Part of a series of case studies showcasing the value of EPSRC's engagement with stakeholders in achieving positive outcomes.

The flexibility to change

EPSRC's strong relationships with researchers, and flexible funding approach, meant that it could respond quickly to support the fast-developing research area of Mathematical Biology.

- Trusted, informal relationships were key to open, honest feedback
- EPSRC shows its responsiveness in recognising Mathematical Biology as a strategic research area
- As of December 2019, Mathematical Biology receives around £24m in EPSRC funding, comprising research and training grants, as well as support for fellowships and the purchase of equipment
- The UK funding landscape for Mathematical Biology now 'vastly better than almost anywhere else.'

Often the headline with an EPSRC funding story is 'this was the amount that was invested, and this was the result'. But this can be to overlook the vital, behind-the-scenes role that EPSRC plays in brokering and facilitating relationships with universities, businesses and other stakeholders: relationships that enable world-class research to happen.

EPSRC has pioneered this kind of engagement, pro-actively building relationships over time, with continuity and consistency. These relationships mean that when new opportunities open up in the research landscape, EPSRC can be quickly alerted to them, and so the UK can be among the first countries in the world to back research in exciting new areas. Research funding portfolios can be shaped as they go along: there is flexibility to change, when EPSRC hears that change is needed.

A good example is EPSRC's journey to create a strategic research area in Mathematical Biology. Mathematical Biology involves developing new mathematical and statistical tools and techniques to investigate biological processes and systems. It helps to make sense of the huge amounts of data that have come from recent advances in the biosciences, such as the completion of the Human Genome Project. It brings the power of mathematics to bear on some fundamental problems in bioscience.

The UK is a world leader in Mathematical Biology. Recognising this, EPSRC undertook a process of careful review and consultation, and Mathematical Biology was subsequently given its own research area following the EPSRC's Balancing Capability exercise in 2015: it

currently receives over £20m in funding from EPSRC, with over 40 grants covering research, student training and fellowships.

Find out more

What this example shows is the value of the deep, informal relationships that EPSRC has built up with its stakeholders. As EPSRC's Head of University Relationships, Maisie England, explains: in the case of universities 'the EPSRC engages at many different levels. There are senior contacts at the strategic level. We also have relationships through our Strategic Advisory Teams (one of which advises the Mathematical Sciences Theme), which are a source of advice at the subject level. Then at the more granular level, our Portfolio Managers go out and engage specifically with academics in their research portfolio communities. This all helps to build trust, and helps us understand what the research landscape looks like.'

The example of Mathematical Biology illustrates this multi-level approach. In this case, the move to create a designated research area came initially from conversations with the community which were catalysed by EPSRC's strategic portfolio planning, and Portfolio Managers in the Mathematical Sciences Theme getting to know their community. According to Maisie England, 'it started with conversations within the Mathematical Sciences Strategic Advisory Team, alongside informal conversations with the wider community. The universities hadn't got together and lobbied for this: we were just hearing a similar story from a number of different researchers. It demonstrates the value of our strategic advisory sources as well as informal, regular, personal contacts, which meant that key researchers could be open and honest with us; telling us that they were facing barriers and that there was a wider need. From these conversations we could build up a picture across the UK, and make the case for a more formal review.'

This review involved working with the wider academic community to understand in detail what the problems and opportunities were in relation to Mathematical Biology. Following this the EPSRC reviewed its classification system, and the review recommended that Mathematical Biology should have a recognised place within the Mathematical Sciences portfolio. The move towards recognising Mathematical Biology as a strategic research area culminated in a Balancing Capability process in 2015, which confirmed the decision to maintain strategic investment in Mathematical Biology. The EPSRC actively manages its research and training portfolio in order to maintain the UK's world-leading position in engineering, the physical sciences, and computational and mathematical sciences research.

The example of Mathematical Biology shows how EPSRC has the flexibility to respond with agility to what is happening around research and innovation. Through continuous

monitoring and engagement with stakeholders, we collect information and evidence about the current UK research, training, and innovation landscape. In partnership with our strategic advisory bodies, we synthesise this information into intelligence and knowledge about the current shape of the landscape, and use it to set aspirational strategies for the direction of our portfolio.

The overall value of EPSRC's approach is now starting to be seen in relation to Mathematical Biology. Professor Raymond E. Goldstein FRS, of the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge, was one of the researchers who fed in to the consultation process around Mathematical Biology. For him 'it is to their credit that EPSRC's Mathematical Sciences team listened to the research community, carving out a space for Mathematical Biology. The area was recognised early and nurtured well within the EPSRC's Mathematical Sciences programme, and other funding agencies – including BBSRC, the Wellcome Trust and ERC – have now begun to support it. The result is that the general funding landscape for work in Mathematical Biology is vastly better in the UK than it is almost anywhere else.'

And already this funding is beginning to have an impact. With EPSRC support, Reidun Twarock, Professor of Mathematical Biology at York University, is working on developing mathematical models that make sense of the structure of viruses. 'This is pure mathematics,' she says, 'that has real-world impact.' Where standard bioinformatics had failed to find a pattern in the genetic structure of viruses, new mathematical tools have discovered hidden sequences. 'This could lead to the identification of better targets for drugs: attacking viruses in a way that makes it much harder for them to escape, through mutation. Our tests already seem to show that new drugs perform better when they attack viruses in this way.'

'I've had several offers to move to Germany,' says Reidun Twarock. 'The reason I haven't taken them is largely down to the EPSRC's wonderful support. Their expectation is that you will go out and build your field: the mandate they give you is amazing.'

Text approved by Maisie England and Katie Blaney, Jan 2020.