

Citation Numbers

We all know that the financing agencies in Brazil and almost anywhere on Earth use the curriculum vitae of scientists for the decision of supporting or not their research. Usually, the main interest has been on the number and quality of the published articles. Nowadays, the numerology for the evaluation of publications is starting to be based on the journal impact factor and on the number of citations of the article. This is only the beginning, but we will see that, in the very close future, those numbers will play a heavy role on the examination of somebody's curriculum vitae and, as a consequence, on the financing of that person's research.

The important question at this moment is: Are those numbers a real description on someone's scientific career? I believe that the answer for that question is not simple. Those numbers are certainly an indication of the scientific quality of somebody's work, but they are not definitive neither infallible.

Let's consider the number of citations of an article. If a scientist works on a very new and innovative topic it is possible that his/her articles, if accepted for publication, will take several years to be cited by other scientists. This is simply so because changing basic ideas, laws and procedures take a long time, as human nature is deeply involved on this. On the other hand, if a scientist works on a very popular topic, his/her work will be much fast cited by other people. Also, since the area of the work is popular, the possibility of having more citations is higher. For me that means that looking at the number of citations of an article is important, but it should not be used as a single way to determine the quality of the work, as serious errors may be committed. For example, Albert Einstein, who is considered the most important scientist of the 20th Century, published only two articles in 1945, the one in *Annals of Mathematics*, "A Generalization of the Relativistic Theory of Gravitation" was cited only 12 times during the first 10 years after its publication. If we were going to analyze the quality of that article in the 1950's based on its citation numbers it could have been considered as not very significant or even mediocre by some people. However, that article, which has been cited 104 times, four of which in 2006 and one in 2007, has a very important content and is still useful and actual. Of course, we have more scientists, more scientific journals and more articles today than in the 1950's, but even though I believe that the idea of giving too much value to the number of citations to characterize somebody's work is not necessarily fair or significant. In fact, I believe that the greatest number of articles today make the number of citations ever less significant.

Certain areas of science are characterized by journals with high impact factor and quite numerous citations, others are just the opposite, independently of all being important. Those differences even occur between topics in the same area of Chemistry or Physics, for example. Today, if one wants to have more citations, one should work in a highly cited area of science, on a single very popular topic, publish a lot and cite ones own work, which independently from that could be or not of importance to Mankind.

To evaluate the quality of an article one should simply read it. That is more difficult than looking at the impact factor of the publishing journal and at its number of citations, but it is the only way to be fair.

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