

## Relative Impact Factors

Two backpackers are walking along a trail in the Sierra Nevada Mountains, in an area known for frequent encounters between people and bears. On the top of the pack of one of the backpackers is a pair of running shoes. The other backpacker remarks, "You aren't going to try to outrun a bear, are you? There is no way you could do that." The first backpacker smiles and says, "No, of course not, I'm going to try to outrun you".

I think about the punch line of this old hiking joke when I consider the situation with journal impact factors (IF), as journals with similar publication topics are just trying to stay ahead of the other journals in that field. If you publish in the medical area and you are focused on the IF, you are probably trying to get into a journal like the *New England Journal of Medicine* (IF = 59.6), compared to say a "lower" IF journal like *Lancet* (IF = 44.0). However, if you are an environmental scientist, you are more likely hoping to be published in *Environmental Science and Technology* (ES&T) or *ES&T Letters*, not because they have such large IFs, but because of the quality of the papers published and the high reputation of the journals. Sometimes the IF of the journal is aligned with its perceived status, and sometimes the IF is not. For those concerned about publishing in a journal with a high IF, the consideration is really about whether the IF is higher for one journal than another, but only within the range of journals that publish your type of research. To make this comparison, we can define a relative IF (RIF) of a journal as the IF for a journal divided by the IF of the best journal in your field. So if we use ES&T as this example, the RIF = 1 for ES&T with an IF = 5.393, compared to RIFs of 0.12 for *Water Environment Research*, 0.21 for the *Journal of Environmental Engineering*, 0.27 for *Environmental Engineering Science*, 0.69 for *Chemosphere*, 0.91 for *Bioresource Technology*, and 1.11 for *Water Research*. But each of these journals has a slightly different and often more specialized focus, and the RIF does not consider the different topics addressed by journals all in the "environmental" category. For example, while the journal *Energy & Environmental Science* (EES, IF = 25.427) has "environmental" in the title, and an impressive RIF = 4.71, the topics they cover have very little overlap with ES&T or *ES&T Letters*. When I have examined publications in EES on topics that might overlap with ES&T, I saw little difference in total citations for those papers compared to ones with somewhat similar topics in ES&T.

How is the IF or RIF for a new journal like *ES&T Letters* calculated? The formula for an IF is very simple, and you can easily calculate it yourself using *Web of Science*. The IF is the number of citations in a year, divided by the number of published papers in that journal in the previous two years. That calculation works fine for any journal that has been around for three years or more, but what about a new journal like *ES&T Letters* that has been around for only two full years? For this case, the calculation for 2015 is based on the number of papers in 2014. So a first year IF (1-yr IF) is not directly comparable to other journal IFs. The reason is that the number of citations gained from well-cited papers in the second year is typically

much higher than the papers one year old. For example, the 1-yr IF of a new journal *ACS Sustainable Chemistry and Engineering* was 4.642 in 2014 based on papers published only in one year (in 2013), but this year it increased by 13% to 5.267 based on publications in the previous two years (2013 and 2014). The topmost cited paper in *ES&T*, published in 2002, received only 19 citations in the first year, 124 in the second year, and 180 in the third year. If the journal had published just this one paper in 2002, its first impact factor in 2004 would have been 124, but its second impact factor in 2005 would have been 45% higher at 180. For most highly cited papers, the numbers are still rapidly increasing even after two years.

How high can an IF for a journal go? It depends on the topic, the number of people publishing in the field, and to some extent the success of the authors that publish in that field. Nanotechnology is a huge field, with a large number of well-funded researchers publishing a lot of papers. These conditions can lead to a high IF for journals in that field compared to others. For example, the *ACS Nano* IF is 13.334, and *Nano Letters* is 13.779. *EES*, which has a lot more papers on nanotechnology than on environmental topics, has an IF of 25.427. In contrast, journals with "engineering" in the title tend to have much lower IFs, not due to the quality of the papers but rather due to the size of the publishing community and the papers published per author in these different fields.

Some journals create situations which can directly benefit their IF, whether or not it is intentional for this purpose. For example, journals publish issues far ahead of their actual date, which can result in more time to accumulate citations. You can read now, in June 2016, papers assigned page numbers in September 2016 for issues of *Water Research* or *Bioresource Technology*, but you cannot read the June issue of *ES&T Letters* or *ES&T* until the first week of June. Publishing issues dated ahead of time can inflate the IF mainly because of the increase in the number of citations for well-cited articles for these extra months. Another approach that benefits a journal IF is to reject papers that do not sufficiently cite recent papers in that journal or recommend when requesting a revision to an article that the author consider including more articles from their journal (I have experienced both of these situations). These approaches may inflate the IF of the journal, but in my opinion, they do more harm to the reputation of the journal relative to any benefit derived from a slightly higher IF.

At *ES&T Letters*, yes, the editors do pay attention to IFs and RIFs, but we do not allow consideration of these numbers to make our editorial decisions. We review papers based on the assessment of our associate editors, editorial board members, and our external reviewers for quality, relevance to the goals of the journal, and urgency in publication. We strive to only publish the best and most important papers. Some of these

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papers we publish will be highly cited, some will not, but we believe they will have a lasting importance that goes beyond a simple 2 year contest for immediate citations. We fully consider the relevance of manuscript topics to readers of this journal and only send out for review manuscripts that fit the scope of topics for the journal, but we do not reject a paper because of some perception that it might lower our IF.

The editors of *ES&T Letters* are very proud of our publications over the past two years due to their high quality and importance to our readers interested in environmental science, engineering, and technologies. We are pleased to have a 1-yr IF = 4.839, which puts us at the top level of journals that publish in similar areas, and we expect this IF will increase next year. However, we do not consider this single number to be the only measure of the success of the journal. We know our papers have a high number of downloads and views online by readers around the world. We think that is because the environmental community enjoys the broad content of the journal, which reaches a much wider community of readers than more specialized environmental journals. Authors have told us how much they like (and are astounded by) the speed at which we publish our papers, as the average time of submission to online publication is just under a month. Thanks to our readers and authors, *ES&T Letters* provides a new and successful opportunity for rapid publication of research studies in the environmental fields.



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#### ■ AUTHOR INFORMATION

##### Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.