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Editorial

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Get Personal: The Author Impact Factor

I do not like to dwell on impact factors, but if we are going to use them, let us get personal and focus on the author and not the journal. If you publish two papers, one in a journal with a journal impact factor (JIF) of 3 and the other with a JIF of 10, is the paper in the journal with the higher JIF better? There is no way to tell, as it is impossible to say how good or useful the paper is without actually reading it, but if you need a metric on the impact of your work based on citations within a two-year time frame, a better approach would be to use citations only for your own papers. Rather than using a JIF, which is based on all the papers in the journal published in the previous two years, I propose the use of an author impact factor (AIF), which directly quantifies citations of the author's own publications in that same time frame.

To calculate an AIF, divide the total number of the citations received in the AIF year for papers published in the previous two years by an author, by the number of papers published in the previous two years. I'll use my own numbers as an example. For my papers published in 2014 and 2015 (not counting editorials, abstracts, and replies to comments) and the number of citations for these papers in 2016, my 2016 AIF was 7.24. Of course, I published in journals that had a wide range of JIFs, so how do my AIF and JIFs for specific journals compare? Consider, for example, my 2016 AIF based on papers published only in *Environmental Science & Technology* (*ES&T*) and *Environmental Science & Technology Letters* (*ES&T Letters*), which was 10.86. In this case, my 2016 JIF was above the 2016 JIFs for these two journals (6.19 for *ES&T* and 5.31 for *ES&T Letters*). But what about my papers in other journals, particularly those with higher JIFs? Did I fare as well? For two papers published in *Energy & Environmental Science* (*EES*) in 2014 and 2015, for example, I had 16 citations, or an AIF of 8.00, which was actually lower than that for papers published in *ES&T* and *ES&T Letters*. In addition, the JIF for *EES* in 2016 was 29.52, so my AIF was quite low relative to that JIF. Therefore, citing only the JIF for those papers in *EES* would overestimate the impact of my work in that journal. There are many reasons why an AIF might be lower than a JIF. One reason could be that the types of papers published in *ES&T* or *ES&T Letters* are not the same as the types of those published in *EES*. The "environmental" aspects of a paper published in *ES&T* or *ES&T Letters* are our first considerations of a good match for the two journals. For *EES*, however, the topics are focused on energy conversion and storage, with the word environmental implying an emphasis on green or renewable energy technologies. Therefore, consideration of the JIF and AIF must take into account the types of papers published in the journal and the sizes of the research communities in those areas.

I would propose two steps in evaluating a researcher's publications using impact factors. First, you want to look at the AIF and see if the papers received attention relative to citations, independently of the JIF. Next, you have to put AIF into the context of the types of journals for possibly different research areas of the author. To normalize these impact factors for the communities of researchers that publish in the different journals, I define the *L*-index as the ratio of the AIF to the JIF, to "level the playing field". So for my papers in *ES&T* and *ES&T Letters*, we would use the average JIF for these two journals of 5.75 (not weighted by the number of papers in each journal, just their JIF average). Given my AIF for publications in these two journals, my *L*-index was good at 1.89, but if you look at my "energy"-focused work published in *EES*, my *L*-index was only 0.27. On the basis of the *L*-index, my energy-related work was much less impactful to the energy scientific community than the environmental science and technology community.

Your AIF for a specific year should not change. You make the AIF calculation based on citations for your papers in the previous two years, and you calculate a new AIF every year. Similarly, your *L*-index would be calculated using the AIF and the JIF for that current year and be recalculated each year on the basis of the previous two years.

If reporting a JIF is required, then it is better to use the JIF for the year an article was published (and indicate the JIF year to avoid confusion), and not the highest or most current impact factor. I have seen curricula vitae (CVs) in which faculty going up for tenure, promotion, or a new position cited the current or most impressive JIFs rather than using those for the year the papers were published. Sometimes, there can be large changes in the JIF. For example, in 2008, the first JIF for the journal *EES* was 8.50 (the journal was only launched in 2006 and therefore it did not have a JIF prior to 2008), so if you published a paper in *EES* in 2008 for that year or the previous two years, then 2008 would be the appropriate year for the JIF for the paper. However, by 2014, the JIF for that journal had nearly doubled to 15.49, so a paper published in that journal in 2014 would use that higher JIF. However, it would not be correct to update your 2008 paper to have the new JIF or to use the even more recent 2016 JIF for that journal of 29.52 for your study published back in 2008.

Another concern with impact factors is the reward structure for a JIF being used at some universities. It does not seem proper for faculty to be rewarded for publication in a journal based on the JIF, as a JIF mostly reflects citations for work by others. Certainly, it is commendable to publish in high-quality journals, but rewards should come for personal scientific or engineering accomplishments and advances, not just getting a paper in a journal with a high JIF. It is fine to aspire to publish in journals such as *Science* and *Nature*, but not to do that solely on the basis of their JIFs. Your reason to publish there should be the scientific reputation of the journals, and the belief that your work would be widely read and appreciated. I am hopeful you feel the same way about publishing your work in *ES&T Letters*! Getting a paper published in *ES&T Letters* means it stood out among research studies in the environment and

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associated technologies fields, the study was judged to be novel, it was performed and reported at the highest scholarly levels, and it required urgent publication—and of course it was within our word limits.

If you want to play the impact factor game, cite dozens of papers published in your favorite journal in the past two years as it could help lead to a higher JIF. Of course, if everyone did that for their favorite journals, all of these journals would soon have a similarly high and meaningless JIF. Instead of focusing on the JIF or AIF, you might consider alternative metrics to assess the impact of your work. Was the paper highly downloaded or quoted in the popular media or tweets? For your ACS publications, it is easy to obtain this information as you can view the number of downloads and directly obtain an Altmetrics attention score for your paper. Did you get invited to give talks at universities or conferences on the basis of your recent work? Speaking invitations (that cover travel expenses) are another indicator that your colleagues had high appraisal for your work. All of these metrics can be used as methods to evaluate the impact of your work based on different outcomes.

No impact factor can substitute for the critical evaluation of your work by experts in the field, and my recommendation is that JIFs not be used or reported, and that universities not give rewards based on JIFs or other strictly numbers-based assessments. But if you find you need to use such metrics, consider using the AIF and *L*-index as alternatives to the JIF. These metrics provide more direct and useful quantifications of the impact of your work over the previous two years rather than the work of others that was published in those same journals. Furthermore, do not choose fields of research just to find research areas that can publish in journals with high JIFs, such as those in medicine, energy, or nanotechnology. Follow your interests, instincts, and passion to choose your research topics, and publish in the journals prized and valued by the communities of researchers in your chosen research areas.

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Notes

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