

The “Black Swan” Phenomenon in Science Publishing: Warning Shot

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The purpose of this letter is to examine whether the black swan phenomenon, as proposed by Taleb (2007), may be taking place in science publishing as a direct consequence of post-publication peer review (PPPR). In essence, this phenomenon states that even if a million white swans are sighted, the sighting of a single black swan eliminates the veracity of the hypothesis that all swans are white. According to Taleb, it acts as a triplet: a rarity or an outlier, extreme impact, and retrospective predictability, indicating that “the occurrence of a highly improbable event is the equivalent of the nonoccurrence of a highly probable one”. Human nature will attempt to try and explain, or rationalize, how a highly improbable event could have occurred.

As PPPR examines more and more papers from the already published literature (Teixeira da Silva 2015a, 2015b), and discovers more and more errors that filtered through what was previously thought to be a fail-safe and impervious peer review system (Teixeira da Silva and Dobránszki 2015), the number of exceptions that annul the rule are increasing. This then begs the question: Are “black swan” events increasingly taking place in science publishing? I claim that yes, and hope to use these few pages to show the rationale why, with a focus on plant science. To achieve this, I have carefully selected several of Taleb’s words and ideas to base my argument.

To charter my thoughts, I decided to select four respectable journals in the plant sciences. The first is *Scientia Horticulturae* (hereafter SH), published by Elsevier Ltd. The second is *South African Journal of Botany* (hereafter SAJB), also published by Elsevier Ltd. The third is *Molecular Plant-Microbe Interactions* (hereafter MPMI), published by The American Phytopathological Society, while the last is *The Plant Cell* (hereafter TPC), published by The American Society of Plant Biologists. The four journals command respectable 2013 JCI impact factors of 1.504, 1.34, 4.455, and 9.575, respectively, the latter being ranked first among all plant science journals. A search for the term withdrawal, retracted, retraction or retraction notice reveal that in the 192, 100, 28, and 27 volumes, respectively published thus far by SH, SAJB, MPMI and TPC, that only 1 (2013), 1 (2014), 0, and 1 (2015) retractions, respectively have been published. In the latter case (TPC), the first retraction ever appeared only on June 2, 2015. Similarly, a search for erratum reveals 25, 7, 14, and 0 errata, respectively while a search for corrigendum lists 16, 2, 0, and 0 corrigenda, respectively for these four journals. TPC does not classify corrections to papers as errata or corrigenda, rather as corrections, having in total 81. The ratio of retractions, errata and corrigenda – particularly the number of retractions – to the volume of published papers is extremely low (except for the TPC corrections), which suggests that peer review has been near perfect, and that the content of these journals is near perfect (i.e., “white swan” events). At least, this is what the publishers would have the public think. This is statistically highly improbable because:

- a) Peer review typically takes place following analysis by anything from 2 to 5 peers, i.e., an infinitesimal fraction of the total peer pool;
- b) A paper is approved for publication by one or two individuals, usually the editor-in-chief, and closely associated editors;
- c) The probability of defending the journal’s image, rather than correcting the literature, is high (i.e., protectionism and editorial bias).

Although it is likely impossible to prove a) to c), since these are events and conditions that remain closed to the public, there are few other plausible explanations. Yet, these three factors alone put into place a set of conditions that make a black swan scenario highly likely, i.e., that the detection of imperfections of what is perceived to be a perfect or near-perfect peer review system, will annul the claim of a perfect peer review and editorial system.

Of particular pertinence is the retraction in TPC, the first in its history, of the Dunoyer et al. (2004) paper, which was anonymously critiqued, through PPPR, on PubPeer (PubPeer 2015). What was previously thought to be a near perfect journal, with impeccable quality control instilled by its peer review, has shown to be a system that has been quite simply, grossly imperfect and open to fraud and abuse. Moreover, the whistle-blowing revelations by Dr. Vicky Vance (2015) revealed that what should have been a perfectly rejected manuscript was ultimately accepted by TPC, only to be

retracted following the revelations that the first author had fraudulently manipulated several figures. The Dunoyer et al. (2004) paper is a classical black swan, i.e., the shocking emergence of an event so highly improbable, that it leaves the academic field shocked. Similarly, the extremely low number of retractions in SH, SAJB and MPMI indicates that a statistically highly improbable event is taking place, and given the number of cases being reported at PubPeer of problematic papers, it will only be a matter of time before the next black swan emerges ("Black Swans can be caused and exacerbated by their being unexpected."; Taleb 2007). This singular event, the TPC retraction, will define "the dynamics of historical events" (Taleb 2007) in plant science.

Conflicts of Interest

The author declares no conflicts of interest.

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