Identifying the Source of Printed Scientific Literature

As if GRE, FLAIR, IR, and STIR were not enough to confuse all of us, you are probably asking yourself why I am writing an editorial about DOI, ISBN, and ISSN. Granted, we may not use these last abbreviations as commonly as the first ones, but as readers and authors, it is important to know what they mean. Although most of us are familiar with the methods of citation and how to find an article or a book based on them, we are perhaps less familiar with their history and their meaning. In a library or a bookstore (physical or virtual), we can easily find a book, journal, or article by using the traditional name-year citation, the International Standard Book Number (ISBN), or the International Standard Serial Number (ISSN) systems. In science, the name-year citation system is widely used for articles, periodical journals, and books (the *American Journal of Neuroradiolgoy* [*AJNR*] uses this system).[1] The use of this time-honored method is rapidly changing and declining, and perhaps in the near future, it will be discarded and completely replaced by the Digital Object Identifier (DOI).

Since antiquity, humans have created systems to locate printed knowledge. In ancient China, books housed in the Imperial Library were kept under 4 main categories (canonical, historical, philosophical, and literary). Books in each category were bound in the same color, which made identifying them easier. Persians were probably the first to use the alphabet to arrange and categorize their books. Perhaps inspired by the Mesopotamian libraries, the Great Library in Alexandria is also said to have been organized alphabetically. The organization of Greek and Roman libraries is uncertain. As libraries grew in the Middle Ages and Renaissance, alphabetic organization became insufficient and librarians started to use numbers.

The first practical (and the best known) numeration system used to classify written works was devised by Melvil Dewey in 1876 and has been revised many times since.[2] The Dewey Decimal Classification, still used by libraries, comprises 10 main categories, subdivided into 100 divisions and 1000 sections. Its advantage is that it is infinitively hierarchical. There are other systems such as the Universal Decimal Classification that contain digits and punctuation marks, as well as 1 used by the Library of Congress (which starts with 21 categories).

Although all of these classifications help us to find a book in a library, they do not identify a specific book. For this purpose, the ISBN system was created in 1966.[3] All commercial books are identified by a unique ISBN. There are about 160 ISBN agencies worldwide, which are in charge of issuing these numbers.[3] In the past, an ISBN had 10 digits, but starting in 2007, it was expanded to have 13 (there are programs on the Web that will allow you to convert a 10-digit ISBN to a 13-digit one). An ISBN looks like this: 978-0-400-13456-6 (I made up this one and thus the last digit is not correct, see below). The last 10 digits are preceded by "978," and once all numbers with this prefix are exhausted, 979 will be used. After the prefix, an ISBN is composed of 4 number groups that are separated by hyphens. The first group identifies a national or geographic grouping of publishers (called the "language-sharing country group"; thus, in all English-language publications, this number is either 0 or 1). The second series of digits belongs to a specific publisher in that group or location (this also called the "root" of the number or "publisher code"). The third refers to the title and edition (also known as the "item" number), and the last is a check digit that validates the ISBN. This last check digit is obtained by using a complicated formula that takes into account all of the digits in a particular ISBN ($x_{13} = [10\text{-}([x_1 + 3x_2 = x_3 + \ldots x_{11} + 3x_{12}]\text{mod}10)\text{mod}10]$) (now you can understand why I did not calculate it for an imaginary ISBN!). Authors generally do not worry about getting an ISBN themselves, as this process is handled (and paid for) by the publisher. Many books also list their Library of Congress number alongside their ISBN.

Ongoing publications (scientific and popular magazines) are identified by an ISSN. ISSNs are administered by 85 centers coordinated from the headquarters in Paris.[4] An ISSN contains 8 digits and looks like this: 0195-6108 (this is the ISSN for *AJNR*). ISSNs are also used to identify electronic publications. For a publication, its on-line ISSN may be different from its print one (*AJNR's* on-line ISSN is 1936-959X) and must be displayed on the homepage of the publication. An "X" may be found at the end of either an ISBN or an ISSN (taking the place of the number 10). Commercial Websites, personal Web pages, and Web pages that contain only links to other URLs are not eligible for an ISSN. In many cases, the ISBNs and ISSNs are converted into barcodes (one commonly sees this on the price stickers used by the larger chain bookstores).

Serial scientific publications are divided into numbered volumes (starting with 1). Depending upon the quantity of articles, journals may choose to publish 1 or 2 volumes per year. *AJNR* is a 1-volume-per-year publication (we are on our 29th volume in 2008). Volumes then are divided according to the frequency of publication (*AJNR* comprises 10 issues per volume). Each volume starts on page 1. As such, references are commonly cited as (I have not included authors or article title here): *AJNR Am J Neuroradiol* 2008;28(2):233–38.

This name-year system works very well for print publications but cannot be used to track publications that exist only in electronic form. For this purpose, the International DOI Foundation developed a new system to identify intellectual property in a digital format.[3] As mentioned, "DOI" stands for "Digital Object Identifier," a code that identifies a specific electronic publication and its location in the Web. The Web contains over 33 million DOIs.[5] A DOI looks like this: 10.3174/ajnr.A1130 (I obtained this from the "Publication Preview" section of *AJNR*). The prefix nearly always begins with a variation of 10.100 and is a group of numbers given by a special Registration Agency to a specific publication and serves to identify its location. After these digits and the forward slash, one finds the name of the publication and a number corresponding to a specific article. If you want to access a DOI directly go to: http://dx.doi.org, and this Website will resolve the DOI's location. DOIs are now accepted as references and can be cited in the bibliography of scientific articles (thus they are included in the calculations for the Impact Factor). Once an article appears in print, its DOI is linked to the traditional name-year reference system, and then it can be cited by using either. All print articles are labeled with their DOI if they first appeared in electronic form (*AJNR* uses such a system). For investigators wanting to cite an article that appears in *AJNR's* "Publication Preview," using the DOI suffices. Because of the rapid turnover of science and the relatively short "shelf life" of scientific (particularly medicine-related) articles, we encourage authors and investigators to use the DOI instead of waiting for these sources to be printed.

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DOI 10.3174/ajnr.A1245

EDITORIAL

What is All of the Hype About?

Medicine is simultaneously an art, a science, and also a business. These 3 incarnations of medicine have complex interactions. For example, the business of medicine undoubtedly distorts our scientific objectivity. A particular manifestation of such distortion that I would like to discuss is the phenomenon of hype. To "hype" is to create interest in something by flamboyant or dramatic methods. Hype has actually been studied in the field of business as it relates to the maturity, adoption, and business application of specific technologies. Such study led to the development of the Hype Cycle by Gartner.[1] The Hype Cycle shows the typical time course of visibility of a new technology with time (Fig 1). Note that the Hype Cycle can have other shapes, including a shape in which the hype never recovers from the "trough of disillusionment" and declines into oblivion. With only a little retrospection, it is quite easy to come up with examples of neurointerventional devices that have followed the full course of the Hype Cycle. I need not point out specific examples by name, because they are both obvious and numerous.

The field of neurointervention is particularly vulnerable to the hype phenomenon because of 2 particular US Food and Drug Administration (FDA) regulatory practices: the 510(k) and Humanitarian Device Exemption (HDE). These have been the primary regulatory pathways for new neurointerventional devices, and they undoubtedly amplify the Hype Cycle. With regard to the 510(k) process, some products are "spun" to the FDA as substantially equivalent to an existing approved product (eg, platinum coils), despite being specifically designed, and marketed, to be substantially different. For HDE, devices are approved by the FDA with only the barest proof of safety and efficacy to treat supposedly rare conditions but then are subtly marketed as having ever-broadening applications. Because the HDE and 510(k) approval processes each require very little data regarding safety and efficacy, there is little information available to physicians to guide therapy. This data vacuum creates an environment that promotes a whirlwind of hype. In the absence of the large amount of data necessary for rigorous proof of the safety or efficacy of a device, attempts are made to exaggerate the scientific merit of a small amount of inconclusive data through hype. This pushes the hype toward the "peak of inflated expectations." As physicians gain some real-life experience with the device, the hype starts to burn out and we head toward the "trough of disillusionment." Then, and only then, is the goal of a prospective randomized clinical trial finally pursued.

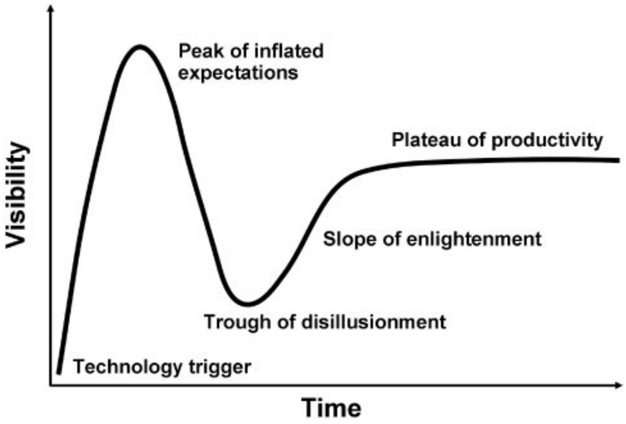

Fig 1. The Hype Cycle.

If we physicians would just demand a prospective randomized clinical trial in the first place, we would save a lot of time and money from being wasted on the Hype Cycle and get to the "plateau of productivity" much more quickly. Of course, randomized prospective clinical trials do not completely flatten the Hype Cycle. Drug-eluting coronary stents have been tested with randomized prospective clinical trials and, nevertheless, are now a classic example of the Hype Cycle of a medical device. However, devices supported by data from randomized prospective clinical trials are undeniably less prone to extremes of hype than those that are not.

Skepticism is essential to sort through hype. Carl Sagan said, "Skeptical scrutiny is the means, in both science and religion, by which deep thoughts can be winnowed from deep nonsense." There is currently plenty of both deep thought and deep nonsense in the field of neurointervention. Hopefully, the future of the field will be driven by science, and the nature of science is that nonsense is ultimately unsustainable.

Reference

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DOI 10.3174/ajnr.A1228