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Academy for the Mathematical Sciences: Progress Update and Consultation, Spring 2023

Summary Document

A Vision for the Academy

1. The new Academy for the Mathematical Sciences (AcadMathSci) will be an authoritative and persuasive voice for the whole of the mathematical sciences. We will work with learned societies, other organisations, and people in the community who develop, teach, research, communicate, and use mathematical sciences. The Academy's focus will include teaching and education, academic research pushing the frontiers of what is known, and the implementation of mathematics in practice in industry, commerce, government and elsewhere. The Academy will support the advancement of the field by bringing together those in the community and more broadly to take action to nurture the people pipeline, increase societal engagement and improve the recognition of the power, value and beauty of mathematical science. Our ambition is that our field delivers on its full potential to improve lives, help people, strengthen society, enhance economic productivity, and benefit and enrich our world.

We need your help

2. You are a vital part of the journey to establishing the Academy, and we particularly value your unique experiences and ideas, whatever your work and interest, and whether you see yourself fitting within teaching, research, education, or as an innovator and practitioner of the mathematical sciences - or a combination of these. This is because we believe that wherever you work and use mathematical sciences, a UK-wide voice spanning these interests is essential to ensure that the mathematical sciences deliver on its potential to benefit our world.
3. The purpose of this consultation is to provide you with an update on progress towards establishing the Academy, and to get your input on what the Academy should look like and do. We want to establish a compelling vision for the Academy, shaped by you, and which you will want to share widely with those with whom you have influence.

4. We welcome your views - whether you have only just heard about the Academy, or are curious to learn more, or have already heard about or been instrumental in the foundational work to date. You are invited to attend a virtual consultation event and/or to provide your responses online: <https://www.acadmathsci.org.uk/about/consultation/>
5. The Consultation Period will run from 26 April until 30 June. Please register [here](#) to join one of the four online Consultation Events, kindly hosted by the International Centre for Mathematical Sciences (ICMS), as follows:
 - Consultation Event 1: Thursday 4 May, 10am - 12 midday
 - Consultation Event 2: Tuesday 16 May, 4pm - 5pm
 - Consultation Event 3: Wednesday 17 May, 2pm - 4pm
 - Consultation Event 4: Thursday 24 May, 4pm - 5pm
6. We welcome your feedback on some or all of the consultation questions available here: <https://form.jotform.com/231106276813350>.
7. Fuller information is in the entire Progress Update and Consultation Document available via [the Consultation Webpage](#): this contains progress updates from each workstream and further explanation and information of where we have so far reached. .
8. We also welcome wider feedback on the plans for the Academy, and you can get in touch more generally at contact@AcadMathSci.org.uk.

What the Academy will do

9. By design, the Academy will value and recognise activity across the totality of education, research, and practice and use of mathematical sciences.
10. It will include all the mathematical sciences, including (but not limited to) mathematics, operational research, statistics, and data science. A word cloud with a fuller list of professions that have and need mathematical scientists extensively is shown in the diagram at the back of this document.
11. The Academy will work with people in England, Scotland, Wales and Northern Ireland. We recognise that many important matters for the Academy (including in education) are devolved to the individual nations.
12. The Academy will:
 - a. Foster vibrant and dynamic engagement between mathematical scientists and policymakers, scientists, technologists and engineers.
 - b. Support - and work to influence - mathematics education, from early years, through school and into university and beyond, ensuring that curricula are appropriate not only for future study, but also for competent and confident citizenship. Please see the [Education section](#) for more detail.
 - c. Build deep support for the abstract innovation and excellence that underpins the mathematics, science, and technologies of the future. See [Academies and Societies](#) section.
 - d. Create broad awareness of the role and power of mathematical innovation in tackling new and emerging societal challenges among potential users and collaborators in mathematical sciences; policy makers and opinion formers; investors and business leaders; potential mathematical scientists themselves; and the general public.

- e. Support the “people pipeline”. The health of the mathematical sciences disciplines are reliant upon a strong people pipeline at all stages from school through to university level and beyond – including the supply of excellent educators to ensure a virtuous circle, and a better deal for those at the early stage of a career in mathematical sciences in education, academia, industry, and government.
- f. Actively promote an [equitable, inclusive and diverse](#) mathematical sciences community, with a key focus on improving the representation of, and opportunities for, groups in the mathematical sciences community that are under-represented compared to the country at large.
- g. Establish a Policy Unit which will support the goals of the Academy, by having a voice at the table where policy and funding decisions are made and amplifying that voice through opinion formers in the media. Among the consultation questions are asking for your input on what the Academy should focus on in its policy work:
www.acadmthsci.org.uk/about/consultation/consultation-doc-policy/
- h. Undertake advocacy activities to pursue our ambitions for mathematical sciences and in line with policy goals. This will be closely linked to the work of the Policy Unit. We would like to see changes that benefit the discipline, and to improve public policy, and actions made by decision makers, through the greater expertise contributed by the mathematical sciences community. Thinking already done about the advocacy function is [here](#).
- i. Bring Early Career mathematical scientists together, working with other organisations, to determine concrete actions that will improve the lives and careers of people in this group, secure funding for these actions where necessary, and take these actions forward. Priorities identified to date are set out [here](#).
- j. Support the improvement in the [implementation of mathematical sciences](#) in practice, whether that is in business, industry and finance, charities or the public sector. This includes innovators and practitioners in all these areas.
- k. Champion the importance of mathematical excellence and cutting-edge mathematical sciences research, both fundamental and directly applicable.
- l. Press for a substantial increase in research funding for the mathematical sciences, commensurate with the great importance of our field to economic productivity and societal wellbeing in the UK.
- m. Work to bolster communication channels in both directions between researchers and users of mathematics for the benefit of all.
- n. Design communication and liaison systems that open up the Academy to the whole community. We will set out this in more detail in due course. In doing so, we are conscious that the Academy will need to communicate both ‘externally’ to advocate the importance of mathematical sciences, and ‘internally’ to the broad mathematical sciences community to ensure the academy is, and is seen as, an inclusive entity which represents the interests of the whole community. We are aware that further work is needed to identify how to connect with a very broad mathematical sciences community including people who don’t usually engage with the discipline. We will take into account that, for example, a much smaller proportion of graduates of mathematical sciences subjects identify as members of their disciplines (e.g.

mathematicians, operational researchers, statisticians, mathematical scientists) than other STEM subjects.

13. Timing: We are now 6 months into the “proto-Academy” set-up phase (which started in October 2022 and is due to last 2.5 years), with therefore up to 2 years to go before the Academy is launched by the first half of 2025. Before that, there will need to be a positive outcome to the “Go/No-Go” decision by the Council of Mathematical Sciences: that decision is due to take place on or before October 2024. The genesis of the Academy was a key recommendation of the 2018 Bond Review, [The Era of Mathematics](#). The [Council for the Mathematical Sciences](#) (CMS) welcomed the review and its recommendations. The subsequent [Green Paper](#) in December 2021 went to the community for [feedback](#). This document builds on all of that work.

How the Academy will work with CMS Learned Societies and other organisations

14. Our approach is for the Academy to work in partnership with the learned societies, professional bodies and membership organisations that already exist - and that this close working will be an essential part of the success of the Academy. We want all organisations that exist to promote and advance the mathematical sciences discipline to flourish.
15. As an authoritative and persuasive voice for the whole of the mathematical sciences, the Academy will be a valuable advocate for the broad community and thus bring additional benefits to the existing learned societies and organisations. www.acadmathsci.org.uk/about/consultation/consultation-doc-acads-and-socs/. With the Academy seeking to ensure that greater and proper weight is given to mathematical sciences, that will help mathematical scientists and their organisations. A rising tide lifts all boats.
16. We agree with every word of the CMS statement on our website, “The Council for the Mathematical Sciences, and its five member societies, established the current process to determine the feasibility and set-up of an Academy for the Mathematical Sciences. They added, “The mathematical community in the UK is a world leader and provides the bedrock to all the sciences and major technological advancements. Developing a single voice on issues affecting the whole community, including educators, practitioners, and academics, will be a key aim of the Academy for the Mathematical Sciences. It is important that the mathematical sciences community, through a potential Academy, becomes more influential with government, funding agencies, industry, the public and the media. We look forward to supporting the programme, to develop a proposal for a future Academy, that is sustainable and works in partnership with the societies covering mathematics, statistics, and operational research.” The five CMS learned societies are: the Edinburgh Mathematical Society (EMS), the Institute for Mathematics and its Applications (IMA), the London Mathematical Society (LMS), the Operational Research Society (ORS) and the Royal Statistical Society (RSS).
17. The Academy will complement the learned societies in much the same way as the Royal Academy of Engineering complements the learned societies in Engineering. It

will not compete with them, but through increased convening power and a combined voice will create much greater influence and recognition for the discipline. Assuming that resource is available, the Academy will be proactive in its horizon scanning and engagement. We have no intention of launching academic journals, which are an important part of the CMS Learned Societies' approach and finances.

18. We are, want to, and will be, working with other National Academies, and other mathematical sciences organisations, including the Joint Mathematical Council (JMC), which operates as an overarching mathematics education organisation, and the Heads of Departments of Mathematical Sciences (HoDoMS).

How the Academy will function

19. We expect the Academy to be a charity and, specifically, a Charitable Incorporated Organisation. This is a charity structure where the trustees (who are the people legally responsible for the running of the charity) are elected by, and accountable to, a wider body (the Fellows). With legal advice, we have prepared a constitution (based on the Charity Commission's own template): the key details are in www.acadmathsci.org.uk/about/consultation/consultation-doc-governance/. We welcome feedback on these.
20. National Academies have Fellows. Likewise, the Academy for the Mathematical Sciences (AcadMathSci) will have Fellows. The Green Paper gave some suggestions of how this would work; the responses to the Green Paper consultation were generally supportive, but there were some sceptical voices and some challenges identified. We are now firming up on the proposals, in the light of that – and are putting them to you for consultation.
21. We envisage that the Fellows of the Academy for the Mathematical Sciences would comprise people who demonstrate excellence in their field, are respected by their peers for their contributions towards the flourishing and support of mathematical sciences in the UK, and who support the aims of the Academy. We expect Fellows to be elected from all parts of the mathematical sciences community, including teachers, other educators, academics, and innovators and practitioners in industry, commerce, government and elsewhere. The consultation questions include how we best ensure equity, diversity and inclusiveness amongst our Fellows. and what excellence looks like in your field/sector/community. www.acadmathsci.org.uk/about/consultation/consultation-doc-fellowship/
22. The Academy won't be a mass membership organisation. It will have Fellows (as all national and royal Academies do) but Fellowship is the route for people joining it.
23. We have modelled the likely costs of running the Academy based on estimates of activities. This suggests an annual budget of £2m would be required for the minimum viable structure. A budget of £4m per annum would enable the Academy to operate the full structure. A fully-fledged structure would be between these estimates. Funds will need to be raised to pay for these - and the availability of funds will determine the extent of what the Academy can do. We are exploring possible avenues for funding which include individual philanthropists; corporations; charities; and government. www.acadmathsci.org.uk/about/consultation/consultation-doc-finance

Consultation materials

24. If you want more detail than this Summary, hyperlinks to online versions of the *individual sections* of the entire Progress Update and Consultation Document are below. The *.pdf* of the entire document is available via [the Consultation Webpage](#);, as are all consultation materials.

Section:

1. [Summary](#)
 2. [Policy](#)
 3. [Advocacy](#)
 4. [Education](#)
 5. [Implementation of Mathematical Sciences](#)
 6. [Academies and Societies](#)
 7. [Equality, Diversity and Inclusion](#)
 8. [Early Career Mathematical Scientists](#)
 9. [Governance](#)
 10. [Fellowship](#)
 11. [Finance](#)
 12. [Full List of Consultation Questions](#)
- Annex A: [Timeline](#)
- Annex B: [The Academy's Executive Committee](#)
- Annex C: [The Academy's Current Workstreams](#)
- Annex D: [AI-generated Word Cloud of Mathematical Sciences Professions](#)

Consultation Questions - Full list

1. Vision

Q1. Do you find this vision attractive? Which elements of the vision do you like? Which elements do you dislike?

2. Policy

The Academy might expect to have a number of core areas in which it proactively develops policy positions and/or undertakes policy research, with some capacity to respond reactively as new areas emerge on which the Academy wishes to take a stance. A list is emerging of the core areas/activities (not necessarily in order of importance) which includes:

Policy for mathematical sciences:

- a. Quantifying the value of mathematics to the UK – possibly a refresh of the 2013 Deloitte Report, to include collecting data on the extent and effectiveness of knowledge exchange and impact of mathematical expertise in industry on the economy and UK plc.*
- b. The people pipeline – including teacher supply and retention, school qualifications, and the availability of mathematical sciences undergraduate and postgraduate courses, the value of other supporting/developing routes to mathematics careers such as apprenticeships; opportunities to upskill, reskill adult learners; professional and other qualifications.*
- c. Measuring baseline data across a wide range of equality and diversity characteristics.*
- d. Collating a searchable repository of existing reports and data on the mathematical sciences.*

Mathematical sciences for policy:

- e. Convening and brokering relationships, for example between government and external mathematical sciences experts to complement and strengthen existing links and researchers employed within government..*
- f. Responding to calls for evidence from government select committees, for example around the role and limitations of machine learning, need for diversity in STEM, etc*

Questions:

Q2. Are there other areas that you would like the Academy to focus on in its policy and advocacy portfolio, beyond those listed above?

Q3. What prioritisation would you place on items in the list above, and any other areas you have in mind?

3. Advocacy

Q4. Do you agree with our broad approach towards advocacy (set out in the Advocacy Section of the full consultation documents)?

Q5. Do you agree with the proposed principles (the 6 tests) for the Academy's advocacy work?

Q6. What do you see as the best communications avenues to reach you and the other mathematical scientists in your field/sector/community?

4. Education

The education workstream has the following suggested priorities:

- a. *Consultation to date has identified securing adequate recruitment, supply and retention of knowledgeable and effective teachers as a major imperative. Policy and action recommendations would firstly require collating information and data to establish the status quo and then considering the workforce agenda holistically.*
- b. *Mathematical sciences is involved in many other school subjects and there is an urgent need to ensure the coherence of the mathematical sciences/stats/data curriculum across those subjects, and develop a programme of work to identify synergies and support non-maths teachers in both secondary and primary schools.*
- c. *While applicants with A*-C in A-level mathematics can enter mathematical sciences degree programmes across the UK, those universities requiring the very highest grades have a very high, and growing, share of these applicants. Mathematics departments with relatively lower entry grades are struggling to fill their places – there seems to be a perception that it is not viable for applicants with less than an A at A-level Maths to study mathematical sciences. Yet employment prospects for maths sciences graduates are good whatever the A-level grade. The current trend is reducing diversity of opportunity, leads to a less diverse cohort of graduates and further contributes to the shortage of mathematics teachers. Designing a coherent policy to reverse this perception and the absolute decline in applicants for mathematical sciences degrees with B and C grades at A-level would be to the nations' advantage. (This issue exists across the UK, although Scotland pupils sit Highers and Advanced Highers, rather than A-levels.)*
- d. *Looking externally, there is much work to be done to address the overwhelmingly negative attitude of the populace to mathematics. There is a need for a well-designed communication strategy which addresses all individuals across all ages.*

The Prime Minister's aspiration of extending maths education to age 18 in England, and the responses to it, suggest the absolute centrality of addressing these and related mathematical science priorities, and integrating mathematical skills into the UK's economy, society, and political culture. It also demonstrates the importance of considering how the Academy and others might tackle these issues holistically.

Q7. Priorities will arise over time - are the priorities above the right ones to begin the work of the education workstream?

Q8. Are there other areas you would like to see prioritised instead?

5. Implementation of Mathematical Sciences

Q9. What can we do now, as a proto-Academy, to increase awareness of the Academy amongst mathematical scientists working in all sectors of the community and encourage them to engage with the Academy and influence its activities and direction?

Q10. One of the attractions of an Academy is it can facilitate the education, academic and practice sectors working together. What do you see as the most effective model for sharing expertise between these different sectors to improve the implementation of mathematical sciences in all areas of the economy?

6. Academies & Societies

Q11. What areas of engagement would benefit from an Academic Affairs committee of the Academy which was able to speak for Mathematical Sciences as a whole?

Q12. How can the Academy best work with existing learned societies in the mathematical sciences?

Q13. How should the Academy foster constructive relationships with existing National Academies? This includes geographic national academies such as the Royal Society of Edinburgh and the Learned Society of Wales, and discipline-specific academies such as the Royal Society and the British Academy.

7. Equality, Diversity and Inclusion (EDI)

Q14. What are in your opinion the three highest priorities concerning EDI in the mathematical sciences community in the UK?

Q15. The EDI workstream is eager to engage with groups active in EDI across the mathematical sciences community to seek input from these on a regular basis. Which types of engagement/communication do you think would work best?

Q16. What activities and relationships should the Academy develop to promote a more diverse and inclusive mathematical sciences community in the UK?

8. Early Career Mathematical Scientists

Q17. How do we ensure that all people who enter the workforce outside academia, with bachelors' or masters' degrees or doctorates in mathematical sciences, continue to engage actively with mathematical sciences, and consider themselves to be, mathematical scientists"?

Q18. How do we make sure that the full community of early career mathematical scientists is represented and heard by the Academy – including early career researchers, teachers, and people working in industry, commerce, and government?

Q19. What actions and activities should the Academy take on to support and build the early career community?

- a. Actions within the communities of practitioners, teachers, and academics.
- b. Actions across the whole early career community.

Q20. What should be our three highest priorities for the early career community?

9. Governance

We have carried out the work to test the options - and have decided that the Academy should be a charity. Of the different forms of charity, a CIO (Chartered Incorporated Organisation) is the right form for the Academy to take.

Q21. Do you have any comments on the Academy's plans for charitable status?

Q22. Do you agree that this structure, including the Trustees, is suitable to keep the Academy constructively and appropriately working towards the flourishing and support of the mathematical sciences and their impact?

Q23. Do you have any other comments on this section?

10. Fellowship

Q24. Do you have any comments on the proposed model of Fellowship?

Q25. "Excellence" is seen in many places in the mathematical sciences: in classrooms, elsewhere in education, in research, industry, government, finance, charities and more. What does "excellence" look like in your field/sector/community?

Q26. We are determined that the Academy will have Fellows from all parts of the mathematical sciences community, including teachers and other educators, research, academia, and innovators and practitioners of the mathematical sciences in industry, commerce, government and elsewhere. We will also have Fellows from all fields of mathematical sciences - and a diverse and inclusive Fellowship. How do we best ensure equity, diversity and inclusiveness amongst our Fellows?

Q27. Do you have any suggestions for the criteria that might be suitable for selecting Fellows working in your area of mathematical sciences?

Q28. Do you have any other comments on these proposals?

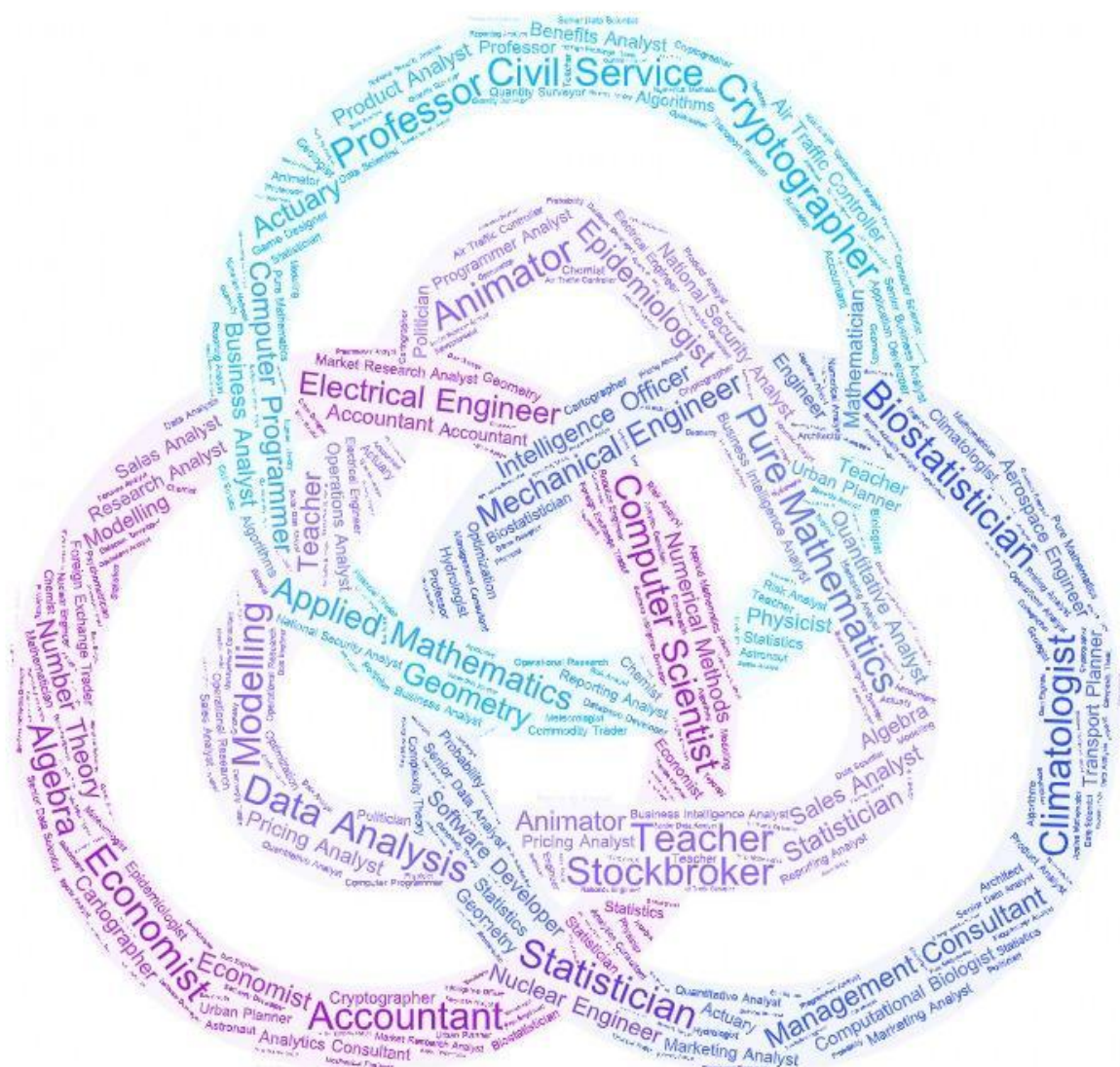
11. Finance

Q29. The Finance section sets out expected activities (in terms of what people hired do in similar organisations); a range of costings; and possible sources of funds. Do you have any comments on whether we are missing any activities that the Academy should pursue; or activities in the list that you think the Academy should not carry out? Are we right to look at all these sources of funds?

In Conclusion

Q30. Are there any other comments that you want to provide?

Annex: AI-generated Word Cloud of Mathematical Sciences Professions



(Word cloud was generated on WordArt.com)