

Scientific papers that use old and new knowledge get the most attention

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Credit: Charles Rondeau/public domain

An examination of millions of scientific papers and patents reveals works that land in the top 5 percent of the most cited research draw upon a mix of old and new knowledge—significant in a day and age when the number of new publications is increasing dramatically, says a researcher at the University of Michigan.

Daniel Romero, assistant professor at the U-M School of Information, and colleagues from Northwestern University analyzed more than 28.4 million [scientific papers](#) in the Web of Science and nearly 5.4 million U.S. patents to determine which works were cited the most and why. They found what they referred to as the hotspot in which researchers doubled their chance of being cited.

This hotspot occurred when the research used a low mean age and high age variance, in other words when it included the latest information available in combination with some tried-and-true research from the past.

"It is natural for scientists to gravitate towards popular and 'hot' research topics and ideas," Romero said. "While focusing on solving recent problems and being aware of the state-of-the-art is crucial to make impact, we find that this is only half of the story. Old and established [knowledge](#) is also important and should be part of our thinking when we do research."

The authors note the vast acceleration in the production of new knowledge and the tendency for researchers to think newer is better. On the Web of Science, 1.5 million new articles were published in 2014 alone, sextupling since 1970, while the U.S. issued 287,831 patents in 2013, quadruple the number in 1970.

The researchers found these patterns to be true across science and technology fields. They also found that research involving collaborations was more likely to land in the hotspot than the work done by a solo researcher, which they say is not surprising since a team is likely to bring broader, more diverse knowledge to a problem than one individual.

"Our results have significance to the way researchers approach the search for ideas to draw on when they formulate their research," Romero

said "Our results also have implications for academic search engines. Search engines could take our findings into account when developing ranking algorithms to avoid over-ranking recent works and providing users a healthy mixture of new and old papers."

More information: Satyam Mukherjee et al. The nearly universal link between the age of past knowledge and tomorrow's breakthroughs in science and technology: The hotspot, *Science Advances* (2017). [DOI: 10.1126/sciadv.1601315](https://doi.org/10.1126/sciadv.1601315)

Provided by University of Michigan

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