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work. I believe I know of several in my field. A lack of citation can also be due to personal acrimony. Furthermore, some work is not acknowledged simply to avoid bolstering the author's citation count!

These factors, combined with the sheer volume of published work, can prevent even first-rate work from being noticed. In such an atmosphere, only written evaluations by those who have read the candidate's work can be taken as formal indicators of competence. But this approach runs head-on against another problem identified by Gad-el-Hak: profligate coauthorship. Exactly whose work is to be evaluated? Someone can easily be a coauthor of a well-cited paper to which he or she has contributed little insight. How do we know for sure whose impact is being factored?

Gad-el-Hak has done us all a favor by so eloquently pointing out what has happened to academic publishing under the impact of publish-or-perish.

References

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For measuring a scientific journal's quality, Mohamed Gad-el-Hak supports the impact factor, which he defines as "the total number of citations made in that year for articles published in the two preceding years divided by the number of citable articles published in those years." A weakness of this factor is that the period between a paper submission and its publication is typically one year, and the two-year period is actually halved. On the other hand, simply noting the weakness may stimulate editors to shorten the publication period.

The major shortcoming of assessing scientific productivity by both the number of publications and the number of citations is that such an assessment is typically made without regard to the number of coauthors. This means that a publication's weight is proportional to the number of coauthors, which looks absurd. It would be more reasonable to assign 0.5 point to the first author and divide the other 0.5 point among the remaining authors. Another, simpler way to assess an individual is to consider the total number of the per-

son's publications and citations along with the number in which that person is the first or only author.

Gad-el-Hak suggests reducing a person's list of publications to 5–10 significant papers. In my view, it is first necessary to remove all abstracts, conference talks, proceedings, and other unrefereed publications from the listing. Doing so would shorten many lists by a factor of two or three.

The number of citations for a published paper depends strongly on how wide the particular field of science is. I work in planetary science, which includes very different fields like geology, atmospheric science, and magnetospheric studies—fields that rarely overlap. Planetary scientists study approximately 20 main bodies (planets and major satellites), asteroids, comets, and interplanetary medium. A paper on, for example, the Martian atmosphere typically would not cite publications on the atmospheres of other planets.

The American Astronomical Society's division for planetary sciences has about 1200 members. Approximately 80% of their publications are in two journals, *Icarus* and the *Journal of Geophysical Research: Planets*. These two journals published a total of 418 papers in 2003; the publication rate for members is rather low, approximately 0.45 paper per person per year. But mean number of authors is four per paper, which increases the rate to approximately 1.8. Evidently, citation indices of people who study, say, nitrogen-methane atmospheres of Titan, Triton, and Pluto are much lower than those who study, say, black holes. Therefore, papers in planetary science do not appear in listings of the most cited astronomy and astrophysics publications.

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One could argue that the publish-or-perish system is now working to the disadvantage of science: The noise is drowning out the signal. Mohamed Gad-el-Hak makes good suggestions for alternative, more quality-sensitive ways than raw paper count to measure one's effective contribution.

I suggest that quality will quickly improve at the expense of volume if academic departments or journals or both properly recognize the task of refereeing. I believe that refereeing