

## Current Science has its ‘Sleeping Beauties’

According to van Raan<sup>1</sup>, ‘A “Sleeping Beauty in Science” is a publication that goes unnoticed (“sleeps”) for several years and then, almost suddenly, attracts a lot of attention (“is awakened by a Prince”).’ Defined this way, a Sleeping Beauty describes a discovery that is ahead of its time and such papers get called Sleeping Beauties because of this delayed recognition<sup>2</sup>. van Raan<sup>1</sup> also calls it the ‘Mendel syndrome’ because of the history of Mendel’s discoveries in genetics, not acknowledged for over 30 years. According to Ohba and Nakao<sup>3</sup>, a paper should be cited at least 100 times sometime after its initial publication to be considered a Sleeping Beauty.

Each Sleeping Beauty has its Prince – a paper that has awakened it from its sleep. The idea of the Prince comes from van Raan<sup>1</sup>, but Braun *et al.*<sup>4</sup> present a more precise description. According to them, the Prince is usually published in a more recognized journal, is often co-cited with the Sleeping Beauty, and itself is highly cited. Braun *et al.*<sup>4</sup> also claim there can be more than one Prince (an idea that obviously abandons the path of *La Belle au bois dormant*, who was awakened by just one Prince).

A Sleeping Beauty is usually described by: (i) Its *depth of sleep* (deep sleep is described by a mean number of annual citations smaller than 1; less deep sleep is when this is smaller than 2). (ii) *The length of sleep* (the number of years from publication to awakening). (iii) Its *awake intensity* (the number of citations per year during the four years following the sleeping period)<sup>1</sup>.

There is some variation in the use of these parameters. For instance, Ohba and Nakao<sup>3</sup> considered *awake intensity* to be five, not four years after awakening. Van Rann<sup>1</sup> excluded self-citations, while Braun *et al.*<sup>4</sup> have an opposite view, stating that self-citations can even serve as Princes.

*Current Science* has published several highly cited papers since 1932. According to *Web of Science (WoS)*, as of 11 February 2013, 27 papers, each cited over 100 times, have been published since 1932. It is tempting, then, to see whether or not there are any Sleeping Beauties among these highly cited papers. The aim of this research, therefore, is to study whether or not *Current*

*Science* has published any Sleeping Beauties.

I analysed all *Current Science* papers that have around 100 or more citations. The citation analyses were carried out in *WoS* by Thompson Reuters, and the data were downloaded on 11 February 2013 – so all of the analyses relate to this date and the *WoS* database. One of the Sleeping Beauties that I report below has actually had 97 citations by this date, but it will soon reach the level of 100 citations. Among all of the highly cited papers, I think that three can be considered Sleeping Beauties. These are as follows.

*Sleeping Beauty 1*: Chatterjee’s<sup>5</sup> paper is an example of a noticeable Sleeping Beauty. Its citation history is presented in Figure 1a. Published in 2000, it was cited for the first time in 2002, but till 2005 it was only referred to in three papers. Later the number of per year citations increased, reaching 26 in 2011. So this paper was in deep sleep for 7 years (the length of deep sleep), and the awake intensity was 10.5. Altogether, this paper has received 97 citations.

Unfortunately, it is difficult to decide which paper is the Prince. A first citation<sup>6</sup> might be a good choice because this paper was highly cited (88 citations) and it shared 19 citations with Chatterjee’s<sup>5</sup> paper. No other paper fills both these criteria at the moment of the sheep of the Sleeping Beauty. However, the problem is that this awakening had little effect because the true awakening was not until 2008, six years after publishing this candidate for the Prince! So, maybe this Prince’s kiss was itself ahead of its time.

*Sleeping Beauty 2*: A better example of a Sleeping Beauty is the paper by Swarup *et al.*<sup>7</sup>, whose citation history is presented in Figure 1b; it received 144 citations. Although it did receive some citations from 1992 to 1999, it had never more than two per year. In 2000, it received three citations, and this was the last year of sleep – this paper later received around 8–18 citations per year (with an exception of 2010, with only two citations). So, this Sleeping Beauty had a period of *less deep sleep* of 10 years (with averages of 1.2 citations per

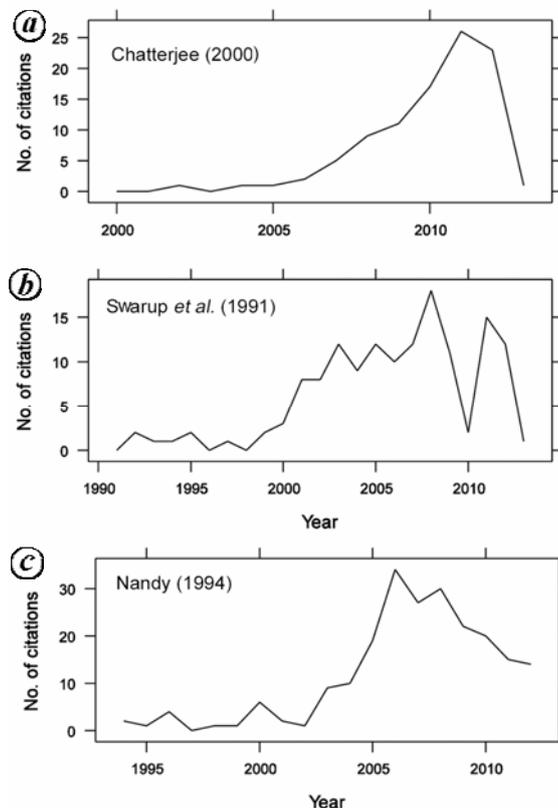


Figure 1 a–c. Citation history of the three *Current Science* Sleeping Beauties. The data include self-citations.

year from 1991 to 2000), and the *awake intensity* was 9.25. Again, finding a Prince is not so easy; my vote is for the paper by Bharadwaj and Sethi<sup>8</sup>, which itself was not so highly cited (29 citations), but it shared 13 citations with Swarup *et al.*<sup>7</sup>. As the paper by Bharadwaj and Sethi<sup>8</sup> was published in late 2001, quite likely it was not the real Prince, because seven other (earlier) citations were reported in 2011. The paper by Chengalur and Kanekar<sup>9</sup> is another candidate for the Prince, but out of 21 citations only six were co-citations with the Sleeping Beauty. So, for this paper it is difficult to decide which paper(s) constituted the Prince(s). It is possible that something else constitutes the Prince, for example a conference presentation in which the Sleeping Beauty is rediscovered, but this would be very difficult to detect.

*Sleeping Beauty 3*: Another highly cited *Current Science* paper<sup>10</sup> – with 218 citations, the fourth most highly cited paper in the journal – is a clear Sleeping Beauty. Figure 1c shows its citation history. It was cited twice in the year of publication (1994), but both citations were self-citations; as was a subsequent 1995 citation. The first two non-self-citations appeared in 1996, but then three years followed without any citations. However, in 2000 there were six citations (two of which were self-citations).

This year was the most important in the history of this paper, as the paper by Randic *et al.*<sup>11</sup> became the Prince. This paper is also highly cited, but less so than Nandy's<sup>10</sup>. So, this pair represents a female domination<sup>4</sup> (note that it has nothing to do with the authors' gender; the female domination means that the Sleeping Beauty paper is more cited than the Prince paper, whereas the opposite situation represents the male domination). Noticeably, these two papers have 122 shared citations. No other paper seemed to be the Prince.

The three papers described above<sup>5,7,10</sup> are good examples of Sleeping Beauties, representing delayed recognition. Maybe the Sleeping Beauties in *Current Science* are not as spectacular as the one discussed by van Calster<sup>12</sup>. He described an article by Peirce<sup>13</sup>, whose sleep lasted for almost 120 years, an astonishing result. Yet the *Current Science* Sleeping Beauties, even if not so remarkable, are worth acknowledging, since they prove that the journal publishes papers that are ahead of their time.

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## Popular article is a neglected intellectual component in Indian science research publication

Instruction ends in the school room, but education ends only with life. The human mind is our fundamental resource on Earth. Compared to scientific papers, popular articles are easily accessible and comprehensible to a wide general audience amongst people from all walks of life. Popular articles are inspirational and give inciting tips and tutorials to young scientific minds with creative implications for the future. 'Juried', 'refereed', or 'peer reviewed' magazine articles with exhaustive bibliography could also spark innovative ideas with new applications of others' research. There had been a temporal mismatch in Indian science education observing system and how education success is measured. Scholarly journal

articles are only based on original research works and reviews. However, to promote scientific awareness among people of the country and their wards, there should be a new imperative for popular article publications in science research institutes to address different intellectual levels in Indian society. I could ponder a publication in *Nature* entitled, 'Effect of aquaculture on world fish supplies in the year 2000' that emphasized growing aquaculture industry to sustain its contribution to world fish supplies must reduce wild fish inputs in feed and adopt more ecologically sound management practices<sup>1</sup>. Which segment of the Indian scientific community did this finding ultimately reach? What percent-

age of students in India have access to read articles published in *Nature*? Popular articles traverse great odds and many cross boundaries acting as the key for illuminated intellectual functioning of the under-resourced. It is a great work to educate a child, in the true and larger sense of the word, than to rule a country. Even in life, by teaching others we teach ourselves. He who opens a school door, closes a prison. Our progress as a nation can be no swifter than our progress in education.

It is widely expected that India will invest more funds in education and research in science as well as technology in coming 5–10 years to enable the country to move from service economy to knowl-