



RobOT

Robust Organic Tectonics: Professor Andy Cooper, University of Liverpool

Professor Andy Cooper at the University of Liverpool has used European Research Council (ERC) funding to advance his fundamental research developing new ways of finding useful materials, with the project contributing to significant industrial investment in the city of Liverpool itself.

Institution: [University of Liverpool](#)

Research project: [RobOT – Robust Organic Tectonics](#)

Funding: [Framework Programme 7 ERC Advanced Grant](#)

Professor Andy Cooper leads a research group at the University of Liverpool that uses experiments, computational modelling and robotics to develop better ways of discovering new materials. The research is fundamental, as it is concerned with materials discovery – helping scientists to find potentially useful materials more quickly – but the techniques that the team have developed have the potential to impact a variety of sectors and industries.

“It was definitely more foundational research, rather than research for applications,” says Andy “However **by doing that, finding new ways to accelerate the discovery of batteries, fuel cells, catalysts..., you can actually have at least as much impact as when you work on those materials specifically. It is the kind of thing that the ERC funding allows, with its blue skies mission.** Not all programmes allow this and increasingly funding is becoming challenge-led whereas the ERC is not, it is science-excellence driven.”

The researchers use sophisticated computer modelling to map how molecules assemble and crystallise to form new materials – each molecule leading to a myriad of possible structures with different properties and possible applications. **They then investigate the properties of the materials using robotics to test hundreds, or even thousands, of materials much more quickly than previous techniques allowed.**

An international team

Andy’s main collaborator is Professor Graeme Day at the University of Southampton, but funding from the ERC enabled him to recruit top scientists from Spain and Poland, as well as collaborate with other groups outside of the European Union (EU). “The EU connection allowed us to hire the best people from Europe,” says Andy. “We were looking for a very specific set of skills in crystal structure prediction, and there are not so many groups in the world that have such skills. If you are only trying to recruit from one country then it’s very difficult to find those skills. We had no applicants from the UK who had the precise skills needed.

“It’s not like hiring a doctor or a lawyer, these are areas of research where there are maybe fewer than 50 people working in them. It’s not unreasonable to say that, for this research, it would not have been able to happen without hiring from the EU.”

Not only was Andy able to recruit highly skilled scientists to his team, but those scientists have since secured permanent positions in the UK, strengthening the country’s scientific capacity and skills base.

Attracting investment in the city of Liverpool

The funding Andy's group have attracted has also helped to build a case for major UK government and industry investment in the city of Liverpool itself. In an £81 million partnership with Unilever and the Higher Education Funding Council for England (HEFCE), the University of Liverpool built the Materials Innovation Factory (MIF) in 2016, developing a unique materials chemistry research hub that aims to be a world leader in computer-aided material science. Andy believes the prestigious European funding, as well as grants from the Engineering and Physical Sciences Research Council and InnovateUK, combined with the local Unilever site at Port Sunlight, built a strong case for investment in the MIF, which has brought hundreds of jobs to the city.

"The ERC has a certain prestige to it and we have had four of these ERC Advanced grants in Liverpool," says Andy. "Large companies such as Unilever, when they are looking to invest in an area, bear these things in mind. There are now 80 Unilever staff that have relocated there from Port Sunlight, we have a Swiss company relocating its office there, Croda has an office there. That's brought jobs into Liverpool and we have some commercialisation activity going on, with spin-out companies being created. This fundamental ERC funding was quite central to this investment and the knock on effects are considerable. These things are linked and that's an important message to the government."

Fundamental research with global applications

Despite the fundamental nature of Andy's research, the team have already filed two patents: one with applications in the nuclear reprocessing industry, and one for a porous material that can remove formaldehyde and other related carcinogens from the atmosphere. **The initial EU funding has since opened doors to much wider international markets.** "Formaldehyde release in buildings is a big issue, especially in Asia, and we have a technology that goes some way to solving this problem," says Andy. "We are getting close to scale up. The Chinese postdoc who did that work has won two prizes: the RSC Emerging Technologies Competition in 2016 and another prize in China for entrepreneurial development. It's a global market because it's a global problem – we are also looking at reducing formaldehyde levels in cars and other closed environments."

With patents and a number of high profile research papers, Andy's team are hoping the success of the ERC funded project will enable them to secure further funding. **"It's a big concern for me if the ERC programme is not accessible to the UK, because at the moment, both inside and outside Europe, I don't see another scheme that is even remotely like the ERC. I think we have done some of our best work under it."**

Computational chemistry, RobOT

