# Publish or Perish

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**The physicist Wolfgang Pauli re**portedly once told a colleague, "I don't mind your thinking slowly. I mind your publishing faster than you can think." Certainly, biology has its share of individuals whose zeal for publication exceeds the thoroughness of their analyses, and who seem more interested in getting their research into a high-profile journal than in, well, getting it right. But a much larger problem lies with scientists who work for years but rarely submit their results to a refereed journal.

There are many reasons why this failure to publish is a scientific crime. The most obvious is that the information is lost to the world. When the scientist who has studied species X for two decades—and published not one jot of data—gets hit by a truck, most of that knowledge will be buried with him or her. The person lying under the truck's wheels may well have stimulated many colleagues, probably by presenting some findings at conferences (a common dodge to avoid actually writing something up). But without publications, that scientist's work will have been largely wasted.

Part of the problem, if I may be permitted a dubious food-related metaphor, is that some scientists live for the hunt, not for the cooking and serving. These are individuals who love to solve problems. For them, results always lead to more questions, which lead to more studies, which lead to more questions, and on and on. Instead of taking time to write up the work they've finished, they keep returning to the field. The field is fun.

Yet all research scientists—especially if they receive public funding—have a solemn obligation to publish their results. We don't disseminate information just for amusement or academic satisfaction. We do so because, ultimately, judgments about the management and protection of any animal or plant population should be based upon the best—make that the best *available*—scientific data. Information that sits around unpublished for years is worthless to managers and to other scientists, and thus does nothing for the conservation of the organisms we study.

Publications are indeed everything in science. They are the fertilizer (no jokes, please, especially about any of my papers) that stimulates ideas in other scientists. Published knowledge is assimilated by colleagues and leads to more research: hypotheses are modified, rebutted, or confirmed, new paradigms are developed or old ones discarded. In a very real sense, publications *are* the scientific method.

Another vital reason to publish is peer review. Granted, the peer-review process is far from perfect, and we've all seen papers that are inadequate or just plain wrong, but which nonetheless managed to sneak through review unscathed. Ironically, some of these are in the highest-ranked journals, some of whose reviewers are, I fear, too busy or ill-chosen to do a good job. My friend Paul Wade and I joke about starting a journal called *Nature and Science Rebuttals;* we're convinced it would have a huge following.

But most of the time peer review is a very useful, constructive process. I have probably learned more about the business of conducting research from referee comments than from any other single source. Some of those reviews spared no feelings, but that's okay; I have never taken comments personally when they were given in good faith, which they almost always are.

Those who do not submit their research to peer review are preventing their work from attaining its full potential. Worse, they risk making uncorrectable mistakes in study design. You can fix bad analysis and poor interpretation, but you can never redo a long-term field study. Imagine someone who has toiled away forever without publishing, and who finally submits his or her life's work to a journal—only to be told by the referees that because X, Y, and Z weren't incorporated into the study design 10 years ago, the work was largely a waste of effort.

It is all too easy to talk endlessly about one's ideas, and those who do this often become trapped in an illusory feedback loop. Talk to the public or to any nonspecialist audience, and they'll of course tell you how terrific your theories are (they don't know any better); and if you hear enough of this unfettered praise, you may actually start to believe it. But run those same ideas past an expert referee, and you may find them suddenly wilting under the scrutiny.

This brings me to a rather less obvious reason to publish. As someone who has published around 100 papers, I can unequivocally tell you this: committing your work to paper forces you to think about your research in ways that you never will by simply talking about it. First, it requires that you carefully organize that sprawling mass that is your data. When that's done, the act of putting your methods, results, and discussion into words obliges you to define your thoughts quite precisely, and to consider the meaning of your work far more deeply than you ever will for a talk. Start to write, and you'll find ideas occurring to you that had never surfaced before. What's more, reading other papers will expose you to many concepts (and problems) that you had not previously considered. But if you do *not* do this, you will not be doing your research justice—guaranteed.

To state that those who don't publish may as well not do the work in the first place is undeniably harsh, though not unreasonable: if you don't publish, you're wasting everyone's time and taking much-needed funding away from other scientists. It isn't that you need to become one of the behemoths of publication. (I am thinking here of a couple of individuals in my own field—Hal Whitehead and Randall Reeves come to mind—who publish so many papers of such consistently great quality that I find myself worrying about them: do they ever sleep?) But you *do* need to publish at least the most significant parts of your work.

Not that the writing of a scientific paper is an easy task for the novice. The late Bill Watkins—legendary for both his science and his red pen—informally reviewed my own first effort, and when the manuscript returned to me I thought he had ritually sacrificed some small animal over it. I don't know how many publications went by before the writing of a scientific paper became routine for me, but one day I suddenly realized I was no longer agonizing over structure and content. So take heart: it gets easier with each paper you take on.

If you really can't write well or you don't have the time to learn, then find someone who can. Biology is full of bright young graduate students, many of whom have strong writing skills. By having them write up your data, you'll get the work into the public realm and give those students experience and a junior authorship or two to add to their résumés.

Finally, all of you students who are contemplating your future in an uncertain and competitive job market, know this: nothing does more to further your career than publication. Publications say that you are serious about research, and can take the scientific process all the way through to completion. I have a rule that I've applied ever since my first publication: always have at least one paper in review at any given time. Keep to that, and in a few years you will find your curriculum vitae expanding to a surprising extent, and with it your career opportunities.

So whether you're new to the field, or someone who has been working for years on an unpublished long-term study—you know who you are—take the time to write up your research. Not an hour a day between lunch and your next meeting—that doesn't work. To really plunge down into the well of ideas, you have to find a large chunk of time and do nothing else. You need to submerge yourself, for only then will you find the unbroken concentration that allows you to fully explore your data and the ideas and issues to which they pertain.

Papers are your legacy to science. So begin now. Plan no more field work for a couple of weeks. Disconnect your phone and turn off your e-mail. Then take your sexy new laptop on a date to the nearest library, dust off your data, and send your work out into the world. You'll be happy you did.

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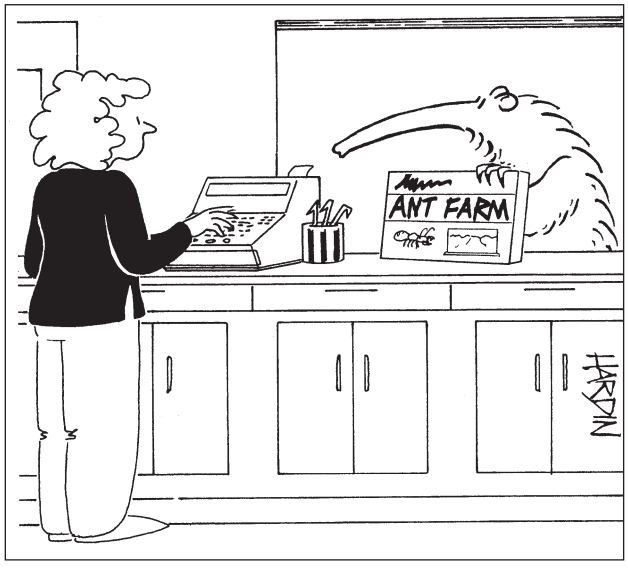


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