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Biographies of Scientific Ideas: The Diffusion of Knowledge in Medicine and Sociology

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Abstract

Currently, more than a million scholarly articles are published *per year*. Understanding how these journal articles, often the primary unit of scientific research, are consumed over time by the scientific community is essential to understanding the production and dissemination of knowledge. Conventionally, the main strategy used to gauge the impact of scientific research is to count the number of citations received. The central problem with this approach is that citation counts do not distinguish between the context of the citation (e.g., the difference between positive, critical, and symbolic) nor do they consider the source of the citation (e.g., the difference between 100 detailed references from area experts and 100 ceremonial mentions from non-specialists). Citation counts thus reveal very little about how researchers actually use and interpret existing knowledge, which directly impedes our ability to meaningfully gauge the impact of scientific research. The purpose of this project is to develop new insight into how knowledge accumulates by systematically examining how a set of seed publications are incorporated, distilled, and expanded upon by a set of potentially connected citing publications. This entails compiling a large, longitudinal dataset of focal articles and their citation histories, which will then be analyzed as life histories. The methodological strategy is a unique combination of quantitative and qualitative approaches (citation context analysis, co-citation analysis, citation network analysis) that allows for the "thick description" of issues related to time, interpretation, audience, and disciplinary context.

This project focuses on a large sample of flagship journal articles from two disciplines: sociology and medicine. The results will thus inform long-standing questions about how knowledge accumulates in the 'hard' versus 'soft' sciences. In addition, studying the diffusion and incorporation of medical findings has practical implications for health policy makers, addressing recent claims that clinical research studies typically go unchallenged in the medical research community. Finally, the data generated from this project create new opportunities to study the diffusion of innovations, networks, and social influence. First, by following a cohort of papers published at the same time, the research avoids retrospective sampling on "winning" innovations. Second, for each seed article, the timeline and connectedness of its adopters can be directly mapped via direct citation links as well as co-citation links. Third, unlike most kinds of adoption data (e.g., sales data), citation choices give us some insight into *how* an innovation was adopted. The content of the citation provides new data on whether some citers are more influential than others in publicizing certain aspects of an innovation.

Broader Impacts

This historical study is designed to produce new insights into what advancement in science actually entails. Examining how ideas are used and incorporated provides a foundation for evaluating the logic and efficiency of knowledge accumulation in science. In the long-term, these insights will enable the development of metrics that describe the use-value of the myriad "new" ideas put forth each year in science. The project thus facilitates the creation of new empirically grounded tools that science and innovation policy makers can use to gauge the scientific impact of research publications and individual scholars.