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A system for predicting scientific impact over time?

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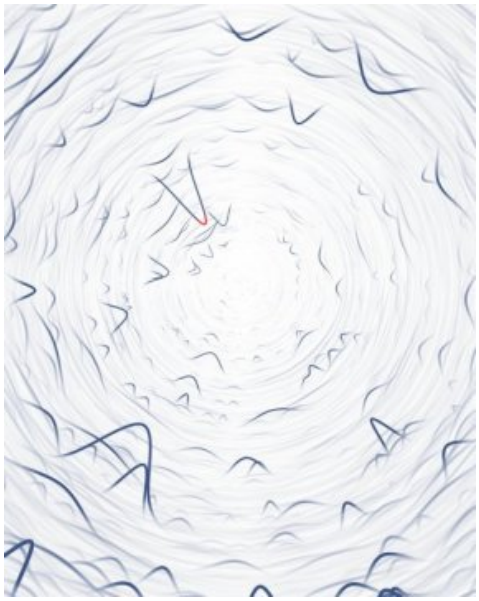
Summary: The impact a scientist will have in their lifetime is distributed randomly over the sequence of studies they publish, according to a new study. This phenomenon can be described by a simple model in which a scientist's impact is a function of factors including productivity and ability, the study shows.

FULL STORY



This set of visualizations represents the career of a scientist as a line, where each bump represents the impact (number of citations) of a paper. The larger the bump, the bigger the impact. When looking at thousands of these lines we see that success is randomly distributed within careers -- the highest impact publication could be the first publication, could appear midcareer or could be a scientist's last publication. This random impact rule holds true for scientists who work alone, in groups, in different disciplines, in different decades, and for different lengths of time.

Credit: Image by Kim Albrecht, data image by Roberta Sinatra

The impact a scientist will have in their lifetime is distributed randomly over the sequence of studies they publish, according to a new study. This phenomenon can be described by a simple model in which a scientist's impact is a function of factors including productivity and ability, the study goes on to show.

Previous research on creativity has suggested that major discoveries come early in a career, after which chances of making a breakthrough drop quickly, perhaps due to waning ingenuity or increased administrative duties. In reality, though, little is known about just how scientific impact emerges and

changes over time.

Here, to better understand this space, Roberta Sinatra and colleagues analyzed the careers of thousands of scientists, focusing on their scientific publications.

The team's evaluation confirmed that many scientists publish their most creative and defining work within two decades of starting careers, as has been thought, but it also showed that productivity exhibits this same early peak, suggesting that influential scientific thinkers break through at younger stages not because youth is intertwined with creativity but because youthful scientists produce more work early in their career. To further explore the roots of creative success without productivity, or age, as factors, the researchers arranged every paper the scientists had published in chronological order, asking if the highest impact paper was among the earliest, or otherwise.

The highest impact papers were rarely the scientists' earliest ones, they found. Instead, the biggest hits were completely random. This random impact rule allowed the researchers to develop a model to predict career impact based on an element of randomness, scientist productivity, and a factor Q particular to each scientist. Their results, which will contribute to ongoing dialogues about how to gauge an individual scientist's potential, suggest that scientific success can be had at any age.

Story Source:

Materials provided by **American Association for the Advancement of Science**. *Note: Content may be edited for style and length.*

Journal Reference:

1. R. Sinatra, D. Wang, P. Deville, C. Song, A.-L. Barabasi. **Quantifying the evolution of individual scientific impact**. *Science*, 2016; 354 (6312): aaf5239 DOI: 10.1126/science.aaf5239

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