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'Precocious' early-career scientists with high citation counts proliferate

Researchers have questions about how so many authors have racked up a large number of citations so quickly, although some of those authors are honest overachievers.

By Alix Soliman

In 2023, more than 450 scientists who had begun publishing research only in the previous eight years were among the ranks of most-cited researchers. Credit: Getty

The number of 'precocious' scientists — those who become top-cited authors early in their careers — has surged in the past few years, according to an analysis[1] of the publishing records of hundreds of thousands of scientists.

Many of these precocious authors publish what the analysis calls an 'extreme' number of papers — an average of more than one per week. The analysis also found that these authors often cite their own papers at a rate well above the average. Some level of such 'self-citation' is common in scientific papers, but the average rate is around 13%, whereas some of these authors' rates were 25–50%.

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The analysis was posted on the bioRxiv preprint server on 15 October and has not yet been peer reviewed. However, another researcher who was not an author of the analysis says its methods seem sound.

Some of the precocious authors show no signs of questionable publishing habits and probably made it on to the list through talent and hard work, says John Ioannidis, the author of the preprint and a physician at Stanford University in California who specializes in meta-research, the study of how research is done.

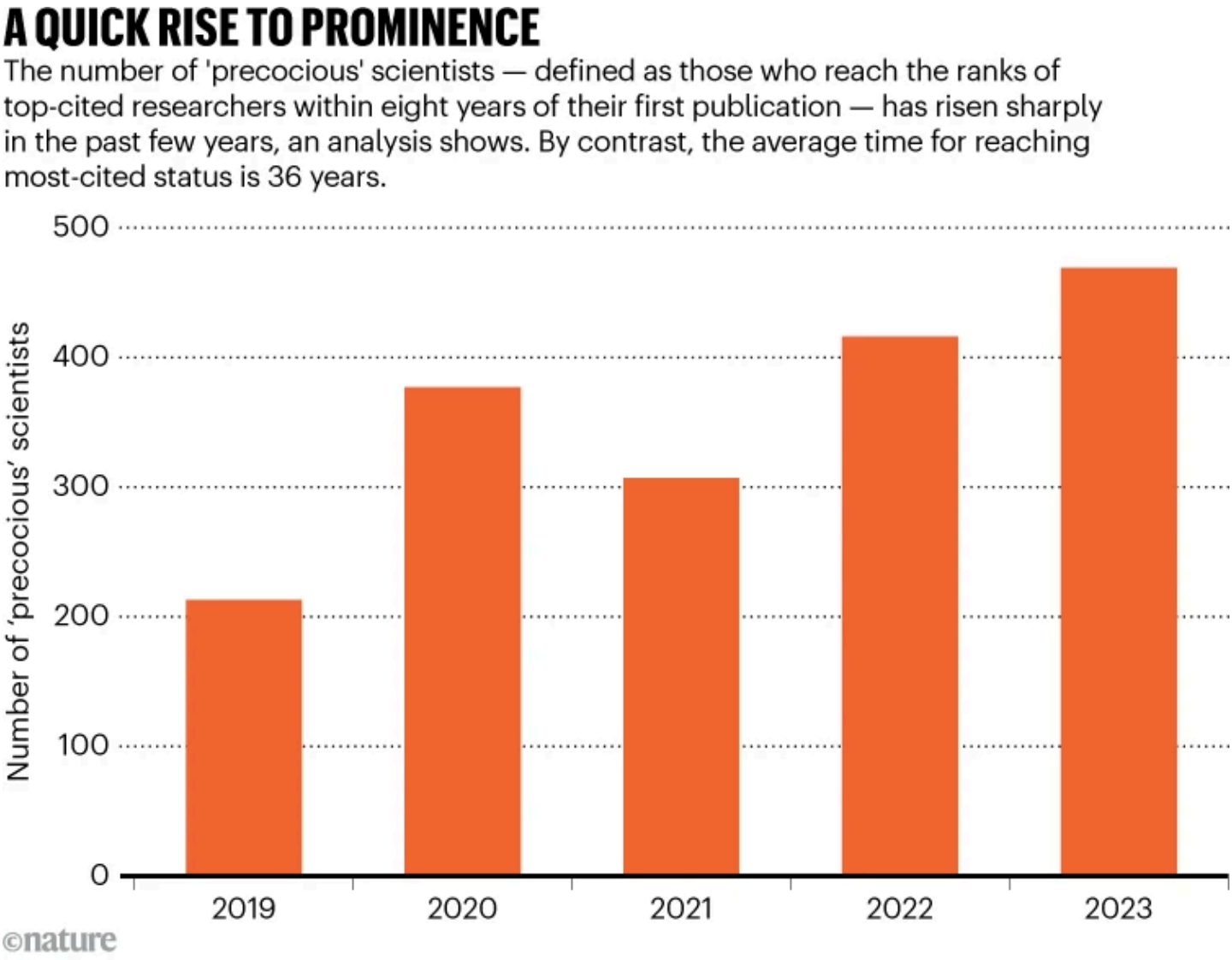
But scientists say the trend raises questions about how so many authors have racked up such a large number of citations so quickly.

Zach Adelman, an entomologist at Texas A&M University in College Station, says that although there are probably true overachievers in the mix, "I don't think that we're all of a sudden mass-producing more geniuses now than we were five years ago."

Early achievers

Ioannidis used data from the Scopus citation database to compile a list of top-cited researchers on the basis of a metric he calls a "composite citation indicator", which takes into account the varying levels of contribution by a paper's co-authors. The index combines data including the total number of citations a researcher's work has accrued, the scientist's placement on each paper's author list and the individual's *h*-index, a measurement of research output that includes citation count and number of publications.

Ioannidis used the composite index to identify top-cited scientists: those whose citation indices are in the top 2% for their field or in the top 100,000 across all fields. He defined "precocious" scientists as those who reached the top-cited list within eight years of their first publication, and "ultra-precocious" as those who did so within five years. By contrast, the average time from first publication to most-cited status was 36 years.



Source: Ref. 1

The analysis revealed a marked rise in the number of top-cited early-career researchers between 2019 and 2023, the period for which Ioannidis has complete data. During this time, the number of precocious authors increased from 213 to 469, and ultra-precocious authors increased from 28 to 59.

Digging deeper into the data, Ioannidis found that 31% of the ultra-precocious authors cited themselves more often than did 95% of the authors in their field, and that 20% fell off the top-cited list when self-citations were excluded. When Ioannidis included some 2024 data, he found that 17 of the authors who qualified as ultra-precocious had had at least one paper retracted.

There can be innocent explanations for such findings: authors can retract their own papers after catching honest mistakes, and scientists might cite themselves frequently if they are especially productive. But a large body of retractions or a high rate of self-citation could also be a sign of unusual publishing behaviours, Ioannidis says.

Domingo Docampo, a specialist in statistical signal processing at the University of Vigo in Spain who has used some of the same metrics to investigate citation fraud, says that the methods used in the study are sound. "The

indicators are believable and can be useful for anyone doing evaluations of researchers," he says.

Citation red flags

Ioannidis found that some researchers had not only cited themselves heavily but also accrued a relatively large number of citations in a relatively small number of papers. The findings suggest that scientists are engaging in attempts to improve their *h*-index, Ioannidis says. For instance, some of the precocious authors had published what he calls "sometimes nonsensical papers" that included dozens or even 100 citations to their own papers, he says.

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Scientists often have a strong incentive to engage in such behaviour, says Ivan Oransky, co-founder of the media organization Retraction Watch, which tracks paper retractions. In some countries, universities consider an academic's *h*-index in the hiring process and when they award grants and promotions, he says, motivating researchers to improve that metric.

Elisabeth Bik, a research-integrity consultant affiliated with Stanford University in California, says that she and other sleuths could use Ioannidis's analysis as an initial screening tool.

Stand-out research

Mark Czeisler, a 27-year-old medical student at Harvard Medical School in Boston, Massachusetts, who has a PhD in psychology, appears on Ioannidis's ultra-precocious list, indicating that his work racked up a large number of citations early in his career. But his record does not raise flags, because it shows no signs of publishing practices that Ioannidis finds suspicious. Ioannidis says Czeisler is an example of an honest researcher whose enterprising work has garnered a lot of attention.

Czeisler and his colleagues worked with the US Centers for Disease Control and Prevention to publish, in 2020, some of the first US survey results on substance use and mental-health issues during the COVID-19 pandemic. That paper[2] has received more than 2,000 references.

Czeisler acknowledges concerns about appearing on a list beside authors whose practices are open to question, but he thinks that if used correctly, a tool that screens scientists for worrisome publishing patterns will benefit science. "Preventive and proactive measures are extremely important," he says.

Ioannidis suspects that the list "includes some of the very best and some of the very worst". It's up to the sleuths to work out who's who.

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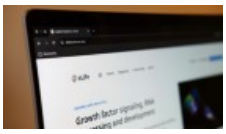

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