nature immunology

The lure of reviews

The powers and perils of review articles for the design and publication of research.

"Can you recommend a good review?" is a question every scientist will ask many times in his or her career. For trainees making their debut in research, for postdoctoral fellows starting new projects or for seasoned scientists following intriguing results into a new field, a review is the first step into the unknown. Review articles are also the ultimate resource for staying updated. In a world in which huge amounts of information are constantly being generated, it is difficult to monitor every primary research article published, especially in fields that are not of immediate interest. Most scientists depend on syntheses from their peers to keep track of progress in such areas and, of course, read reviews published in their own field. Beyond delivering a synthesis of the most recent advances, a review is an attempt to organize new and old data sets into conceptual frameworks that make sense biologically and evolutionarily. Written by experts in the field, reviews reflect the personal views and interpretation of the authors on the present state of things. Everyone appreciates a good synthesis and—why not—a peek into the brains of their mentors and colleagues.

When commissioning review articles, the editors of *Nature Immunology* advise authors to provide fresh scientific insight and a novel synthesis of the data so it is obvious to the reader which directions will most probably bear fruit in the near future. New ideas and hypotheses for research are born from seeing the big picture and from the data as an ensemble, not from disparate, singular results. A good review opens new avenues of research by formulating questions and suggesting directions for future studies.

It is no surprise, then, that review articles have become very popular. Journals such as *Cell*, *Immunity*, *The Journal of Immunology*, *The European Journal of Immunology*, *Mucosal Immunology* and *Nature Immunology* publish at least one review article per issue. These are usually commissioned directly by the journal from leaders in the field and are intended to cover topics considered of high interest for the journal's audience. Because they are highly cited (on average, a review article is cited almost twice as often as a research paper), they help boost the impact factor of the journal.

Thus, both the scientific community and journals seem to benefit from the publication of reviews. Occasionally, there are complaints about a perceived inflation of reviews, especially in trendy areas in which the progress made in the field does not justify the number of published reviews (for example, does it seem that regulatory T cells and T_H17 cells have been over-reviewed?). However, a well-written, coherent piece with the right mixture of data synthesis, data integration and informed guesses can constitute a highly read, highly cited and highly influential article.

Some reviews are so influential, in fact, that sometimes they become a source of information as important as primary research articles. Occasionally, *Nature Immunology* receives submissions that experimentally dismiss predictions of models proposed in highly cited review articles. The dismissal of such predictions is considered sufficiently important to be of interest to a large audience. Although such studies do not challenge but instead reproduce the original data that generated the model, they do offer a different interpretation of those data. Depending on the case, the editors may choose to reject such manuscripts. Models, no matter how fitting they may seem at a certain point or how influential they may become, are simply interpretations; they are influenced by the state of knowledge in the field and, to a certain degree, by the authors' ability to analyze and interpret data. By trying to integrate the data into working models, reviews can oversimplify, omit contradictory data sets or suggest implications that go beyond the more cautious interpretations of the original primary research articles. In contrast, if the assays are done correctly, the raw data are infallible and can fit into radically different models. The difference is made by the additional data sets that build context.

From this perspective, when assessing novelty, the editors of *Nature Immunology* seek original data that will help build a new context in which old and new data can be successfully integrated. This does not mean that results that disprove various predictions or corollaries of current models should not be published. Disproving theories is an essential part of the entire process of research and discovery. However, from case to case, it may not be considered a sufficiently large step forward in the understanding of a certain process. The baseline for assessing novelty should always be the primary data (that is, has this been shown before?) rather than a certain interpretation made of the data (that is, has this been suggested before?).

Reviews can be great guides, tools or engaging intellectual exercises. However, because models are born and refitted constantly, primary data should always be the main point of reference. In the end, no one reads an old review.