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"Sleeping beauties" or delayed recognition: When old ideas are brought to bibliometric life

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Section 4:
Expert Opinion

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

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The term "Sleeping Beauty" was first used in a bibliometric context by Professor Anthony F.J. van Raan in 2004[1], extending the concept of delayed recognition originally discussed by Dr. Eugene Garfield in 1970 and 1980[2,3] and analyzed by Professor Wolfgang Glänzel in 2003[4]. 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[5]. Interestingly, the distinctive nature of Sleeping Beauties seems to hold true when all citations are taken into account[6], when author self-citations are excluded[7],

or when only journal self citations are considered[8]. A notable case was described in the intra-journal study by Professor Redner[8] 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[9]. 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 (114 or more citations at end November 2010), 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 fulfils 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.
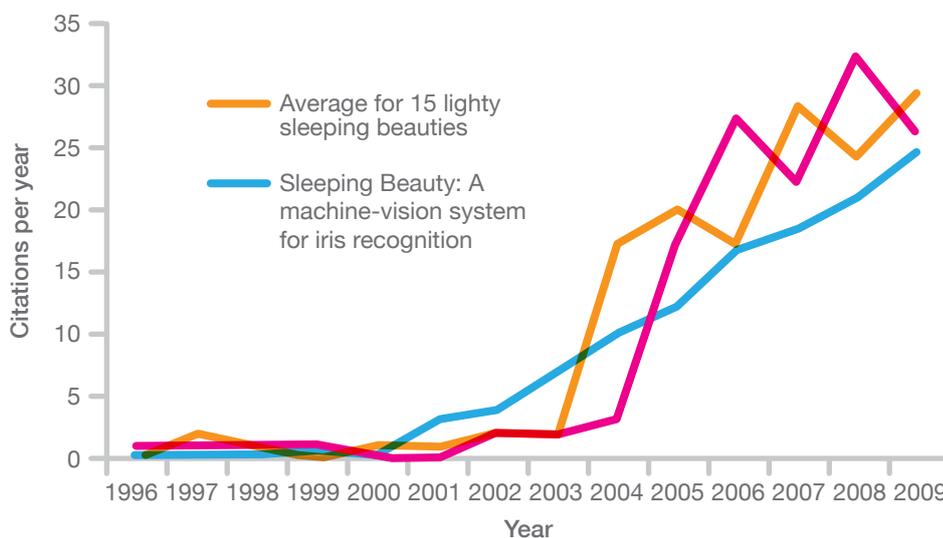
Awakening the Sleeping Beauties

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[10].

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[11,12] 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[13] 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[14] 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

Lou, Y., Ni, W.-M. "Diffusion, self-diffusion and cross-diffusion", Journal of Differential Equations

Citations*

124
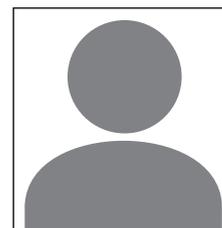
Comment

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[15] in 1998 […]. This may explain why there are very few citations between 1996 and 1999, but more citations later on."

Paper

Borowy, B.S., Salameh, Z.M. "Methodology for optimally sizing the combination of a battery bank and PV array in a Wind/PV hybrid system", IEEE Transactions on Energy Conversion

Citations*

120

Comment

Professor Salameh: "I think we were looking 15 years ahead of our time: I believed then in renewable energy as a way of the future to add/generate electricity and to reduce pollution. Now, research in renewable energy has become fashionable. All over the world, 'renewable energy' has become a buzz word, with even politicians jumping on the bandwagon."

Paper

Ferson, S., Ginzburg L.R. "Different methods are needed to propagate ignorance and variability", Reliability Engineering and System Safety

Citations*

114

Comment

Dr. Ferson: "The real answer is that I have no idea, but it does seem that interest in non-probabilistic Keynesian uncertainty (which is what our paper is about) cycles with big downturns in the economy. Interest in this paper seemed to increase after the collapse of Long-Term Capital Management in the late 1990s, and again in the wake of the 2008 crisis, when people no longer trust their traditional methods for handling risk."

Paper

Brenner, H., Gefeller, O. "An alternative approach to monitoring cancer patient survival", Cancer

Citations*

114

Comment

Professors Brenner and Gefeller: "It seems that the scientific community was not ready at the time of publication. We suggested a new methodological approach that although being quite straightforward – was accepted slowly, with some initial reservations. It was not until practical applications of the methodology using cancer registry data of different origins were presented at conferences that our approach found its way into the standard repertoire of statistical methodology for cancer registry data. One other reason might be that our attitude in communicating our research results is probably somewhat more introverted and silent than the average in the field. We are, of course, very glad that the method proposed in our article is now widely recognized and used in our field of research."

*Number of citations from initial date of publication until end of November 2010.

1. Van Raan, A.F.J. (2004) "Sleeping Beauties in science", Scientometrics, Vol. 59, No. 3, pp. 467–472.

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

3. Garfield, E. (1980) "Premature discovery or delayed recognition – Why?", Current Contents 21, May 26, pp. 5–10.

4. Glänzel, W., Balázs, S., Thijs, B. (2003) "Better late than never? On the chance to become highly cited only beyond the standard bibliometric time horizon", Scientometrics, Vol. 58, No. 3, pp. 571–586.

5. de Solla Price, D.J. (1976) "A general theory of bibliometric and other cumulative advantage processes", Journal of the American Society for Information Science, Vol. 27, pp. 292–306.

6. Glänzel, W., Garfield, E. (2004) "The Myth of Delayed Recognition", The Scientist, Vol. 18, No. 11, p. 8.

7. Costas, R., van Leeuwen, T.N., Van Raan, A.F.J. (2010) "Is scientific literature subject to a 'sell-by-date'? A general methodology to analyze the 'durability' of scientific documents", Journal of the American Society for Information Science & Technology, Vol. 61, No. 2, pp. 329–339.

8. Redner, S. (2005) "Citation Statistics from 110 years of Physical Review", Physics Today, June, pp. 49–54.

9. Einstein, A., Podolsky, B., Rosen, N. (1935) "Can Quantum-Mechanical Description of Physical Reality be Considered Complete?", Physical Review, Vol. 47, No. 10, pp. 777–780.

10. Burrell, Q.L. (2005), "Are "sleeping beauties" to be expected?", Scientometrics, Vol. 65, No. 3, pp. 381–389.

11. Malfliet, W., Hereman, W. (1996) "The tanh method: I. Exact solutions of nonlinear evolution and wave equations", Physica Scripta, Vol. 54, No. 6, pp. 563–568.

12. Malfliet, W., Hereman, W. (1996) "The tanh method: II. Perturbation technique for conservative systems", Physica Scripta, Vol. 54, No. 6, pp. 569–575.

13. Baldwin, D., Gökta , Ü., Hereman, W., Hong, L., Martino, R.S., Miller, J.C. (2004) "Symbolic computation of exact solutions expressible in hyperbolic and elliptic functions for nonlinear PDEs", Journal of Symbolic Computation, Vol. 37, No. 6, pp. 669–705.

14. Tretmans, J. et al. IFIP International Conference on Testing of Communicating Systems 12

15. Ni, W.M. (1998) "Diffusion, cross-diffusion and their spike-layer steady states", Notices AMS, Vol. 45, pp. 9–18.