



Advanced materials receives big push to bridge UK university–industry gap

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With a planned government investment of £235 million from the UK Northern Powerhouse initiative and a further £80 million from universities, the Henry Royce Institute for Advanced Materials at The University of Manchester is The United Kingdom's biggest investment in materials research in some time. The ambition for the Royce, as it is dubbed, is to become "the UK's home of advanced materials research and innovation," according to the government's Engineering and Physical Sciences Research Council (EPSRC). The institute is named after one of the founders of Rolls-Royce, the company that once made some of the world's most expensive cars and that is now one of the largest suppliers of gas turbines for commercial aerospace. EPSRC has provided £105 million of the

cost of a new building on the Manchester campus, with construction about to start for completion in 2019.

The chair of the Royce is Baroness Brown of Cambridge, better known as Julia King, whose career was in materials research before she served as Vice-Chancellor of Aston University until last year. She admitted that the institute "is a lot of different things to different people. At the moment," she told *MRS Bulletin*, "it is a number of partners particularly associated with the northwest [of England]. What it needs to become is the UK's national institute for advanced materials."

The Royce is a new model in engineering research for the UK, as the government no longer supports national engineering research centers outside of universities. This is unlike the United States, for example, which has research

centers like those operated by the US Department of Energy's network of national laboratories, such as the National Renewable Energy Laboratory (NREL).

While Manchester will be the focus of the Royce, the new institute will operate a "hub and spoke" model, with smaller research centers across the UK. As well as the Manchester hub, the first phase of the Royce will include satellite centers at Leeds, Liverpool, Sheffield, Cambridge, Oxford, and Imperial College London.

The Royce's research will operate along four themes: energy, engineering, functional, and soft materials. According to EPSRC, the UK's leading funding body for academic research in engineering and the physical sciences, the aim of the new institute will be to conduct research that enables "the iterative design of advanced materials" for diverse applications such as energy-efficient ICT [information and communication technologies] or for use in hazardous or demanding environments such as nuclear or aerospace.

It is no coincidence that Manchester is to be the hub of the new activity. The Royce Institute was first announced in 2014 by the then Chancellor of the Exchequer, George Osborne, as a part of the government's ambition to create a "northern powerhouse," an attempt to reverse the economic decline of what was once the UK's major manufacturing region. To do that, King says, "it clearly has to support the economy of the northwest. We do need this regional economic stimulus." There will also be a building in Sheffield, also in the northern part of England.



Artist's rendition of the central hub of the Henry Royce Institute—the United Kingdom's leading center for advanced materials research and commercialization—which is due to open in 2019. The £150 million building will accommodate over 400 staff. Credit: The University of Manchester.

Jo Johnson, Minister for Universities and Science, also announced funding for the satellites at Cambridge, Leeds, Sheffield, Imperial College London, and the Culham Centre for Fusion Energy near Oxford. EPSRC also promised future funding for spokes at the Universities of Liverpool and Oxford and the National Nuclear Laboratory.

When he announced the latest phase of funding for the Royce earlier this year, Johnson said that the “government is determined to support further commercialization of our science and research discoveries as innovation leads to new products, services, and better ways of doing business.”

For this to happen, the Royce must build strong links with the industry that can turn research into commercial products and processes. One sign of the importance of business links was the recent appointment of the institute’s CEO Andrew Hosty, Fellow of the Royal Academy of Engineering, who has spent 25 years in industry, including time as Chief Operating Officer of Morgan Advanced Materials Plc.

Neil Alford of Imperial College London also believes that the Royce has to establish strong industry links. He sees the Royce as filling a gap left by the decline of corporate research. “The demise of the corporate labs places the onus on the academic community,”

he explains. But universities are not in the best position to commercialize their research. He sees the Royce as an opportunity to “short circuit” the time it takes for research to make the transition between academia and industry. Alford believes that the role of the Manchester hub will be to carry out research that is closer to the market. “If they can do that, great,” Alford says.

King admits that the size of the investment in materials research at the Royce will inevitably affect what EPSRC will be able to put into the “materials kit” for other parts of the country. “So I think we have to make sure that the Royce is absolutely a national center with its doors open. And that is about providing capabilities for a world-class materials center across the UK. We have got to be careful that we are a center for the community, for the academic and business community, and we have got to be thinking about how our strategy is implemented so that we can draw all of those people in.”

“Our doors need to be open to materials researchers in other universities. It is also about making sure that the world-class research that we do gets accelerated out of our universities, either into interested companies or into new businesses,” she explains.

King says that the Manchester hub will provide incubator facilities for new

businesses. She suggests that the Royce may be able to tap into the resources of another materials research initiative on the Manchester campus, the £61 million Graphene Engineering Innovation Centre, with its associated facilities for accelerating applications and building new businesses.

Alford, the Royce’s “champion” for what the institute bills as its research in theme on “atoms to devices” (A2D) materials, heads up the development of one of the institute’s spokes, a £5 million A2D research center at Imperial’s new campus in East London. Like the Royce itself, Alford’s A2D does not have a finely tuned manifesto. A2D, he admits, “is just a name” for the various techniques involved in the deposition of two-dimensional materials.

Alford endorses the idea that the Royce must work with all universities. The A2D activity already includes universities such as Leeds and Liverpool. These researchers, he explains, are still thinking about just what the A2D theme will cover. “We are trying to see what it is that we are going to do that is going to make a real difference. We have got these techniques for making things. We are asking ourselves what are the application areas that we can get involved in?”

Michael Kenward

EC report shows public investment in research and innovation yields results <http://bookshop.europa.eu>

Public funding of research and innovation (R&I) acts as a catalyst to boost private R&I activities and overall economic growth, according to the report, “The Economic Rationale for Public R&I Funding and Its Impact,” which was released last March by the European Commission.

The study finds that roughly two-thirds of economic growth in Europe can be traced back to innovation. It also estimates that the typical returns for private R&I investment range between 10% and 30%. These returns can be twice or three times higher

for the economy in general, due to the positive spillover effects that enable other firms to benefit from these investments.

The study, which reviews existing empirical literature, underlines that the role of public R&I funding is especially important in light of the current rapidly changing and riskier innovation landscape.

Public R&I investment helps generate and diffuse new knowledge. It also contributes to developing new skills and creating networks that enable stronger knowledge flows. Overall, the returns on public R&I investment are estimated to be

around 20%, with returns on EU-funded R&I estimated to be even higher.

However, for public R&I funding to have maximum impact, it should cover the whole cycle of innovation, from fundamental research to market-creating innovation—that is, solutions or products that completely reshape markets.

The study also examines the factors that have contributed to a temporary slowdown in Europe’s productivity. It argues that the digitization of the economy in the past decades has revolutionized the way in which innovation works and how its benefits are diffused, with a growing concentration of innovation benefits with some key players. This has broad implications for public innovation policy. □