Research in Ireland
The Benefit of Feedback

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Science Foundation Ireland invests in, and supports, the best researchers with great ideas which lead to excellent projects that have the potential to make a real difference to Ireland and its people, positively impacting our economy and society. We foster collaboration with industry and charity, nationally and internationally. We promote science, technology, engineering and maths (STEM) to everyone, inspiring and supporting young people towards exciting futures in STEM – good for them and good for Ireland.

Science Foundation Ireland delivers value for money. By focusing efforts and resources on the best people and ideas, we can support the best returns on the investments we make on behalf of Irish citizens – supporting Ireland's future through creating an environment that can advance technology, quality of life, and the volume of high-value jobs both now and in the future. Science Foundation Ireland helps Ireland to compete and stand out internationally, building Ireland's reputation as a world leader in science, technology and engineering, attracting leading scientists and young people to work here where their talented minds in turn help fuel our collective progress.

Science Foundation Ireland regularly requests the researchers it supports to provide detailed information on the outputs and impacts of their research programmes. Such data are vital to demonstrate clearly to the Irish public the value created by investment of taxpayer's money; to argue the case, where appropriate, for increased budget to develop challenging key performance indicators for the research ecosystem; to allow international benchmarking and from all of these to improve existing programmes, develop new programmes, and close unproductive or dated programmes. Feedback from various stakeholders, including the research community producing the research, and the enterprise and public systems utilising the outputs of the research is also a key component of continuously improving Ireland's research ecosystem. Science Foundation Ireland regularly and routinely solicits such feedback, analyses it and executes appropriate actions.

Two major themes emerge from such feedback: first situations where Science Foundation Ireland needs to improve its communications, e.g. provide more information or clarification; second, where Science Foundation Ireland needs to consider improvements to existing programmes, new programmes, closing programmes, or the balance of programmes. To begin to address the first theme, we provide below some information and commentary on a variety of topics that have emerged from recent feedback. The second theme is being addressed through a series of interactive workshops, meetings, and the SFI Summit 2015, 'For What's Next' – the outputs and actions from these will be communicated in 2016.

Background:

Science Foundation Ireland (SFI) is one of the largest research funders (of approx. €154m in 2014, representing approx.21% of total) in Ireland, making all its awards through a competitive international, merit based process. Science Foundation Ireland is second only to the Higher Education Authority (HEA) (of approx. €176M, approx. 24% of total) which distributes via recurrent non-competitive block grants. Nine other funders collectively award just over 40% of the rest of the national public research budget.

As an investor of public funds, Science Foundation Ireland has the responsibility to abide by best practice, and thus uses international peer review in pursuit of scientific excellence and impact.

As an agency of the government, Science Foundation Ireland implements government policy which means that it is largely restricted to funding research in areas prioritised in the Research Prioritisation Report. Many small countries have some form of research prioritisation; it is not unique to Ireland. For some countries, such as Singapore, adopting this approach has resulted in significantly enhanced publication outputs in prioritised areas.

Science Foundation Ireland carefully monitors its investments and it is through its measures and evaluations that the benefit of investment in research can be demonstrated to government and ultimately the taxpayer. The tangible data and examples of success enable us to show, in a very real way, how research benefits Ireland by generating, amongst other things:

- A reputation for scientific excellence in select domains, acknowledged by international peers
- An environment that attracts and nurtures scientists, as well as business and other talented people
- New companies attracted, expanded and started by an innovative and enterprising economy
- Trained and skilled people for the workforce
- Well paid jobs at the cutting edge of technology and innovation
- A national focus on how science and technology can help solve universal problems and challenges e.g. aging population, climate change, food supply and security
- A favourable environment for the entire population to have an informed debate on many scientific issues that impact on society, for example, health and medicines, data protection and privacy, fracking, pylons, food contamination, epidemics, flood protection and genetically modified foods etc.
- An opportunity to encourage children to study Science, Technology, Engineering and Maths (STEM) subjects.

Evolution of the Science Foundation Ireland mandate:

The following timeline outlines the evolution of Science Foundation Ireland and its associated remit; it demonstrates the scope for funding under a diverse and balanced portfolio of Programmes.

In 2000 – Science Foundation Ireland operated under the aegis of Forfás.

In 2003 – Science Foundation Ireland was formally established with a mandate describing its functions. The 2003 SFI Act, section 7, in summary states that Science Foundation Ireland was established to fund orientated basic research in:

a) ICT
b) Biotechnology, and,
c) Other areas that concern economic and societal benefit, long-term industrial competitiveness or environmentally sustainable development as may be prescribed from time to time by the Minister.

In 2008 – Sustainable energy and energy efficient technologies were added to Science Foundation Ireland's mandate

In 2012 – Agenda 2020 is Science Foundation Ireland's strategic plan, covering the period 2012-2020. It was created through widespread consultation with stakeholders and was approved by the foundation's Board, the Department of Jobs, Enterprise and Innovation, and the Minister for Jobs, Enterprise and Innovation. Agenda 2020 contains a cross section of KPIs, targets for which were

designed to assist in the measurement of Science Foundation Ireland's progress. The first of these KPIs is very relevant in regard to the areas Science Foundation Ireland is permitted to invest in:

'Proportion of SFI expenditure in the areas identified in the 2012 Report of the Research Prioritisation Steering Group, and/or in areas of demonstrable potential economic impact for Ireland, and/or in areas of significant partnership with major research entities, and/or to support the development of young researchers'

In 2013 – The scope of Science Foundation Ireland was broadened by the 2013 amendment of the Act to permit us to fund orientated basic research and applied research[1]. This amendment also permitted the foundation to fund internationally, including in Northern Ireland. Further to the integration of Discover Science and Engineering with Science Foundation Ireland, the 2013 amendment also formalised our responsibility to support and promote Science, Technology, Engineering and Mathematics (STEM*).*

Common questions/concerns

Need for more funding for fundamental / pure basic research:

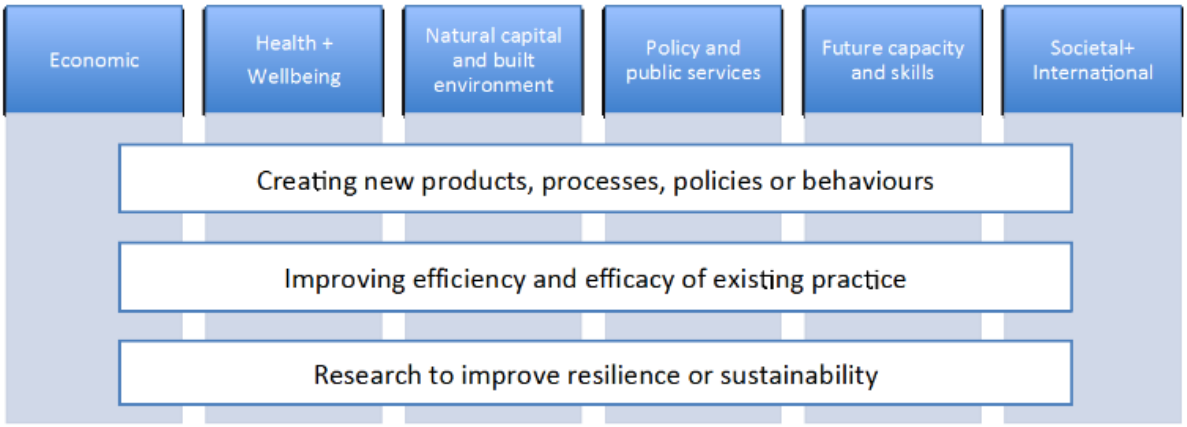
The terms **'fundamental'** and **'pure basic'** research are often used interchangeably. According to the truest definition of the latter, Science Foundation Ireland has never been permitted to fund 'pure basic' research. There has always been a requirement to articulate the strategic impact of a research proposal. Impact criteria are used by Science Foundation Ireland to assist in ranking research proposals which have been internationally peer reviewed to be excellent .

If Science Foundation Ireland is requested to fund proposals in domains such as pure mathematics and theoretical physics, we must return these proposals as ineligible and outside our legal remit. However, where the research in these areas, e.g. mathematics, is oriented in nature, we can accept, review, and fund the excellent and impactful proposals accordingly. For example, in mathematics, we currently fund in areas such as financial mathematics, industrial mathematics, and the mathematics of communications.

In other words, being able to clearly articulate the relevance and potential impact of a research proposal is a key requisite in insuring, however early stage, that it is eligible for Science Foundation Ireland funding.

To support researchers in clearly articulating the potential impact arising from proposals, Science Foundation Ireland has worked with five other countries [SAEI report] to define the possible impacts arising from excellent research. These are summarised under six pillars and three cross cutting themes.

[1]http://www.oecd.org/innovation/inno/frascatimanualproposedstandardpracticeforsurveysonresearchandexperimentaldevelopment6thedition.htm



We have also provided guidance to researchers on how to prepare an appropriate and strong impact statement. All excellent research proposals should be able to articulate and demonstrate their potential impact under this framework. We encourage applicants to study the guidance and write considered impact statements.

These principles also apply to the research Science Foundation Ireland funds in partnership with industry. Even when carrying out the most basic research, many researchers want to see the benefits of their research realised, whilst industry often wants to be close to the cutting edge of emerging new research. A sweet-spot is where industry knows it wants to be associated with some of the best researchers globally in a particular field but cannot justify spending 100% of shareholder money on the project; industry can, however, justify spending 10-50% of the total costs. Not surprisingly, a growing number of early stage projects in partnership with Industry, are being funded by Science Foundation Ireland owing to their scientific excellence and clear articulation of impact.

***Oriented basic research remains at the core of our remit**:*
Science Foundation Ireland is not deprioritising investment in oriented-basic research. Recent analysis shows that the majority of our portfolio of investment lies in Technology Readiness Levels[2] (TRL) 1 and 2. With time, and Science Foundation Ireland's expanded remit, investments will most likely move to span the TRL levels from 1 up to level 7. If this happens in the context of a static budget, then the overall levels of investment in TRL 1 will most likely decrease relative to the overall funding envelope.

Science Foundation Ireland is making the case for an increased budget but this cannot be won without the evidence from both impact statements of current grants and the data of outputs and impacts from completed grants. It is in the research community's best interest to help us to secure this budget case by providing appropriate impact data.

Science Foundation Ireland has a continuing commitment to fund researcher-led projects through programmes such as *Investigators, Career Development* awards and *Starting Investigator* grants, *Research Professorship* and *Future Research Leader* awards. There will be a continued focus by the foundation on investment in TRLs 1 & 2. Additionally, there are many opportunities to win funding

[2] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

for early stage research under the collaborative initiatives that Science Foundation Ireland runs with the Wellcome Trust, the Royal Society and more recently with the BBSRC, and successes under these initiatives are becoming increasingly evident.

More funding needed for smaller awards similar to the discontinued Research Frontiers Programme: Science Foundation Ireland took over the operation of the RFP (previously Basic Research Grant Programme) from Enterprise Ireland in 2004. RFP was aimed at funding a very broad range of scientific research and was initially managed separately from our core programmes as it included proposals which did not necessarily fit with the strategic remit of the ICT and Biotechnology divisions of Science Foundation Ireland.

Although the RFP has ceased since 2011, we operate a number of different funding schemes where opportunities are afforded to researchers at different stages of their career to conduct smaller scale research projects. These include, but are not limited to, the *Starting Investigator* and *Career Development Award Programmes,* the *Industry Fellowship Programme, TIDA, Wellcome Trust* seed award etc. The *TIDA* programme, in particular, is designed to enable researchers to focus on the first steps of an applied research project which may have a commercial benefit if further developed. Award values are approximately €100k and are aimed at providing support for one post-doctoral researcher for the duration of 12 months. In the biomedical field, Science Foundation Ireland and the HRB are the funding partners with the Wellcome Trust on their small grants scheme which is open to applicants in Ireland.

Researchers might also wish to consider their alignment with awards of scale, in particular Research Centres (RCs), where opportunities may exist to engage in smaller scale projects by becoming funded investigators associated with that award. There are a number of ways that this can be facilitated, for example as part of the existing RC budget or a new 'Spokes' initiative.

Science Foundation Ireland is the largest competitive funder of research in Ireland and as such has an obligation to strategically consider and fund larger projects; some of the smaller research funders can, and do, fund small research grants. Nonetheless, Science Foundation Ireland is considering this feedback and may if budget permits, consider launching a new future programme such as a dedicated PhD studentship programme.

Potential to eliminate the duplication of effort during the annual reporting and research outputs process and improve the compatibility of SESAME with data systems used by the HEIs:
These are two related issues. The duplication issue can be addressed, in part, by an awardee completing their researcher profile first, and then pulling the data into the relevant fields in the reporting template(s) for the programme under which their award has been made. The narrative, for example, progress relating to the objectives of the funded programme of research and that relating to impact, can then be added. In theory, it is a linear process, however, we do recognise that multiple award holders might feel that they are making duplicate entries. This may be true in part for those individuals holding investigator type awards who are also PIs in a Centre-type award.

The SESAME system does not currently allow for research outputs to be linked between research profiles. Therefore the outputs for an individual researcher who is associated with a Centre-type

award and who is also the recipient of a separate Science Foundation Ireland award must be entered into both research profiles separately. To facilitate this process, we encourage individual researchers with our awards to complete their research profiles first. This information can be downloaded from the research profile in excel format and the research outputs from a number of individual researchers can be collated in excel and automatically uploaded to the Centre-type award research profile. Following this and other guidance will ensure the reporting process is more streamlined and less onerous.

In relation to the integration of SESAME with other reporting systems used by Irish HEIs and other funding agencies, Science Foundation Ireland recognises that the optimal situation is full integration of SESAME with such systems. However, this is a complex task due to the differences in the systems used, differences between the definitions of outputs in each system and the high potential for duplication of entries. The financing of a project to support this integration is also challenging. We are actively investigating options in this area and our performance improvement team is currently liaising with UCD to discuss compatibility between SESAME and the UCD system on a pilot basis.

Science Foundation Ireland has recently proposed to the HEA that they institute a national CV system for HEIs in Ireland similar to that in Canada; the latter was developed by Smart Simple, the software providers of SESAME. Such a system would align incentives and increase efficiencies and allow for better data analysis. Each researcher would update their CV periodically. The resultant CV database would then be used to pull information required by different funders or the HEI themselves supplemented with a small number of additional bespoke questions. The DG of SFI recently presented such a request to the HEA Board.

Concern that SFI's focus on National Research Prioritisation areas is overly restrictive:

Irish government policy mandates that public research funding is aligned with areas of strategic opportunity for the State. These areas have been identified on the basis of an assessment of their economic potential for Ireland as set out in the recommendations of the independent National Research Prioritisation, published in 2012 and adopted as Government policy. The majority of public funds for research must now be directed towards the NRP priority areas. However, research priorities will evolve and new and emerging strategic areas of opportunity related to science or engineering may be prescribed with due regard to (a) economic and social benefit; (b) long term industrial competitiveness or (c) environmentally sustainable development. As an agency of the government, Science Foundation Ireland must implement government policy, including research prioritisation.

Many of our funding programmes, in particular those that support early career and outstanding individuals are not as narrowly aligned with the 14 Priority Areas. Additionally, recent calls run under the Research Centres and Investigators programmes have been thematic in nature and have afforded the recognition of 'strategic areas of scientific endeavour that concern the future development and competitiveness of industry and enterprise in the State' to be considered. Finally, the 14 areas also include/ encompass a number of the underpinning platform science and technology areas, and therefore encompass broader themes relevant to STEM. It is recommended that every prospective applicant reflects on the alignment and fit of their research programme with priority areas and the underpinning platform science and technology areas that are in support of the former.

Science Foundation Ireland's focus is very clearly articulated in its government approved strategy "Agenda 2020" particularly the first KPI: 'Proportion of SFI expenditure in the areas identified in the 2012 Report of the Research Prioritisation Steering Group, and/or in areas of demonstrable potential economic impact for Ireland, and/or in areas of significant partnership with major research entities, and/or to support the development of young researchers', (target = 100% of funding).

Science Foundation Ireland funds only industrial research collaborations and these consist of mainly multinationals:

This is not the case. Science Foundation Ireland does indeed fund many research projects in which academic researchers collaborate with partners in enterprise. However, analysis of our total portfolio of awards shows that 30% of award holders report at least one non-academic collaborator; thus 70% of award holders work only with academic collaborators. Of these academia-industry collaborations, in 2014, Science Foundation Ireland-funded researchers engaged in 901 collaborations with companies. These collaborations comprised 462 with MNCs (51%) and 439 with SMEs (49%). The current balance between MNC and SME engagement in our funded programmes is approximately equal. This distribution is mirrored in the spread of contracts being signed between the 12 Research Centres and their industry partners.

The assertion that Science Foundation Ireland funds only industrial research collaborations is also sometimes linked with the investment in the 12 Research Centres. Our current investment portfolio totals 715 active awards comprising total investments of €840M with outstanding commitments of €460m, as of end March 2015. The percentage of the outstanding commitments comprising the 12 Research Centres is 58%. The forecasted steady state funding split between the large Centres and partnerships as compared to the individual Investigator-led awards is 45% / 55%. In summary, Science Foundation Ireland currently invests approximately equal amounts of its budget in individually-led awards and in large Centre-type activities.

Despite the perception that industrial funding of research conducted in public institutions (mostly Universities) in Ireland is significant, it is in fact very low averaging approx. €20m p.a. each year from 2006 – 2011 by comparison with Finland which averages €150m p.a., Israel €120m p.a., New Zealand €80m p.a., Singapore €80m p.a. and Denmark €60m p.a. This is an area where Ireland needs to improve, both by engaging more companies and by increasing the cash contribution to publically funded R&D in Irish Higher Education Institutions. Some Science Foundation Ireland programmes are designed to achieve this with the deemed benefit of excellent research, assisting industry and improving Ireland's ranking.

Commentary pertinent to Science Foundation Ireland funding:

A cross section of comments were received through our reporting mechanisms which covered topics ranging from: changing the eligibility criteria for different funding programmes; extending the duration of awards; the restrictive nature of capping the numbers of applications permitted from research bodies; separate support for travel and allowing the patenting and other commercialisation costs to be eligible for funding within SFI's Grant Application Budget Policy. We have implemented a number of changes over the last 12 months which will address some of these requests. For example, the institutional cap for applications made to the *Starting Investigator* (SIRG) 2015 and *Career Development Award* (CDA) Programme has been raised compared with previous calls. The duration

of awards made under certain funding programmes is being reviewed. For example the *Technology Innovation Development Award* (TIDA) programme is currently being revised to reflect the longer timeframe that may be required to successfully complete the first steps of an applied research project which may have a commercial benefit. Eligible costs are also under review, as we revise our grant terms and conditions and associated Science Foundation Ireland award budget policy.

Ongoing feedback:
Science Foundation Ireland has established systems in place for feedback but would also encourage researchers to engage with our pre- and post-award teams as necessary. A supportive and engaged infrastructure can only benefit science in Ireland.

A collation of results from the October 2015 Research Summit 'For What's Next' will be published in Q1 2016.

The next deadline for programme feedback is concurrent with the Annual Reporting deadline for all Science Foundation Ireland's awards in Q1, 2016. If you wish to communicate with us about the contents of this report, please email reporting@sfi.ie.

We look forward to ongoing participation.