The Physiological Society's response to the Commons' Science & Technology Committee inquiry on a new UK research funding agency

For more information about the inquiry, please visit: https://committees.parliament.uk/work/265/a-new-uk-research-funding-agency/

Executive summary:

- Public funding is needed to develop high-risk, high-reward, fundamental biological research that requires significant financial input and time to be allowed to reach fruition. This will feed new ideas, discoveries and technologies in crucial areas such as health and ageing. There is a huge appetite and need for more discovery research funding in the UK research community.
- The distinctive feature of a new agency in the DARPA model would be its focus on pursuing innovations with transformative potential, combining high-risk with high-reward.
- A new research agency distributing public money must be focused on innovation with societal benefit. It should harness opportunities in interdisciplinary research to deliver on widely agreed needs, such as challenges involved in meeting the Ageing Society Grand Challenge. Transparency, accountability and a clarity of purpose is crucial to ensuring public support.
- Budgets for UKRI and ARPA should be entirely separate, to avoid competition over funding streams during budget-setting. Grant allocation will be informed by strategic Government priorities, with rules of good governance to guard against conflicts of interest in decision-making. The agency should have the capacity to fund projects over a longer timeframe than most current UKRI grants.
- In deciding whether to base a new agency within or outside of the south east, the Government should consider the opportunity to redress the balance of investment in historically underfunded regions and nations of the UK.

Consultation response:

1) **What gaps in the current UK research and development system might be addressed by an ARPA style approach?**

Public funding is needed to develop high-risk, high-reward, fundamental biological research that requires significant financial input and time to be allowed to reach fruition. This will feed new ideas, discoveries and technologies in crucial areas such as health and ageing. There is a huge appetite and need for more discovery research funding in the UK research community.

As part of The Physiological Society's work into the economic and social impact of physiological research in the UK, we have engaged with a number of large pharmaceutical companies that have reinforced the value that they gain from the UK continuing to be a world-leading hub for fundamental research. this research allows pharmaceutical, and other R&D intensive organisations to seek advice and build networks which complement their science and products. As such, an ARPA-style approach presents the opportunity for fundamental research, which often has small short-term financial value to be nurtured to sustain the UK's future R&D pipeline as well as

broaden access to this research to allow both public and private organisations to build specialist applied research and products to the mechanistic understanding discovered through science such as physiology.

As *Wired* noted in March; 'the [US Department of Defense] allowed Darpa to bridge the gap between basic research and commercial application by providing real-world demand ahead of the private sector's willingness to pay. This avoided Darpa building "solutions in search of a problem", while still allowing a focus on radical, high-risk technologies…the UK's Arpa will need an equivalent.'[1]

2) What are the implications of the new funding agency for existing funding bodies and their approach?

The distinctive feature of a new agency in the DARPA model would be its focus on pursuing innovations with transformative potential, combining high-risk with high-reward. Existing funders must continue to support work on fundamental and applied science, the UK's excellence in which provides the underpinning that will be necessary to make a success of an ARPA-style agency in the UK.

For the new agency to be successful and avoid competing with existing funding bodies, it will need to have success criteria and a culture that are distinct from them, such that there is no confusion or overlap about which funder would be appropriate for a particular idea. While the themes of a new agency should have parallels with the Global Challenges Research Fund and Industrial Strategy Challenge Fund, the scale of the projects, risk-tolerant nature of the funding, and ambitious moon-shot programmes could be differentiators. A UK DARPA could also have a role in bridging the gap between different funders in their ambitions to meet the Government's Industrial Strategy Grand Challenges for targets such as the 'Ageing Society' which will require mechanistic understanding, application for specific diseases, behavioural science interventions, additional equipment and a more conducive built environment.

Current funding for the Industrial Strategy Grand Challenge mission for 'Ageing Society' is focused predominantly on applied science in healthy ageing, particularly in the context of promoting the UK service sector overseas as a post-Brexit UK export to other economies with a significant ageing population such as China, India and Japan. As such, we are concerned that investment in the 'Ageing Society' Grand Challenge has to date focused on assisted living products and 'homes of the future, that are built to a standard suitable for the changing needs across a lifetime'[2]. While undoubtedly laudable aims, The Physiological Society does not believe that these innovations will be sufficient to meet the Government's own 'five healthier, more independent years by 2035', nor will it likely reduce the significant inequality gap that exists between socio-economic groups. A new DARPA-style organisation has the opportunity to invest in cutting-edge research that could lead to the step change required in order to meet this goal without the need for an immediate financial return on investment. The Government's own target means engaging with people that are at least a decade away from the State Pension age as well as those who are

[1] https://www.wired.co.uk/article/dominic-cummings-british-darpa#:~:text=The%20plans%20have%20cleared%20the,blue%20skies%E2%80%9D%20science%20research%20agency.

[2] https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/missions#healthy-lives

experiencing age-related conditions. Understanding the mechanisms behind ageing and age-related conditions will be crucial to improving the health and wealth of the nation in older age.

A DARPA-style fund also provides the opportunity to think more broadly and harnessing a cross-discipline approach about the step-change in the government's approach to the challenges presented by ageing and inequality gap. For example, while epidemiological data can highlight inequality of outcomes, it can only demonstrate correlation. In order to prove causation, we will need a combination of state-of-the-art imaging and diagnostic equipment to facilitate the discovery of mechanisms at a cellular level.

3) What should be the focus of the new research funding agency and how should it be structured?

A new research agency distributing public money must be focused on innovation with societal benefit. It should harness opportunities in interdisciplinary research to deliver on widely agreed needs, such as challenges involved in meeting the Ageing Society Grand Challenge. Transparency, accountability and a clarity of purpose is crucial to ensuring public support.

Compared with existing funding bodies, a new agency would need to be flexible, with a flat structure and low administrative overheads. This should not however, be at the expense of encouraging equality, diversity and inclusion and could be used as an opportunity to promote high-risk research among principle investigators that reflect these key objectives to diversify thought and approach in research. Its operations must allow both the high failure rate inevitable with risky research, and for the agility and flexibility to act on unexpected results or promising avenues of innovation when they arise.

The structure of the agency should be as accessible as possible, open to innovators and industry. It should recognise that the insights of practitioners and research users are of great importance in instigating innovations that produce tangible, real-world benefits.

A problem- or mission-oriented approach that defines problems, such as 'how can we address the societal challenges and opportunities presented by an ageing society?' can spur collaborations and encourage private sector investment by highlighting opportunities. Through this model, an agency can then fund bottom-up experimentation by cross-sector partnerships to address the problem.

4) What funding should ARPA receive, and how should it distribute this funding to maximise effectiveness?

An ARPA-style organisation will need to have significant financial resources at its disposal in order to deliver on its potential. An ARPA-style agency has the potential to make a significant contribution to the Government's commitment to reach the target of 2.4% of GDP being spent on R&D by 2027, particularly if part of its mission is to offer initial investment to SMEs and start-ups that could then seek additional finance from the private sector.

Funding for ARPA should not, of course, replace other established approaches to research funding, which would remain a vital part of the research and development ecosystem.

Budgets for UKRI and ARPA should be entirely separate, to avoid competition over funding streams during budget-setting. Grant allocation will be informed by strategic Government priorities, with rules of good governance to guard against conflicts of interest in decision-making. The agency should have the capacity to fund projects over a longer timeframe than most current UKRI grants. Many areas of bioscience, including physiology,

require longer funded periods to accomplish full projects – this could be accommodated where necessary in funding stream.

5) **What can be learned from ARPA equivalents in other countries?**

The key learning from DARPA in the US is the need for transparency throughout the organisation. A UK DARPA should be seen as an opportunity to demonstrate to the UK public about the need for experimental, aspirational and sometimes absurd-sounding science. A starting point for this would be making the budget for the programme clear and subject to parliamentary scrutiny. In addition, the staff recruitment and project selection criteria should be made as transparent as possible such that a new ARPA-style agency has the confidence of the UK public around both investment in military and non-military research (recognising that this distinction is not always clear, particularly in areas such as human physiology in extreme environments) and as a leader in promoting equality, diversity and inclusion. Recruitment practices for the US' DARPA are not always transparent, with staff often seconded from academia and given budgets to allocate with very little oversight. At The Physiological Society, we do not believe that this approach is likely to encourage funded research and PIs that reflect EDI principles.

Secondly, a robust peer review system must be in place to ensure that projects and their approaches are ethical and scientifically rigorous. While a lack of peer review may lead to quicker delivery times, it does not support the approach to science that would give the academic community confidence in any findings.

6) **What benefits might be gained from basing UK ARPA outside of the 'Golden Triangle' (London, Oxford and Cambridge)?**

In deciding whether to base a new agency within or outside of the south east, the Government should consider the opportunity to redress the balance of investment in historically underfunded regions and nations of the UK.

A DARPA-style agency would allow for the demonstration of high-quality, high ROI research beyond the Golden Triangle to be recognised and harnessed. The £800m earmarked for the new agency represents a small fraction of the UK's overall public R&D spend with very few projects likely to be able to demonstrate success, particularly within the context of an electoral cycle so ensuring that this money is invested in areas which can demonstrate wider public returns such as creating jobs in related or parallel sectors will be crucial in demonstrating shorter-term impact and maintaining public support.