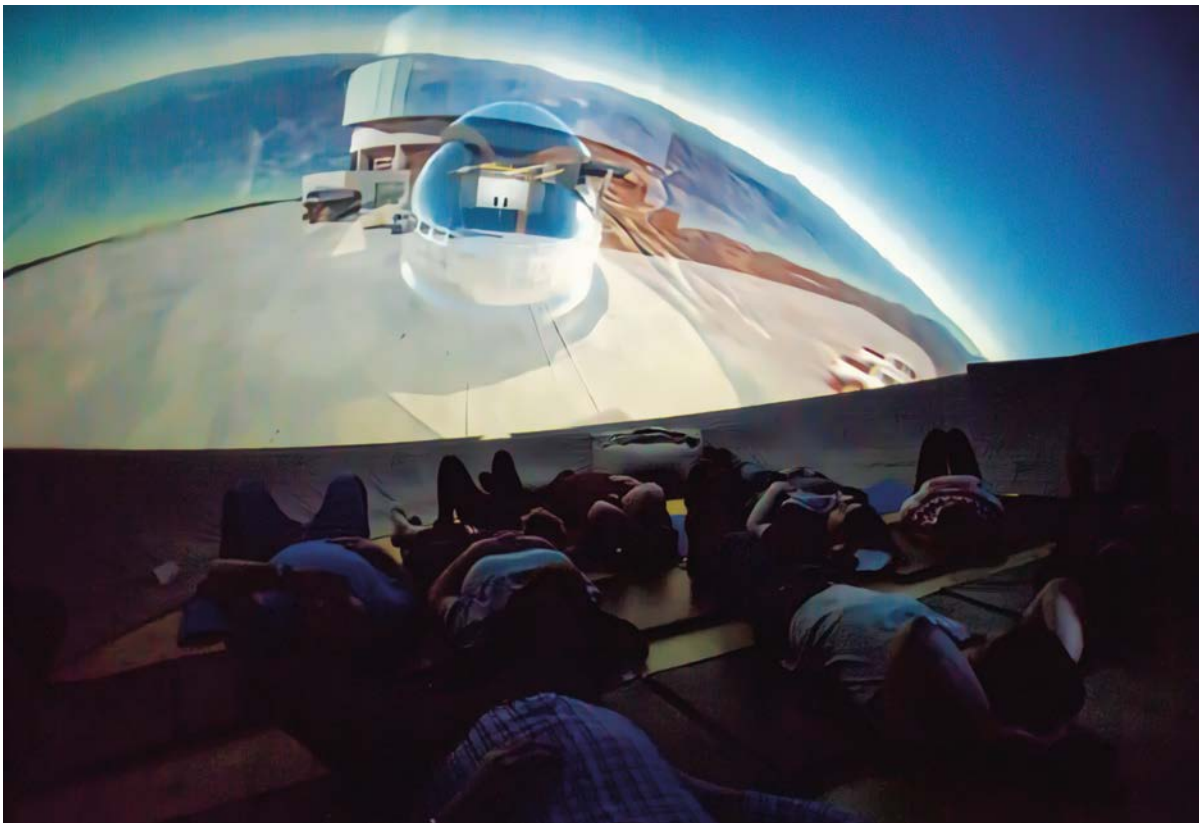
Audiences who experienced stargazing or a dark sky environment found that the beauty was an important factor in their enjoyment of them

Engaging with other people was also a factor that increased enjoyment. This included teamwork and collaboration to complete creative activities, where social interaction with in-depth engagement over a series of events scored most highly. Intergenerational projects were also successful, where creative tasks seemed to increase understanding and appreciation between age groups, and their different life experiences. The in-depth engagement inspired all age groups to continue their exploration of astronomy and geophysics topics further via different programmes of activity such as workshops or courses.

Staff working in the funded organisations, such as youth leaders and teachers, were multiplier audiences in several of the projects, and observed the transformative impact that the subject matter was having on their young people.

Knowledge and understanding

Across all projects, audiences increased their science learning and developed their knowledge and curiosity about astronomy and space. They reported also learning about the natural world, environment, climate change and nature. Learning through experiences and accessible and inclusive science was reported. Where audiences had prior subject knowledge they found that their understanding was enhanced,



and those who had little prior knowledge described learning from the projects, and putting an end to some common misconceptions.

Attitude and values

Outcomes here related to opinions, feelings and perceptions about individuals, as opposed to attitudes to astronomy, geophysics and science topics in general. These opinions resulted from engagement that fell into the in-depth category. Particularly interesting was the fact that audiences in four of the 12 projects specifically reported outcomes that can be described as wellbeing outcomes, and a contribution to social cohesion, mental and physical health, and staff in most projects also mentioned the potential for astronomy activities to have such outcomes.

Feelings of increased confidence and improved self-esteem were noted, described by audiences of all ages. Individuals felt surprise at how well they integrated or participated in activities. Positive self-perceptions were accompanied by changes in attitude to personal environments. Working in teams, across ages, had a positive impact on perceptions, empathy and tolerance for others.

Those who encountered the broad and the deep forms of engagement reported more positive attitudes towards scientists and science in general. Encounters that took place in unusual locations had more positive impact than when audiences were expecting to meet scientists.

Activity, behaviour, progression

Progression can be a difficult learning outcome to measure, because most outreach events are one-off events, and measuring progression requires in-depth engagement and follow up assessment, or some form of longitudinal project attendance. However, it was possible to see some forms of progression reported by the funded organisations' audiences. The

most common was an intention to apply knowledge and/or skills learned during activities, including using stargazing equipment and taking home astronomy-themed craft activities to continue in their own time. Audience members also made plans to share their new knowledge with friends and family. Teachers and youth leaders were also able to witness progress with their young people, and adult audiences sometimes showed intention to expand further learning independently.

Skills

Developing practical skills was not an intended outcome for any of the funded organisations, but many reported it anyway. There were examples of audiences learning how to stargaze using technology, including cameras and apps, and teachers described how young people developed 'soft skills' and transferable skills, such as communication skills and problem solving, from the in-depth forms of engagement.

One unexpected benefit of moving online during the pandemic meant that the older adult learners developed new technology skills, and where audiences included mixing different age groups, it was reported that there were skills transfers between the different ages.

Wellbeing

A surprising outcome from this project was the unexpected reports of wellbeing. The more vulnerable audiences, or those facing more challenging situations – such as the carers, prison inmates, isolated old people, and young people not in education – self-reported wellbeing impacts. Taking wellbeing into account when planning RAS200 activities was aided by the funded organisations' considerable experience with these groups and their needs, and those needs being embedded at the planning stage. The wellbeing reports were often attributed to emotional connections to the formats and atmospheres experienced during the activities. There was significant impact of wellbeing due to emotional

connections resulting from the scale and beauty of astronomy, and views were shared and supported across other RAS200 projects.

All RAS200 project leads commented on potential or actual wellbeing impacts developing from astronomy activities, which is why the external evaluation team suggested that the RAS conduct formal research into this aspect. The RAS is ideally placed to conduct research assessing astronomy wellbeing outcomes in order to confirm and understand any impact our subjects might have on wellbeing. If there is such a unique benefit of doing astronomy in STEM engagement, the RAS must promote it.

Impact on funded organisations

For each project that was funded, we give a short overview, and look at outcomes and lessons learned. Each project had different aims and objectives, different audiences and varied in terms of size of staff, sector, geography and reach. The main highlights will be around lessons learned, and legacy for the RAS. Some information was recorded based on the final reports handed to us on end of grant. Other information is from records submitted to the external evaluation team.

Bounce Back

Initially 'Beyond Prison Walls' and eventually 'Explore' the Bounce Back project aimed to extend the reach of astronomy, geophysics and related subjects by bringing these topics to prison inmates and their families, focusing on HMP Brixton and other London prisons, and surrounding areas, using educational activities and materials created for the project.

The programme evolved and developed, and was adapted to fit within the COVID-19 pandemic. Three Explore learning modules were delivered, over 500 inmates took part in person, and prison radio was used to extend the reach of the modules during the lockdowns of 2020 and 2021. Lockdowns in the prison environments equated to 23/24 hours in cells per day.

Evaluation and observations demonstrated that astronomy was an efficient 'gateway' topic, used as a hook to engage these hard-to-reach audiences, who suffer discrimination, disadvantage, unemployment, poverty and a cycle of reoffending and prison sentences. Inmates were often those who had been permanently excluded from school at an early age, and therefore lacked formal education and qualifications.

The visitor centre at HMP Brixton was redecorated with a space and astronomy theme, developed with the help of RAS

Fellows and prisoners. Improvements in the prison environment was shown to have a positive knock-on effect on relationships and behaviour within the prison walls.

In addition to the RAS200 project, Bounce Back were able to secure additional funding, £5000 from the Stephen Hawking Foundation, which was match funded by the RAS. Then, towards the end of our funding period, the organisation became a wholly owned subsidiary of a larger charity called "Change, Grow, Live".

Success highlights

- Adapting to COVID-19 restrictions, widening the reach of the content via prison radio;
- The subject of astronomy was highly engaging for prisoners and provided them with interesting content which, in turn, is understood to develop critical thinking and employability skills;
- Prison staff engaging with the content, giving a broader reach to activities delivered in prisons;
- The contribution of RAS Fellows was highly valuable, and prisoners appreciated the opportunity to discuss their ideas with them;
- Modules developed for the project continuing to be used within work delivered by Change, Grow, Live;
- Prisoners being observed to discuss the space-themed murals with their children at the visitors' centre at HMP Brixton;
- Having engaging astronomy content, especially during lockdown, was reported to have had a positive impact on prisoners' wellbeing.

Lessons learned

- Involving family members was logistically extremely challenging and many prisoners did not take up an offer to invite family members to activities;
- The project followed a phased approach to developing content, with the first year focusing on piloting and refining delivery. This launched a second-generation programme, Explore, which was informed by learning from Beyond Prison Walls;
- The Dynamic Purchasing System (DPS) was introduced for prisons by UK government in 2018 which limited roll-out opportunities to other prisons.

Legacy

- Redecoration of the visitor centre at HMP Brixton will continue to provide a space-themed area for inmates to interact with their families. This provides opportunity for discussion and learning in an informal environment;

- The 'Explore' modules will continue to be delivered by Bounce Back as part of their menu of services, and will potentially be incorporated into the company initiative headed up by the former CEO of Bounce Back in the future;

- Bounce Back has extended the work it does with partner organisations and prisoner families. The learning for Bounce Back includes a new approach and understanding of modular learning. This will enable the organisation to engage prisoners in a completely new way, and change the perception of what prison education, and prisoners, are capable of;

- Potential commissioning and prison services seeing the impact of the RAS200 project on prison staff and prisoners;

- Individual legacy such as an ex-prisoner who took part in the Explore programme and was quoted to say: "Stephen Hawking said 'Black holes are not eternal prisons' and we could escape them. His theory proved that the darkest places in the Universe actually radiate forth with light and that there is a halo of illumination surrounding the most infinitely hopeless places in existence. Prison is a big black hole, a dark place, a hopeless place, but with programmes like Explore, and with more programmes like Explore, perhaps a light can shine and supersede the darkness."

Care 4 Carers

C4C has always offered short and residential respite breaks for carers in Scotland, and has had a long-standing partnership with Our Dynamic Earth in Edinburgh. It was via this partnership, along with new relationships with RAS Fellows and Cosmos Planetarium, that the C4C team created astronomy-themed short breaks and services for carers. These short breaks provided new opportunities for learning and enjoyment of astronomy while people gained respite from their caring responsibilities.

The RAS200 residentials have been a huge success, with astronomy activities taking place on the Isle of Coll, a dark skies area in the Inner Hebrides

RAS200 activities and workshops for C4C included taster sessions at open days, arts classes using space as an inspiration, and the astronomy short breaks and residentials. Activities worked well to bridge a gap for people who attended these sessions without actually signing up for astronomy-related activities, and the workshops often sparked an interest in the subject because of the unintimidating and accessible methods of delivery.

C4C were able to leverage additional funding of over £100 000 from other sources, in addition

to the £100 000 from the RAS. This, combined, means that astronomy and geophysics activities have become an integral part of their package, and science is now a key offer in their support programme for carers.

The RAS200 residentials have been a huge success, with astronomy activities primarily taking place on the Isle of Coll, a dark skies area in the Inner Hebrides of Scotland. These are now a regular feature in C4C's programme, with many carers returning multiple times, and some choosing to take their learning further.

C4C found that people of any age and circumstance are open to discovering new subjects, if the topic is made accessible and enjoyable, but particularly if the information is delivered via an organisation or people that they trust and feel safe with. One of the largest unexpected outcomes of the project were around self-confidence and feeling better physically and emotionally. People reported enjoying being able to think reflectively and more widely and broadly about life, as a means of coping with the demanding nature of caring responsibilities, and the demoralising and stressful situations they may find themselves in when they were not on the astronomy residentials on Coll and other remote areas.

Success highlights

- Astronomy and geophysics successfully integrated into C4C's programmes and found to be popular and accessible subjects for carers;
- Building and sustaining relationships: C4C have established and maintained relationships with a range of partners, particularly Cosmos Planetarium, over a long period e.g. 7+ years;
- The project helped to develop strong, trusted partnerships that led to further funding bids, leveraging additional funding, and other engagement opportunities. Funders have confidence in C4C as the organisation have evidence for what they can achieve;
- Developing new knowledge and skills for both carers and project partners;
- New expertise to run science-based activities anywhere.

Lessons learned

- Adapting programme activities to meet the changing needs of carers;
- It was important to keep the programme balanced so new carers are not overwhelmed, but carers who have taken part for a number of years did not get bored;
- Evaluation is crucial and should be shared to help reflect on and review what you are doing;
- Needing to be flexible – the COVID-19 pandemic highlighted the need to develop flexible programmes to help adapt to different situations and find new ways to engage with their audiences. Some carers, like many of the UK population, had never participated in online activities, but became accustomed to it, during the pandemic.

Legacy

- Astronomy, geophysics and science in general are now an integral part of C4C's offering to carers, and they have built a substantial reputation from the work they have done in the RAS200 project;
- The RAS200 project strengthened C4C's reputation as a short breaks service provider and C4C has impressed carers, partners and funders as an organisation that provides truly unique experiences;
- The project developed a strong, trusted network of partners who continue to work together. Working in partnership was essential for the project to be a success. Champions and supporters of the project were vital, supporting staff, ensuring carers had a good experience and enabling C4C to offer more events and activities;
- Some carers' confidence has been significantly improved because of RAS200 activities, to the point where they are keen to give back and share their knowledge with other beginners in the subject. Some have also gone on to join the Edinburgh Astronomy Society;
- Future events have been planned to help meet the demand for places and prevent disappointment amongst carers, who clearly are keen to travel to remote and rural locations, including Dark Sky locations, as they feel supported and safe;
- Evaluating and reviewing the programme and sharing learning with project partners as the project progressed helped to better meet the needs of carers, e.g. carers asked for longer residentials because of the length of travelling time to and from the Islands, so four-day residentials were developed and will remain in the programme;
- Astronomy residentials continue to Coll and other islands, and the team have secured further funding thanks to RAS200;
- Steven Grey from Cosmos Planetarium is now one of the STEM deliverers for Aerospace Kinross.

Cornwall

Cornwall Sea 2 Stars (CS2S) aimed to take astronomy and geophysics to a widespread geographical area across Cornwall. CS2S was set up as a not-for-profit limited company created especially for RAS200 and was constituted of different partners, from astronomy observatories, Goonhilly, Truro High School and others. The funding was for two elements; one was a mobile trailer which would be able to exhibit astronomy and geophysics displays across Cornwall, and the other was an Earth Story Trail that would be situated in a Forestry Commission woodland. Eventually, the trail was agreed to be placed in a field on the land of Truro High School for Girls, a private school with an area for public access. The trail element was mostly funded by the RAS, the £35 000 also covered the refurbishment of the trailer, exhibition and associated equipment and resources. The project was awarded a further £2700 for a sandbox to project virtual reality topological information, but the funding was reallocated to the purchasing of Mars Atlases for schools in Cornwall.

Over five years CS2S were able to participate and run events using the trailer, to the order of 70 events in 30 venues across the county, with an estimated reach of 3000 school children, and 6000 members of the public. There was a team of presenters associated with the trailer demonstrations, visiting agricultural and country shows, community events and space events at Goonhilly. The added bonus of attending non-space-related shows was that the reach was local and not of those with high science capital, but those who were there for other reasons. On occasion, larger events did attract tourists and visitors.

Other activities were carried out by individuals associated with the project. These activities included handling meteorites, stargazing and solar observing, presentations, library sessions (in particular the 2019 Summer Reading Challenge theme of Space Chase), visiting schools and uniformed groups, and events for organisations such as the Women's Institute and the University of the Third Age. The physical touring of this project was greatly affected by the pandemic, with at least a year of impactful events unable to be carried out.

The Earth Story Trail was installed by the Summer of 2023 at Willow Field by Truro High School, as part of the Astronomy Hub, alongside the refurbished trailer. Despite the location being in the grounds of a private school, the site of the trail is also accessible to the public via a footpath, although the trailer is only to be open during pre-planned events. Further signposting is required for the Astronomy Hub, as the location is difficult to see from the road, and this means that only people who are invited to experience the trail might find it, or know that they are allowed access.

The trail was supposed to be a permanent installation, lasting 5–10 years, with an emphasis on Earth's planetary science and geophysics, including plate tectonics, how Earth has maintained liquid water, and whether or not there might be life elsewhere in the Universe. The plan was that the trail was to be maintained by members of the Astronomy Hub, who were members of CS2S until the company came to an end with the end of the RAS200 funding. Once installed, the trail was to be promoted to interested groups such as Cornwall Geological Society, post-16 colleges that deliver geology modules, and schools delivering GCSE geology. On visiting the trail, it was noted that the trail wasn't a permanent installation, but something that could be stored during the winter months and in poor weather. This could pose the issue that people visiting on the off-chance might not find the trail as advertised.

Success highlights

- The geographical reach across much of Cornwall;
- The resources created were multi-purpose and were used at a variety of events;
- Visitors particularly enjoyed the drop-in informal events, with the opportunity to chat to the experts on the project team;
- Activities developed for the project have had extended reach beyond the trailer;
- The offer of a permanent Astronomy Hub at Truro High School for Girls is providing a physical space for legacy outcomes.

Legacy

- Due to Spaceport Newquay, Goonhilly and CS2S there is greater interest in space throughout Cornwall, providing a basis for continued use of CS2S activities;
- The Earth Story Trail should provide 5–10 years of legacy;
- Copies of Mars Atlas were purchased by CS2S, and provided to all schools in Cornwall;
- There is a legacy website with online resources that will remain online for at least five years post project end. Once the website is archived the materials will be publicly accessible via other space education organisations;
- Physical resources have been transferred to the ownership of Truro High School for Girls, with a commitment from the school to act as a hub for the project, helping to coordinate opportunities in the future;

Lessons learned

- The core team were a conglomerate of volunteers. A dedicated coordinator would have been extremely beneficial;
- The trailer was difficult to tow to some of the remoter areas due to its size, restricting opportunities to reach particular audiences;
- The towing of the trailer could only be done by qualified personnel;
- Due to the logistical issues of towing the trailer it was best suited to visits that lasted for more than one day;
- The team found it hard to initially engage with some groups, persistence was key;
- Demand put a strain on a small team: in future there should be a focus on more specific target audiences than hard-to-reach communities, and more investigation with moving the trailer should have been carried out;
- The Earth Story Trail funds were given in full before it was installed, and on inspection, it was not installed to RAS requirements, and is not being advertised to the local community;
- The not-for-profit limited company CS2S was unable to continue past the funding period, and was wound up in early 2023, which may affect the legacy of the project.

- Although the company has been disbanded, the relationships and partnerships developed will continue;
- Individuals from the project team are still being invited back to community groups, schools and youth groups that were visited during the period of the project.

Girlguiding

The Girlguiding project aims included providing a range of activities for all members, women and girls aged four to 25 years, designed to build confidence and have fun. Activities were designed for beginners to astronomy and geophysics, built with differentiation in ability and age. The most popular outcome was the Brownie Space Interest badge, which has sold more than 46 000 during the funding period, but also national events, Space Camps and a suite of online resources.

The Brownie badge was developed with the RAS, Fellows and the UK Space Agency and was launched in 2018, as part of a range of new badges. Previous to the launch of the new badges, some of the youth members were involved in the development process and expressed an interest in learning more about space topics.

Space- and astronomy-led activities have been embedded into national Girlguiding events nationwide, covering a range of space themes, subjects and experiences, for a wide range of age groups via the different levels of Girlguiding membership (Brownies, Guides, etc). The Space Camp events were completely space-led and focused, while other residential programmes such as Wellies and Wristbands had space elements to them.

The project also supported the upskilling and development of the volunteer leaders in delivery of the space activities whilst utilising the leaders' range of skills and experiences. The activities were designed to be run without requiring prior science experience, which removed barriers to delivery.

In-person events were stopped altogether during 2020–21, significantly impacting the success of the planned project. The project delivery model was adapted, with the RAS's help, to create and promote online programmes, ensuring that Girlguiding still delivered space-related activities regardless.

Success highlights

- Brownie Space Interest Badge – now a core part of the national Girlguiding programme;
- Space and astronomy embedded into national events and training centres;
- Over 17 000 girls reached in-person during the project (not including badges sold) and over 10 000 online resources downloads between 2020–21;
- New opportunities for RAS Fellows to engage with new audiences, including girls aged four and up;
- Girlguiding staff being trained to deliver space and astronomy activities and programmes such as the Space Camps.

Lessons learned

- How to adapt from in-person to online delivery;
- Establishing the appetite for STEM and space activities, and scheduling additional events to meet demand;
- Using local RAS Fellows for local events and unit meetings.

Legacy

- Long-term outputs through integration of space and astronomy into Girlguiding's future delivery, including by way of the Brownie Space badge;
- Space Camps, supported heavily by RAS Fellows, have been scheduled during 2023 and 2024, and have been highly in demand, with waiting lists at several centres. Staff have been upskilled to deliver Space Camp activities;
- Development of relationships with multiple partners, particularly with the RAS staff and Fellows. This will help Girlguiding's STEM offer increase nationally and at a local level with individual units;
- The project has impacted people at an individual level, giving girls and women stronger networks and opportunities within the STEM community.

National Youth Agency (NYA)

This project used passion for sports, particularly football, and combined that with geophysics to create the Geophysics in a Box (GIAB) package. GIAB aimed to engage young people who had not considered that STEM was for them, using the hook of something familiar for them – a love of football. NYA used elements of football to explain concepts such as earthquakes, waves and gravity. This was a unique opportunity to inspire disengaged youth.

The activity boxes were piloted with local schools and youth groups in Leicester and was supported by local partners including the National Space Academy. Market research highted the need for very interactive learning for informal learning settings, and more calculations for formal learning settings. The boxes were revised and then rolled-out to other areas of the country.

The project was awarded a smaller award of £25 000 from the RAS, but this gave them the opportunity for match funding from other avenues including the Ogden Trust.

We aimed to engage young people who had not considered that STEM was for them, using the hook of something familiar – a love of football

With the funding, 80 full kit boxes were distributed to schools and youth groups across the UK, along with supporting guidance and resources for teachers and leaders. NYA project team also delivered directly to 200 young people in local areas, and the boxes in circulation have the opportunity to reach in excess of 5000 participants.

Success highlights

- Partnerships with organisations that were not previously considered, continuing beyond the funding period;
- Co-production of activities with the young people meant that the boxes were refined and redesigned to be correct for the target market;
- NYA and partners provided different contributions to the project, enabling different expertise;
- Training of trainers, youth group leaders and teachers means this project will have greater longevity.

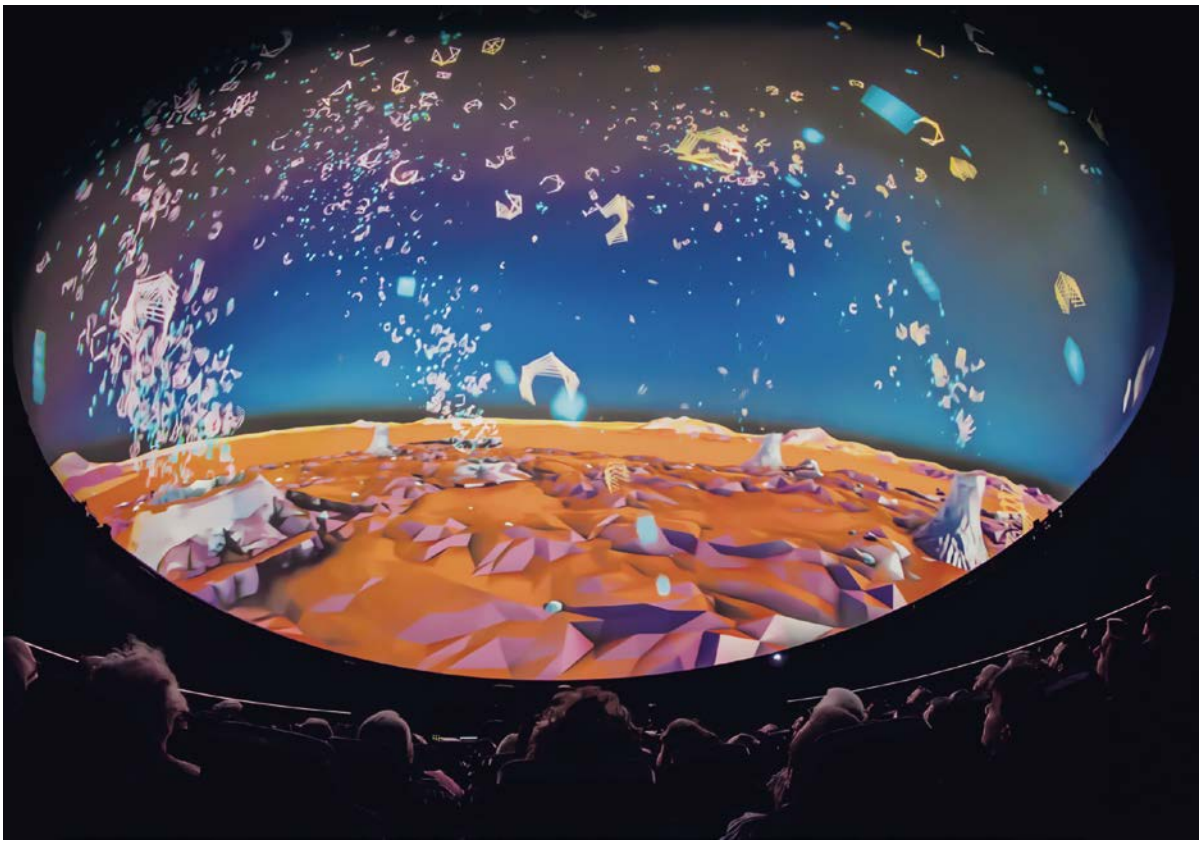
Lessons learned

- The boxes had to be different for schools and youth groups;
- It was logistically difficult to return and repeat load the boxes – this process will need refining.

Legacy

- The 80 boxes are still in circulation;
- The project allowed NYA and the RAS to work with new audiences, strengthening partnerships with local communities;
- The expansion of using the activity boxes as a model for indirect delivery.

National Space Centre (NSC) Creative



NSC Creative were awarded £100 000 to develop two versions of Gustav Holst's The Planets in a Fulldome (Fulldome refers to immersive dome-based video projection environments where the viewer is surrounded by the video projection in a hemispherical angle of view) planetarium show, in a film called The Planets 360. The two versions were a classic version featuring the suite performed by the Philharmonia Orchestra, and the modern version was a new musical interpretation composed by sonicXploras. Both musical editions were accompanied by Fulldome planetarium shows that could be used as a full show, or in a modular format whereby you could pick different planets or sections of the show as appropriate.

The full show classical version was 50 minutes, and the modern version was 23 minutes, both advertised as suitable for secondary school students and adults. The shows were often used in the modular format to illustrate talks, workshops and presentations.

The shows took longer to create than anticipated, due to the complexity of the shows and the modular segmentation. There was a film premier at the National Space Centre, Leicester, in February 2018, which was attended by RAS200 staff, Steering Group, Fellows, guests and members of the planetaria community. NSCC welcomed feedback at the premiere, and both versions were refined based on this. The final versions of both films were presented at the British Association of Planetaria (BAP) Conference in October 2018. The films were made available licence free on the NSCC website.

The funding application didn't specify dissemination data, audience number targets, screenings or similar KPIs so it was difficult for the evaluation team to assess and measure impact of the show. The RAS and the evaluation

team endeavoured to research efficacy of dissemination, and were told of multiple screenings by fixed planetaria and for specific events, e.g., National Space Centre World Music Day, Edinburgh Science Festival 2019 etc. The films have had most success with the mobile planetaria community, in particular in conjunction with BAP and Cosmos Planetarium; featuring it in their work as part of the Care 4 Carers RAS200 project. A delivery guide was written by Cosmos Planetarium's Director Steven Gray.

The show was screened in February 2020 in a mobile planetarium at the RAS in the courtyard of Burlington House. The RAS, BAP and Cosmos Planetarium ran a workshop, separate to the NSCC, to promote the show and its use to potential users. This has given the RAS further access to a cohort of individual mobile planetariums that will use the show, that can be used for future evaluation.

Success highlights

- The Planets 360 was very well received, particularly by the mobile planetarium community;
- Relationships were forged between the RAS, Cosmos Planetarium and BAP.

The shows were often used in the modular format to illustrate talks, workshops and presentations

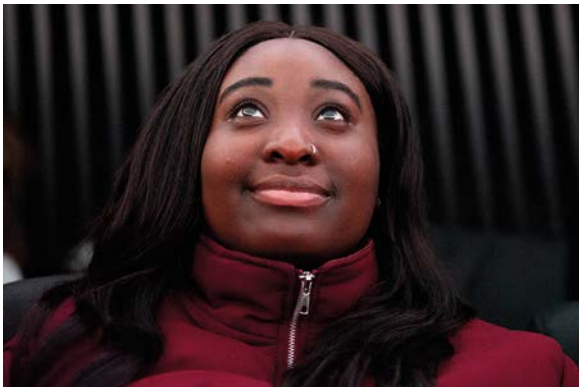
Lessons learned

- No KPIs or success indicators were in the application form. Payment was made to create the show, leaving little fund left for dissemination. As such, it was very hard to measure the reach or impact of the show, or for the RAS to insist to NSCC that these numbers be reported;
- Once The Planets 360 was delivered, the RAS had very little interaction with NSCC, and this relationship could have been stronger if more onus was put onto what happened after the show was created at the beginning of the project.

Legacy

- The Planets 360 suite of Fulldome presentations and surrounding resources;
- The relationship between the RAS and the mobile planetarium community.

Prince's Trust



The Prince's Trust was awarded £93 900 to embed astronomy and space science into a range of their programmes, from residentials, to careers sessions and film making. The hope was to give young people an opportunity to rebuild, or build, confidence, self-esteem and transferable skills required to get into the workplace, in order to improve aspirations and potential for the future. The sessions were well received by the young people who took part, but also by staff at the local hubs, who were trained to deliver sessions. Staff were encouraged to use the training that they received and tools given by the RAS200 programme, to create their own astronomy-related sessions which gave them ownership of the content and made it entirely relevant to the young people they knew well. This also meant that delivery staff developed their own knowledge and were able to upskill other colleagues and share best practice.

The Prince's Trust worked with additional partners such as Techniquest Science Centre, in order to develop a resource called 'Stars and Space Activities and Resources Book', which was used across various science and

discovery centres. Techniquest staff and RAS Fellows also delivered the initial staff training around using this resource.

The Prince's Trust underwent significant staff changes, an organisational restructure, and revamped its STEM offer, during the course of the project. Delivery became more localised and place-based. Unfortunately, due to these various changes, new staff reported less confidence in delivering these resources even though they had access to all the materials.

The Prince's Trust therefore did further training for the youth workers to feel fully equipped to deliver the activities in the Stars and Space programme and key staff members became champions of the project, creating further resources and training other staff members in a cascade approach.

Delivery was curtailed by the pandemic, but around 950 young people participated in the programme and over 30 staff were trained to deliver. Perhaps the most surprising, but very interesting, impact of this project, was that the young people reported that Stars and Space gave them opportunities to build their confidence, support their wellbeing and interact with other young people. In addition to these reports, an increased appetite for astronomy and space science were also reported.

Shorter space and astronomy sessions evolved into week long courses, and the online 'Get Started with Stars and Space', initially created for the pandemic, continued to be popular post-pandemic. The two-day online course was extended, and allowed for young people from different geographic regions to experience the programme. The online nature also meant that more RAS Fellows, from wider areas, could contribute to the course in different ways.

Success highlights

- The adaptability of the project in line with the new organisational strategy, allowing for a place-based approach. Stars and Space was delivered to different Prince's Trust programmes in order to meet local needs;
- Youth workers felt inspired and enthusiastic to deliver the programme;
- Online delivery started during the pandemic reached more isolated young people who might not have been able to attend in-person settings;
- RAS Fellows involvement in training staff and creating resources.

Lessons learned

- In order to maintain the confidence of the staff in delivering the sessions it was necessary to keep all staff updated on the project on a regular basis;
- It was difficult to track how many Stars and Space sessions were actually delivered across the regions due to the high turnover in staff following the operational restructure.

Legacy

- Stars and Space are now embedded into Prince's Trust programmes, and delivery of hybrid and face-to-face sessions will be sustained past the funding period;
- The staff members who became champions of delivery will continue to ensure that teams in their regions are up-to-date in their training and equipped with the tools required to deliver the sessions;
- There was some informal mentoring between RAS Fellows and some of the young people, sharing information about careers in astronomy and answering space-related questions;
- The project provided staff with transferable skills and the confidence to deliver across other themes and Prince's Trust programmes.

South Africa

The South Africa project was awarded a proportion of the funds requested, £25000, which meant that their original plans were reassessed. The exhibition created was a fixed instalment illustrating the development of astronomical data over a period of 200 years. The exhibit was delayed by the pandemic, but opened in December 2021 at the visitor centre at the SAAO's Sutherland site.

The exhibition content follows astronomical data through various formats, from the historical up to 'big data' that is currently used via supercomputers and Cloud systems, using a variety of demonstrations including scans of astronomical drawings up to cutting-edge modern technology in order to give audiences and immersive and engaging experience. The exhibition also highlights the South African heritage of astronomical excellence, and the role of the African continent in world astronomy.

The SAAO also had its bicentenary in 2020 (which is when the exhibition was intended to open) and this would have been a focus of any publicity. In any case, it is estimated that approximately 12000 visitors might have interacted with the exhibit in its first year of opening.

The project used partners across South Africa, some of whom had not worked together previously. There were plans to install another version of the exhibition at the SAAO Cape Town Visitor Centre, due to open in 2023. In order to replicate the Big Data exhibition, additional funding was acquired from the National Research Foundation of South Africa.

Success highlights

- Adapting to reduced funding;
- Securing additional funding to expand the project;
- The incorporation of historical data and the latest technology in one exhibit.

Lessons learned

- How to deal with ongoing exhibition maintenance;
- How to move from a mobile exhibit to a fixed one, due to budget limitations;
- Using partner organisations staff and expertise as opposed to a professional design company, which slowed progress.

Legacy

- The relationship formed between the RAS and the SAAO;
- The exhibitions will be in place for at least the five years starting from the close of the project, and will be used in the SAAO public visitor and education programmes.

The exhibition highlights the South African heritage of astronomical excellence, and the role of the African continent in world astronomy

Welsh Culture

The project planned to introduce astronomy and geophysics into a traditional culture festival that happens annually in Wales, the Eisteddfodau. The £100 000 funding went through a group at the University of Aberystwyth, but the project team was an amalgamation of university researchers, outreach professionals from the festival and volunteers. The National Eisteddfod of Wales (Wales's main cultural festival with an annual audience of approximately 170 000) and the Urdd National Eisteddfod (Wales' largest youth festival with an annual reach of approximately 90 000) provided established platforms for this engagement.

Collaborations were a main driver in this project, with partners from the Eisteddfod and Urdd, Fellows, scientists, a multimedia production company, schools and art experts. Having a presence at the festivals was not the only thing delivered; the project created novel art-based ways of communicating the science to untraditional audiences. Visual and performance featured heavily, including musical and theatre productions, dance displays and art installations, and a written and spoken-word competition that was run nationally across Wales.

The festivals already reach a wide demographic of audiences including but not limited to different languages, gender, socioeconomic circumstances, disability, additional learning needs and cultural interests. However, until the RAS200 project, there was little or no astronomy or geophysics present at the festival. The geographic rotation of the festival also means that all regions of the country, including urban and rural populations, were reached. Virtual components of the festivals were delivered in 2020 and 2021.

RAS200 inaugurated the collaborations between the National and Urdd Eisteddfodau, culminating in Lloergan. Lloergan was a choral production that opened the Ceredigion National Eisteddfod in 2022. The choral production was a large-scale professional music production, which was larger and bigger than anything expected to culminate the project.

The Welsh Culture project underspent by £3000 because of the COVID-19 pandemic, and some reallocation of funds during 2020 and 2021. There was substantial in-kind contributions from the main project team members, from home institutions and administration support from the festival teams.

Success highlights

- New and novel ways of communicating astronomy and geophysics to audiences not normally engaged with science;
- Development of multidisciplinary network of organisations and individuals across Wales, and beyond, working together;
- Profile raising across Wales using media and cultural partnerships;
- Growth of science engagement at the Eisteddfod, including the evolution of the Science Pavilion to the Science Village, and the appointment of a dedicated Science Officer.

Lessons learned

- Responding to the challenges of the pandemic and moving online;
- Understanding the importance of different groups of people working together;
- How to create opportunities for early career scientists to develop new skills and engage new audiences.

Legacy

- Networking in and across Wales;
- Multidisciplinary collaborations with complementary expertise;
- Outreach professionals had the skills and expertise, and the Eisteddfodau teams gave new opportunities to the scientists involved in the project, which will continue;
- For the festival teams, working with new partners like the communication and media partners, they have learned how to present complicated science topics in a way that is reachable and understandable to audiences not traditionally engaged in these topics;
- There is tangible legacy in the Science Village which will remain a fixture at future festivals;
- There were many resources developed for the project, including publications from songs and poetry books to articles in national journals, and resources printed in the Welsh language, accessible on the Coleg Cymraeg Cenedlaethol website.

The choral production was a large-scale professional music production, which was larger and bigger than anything expected to culminate the project

Galway

This project was led by the physics department at the University of Galway, and the plan was to promote astronomy and geophysics across the region via a cultural programme, multigenerational projects, and engagement with diverse communities and people from disadvantaged groups (particularly socially, economically and educationally). There was a collaboration with social organisations, local institutions, arts practitioners and academic researchers. This meant that there were fewer barriers with engaging with key groups, schools and museums. Partners included Galway 2020 museums and Galway City Council.

The project was awarded £95 000, and reached potentially 12 000 individuals directly. However, due to internal infrastructure issues and other external matters, the project only claimed £81 500 in the allocated time. It is hoped that the planned planetary walk and outdoor planetarium suggested may be developed in the future.

Activities included arts-based projects, cultural events and intergenerational workshops. The mixture of arts, culture and science meant that the project was able to explore different methods of communicating complicated ideas with marginalised groups. The pandemic affected the face-to-face plans for events intended to be part of Galway's 2020 European City of Culture celebrations. The community work was adapted to be delivered online, and arts and crafts packs were sent out instead of in-person workshops.

Success highlights

- Partnerships that delivered intergenerational workshops on astronomy and geophysics via the already established Croi Young Hearts programme;
- New opportunities with new partnerships e.g. Galway Aquarium;
- Engaging with marginalised groups, continuing during the pandemic, even when people faced significant challenges;
- Using astronomy and geophysics to facilitate social interaction, making people feel connected and less isolated;
- Volunteering opportunities for university students;
- Adopting the Universal Design for Learning framework for activities.

Lessons learned

- A flexible approach is essential in responding to changing situations;
- The importance and challenges of working with different partnerships, all of whom may have their own priorities;
- Working out how to maintain audience interest over a prolonged period of time;
- Recognising the need to support IT skills when moving programmes online;
- Working successfully with schools;
- The university administration departments can be a barrier to distributing funds, and in the future it might be more efficient for a community organisation to run a community engagement project.

The mix of arts, culture and science meant that the project could explore different methods of communicating complicated ideas with marginalised groups

Legacy

- Partnerships and multidisciplinary approach developed for the project supporting a new STEAM Learning Community being developed in the West of Ireland;
- University involvement with community organisations;
- New links for the university with local organisations;
- A greater appreciation of how the arts and sciences can work together. This, and a successful art exhibition as part of the RAS200 project, has led to ongoing collaborations with Galway Arts Festival and Galway Arts Centre.

Workers Education Association (WEA)

The WEA received £93 500 from the RAS200 fund in order to offer astronomy as part of its wider STEM curriculum. There were two phases of work; the first was two and a half years, in which a broad science remit was adopted, with astronomy as one part of the wider STEM curriculum that was offered, with a regional focus on the NW of England. This phase was used as a pilot scheme and in order to develop knowledge and expertise in digital marketing and social media, which was then applied across other subjects.

Phase two was from 2018 until the end of the funding, after the RAS suggested that the project would benefit from a stronger astronomy and geophysics focus. The astronomy courses were developed, from taster courses to longer courses, and were delivered online making them accessible to the whole of the UK and internationally. These courses were branded RAS courses during the funding period, but continue as WEA courses today.

There were various WEA restructures during the funding period, including a devolution and various staff changes, affecting the WEA RAS200 project staff and astronomy tutors. There was a new online learning platform developed, Canvas, in early 2019, and the RAS courses were influential in informing the WEA's pedagogy in online learning. The RAS courses were then used as examples for other WEA online courses in the first stages of the global pandemic.

During the funding period the WEA worked with Fellows and some of the other funded organisations, such as the National Autistic Society, in order to develop approaches to make courses more manageable for autistic people. This collaboration did inform content and delivery.

By the end of the funding period the WEA had trained seven new astronomy tutors and developed courses and astronomy resources on Canvas, available for use by all WEA tutors. It is estimated that the reach by the end of 2022 was over 7500 people directly, through courses, lectures and public events.

Success highlights

- New partnerships and multidisciplinary approaches;
- Adapting to online learning and using RAS200 to pilot projects;
- Creating a substantial resource base of astronomy curriculum material, including models which can be used in other subjects;
- Developing a cohort of astronomy tutors who were able to deliver throughout the pandemic;
- Establishing astronomy as a WEA subject.

Legacy

- Embedding astronomy into the WEA curriculum, with significant resources for tutors and learners;
- Training of astronomy tutors will help to maintain a cohort of expertise for future delivery.

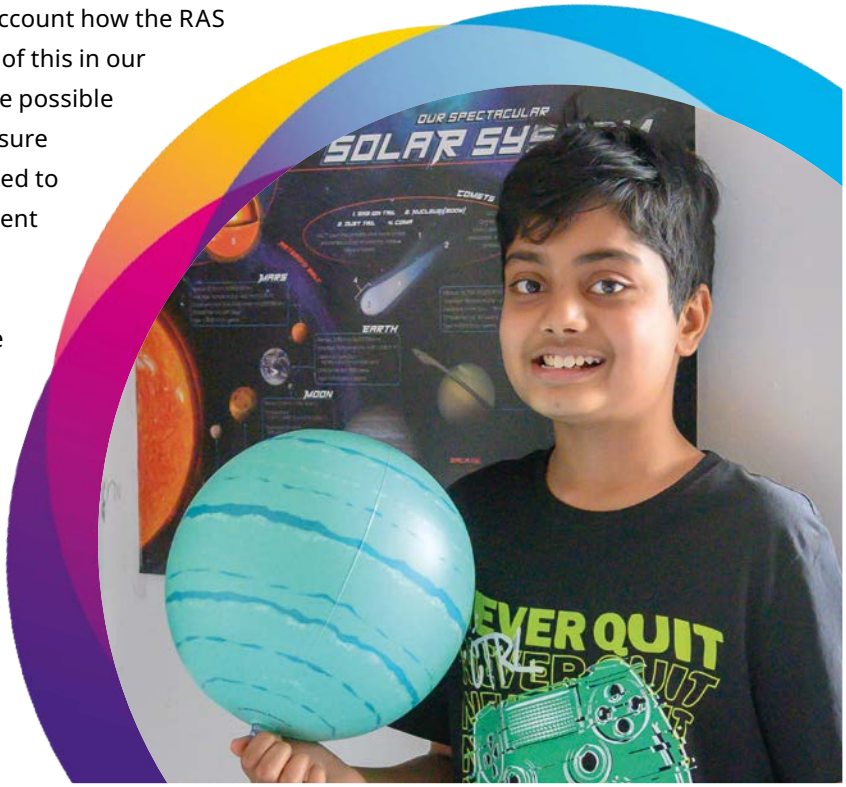
Lessons learned

- How to adapt to 'digital fatigue' and competition from other online learning opportunities, and adaption to ensure recruitment (e.g. introducing special one-off lectures);
- The project altered the demographic of those engaging with WEA courses – rather than being for "the most disadvantaged in society" had over 50% being in employment enrolled on the astronomy course. This suggests that the marketing needed to be more targeted and specific;
- Links between learned societies and organisations and the WEA were useful in terms the benefits brough via staff training, but it is important to remember that this needs to be constantly developed as staff turnover is ever-changing;
- National events result in a peak in interest and provide opportunities to raise the profile of the organisation and the projects offered;
- There may be an audience for family learning and multigenerational approaches but this needs to be investigated.

By the end of the funding period the WEA had trained seven new astronomy tutors and developed courses and astronomy resources available for use by all WEA tutors

National Autistic Society (NAS)

The meta-project with the National Autistic Society (NAS) focused on working with the funded organisations to create a booklet for outreach professionals and astronomers in working with autistic people. The focus of the booklet was on how to make community education work more autism-friendly. The guide provided information about the many ways autism can affect people's experiences of day-to-day life, taking into account how the RAS and partners can take account of this in our community projects, and where possible adapt venues and events to ensure they are autism-friendly. It aimed to enable staff, volunteers and event organisers to feel confident communicating with autistic people so that everyone is able to get involved and contribute as fully as possible. The booklet included sections on what autism is and how it related to STEM subjects, how to plan visits to our organisations by autistic people, how to make our spaces autism-friendly, and top tips to working with autistic people.



Success highlights

- Working with new partners and having the NAS collaborate with the other funded organisations and the RAS;
- The booklet has been well received and well used.

Legacy

- The partnerships created throughout the project;
- The booklet has been disseminated as printed materials and an online version, and remains on the RAS website.

Lessons learned

- Initial interaction with the NAS was mostly via an NAS representative presenting at various RAS meetings, and it did take a while for the meta-project to get up to speed;
- High staff turnover meant that the people who created the booklet were not the same people who started the project at the NAS in 2015. This required a lot of chasing from RAS staff in order to keep momentum going. The NAS were subjected to a lot of furloughing during the pandemic which also had an impact on staff.

RAS200 involvement and outcomes for Fellows

The large number of project proposals reported earlier is a clear indication of the appetite for outreach and engagement across the Fellowship of the Royal Astronomical Society. All of the successful projects made use of the time and expertise of Fellows, even if it was only at the level of giving advice or reading through material that was produced. In their Concluding Report of March 2023, Jenesys said that there had been a total of 78 direct Fellow involvements in the RAS200 projects, some of which involved the same Fellow interacting on more than one occasion. Since many hundreds of outreach and engagement involvements by Fellows are logged each year it is clear that RAS200 was only part of much wider activity on behalf of the RAS.

While RAS200 increased opportunities for Fellows to be involved with public-facing work, Jenesys found "a widespread perception that relatively small number of Fellows take part in most RAS outreach" and quoted a Fellow commenting: "I think could make use of us more." This is an important lesson for the RAS itself coming out of RAS200. There was feeling that the Society could have done more to "chase" Fellows, although RAS200 was given a regular slot at the Annual General Meeting from 2014 to 2022 and the Society's 'house' magazine – *Astronomy and Geophysics* – carried at least three articles a year, to a total of 24 articles, on the project and the partners. Fellows also acknowledged that the team at RAS headquarters in Burlington House is quite small, and that the Society has limited resources that dictate just what can be done.

Fellows who did get involved with RAS200 were enthusiastic and positive about their experiences. They also reported that the focus on people who "never willingly showed up at an astronomy lecture" was important: "I wasn't aware that there were groups … operating in that kind of non-formal sphere, and it's an area that's got a lot of potential and growth." Fellows appreciated the importance of collaborations with partners and partner organisations to reach the "never willingly's" and learned much that could be applied in other engagement situations from the particular involvements they had.

Fellows who got involved were enthusiastic about their experiences. They reported that the focus on people who "never willingly showed up at an astronomy lecture" was important.

As well as the effects on individual Fellows, RAS200 had an impact on the Society as a whole. The Steering Group presented a discussion document to the RAS Council in May, 2023 (see Appendix 3). This paper located the scheme in a decade of change towards outreach and engagement within the Society, whilst appreciating that the scheme itself helped to catalyse those changes. The discussion paper highlighted the increase in resources, including personnel, devoted to public-facing activities, albeit – as noted by Fellows (see above) the team remains relatively small.

Other impacts on the Society included the increased awareness of the importance of outreach and engagement amongst the RAS leadership and Fellowship, the development of an 'E&O cadre' and a network of partners on which the Society can build, as well as creating opportunities to promote activities outside of its London centre. The bottom-up, community-led nature of RAS200 has also served as an example to other "better-off if more ponderous, organisations".

Characteristics of success

Looked at purely in financial terms, a verifiable 220 000 people directly involved in the RAS200 projects at a total cost of just under £1 million represents less than £5 per person, remarkably little by STEM engagement standards. In reality, it is clear that many more were engaged by the projects: for example, numbers attending planetarium shows of The Planets 360 have not been rigorously logged, parent and guardian involvements with young people's activities are not well known, and social media and other 'second order' effects are notoriously difficult to quantify.

The sciences covered by the RAS are some of the most publicly accessible there are: although modern research is carried out using enormous telescopes and space missions to explore other worlds and our own, anyone can look into the sky and see meteor showers and (depending on latitude) the Northern and Southern Lights, planets, stars and constellations in our astronomical neighbourhood, and even into other galaxies. Several of the RAS200 projects made use of hands-on learning as well as just general enjoyment; some went away specially to find 'dark skies'; whatever the project, there were very few if any instances of 'audiences' not engaging.

Some of the key aspects of RAS200 that led to success included the RAS partnering deliberately with organisations that had years of experience of dealing with less-traditional, harder-to-reach groups, that knew these groups well, and were able to tailor astronomy and geophysics to such groups. The partners were keen to make use of the inherent attractions of RAS sciences to provide new experiences for their clients in settings that enabled them to get a lot out of these experiences. Prisoners doing astronomy sessions found they had something else, something novel, something that made them a bit special, to talk to their children about when they came to visit. Carers found unfocusing their eyes from the day-to-day tasks of looking after loved-ones and looking out to the heavens gave them inspiration and strength for days ahead. The Welsh Eisteddfodau now have huge science sections in the middle of their traditional arts activities as a result of RAS200.

One of the key aspects of RAS200 success was partnering deliberately with organisations that had years of experience of dealing with less-traditional, harder-to-reach groups

Wellbeing for individuals and groups involved in the projects benefitted in ways that the original project proposers did not anticipate; in some instances, personal tragedies were made more bearable or even avoided altogether. There are many other success stories, as the project-by-project sections have already described, and can be found in the various Jenesys reports.

Though never envisaged when the Society first set RAS200 in motion in 2013-14, it helped groups cope with collective nightmare that was COVID. Clearly the pandemic was very disruptive, especially for projects that required in-person attendance – at country markets or large open-air festivals, or in enclosed planetaria, for example. But RAS was still able to reach out and provide learning opportunities and entertainment to literally thousands in the isolating years of 2020–21. Indeed, tens of thousands of Brownies obtained astronomy badges due to online activities funded by RAS200, even if they could not hold their traditional 'wellies and wristbands' camps.

This success in the midst of national and international crisis was a consequence

of RAS200 using partners to reach out and giving them long-term projects that meant all of them got some in-person action as well as online provision, where it could be provided. The long-term nature of the funding, and generally hands-off management from the Society, also allowed projects to develop and adapt throughout the running of scheme.

For some partners, large-scale, long-term support enabled them secure additional funding such as to ensure a legacy from their RAS200 activities; the kudos of being supported by a well-respected, scientific society helped considerably with this. Partners and the RAS alike developed new relationships and gained experience in working together.

Finally, in explaining some of the factors that contributed to the successes that were achieved by RAS200 it is important to acknowledge some special features of the RAS itself:

- Throughout its decade and the changes in personnel as elections for Officers and Ordinary Council Members took place, RAS200 had the unwavering – albeit watchful – support of the Society's Council. This included support from six Presidents, two Executive Directors and all the senior office staff. For its part, the RAS200 team gave its reports regularly to Council, to the Society's Annual Report and General Meeting and to the annual (sometimes virtual) National Astronomy Meeting

- Although, as already noted, the RAS staff team involved with outreach, engagement and education is relatively small, they drove and sustained the efforts required for the project continuously and with enthusiasm. RAS200 and the Society itself was very fortunate that the skilled staff team was able to retain personnel and remain stable for the duration of the project

- That team's efforts for RAS200 were augmented by the project evaluators, Jenesys, who generated informative and constructive critical engagement with the project. Much of the information contained here has been gleaned from the detailed periodic reports Jenesys gave the Society, and from its presentations to Council.

- The Fellowship was kept abreast of project developments in articles carried in *A&G*, articles that project partners were able to make use of for their own internal and external communications. There was even some spill-over into relevant professional publications, such as the *CAP Journal* and an article in *Context* magazine, issue 161, Feb 2019, titled 'Reaching for the stars: To boldly go where no astronomy projects have gone before' by Sheila Kanani and Sherell Salmon.

- The RAS commands great loyalty and affection from its Fellows. Nowhere was this made more manifest than in the RAS200 Steering Group. Group members had years – in some cases, decades – of practical experience in public engagement with science and were familiar with many of the issues surrounding such activities. Several members of the Group were involved for the full ten years of the project; others came and went, depending on workloads and personal commitments. But the overall Group's tireless oversight of, and passionate involvement in, the work being done by RAS200 partners meant that the Society was an ever-present and supportive factor in the successes they had.

Conclusions

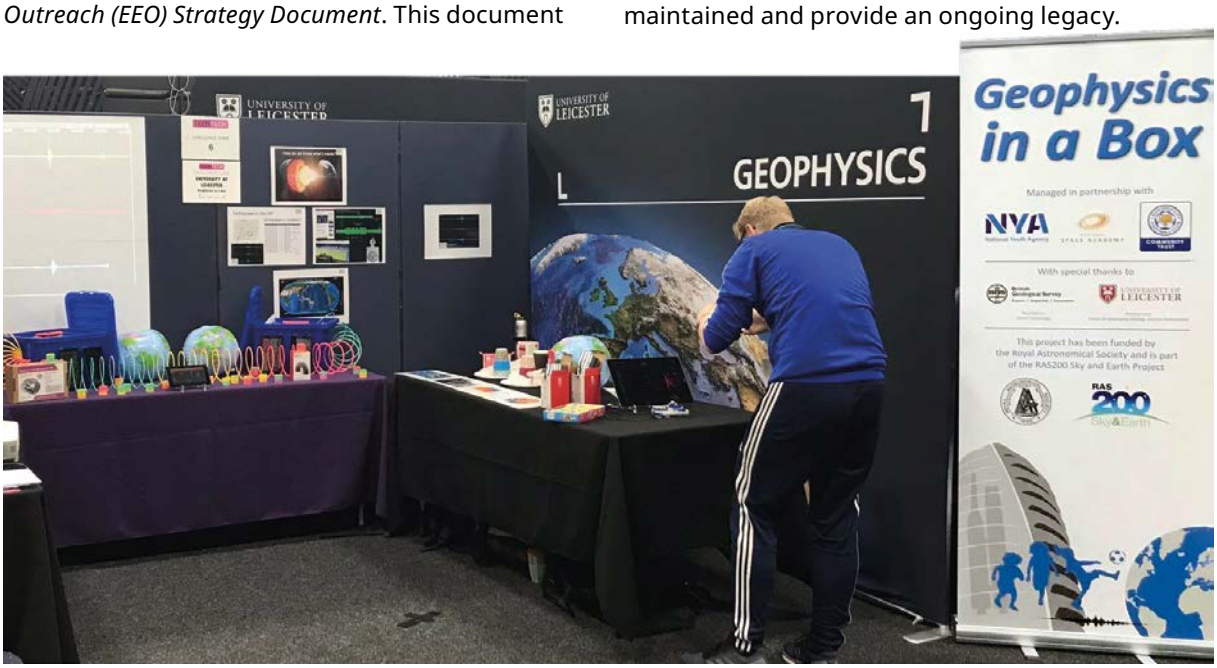
Anyone familiar with outreach to and engagement of the public with science (broadly understood) is aware that this can be a fragile area. Often it is more junior staff (and students) who are involved, people with pressing needs of obtaining secure and full-time employment and great competition for their time and talents. Continuity was always a challenge for projects with long-term goals.

As noted above, the Society itself was extremely fortunate in having remarkable stability in its staff outreach and engagement team. That was also the case for many of the partners, whose teams signed-on for the full duration; where there was staff turnover, RAS200 partners were remarkably successful in maintaining continuity of effort and commitment. This was enhanced by regular contact with RAS staff and Steering Group members and an annual meeting of all involved with RAS200 to share experiences and build a genuine community with common goals, albeit with varying experiences.

At the time of writing this report, the RAS has just drawn up its *Education, Engagement and Outreach (EEO) Strategy Document*. This document is an important milestone in embedding these activities within the RAS so that the Society itself can be more socially relevant and embedded. The Strategy Document recognises the need to build on and develop the successful relationships established by RAS200 whilst extending the Society's partnerships to others not originally involved in the scheme.

This poses challenges that the RAS will have to address over the coming years and months. One Fellow interviewed by Jenesys remarked: "I know they are a small Education and Outreach team, but I am not clear if the priority is for them to actually do the outreach, or support Fellows to do it." The practicality is that it is both. And that is a lot of work and responsibility for a small team, albeit supported by many Fellows.

As the Society goes forward with its EEO strategy, attention will need to be paid to the dilemma raised by this Fellow, one that was also noted by the RAS200 Steering Group. After a decade of effort and looking outward, the Society needs to build on what it has achieved, to ensure its place in wider society is maintained and provide an ongoing legacy.



Appendix 1: RAS200 development themes for the RAS

Designing A Programme That Reaches the Intended Audience	
1.	Develop clear, specific vision and purpose for each programme, with definition of why you are doing this, who you want to reach and what impact and specific outcomes you want to deliver for your audience.
2.	Fund the organisations already working with those target audiences, who match the programme's vision and purpose, and have potential to sustain legacy engagement.
3.	Allow audience expertise, rather than science expertise, to lead the activities resulting in meaningful experiences, optimising audience involvement, and importantly, their trust.
4.	Empower funded organisations to select audience-appropriate 'local' partners and relevant science expertise.
5.	Capitalise on the innate appeal and broad accessibility of astronomy to create relevant experiences for audiences.
Specifying and Assessing a Range of Outcomes	
1.	Don't only measure 'success' by numbers reached.
2.	Accommodate different types of outcomes within both programme planning and evaluation frameworks.
3.	Assess outcomes for internal and external participants, including organisations, audiences and partners.
4.	Agree expected outcomes with grant recipients on award of funding for short- and long-term schemes, and review regularly.
5.	Determine what needs to be evaluated and what needs to be monitored at the outset of any programme and adopt a systematic, consistent framework to implement this.
6.	Be practical – think about what is necessary and realistic and what you can resource – about monitoring and evaluation, and agree these with grant recipients.
7.	Agree the detail of expectations with grant recipients on award of funding, and review regularly.
Optimising RAS200 Impact on the RAS	
1.	Enhance the RAS reputation for public engagement – disseminate RAS200, focusing on unique features, e.g., formal research into the wellbeing impact of astronomy, learning from long-term grants.
2.	RAS200 learning is potentially transformative for RAS outreach and engagement – ensure it is embedded in strategy, operational plans, and E&O grant award criteria.
3.	Use the power of partnerships with RAS200 project leads – develop a strategy for sustaining relationships without high levels of funding.
4.	Increase Fellow involvement in E&O by providing a structured framework to facilitate and support Fellow involvement in outreach and engagement.
5.	Capitalise on the appetite for RAS200 learning to be embedded in RAS outreach and engagement – determine how this should be resources and implemented.

Appendix 2: Themes (as outlined to potential applicants)

This document is intended to help create or firm up collaborations for outline proposals for the RAS200 Sky & Earth programme. The themes in this list are groupings of the most prevalent of those discussed during the 15 town hall style meetings, held by the RAS200 Steering Group, that took place across the UK in the autumn of 2014. The themes and ideas are by no means exhaustive and might be considered by groups or individuals other than those named here. The purpose for the email contacts in this document is not because they are leads in those themes but to use as a point of contact, and in the hope that the same type of projects in different locations across the UK do not apply separately and are able to amalgamate before the outline proposal application deadline.

This 'top 20' is not meant to be prescriptive in any way and projects that do not fit within these themes will be considered equally.

The themes

1. **Peer-to-peer learning**
    a. help of university groups
    b. Astronomy and Geophysics clubs
    c. legacy experiences
    d. topics for younger people
    e. peer mentoring

2. **A&G bus/mobile planetarium/train/coach**
    a. "Bring the A&G to you"
    b. Transport to dark sky sites
    c. Going to geographically hard-to-reach areas or location specific deprived areas

3. **A&G at outdoor locations**
    a. Music festivals
    b. Rural consortia
    c. Campsite
    d. Outdoor learning community
    e. Beaches
    f. Geocaching
    g. 10k runs
    h. Astronomy and Geophysics busking

4. **Using IT software and hardware**
    a. Resources
    b. Linking people together using the internet
    c. Citizen science projects
    d. Immersive spaces, CGI
    e. Cubesats
    f. Radio telescopes
    g. Electronics
    h. Programming

5. **Community grouping**
    a. Community leaders
    b. Local role models and Astronomy and Geophysics ambassadors
    c. Youth groups
    d. Working with prison families
    e. Pubs
    f. Local fetes
    g. Football matches
    h. Garden centres
    i. Cinemas
    j. Book clubs
    k. Bus stop TV screens
    l. Libraries
    m. Maker fairs
    n. Using museums/learning centres/ schools in a different way

6. Awards and badges

    a. Scouts
    b. Guides
    c. Brownies
    d. Duke of Edinburgh

7. Seismometers/magnetometers

    a. Schools
    b. Music festivals
    c. Shopping centres

8. Working with Special Educational Needs groups

    a. National Autistic Society
    b. Resources
    c. Support
    d. New technology
    e. Teacher CPD

9. Family sessions

    a. father and child sessions
    b. mother and toddler sessions
    c. parent and teenager

10. Art, photography, creative writing and A&G link ups

    a. Edinburgh Calton Hill
    b. Giant model of the Sun
    c. Max Alexander photography

11. Languages and A&G

    a. Gallic
    b. Welsh
    c. EAL and role models from those countries
    d. BSL and Astronomy and Geophysics keywords

12. Theatre shows, A&G cabaret, storytelling

13. Music and A&G link ups

    a. Holst The Planets
    b. Entropy: Live Astronomy Documentary Meets an Electronic Music Performance

14. International link ups

    a. Ghanaian scout groups
    b. Observatory South Africa
    c. Indian schools

15. Geological areas of interest
    e.g. Scottish highlands

16. Ancient cultures

    a. Astronomy and Geophysics historical sites
    b. Astrolabes
    c. Megalithic sites

17. "What's next?"/careers advice/signposts

18. Residentials

    a. Google start up weekends
    b. Respite for young carers
    c. Astrobiology summer camps
    d. Scout and guide camps

19. Media

    a. TV shows
    b. Films by young people
    c. Radio programmes on local radio stations

20. Adult education

Appendix 3: The Impact of RAS200 on the Royal Astronomical Society

Introduction

Conceived in 2013, RAS200, the Society's £1 million project for outreach to engage with groups not previously or usually impacted by the sciences of astronomy and geophysics, has been a part of our landscape for the past decade. The project partners have been evaluated on a continuous basis with a view to looking at the reach, the depth and the breadth of their activities. But it has also been part of, and a catalyst for, a number of changes to the RAS itself. This short report attempts to capture the impact of RAS200 on the Society, citing statistically hard evidence where it is available and exemplifying the lessons learned where it is not.

1. Increased resourcing and experiences for Education, Outreach and Engagement

RAS committees covering education and outreach, including media relations and political engagement predate RAS200 considerably. Over the decade since the programme started however, the number of staff at Burlington House involved in such activities has increased by 1.5 FTE, with at least 0.5FTE originally dedicated to RAS200 now being absorbed into the overall team.

The £1 million from reserves was clearly a major boost in terms of the funding available. Although this is time limited – the programme is now officially at an end – RAS200 has shown that well-timed and targeted schemes can make a real difference. RAS200 has deliberately involved the Society with harder-to-reach sectors of the general public, giving us experience in working with diverse groups of citizens young and old outside of more traditional, already-science-orientated audiences.

2. Raising the profile of Education, Engagement and Outreach amongst the RAS leadership

RAS200 was initially conceived as a response to a challenge from the RAS Treasurer in 2013 at a Council Away Day meeting. As the project has developed, the programme has been the subject of regular reports to the Council, from whom approval was sought and granted at every stage. From 2016 onwards, the Society's leadership has also received reports from RAS200's evaluators, Jenesys, further enhancing its understanding of the importance and impact of EEO.

Thus the leadership of the Society has been made increasingly aware of the scope and potential of RAS200 – and EEO more generally – to deliver wide-reaching and in-depth outcomes for our fellow citizens during the last decade. This was particularly the case in the run-up to the Society's bicentennial. RAS200 issues have been discussed at three or four Council meetings per year and regularly at Officers' Meetings in between.

3. Raising the profile of Education, Engagement and Outreach amongst the Fellows

The wider Fellowship have also been sensitised to EEO through regular reports about RAS200 to the Annual General Meetings and other meetings, and encouraged to participate wherever and whenever possible. During the COVID lockdown, this was particularly important to help RAS200 partners deliver programmes, albeit in distance-learning and other safe environments, and some 70+ Fellows have been involved in helping in this way.

Throughout the 10 years of RAS200, the Society's magazine Astronomy and Geophysics has provided extensive coverage of the work being carried out by RAS200 partners and the Society itself. RAS200 has been

showcased at the National Astronomy Meeting on a number of occasions, helping to raise the profile of EEO amongst – particularly – younger astronomers and geophysicists.

4. Developing a stable, confident EEO cadre within the RAS

Over the course of its lifetime, RAS200 has been under the guidance of a Steering Group independent of the previously established Education Committee. During this time some 20-plus Fellows have served on the Group; although many of these had pre-existing involvement and experience of EEO, RAS200 has nonetheless brought several of them

together on the Steering Group and in the activities of the RAS200 partners, enhancing the network of Fellows with experience of dealing with their fellow citizens.

RAS200 has boosted the RAS confidence in its own abilities and judgement. The programme was envisaged as an outward-looking, bottom-up and community-led endeavour which, whilst not entirely novel in the STEM outreach community, was enough of a departure from the norm for the RAS to represent some risk to the Society financially and reputationally. The development of a stable EEO cadre around RAS200 – and its close working relationship with the RAS leadership – has provided the Society with valuable experience and personnel such that it can carry out its EEO strategy with confidence. It has also demonstrated that – even if some of the individuals change over the course of time – the Society itself and its values and (generally) good practices can provide a stable platform for long-lived EEO projects with a view to creating a lasting legacy.

5. Creating a network of partners we can build on

The RAS clearly deals with a number of partners in its various public-facing activities. These range from fellow scientific societies, research councils and space agencies to sympathetic policy makers. What characterises pretty much all of

them is a pre-existing, pre-disposition to the sciences the Society has in its remit to promote. RAS200 brought into the Society's orbit, however, several organisations that had no, or very little, previous experience of STEM engagement.

This is an important development in the experiences of the Society with regard to working with our fellow citizens and embedding what we do amongst the general public more widely. Just as RAS200 partners report that working with the RAS has changed their organisations, in terms of what they can deliver and how they think about it, RAS200 now means the Society is better equipped to work with broad sections of society, including those who would previously have been characterised as hard-to-reach.

6. Making a difference outside of the London centre

There are often complaints that the RAS is too London-centric. Burlington House and its close environs are frequently the locus for Society meetings, and Fellows and RAS supporters are expected to travel considerable distances to attend events. The Society tries to compensate for this with the peripatetic National Astronomy Meeting, and that is a vital event to make the RAS regionally relevant. But that is a week-long event in one location per year, leaving the rest of the UK and Ireland untouched.

Right from the outset, RAS200 set out to take the RAS out of London, organising town hall meetings to discuss projects in every part of the British Isles and eventually funding at least one project in most regions throughout the UK and Ireland, as well as in South Africa. But it had to be a deliberate policy of not just sitting in Burlington House for communities to respond. Instead, locally-generated interest resulted in locally-generated projects even if some of the organisations involved had national coverage.

Throughout its decade, RAS Fellows and staff – Steering Group members, in particular – have travelled to the various project partners to help and observe. This willingness to travel and be part of activities throughout the UK and Ireland has been an important part of the success of RAS200 (insofar as it has been successful) and holds important lessons for the Society going forward.

7. Raising the profile of RAS Education Engagement and Outreach, amongst other scientific organisations and the wider STEM community

The RAS is a middling-sized charity, dependent for funding on its members and publishing activities. We do not hold flag days, launch TV appeals or get support from overseas sovereign wealth funds. It therefore came as some surprise to some of our fellow scientific societies and organisations that the Society was prepared to make quite such a commitment to outreach and engagement from its limited resources, and even more so that we were prepared to do so on a bottom-up community basis, rather than dictating the terms on which we were prepared to fund partners.

As a result, RAS200 has been watched by other, often better-off if more ponderous, organisations, to see how it would all work out. The success of RAS200 (measured either financially, in terms of cost per direct engagement <£5 a time, or depth of personal experiences, in terms of individual testimony) has resulted in other bodies adopting similar approaches, and the RAS now has an enhanced reputation for innovation where EEO is concerned. This augments our already good reputation in the fields of educational efforts, diversity work and attempts to be as inclusive in our activities as possible.

8. Highlighting the importance of RAS200

From the outset, RAS200 has been subject to in-depth, longitudinal evaluation such that the partners, their projects and the overall RAS200 programme has been monitored and its impact assessed. The repeated presentations to Council mean that the issue of evaluating our EEO activities has been brought to the attention of the Society's leadership. Where RAS200 / RAS200 projects have been presented to the wider Fellowship, evaluation has also been emphasised.

Although evaluation is not yet standard for all RAS EEO. activities, it is clear that RAS200 holds a lesson for the Society as a whole that it has no excuse not to take on board.

9. Making the RAS more outward looking and socially embedded

As stated in the Introduction, RAS200 has been part of a decade of change at the RAS. Its work with partners with key expertise in dealing with social groups not previously engaged with Astronomy and Geophysics means that these communities now have awareness of the Society and can answer the "what's in it for us?" question when it comes to talking about what we do. For a society whose activities do not necessarily have immediate relevance – unlike, say, bio-medical research – but nonetheless rely on public funding and goodwill, this is an important development.

It sits alongside the other efforts of the RAS to make our sciences relevant to the wider public such that we can argue that they are important and worthy of support – not something we can take for granted in what are difficult economic times. The testimony of individuals whose lives are or have been incredibly difficult and challenging that being involved with RAS200 projects has made a real difference to them, coupled with the very large numbers reached by project activities, is a real boost to the confidence of the RAS that our sciences really do matter to people across a wide social spectrum.

We can cite the experiences of RAS200 when challenged as to why we should receive public support, in kind and financially. We can demonstrate that we more than pay our way in terms of the social capital we generate for our fellow citizens. And that could make the difference between oblivion or facing the next 200 years with confidence and enthusiasm; that is the real legacy for the Royal Astronomical Society of a decade of RAS200!

Appendix 4: The RAS Education and Outreach Strategy, demonstrating how impactful RAS200 was on creating it.

Education and Outreach Strategic Aims

Objectives - a measurable step to take to achieve the strategic aim

Activity or Action - a plan to meet objectives, could include KPIs

Reflect mission, vision and values

Overarching Vision: Deliver quality Education and Outreach programs in both Astronomy and Geophysics, taking full advantage of the ability of our science to inspire, and to promote an interest in, and understanding of, STEM as a whole. Make the most of our subjects' potential for enhancing wellbeing and quality of life, and for providing reflection on our place in the Universe.

Aim	Objectives	Activity description
Deliver high-impact Education and Outreach (E&O) programmes, inspired by our subjects, which reach the public and future scientists independent of their background	Increase the impact, reach and focus of our activities by prioritising events targeted at specific under-served communities	• Identify specific communities for focused efforts and revisit progress and priorities regularly (~2 years?), working with ECN, E&O Committee, and CDAG • Prioritise activities without limiting our scope • Work with potential new and existing partners, applying lessons learned from other large scale E&O projects e.g. RAS200, to support all ongoing work. • Align E&O grants criteria with the strategic objectives of the society (or assess grants based on RAS objectives)
	Assess and evaluate the impact of all RAS-related E&O activities	• Build formal evaluation into all activities and events from the planning stage, including E&O activities funded by RAS grants • Identify specific goals and targets to benchmark efforts • Develop or use an existing event online reporting process (e.g. STEM Ambassadors) to facilitate timely tracking of activities
	Fully engage our Fellows in RAS-led E&O programmes	• Promote and incentivise E&O activities with RAS Fellows • Update and consolidate key lines of communication (e.g. University points of contact and outreach officers) and make available to membership • Review and update processes for communication between RAS and Fellows, working with E&O committee
	Extend our E&O programmes to address issues of global significance relevant to our subjects	• Identify key Fellows to develop priority areas of communication (e.g. climate crisis), and materials • Include issues of global significance when relevant or related to the topic of an event.

Aim	Objectives	Activity description
Establish the RAS as an authoritative voice for Education and Outreach information and resources relating to Astronomy and Geophysics	Review and update the RAS E&O website(s) for ease of navigation and efficient updating.	• combine all E&O related material under one highly visible link with consistent and attractive look and feel throughout • clearly label and organise all subsequent links • incorporate information on current and future RAS E&O projects and programmes • Use the RAS website to signpost other good E&O resources.
	Empower members and collaborators (e.g. teachers, astronomical societies, RAS200 partners)	• ensure that resources can be shared widely • promote astronomy and geophysics education in schools and universities • facilitate networks and links between RAS Fellows and collaborators.
	Use social media to promote and encourage engagement in E&O activities.	• advertise upcoming activities • report on recent activities
	Harness current events in astronomy and geophysics (new facilities, celestial events) to engage larger, and more diverse audiences	• interface with public media both to inform them and to enhance their coverage with related activities, building on existing programs, e.g. Supermassive podcast.

Aim	Objectives	Activity description
Fully engage and support our Fellows in Education and Outreach programmes, and provide specific support to ensure their skills make a positive impact on the world	Increase the involvement of RAS Fellows in E&O activities.: train, target, track, assess impact, reward	• Offer and promote E&O activities to the membership • Consult with Fellows, Staff and RAS friends who are already active in E&O activities to learn from their experience • Survey Fellows on E&O involvement, record interest in various activities, provide support, and track their activities • -Encourage good assessment practices and provide framework for evaluation • Provide regular and accessible E&O training opportunities for Fellows • Promote opportunities for RAS Grants to cover activities • Recognise extensive and/ or outstanding E&O work
	Provide information, advice and guidance for careers and opportunities in astronomy and geophysics, and beyond	• Build and maintain information and publications on careers on the RAS website • Advertise current job openings in Astronomy and Geophysics and related fields (e.g. current RAS job mailing list - Jodrell Bank) on website and at NAM
	Facilitate bespoke and relevant training and networking opportunities, in particular for Early Career Network members	• promote and report activities of ECN • regularly communicate with ECN to facilitate desired activities

Aim	Objectives	Activity description
Nurture partnerships that support our overarching vision and strategic ambitions in Education and Outreach, and seek and share resources to facilitate these collaborations	Identify and prioritise existing and future partnerships with science and related organisations to enhance our ability to deliver diverse and impactful E&O programmes to a wide audience	• Establish a typology of strategic partnerships - formal, informal etc • Regularly assess formal/ informal partnerships which provide funding opportunities and align with our priorities (STFC/UKSA/Ogden) • Prioritise partnerships with STEM and education-focused organisations where this will increase our influence, reach or impact.
	Use demographic and socioeconomic data to develop a list of strategic school partnerships through which we can identify and focus on diverse audiences	• GCSE Astronomy • STEM Ambassadors • RGO • Consider regional/national etc • Encourage applications for RAS E&O awards and grants through school partnerships
	Understand and address the skills requirements for the space industry and other emerging/ growing sectors, and work with partners to highlight these to our Fellows and the next generation of scientists	• Link to ongoing RAS policy work to maintain a strong collective knowledge of Government ambitions and resulting strategies (e.g. levelling-up agenda, addressing the skills gap) • Work in selected partnerships to leverage financial and other resources to support our aims
	Partner organisations for reaching targeted underserved audiences for broad public engagement activities	• Build on existing and past partnerships to continue or develop new ones • Build and maintain a partners webpage (on E&O site) providing information on all partnerships, past, present and future (e.g. RAS200) • Learn lessons from RAS200 in order to reach out to further partners serving the underserved communities who may benefit from astronomy and geophysics


RAS
200
Sky&Earth

"Stephen Hawking said 'Black holes are not eternal prisons' and we could escape them … there is a halo of illumination surrounding the most infinitely hopeless places. Prison is a black hole, a dark, hopeless place, but with programmes like RAS200 a light can shine and supersede the darkness." – ex-prisoner, Bounce Back project

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