AEOH and the Literature of Environmental and Occupational Health

This supplemental issue of Archives of Environmental & Occupational Health: An International Journal (AEOH) provides a revealing overview of the history of our own venerable publication and an insightful analysis of the literature of environmental and occupational health (EOH) as a whole. Why are we committing valuable pages to what may be considered by some a solipsistic undertaking, studying ourselves and journals like us?

It is because the scientific literature is the essence of science, its collective memory, and its forum for weighing evidence. How our literature supports us and the uses we make of it are critical for further advancement. AEOH, in particular, played a major role in this literature for most of its 90 years and our history, to a remarkable extent, is the history of our whole field in the last three quarters of the 20th century. We are experiencing another acceleration in scientific productivity and complexity and it is important that our stumbling means of storing and accessing ideas be modernized. Our scientific literature is the way we keep track, not just of thoughts, but of ideas, insights, and leads. The form and infrastructure of our literature both facilitates and constrains how we communicate and the standards we keep.

We have explored these themes since 2006 in the pages of AEOH in a series of editorials called “The Literature of Environmental and Occupational Health.” This supplement gives us the opportunity to look a little more deeply at the role of journals in our field. It consists of 4 valuable explorations into our collective library and conference room by Professor Derek R. Smith, who serves us as Deputy Editor. In keeping with the commitment of AEOH to rigorous but pragmatic peer review, his work received the same close scrutiny as any other submission to this journal and we circulated the manuscripts to a panel of reviewers that included current journal editors.

More than universities, research institutes, or even organized scholarship, journals have been the one essential institution of science. They began as letters from one scientist to another and later as the detailed minutes of meetings called to present new findings and to discuss their implications. Without these “proceedings,” the evolution of scientific thought would have been attenuated over time, as only the people in the room would have heard the original argument and diffusion would have taken years as scientists interacted one-on-one. These proto-journals provided the indispensable link among scientists regardless of location, level of support, or sponsorship. Support for these proto-journals was among the most important functions of the earliest scientific societies, second only to bringing together scientific minds in the first place.

Journals obviously made science more accessible but also empowered scientists. Most scientists in those days were wealthy amateurs, pursuing a personal interest. Those who did not have independent means were sponsored by the rich and powerful but few original thinkers in constrained circumstances would have had the education required to pursue scientific interests. Without proceedings and the journals they later evolved into, early scientists outside of a few major cities such as London and Paris would not have been able to reach one another with any reliability or regularity. The growth of science would have been much slower and inefficient. There would be even more examples of the common story of a finding being independently discovered in different places and research being wastefully duplicated, rather than purposefully replicated. That growth would also have been distorted because investigators working in isolation would have had no sense of the mainstream or the major problems that were emerging in their field. Something like this happened in the Soviet Union during the Stalin era, when superb minds were
cut off from world science and research turned inward and political, yielding strange fruit.

That the accumulated scientific literature is organized and stored in journals was not inevitable, by any means. Throughout the Middle Ages, the major way that new technical knowledge was transmitted was to weave it into reviews of existing knowledge in the form of compendia. The very popular encyclopedias in the Chinese tradition and of the European Enlightenment, of which Diderot’s was the most famous and influential, showed that this approach was quite viable when the pace of scientific advancement was slow. Facts were carefully weighted, integrated, and put into place in a comprehensive intellectual edifice. In the 19th century and into the 20th, the great German *Handbücher* continued this tradition, with exhaustive review volumes that integrated as much as was known or that the author thought was relevant about the major research issues of the day. We see this tradition reflected in the *Handbook of Physiology* and the *Handbook of Toxicology*, but these days such major reference works are intended as briefings for the new investigator and points of departure, not comprehensive treatises.

As the pace of science increased, this approach gave way to the proceedings, which focused on an entire body of work that usually represented a systematic series of experiments. The modern journal then followed and for a time, certainly in medicine, went through a phase in the late 19th century during which many articles were quite short and reductive, sometimes only a few paragraphs, particularly in the medical literature. This apparently worked when the audience was small, the problem was widely appreciated, and the readers were well known to the author. Modern journals tend to print slightly longer articles, at least in the biomedical sciences (but not the physical sciences) that focus on a single experiment, study, or major aspect of a study. The new unit of publication therefore tells a schematic story, a unit of scientific contribution smaller than a line of investigation but larger than a fact.

Journal articles today are written to be complete within themselves, with a very stereotyped and stylized format but one with a purpose. Lay readers and new scientists are sometimes misled into thinking that the language of a scientific article is a literal narrative of the study. It almost never is. The introduction is not usually a literal historical record of how the work came about but a set-piece to contextualize the work by connecting it to what has gone before and what questions were open for investigation. The methods section is a description of what worked rather than a tedious explication of all the false starts and problems encountered along the way. The discussion is just that; but toward the end the investigator almost always feels a scientific responsibility to call for further investigation (at its most superficial, the lame “more research is needed”) and ideally guides his or her successor (or makes notes to himself) by giving suggestions. This, in turn, ideally connects with the introductions of future papers, creating a chain or subject thread that makes sense out of the literature.

This quintessentially linear or branching way of connecting papers over time made sense when the major scientific problems were well-defined and were being pursued in parallel by various groups of investigators without much overlap. Now, we are much more concerned with interdisciplinarity. This linear style of connectivity needs to be supplemented by lateral thinking, linkages, and ready access to the literature in other fields. The challenge we face now is how to create something like the ancient encyclopedias and dusty handbooks, an integrated view of how things fit. Simply removing the barriers to access, as with the *Public Library of Science*, is not enough. We need to pull disparate material together.

There is no technological fix for the program of knowledge integration other than supporting cognition. Better indexing, citation analysis, smart search engines, data links, and so on all help enormously but the actual work of integration goes on in the brain. That is where the journal again becomes indispensable.

Journals are more than just archives, although they are that. They are forums for opinion and venues for the act of integration. This is why journals that restrict themselves to original research articles are usually not very popular or influential: their function is limited to the archival. Carefully crafted and conceptualized review articles play a critical role in this process of integration. So do Letters to the Editor, special articles, and, for applications of science, case studies.

A living journal is a place where scientists wrestle with tough problems, challenge one another, and think out loud. This is why the Letters section of major, high-circulation journals such as *Science* and *Nature* are bristling with controversy and the give and take of argument. They are the public forum of science. Some journals do this superbly: *Lancet* and the *Journal of the Royal Society of Medicine* have for years specialized in significant letters that make substantial contributions to thinking about science and medicine. Other journals, including, alas, our own do not attract so many letters, because we do not command the same attention as an institutional forum for debate.

A nimble and responsive journal can be the marketplace of ideas for a new or evolving field, not merely a posterboard for presenting its current product. To do so, however, requires a sense of community among its readers, openness in its editorial pages to debate, and sustained rigor in its review process. Derek Smith’s studies tell us that *AEOH* once had the capacity to shape the field and reminds us that this same ability to host and focus discussion is needed today.

The measure of a journal’s worth consists of 2 elements: its efficiency as a means of archiving information and its ability to bring together new thinking, to frame, and creatively to shape the direction of a field. The first is easier to determine. The second element is characterized by a journal’s skill in achieving a complicated balance of receptivity with discretion, attractiveness to authors and selectivity, reader adherence and accessibility, and scientific rigor and openness to new thinking. For lack of a more precise scientific term, perhaps we can call this elusive quality a journal’s “mojo.”
AEOH once had it in abundance and played a critical role in shaping our very field. We would like to think that we are getting our mojo back.

Tee L. Guidotti
Editor-in-Chief
Archives of Environmental & Occupational Health

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