Preparatory material on Interdisciplinarity for the GRC 2016 Annual Meeting

Context

This concept paper on 'Interdisciplinarity' was prepared by Research Councils UK (RCUK) and the Indian Science and Engineering Research Board (SERB), hosts of the GRC 2016 Annual Meeting, in order to provide a common basis for discussion at the five GRC Regional Meetings in Africa, Americas, Asia-Pacific, Middle East/North Africa (MENA) and Europe. The views and questions expressed in this paper, and evidence used to support them, are designed to stimulate lively discussion. For this reason some may be contentious and none should necessarily be taken as the official view of the hosts of either the Regional or Annual Meetings.

Expected outputs from Regional Meetings

The expected output from the discussions at the meeting is a set of regional messages on the role for both individual regions and all GRC participants in supporting and facilitating interdisciplinary research and collaborations. It is expected that these messages will recognise the challenges in interdisciplinary working, but focus on positive actions which can be taken by GRC participants, either within their own organisation or by working with other GRC participants. The 2016 Annual Meeting expected outputs will consist of a GRC Position Statement, which will draw on the messages put forward by the five Regional Meetings, and a report commissioned by the co-hosts of the Annual Meeting. The Annual Meeting hosts would very much appreciate the positive engagement of GRC participants, if required, with the author of the commissioned report.

Next steps

Your regional output on Interdisciplinarity, as well as the outputs from the other four GRC Regions, will be presented at the GRC International Steering Committee (ISC) meeting in January 2016. The ISC will consolidate the outputs of the five Regional Meetings and address recommendations to the co-hosts of the GRC 2016 Annual Meeting and GRC Governing Board on possible outcomes to be envisaged for the GRC on this topic.

Interdisciplinarity Concept Paper

1. INTRODUCTION

At the GRC's fourth Annual Meeting held in Tokyo in 2015, two discussion topics for the Annual Meeting in Delhi on May 26-27, 2016 were endorsed:

- Interdisciplinarity
- Equality and Status of Women in Research

The purpose of this paper is to provide background material for the discussion at the GRC Annual Meeting and Regional Meetings on the theme 'Interdisciplinarity'.

In this concept paper, a brief background narrative is provided to demonstrate the rationale for taking up this topic at the GRC, followed by a range of discussion points under three discrete heading (in Section 4: Discussion Points). Taking this background material into account, GRC participants are encouraged to participate actively in the discussions at the GRC Regional Meetings this autumn and next year's GRC Annual Meeting in Delhi and to provide inputs on their national and/or regional experiences regarding this topic.

Inputs from the Regional Meetings will be consolidated and reported at the Delhi Meeting in May 2016, with a view to adopting an Interdisciplinarity Position Statement on guiding principles, common understandings including where we could work better to increase our understanding of the extent to which existing research activities are interdisciplinary, and/or best practice.

In addition to this concept paper, an external report on 'Interdisciplinarity' has been commissioned by the co-hosts. The report's author(s) will provide input on their concept, methodology and approach to Regional Meeting participants, and their final report and recommendations will be presented to the 2016 Annual Meeting participants. The report is intended to serve a range of functions:

- Discussion paper for the GRC Annual Meeting (an embargoed copy will be shared with participants);
- The creation of a useful baseline of policies and practices of GRC participants in the topic area;
- Output of the GRC 2016 Annual Meeting (it will be published with the proposed 'Interdisciplinarity' Position Statement following the Annual Meeting).

2. BACKGROUND

At the 2015 GRC Annual Meeting in Tokyo participants endorsed a 'Statement of Principles for Funding Research Breakthroughs'[1] which, among other recommendations, stated that: "Through their funding programs, GRC participants should…ensure support for research in diverse disciplines and foster interdisciplinary or cross-disciplinary exchanges to stimulate exploratory approaches". There is no assumption here that interdisciplinary research is better or more valuable; the research question remains the most important driver. However, given the perception that a growing number of research questions require interdisciplinary working, there is a need to get a better understanding of the levels of interdisciplinarity in the existing research base, and also to ensure that interdisciplinary research projects are treated fairly and consistently.

[1] http://www.globalresearchcouncil.org/sites/default/files/pdfs/Statement%20of%20Principles%20for%20Funding%20Scientific%20Breakthrough.pdf

There is common agreement that, increasingly, complex research problems are not solved by single disciplines, and that research at the frontiers of disciplines can be transformative. This feeds back into individual disciplines where, again, it can have transformative effects. While many funders have come a long way in building and supporting working between disciplines, we still need to think creatively about fostering collaborations between distant disciplines where the benefits of interdisciplinary working may not always yet be obvious.

It is important that funding bodies, research organisations, publishers and researchers are aware of how they may need to continually adapt to encourage and facilitate working across 'traditional' boundaries and interfaces. The landscape for the support of interdisciplinary research is complex and every stakeholder has a vital role to play in supporting and promoting research that spans sectors and disciplines. Shifts in thinking and culture are required to continue to embed interdisciplinarity in the way we as funders work. This requires a co-ordinated approach to the development of strategies, policies and processes across the research and innovation ecosystem, starting from education through to Higher Education sectors, the publishing industry, funders, policy makers and individual researchers.

While we recognise that many funding agencies will not have specific policies or schemes for supporting interdisciplinarity, but will have embedded what they consider to be good practice throughout their funding policies, there are a number of factors frequently perceived to inhibit interdisciplinary research. These include:

- Leadership and brokerage between disciplinary partners;
- Routes to funding are often perceived as difficult;
- Discipline-based peer (or merit) review is said to discourage the funding of interdisciplinarity and lead to negative assessments of its outcomes;
- There is a concern that high-profile journals favour discipline-based research and that it is more difficult to secure prestige publication of interdisciplinary work;
- Institutional structures (for example in universities) tend to be discipline-based organisations not well-aligned to interdisciplinary activity, which has consequences for research careers;
- There is inadequate interdisciplinary research skills' training.

Many of these factors will be affected by funder policies (for example on peer review, publication, training) and the GRC provides a unique forum for funders across the world to discuss how best to support and facilitate interdisciplinary research.

3. DEFINING 'INTERDISCIPLINARITY'

There is an extensive theology around the differences between inter- , trans- , multi-, post-disciplinary research, each with its own shade of meaning. For the purposes of discussing policy, we suggest that it is not helpful to debate the relative merits of these but to adopt the term **'interdisciplinary research' to describe research where two or more disciplines work together**.

A more detailed definition is provided by Land 2011: 7, citing Giddens 1991:[2]

> "Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding

[2] Land, R. 2011. 'Crossing Tribal Boundaries: Interdisciplinarity as a Threshold Concept' in Becher, T., Trowler, P., Bamber, V. and Saunders, M. (eds) Academic Tribes and Territories: Intellectual Enquiry and the Culture of Disciplines. 3rd edition. Buckingham: Society for Research into Higher Education and Open University Press.

or to solve problems whose solutions are beyond the scope of a single discipline or field of research practice."

while a discipline is different depending on the context of the discussion, for the purposes of GRC discussions we will work on the understanding that we will talk about the concept of interdisciplinarity in abstract terms, rather than trying to be exact about disciplinary definitions.

4. DISCUSSION POINTS

Although 'Interdisciplinarity' can be addressed from various perspectives, this paper proposes a range of questions, grouped into sub-themes to facilitate the discussions in the GRC Regional Meetings. Participants are asked to debate the questions in the following three sections, while expressing other viewpoints based on the particular interests of their respective regions.

Establishing the right conditions for interdisciplinary working

1. **Do funders have a duty to explicitly encourage interdisciplinary working or should this be left up to the applicants?** In consulting with the research community on their priorities, do funders feel that there is enthusiasm for interdisciplinary working or a sense of caution? Does this vary across disciplines? Does this vary across countries and if so, is it possible to identify the conditions within the national research system which make this the case?
2. **Are there particular mechanisms which should be considered when planning an interdisciplinary programme?** For example funding for initial networking and workshops to help consolidate collaborations, or brokering the initial relationships? If funders provide these opportunities already do we have a duty to link them visibly to signpost them as particularly supportive of interdisciplinarity?
3. **How much of a role should institutes dedicated to interdisciplinary themes play in supporting and/or promoting interdisciplinary research?** Do they have a genuine impact on the sustainability of funding? Sustainability of funding is often perceived as a barrier to interdisciplinary research, which is often explicitly supported through time-limited 'grand challenge' programmes or the establishment of institutes or centres (it should be noted that the majority of interdisciplinary research tends to be 'implicitly' supported through business-as-usual programmes).
4. **Is the 'grand challenge' approach enabling a growth in interdisciplinary research?** Real world problems are inherently interdisciplinary and collaborative approaches are increasingly important. It is clear that some level of working across different disciplines might be seen as a feature of most research[3] and for progress to be made in some areas or for translation to occur expertise must be combined.
5. **What role does interdisciplinary research play in innovations and breakthrough research?** A 2015 Elsevier review of interdisciplinary research suggests that China has the highest percentage of publications which belong to the top 10% of interdisciplinary research,[4]

[3] One of the most widely published quotes relating to interdisciplinary research is from Karl Popper "We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline." Popper, K. R. Conjectures and Refutations: The Growth of Scientific Knowledge. New York: Routledge and Kegan Paul, 1963, p. 88.

[4] Katrenko and Pan, 2015 , *A review of the UK's Interdisciplinary Research using a Citation-based Approach: Report to the UK HE funding bodies and MRC* pp17-19. http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/Independentresearch/2015/Review,of,the,UKs,interdisciplinary,research/HEFCE2015_interdisc.pdf

closely followed by Brazil. The review suggests a key reason for this is that "for China, the recognition of the importance of IDR to innovations and breakthroughs in research seems to be at a higher level".

6. **Are there disciplinary variations in terms of interdisciplinary working?** The 2015 Elsevier review found that the percentage of interdisciplinarity is generally lower for the Humanities, and to a lesser extent for Social Sciences, Computer Science and Engineering. Are these variations consistent in a global context? Are lower levels of interdisciplinary working the result of disciplinary cultures or due to perceived additional barriers and can, or should, we as funders do something about this? Discussions should take into account that the Elsevier review was based on publications and the arts, humanities and social sciences are not as publication focused/intensive as STEM subjects.

7. **Should interdisciplinarity play more of a part in international collaboration?** Many of the challenges in developing international partnerships are common across all research. These include the complexities of bringing together different funders, each with their different remits, differently organised research bases, and potential gaps and overlaps in funders' remits. International programmes and partnerships often provide an important route for funders to help to address large-scale issues that are not normally possible within conventional national programmes. For example the Belmont Forum[5] uses collaborative research actions to bring together new partnerships of natural scientists, social scientists and users to address societally relevant global environmental change challenges. However, the 2015 Elsevier report notes that "IDR [interdisciplinary research] is correlated with lower levels of international collaboration".

Assessment, evaluation and measurement of interdisciplinary research (proposal and publication)

8. **Do discipline-based models of peer review create barriers?** Do we need fresh criteria developed from the start in an interdisciplinary context? Strang and McLeish argue that "[w]hen the starting point for evaluation is that of single discipline research, attempts to add special 'bolt-on' criteria for IDR [interdisciplinary research] can be awkward."[6] Do participants have experience and/or examples of good practice? For example do funders provide support to funding panels and reviewers by explicitly addressing interdisciplinary research in the guidance provided to panels and clarity around panel remits? Do funders provide their administrative staff with training to recognise and support interdisciplinary research?

9. **How can we as funders quantify and measure interdisciplinarity, evaluate interdisciplinary diffusion and provide international comparators?** The indicators used to quantify interdisciplinary working are often not well described and there are no robust methods for measuring take up across organisations' funding portfolios or the level of interdisciplinarity.

10. **Is there a lack of sufficiently experienced and open interdisciplinary publishers and reviewers?** Anecdotal evidence from interdisciplinary researchers suggests that it can be difficult to find appropriate publishers and journals for their outputs. There is also a perception that it is hard to find peers able to review submissions who are sufficiently experienced in interdisciplinarity. It is often said that these issues, in combination with other

[5] https://igfagcr.org/

[6] Strang and McLeish, 2015, *Evaluating Interdisciplinary Research: a practical guide*, Durham University Institute of Advanced Study, p6 https://www.dur.ac.uk/resources/ias/publications/StrangandMcLeish.EvaluatingInterdisciplinaryResearch.July2015.pdf

reasons, mean that interdisciplinary research is less likely to achieve appropriate recognition and this can have a detrimental effect on a researcher's career path.

11. **Is it time to work towards a more harmonised approach to authorship?** It is well known that different attribution models for authorship exist across disciplines, especially where multiple authors contribute to an output. Where these models are not recognised across disciplines, this can cause difficulties for interdisciplinary researchers in raising their profile and getting appropriate recognitions for their contributions. An interesting example of work being done in this area is Project CRediT[7], which is exploring whether there "can be convergence around the creation of contributorship and attribution models and technologies".

12. **Do interdisciplinary projects where the disciplines are far apart face more of a challenge in finding support and/or recognition than those where the disciplines involved are close 'neighbours'?** Does the degree or extent of interdisciplinarity affect how funders trwat research applications and programmes?

Careers, training and recognition

13. **Are institutional structures equipped to support interdisciplinary researchers and research?** Many institutions still structure their departments using a single disciplinary structure. This can leave interdisciplinary researchers at a disadvantage in terms of career progression, either because they have no obvious 'home' or because the institutional evaluations of their performance are not adequately equipped to recognise and assess fairly their interdisciplinary research. The 2015 Elsevier review notes that China's high level of interdisciplinary working may be because "the establishment of its discipline-based faculty system is relatively new compared with the countries that are more mature in research".[8]

14. **How can interdisciplinary research skills be supported through training?** Is there a role for funders to encourage skills which facilitate interdisciplinary working at PhD level? Can we assume that these will lay the foundations for interdisciplinary working throughout the researchers' subsequent careers or is further/continued support required? Should additional specific provision be made by funders for training within interdisciplinary projects and programmes, for example where training in shared methodologies or introductions to new areas of knowledge is needed? If so, what form could the training take?

15. **Should funders provide support for non-research skills which facilitate interdisciplinarity?** The 2011 Innogen briefing on *Key success factors in the quest for interdisciplinary knowledge*[9] states that: "Management skills are not routinely taught to academics: while this issue may seem mundane in a monodisciplinary context, this skills deficit is attenuated when faced with the challenges of an interdisciplinary programme." How can funders support the development of good management? Are there actions or training specifically related to interdisciplinary working? Where training exists does it differ significantly across disciplines and does this matter?

16. **How can we capture the added value of interdisciplinary research?** While interdisciplinary research is not per se more valuable than monodisciplinary research, it is not always easy to capture the interdisciplinary aspects of a researcher's work or career. Should participation in interdisciplinary research be considered an indicator of added value?

[7] http://credit.casrai.org/about-us/
[8] Katrenko and Pan, 2015, p19
[9] http://www.innogen.ac.uk/downloads/Key-Success-Factors-Interdisciplinary.pdf