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Benjamin F. Jones

Modern Genius Found in Teams, Not Individuals

**Benjamin F. Jones, Brian Uzzi, Kellogg School of Management
Stefan Wuchty, NICO**

An acclaimed tradition in the history of science highlights the role of individual genius in scientific discovery. This tradition can be seen in the tendency to equate great ideas with particular names, such as the Heisenberg uncertainty principle, Euclidean geometry, Nash equilibrium, and Kantian ethics.

Yet, especially in recent times, collaborations between scholars are more frequent in many fields. In “The Increasing Dominance of Teams in the Production of Knowledge,” Stefan Wuchty, NICO, and Ben Jones and Brian Uzzi of Kellogg present a systematic analysis of teamwork across all fields of science, engineering, social sciences, arts and humanities, and patenting. The authors searched 19.9 million papers published over the most recent five decades and more than 2.1 million patents over a similar time frame (see *Science* 316:1037-1039, 2007 and “Why Do Team Authored Papers Get Cited More,” *Science (Letters)* 317:1496-1497, 2007).

The team’s findings show that science has been changing fundamentally, and in a remarkably universal way. First, research is increasingly done in teams across virtually all fields. In the sciences, average team size has grown steadily each year and nearly doubled from 1.9 to 3.5 authors per paper over 45 years. Nearly 100 percent of 171 different fields of science and engineering, 54 fields of social sciences, and 36 patenting fields show an increased propensity for co-authorship over time—even 90 percent of arts and humanities fields show this rise in teamwork.

The relative research impact of team-authored papers also is growing. Teams typically produce more highly cited research than individuals do and this advantage



Brian Uzzi



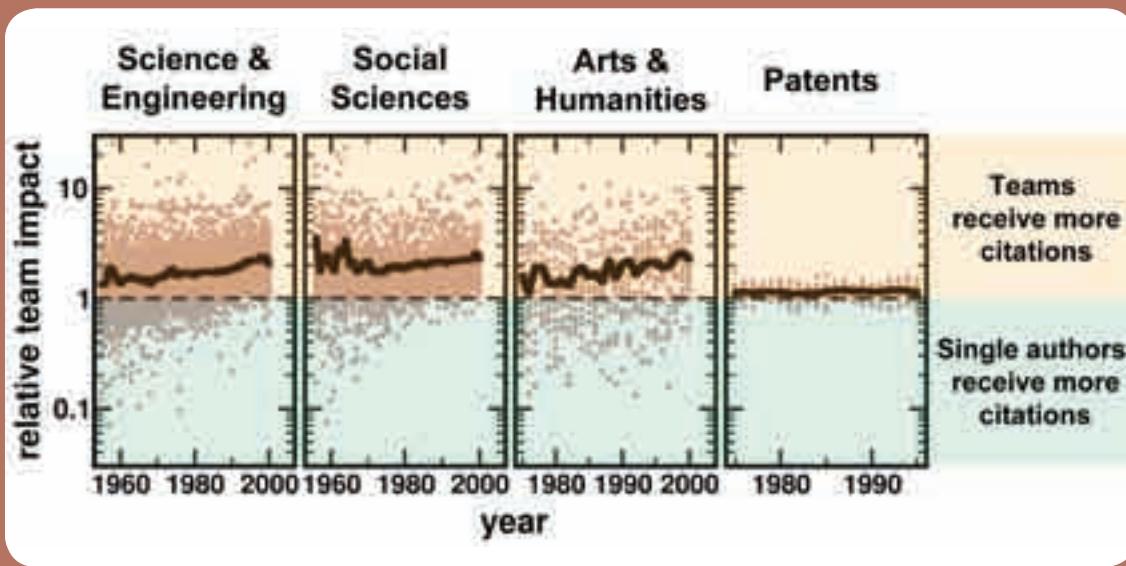
Stefan Wuchty

Photo by Robb Hill

is increasing. Perhaps most importantly, teams now produce the exceptionally high impact research, even in fields where that distinction was once the domain of solo authors.

While analysis of root causes of these trends will be left to ongoing work, the findings substantiate that the contest between collaboration and individuality appears to increasingly favor teamwork. This change is likely to reshape research with implications for how we train scholars, reward individuals, integrate newcomers, organize research, allocate funding, and boost scientific and technical progress.

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The core findings showing the systematic relationship between teamwork and the quality of scientific research is summarized in our measure of relative team impact (RTI), which computes the mean number of citations received by team-authored work divided by the mean number of citations received by solo-authored work. RTI greater than 1 indicates that teams produce more highly cited papers than solo authors and vice versa for RTI less than 1. Each dot in the graph is the RTI for a particular field in a particular year. The black line is the average across the underlying fields. While teams underperformed solo authors in many fields in the 1960s, teams now outperform solo authors in virtually all fields.