

# Research into the impacts of discovery science and maths research

Invitation to Tender

## Summary

1. This document invites tenders for research into the economic, societal and environmental impacts of discovery science and maths research. The research is to be completed and delivered by 31 October 2019.
2. As an indicative budget, up to a maximum of £30,000-£40,000 has been allocated for undertaking this work, including all fees, costs, taxes and expenses relating directly to the research. A costing breakdown within this budget will be required as part of the tender.
3. The deadline for the submission of tenders is 7 July 2019. One or more tenderers may be invited for interview at Thomas Graham House, Milton Road Science Park, Cambridge or Burlington House, London on 25 July 2019.
4. Once selected, the tenderers of the successful submission will work with a Steering Group (see paragraph 5 for definition) to refine their proposal and develop a final plan for a research project and a detailed budget no later than five (5) working days after being appointed.

## Introduction and context of the research

### Learned Societies Collaboration

5. This research is being jointly commissioned by four Learned Societies: The Council for Mathematical Sciences, The Institute of Physics, The Royal Society of Biology and The Royal Society of Chemistry (Contracting Partner). This group will be referred to in this document as the *Learned Societies Collaboration*. A *Steering Group* will include a representative from each of the Learned Societies involved in the collaboration and will work with the tenderer of the successful submission to refine the research proposal and plan, check that agreed milestones are completed to a satisfactory standard and provide editorial input to written outputs of the research. A *Project Lead* will be appointed from one of the Learned Societies commissioning this research. The successful tenderer will be expected to engage with the Project Lead and Steering Group on a regular basis.
  - The Council for Mathematical Sciences (CMS) comprises of representatives from the Institute of Mathematics and Applications, the London Mathematical Society, the Royal Statistical Society, the Edinburgh Mathematical Society and the Operational Research Society. The CMS acts as an authoritative and objective body to develop, influence and respond to UK policy issues affecting mathematical sciences and the UK economy in general.
  - The Institute of Physics is a leading scientific membership society working to advance physics for the benefit of all. We have a worldwide membership from enthusiastic amateurs to those at the top of their fields in academia, business, education and government. Our purpose is to gather, inspire, guide, represent and celebrate all who share a passion for physics. And, in our role as a charity, we're here to ensure that physics delivers on its exceptional potential to benefit society. Alongside professional support for our members, we engage with policymakers and the public to increase awareness and understanding of the value that physics holds for all of us. Our subsidiary company, IOP Publishing, is a world leader in scientific communications, publishing journals, ebooks, magazines and websites globally.
  - The Royal Society of Biology is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of individuals, learned societies and other organisations. Individual members include practising scientists, students at all levels, professionals in academia, industry and education, and non-professionals with an interest in biology.
  - Royal Society of Chemistry: With around 50,000 members and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world. Our

members include those working in large multinational companies and small to medium enterprises, researchers and students in universities, teachers and regulators.

## Context of the research

6. The research project will take place during a time of significant national and global political and economic uncertainty that will see key decisions being made on whether, how and when the UK leaves the European Union, and may see a change in Prime Minister or even a general election. The project needs to be able to influence in a range of circumstances, by raising awareness of the longer-term issues and looking at themes that matter to the main political parties, as well as UKRI, our communities and the UK taxpayer.
7. The prospect of and risks associated with the UK leaving the European Union without a deal, which is likely to have negative economic consequences and make the public spending climate tough, means we are operating within a fast-moving and uncertain political environment. Regardless of when and how Brexit goes ahead, the outlook for research funding is likely to be challenging, and the proposed research will need to address these challenges where it can. The project would be very much part of work on the next and subsequent Spending Reviews, in which science will likely compete with housing, NHS, education and defence spending at a time when the outlook for the UK and global economy appears to be worsening.
8. Whilst there is evidence on the role and value of research in the UK's economy and society,<sup>1,2</sup> evidence on *discovery* science and maths research is limited. There is evidence that shows how outcomes from discovery research can lead to longer-term benefits (e.g. REF2014 case studies), but the evidence base is fragmented, often out of date and lacks visible champions from outside academia. It needs bringing together into a compelling case that sets out the role played by discovery science and maths research as part of a successful research and innovation sector.
9. EU framework programmes for research and innovation are an important enabler for discovery science and maths research in the UK. They offer funding and access to collaborative opportunities and equipment of a scale and scope that is unique globally, and evidence from our community suggests they provide more scope for curiosity-driven research. Competitive, excellence-focused grants like those from the European Research Council, which are often for discovery research, bring prestige that allow its winners to attract the best international talent for their research groups and often leverage further public and private investment from the UK and overseas. The UK's access to such funding programmes is partly dependent on the outcomes of Brexit.
10. UK government has become increasingly focussed on applied or challenge-driven research in recent years, and there is evidence of this trend in other advanced economies, too.<sup>3</sup> With finite funding available, this risks dwindling support for discovery research as more emphasis is placed on the short-term gains of challenge-driven research. Researchers in the chemistry community, for example, see limited support for discovery research as one of the most significant barriers to scientific progress.
11. *Discovery research*, also known as fundamental basic, pure or curiosity-driven research is theoretical or experimental work undertaken to acquire new knowledge of the underlying foundations of phenomena, without any intended direct application or use. In contrast, *applied research* aims to solve specific problems or challenges, which industry, governments, or society might define. Based on the OECD Frascati definition of research.<sup>4</sup>

## Objectives

12. To build on, synthesise and effectively communicate the evidence base on the impacts of discovery science and maths, considering:
  - a. the impacts on science and maths themselves (e.g. pushing the frontiers of knowledge and contributing to other fields of research)
  - b. the impacts on the economy, including social prosperity that stems from this (e.g. skilled job creation), including national and regional examples.

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<sup>1</sup> [The economic significance of the UK science base](#), Haskell, Hughes and Bascavusoglu-Moreau for CaSE, 2014

<sup>2</sup> [International comparative performance of the UK research base 2016](#), Elsevier for Department for Business, Energy and Industrial Strategy, 2016

<sup>3</sup> Note that China and South Korea are now considering moving back to more funding for discovery research

<sup>4</sup> OECD Frascati definition of research <http://www.oecd.org/sti/inno/frascati-manual.htm>

- c. the impacts on society and culture (e.g. contributions to health, environment and wellbeing), again, with a regional emphasis (and largely UK focus)
13. To use this evidence base to inform and influence the Treasury, BEIS and UKRI so that they understand the role and importance of excellent discovery science and maths research as a vital part of an effective research and innovation sector, as well as the benefits it delivers to the economy, society and the environment, and invests in it.
  14. Within the scope of the exercise, the campaign objectives may be modified or extended as needed.

### The role of the research

15. This research will provide key evidence for the project partners' work on the Spending Review and on science funding and policy going forward and on the government's 2.4% GDP research and development spending commitment. It would put fundamental or 'discovery' research, which is undertaken primarily to acquire new knowledge without any particular application or use in view, in the context of the overall research landscape, rather than arguing for it against applied research or experimental development.

## Specification of the research and methodology

### Methodology

16. The tenderer will propose appropriate qualitative (stories/ case studies) and quantitative (analysis of relevant datasets, development of 'killer stats' and contextual understanding of the landscape) methods to explore the impacts of discovery science and maths research on the economy, environment and society, bearing in mind existing work and the importance of both evidence and clear communication. A well-rounded evidence base that enables us to influence most powerfully must include both qualitative and quantitative evidence. Anticipated outputs and timescales are outlined below:
  - a. New data research into the role and value of discovery research as part of a successful R&I sector, its impacts on society, economy and environment, drawing on relevant existing data and evidence.
  - b. Survey of researchers, companies, investors etc. to obtain quantitative data on the role and value of discovery research. This may also help provide leads on impact case studies.
  - c. A toolkit of case studies and key messages to demonstrate a broad range of impacts of discovery science and maths research on the economy, the environment and on society. These should be accessible to a range of audiences, including MPs and the UK taxpayer. They should include both national and regional examples, be recognisable by different science and maths communities, including those at the intersection between them, and be suitable for use individually or as a set.
  - d. Round table discussions with researchers, companies, investors etc. (including representatives from e.g. Treasury and BEIS) exploring the role and benefits of discovery research. The role of the successful tenderer will include attending the round tables, presenting initial research findings, and using the round table outputs to steer later research stages and presenting findings.
17. Tenderers are expected to detail the information they will gather and provide details of suitable methodologies. These should be appropriate to the research questions, address the challenges inherent in sampling and deliver the right blend of contextual statistical information and impactful case studies.
18. While tenderers are asked to submit a proposed methodology and identify key data to be collected, the exact process will be refined and developed in collaboration with the Steering Group and Project Lead. Tenderers must explain how they will engage with the Steering Group and Project Lead for this purpose.
19. Tenders must demonstrate an informed approach to researching in the complex areas of both economic and environmental/societal landscapes and demonstrate expertise in both data research, the development of impactful case studies, and the presentation of results as reports or other formats that are suitable for public consumption by a non-expert audience.
20. The tenderer will be responsible for the design, collection and analysis of data and evidence. They will report on the data and evidence and its inferences at regular intervals and in a final report.
21. Paragraphs 22 and 23 below provide more detail on the research specification for the new data research and the survey and case studies, respectively.

## Research Questions

22. The research should begin by describing the contextual framework within which discovery science and maths research sit and developing this in order to frame discussion on the matter. This should include:
  - i. Robust definitions of the different types of research (discovery, applied, experimental, challenge-based) that are suitable for both science and maths. The definitions should be sensitive to language used by key stakeholders, and should provide the intellectual framework for the report and the policy debates;
  - ii. A description of where discovery science and maths research sits within the broader science and maths system of research, innovation, commercialisation and investment, including:
    - How it interacts with the broader system;
    - The ability of the UK's science base to absorb discovery science and maths research;
    - Any regional variations across the UK in capacity and activity;
    - How collaborative it is compared to other types of science and maths research;
    - How international it is compared to other types of science and maths research.
  - iii. An assessment of the suitability of all current mechanisms and policies for funding discovery science and maths research in the UK
23. The research should explore the impacts of discovery science and maths research with national and regional examples on (i) the economy, (ii) science, innovation and investment, and (iii) society and the environment, including but not limited to:
  - i. How does public investment in discovery science and maths research benefit the UK's national and regional economies?
    - Whether there are factors that lead to a higher or lower return on investment that are unique to discovery research;
    - Examples of how public investment in discovery science and maths research leverages private investment;
    - Whether there is a relationship between public funding for discovery science and maths research and the decisions of companies to locate and invest in local economies;
    - Examples of how discovery research creates long-term value through the journey to develop new technologies, and/or services that contribute to the economy.
  - ii. What are the impacts of discovery science and maths research on the broader science base? E.g.
    - Current fields of e.g. applied science that wouldn't exist without discovery science and maths research;
    - Skills or perspectives discovery science and maths researchers bring to the broader science and maths ecosystem of research, innovation, commercialisation and investment;
    - Infrastructure or equipment that exists for the purpose of discovery science and maths that is also used in real-world applications;
  - iii. What are the impacts of discovery research on society and the environment? E.g.
    - Better understanding and monitoring of the causes and functions of environmental damage to change behaviours, regulations or laws;
    - Solutions to mitigate, remediate or prevent environmental damage;
    - Improved health and quality of life e.g. improved medicines or better safety regulations;
    - Changes to how we communicate, live, travel and work e.g. discovery research leading to display or communications technology;
    - Changes to societal attitudes or behaviours e.g. increased recycling rates or consumer pressure to use sustainable packaging because of better understanding of materials.
24. The final report, case studies and key messages should be written in an engaging style and fit for public consumption by a non-expert audience with only editorial input from the Learned Societies Collaboration. The Learned Societies Collaboration will own the intellectual property rights (IPR) for any data collected and all research outputs, but will be open to agreeing the use of the data by the research team for any future papers independent of this tender.

## Timescale and deliverables

25. A project initiation meeting with the Steering Group, at which a project plan will be agreed.
26. Regular oral or email progress updates throughout the period of research to the Steering Group *via* the Project Lead on a weekly basis.

27. Qualitative and quantitative research that fulfils the specification of the research.
28. A set of case studies that illustrates the specification of the research.
29. A final report drawing together the findings of the research.
30. An executive summary of the key findings, aimed at UK policy makers.
31. Materials to communicate the key findings of the report, to be developed in collaboration with the Project Lead and Steering Group. This may include briefing, infographics, videos or other formats to convey the key findings of the research.

## **Tender requirements**

32. Tender responses should provide the following information:
  - The nature and size of your organisation. If the tender is submitted on behalf of a consortium, a list of consortium members should be included and the lead member and a point of contact identified.
  - Details or CVs of the staff who will manage and undertake this work, with clearly identified roles and levels of input, including lead contact.
  - A proposal, of no more than 10 sides of A4 (minimum 10-point font), including:
    - i. An outline of your capabilities to undertake the work, including how it will be managed and how milestones will be monitored.
    - ii. A summary of data, evidence or previous work that could inform the study.
    - iii. The specific research design you propose to use to undertake the study within the timetable outlined. This should include the overall approach; the research questions that you think address the stated aims and objectives; details of the population groups(s) to be studied; an outline of sampling methods, sample size and proposed analysis and why you have chosen these specific approaches; a summary of potential sources of bias; procedures for quality assurance; and any ethical, legal and practical considerations of the study.
    - iv. Ideas for dissemination of this work, including the audience to engage with the outcomes of the research, suggestions for final reporting and any other pathways for maximum impact.
    - v. An indicative timetable with clear milestones.
    - vi. A risk management and mitigation plan.
    - vii. Details of how you will work with the Steering Group to finalise details of the research study.
    - viii. Details of how you will engage with stakeholders for e.g. the development of case studies.
    - ix. A detailed breakdown of the inclusive costs and pricing structure for the research (this should not include any expenses outside the main research – for example travel incurred by meetings with the Learned Societies Collaboration).
  - A proposed Service Level Agreement to inform the RSC of the Standards of Service that can be expected.
  - Details of any limitations of liability to be placed on the contracts, and details of professional and indemnity insurances.
  - Details of your company's relevant policies such as anti-bribery and data privacy policies.
33. Payments will be made in phases, linked to identifiable achievement of agreed milestones.
34. Tenderers should indicate the names of two current or recent clients, preferably within the public sector, for whom they have conducted a similar service and to whom reference may be made.

## **Procedure for tender selection**

35. Tenders and any inquiries should be emailed to Dr Isolde Radford, [policy@rsc.org](mailto:policy@rsc.org) by 07 July 2019.
36. Tenders must be accompanied by a signed certificate of non-collusion using the form provided in Appendix A of this document. Successful tenderers will be required to provide the original signed certificate of non-collusion to the Royal Society of Chemistry on request.
37. More than one tenderer may be invited to present their ideas at an interview at Thomas Graham House, Milton Road Science Park, Cambridge or Burlington House, Piccadilly, London on 25 July 2019.

## Selection criteria

38. The contract will be awarded to the tenderer who demonstrates the most promising bid in terms of the criteria set out below. Criteria are weighted according to importance.

Criteria	Weighting
Effectiveness of the overall methodology for undertaking the study	30
Understanding of the issues and complexity relating to measuring impacts over long periods of time	20
Relevant experience and qualifications of the project team, including the track record of the team in undertaking relevant studies and producing suitable high quality materials to present the results to a non-specialist audience, which may include written reports and briefings, data visualisation, infographics, videos or other formats.	30
Costing	20
<b>Total</b>	<b>100</b>

## Warnings and disclaimers

39. While the information contained in this Invitation to Tender is believed to be correct at the time of issue, neither the Royal Society of Chemistry, nor any other awarding entities will accept any liability in any circumstances for its accuracy, adequacy or completeness, nor will any express or implied warranty be given. This exclusion extends to liability howsoever arising in relation to any statement, opinion or conclusion contained in, or any omission from, this Invitation to Tender (including its Schedules) and in respect of any other written or oral communication transmitted (or otherwise made available) to any tenderer. No representations or warranties are made in relation to these statements, opinions or conclusions. This exclusion does not extend to any fraudulent misrepresentation made by, or on behalf of, the Royal Society of Chemistry.

40. If a tenderer proposes to enter into a contract with the Royal Society of Chemistry, it must carry out its own due diligence enquiries and rely only:

- on its own enquiries and judgment in relation to this procurement, including the preparation of its Tender; and
- on the terms and conditions set out in the contract(s) (as and when finally executed), subject to further amendment by the Royal Society of Chemistry and to the limitations and restrictions specified in it.

41. The Royal Society of Chemistry will carry out its own due diligence if the tenderer is a company.

42. Neither the issue of this Invitation to Tender, nor any of the information presented in it, should be regarded as a commitment or representation on the part of the Royal Society of Chemistry (or any other person) to enter into a contractual arrangement.

43. This Invitation to Tender should not be regarded as an investment recommendation made by the Royal Society of Chemistry. All tenderers are recommended to seek their own financial and legal advice.

## Confidentiality

44. This Invitation to Tender and any other documents subsequently issued by the Royal Society of Chemistry as part of this tender are (or will be) subject to the terms of the Non-Disclosure Agreement signed by each tenderer before the issue of this Invitation to Tender.

45. The contents of this Invitation to Tender must not be copied, reproduced, distributed or passed to any other person at any time except for the purpose of enabling the tenderer to submit a tender.

46. The Royal Society of Chemistry may use the information included in a tenderer's response for any reasonable purpose connected with this Invitation to Tender.

## Form of Tender

We, the undersigned, having examined the Invitation to Tender and all associated documentation, do hereby agree to supply and deliver the services as specified in those documents and in accordance with the attached documentation at the stated prices for the contract period.

If this offer is accepted, we will execute such documents in the form of the contract, howsoever amended by the Royal Society of Chemistry, within five [5] working days of being called on to do so.

We agree that before executing a contract, the formal acceptance of this tender in writing by the Royal Society of Chemistry or such parts as may be specified, together with the contract documents attached hereto, howsoever amended by the Royal Society of Chemistry, shall comprise a binding contract between us and the Royal Society of Chemistry.

This Invitation to Tender and any other documents subsequently issued by the Royal Society of Chemistry as part of this tender are (or will be) subject to the terms of the Non-Disclosure Agreement signed by each tenderer before the issue of this Invitation to Tender.

The contents of this Invitation to Tender must not be copied, reproduced, distributed or passed to any other person at any time except for the purpose of enabling the tenderer to submit a tender.

The essence of tendering is that the client shall receive *bona fide* competitive tenders from all firms tendering. In recognition of this principle, we certify that this is a *bona fide* tender, intended to be competitive, and that we have not fixed or adjusted the amount of the tender by, or under, or in accordance with any agreement or arrangement with any other person. We also certify that we have not done and we undertake not to do, at any time before the returnable date for this tender, any of the following acts:

- a) Communicate to any person the amount or approximate amount of the proposed tender;
- b) Enter into any agreement or arrangement with any other person that he shall refrain from tendering, or as to the amount of any tender to be submitted;
- c) Offer or pay, or give, or agree to pay, or give, any sum of money or valuable consideration directly, or indirectly, to any person for doing, or having done in relation to any other tender, or proposed tender, for the said work any act or thing of the sort proscribed above.

In this form, the word 'person' includes any persons and any body or association, corporate, or unincorporated; an 'agreement or arrangement' includes any such transaction, formal or informal, and whether legally binding or not.

We agree that the Royal Society of Chemistry may in its consideration of the offer and in any subsequent actions, rely upon the statements made in this Form of Tender.

I warrant that I have all requisite authority to sign this Form of Tender and confirm that I have complied with all the requirements of the Invitation to Tender.

Signature:

Name:

In the capacity of:

Telephone:

Date:

Signature:

For and behalf of:

Company Name:

Address:

# Appendix A to Invitation to Tender

## Certificate of non-collusion

We certify that:

1. The prices in the Tender have been arrived at independently, without consultation, communication, agreement or understanding for the purpose of restricting competition, as to any matter relating to such prices, with any other person other than the Royal Society of Chemistry and will not be communicated to any other person than the Royal Society of Chemistry without the prior written consent of the Royal Society of Chemistry.
2. Unless otherwise required by law, the prices which have been quoted in the Tender have not knowingly been disclosed by the Tenderer, directly or indirectly, to any other Tenderer or competitor, nor will they be so disclosed.
3. No attempt has been made or will be made by the Tenderer to induce any other person or firm to submit or not to submit a Tender for the purpose of restricting competition.
4. No attempt has been made or will be made directly or indirectly to canvass and/or solicit any person in connection with the award of the contract which is the subject of this invitation to tender and that no person employed by us has done or will do any such activity.

We agree that the Royal Society of Chemistry may in its consideration of the offer and in any subsequent actions, rely upon the statements made in this Form of Tender.

Signed:

Name:

Date:

On behalf of:

Company Name:

Address: