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Mapping Philanthropic Support of Science

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Extended Abstract

Nonprofit organizations and foundations play a crucial role in supporting science, representing around 44% of basic research funding at US universities [2]. Unfortunately, our current understanding of scientific funding has primarily been limited to federal agencies, while in philanthropy, we have only been able to study subsets of donors [3]. However, the recent release of US nonprofit tax records by the Internal Revenue Service (IRS) has enabled us to capture the complete swath of philanthropic foundation donors. Our analysis, the first of its kind, reveals a large number of nonprofit funders offering a wide range of support. We find that philanthropic funders tend to support geographically close recipients, with grant-giving relationships becoming increasingly entrenched over time. Furthermore, the bipartite network of supporters and recipients contains predictive power, allowing us to forecast future funder-recipient relationships.

To track philanthropic funding to science we collect and disambiguate over 10 million grants listed on tax returns of 685,397 non-profit organizations in the US from 2010-2019. We identify a subset of organizations involved in scientific research and higher education, finding 695,917 grants, totaling over $200 billion to science. We next constructed a network in which nodes represent organizations, and a directed weighted link captures the grant amount from a funder to a receiver.

In contrast to federal funds distributed nationally, philanthropic funding is strongly focused locally. If grants were distributed randomly across the nation (preserving the number of recipients in each state), about 5% of grants would be awarded in the donor's home state. In contrast, we find that 49% of grants in the donor's state, a locality nearly 10-fold the random baseline. Likewise, when we examine grants over time, we find that 71% of grants repeat one year later, and for the 27,384 funding relationships ongoing for 7 years there is a nearly 90% likelihood to continue. Funding relationships that persist over multiple years are also likely to involve higher annual amounts.

Finally, a common phrase in philanthropy says "if you've met one funder, you've met one funder," implying that each foundation has its own priorities and little can be gleaned from one funder's priorities about another. However, we find evidence of predictability in funding patterns. We examine a subset of funders active in both 2018 and 2019 and use the bipartite Adamic-Adar Index (AA) to predict new relationships [1, 4]. We find that the predictions obtained from the AA index from 2018 have strong predictive value for 2019, resulting in a remarkably high area under the receiver-operator curve (AUROC) of 0.87.

These findings have important implications for researchers, foundation funders, and government policymakers. Applying novel tools from machine learning and network science to philanthropic data could improve funding allocation, help funders better provide for recipients, boost recipient access to philanthropic resources, and enable policymakers to increase the impact of philanthropic funding.

References

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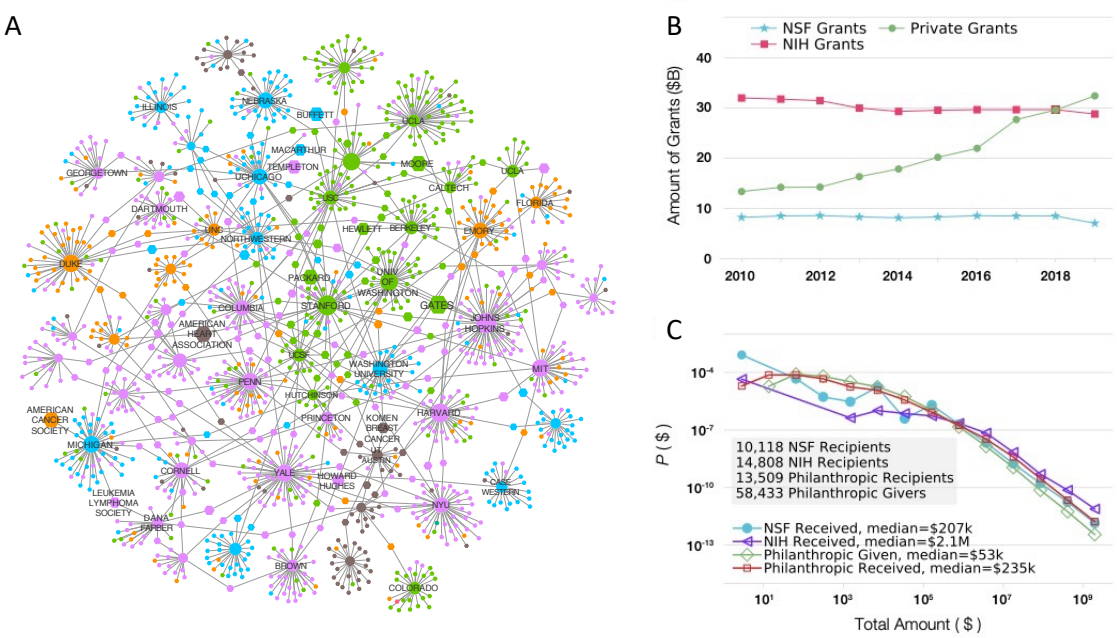

Figure 1: **The Philanthropic Ecosystem of Science.** A) The network of major funders and recipients. We show a network of 55 recipients (circles) and 1254 donors (octogons) with 1422 grant relationships between them. Nodes are colored by US region with purple being northeast, blue being midwest, green being west, brown being southwest, and orange being the south. We see that most donors have their top recipient/s in the same region. B) The amount of grants provided to institutions performing research by private nonprofit organizations has grown considerably over the past decade, surpassing the amount of grants given by the NSF and NIH. C) The distribution of the total amount of science-related grants given or received by philanthropic organizations, compared to grants distributed by NSF and NIH. Note that while the NSF, NIH, and philanthropy all support similar numbers of recipients, there are far more philanthropic donors than recipients.