The Evolution of "Hot Papers"

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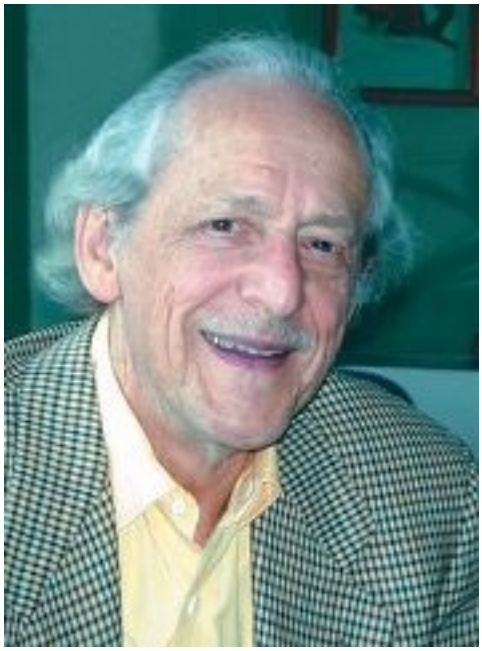

Our reader surveys indicate that "Hot Papers" is one of our most popular editorial features. When and how did it begin?

After the *Science Citation Index* was launched in the '60s, we soon learned that the age of the average cited paper, depending upon the field, was 5 to 15 years old. In molecular biology, while 25 percent of cited papers were about 2 years old, the rest were much older.

These data initially obscured the fact that a small group of papers were well cited within months of publication. It wasn't until 1975 that a series of essays in *Current Contents* identified the 100 most-cited life science papers published in the current year.[1]

Two years after we started The Scientist, we began a feature called "Hot Papers." A group of experts was assigned the "subjective" task of compiling lists of current articles they considered to be significant--that is, "hot." These selections were not based on "objective" citation data. However, the process proved to be problematic.

we were switching to citation frequency to aid the selection process. Commentaries by the authors of the chosen papers would help explain their significance. Then in 1990 the Institute for Scientific Information (ISI) in Philadelphia launched the journal *Science Watch*, which included lists of "Hot Papers" in several categories. They were chosen from a specially compiled list of frequently cited current papers identified from the latest year of *Science Citation Index*. The procedure was similar to the one we had used for 25 years in *Current Contents* to identify *Citation Classics*. The difference was the time dimension. With *Citation Classics* we were interested in papers that had achieved significant, long-term citation impact. With "Hot Papers," we would select papers highly cited within the first year or two of publication.

As with most citation analyses, critics will cite anecdotal evidence that delayed recognition is common in the history of science.[3]

The case of Mendel is often cited.[4] As Zirkle demonstrated 40 years ago, the delay in recognition of Mendel's work was not, according to myth, due to its publication in an obscure journal, but due to the inability of the scientific community to comprehend the significance.[5] Subsequently, I used citation data to verify many examples.[6] However, there are many more thousands of papers that achieve prompt recognition, sometimes within months or weeks of publication. And not surprisingly, many of them appear in journals such as *Science*, *Nature, Cell, New England Journal of Medicine*, and others.

In 1999 ISI's *Science Watch* included with its annual subscription a bimonthly CD-ROM containing lists of well-cited papers for about 70 subfields. By carefully examining this database, we identify putative Hot Papers that are eventually reported in each issue of *The Scientist*. However, staff reporters interview the lead investigators. We no longer rely on the authors to write commentaries; this too often delays the process and requires considerable editing.

Each of us may interpret the term "hot" differently. We often like to imagine that our own personal research field is hot. The way most recent discoveries become hot is that colleagues recognize their significance and are stimulated to perform new research that confirms, amplifies, or refutes the works in question. Citation frequency reflects the level of research that is stimulated by breakthrough discoveries or, rarely, radical hypotheses as in the case of cold fusion.

While the absolute number of Hot Papers is nontrivial, most of the million or so papers published each year take years to be cited.

There is an inherent delay in the normal process of diffusing ideas. Science and scholarship do not happen overnight. Even the Hot Papers themselves required years to incubate. New scientific ideas abound. So getting one's ideas across requires an ongoing educational and marketing effort. In addition to publishing, most highly cited authors spend years proselytizing their discoveries by discussing them at conferences and seminars and at every other opportunity.

Selecting "Hot Papers" on the basis of citation frequency is a neutral process that allows us to call out work that has captured the scientific community's attention. Citations reflect that attention. Experts on the topics covered by a particular Hot Paper ordinarily should not be surprised at our choices. But it is remarkable, based on 30 years of experience, how many, including the authors themselves, are unaware of the extent to which the work in question has been recognized. Providing them this kind of feedback has provided me great gratification for the past three decades.

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References

1. E. Garfield, "1975 life sciences articles highly cited in 1975," Current Contents, 15; 5-9, 1976. Reprinted in *Essays of an Information Scientist*, 2:452, 1974-6. www.garfield.library.upenn.edu/essays/v2p452y1974-76.pdf

2. E. Garfield, "Of hot papers and 'critical' acclaim," *The Scientist*, 3[4]:10, Feb. 20, 1989.
www.the-scientist.com/yr1989/feb/comm_890220.html

3. G.S. Stent, "Prematurity and uniqueness in scientific discovery," *Scientific American*, 227[6]:84-93, 1972.

4. E. Garfield, "Would Mendel's work have been ignored if the *Science Citation Index* was available 100 years ago?" *Current Contents*, 2:69-70, 1970. Reprinted in Essays of an Information Scientist, 1:69-70, 1962-73. www.garfield.library.upenn.edu/essays/V1p069y1962-73.pdf

5. C. Zirkle, "Some oddities in the delayed discovery of Mendelism," *Journal of Heredity*, 55[2]:65-72, 1964.

6. E. Garfield, "Delayed recognition in scientific discovery: citation frequency analysis aids the search for case histories," *Current Contents*, 23:3-9, 1989. Reprinted in *Essays of an Information Scientist: Creativity, Delayed Recognition, and other Essays*, 12:154, 1989. www.garfield.library.upenn.edu/essays/v12p154y1989.pdf

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