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SCIENCE POLICY

From "Science in Europe" to "European Science"

Early impacts of the European Research Council suggest shifts toward competition and excellence in EU-wide basic science.

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According to proposals of the European Commission (EC) for Horizon 2020 (*1*), the next Framework Programme (FP) for Research and Innovation will direct resources to three priorities: (i) excellence in Europe's science base; (ii) industrial leadership; and (iii) societal challenges. We examine the agenda for improving Europe's science base and discuss changes in the policy system, with a focus on the European Research Council (ERC). Describing the European-level policy system through its statement of added value and rationale, target of intervention, and science support organizations, we argue that it is transitioning from a period we term "science in Europe," to a period we refer to as "European science." Although we argue this transition in terms of clear differences, we acknowledge that, in reality, the process is gradual, nuanced, and far from complete.

From Science in Europe . . .

From the 1950s to the early 2000s, European science policy was "focused largely on supporting technology (application), whereas support for basic science rests firmly with member states" (*2*). This was shaped by the "principle of subsidiarity," which states that the European Union (EU) could act only when action by individual countries was insufficient and by a focus on industrial competitiveness stated by the European Treaty. It influenced two assumptions regarding the added value of, and rationale for, European-level policy. First, "European added value" was interpreted through different forms of subsidiarity and the coordination of national-level science and research (*3*); it was redefined often to accommodate changing and multiple goals of the EU FPs and became increasingly inoperable (*4*). Second, there was the assumption that Europe was a world leader in science, but was lagging in industrial and economic exploitation of scientific ideas (*5*, *6*). Thus, support was targeted at technology and application, lessening the perceived importance of publicly funded fundamental research for the industrial and economic future of Europe.

Hence, European-level science and research policy focused on applied research and development or on broad social conditions for research, such as collaboration and networking, while leaving development of the science to the national level. In parallel, multinational agreements pursued large-scale scientific endeavors and infrastructures [e.g., the European Organization for Nuclear Research (CERN) in particle physics].

This shaped the organization of science support at the European level, characterized by three types of organizations: field specific, intergovernmental large research facilities like CERN and the European Molecular Biology Laboratory (EMBL); umbrella organizations like the European Science Foundation (ESF) coordinating national activities (*7*); and the FPs with large budgets but no explicit focus on scientific research. Despite great ambitions and sometimes success (*8*–*10*), these organizations were (and are) focused on specific fields; lacked focus, funding, and authority; or did not place real emphasis on scientific excellence. Hence, overall science policy at the European level had no crystallizing organizational actor.

Correspondingly, European scientists competed for global recognition and mainly national resources. Both the availability of research funds and the conditions and criteria of funding varied greatly between countries. This contributed to the perceived underperformance of science in Europe as a whole, with blame attributed to its segmentation and fragmentation (*11*).

In addition, the FPs had an increasing variety of goals, including emphasis on cross-national networks, small and medium enterprises, and technology transfer. It became more difficult to identify strong, attributable, and intended effects of FP efforts (*12*), even for the core goal of industrial competitiveness. Although the FPs have had some positive effects in certain sectors, like the European telecommunications industry (*13*, *14*), their impact on industry at large remains much more opaque. Impact on scientific performance is also unclear. It has been suggested that, for universities, FP resources are just convenient sources of funding that do not generate structural effects (*15*).

. . . toward "European science"

Toward the end of the 20th century, assumptions about the added value of and rationale for science policy at the European level, as reflected in official documents, started to shift. First, the understanding of European added value changed to incorporate competition. In 2003, an expert group called for competition in the context of excellence in research to become "an essential part of a new, forward-looking definition of European added value" (*16*). A year later, this call was answered in official EC documents as "the added value which comes from competition at EU level" (*17*). This coincided with a change of focus marked by the notion of the European Research Area (ERA) (*18*) and included stated intentions for "integration" (*19*). Policy attention shifted from mainly coordinating national efforts to developing a pan-European science base. It also precipitated implementation, alongside tried and tested policy initiatives, of new instruments aiming to increase the level of integration in different aspects of the European science system (*20*).

Second, Europe had to recognize that its problems in science went beyond applications. By the late 1990s, it was recognized that European countries were lagging behind the United States and Japan both in science and its applications (*6*, *21*). European policy for science and research could no longer focus on technology and applications. Reframing science by introducing the notion of "frontier" research (*22*) by-passed the basic-applied divide and made it possible (i) to recast the EC as a funder of research, innovation, and science and (ii) to set up organizations that disrupted the established way of supporting research at the European level.

These two changes of policy assumptions and rationales made possible the establish-

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ment of the ERC in 2007, the first dedicated research-funding agency at the European level to support investigator-driven research, with a focus on excellence. The ERC aims to support risky, adventurous research and to create leverage toward structural improvements in the research system of Europe (*23*) and a "truly European research base" (*24*).

The ERC is different from the organizational arrangements discussed above in five substantive ways: It (i) explicitly focuses on supporting research at or beyond the frontiers of knowledge; (ii) supports investigator-driven, rather than programmatic, research; (iii) has a budget and allocates funding (unlike the ESF and European Cooperation in Science and Technology); (iv) has few clear and targeted goals (unlike the FPs); and (v) uses peer-reviewed scientific excellence as the sole criterion for selection rather than as a discourse for achieving other political goals.

These objectives are pursued through two main funding instruments (*25*): Starting Independent Researcher Grants targeting researchers at relatively early career stages and Advanced Investigator Grants meant for researchers at the forefront of their fields. Legally, the ERC is an EC executive agency tasked with administering the IDEAS Programme (*26*). However, the Scientific Council has guaranteed autonomy to decide its scientific direction and to implement its work program. Although the ERC is still comparatively small (*27*), it embodies distinguishing characteristics of the new stage in European-level science and research. It is the organization congruent with the transformed policy rationales and targets and marks the emergence of European science.

Where We Stand and Early Effects

European-level science policy is still a mixture of cooperation and competition, scientific excellence and political goals, and established and novel organizations. The transformation discussed in this article is at an early stage; its future and long-term prospects unclear. On one hand, EC proposals for Horizon 2020 suggest a 77% funding increase for the ERC. On the other hand, the legal position of the ERC as an executive agency generates tensions mainly associated with the relation with the EC and the appropriateness of its financial rules and regulations in light of its objectives. There is also strain between the inherently long-term agenda of the ERC and political pressures for short-term effects.

European science as a new policy platform, and the ERC as one of its key distinguishing features, could have far-reaching effects on the science base; indeed, early impact already can be glimpsed. EURECIA (*28*) studied the effects of the ERC and its funding schemes on (i) researchers, research, and careers; (ii) universities and research institutes; (iii) national funding; and (iv) European funding.

Many of the projects the ERC supports are innovative and work on or exploit recent scientific innovations (*29*, *30*). The ERC has had some effects on universities and research organizations in Europe (*31*). These are most pronounced in organizations ranking just below the top research performers, which use ERC grants to develop and implement structures and practices conducive to research excellence, like support for grant preparation and administration; ERC as a marker for research excellence also enables them to perform, compete, and align their activities in a European, rather than national, context.

At the national level, establishment of the ERC provided impetus for an overhaul of systems that did not include dedicated research funding agencies (*32*), such as in France and Poland, where the ERC was the model for a research funding agency. At the European level of the funding landscape, the ERC has coshaped a number of changes, e.g., strengthening the importance of excellence for the ERA agenda, changes in traditional principles in EU support to research by supporting individuals rather than organizations, and no "just retour" (*33*).

European science policy and organization are undergoing a transformation, and early evidence suggests wide-ranging effects on the science system; but only time, and more research, will tell whether these intended effects will bloom or wither away.

References and Notes

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18. The notion of ERA, adopted in 2000, can be regarded as a means to achieve the ambitious targets of the Lisbon Strategy of the EU. Initially, ERA focused on creating an "internal market" in European-level research by aligning national effort and integrating research capacity. During the last decade, it has broadened its remit to incorporate, among others, the promotion of excellence in European-level research.
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25. More recently, the ERC introduced two more schemes: the Synergy Grant and the Proof-of-Concept grant.
26. IDEAS is one of four main program lines of FP7: "The objective … is to reinforce excellence, dynamism and creativity in European research and improve the attractiveness of Europe for the best researchers from both European and third countries … by providing a Europe-wide competitive funding structure, in addition to and not replacing national funding, for 'frontier research' executed by individual teams"; http://cordis.europa.eu/fp7/ideas/home_en.html.
27. During the 7th FP, ERC's budget was €7.51 billion (U.S. $9.76 billion); http://erc.europa.eu/facts-and-figures.
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