

Mapping the landscape of research funding

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Credit: Charles Rondeau/public domain

(Phys.org)—It usually goes unspoken, but science research is highly resource dependent. Working scientists are largely preoccupied with applying for grants, deepening their networks, enhancing ties with funding organizations, and assembling research collaboratives that are likely to attract funding. All of this is directly orthogonal to the practice of science, and comprises a host of skills not normally addressed by

science training that early-career research scientists have to master.

Additionally, the landscape of science [funding](#) has shifted dramatically in recent decades. Understanding which [research](#) institutions and investigators are likely to attract funding and how they fit into networks of other science institutions is key to understanding the topology of this landscape and how it might evolve. A collaborative of European researchers has applied network theory to a public database of 43,000 government-funded research projects over a span of three decades in order to weigh the importance of network relationships in attracting grants. They have published their results in the *Proceedings of the National Academy of Sciences*.

It's important to understand that most research projects are collaborative, involving the engagement of institutional researchers both internally and externally. The authors of the current study wondered specifically what role funding plays in the formulation of research partnerships. Based on the [public database](#) of grants, they constructed two types of networks. First, they referred to a project partnership between a primary investigator and a collaborator as an edge and the resultant network as the investigator network. Second, they referred to a project partnership between the affiliations of a primary investigator and a collaborator as an edge and obtained the affiliation network.

In analyzing these network structures, they found that over the time period investigated, inequality arose in the distribution of funding, which was noticeable at the institutional level as the leading universities diversified their collaborations and became the knowledge brokers in their networks of collaboration. And they also determined that elite universities formed a cohesive network core, in essence, a "rich club" that overattracted resources but which produced research with notable breadth and depth.

"This is likely to have arisen due to their ability to develop a broad range of expertise and extend partnerships with specialist entities," the authors write. "In addition to that, these universities formed the very center of a rich core through their strong reliance."

The authors note that although many in the research community would be alarmed at this inequality of funding, the effects were not particularly adverse, at least as far as the quality and variety of research are concerned. They found that other well-funded institutions that did not have the elites' capacity for expansion nonetheless benefited from their associations with members of the "rich club."

The study reveals how collaboration networks evolve in response to funding incentives; the researchers observe that a more thorough exploration of the subject, including a weighted version of the networks they defined, would vastly improve the map for researchers attempting to navigate the landscape of [research funding](#). Perhaps a collaboration with [network](#) researchers at other elite institutions could attract the funding for such and effort.

More information: Anatomy of funded research in science. *PNAS* 2015 ; published ahead of print October 26, 2015, [DOI: 10.1073/pnas.1513651112](#)

Abstract

Seeking research funding is an essential part of academic life. Funded projects are primarily collaborative in nature through internal and external partnerships, but what role does funding play in the formulation of these partnerships? Here, by examining over 43,000 scientific projects funded over the past three decades by one of the major government research agencies in the world, we characterize how the funding landscape has changed and its impacts on the underlying collaboration networks across different scales. We observed rising

inequality in the distribution of funding and that its effect was most noticeable at the institutional level—the leading universities diversified their collaborations and increasingly became the knowledge brokers in the collaboration network. Furthermore, it emerged that these leading universities formed a rich club (i.e., a cohesive core through their close ties) and this reliance among them seemed to be a determining factor for their research success, with the elites in the core overattracting resources but also rewarding in terms of both research breadth and depth. Our results reveal how collaboration networks organize in response to external driving forces, which can have major ramifications on future research strategy and government policy.

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