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COMMENTARY

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Science in decline: Is quality sacrificed for quantity and ease of access?

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An ultimate goal of science is to bring about an awareness of the workings of the universe and the natural world. The scientific method provides objective evaluation of data and information, resulting in the advancement of knowledge. This knowledge is critical to provide solutions to issues such as understanding the origins of the universe, the biodiversity crisis, ecosystem failure, climate change, epidemics, neurobiological disorders, and chronic diseases. Thoughtful attention of the findings from scientific studies essentially provide the ammunition needed to ensure the persistence of humans on earth. Despite the obvious importance of science, most academics (scientists not employed in the industrial sector) are underpaid (Bender and Heywood 2006), particularly given the level of their expertise and the financial investment needed for their training. Nevertheless, many scientists are idealists, and are not in science for the money or the grandeur, but because they have an intense curiosity about the universe and the world around them. Thus, researchers toil on, piecing together the machineries of the universe through careful and thoughtful study and reveal their findings to their peers through the medium of scientific publication. This published science is also available to be read by relevant leaders who can enact change for the good of society.

Unfortunately, the idealistic construct of science has been torn down over the last decades by the now fanatical need to publish in quantity, to attain grandeur and celebrity-style recognition, and to have followers on social media. Young and experienced researchers believe that they cannot advance their career before producing many publications (perhaps correctly) that have high visibility so that they are cited more often to improve their h-index score. The advent of the Adobe pdf file format in the late 1990s (Abrams and Levenson 2004) allowed for the easy distribution of research articles, first by email, but later through direct download from publisher's websites. This allowed for the exchange of published articles between researchers with no payment to the publishing houses. This change in the business model of publishing resulted in a shifting of the cost from readers to the authors with the creation of Open Access (OA).

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Scientific advancement is obstructed by excessive Article Processing Charges

The OA publication model has gained traction over the last two decades allowing for free access to scientific publications by end users (Laakso et al. 2011, Tennant et al. 2016). This approach differs from traditional scientific publishing where online or print-only articles were located behind expensive subscription paywalls and were therefore not freely available. The OA model has become the new norm, with many journals moving to either exclusively OA (termed "OA Gold") where authors pay an Article Processing Charge (APC) or the 'hybrid' model where the authors can choose to either pay for OA or opt out on OA, resulting in the article remaining behind a paywall. Some publishers also have an "OA Green" option where the authors can self-archive a prepublication version of the article, which is not formatted by the publisher and is not available through them. Many institutions encourage or even force their researchers to publish OA Gold. Indeed, the Coalition-S model for European researchers now requires any science generated with public funding to publish OA (e.g., https://www.coalition-s.org/about/). On the surface, publishing OA resonates as an extraordinary model for scientific publishing because research outputs are easily accessible and unaffordable subscription paywalls are removed.

There is a perception that OA publications are cited more often due to their greater visibility (Tang et al. 2017), enhancing the profile of the authors (McKiernan et al. 2016). Indeed, this aspect is used by prominent academic publishers to nudge researchers toward choosing OA. Unfortunately, there are unintended consequences to choosing OA – journal publishers require the authors to pay APCs which can be exorbitant, in the order of many thousands of US dollars (Williams et al. 2023). Indeed, *African Journal of Herpetology* APC is set by its publisher, Taylor & Francis, and is beyond the control of the Herpetological Association of Africa. The APC makes this the most expensive herpetology subject journal globally, resulting in potential authors seeking other venues for their work. Additionally, high APCs are now leading to 'closed research' where some researchers simply cannot afford to publish in the new OA landscape (Zhang et al. 2022). Although we acknowledge that publishers do incur direct costs associated with the publication of articles and operate a profit bearing business, many publishers generate extremely large revenues with high profit margins under the OA business model (Williams et al. 2023). In addition, publishers receive the scientific content from researchers gratis, and most editors and peer-reviewers provide their services to the publishers with no compensation. This system has allowed the academic publishing giants (Springer, Wiley, Elsevier, Taylor & Francis) to reap massive profits, some in the order of billions of dollars (Williams et al. 2023). The revenues of these publishing houses began to increase sharply when OA became mainstream for scientific publishing.

Does OA really boost citations?

Publishers promote the claim that Gold OA publications are cited more often than non OA publications. Interrogation of the data show that this relationship is more nuanced and can also depend on the context and discipline (Piwowar et al. 2018). No significant differences between OA and non-OA publications have been reported in some studies

(see Davis 2011, McCabe and Snyder 2014), while Green OA articles were found to be cited more often than Gold OA by Piwowar et al. (2018). In addition, context has a major impact in the decision to go with OA. Authors are more likely to publish potentially impactful articles in OA, immediately biasing the resultant citations rates (Craig et al. 2007). These different influences on citation rates are difficult to disentangle, and studies that have attempted to do so report that OA appears to have a negligible impact on citation rate (Craig et al. 2007). So, we must ask, does OA really boost the profile of a paper as claimed by publishers and some published studies?

Does quantity rein above quality?

The new business model of publishing houses prioritizing OA and APC over paywalls and subscriptions is likely to have resulted in a change in publishing houses priorities. With their reduced publication costs for online-only publication and exorbitant APCs, it is in the interest of publishing houses to maximize the number of papers published in their OA focused journals. There is thus a danger that these profit-driven pressures will lead to a lowering of scientific standards in the quest to publish more papers. These pressures are thus anti-science – high scientific standards and rigor should be non-negotiable in science. Although the effects of the new business model of publishing houses have not been formally quantified, rates of publications have exploded over recent years (van Noorden 2014). Although burgeoning rates of publications is usually seen as successful science, it may in fact mark the sign of scientific decline.

The way forward for African Journal of Herpetology

With regards to *African Journal of Herpetology*, representatives of the Herpetological Association of Africa have been working with our publisher, Taylor & Francis, to break down some of the barriers to affordable OA. While most publishers provide some discount options for authors from low-income countries, these are not available for authors from middle-income countries, where many of our authors are based. Other more meaningful alternatives are being sought out to provide authors with better options to publish OA. In the meantime, authors are reminded that *African Journal of Herpetology* is a hybrid journal with a print copy and a free pdf supplied to the authors for personal use, and online pdfs of the content are always available free to members including back-issues.

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