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Section 4:
Expert Opinion

“Sleeping Beauties” or delayed recognition: when old ideas are brought to bibliometric life

Sarah Huggett

The term “Sleeping Beauty” was first used in a bibliometric context by Professor Anthony F.J. van Raan in 2004, extending the concept of delayed recognition originally discussed by Dr. Eugene Garfield in 1970 and 1980 and analyzed by Professor Wolfgang Glänzel in 2003. Sleeping Beauties are articles which are very scarcely cited in the immediate years following their publication, but then go on to become highly cited. Van Raan’s analysis of more than one million 1988 papers led to the “Grand Sleeping Beauty Equation”. This equation enables various calculations, such as the number of Sleeping Beauties of a given “sleeping time” (that is, the number of papers in a low-citation period of defined length); the number of papers of a given “sleep intensity” (where “deep sleep” is defined as less than one citation per year on average, and “lighter sleep” as one to two citations per year); and the “awake intensity”, which reflects the number of citations per year in the four years after the low-citation period or “sleep” has ended.

To sleep, perchance to dream…

As several studies have shown, Sleeping Beauties do not conform to the normal or expected citation distribution; as such, they are an exception to the “cumulative advantage” bibliometric rule originally described by Derek de Solla Price. Interestingly, the distinctive nature of Sleeping Beauties seems to hold true when all citations are taken into account, when author self-citations are excluded, or when only journal self citations are considered. A notable case was described in the intra-journal study by Professor Redner as follows: “It is worthwhile to emphasize the extreme nature of a famous paper in physics by Einstein, Podolsky, and Rosen (EPR) in Physical Review in 1935. This paper questioned the underpinnings of quantum mechanics. While it was acknowledged to be a conceptually important paper (I learned about this paper 40 years ago when I first studied quantum mechanics), it remained mostly uncited until experimental techniques had developed in the late 80s and early 90s to the point where some of the predictions of the EPR paper could be meaningfully tested. In fact the average age of citations to the EPR paper (more than 60 years) is the largest of any paper in all of Physical Review with more than 30 citations.”

The relative scarcity of Sleeping Beauties was also confirmed by Research Trends’ own investigation: from the 20,000 most-cited 1996 research journal articles, there were only 15 “lightly Sleeping Beauties”, defined as publications that were cited once or less each year in the five years following their publication, and two Sleeping Beauties, defined as publications that were cited once to twice a year in the eight years following their publication (see Figure 1). Interestingly, only one paper fulfills both criteria.

Figure 1 – Average citation rate of the 15 “lightly Sleeping Beauties” and the citation rate of the two Sleeping Beauties identified among the 20,000 most-cited 1996 research journal articles. Source: Scopus.
Awakening the Sleeping Beauties

Sleeping Beauties can reflect premature discoveries that the broader scientific community is not ready to recognize as a breakthrough at the time the research is published. In other cases, a particular scientific subtopic may fall out of fashion only for its popularity to soar years later a phenomenon that speaks to the nature of science as a consensus endeavor. In some cases, however, Sleeping Beauties could simply be awakened by chance.

Professor van Raan observed: “It is our experience in the application of bibliometric methods in research evaluation that on quite a few occasions, scientists claimed that one or more of their publications will not be picked up for a while, as they consider themselves as being ‘ahead of time’. I always call this the ‘Mendel syndrome’ [after Gregor Mendel, who demonstrated that genetic inheritance of traits obey certain laws but the significance of this was only recognised some 15 years after his death]. So the search for Sleeping Beauties is not just an exotic whim, but a necessity in order to have an answer to Mendel-like claims in terms of probability, field specificities, etc. At the same time, it is fascinating to find the prince who awakens the sleeping beauty and why this happens.”

The authors of the Sleeping Beauties unearthed by Research Trends’ analyst comment:

Paper
Malfliet, W., Hereman, W. "The tanh method: II. Perturbation technique for conservative systems", Physica Scripta

Citations*
150

Comment
Dr Hereman: “This article is the second piece of a two-part research paper on the hyperbolic tangent (tanh) method, which is a mathematical technique to find exact and approximate solutions to nonlinear differential equations. Dr. Malfliet and I expected that our straightforward method would be noticed immediately. However, it took several years before other research groups started successfully applying the method to nonlinear problems of relevance to mathematics, physics, and engineering. The delay might be due to the initial lack of access of some researchers, such as Chinese scholars, to the Western research literature, and the limited access to expensive computer algebra systems (like Maple and Mathematica).

Indeed, the availability of symbolic software to automate the tanh method helped popularize our work. Finally, several generalizations of our method have recently been published with credit given to our original research. Some of these extensions are generating debate, which in turn leads to additional citations of our 1996 publications in Physica Scripta.”

Paper
Tretmans, J. “Test generation with inputs, outputs and repetitive quiescence”, Software-Concepts and Tools

Citations*
141

Comment
Dr. Tretmans: “First, the paper was published in a journal which, I think, is not often read by software testers or the model-based testing community. It was a special issue devoted to TACAS 1996 (LNCS 1055), for which I was invited to produce an updated version of this conference publication. Being not that often read by the software testers means, I guess, that people must be indirectly informed about existence of the article for example via other articles (including my own later publications) that refer to it. This might take some time. A second reason might be that in those days research on software testing appeared very often on (small) workshops or symposia, the proceedings of which do not occur in citation indices.

A last reason that I can think of is that the paper is rather theoretical, more theoretical than the average paper in the area. In 1999 we published a paper describing a tool implementation of the test generation algorithm and usage of this tool. My impression is that after this publication the interest in the underlying theory increased, and consequently the number of citations.”

Paper

Citations*
124

Comment
Dr. Lou: “I think that people started to pay attention to my 1996 JDE paper with Professor Ni mainly after Professor Ni published his influential survey article in 1998 […] This may explain why there are very few citations between 1996 and 1999, but more citations later on.”
"Number of citations from initial date of publication until end of November 2010.

2. Garfield, E. (1970) “Would Mendel’s work have been ignored if the Science Citation Index was available 100 years ago?”, Current Contents 21, January 14, pp. 5–6.