**Commons Science, Innovation and Technology Committee: inquiry into Science Diplomacy: Response from the Royal Astronomical Society**

1. This is the official response from the Royal Astronomical Society (RAS) to the inquiry by the House of Commons Science, Innovation and Technology Committee into Science Diplomacy.

2. The RAS represents more than 4,000 astronomers and geophysicists, in the UK and around the world, in occupations in academia, industry, education and public engagement, and journalism, as well as others in the wider economy. Our members are described as 'Fellows'.

3. This evidence was shaped by input from our governing Council, our Policy Group, and RAS Fellows in general, and others in universities and research establishments.

4. We do not believe there are any prejudicial conflicts of interest to declare. For the completeness of the record, some members of our governing Council are connected to projects cited here (such as the Mount Paektu collaboration), many of our Fellows use the international facilities described (such as the European Southern Observatory) and some have been involved in work funded as part of UK Official Development Assistance.

5. We welcome the interest of the Committee in this area, and would be delighted to give oral evidence to explore the points in this written submission in more detail.

6. In addition to our responses to the points of interest, we would like to draw the attention of the Committee to the international work done by our Society, undoubtedly also an example of soft power. Although we are a UK-based organisation, our Fellowship covers 70 countries around the world and we are affiliated to organisations including the International Astronomical Union[1] (IAU) and the European Astronomical Society[2]. We use the latter partly to represent the interests of UK astronomers with organisations such as the European Commission, even after Brexit.

7. Our contribution to the IAU is used to support projects such as the Office of Astronomy for Development (OAD)[3], which uses astronomy to further sustainable development. Since its inception in 2013, the OAD has supported 236 projects in 112 countries and reached more than 2 million people.

8. As a scientific publisher in partnership with Oxford University Press, our journals Monthly Notices of the Royal Astronomical Society, Geophysical Journal International and RAS Techniques and Instruments are significant exports for the UK,

[1] IAU https://www.iau.org/
[2] EAS https://eas.unige.ch/
[3] OAD https://astro4dev.org/

and another example of our reach. In 2024 almost 8,000 authors from 100 countries submitted papers to these publications[4].

9. Turning to the specific questions from the Committee:

**To what extent is the UK considered a global leader in science and innovation and how does this contribute to its soft power on the global stage?**

10. In the sciences represented by the RAS, the UK remains ranked highly globally. For example, in citation indices we are ranked fourth in the world in astronomy[5], fourth in space and planetary science[6] and fifth in geophysics[7]. (This is a drop of one place in each area since 2022, as output from China increased.)

11. These are also among the disciplines with the most international collaboration. In astronomy it is estimated that between 55% and 85%, and in geophysics 38% of multi-author papers include authors from different countries[8].

12. In intergovernmental scientific organisations the UK is a respected partner. In our sector these include the European Southern Observatory (ESO) headquartered in Germany and with facilities in Chile, the Square Kilometer Array Observatory (SKAO) headquartered in Cheshire and under construction in Australia and southern Africa, and the European Space Agency (ESA).

13. In the Pacific, the UK has been a partner since 2015 with the East Asian Observatory[9] (EAO) in operating the James Clerk Maxwell Telescope. EAO member countries until recently consisted of China, Japan, Korea and Taiwan, and facilitated collaboration between astronomers in these countries. Within the last year China, Japan and Korean have dropped out, and Thailand has joined, but UK astronomers continue to collaborate with their peers in all five countries.

14. To give one example in geophysics, scientists from Birkbeck, University of London, work in cooperation with their counterparts in the Democratic People's Republic of Korea (DPRK or North Korea) to study Mount Paektu, an active volcano on the North Korea – China border[10,11]. This work takes place despite sanctions on the DPRK

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[4] Private communication from RAS publication staff using OUP data
[5] https://www.scimagojr.com/countryrank.php?category=3103&area=3100&year=2024&min=0&min_type=ci
[6] https://www.scimagojr.com/countryrank.php?category=1912&area=1900&year=2024&min=0&min_type=ci
[7] https://www.scimagojr.com/countryrank.php?category=1908&area=1900&year=2024&min=0&min_type=ci
[8] Estimates change as studies took place at different times, and have different sets of journals in scope, but astronomy and geophysics were highly international in all cases. "Evolution and convergence of the patterns of international scientific collaboration", M. Coccia and L. Wang, PNAS, 2016 https://www.pnas.org/doi/10.1073/pnas.1510820113 and "The frequencies of multinational papers in various sciences, H. Abt, Scientometrics, 2007 https://link.springer.com/article/10.1007/s11192-007-1686-z
[9] East Asian Observatory https://www.eaobservatory.org/
[10] "The resilience of scientific diplomacy in North Korea", East Asia Forum https://eastasiaforum.org/2023/11/09/the-resilience-of-scientific-diplomacy-in-north-korea/
[11] The Mt. Paektu Research Centre https://themprc.org/

following nuclear tests that included restrictions on scientific collaboration , and is supported by UK diplomats engaging at the UN Security Council.

15. These are all clear examples of soft power, with flows of scientific discovery, technology, highly skilled people, and associated economic impact, between collaborating nations.

**How has this agenda been impacted by the current geopolitical environment, including the international activities of Russia and China?**

16. The full scale invasion of Ukraine in 2022 led to an immediate end to most collaboration by ESA and NASA with the Russian space agency Roscosmos (a notable exception is the International Space Station), and a variety of actions by scientific bodies in the West to restrict participation of Russia-based researchers (for example the RAS blocked their registration at our conferences).

17. In ground-based astronomy pre-invasion, Russia was part of the European Very Long Baseline Interferometry network, connecting radio observatories across the continent to enable imaging at very high angular resolution (thus yielding very sharp images). This participation has now come to an end[12].

18. In space and planetary science, there are three standout examples. Two are the delayed launches of Euclid and Hera on SpaceX Falcon 9 rockets instead of the planned Soyuz vehicles[13], and the other is the delay in the launch of the Rosalind Franklin Mars rover from 2022, again on a Soyuz, to 2028 on an as yet unspecified US commercial rocket[14]. ESA has limited launch capacity, so scientific missions are now more dependent on US operators than in the past.

19. Under the second Trump administration in the US, there are additional pressing concerns such as the proposed drastic cuts in science funding for NASA (up to two thirds in some budget areas), including the possibility of the outright cancellation of the already constructed Nancy Grace Roman telescope and the long-planned Mars Sample Return mission, both with significant investment and involvement from ESA, including the UK[15,16,17].

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[12] Director, e-MERLIN VLBI National Facility, private communication

[13] ESA moves two missions to Falcon 9, Space News https://spacenews.com/esa-moves-two-missions-to-falcon-9/

[14] The 'rebirth' of ESA's ExoMars Rosalind Franklin mission https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Exploration/ExoMars/FAQ_The_rebirth_of_ESA_s_ExoMars_Rosalind_Franklin_mission

[15] White House may seek to slash NASA's science budget by 50 percent https://arstechnica.com/space/2025/03/white-house-may-seek-to-slash-nasas-science-budget-by-50-percent/

[16] Trump White House budget proposal eviscerates science funding at NASA https://arstechnica.com/space/2025/04/trump-white-house-budget-proposal-eviscerates-science-funding-at-nasa/

[17] Science: Confusion and worry as DOGE cuts hit NASA https://www.science.org/content/article/confusion-and-worry-doge-cuts-hit-nasa

20. Of particular significance to space activities are the UK's efforts in the areas of space weather hazard forecasting and the related area of space junk removal which have traditionally involved US programmes, now under existential threat from proposed cuts to the NASA heliophysics budget. This work is of sufficient importance to the national risk register[18] that if the cuts go ahead, the UK and Europe as a whole will inevitably look to the rapidly-growing Chinese programme to try to repair the damage.

21. Alongside this, the US decision to apparently bar entry to individual scientists on the grounds that they hold views against the policies of the Trump administration[19] is sending the message that collaboration with peers in a longstanding allied country is no longer straightforward. Scientists should not have to place themselves at risk of detention and / or deportation through previously routine travel to work with their US peers.

22. The RAS is deeply concerned about all of these developments. If the funding cuts go ahead, then it will be difficult to continue to see the US as a reliable scientific partner, and the UK will need to deepen its collaboration elsewhere, for example with our European neighbours, Australasia, Japan and India. We would of course prefer to see full cooperation with the US maintained despite these tensions.

23. China is one of the other emerging science powers, and now outranks the UK in citation indices for our fields, for example. There are continued concerns about its human rights record, and how scientists in the public and private sector engage with its government. Irrespective of this, UK and European astronomers and geophysicists continue to collaborate with their Chinese peers, for example via ESA in the Solar wind Magnetosphere Ionosphere Link Explorer (SMILE) mission[20].

**How effective is the UK Government's strategy for positioning the UK as a global leader in science and technology and what role does the Department for Science, Innovation and Technology (DSIT) play in advancing this agenda?**

24. The RAS to date has not been involved with this strategy, or with the relevant discussions with DSIT. Given the international nature of our sciences, we would welcome the opportunity for the community we represent to engage with DSIT officials in this area.

**Does the UK need an International Science Strategy and what would it contain?**

25. Science, particularly fundamental science, relies on collaboration across national borders. As we have indicated, we also strongly agree with the premise that it is a

[18] National Risk Register 2023 edition https://assets.publishing.service.gov.uk/media/64ca1dfe19f5622669f3c1b1/2023_NATIONAL_RISK_REGISTER_NRR.pdf

[19] Science: International scientists rethink U.S. conference attendance https://www.science.org/content/article/international-scientists-rethink-us-conference-attendance

[20] Smile mission https://www.esa.int/Science_Exploration/Space_Science/Smile/Smile_factsheet2

key part of the deployment of soft power for the UK. An International Science Strategy could be developed centred on these tenets, and should certainly include discovery sciences such as astronomy, space science and geophysics.

**What are the key international scientific relationships for the UK?**

26. The RAS and other scientific organisations fought hard for the UK to associate to the Horizon Europe programme, recognising the benefits for science in the longstanding ties it fostered with our European neighbours. The programme remains crucial for the health of our sciences, not simply as a source of funding (historically UK astronomers and geophysicists were major beneficiaries[21]), but to ensure that those relationships remain strong, as they underpin scientific projects across and beyond the continent, such as ESO and the Low-Frequency Array Radio Observatory[22] covering eight European countries including the UK.

27. Astronomers across the continent also collaborate on the Astronet[23] roadmap, setting prioritising for scientific goals, and working for better coordination of national programmes. Networks such as Europlanet[24] take this a step further, with planetary scientists sharing facilities, services and tools across national boundaries.

28. Our relationship with NASA and science in the US in general is of course also a key relationship, but one currently under threat for reasons set out above.

**What impact will the rebranded Science and Technology Network have on the UK's global position?**
**Are the thematic areas selected by the Network the right ones to prioritise?**
**What areas or sectors should the Network prioritise in the coming years?**

29. At present the STN priorities do not include fundamental sciences like astronomy, and would only include geophysicists via their expertise in supporting climate science. We suggest that the Government considers the broader science ecosystem, recognises the strength in areas such as astronomy, geophysics and space science, and makes use of their many existing international ties.

30. To enable this, the STN could form a steering group with members drawn from all science, knowledge and technology centres of knowledge/excellence in the UK. The RAS would be pleased to participate in this to table salient topics in the fields we represent.

**How can the impact of science diplomacy activities be measured, particularly in terms of enhancing national branding, fostering international influence, and contributing to conflict resolution?**

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[21] One estimate is that UK astronomy received 30-40% of resource funding from EU sources, according to work carried out by the Science and Technology Facilities Council and communicated to the RAS.
[22] LOFAR https://www.astron.nl/telescopes/lofar/
[23] Astronet roadmap 2022-2035 https://www.astronet-eu.org/?page_id=521
[24] Europlanet https://www.europlanet.org/

31. It is possible to provide quantitative measures in areas such as the resulting investment, share of published scientific papers, involvement in international projects, and the migration of talented researchers to the UK. These are at best proxies for the question being asked. It is rather harder to measure the qualitative impact of activity such as the Mount Paektu collaboration referred to earlier, where cooperation in science can sometimes take place despite wider tensions.

**To what extent are science and technology innovation activities supported through UK Official Development Assistance (ODA) spending?**

32. A former trustee of the RAS described the impact of one such ODA funded project, Development in Africa with Radio Astronomy (DARA) selected for support by the Newton Fund[25]. This led to concomitant benefits for both the UK and South African participants, including 250 young graduates receiving basic training in radio astronomy in preparation for the operation of the SKAO.

**How can the UK assess the value derived from its participation in international science collaborations in areas such as space initiatives, climate, particle physics, and vaccines development?**

33. Beyond the possible metrics described above, there are cultural benefits from the exchange of people associated with international collaborations, and profile for the UK in being involved. For example, there are British born directors at both ESO and ESA and we are undoubtedly seen as an important partner in both these organisations, as well as hosting the headquarters of SKAO.

**What are the benefits of bilateral agreements or global collaborations, such as CERN, for the UK economy and its innovation ecosystem?**

34. In purely monetary terms in astronomy, a 2022 UKRI study established that the first two decades of UK membership of ESO had by that time delivered more than £117 million of contracts to more than 250 organisations. The economic impact of benefits each year amounted to an average of £45.5 million, with an annual public spending commitment of £22 million[26].

35. In space, ESA member states enjoy a 'georeturn', whereby contributions to the Agency from each country are returned to it through industrial contracts. Historically the UK had a lower figure of 93p for each £1 invested, but more recently this has

[25] Under one sky: astronomy as a catalyst for cultural relations, H. Dalgleish, British Council, 2021 https://www.britishcouncil.org/sites/default/files/l073_cultural_relations_essay_4_under_one_sky_astronomy_as_a_catalyst_for_cultural_relations_final_v2.pdf

[26] UK reaps rewards from European astronomy organisation membership https://www.ukri.org/news/uk-reaps-rewards-from-european-astronomy-organisation-membership/

improved dramatically to 99p, amounting to £844 million from 2022 to 2024[27]. This also does not take account of the wider economic benefits ESA membership, which buttresses the space sector here, with an estimated turnover of £19 billion a year.

**How can the UK be made an attractive destination for global R&D investment, and how can the benefits of this investment be maximised locally and nationally?**
**How can the government ensure leading scientific researchers continue to view the UK as an attractive place to base themselves?**

36. The Society is in a position to speak for our Fellows who are active in research. The message we receive is that the UK should be outward-looking and seeking to deepen international ties, and committed to concomitant public sector investment in R&D including in fundamental science, to the level of our international peers. The Government should also seek to develop an immigration system that actively encourages rather than deters talented people in science from coming to the UK, and ensure that its messaging is in line with this goal.

[27] Record UK contract wins through European Space Agency https://www.gov.uk/government/news/record-uk-contract-wins-through-european-space-agency#:~:text=The%20UK%20is%20a%20founding,return%20(geo%2Dreturn).