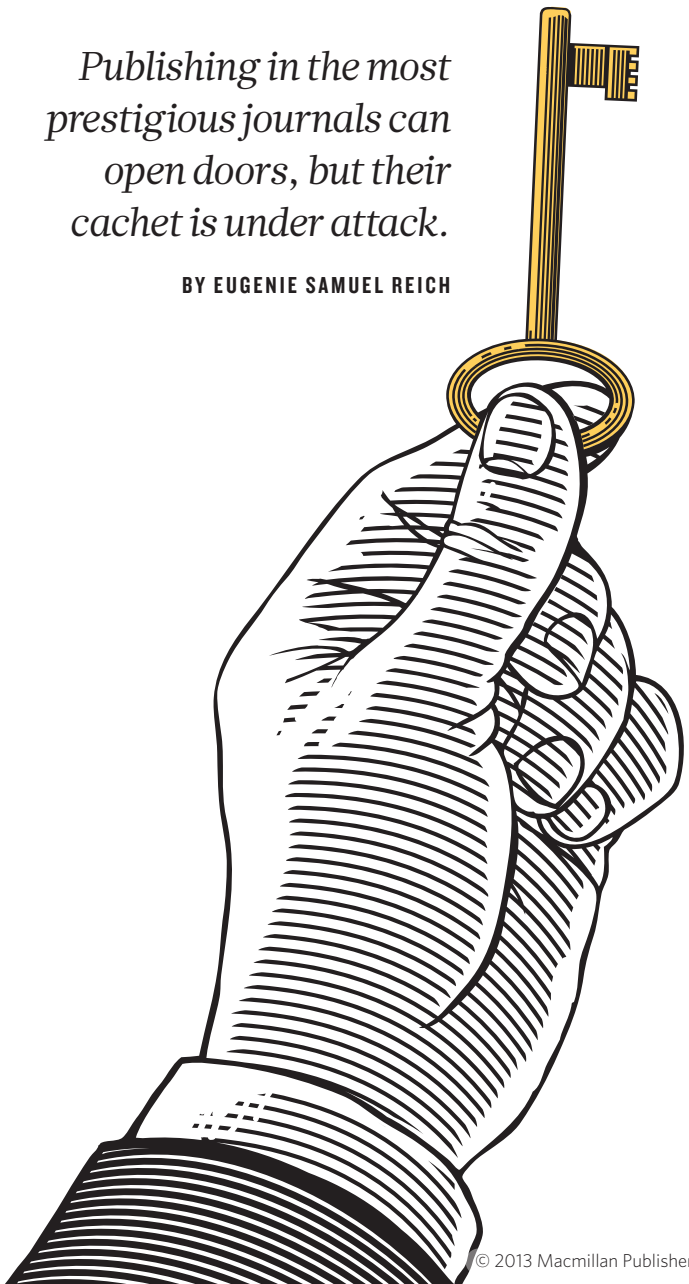
THE GOLDEN CLUB

Publishing in the most prestigious journals can open doors, but their cachet is under attack.

BY EUGENIE SAMUEL REICH



LESTYAN/SHUTTERSTOCK

Jeffrey Rimer has noticed a change in the way other scientists treat him since his paper on kidney-stone growth inhibitors appeared on the cover of *Science* three years ago. When his colleagues introduce him, they often mention his publications or the publicity he has garnered, which he interprets as a nod to his *Science* paper[1]. "From the reaction of colleagues, it's almost like you've joined a club," says Rimer, a chemical engineer and assistant professor at the University of Houston in Texas. "Fair or unfair, it's like you've proved you can do good science."

Researchers often say that publishing in prestigious journals can make a career. And for decades, the most sought after of the bunch have been *Nature* and *Science* — broadly read journals that reject more than 90% of the manuscripts they receive. A paper in one of these journals, it is said, can bring job opportunities, invitations to speak, grants, promotions and even cash bonuses and prizes. Rimer believes that his *Science* paper contributed to his winning a grant from the Welch Foundation, a chemical-research funding organization based in Houston, in 2012, and he expects that it may help when he seeks tenure at his university.

His impressions echo what many other scientists say — often with gritted teeth — about premier journals. But the publishing world is rapidly changing, and the leading titles are facing increasing competition. The push for open-access publishing has gathered steady steam; more than 5,000 open-access journals have been launched since Rimer's paper was published in October 2010. These journals, along with the more established open-access publications, are attracting a growing share of submissions, threatening the hold of the leading journals.

Beyond that trend, some advocates for the open-access movement have specifically attacked *Science* and *Nature*, which they label as 'glamour journals'. They say that the journals' prestige is part of a business model in which hot findings are flaunted as a way to justify their subscription rates. And many senior scientists worry that too much attention is paid to where people publish rather than to what they have done — that *Science*, *Nature* and similar publications hold too much sway over the careers of working scientists. "It's like a kind of addiction," says Stephen Curry, a structural biologist at Imperial College London who has been vocal about the issue on his blog, Reciprocal Space.

To get a sense of whether the changes in the publishing landscape have altered the allure and impact of top-tier journals, *Nature* interviewed Rimer and several

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VIEWS FROM THE LAB BENCH

ANKE BILL
Says that her *Cell* paper helped her job search.

YINGJIE PENG
Says that astronomers do not generally care where papers appear.

ANNELE VIRTANEN
Says that her *Nature* paper opened doors outside her field.

JEFFREY RIMER
Says that his *Science* paper helped him to win a grant.

PING CHI
Says that her *Nature* paper helped to start a clinical trial.

ILLUSTRATIONS BY MARTIN HARGREAVES, BASED ON PHOTOGRAPHS BY PJ KASZAS/NOVARTIS (AB); KELVIN FAGAN/UNIV. CAMBRIDGE (YP); RAIJA TORRONEN (AV); MSKCC (PC)

other early-career researchers who published for the first time in *Nature*, *Science* or other journals in October 2010 (see 'Views from the lab bench').

Several of those researchers say that three years on, they feel that getting a paper in a premier journal helped their careers in concrete ways. Although they cannot know how their careers would have unfolded without these high-profile publications, what they believe is still telling. It is why some of them are reluctant to join established scientists who say that they will not submit to *Nature* and *Science* as a matter of principle, a step many younger researchers are unwilling to take.

Yet critics are working hard to change how researchers — and those who assess their work — judge the value of different publications. Sandra Schmid, head of the cell biology department at the University of Texas Southwestern Medical School in Dallas, is one of many academics advocating ways to identify promising candidates other than simply looking for leading journals on their CVs. "The drive to publish in these journals does more harm than good," she says.

PUBLICATION PUBLICITY

Ping Chi, a medical oncologist who landed a paper[2] in *Nature* three years ago, says that she got an important boost towards launching a clinical trial of new cancer drugs, which is now starting up. Her paper investigated how two proteins stabilize the survival of gastrointestinal tumours. Had it been published in a lesser-known journal, she says, she might still have been hired by Memorial Sloan-Kettering Cancer Center in New York, but she probably would not have received such a generous start-up package and would have spent some of the past two years raising funds. Instead, she put her energy into persuading her collaborators and pharmaceutical companies to support the clinical trial of a therapy that inhibits the proteins.

The *Nature* paper, Chi says, helped to establish her work as a significant advance, especially because it received media attention (thanks in part to a press release issued by *Nature*'s press office).

In some developing countries, publishing in top-tier journals has extra appeal; researchers in China and India sometimes receive bonuses or salary increases when they get papers into *Science* or *Nature*. Yingjie Peng, a Chinese-born astrophysicist and postdoctoral researcher at the Cavendish Laboratory of the University of Cambridge, UK, says that if he were to seek a faculty position in China, it would be invaluable to have a *Nature* or *Science* paper. "Government officials may not understand the work — the easy thing to do is compare journals," he says.

Peng argues that publishing in elite journals is less important in the United States and the United Kingdom. Most astronomers see papers as soon as they are posted to the arXiv.org preprint server. And where a paper is published is not as important as who did the work and how technically adept it is. Peng is doing well in terms of recognition; his paper[3] on galaxy evolution, published in *The Astrophysical Journal* three years ago, has already received a substantial count of more than 150 citations.

The Astrophysical Journal allows longer papers than *Science* and *Nature* typically would, which gave Peng a chance to fully explain his method for extracting laws of galaxy evolution from data rather than deriving them entirely theoretically. He credits the paper with helping him to get his position at the Cavendish.

Anke Bill, a cell biologist at the Novartis Institutes for Biomedical Research in Cambridge, Massachusetts, had a similar experience with her 2010 paper[4] in *Cell*, a specialized journal that is highly prestigious in the biological sciences. Her paper focused on cytohesins, proteins thought to be involved in human lung cancer. Bill says that she and her adviser had initially aimed for the wider exposure that would come from publishing in *Nature*. But they say that they received a tough set of reviews that required more experiments. When Bill resubmitted the paper with the extra data, *Nature*'s editors decided that the paper was too long and technical, she says, but *Cell* accepted the paper in its expanded form.

Bill says that beyond the world of biomedical science, a *Nature* or *Science* paper would have boosted her reputation more. But within her field, she says, the *Cell* paper had a big impact. It may have helped her to land her current position, especially because the laboratory at the German university where she did her PhD was not well known outside that country. The *Cell* paper showed that she could develop and test a promising novel hypothesis. "I got positive feedback everywhere I applied," she says.

Other researchers point to the advantages of less selective journals, such as *PLoS ONE*, which publishes a high volume of papers online. Nicholas Longrich, was a postdoc in palaeontology at Yale University in New Haven, Connecticut, when he published his 2010 paper[5] in *PLoS ONE* showing evidence of cannibalism in *Tyrannosaurus rex*. "The fact that you probably won't get it rejected and have to submit elsewhere means you can get your work out quickly," he says.

Longrich also liked that *PLoS ONE* is open access, which made it easier for his *T. rex* work to be read by others. Still, he says that he did not land his current job as a lecturer at the University of Bath, UK, until he published three more papers, in subscription-based journals (*Nature*, *The Proceedings of the National Academy of Sciences* and *Current Biology*). "Did *Nature* help my career more than *PLoS*? I can't prove it, but I think so," he says.

MEASURING IMPACT

Critics of the status quo object to evaluating research on the basis of where it is published. The shorthand way to do this is by the journal impact factor — an index kept by Thomson Reuters, an information-services company based in New York. A journal's 2013 impact factor, for example, would be computed by summing the number of citations garnered this year to papers published in that journal in 2011–12 and then dividing that sum by the number of papers the journal published during that span.

Curry, who received hundreds of comments

on his blog when he criticized impact factors in 2012, says that *Nature* and *Science* may command high reputations in part because they have high impact factors (38.6 and 31, respectively, in 2012), but those figures are averages that are pulled upwards by a few very frequently cited papers. It is not rational, he says, for papers that are not cited as often to get a boost just because they come out in the same journal.

Some experts are taking active steps to challenge the sway of the leading journals. In December 2012, hundreds of scientific leaders, funding bodies, journals (including *Science*, but not *Nature*) and other organizations gathered in San Francisco, California, to sign the Declaration on Research Assessment (DORA), which criticizes reliance on the impact factor and commits signatories to evaluate research on the basis of its scientific merit. Schmid, the Texas cell-biology chair, signed DORA and published a commentary in *Science Careers*[6] saying that her department will no longer filter applicants for faculty jobs on the basis of their publications.

Her department fills one or two faculty positions a year and receives as many as 300 applications for each one. In the past, the department weeded out candidates who had not published in top-tier journals, but Schmid dislikes that approach. "How many brilliant scientists are just outside the spotlight?" she says. She is now filtering candidates on the basis of a covering letter describing their past work and how they envision their future.

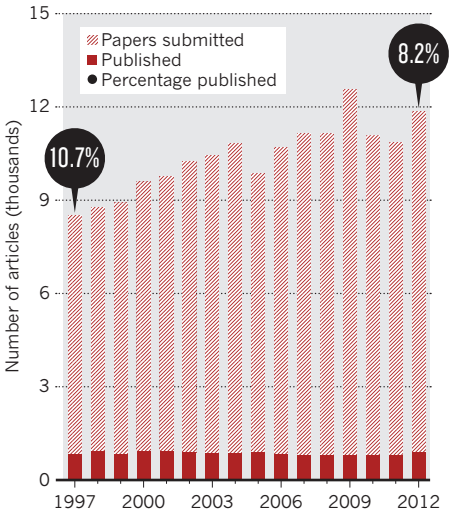
RANKINGS RACE

It is hard to assess how widespread such changes are, because research evaluations and hiring processes are often confidential. But Henk Moed, a bibliometrician and scientific adviser at Elsevier, a science publisher in Amsterdam, suspects that the journal impact factor still looms large in many hiring decisions. Evaluators may decide privately to average the impact factors of the journals listed on a CV as a way to rank candidates. He notes that some institutional rankings, such as the Academic Ranking of World Universities, compiled by Shanghai Jiao Tong University, give explicit weight to the number of *Nature* and *Science* papers an institution has produced — making it likely that some universities would then begin to rank prospective faculty by the same measure. "There is more and more evaluation, and a need for researchers to prove their quality," Moed says. "Journal reputations play a role, and that role has increased."

Others echo Moed's sense that *Nature* and *Science* papers are often relied upon implicitly. Amy Ruschak, a biochemist and assistant professor at Case Western Reserve University in Cleveland, Ohio, says that her 2010 *Nature* paper[7] on a cellular apparatus that destroys toxic proteins was a highlight of her application for faculty positions and undoubtedly contributed to her success. "It's central, but no one will specifically say that," she says.

GROWING COMPETITION

Submissions to *Nature* have risen over the past 16 years, and the journal has become more selective. But the growth in submissions is slower than the worldwide increase in the number of published papers.



SOURCES: *NATURE*; SCOPUS/ELSEVIER

Moed notes that bibliometricians are trying to improve measures of journal quality while also educating researchers about the value and limitations of such metrics. And Stefano Bertuzzi, executive director of the American Society for Cell Biology in Bethesda, Maryland, which spearheaded DORA, says that although the current scientific culture unduly rewards *Nature* and *Science* publications, he thinks that the rapid growth of open access to articles online will change that. "Open-access articles get read a lot, so they should gain visibility," he says.

Visibility is what motivated Olga Momcilovic, a cell biology postdoc at the Buck Institute for Research on Aging in Novato, California, to send her paper[8] on DNA damage in stem cells to *PLoS ONE* in 2010. "Social media and Google searches list papers by relevance, not by impact factor," she says.

There are some signs that the leading journals are not keeping pace with the overall growth in publishing. According to information made available by *Nature* and *Science*, submissions to both journals have climbed over the past ten years, reaching more than 10,000 per year for *Nature* and more than 12,000 for *Science*. However, the number of articles published worldwide in all journals has been rising much more rapidly, suggesting that many researchers are looking to publish elsewhere (see 'Growing competition').

A similar story emerges from data on the most highly cited papers. In 2012, Vincent Larivière, an information scientist at the University of Montreal in Canada, studied the clout of *Nature, Science* and other top journals by examining citation statistics[9]. He found that although these journals are publishing a growing number of highly cited papers each year, they are not keeping up with the industry as a whole; overall, their proportion of the total number of highly cited papers is declining.

Nature and *Science* have press offices that are more active than those of many other journals, however — making it more likely that papers published there will receive notice. And because electronic publishing has led to a flood of online information, journals that can claim to be highly selective fill a niche by elevating papers worthy of reading, says Larivière.

Annele Virtanen, an aerosol chemist who is now an assistant professor at the University of Eastern Finland in Kuopio, agrees. She was a postdoc in 2010, when she published a *Nature* paper[10] showing that organic aerosol particles that most researchers had assumed were liquid were probably solid. The publication opened all kinds of doors for Virtanen. The journal's visibility meant that climate modellers and atmospheric chemists outside her original research field saw her paper, and many wrote to her, helping to drive her current research in a more generally relevant direction.

She now has more results and is thinking of submitting to *Nature* again — or to *Science*. Shooting for these publications, she believes, means reaching to do excellent research that will stand out. "It improves the level of science," she says. "I can't see so many bad sides." ■

Eugenie Samuel Reich *reports for* Nature *from Boston.*

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