

the illusion that the mere existence of institutes and research facilities was more important than their actual performance.

Attitudes have changed, partly thanks to the EU, which absorbed the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia in 2004, then Bulgaria and Romania in 2007 and Croatia in 2013.

These countries have had a low rate of success in winning grants from the Framework programmes. But all of the former communist states are recipients of the commission's 'structural funds' — subsidies designed to reduce social and economic disparities, a goal of the EU. How the funds are used is decided locally, but of the €170 billion available for 'cohesion and regional development' in 2007–13, the commission pushed for €20 billion to be spent on research. In 2014–20, almost €44 billion is meant to be used for science and innovation in poorer regions.

The cash has been most effective when used to refurbish universities and provide labs with the equipment needed to train students and entice researchers to stay, says Peter Tindemans, secretary-general of science-advocacy group EuroScience in Strasbourg, France.

The funds have also financed the €850-million Extreme Light Infrastructure, a pan-European laser facility under construction at sites in the Czech Republic, Hungary and Romania. The facility is expected to attract leading talent from around the world to the region, but Tindemans cautions that improvements to the research environment must come first. "You can't jump-start scientific development solely with large infrastructures," he says.

FOSTERING EXCELLENCE

To win cash from EU funding programmes, researchers must often fit their work into broader societal or economic goals. But one corner of the European funding apparatus is all about science for science's sake.

Set up in 2007 to raise the quality of research across Europe, the European Research Council (ERC) awards generous grants that are open to any discipline, come with minimum bureaucracy and are judged solely on the quality of the application.

The ERC budget has grown from €7.5 billion in 2007–13 to €13.1 billion for 2014–20. At up to €2.5 million over 5 years per researcher, its grants are longer and larger than those of most national funders. The approach seems to work: 7% of ERC-generated papers come in the top 1% of the most highly cited articles by discipline, publication type and year.

Not everyone is happy with the 'excellence at all costs' approach. Since the ERC's inception, half of the grants it awarded under its three core schemes have gone to just three countries: the United Kingdom, Germany and France.

But the ERC system lifts the quality of research beyond the projects that it funds.

EUROPEAN, BUT NOT EU

Although separate, CERN and ESA receive EU funds.

Before the EU began to have a major role in coordinating Europe-wide research in the 1990s, the task fell mainly to pan-European research organizations such as the CERN particle-physics laboratory.

Established by treaty in 1952 by 11 countries, CERN, near Geneva, Switzerland, was born in the same post-war spirit of peace as led to the formation of the EU. But the lab pre-dates the EU's main forerunner, the European Economic Community, which had no remit for

research, by about five years. CERN now has 21 member states and is a major recipient of EU funds, including for a 2020 upgrade of its Large Hadron Collider, which scientists used to discover the Higgs boson.

Another organization that grew up alongside the EU is the European Space Agency (ESA). It arose from a 1975 merger between the European Space Research Organisation and the European Launch Development Organisation. Both were created in the 1960s to guarantee Europe independent access to space.

ESA has racked up a string of successes, including the Rosetta mission that put a lander on a comet in 2014. The EU is now the biggest single contributor to the 22-nation-strong agency, accounting for some 20% of its budget. ESA and the EU are partners in the multibillion-dollar Copernicus Earth observation system and in the Galileo global satellite navigation system.

Rosetta's Philae lander touches down on a comet.



Either in an attempt to win more of its grants or simply inspired by the ERC, member states are redesigning national policies to make their science more competitive, says Jose Labastida, head of the ERC's scientific department. He cites Poland's National Science Centre, set up in 2011, as an example.

And 17 countries have run schemes that fund ERC runners-up — applicants who met the quality threshold but were unsuccessful — essentially reusing the agency's high-quality peer-review process. "The ERC has raised the scientific level all over Europe," says Catherine Cesarsky, an astronomer at the French Atomic Energy Commission near Paris.

RESEARCH MELTING POT

Science thrives on collaboration — and the EU has partnered with other agencies (see 'European, but not EU') and creates myriad opportunities for researchers to pool ideas and cooperate.

Most of the funding for the EU's Framework programmes is reserved for projects in which partnerships are formed by at least three organizations from different countries. The last programme, FP7, which ran from 2007 to 2013, spent €41.7 billion of its €50.5-billion budget on some 26,000 joint projects, generating more than 500,000 pairs of collaborative links between research organizations, according to the commission. The Framework programmes also fund mobility grants that foster collaboration.

In less-well-off countries, meanwhile, structural funds equip researchers to work with their counterparts in more scientifically

developed nations, says Rémi Barré, an emeritus researcher at the National Conservatory of Arts and Crafts in Paris.

The gradual political, economic and research integration of the EU's member states has created an environment that is conducive to collaboration, according to geneticist Paul Nurse, head of the Crick Institute in London. Research is now embedded across the EU's activities, from the bloc's negotiation of the COP21 climate accord in December 2015 to its environmental-protection policies and regulatory bodies such as the London-based European Medicines Agency.

Contact between science ministers from different member states and researchers has become the norm, says Frank Gannon, former head of the intergovernmental European Molecular Biology Organization. By contrast, he recalls how fragmented European research was a few decades ago when he was a researcher in Ireland. "The sense of isolation of a researcher was massive." ■

Reporting by Alison Abbott, Declan Butler, Elizabeth Gibney, Quirin Schiermeier and Richard Van Noorden

CLARIFICATION

The News Feature 'The material code' (*Nature* **533**, 22–25; 2016) did not make it clear that the director of the Materials Genome Project is Kristin Persson, and that she has an affiliation with the University of California, Berkeley.