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Department for Science, Innovation and Technology
100 Parliament Street
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Dear Department for Science, Innovation and Technology,

As its President, I am writing on behalf of the Royal Society of Edinburgh (RSE), Scotland's National Academy and the Young Academy of Scotland (YAS). The RSE is delighted that the UK Government's Department of Science, Innovation and Technology is launching a consultation to establish a National Academy for Mathematical Sciences. We believe that such an establishment would be valuable for the mathematical community and wider society. Therefore, we strongly support the initiative.

Are these the correct objectives for a national academy focused on the mathematical sciences to pursue? Are there any other objectives that the new organisation should pursue?

The RSE welcomes the objectives set out in the consultation and commends how, even in its embryonic stages, the government is already engaging well with the mathematics community and relevant organisations across the UK. We hope this continues following the creation of the academy and that the breadth of the mathematics and education sector is fully recognised within the new academy's remit.

The RSE strongly welcomes the objectives of strengthening the UK's mathematical community and the notion of forging links with other learned societies and providing high-quality advice to policymakers. It is crucial that the two objectives are sustained when the academy is seeking to submit evidence or advice to the government. The devolved academies can best give policy advice concerning areas that sit within devolved competence (such as education). And it's important that the national academy represents perspectives across the UK and each nation's different approaches and needs.

The RSE advises caution in overlinking the mathematical sciences to the pursuit of (especially short-term) economic growth. Whilst we concur that this will, and should be, an important objective for the academy, it is important that this objective does not overshadow the other aims of the academy. Pursuing mathematics for its own sake is also critical and has historically led to unexpected economic benefits. As noted in the objectives, the national academy would aim to raise the status of mathematics and inspire the nation by promoting its benefits. This is crucial with the current shortage of teachers, the critical lack of mathematical competency among primary school teachers,¹ and for addressing pipeline issues, such as the low numbers of females studying or working within mathematical fields.²

¹ The Royal Society of Edinburgh (2018) *The Memorandum on Entry Requirements for Initial Teacher Education Programmes in Scotland* [online] Available at: <https://rse.org.uk/wp-content/uploads/2023/04/RSE-AP-LSG-Entry-requirements-to-programmes-of-initial-teacher-education-in-scotland-2018.pdf>

² The Royal Society of Edinburgh (2022) *Diversity in STEM Call for Evidence: Royal Society of Edinburgh response* [online]] Available at: <https://rse.org.uk/wp-content/uploads/2022/04/RSE-AP-Response-to-Diversity-in-STEM-2022.pdf>

Mathematics is an essential tool in all aspects of modern society. Still, there remains a persistent perception that mathematics as a subject is difficult and intimidating and that what is taught is 'irrelevant' to everyday life. It is socially acceptable to say, 'I can't do Maths,' whereas few would say, 'I can't do English'.

A national academy has a remit to inform and engage with the public. It could play a significant role in addressing this through its public-facing activities and by encouraging a wider range of options in mathematics education that are tailored not only to progression through the academic routes but also to technical progressions pathways and aspects of mathematics that are vital to modern-day living.

Some educators, particularly in early years, primary, and early secondary, are unfamiliar and uncomfortable with mathematics. This can have a negative impact on the perceptions of those they teach and, on the students' later interest in pursuing the study of mathematics to higher levels. The academy should explore how it might play a role in supporting initial teacher training and in continuing professional development for non-specialists.

His Majesty's Government is prepared at this stage to provide funding to support the initial establishment of a new organisation, but we are conscious that the future possibilities here are broad. Given this, what activities should the organisation specifically focus on in the first 1-2 years of its work, and what should it explore developing for the longer term?

The academy's first 1-2 years should be dedicated to creating its operational/governance structure. This includes electing Fellows, creating academy laws, and establishing a short-term mechanism for how it will respond to government policy as the voice of the mathematics community. The RSE has its laws available online.³ to assist and would be willing to advise those tasked with developing the operational laws of the academy, including the process for electing Fellows.

It is imperative that the process of electing Fellows be clearly defined from the offset and reviewed when required. During this process, it is important to define 'excellence', meet diversity and inclusivity needs, and decide an appropriate number of Fellows that will be elected in the first instance and then each year afterwards. Failure to define 'excellence', recruit a diverse Fellowship and ensure a limit to the number of Fellows from the start could result in a questioning of the academy's authority.

An initial engagement strategy should be developed to ensure that there are mechanisms in place for the academy to work with UK-wide stakeholders to represent the voice of the mathematical community effectively.

In addition to the other longer-term objectives, it should aim to develop a strategy to increase the understanding of mathematics in society. For example, set out to decrease the prevalence of Arithmophobia in the UK.⁴ And encourage industry and others to engage more with mathematical science. Currently, similar academies across nations with comparable economies (such as Germany and South Korea) receive further funding support from industry partners. This is something that can be achieved if the academy fosters a clear strategy for engagement.

There are a wide range of individual and organisational stakeholders already doing valuable work in the area, ranging from academics to learned societies to the existing national academies. How should the new organisation work to complement these existing entities and draw together their work?

It is important that the new academy should not aim to compete with other academies' work but instead operate as an umbrella organisation to all existing mathematical academies. For example, it does not need to reinvent the wheel and open another publishing house. The RSE is one of the learned societies

³ For more information, see: [The Royal Society of Edinburgh \(rse.org.uk\)](http://rse.org.uk)

⁴ Butterfield, L. (2017) *Just what is our problem with numbers?* [online] Available at: [Just what is our problem with numbers? | University of Oxford](http://www.oxfordjournals.org/abstract/doi/10.1093/oxfrev/adv001)

that are mathematical publishers, and it publishes a highly regarded journal (Proceedings A).⁵ Several other UK institutions already publish journals in the mathematical sciences, including the London Mathematical Society, the Institute for Mathematics and its Applications, the Royal Statistical Society, the Edinburgh Mathematical Society, and the Glasgow Mathematical Journal Trust. In order to review an area of policy, other academies could assist via a sub-contract agreement.

Alongside the work with other national learned societies, the new academy should factor collaboration with the international community into its remit. Mathematics connects globally, and there is value in knowledge exchange between nations for the benefit of the UK and our international network. Sharing knowledge results in timely solutions, as we have seen during the pandemic.⁶

The UK is home to many of the world's best scientific institutions, some dating back centuries and some much more recent. What lessons can the new institution learn from the experience of these organisations?

The leadership must avoid losing touch with the grassroots of the community. Academies with a large Fellowship tend to have a smaller group of more active members. We would advise that from the offset, there is an emphasis on ensuring diversity within the Fellowship and establishing an effective communication and engagement strategy within the organisation. Ensuring that there is greater diversity, and a clear engagement, may help to ensure a greater reach of active participants across the community.

Having a clear governance/operational structure will be important for the academy's development, ongoing effectiveness, stability, decision-making, and strategy.

Ensuring there are stable funding streams for operational costs and planned activity. Operating, planning, and delivering without the certainty of funding is challenging.

If you have any enquiries about this advice paper or if you wish to engage with the RSE, contact Stephanie Webb, Policy Advice Officer (swebb@theRSE.org.uk).

Yours sincerely,



Sir John Ball PRSE FRS
President of the Royal Society of Edinburgh

⁵ For more information, see: <https://rse.org.uk/resources/proceedings-a-mathematics/>

⁶ Gordon, R. (2022) *New era of global public health partnerships?* [online] Available at: <https://www.deloitte.com/global/en/our-thinking/insights/industry/government-public-services/government-trends/2022/global-health-partnerships-collaboration.html>