Institute of Mathematical Innovation 2020-2022 Charter

Vision and USP

The Institute of Mathematical Innovation (IMI) stands as a beacon of excellence in *the era of mathematics*[1], leading the delivery of deep rooted, multi-disciplinary, data-driven and mathematically grounded research contextualised by real-world, societal and industrial challenges.

As highlighted by the *Bond Report,* Bath is unique in that it has both a centre for doctoral training (SAMBa) **and** a research institute focused on data-driven mathematical modelling in interdisciplinary contexts. This has been more recently complemented by other centres for doctoral training with strong mathematical modelling components (ART-AI and AAPS). Mathematical Sciences at the University of Bath, in the broader sense, has been fashioned over the last decade to drive the vision of and capitalise on this tandem infrastructure. IMI will also be the first institute in the UK to host a mathematical sciences-focused postdoctoral training centre.

Organisation of Research and Impact

The IMI is organised into four main pillars of activity. Many of its activities will straddle more than one, if not all, of the main pillars. IMI will add value to grant capture as well as delivery of research activities.

Pillar I (Core academic research engagement): The institute will command excellent contextual mathematical research credibility within the physical, life, engineering and social sciences, as well as within mathematical sciences, through the quality of research that it hosts. IMI will earn respect from colleagues on campus, from within associated research disciplines (nationally and internationally), from within the global mathematical community and from within government.

Pillar II (Industrial Research and Impact): IMI will add value to University industrial and outward facing partnerships, naturally laying the foundation for future REF impact case studies (across several REF UoAs). It will concentrate on potential strategic partners, exploiting deep relationships with longevity that deliver real added value and impact. IMI will partner with research centres of excellence and CDTs, collaborating to drive innovation and impact.

Pillar III (Internationalisation): IMI will ensure it is hard-wired into the national *and* global network of similar institutes/centres of research excellence to enhance the other three pillars of activity. IMI will lead collaborative grants, projects and networks across international boundaries.

Pillar IV (Postdoctoral training centre): IMI will become the first British institution to develop and drive forward the concept of (cohort-based) postdoctoral training. The institute will provide a skills bridge between doctoral training and the robust demands of modern academia/advanced knowledge-based industry, focusing, in particular, on the modern perspective of data-analytics.

People

Core Staff: Core staff are the Institute Director, the Director of Knowledge Exchange, the Institute Manager, the Institute Coordinators as well as permanent and temporary Mathematical Innovation Research Associates (MIRAs). MIRAs are in-house researchers whose primary goal is to add value to large-scale interdisciplinary grants by being costed in to deliver mathematical and statistical work packages.

Research Fellows: Research Fellows (RFs) are Bath academics (L/SL/R/Prof) from across the mathematical spectrum in all departments, including those wanting to develop a deeper mathematical aspect to their research.

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[1] The Era of Mathematics is the term coined by the influential "Bond report" commissioned by *EPSRC and Innovate UK's Knowledge Transfer Network.*

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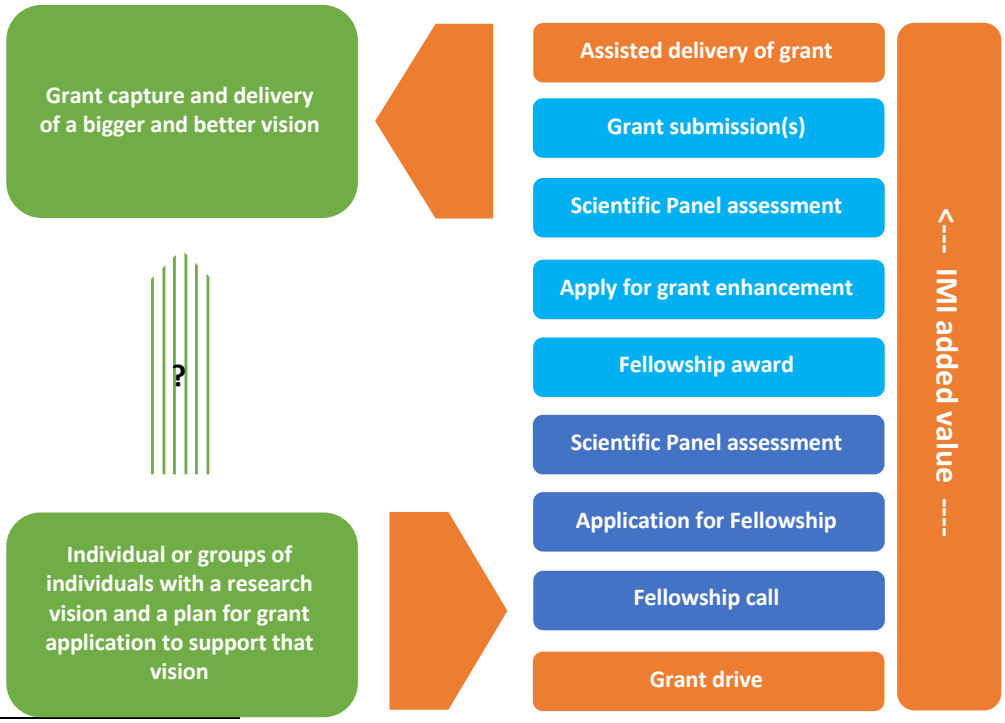
- Applicants for a RF must submit an application form making a case that, **as part of a long term research vision**, they will make *at least one* major bid (normally[2]>£300K) for research funding income during their **initial tenure as a fellow (18 months),** indicating how they will **take advantage** of the **grant enhancement** that the fellowship has to offer (see below).
- There will be at least two calls per year for RFs (PIs and Co-Is targeting large interdisciplinary grants may apply as a team of RFs) which will coincide with "grant drives" across campus (see below).
- Additionally RF applications will be considered at any time for applicants targeting funding opportunities exceeding £1M.
- All applications will be reviewed by IMI's Scientific Panel who will assess them against the criteria:
    - The case for mathematical innovation;
    - Applicant's long-term vision;
    - Alignment with an external call;
    - Ability of IMI to add value through grant enhancement;
    - Relation to IMI and University themes;
    - Time to delivery;
    - Built in features that support equality, diversity and inclusion.
- Once a fellowship is awarded, fellows may then make a more concrete case for **grant enhancement** (see below).
- RFs must produce a short report every six months summarising their progress for inspection by the scientific panel, who may choose to give feedback.

Grant enhancement for Research Fellows: RFs apply from **within their fellowship** for additional support from the IMI to enhance their grant applications, **all of which is delivered on successful capture of funds**. This can occur through some of the following methods:

- *Cash enhancement:* e.g. extending postdoc contracts, paying for workshops, travel, visitors, computing, facilities to enhance impact.
- *Administrative enhancement:* Support from IMI team to deliver an activity in a grant e.g. running workshops, organising events etc.
- *MIRA pump priming:* MIRAs are automatically accessible to fellows to help develop the mathematical aspect of a grant submission (particularly for interdisciplinary grants) **providing** that the MIRA's time is costed into the submission to help deliver that part of the grant.



[2] Exceptions to the £300K threshold may be made for e.g. *UKRI New Investigator* awards and other *highly prestigious* awards that may open the door to other opportunities.

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Senior Research Fellows: Senior Research Fellows (SRFs) will have worked as fellows of the institute for a number of years, have developed at least one large scale programme of research through collaboration with the IMI, have applied as PI on more than one occasion for major external funding (>£500K) in partnership with the IMI and have collaborated with MIRAs on various projects. Senior Fellowships are awarded subject to approval by the Scientific Panel and, where funding is available within the institute budget, the Director will aim to buy out a percentage of the SRF's time. SRFs may be required to attend Executive Meetings, Governance Board Meetings and External Advisory Board meetings.

Postdoctoral Researchers: Large-scale projects that are developed and supported in collaboration with the IMI will bring in postdoctoral researchers who will also be affiliated with the institute.

Method of delivery

IMI relies on its Fellows and Senior Fellows to assist the institute in developing added value along the lines highlighted below. Where possible the IMI will interface its research enhancement activities with campus CDTs.

Grant drives: The IMI participates in at least two grant drives[3] per year. These will be University wide activities, led by a conglomerate of University Research Centres and institutes (among others but not exclusively, IMI, MAD, CAMERA, CSCT, C3Bio, CTI, IAAPS, Milner, IPR, for example). Grant drives are run in a similar spirit to virtual sandpits, are run over several weeks, and consist of participants congregating into teams to formulate a grant application in response to either a broad research theme (e.g. "cancer" or "environment") or a large funding call (e.g. UKRI COVID). Whilst most participants will be Bath academics, external (industrial) partners and off-campus academics will be included where appropriate. Grant drives also offer the opportunity to attract applications for IMI fellowships.

Knowledge exchange: IMI will participate in and develop knowledge exchange activities within and between industry and academia, such as study groups as well as activities in collaboration with the campus CDTs. These activities will be undertaken to stimulate further research funding income, either through grant applications or industrial partnership and also offer the opportunity to attract applications for IMI fellowships.

Enhanced grant capture: Through its fellows, IMI offers a system of financially enhancing grants as well as adding value through the inclusion of MIRAs (see description of RFs above) as well as building up consortia that can give further credibility to grant applications.

Enhanced delivery of grants: IMI will assist its fellows to deliver a stronger realisation of their research vision and execution of grants. Examples include, creating stronger consortia with industry, assisting with leveraging further grant capture, assisting with administration of research activities, helping to build a stronger profile of research projects through IMI's webpages and general advocacy into other opportunities that IMI has access to.

Assisting with impact: IMI will work with its fellows to assist in generating as much impact as possible, looking at different ways to strategically enhance impact through (industrial) partnership, assisting in chasing appropriate funding support specifically tailored to developing impact and working up REF impact case studies.

Postdoctoral training: A concept and funding for the postdoctoral training centre will be created in collaboration with other Bath Centres and Institutes and phased in over the 2020-2022 period and will operate as a low-cost and limited-time-commitment add-on to core IMI activities, with knowledge transfer and impact being two underlying key aspects. Fellows will be encouraged to cost in contribution to postdoctoral training activities to their grant applications and the IMI will seek continued funding to develop a sustained programme of activity that will be open to all postdocs across campus that are interested.

[3] Grant drives exclude PhD students (for which various sandpit/study group/ITT activities already exist on campus), focusing on a faster and more mature pace with the goal being on grant submission rather than (doctoral) training.

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Committees

Executive: The daily running of the institute is undertaking by the Executive, which consists of the Institute Director, the Director of Knowledge Exchange, the Manager and, where relevant, Senior Fellows.

Scientific Panel: The principal role of the scientific panel is to assess applications for RFs (and in due course SRFs), assist the Director by suggesting the level of grant enhancement (financial or otherwise) that could be offered into a RF's proposed grant applications, monitor the progress of fellows (brief reports every six months provided by fellows) and give feedback.

- The scientific panel will meet at least twice per year, synchronised with the twice-yearly call for RF applications and grant drives.
- The Panel will also be consulted by email when ad-hoc applications for fellowships come in (predicated by a large grant application exceeding £1M with proposed IMI grant enhancement).
- In monitoring the progress of fellows, the panel has the authority to terminate fellowships early when there is insufficient evidence of activity.
- Members of the scientific panel will assess applications against the highest standards of vision and quality (see criteria mentioned in description of Research Fellows), keeping in sight the balance of academic depth, mathematical innovation and impact of fellows' proposed activities. The IMI Manager will be in attendance at meetings.

Internal Board of Governance: Meeting at least twice per year in the initial phase of the 2020-2022 refocusing of the Institute, the Internal Board of Governance will be made up of stakeholders from within the University senior management. This will include:

- Deputy Vice Chancellor;
- Pro-Vice Chancellor for Research;
- Dean of Science;
- Associate Deans for Research
- Head of Departments of Mathematics and Computer Science.

In attendance will be the Director of RIS as well as the Manager of the IMI. The main role of the Board of Governance is to advise strategic direction and provide guidance, where necessary, to the Director. The board will agree to annual KPIs and monitor the progress of the Institute against them.

External Advisory Board: The External Advisory Board is a body of leading academics and industrialists from the UK and internationally, who are independent of the University of Bath. They will meet at least twice per year and advise the Director on the Institute's strategic direction against the changing national and international landscape. The External Advisory Board will externally advocate on IMI's behalf.

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