

***Suppression and Detection Research and Applications –  
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## **Disseminating Research Results in the 21<sup>st</sup> Century.**

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Just as new technology has facilitated many innovations in fire suppression and detection research and applications, it has also changed the way we disseminate and use research results. Today, information is immediate. Engineers, researchers, and scholars often need access to the latest or most pertinent information whether it is generated nearby or on the other side of the world. We now expect to be able to access information, add to it, or redistribute it at the click of a mouse. To keep pace with the changing modes of acquiring and using information, the function of a technical journal has evolved from the scheduled distribution of a bound hard copy to a portal leading to knowledge in all of its forms. The journal of the 21<sup>st</sup> century is completely familiar in the way it produces print resources and wholly novel in the way it incorporates advances in information exchange.

This paper describes the role of peer review as the contemporary process of accrediting scientific knowledge about fire suppression and detection. As not all publications are equal, the concept of quality assurance in published knowledge is introduced. The Institute for Scientific Information (ISI) compiles a statistical measure known as the journal impact factor. Just what this is and what it means is important to many organizations, institutions, and government agencies. In the electronic journal world, research results are available as soon as they have been edited, ahead of publication in the print version. Such electronically published articles are identified by a unique number known as the Digital Object Identifier (DOI). The DOI is a standard for identifying a piece of intellectual property on a digital network and associating it with related data. Sometimes called "the bar code for intellectual property"; the DOI and its use in accessing information about fire suppression and detection will be described.

### **What is Peer Review?**

Peer review is the contemporary process of accrediting scientific knowledge. Fire research submitted to an appropriate journal is reviewed by scholarly experts before it is accepted for publication. It is then widely available to the interested public, presented in a clear and logical style, and archived in libraries for future reference. These are fundamental requirements for communication and successful application of fire research. Peer-reviewed publication helps bridge the gap from research to practice.

Peer review has been the mainstay of the scientific process for hundreds of years, providing an “ in-depth critique of assumptions, calculations, extrapolations, alternate interpretations, methodology and acceptance of criteria employed and conclusions drawn in the original work” [NRC, 1998].

Peer review is the means by which the value of new knowledge is appraised and its publication justified. It is a process by which articles submitted for publication to a professional journal are evaluated by experts in the author's field - that is, his or her peers. While the peer-review process is also widely used for books and grants, discussion in this paper focuses on journals.

The Royal Society of Edinburgh is generally given credit for having introduced the concept of peer reviewing technical manuscripts. The preface to the first volume of its *Medical Essays and Observations*, published in 1731, clearly states the society's editorial policy and objectives in a way that resembles today's peer-review process [Kronick, 1991]. Peer review has subsequently become essential to increasing our scientific knowledge and has been termed the "gatekeeper of science."

Science depends on clear, accurate, and precise wording in the descriptions of work performed and results obtained. It is imperative to have only one possible interpretation of what is written. Moreover, to advance, science depends on complete reporting, both in terms of what experiments or studies were conducted and how they were conducted. Hence, the role of gatekeeper is critical to the advancement of science.

A significant body of literature on peer review has evolved, much of it from the medical field, which has the longest and strongest tradition. Peer-review publication in medicine is of such stature that it has pre-empted the general news media ["The Inglefinger Rule", 1980]. This is why medical journals are cited as the source of reports on new medical discoveries.

An overarching caution requires special comment. Peer review is not a panacea. It offers a sense of security and enhances confidence, but it does not guarantee the accuracy of correctness of research findings or data analysis. Replication, additional testing, and confirmatory studies are the time-tested path to factual accuracy. [Patton and Olin, 2006].

### **Peer Review and Regulatory Decision-Making**

The need for fire safety codes and standards to become more scientifically based is generally recognized. There are three objectives of peer review that apply to standards development:

- The immediate objective for any peer review is to uncover problems and confirm sound scientific analyses.
- This strengthens the basis for professional staff and subject matter experts to complete the analysis for decision-making.
- The final objective is a high priority peer-reviewed product dedicated to enhanced decision-making and public confidence in the scientific foundation for regulatory

decisions.

Peer review generally focuses on independence and expertise, requirements that apply in the regulatory context as well as for the scientific community at large. Emphasis on independence and expertise rules out common substitutes for peer reviewed publication such as inhouse evaluation, stakeholder participation, and public comment on proposed regulations. These all make valuable contributions to decision-making but must be distinguished from formal peer reviews. [Patton and Olin, 2006].

Historically, considering unpublished or unreviewed material to substantiate changes to NFPA standards has led to several problems [Watts, 1997.]

### **Professional Benefits of Publishing in Peer-Reviewed Journals**

Jameson [1995] rhetorically asks why few people recognize Nikola Tesla's name, but any grade-school child can tell you that Thomas Edison invented the light bulb. A contemporary of Edison, Tesla invented alternating current, radio, fluorescent lighting, and turbines. He contributed to the development of robots, computers, missiles, satellites, microwaves, and nuclear fusion. But, while Edison authored more than 3½ million pages of information, Tesla never submitted an article to a peer-reviewed journal.

For the scientist or engineer, publishing establishes ownership of ideas and enhances professional reputation. For the author's employer, publishing establishes patent rights and enhances the company's reputation in the industry. A technical article explaining how to solve a common industry problem with a new product or design concept can be a very effective marketing tool. For example, a 1986 article in *Fire Technology* [Johnson, 1986] is credited with creating widespread interest in aspirating fire detection. Such an article can enable a company to position itself as a technical leader, translating into untold free publicity.

### **Journal Impact Factor**

There are several choices of peer-review journals in fire safety science and engineering. Authors have many reasons for choosing a place to publish their work, such as audience, timeliness, and impact. The latter, in the form of a statistically compiled journal impact factor, is sometimes used by academic administrations for selection and tenure decisions. In addition, librarians and information scientists use the impact factor as a bibliometric to help manage journal collections. Governmental and legislative bodies of many European Community countries use it to assess performance of their research institutes and laboratories. This in turn leads to the use of publication impact in research budget justification.

The Institute for Scientific Information (ISI) has been indexing, abstracting, and evaluating technical journals for more than half a century. It annually publishes the *Journal Citation Reports* (JCR) that assesses the output of scholarly and technical journals in terms of citation frequency. This involves the coding of more than 12 million

references each year. The Science Edition of *JCR* contains data from over 5700 journals in the areas of science and technology. It ranks journals by the total number of articles published, the total number of times the journal is cited, and the impact factor, a measure of current citation frequency.

Generally, the most important ranking is the impact factor. The annual JCR impact factor is a ratio of the number of citations to the total number of recent citable items published. Thus it is the frequency with which the "average article" in a journal has been cited in a particular year or period. The higher the ratio, the greater is the measured impact of the journal.

ISI counts the number of articles published and the number of citations to the journal in each year of publication. The impact factor is then calculated by dividing the number of current year citations to the number of source items published in that journal during the previous two years. Statistics accumulated by ISI show that article citation rates tend to peak in the second year after publication. This means the measure is for current impact and it can vary from year to year. The impact factor is intended to eliminate some of the bias of absolute or total citation frequencies that favor large journals over small ones, frequently issued journals over less frequently issued ones, and older journals over newer ones. A good deal more information about ISI citations, the *JCR*, and the impact factor, is available on the ISI web site <http://www.scientific.thomson.com/products/jcr/>

## **Electronic Publishing**

The internet is radically changing the nature of scholarly journals. Whether you are a practitioner or a researcher, you will be affected by changes in scientific communication brought about by electronic publishing. The Internet is going to forever change how scholarly material is disseminated and electronic publishing will change the way you think about searching for, reading, and submitting papers.

Among the changes that will take place, electronic publishing will allow practices never available in traditional paper publication. For example, electronic addenda need not follow the traditions of linear static publication. They can include full details of proofs, computer codes, dynamic simulations of results, hypertext bibliographies, and large databases such as real data sets behind the published application,

Transmitting scholarship on paper is expensive. There are the marginal costs of printing, binding, and shipping thousands of copies. Electronic publishing has higher fixed costs in the operation and maintenance of the system, but marginal costs are zero, the Internet allows copies to be shipped through the ether. For this reason alone, electronic journals will prosper.

As with any new technology, there are also potential detriments that must be accepted as part of "progress". The ease of online publishing and the accessibility of the web will lead to many new sources including increased self-publishing and "vanity" presses.

Motivated by quick profits, there will be new publishers who will solicit marginal work, promising authors less requirements for revisions and lowering the standards of peer-review. Authors and readers will need to be alert to the quality of journals.

### **Online First**

Articles in *Fire Technology* now identify upfront the date that the article was available online. This is part of recent information technology developments that are being implemented to enhance early access to the latest advances in fire safety science and engineering.

“Online First” allows articles to be published as soon as they have been edited, ahead of publication in the print version of *Fire Technology*. Each article in Online First shows the bibliographical data, an abstract, and a downloadable PDF of the full text version for *Fire Technology* subscribers.

The version that appears in Online First is the same as the subsequent print version, edited to *Fire Technology*'s normal standards. Publication takes place on the day that the article is posted on the *Fire Technology* web page, (the date is given at the top of the article), and the article is fully citable (see below for how to cite it). If an Online First article meets the relevant criteria it will appear in searches, topic collections, and email alerts.

When the article appears in a print issue of *Fire Technology* the article will move from the Online First page and appear in the table of contents of the relevant issue of *Fire Technology*- both online and in the print version.

### **Digital Object Identifier**

Online First articles and similar electronic publications are identified by a unique number known as the Digital Object Identifier (DOI). A digital object identifier is a standard for identifying a piece of intellectual property on a digital network and associating it with related data. In the online version, the DOI appears with other information under the article title. In the print version, look for the DOI to appear at the beginning of the article, in the upper right hand corner of the first page.

DOIs have been called "the bar code for intellectual property". A DOI differs from commonly used internet pointers such as the URL because it identifies an object as an entity, not simply the place where the object is located. A DOI also differs from other identifiers of intellectual property such as standard bibliographic identifiers (ISBN, ISRC, etc.) because it can be associated with defined services and is immediately actionable on a network.

The DOI is a permanent identifier of all versions of the article, whether electronic or print. As such, the DOI will appear in every version of an article and should be included in the citation for both print and electronic versions of articles.

## **Recommendations**

Three basic recommendations can be made to reflect the importance of peer-reviewed publication in disseminating fire safety science and engineering research results:

### ***1. Researchers should publish their results in peer-reviewed journals.***

While this may seem obvious, some researchers respond that there is not always time to prepare a paper for publication. This response is a fallacy that could correctly be interpreted as saying there is not time to do the research right. In high school science, we are trained that recording and reporting is an essential part of scientific investigation. If the research is not worth publishing, it is not worth doing in the first place.

Authors who have difficulty communicating their work can turn to professional technical writers for assistance. In the same way that fire safety specialists expect to be called upon to lend their expertise, technical writers provide an invaluable service that is underutilized. Most major corporations have editorial staffs, and lists of writing consultants are available from the Society for Technical Communication.

### ***2. Practitioners should reject results that have not been peer-reviewed.***

Fire safety practitioners are justified in rejecting research or test results that have not been published in a peer-reviewed journal. While some engineers may feel qualified to comment on the science, it is generally not an appropriate or efficient practice. We should be careful not to assume that someone else has evaluated the information if it has not been subjected to the traditional peer-review process. If the research has not been published in a peer-reviewed journal, we should assume it will not stand up to the scrutiny of peer review. Notice-and-comment rule-making procedures and stakeholder processes promote public participation but they cannot substitute for peer review.

### ***3. Research sponsors should require peer-reviewed publication of results.***

There is no better way to identify the value of funded research than to have it subject to outside peer-review. Many federal agencies have scientific laboratories and offices that, consistent with scientific custom, routinely submit research and other technical reports to scholarly journals. Because the journal and not the sponsoring agency manages all aspects of the peer review; framing appropriate review questions, selection of reviewers, and evaluation of conflict of interest issues.

At least one U.S. government funding agency specifies the following as a condition of support: "In lieu of a Final Report, the grantee agrees to submit for publication the results in a peer-reviewed journal." This requirement benefits both the funding agency and the author.

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