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The Literature of EOH. III. The Review Paper

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Editorial

The Literature of EOH. III. The Review Paper

In previous editorials in this series, I examined the scientific literature in EOH (March/April 2006) and the original research paper (May/June 2006). I now turn my attention to the review paper.

The review article is much older than the research paper and represents the classical form of scholarship. From ancient times, authors of papyri and manuscripts in scientific fields have compiled, in detail, what is known about a subject and intertwined personal insights into the broader tapestry of knowledge. In Europe during the Middle Ages, authors based scholarly writing on the conventions of theology and classical texts. Often, the author was writing with the assumption that everything that could be known about a subject had already been written. The author did not seek to add facts but to organize classical knowledge, with new insight and creative juxtaposition.

Scholars took the same basic approach in writing the thesis, a requirement of early academic qualification. Theses were first written as a demonstration by the student of mastery of classical learning, and often were just long review articles. This tradition continues, at least in European and American medical education, to the present day (for example, in the requirement for qualification for the Associate of the Faculty of Occupational Medicine of the Royal College of Physicians, London). The requirement for unique original contribution to knowledge, particularly at the doctoral level, came later and was mostly developed in Germany in the nineteenth century. At that point, the doctoral thesis and the review article took separate paths in their historical development.

The review article plays a critical role in the scientific literature by connecting the dots. Someone has to read the relevant literature and put it together. It is impractical for everyone to do it for themselves. A knowledgeable expert can see relationships and nuances that might escape the reader with less familiarity and can describe gaps that still need to be filled. An outstanding review article can cause scientists to look at a problem in a fundamentally new way, appreciate facts in a different light, and integrate observations into a new, compelling framework. In other words, the authority of a review article is determined not only by its

quality, comprehensiveness, and logic but also by the author's imagination.

The review article is an invaluable way for researchers to quickly publish the state of the art in a field. For the student and investigator with a peripheral interest, the review article is a means of staying up to date on current research and hot topics in the field. Any investigator who wishes to enter the field, however, is well advised to seek out and read the primary sources anyway. In that case, the review article serves as an annotated bibliography, commenting on and suggesting one interpretation for the experienced investigators to consider and to challenge on the basis of their interpretation of the evidence. The reader who makes best use of a review article is the one who engages it critically and questions its assumptions and conclusions even as it is read.

Review articles can be transformational. A lengthy paper by Raymond Lindeman, written while he was still a graduate student, is credited with converting limnology from the natural history of lakes to a sophisticated, empirical discipline in ecology. David Goldsmith's 1982 paper on silica and lung cancer broke open years of denial and led inexorably to the acceptance of the association by IARC 14 years later.

The latest development in review papers came with the widespread adoption of evidence-based medicine and critical appraisal in the 1980s. Structured review articles were introduced in medicine, requiring authors to specify how they selected papers for review, to describe why they excluded others, and to be explicit on standards of interpretation. This development was a step toward evidence-based medicine, an important trend in the practice of health disciplines, without doubt, but not directly relevant to research. In research, the weight of evidence of the literature is important, but it is the telling anomaly that points the direction to new insights. Researchers using methods primarily to assess the general trend of the data, such as meta-analysis, may obscure the inconsistencies and unexplained observations that lead to scientific advances.

The scope of a review paper has to be realistic. Most authors have had the experience of choosing a topic that seemed

restricted enough at the time, only to see it grow unmanageable as they wrote it. The problem is 3-dimensional: how deep to delve and how big an area to cover.

When determining depth, the author should keep in mind the intended audience. The phenomenology of biomarkers can be described without molecular and genomic explanations; however, a study of population biology and phenotypic distribution does require such detail.

Determining an article's breadth is trickier. The simple answer is that it depends on what the review article is supposed to be about. Authors cannot, and should not, explore every conceivable implication of the topic; they must decide ahead of time what the point of the paper is, what to emphasize, and where to stop.

What to keep in and what to keep out is a perennial problem. Most authors of review articles have more potential material than they can use. Anyone who has written a review knows that much more than 80% of the knowledge comes from much less than 20% of the sources reviewed. The scientific literature demonstrates an extreme case of diminishing returns.

A major issue in literature searches inevitably is the choice of language. On one hand, it is not true that good work always will appear in English or will be picked up and referenced in the major journals. If an author writes a review of the pneumoconioses of organic dust origin, that person is well advised to read or arrange for translations from Chinese. On the other hand, the less accessible the journal or monograph, the less likely it is to contain a gem or an essential fact or comment, unless the topic is highly restricted and relies on local sources or data. So when does the author stop looking? When the story is complete. Authors should ask themselves: After I have exhausted all the major language sources which contain significant publications of active investigators and after I have defined the context

adequately, is the story coherent and does it provide a useful framework for understanding the problem?

Some sources cannot be taken at face value. The aspiring author should know and understand the topic well enough to know its nuances and where the trail leads. What were the politics of Soviet-era publications that implied that extinction curves for behavior could be used to set neurotoxicity standards? Under what constraints were investigators in Czechoslovakia working in the 1960s, when they reported hematological disturbances in factory towns without spelling out the working conditions? An author who delves into the historical record or into areas of political controversy today must be prepared to look beyond the data to appreciate how, why, and under what constraints a researcher conducted a study and how this could have biased the result. Objectivity sometimes requires reconstruction.

A high quality scientific review paper is among the most valuable contributions knowledgeable scientists can make to their fields. Review papers also carry the potential for bias and for perpetuating error. An author who undertakes a review paper is accepting a heavy responsibility not to mislead. It is an obligation as profound as accuracy in an original research paper.

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