GROUNDWORK

Furthering the Influence of Earth Science

How scientometry is killing science

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"Publish or perish" is making science perish.

When I was a student, one of my professors once said that the quality of a field geologist is assessed through gossip. When I asked him what he meant by it, he responded by pointing out that unlike in laboratory work or purely theoretical endeavors, a field geologist's work was difficult to impossible to replicate and therefore to check. One therefore relied on the opinion of those people who were closely associated with that work through similar interest or actual collaboration or simply close acquaintanceship with the author, since publication in a reputable journal does not always guarantee high-quality work. When one needed evaluation of a certain geologist's work, one asked those people's opinion who were familiar with it.

This is still done, but it is now increasingly shadowed by scientometric data. Scientometry was defined by its creators (as *Naukometriya* in Russian) Nalimov and Mul'chenko (1969, p. 191; 1989) as "the application of those quantitative methods which are dealing with the analysis of science viewed as an information process," although the idea of keeping an index of citations originated in 1873 with *Shepard's Citations*, in the United States common law, which enabled previous court decisions to be looked up with ease. During evaluation of geologists (not only academic), letters of recommendation are increasingly supported by the number of papers published in peer-reviewed journals, the number of citations, and such evaluation factors as *h* or *g*. A result of this reliance on scientometric data has been the proliferation of "scientific" journals, the main reason for the existence of which is to publish papers that will be scanned by the scientometric organizations. Among such journals even clandestine ones have come into existence, allowing authors to cite each other's work just to boost their scientometric standing. When detected, scientometric survey organizations throw them out of their lists, but until then they continue their sinister activity and influence the scientometric data.

This state of affairs is particularly pernicious in societies with no scientific tradition. Here is an example from my own experience in my own country, Turkey. Turkey had no science whatever prior to the founding of the Republic of Turkey in 1923. After the Republic was founded, one of the chief aims of its founder, Mustafa Kemal Atatürk (1881–1938), was to introduce science into his country. To that end, he made use of the opportunity provided by Hitler's expulsion of Jewish and politically undesirable scientists from Germany by hiring as many of such Nazi victims as possible. The experiment largely failed, however, because it turned out that the natives were more interested in obtaining university positions with a view to enhancing their social status than in discovering the secrets of nature. The result was that after the Germans left (almost all of them left in exasperation as soon as the war was over; some returned home, others went to the United States) the university positions began to be filled with politically manipulative but scientifically incompetent people. Therefore, after a forced start, Turkish science largely returned to its pre-Republican levels. Medicine looked as if it were an exception: It was not. Many competent physicians were indeed trained in Turkish universities, but they saw their job as providing service to the community while filling their own pockets by opening private practices parallel with their positions as university teachers. Vanishingly few of them have done any scientific research.

In the early nineties a group of Turkish scientists, upon the urging of the then cabinet member Professor Erdal İnönü (1926–2007), a physics professor and Caltech Ph.D. (who, after a promising start as a Princeton post-doc, himself abandoned science for administrative positions and eventually politics) decided that founding an academy of sciences might help to improve things. Accordingly, İnönü's government appointed ten founding members. Their job was to elect another ten immediately, thus bringing the number to 20 with the purpose of constituting a council to enable the Academy to begin functioning. I was one of the ten appointed. During the discussions it became obvious that our most urgent matter was to establish criteria by which the next ten members (and also the future ones) might be elected. Since we were all from different disciplines and since there was no existing Turkish science community as such, we only knew the more prominent people in our own fields. It was therefore decided to rely on scientometric data. The result turned out to be so appalling that it led one member to exclaim, "Why the hell don't we once consider what the candidate will be remembered for after he or she croaks!" Despite such protests, the process went nowhere and the Academy got stuck with the scientometric data, because an alternative, which might have existed in a scientifically mature society, simply was not available in Turkey. As a disastrous consequence, many a worthless "scientist" was elected; many an excellent one was excluded. The Islamist government of Mr. Recep Tayyip Erdoğan used this as an excuse to destroy the Academy entirely in 2012 by having members appointed directly by state organizations that his party controlled (cf. Schiermeier, 2012).

Turkish universities also rely on scientometric data more than anything else and end up having to appoint incompetent people

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to university positions, because if they do not, the unsuccessful candidate goes to court and argues that his or her scientometric data are better than those of so and so. The court almost invariably reverses the decision of the university, giving the position to the scientometrically better-looking, but in reality inferior, candidate.

This is deadly. It automatically disadvantages stratigraphers, structural geologists, tectonicists, or geologists with regional interests. People working in laboratories and with modeling almost always look better scientometrically than their colleagues working in the more field-orientated areas of geology. But, the success of laboratory work is ultimately and critically dependent on field data. Geology is commonly regarded as unique among the sciences because of its historical component. This is untrue. Cosmology also has an historical component (at least since Edwin Hubble [1889–1953]), and every theoretical science making cosmological statements has to take the historical evolution of the universe into account. No theoretical cosmological model can be taken seriously if it flatly contradicts the data on the evolution of the universe. Similarly, no theory of biological evolution can expect a hearing if it contradicts paleontological observations.

Ignoring field relationships, for example, has been detrimental to the studies of the Altaids over the last two decades (see Şengör, 2014; Şengör et al., 2014). This is an orogenic system occupying some nine million square kilometers in central and northwestern Asia. After the publication of the synthesis by Şengör et al. (1993) in *Nature*, there was a surge of publications reporting geochemical data from the Altaids, which was, in itself, most welcome. Almost every one of these papers contains some statement about the tectonic evolution of either the small area in which the authors (such papers are invariably multi-authored) worked or, worse, about the entire system. However, because an adequate knowledge of the field relationships is commonly lacking in a vast number of these papers, such statements are usually baseless, contradictory, and often plainly wrong. Once, I encountered a doctoral student in the field collecting rocks with a view to doing zircon dating. When I asked him which units he was working on, I was shocked to discover that he neither knew nor cared.

But every student knows that by working in a laboratory simply measuring samples, and therefore obtaining "quantitative" data fast, he or she has a much better chance of publishing ten papers while a field worker can only generate one. Therefore, the former will be in a much stronger position when it comes to finding a job. But without the one with the field data, the ten published by the other will be condemned to remain meaningless.

What is most regrettable is that the funding agencies, by relying on scientometric criteria, exacerbate this deplorable situation. One hears ever more frequently the importance of being "quantitative" in geology. One of my mentors once retorted to such a statement by saying "no other branch of geology is as quantitative as field geology: The field geologist reports dips and strikes in numbers—in thousands!"

One of the reviewers of this note asked that the following sentence should be considered for addition to the text. I entirely agree with what is said in that sentence and add it here with pleasure: "Properly made geologic maps are the most quantitative data in geoscience: While we may debate the nature of a contact, the contact and dip-strike measurements, if properly located, should be there 100–200 years hence and are therefore both quantitative and reproducible, something that cannot be said of experiments in some of the other sciences." History fully bears out this statement.

Is there a remedy? The sheer numbers now involved in science make it very difficult to build opinions on the basis of "gossip." The solution lies in making sure that the office making a decision on a scientist (which is different from decisions about creating faculty and/or researcher positions in institutions) consists *only* of a person or persons competent in the field in which the office is expected to produce an opinion. Anybody relying on scientometric criteria alone to make a decision about a scientist is simply not competent to do so.

Do not let us ever forget: More does not automatically mean better.

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