

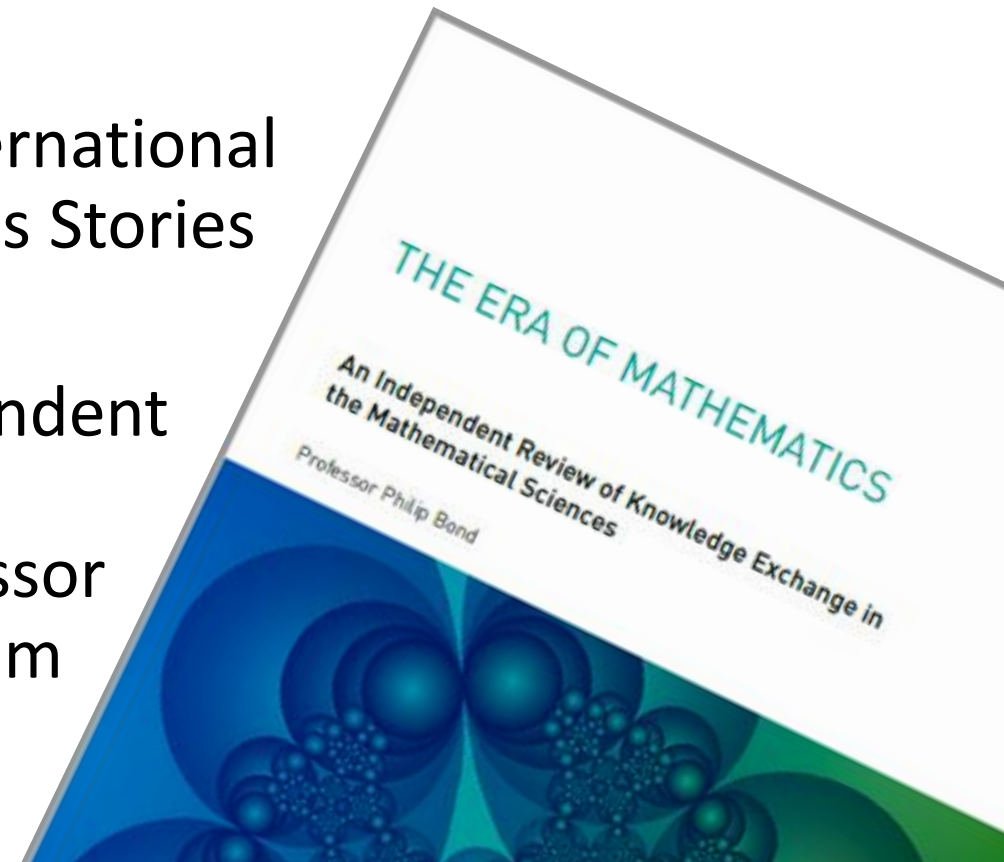
The next steps of the Big Mathematics Initiative

Community Presentation following HoDoMS
22/4/2021

- Working group – to take forward the recommendation of the Bond Review and work done by the BMI, for a National Academy for Mathematical Sciences

Background - “The Era of Mathematics”

- The increasing recognition of the efficacy, relevance and intrinsic value of mathematical sciences (MS) has led, in recent years, to a variety of initiatives, undertaken both to quantify its value and to offer a number of recommendations
- These included: Deloitte Report, EPSRC International Reviews of Math Sci, REF 2014 Impact Success Stories ...
- The latter included, in particular, an Independent Review of Knowledge Exchange in the Mathematical Sciences’ authored by Professor Philip Bond and an enthusiastic support team and published in 2018



Bond Review – 26 recommendations

FULL LIST OF RECOMMENDATIONS

GOVERNANCE – recommendations for the entire mathematical sciences community

- * 1. An Academy for the Mathematical Sciences should be established in order to facilitate links between academia, government and industry. The Academy should act as the focal point and coordinating centre for the community and draw on the deep expertise of the existing learned societies.
2. The means to structure, streamline and raise awareness of the existing KE support mechanisms that are available should be generated.
3. Existing mechanisms for knowledge exchange (KE) initiation should be made more robust and expanded in scope and capacity. Mechanisms should be put in place that make it straightforward for both industry and academics to find appropriate expertise.
4. Awareness should be raised within the mathematical sciences community of wider research challenges and societal challenges (including the sustainable development goals addressed by the Global Challenges Research Fund, GCRF) and deeper integration of mathematics should be promoted within industrial challenges (including the Industrial Strategy Challenge Fund, ISCF).
5. A more systematic and coordinated approach needs to be adopted to make new and maintain existing KE contacts and to track the outcomes and impacts of KE activities.

NATIONAL RESOURCES & INFRASTRUCTURE – recommendations for new funding and infrastructure

- * 13. To counter the underfunding of the MS research pipeline and adequately underpin MS in the UK, UK Research and Innovation (UKRI) should look to at least triple the funding going to MS across multiple Research Councils, including but not limited to EPSRC and Innovate UK.
- * 14. A national centre in impactful mathematics for the UK should be created to work with industry and government to drive mathematical research through to commercialisation. This could be based on existing models, such as the Fraunhofer Institute for Industrial Mathematics in Kaiserslautern or the UK Catapult network, suitably modified to provide national-level integration of low-TRL research from universities and to act as a national KE hub.
- * 15. There should be at least one national centre, based on the Heilbronn Institute model, to better enable mathematicians focused on fundamental research to engage directly with government and/or industry.
- 16. Resources for workshops with industry should be broadened and increased. In particular the Mathematical Study Groups with Industry should be expanded in scope.
- 17. Strong incentives should be put in place for cross-disciplinary work between the mathematical sciences and other disciplines.

REGIONAL SUPPORT – recommendations seeking to boost local economies

- * 18. Funds should be made available for regional KE centres and/or thematic KE networks following successful models such as the Turing Gateway to Mathematics, the UK fluids network (ERCOFTAC), the University of Bath's IMI and the University of Oxford's OCIAM.
- * 19. Universities should have dedicated teams in mathematics departments to act as facilitators and KE translators. These should be connected to central KE functions within universities and coordinated through the National Academy.

Big Mathematics Initiative

- Came into existence in 2019 under the stewardship of CMS, which contributed towards its administrative costs
- Role to (i) look at the major items in the Bond Review and ‘flesh out’ the recommendations, (ii) provide evidence to support these recommendations, and possibly (iii) to see them through to fruition via identification of funding routes/champions/government ministers or other friends
- Two committees:
 - Strategic Committee (Chair Claire Craig)
 - Implementation Group (Chair Bernard Silverman)
- BMI time and money limited ..
 - each committees met 3 or so times and produced several excellent reports
 - town meeting last summer
 - final report presented to CMS in October 2020
- Main focus was on the National Academy with fairly extensive consultation

Next Steps – Green Paper

- CMS agreed that the next step for the proposal of a National Academy for the mathematical Sciences was for a small representative group from the community to synthesise previous research and discussions. It was felt that a Green Paper, with concrete suggestions as to the shape of a new Academy, and the process of its setting up, would significantly aid forthcoming detailed debate.
- OED definition of a Green Paper is "a preliminary report", which sets out specific proposals in order to stimulate discussion." In government parlance, a Green Paper is a publication that details specific issues, and then points out a possible course or courses of action.
- This document will be open to all stakeholders, both within the broad mathematical sciences community and outside, for consultation and response.

The next steps

- Isaac Newton Institute Director volunteered to constitute the small team to continue the BMI activity in regard to the national Academy. But why?
- Consultations found that people had confidence in the integrity and independence of the Isaac Newton Institute (INI) and ICMS.
- INI serves the whole of our broad community and are neutral as regards learned society affiliation and when dealing with internal and external stakeholders
- INI has extensive network of contacts beyond academia to engage with mathematicians and partner organisation in industry, commerce government, policy making bodies etc
- Recent additional mathematics funding enables INI to act as an incubator for the early years of a proto-academy
- INI and the Newton Gateway is also partnering with ICMS to roll out its offering on KE to the whole of the UK – a KE connected centres network

Next Steps – the working group

Membership spans the mathematics community:

- Ken Brown (Glasgow) – pure mathematics; former VP of LMS
- Christine Currie (Southampton) – operational research; member of BMI Implementation Group
- David Leslie (Lancaster) – statistics; member of BMI Implementation Group; RSS Fellow
- Celia Hoyles (UCL) mathematic education; ex IMA President
- David Abrahams (Cambridge) – applied mathematics; Bond Review and BMI Strategic Committee

Remit - to produce a Green Paper by the summer for consultation and feedback

The Mission of a National Academy

- The voice of the UK Mathematical Sciences community does not sing clearly or loudly. The mission of the National Academy for the Mathematical Sciences is to **advocate for the whole of the mathematical sciences, in all regions of the UK.**
- Although (or because) the UK has a large number of specialist professional and learned societies, our community lacks a clearly-identified, authoritative and effective body to represent our discipline externally. **This body must bring together the subject's diverse fields, from pure mathematics through industrial and applied mathematics to statistics and operational research.**
- Disembodied, **our discipline has failed to be recognised** nationally for its research excellence, its utility and its transformative power.

Overarching aims

So, in the Green Paper we try to embed various aims within it (these were broadly mentioned at the town meeting):

- **Advocate** for the whole of the mathematical sciences
- **Develop** the mathematical sciences brand
- **Support** the learned societies
- **Coordinate** discipline-wide and life-long MS education
- **Facilitate** career development for mathematicians, and collaboration between academia and industry/government
- **Recognise** distinction and mobilise community by election of Fellows

Need for an Academy

- Better advocacy and branding
- Bring community together
- Effective convening power
- Allow mathematics to advise and inform at the highest level
- Partner with cognate disciplines IOP, RSC, RSB, ... at high level
- Link to other Academies and (hopefully) benefit from direct government funding
- Enable and enhance relationships with other UK bodies inside and outside of UK MS (RSS, LMS etc, ATI, HIMR, ACME, JMC, RS, RAEng, ASS ...)
- Forge relationships with external bodies and internationally

FAQs stated and addressed in the excellent BMI paper†:

Q: Can't we achieve these aims with existing institutions?

Q: The need for advocacy is immediate, whereas setting up an Academy could take many years before it is effective. How can we avoid having a lot of noise but no effect, especially in the initial years.

Q: Where will resources come from?

Q: Do we need to have a 'Fellows by distinction' model? What does it mean to be a Fellow?

Q: Will an Academy be independent?

Q: Would an Academy only represent England or the whole of the UK?

†www.cms.ac.uk/wp/bmi-published-documents/

Suggested National Academy Components

- Constitution (legalities and geographical/virtual footprint)
- Governance
- ED&I
- Fellowship
- Academic Affairs (internal interactions with academic community)
- Education and Engagement
- Knowledge Exchange and Policy
- Operations (Administration)
- Finance

Governance & Fellowship – present thinking

- A broad Fellowship gathered from across the whole of the MS
- Elected President and Vice-Presidents (from Fellowship)
- Chief Executive (plus sufficient staff with policy experience)
- Small Council – constituted from the P & VPS and others (from Fellowship and/or experts) with an independent Chair – these are the Trustees
- VPs – one each for
 - Academic Affairs
 - Education and Engagement
 - Knowledge Exchange & Policy
 - Operations & Finance
 - Fellowship
- ED&I to be embedded into several of the VP's roles

Proto-Academy governance

- A clear message from others is that an academy should not fixate on its internal matters especially appointing new fellows!
- Fellowship should be broad and election based on standing AND ability to contribute – diverse across gender, background, subject, section of community

So current thinking regarding the start-up phase:

- Small group of interim Trustees appointed with an interim President
- Appointment of an (interim?) Chief Executive
- INI to provide administrative support and a short-term ‘home’ to see the Academy from conception/set-up phase, through to fledging

Proto-Academy

- Funding – need to find enough money in the early phase for sufficient administrative staff (especially Chief Executive, policy/comms and ops/finance) to assist Trustees in working on the following parallel strands:
- Set up its policy and advocacy section
- Develop strong communication links
- Work on the constitution and create the necessary legal structures
- Formulate the criteria for Fellowship and a timeline for elections
- Develop a business and operations model
- Develop a financial model
- Create a roadmap for the incorporation of its three main activities –
 - Academic Affairs
 - Education and Engagement
 - Knowledge Exchange

Academic Affairs Education & Engagement Knowledge Exchange & Policy

Timing will be everything .. to win hearts and minds and maximise effectiveness

- These elements must work closely together: developing the mathematical sciences brand; demonstrating the power of mathematics in society; and ensuring equality, diversity and inclusivity in all that the Academy does
- The Academy should aim to bring the community within its umbrella - NOT by replacing existing entities but by providing them with a well-resourced and well-connected outward-facing body

To do....

- The Working Group to continue talking to others (key stakeholders etc)
- WG will continue its meetings, email discussions and exchanges
- WG will continue writing and receiving input from various parties – aim for completion of Green Paper and release in late July
- Town Meeting .. Possibly September best time?
- Consultation through to end of October
- Others to seek funding, at least for the proto-academy phase and seek to find a suitable interim Chair/President
- Finalised document by end of year

Current position and background to a national KE Network

- INI (through the Newton Gateway to mathematics) and ICMS play an overarching role in the provision of KE to the UK community:
 - Study Groups
 - Modelling Camps
 - Day/short meetings and workshops
 - Strategic w'shops related to GCRF, ISCF and SPF ...
- Many other departments are expert in KE (OCIAM, IMI, Lancaster)
- ICMS establishing research partnering with Industry
- Gateway has also been undertaking brokering, community building activity (eg DSTL, GCHQ), and horizon scanning in recent years
- Since lockdown INI and ICMS been working collaboratively with Knowledge Transfer Network (KTN) under V-KEMS
- INI and ICMS now have KE follow-on funding

KE Connected-Centres Network

- Bond Review: “A national centre in impactful mathematics for the UK should be created to work with industry and government. ... This could be based on existing models ... to act as a national KE hub.”
- Don’t want a new entity, or one that focuses resource exclusively, but need something that uses and shares the established expertise and investment
- Proposition: a scalable and flexible Connected Centres Model for fostering KE across every mathematical sciences department in the UK
- The Newton Institute will initiate and support activities within the Connected Centres network, with the longer-term aim of the nodes (collectively/regionally/individually) attracting substantial funding
- Aim is to create:
 - a set of local partners (university MS departments)
 - schedule of activities
 - a shared technology platform across the Connected Centres
- A consultation paper will be produced by the end of July to tie in with the Academy discussion