

Citation Index (CI): Is it linked to the quality of the work?

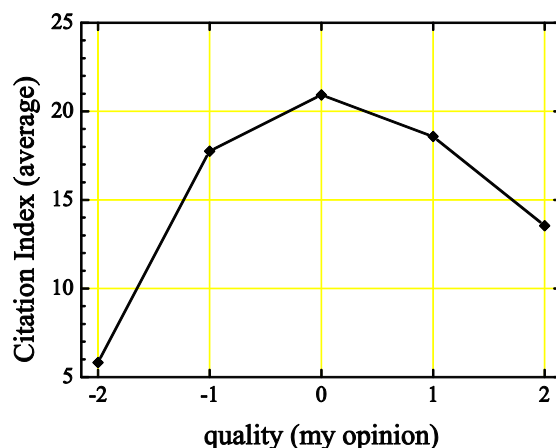
This question is not new, it is often discussed privately. The question is formal – anyway there are no other objective criteria to estimate a work. The question is painful – many of our (Ukrainian) Academicians have a rather low CI, sometimes almost zero (a typical explanation of this fact is that they were involved in a secret defense-related work. Note, however, that works of Fermi, Oppenheimer or Feynman, in contrast to those of Kurchatov, are cited often enough).

I met with this question, when I found that the best of my works ("the best" from my subjective point of view, of course) are almost not cited. Having reached the retirement age, I decided to try to find a more or less "scientific" answer. The number of my publications already exceeded one hundred – the number which is sufficient to get some statistics, but at the same time not too large, I still remember content of the papers.

I used the following method: I took the list of publications from my CV, checked the CI of each of the paper, and then estimated their quality using five-level scale (namely this estimation leads to a "subjectivity" of the approach):

- **+2.** The excellent work – I am proud of it.
- **+1.** A good work, made on the world standards level and in principle worthy publication in Physical Review Letters.
- **0.** A standard work – investigation was performed at a sufficiently high level, "new results interesting for a wide audience" have been obtained – the work worthy publication in Physical Review.
- **-1.** A weak work – could be not published. But – some work had been done, some results were obtained, maybe these results would be interesting for somebody, and one more publication would also be of use.
- **-2.** A worthless work – there is nothing to be proud of. There may be different reasons for appearance of such works: (a) a mistaken work (it may happen – only the person who is doing nothing, is free of mistakes); (b) you have a grant, and need at least one publication to write a report; (c) you urgently need a certain number of publications, for example, for the defence of a thesis or for career reasons. Often such a goal is achieved with the help of "clones" – an article in English published in a leading journal, is duplicated (e.g., in Russian) in a local journal or proceedings of a conference etc.; (d) finally, your name could simply be put to a long list of authors, and it was inconvenient to refuse.

Thus, I estimated my articles in this way and then divided the sum of CIs on the number of papers in each of five classes. The result is presented in the following figure (as for May 2011):



Conclusion: the average CI of excellent papers and of worthless works is approximately the same, while the "standard" papers typically have the highest CI.

A philosophical note

Albert Einstein was the greatest scientist of XX century – this point of view is generally accepted, and I share it. He is the author of four outstanding works (i.e., far more than any other scientist – only few Nobel price laureates may claim to two outstanding works as maximum). These works are the following:

1. The work devoted to Brownian motion [1]. In this work, Einstein introduced new methods of theoretical physics – the theory of stochastic equations and the method of path integral, which subsequently (together with Feynman diagrams) led to a revolution in field theory. From my (and not only mine) point of view, this is the best Einstein work.

2. The work on photoelectric effect [2]. It also is the brilliant work, but of a lower rank. Einstein received the Nobel Prize in 1921 namely due to this work. It is cited more often, although still not too often.

3. The special theory of relativity [3]. This is the most cited work; namely here the famous formula $E=mc^2$ and the "twins' paradox" were discussed for the first time. However, from my point of view, this work belongs to the class of "standard" works – when the Maxwell equations of electrodynamics and the Lorentz transformation had been found, a formulation of the special theory of relativity was just the next step.

4. The general theory of relativity [4]. In my subjective point of view, this is rather a philosophical than physical and/or mathematical work. But namely this work is most often discussed, especially in about-scientific community.

Thus, the above trend is confirmed here as well – the relation between the CI and the quality of the work is essentially nonlinear...

[1] A. Einstein, Annalen der Physik **17** (1905) 549-560 (issue 8) "*The motion of elements suspended in static liquids as claimed in the molecular kinetic theory of heat*".

[2] A. Einstein, Annalen der Physik **17** (1905) 132-148 (issue 6) "*Generation and conversion of light with regard to a heuristic point of view*".

[3] A. Einstein, Annalen der Physik **17** (1905) 891-921 (issue 10) "*The electrodynamic of moving bodies*".

[4] A. Einstein, Sitzungsberichte der Koniglich Preussischen Akademie der Wissenschaften, part 2 (1915) 844-847 "*The field equations of gravity*"; Annalen der Physik **49** (1916) 769-822 (issue 7) "*The basics of general relativity theory*"; Annalen der Physik **55** (1918) 241-244 (issue 4) "*Principles of the general theory of relativity*".