

Is there a real need for another review article?

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Abstract: Review article is a unique and an important category of publication serving the scientific community, but the recent trend of a rapid increase of such articles published in different journals is alarming because majority of them fail to contribute to the science and its development to a significant extent by providing new elements. Requirements of authors contributing to any review articles include prior direct working experience and understanding of the subject matter to a significant level. The article contents shall be a collection of published papers first, and then more on evaluation and synthesis of the available literature. In addition, both problems and opportunities together with future directions of the research subject shall be offered to foster the future development. Unfortunately, many of the recent published ones have some level of coverage superficially, but clearly fail to provide insightful information for science in a significant and important way to make a substantial contribution to the research advancement.

Keywords: Publication, review articles, scientific publication, science philosophy, science future

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A new trend is emerging evidently now on the fast increase of review papers published in all science subjects, and environmental science is used as an example to illustrate this here. The total number of review articles published was 59,541 and 341,397 in 2000 and 2021, respectively, an increase by 5.7 times over a period of 22 plus years for all science subjects (Figure 1). In environmental science as a subject of choice, there were 9,554 and 42,795 papers published in 2004 and 2021, respectively, an increase of 4.5 times, but review papers published was 852 in 2001 and the recent highest 6,203 in 2021, an increment of 7.3 and apparently higher than the grand average of all subjects (Figure 1). It is not likely that there have been more major breakthroughs or new discoveries in environmental sciences than other research fields.

This phenomenon has been promoted by at least a few factors known. One of them is the requirements of publications in order to graduate for higher degrees in some developing countries, and China is one of them with the largest population of graduate students and, as a result, the greatest number of publications. Another one was the non-anticipated Covid-19 pandemic which required quarantine and restrictions on personal mobility, and this was used as a justification for writing review papers at home without conducting any research experiments by many young researchers. A third is to use available data to generate papers, e.g., bibliometric analysis of a selective research topic to get publication quickly

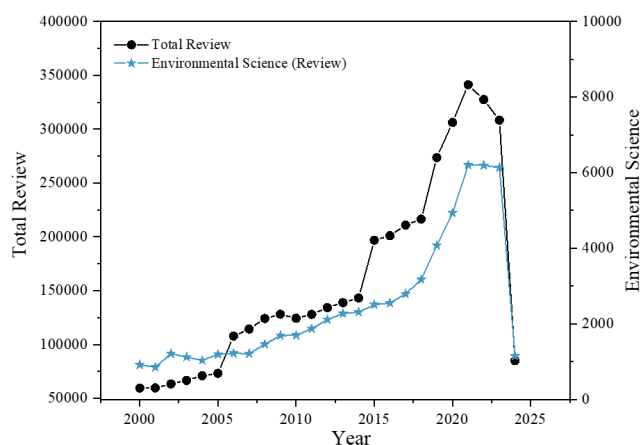


Figure 1. Publication trend of review articles for all subjects and environmental science as one selective example based on data available from Web of Science from year 2000 onward.

without performing any experiments using Web of Science data. There are also additional means used in this aspect, application of high-throughput sequencing for metagenomics (Chen and Gu, 2022; Gu, 2022a) is an example in addition to bibliometric analysis on a selective topic. Under these scenarios and situations mentioned above, more graduate students took advantage of these as short-cut or new way to boost their academic and scientific output, and profile populated with

publications of review papers, instead of investing their brain power in original research, experiments, data and then the papers in a logical sequence for the scientific training. This is not a healthy situation and development, and will have more serious negative drawbacks on the future development of science and also the quality of future generations of young scientists (Gu, 2022a, b).

Review article is valuable and important to science because of its special position in science by centralizing scattered individual publications in a single paper for a period of time, and also by providing a critical analysis, and identification of problems and future directions of the subject involved. Some basic requirements for a review article are apparent and others are not so, but these seem to be ignored by many now. To be specific, a good review article shall contain a reasonable and thorough coverage of the research subject firstly, which is less difficult to do. Then, synthesis of them into some logical form or structure through evaluation and critical analysis shall be evident. Furthermore, identification of problems and development together with future directions of the research subject as the key elements or structure of the article (Day, 1989; Hites, 2014). Recently published review papers are mostly a physical collation of published papers without any synthesis, analysis or identification of the future directions for development. As a result, the large number of such articles does not serve an important role in the history and development of science. This phenomenon is more widespread in commercially publishing journals than academic societies' ones. The current phenomenon reflects the metamorphosis of the academic publishing as a business competing for profit since open access became a mode of publication driven by new publishers. At the same time, manipulation by the authors who wrote these large number of articles based on their reading and knowledge of the subject is also an important factor because of the increasing submission of this type article. Authors must have rich working research experience or enough on the selective subject with 5-8 years working on the subject first-hand as one requirement (Evans, 1977; Liu and Suffita, 1993; Schwarzenbach et al., 2006). This one has been de-emphasized recently or ignored completely and many young promising scientists start this part of their practice too earlier and pre-matured than previously anticipated conventionally in the cultivating of science and its development by writing a review article.

Let me take a research subject as an example for which I have working experiences and some knowledge to dissect the issues involved and analyze the current situation in my further discussion here. For an article on the popular topic of degradation and bioremediation of environmental pollutants, it is often predictably to see a new submission of review article on this subject containing a brief introduction section and then the main body of text which is dominated by a list of different environmental pollutants and their chemistry, distribution and concentrations in different environmental samples, the different microorganisms reported for degrada-

tion and transformation, and some information on the mere degradability, and (eco)toxicity of them (Gao and Gu, 2021; Gu, 2016; 2017; 2020; 2021). Such a practice can easily produce 15-30 pages of text with majority of the information, if not entirely, is at textbook level lacking of any substantial depth or specific significant element. What are mostly missing and valuable to the subject contents in this case are the biochemical reactions, enzymes/genes involved, degradation pathways, and anything newly reported recently for inclusion in a new review article to advance the revised knowledge structure (Cheung and Gu, 2007; Gu, 2003; Gu and Gu, 2005; Sheton and Tiedje, 1984a, b). By a closer scrutinization of the papers available, valuable research articles shall be identified through critically evaluation of them from the vast majority of the less useful ones so that solid scientific results and useful ones can be strengthened by good judgement from the available articles. This process as a key step of reviewing is truly time-consuming to authors, but rewarding to readers when a careful analysis and consolidation of data can be conducted thoroughly for accomplishment. When no differentiation is being made to the available publications, the valuable and correct ones are not separated from the less meaningful or incorrect ones. Without a true effort on this, any review article can be said fail to serve the scientific community and not deserve to be published for science. Therefore, the value of review article is on the collection, evaluation and critical analysis of available papers to provide a new structure or paradigm on the research of the chosen subject, these shall be held as the basis and necessary steps involved in writing a review article (Evans, 1977; Liu and Suffita, 1993; Schwarzenbach et al., 2006) (Figure 2). Further advancing the information in a review article, identification of the weakness and opportunities of the research subject shall be given and such information will serve the current and future research for the scientific community involved.

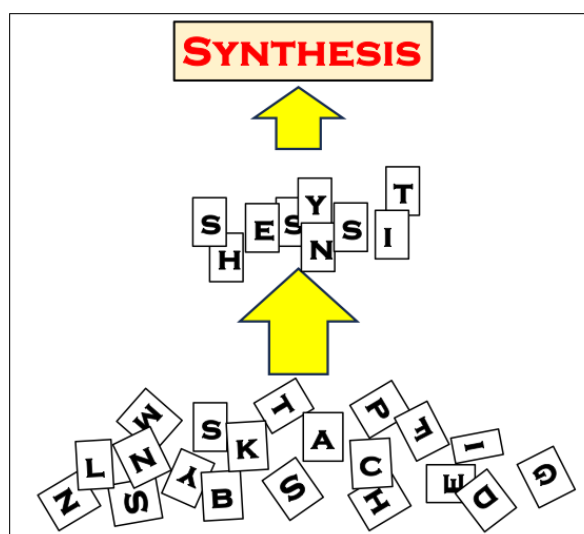


Figure 2. An illustration of the structure and steps involved in the writing of a review article from collecting of information, processing to synthesis for a clear picture.

There are also other elements important to review article. Illustration is known to be much more powerful than words in text form, and can serve the purposes for communication most effectively when it is composed scientifically and artistically with meaningfulness to keep these two elements in balance. Related to this, both Highlights and Graphical Abstract have been introduced into scientific publication as new elements for inclusion with scientific paper because they serve important role in guiding authors and also providing effective imagery communication for a fast grasp of the results in the publications in a few seconds, not after reading the title, abstract or conclusions by readers. It is often found that there are more than 3-4 items and each of them is a short paragraph for Highlights or each of the entry items is on the background of the subject or research tools/methods used without the needed elements for highlighting, the most important findings or discoveries or insights. For Graphical Abstract, it is not uncommon to physically pull all figures or selective ones of the paper into one composite picture as Graphical Abstract. This is a serious misunderstanding of the requirements or the meaning of such an item as an effective way to communicate with the readers at a first glance for possible further reading of the entire text of the paper.

It is true that there is no single way to write or compose a review article, but the basic principle must be held to serve the communication purpose and development of science. Population of science with meaningless or less meaningful papers is diluting high-quality science and also simply wasting the human resources which should be invested into innovation and primary research to produce high-quality research data (Gu, 2022b). Scientific communication of research article or review article is critically important for the development and advancement of science, but publication shall not be used for judging or classifying scientists into different categories or classes, especially not for promotion and financial reward to any extremely extent, e.g., numerical statistics of papers published and citations, h-index, etc. It is my wish that the current reality facing the whole scientific community deserves serious attention by those who are actively contribute to the development and also the current phenomenon identified here. Review article is needed, but the quality shall be maintained and held up.

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Conflict of Interest

Author declares that there is no conflict of interest in the information presented here.

Ethical approval

This article does not contain any studies with human participants or animals performed by the author involved.

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