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LETTER TO THE EDITOR

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Bypass and hyperbole in soil science: A perspective from the next generation of soil scientists

We, the co-authors of this letter, are an international group of soil scientists at early career stages, from PhD students to postdoctoral researchers, lecturers, and research fellows with permanent positions. Here, we present our collective musings on soil research challenges and opportunities and, in particular, the points raised by Philippe Baveye (Baveye, 2020a, 2020b) and Johan Bouma (Bouma, 2020) on *bypass* and *hyperbole* in soil science. Raising awareness about these issues is a first and necessary step. To this end, we would like to thank Philippe Baveye and Johan Bouma for initiating this debate.

The so-called "rat-race" in the scientific publication system, and the associated practices including "bypass" and "hyperbole" as highlighted by Baveye (2020a, 2020b), particularly affect the ability of early career soil scientists to begin and consolidate their careers and to make meaningful contributions to their disciplines. PhD students, postdoctoral researchers, junior and senior lecturers and well-established professors hold contrasting perspectives on these issues and unequally suffer from the pernicious impacts and imperfections of the current system. We strongly believe that finding and implementing effective and efficient solutions to adjust the system requires the involvement and collective responsibility of the whole soil science community.

1. | OVERCOMING BYPASS: A COLLECTIVE EFFORT

To some extent, we believe that bypass – the avoidance of older literature – *does* exist. Bypass from early career researchers (ECRs) may arise from a "fast science" culture and will continue as long as we measure researchers' merit with quantitative publication and citation metrics, such as annual publication output and impact factors. Some of the co-authors of this letter have received suggestions that citing recent publications is often best for demonstrating the timeliness of an issue. Furthermore, some note that supervisors, senior colleagues, journal editors and peer reviewers have advised ECRs "not to review older literature" or "to look for recent references".

We argue that tackling bypass requires the collective responsibility and active involvement of the whole soil science community, and that the mechanisms to address bypass may already exist. For example, comprehensive review papers should be used to systematically document the paradigmatic evolution of a topic and draw, where necessary, from a comprehensive research body irrespective of publication date. Rather than reflecting trends in recent publications, timeliness of a topic should hinge on the actual relevance of a study at the time of its conception. Although rewarding citation-wise, review papers are currently considered as having little to no achievement value in certain contexts (e.g., UK Research Excellence Framework). As a result, review writing by ECRs may be further discouraged in the future. Reversing this trajectory is important as writing review papers is critical for preserving the heritage of soil science and should be undertaken by the whole research community. We want to highlight the capital role that senior scientists can play in honing and balancing critical reviewing skills by ECRs and, considering their more comprehensive knowledge of older literature, avoiding bypass practices.

From our experience, there is also a "disciplinary bypass" whereby soil scientists fail to acknowledge (similar) work being carried out in neighbouring fields. To a certain extent, one can argue that some of the critiques raised by Baveye (e.g., the use of aggregates or genomic approaches in soil) are indicative of the desperate need to build more bridges instead of walls between soil communities (e.g., soil physicists, soil chemists and soil biologists) and neighbouring disciplines.

2. | AVOIDING HYPERBOLES, NOT POPULARITY

Publishing in cross-disciplinary, high-impact journals and progressing in one's career is often perceived as more achievable if one engages in a self-selling campaign. Unfortunately, we are sometimes prompted to exercise a

considerable dose of hyperbole, especially when opportunities to sustain research careers heavily depend on metrics such as the *H*-index, the volume of published outputs and the acquisition of competitive funding.

As evidenced by Baveye (2020a, 2020b), hyperbole seems to be a common approach to heighten awareness, raise attention and obtain grant funding. The importance of soils is becoming increasingly recognized, partly due to some of the hyperboles cited by Baveye (2020a, 2020b), such as the *4per1000*. Nevertheless, we need to be careful about how our research is interpreted outside the scientific community. Therefore, although we share the view of Baveye (2020b) that "exaggerated claims that are not supported either by existing knowledge or by experimental observations" are undesirable in soil science, we do not condemn entire fields of soil research solely because they can be accused of "hype". Whatever the reason may be for exploring "novel" research fields – whether it is based on sound scientific arguments, personal endeavour, to secure funding or to achieve widespread acclaim – the first criteria for evaluating any research should be to assess (a) whether the scientific claims are supported by the data presented and (b) whether the study was conducted with rigour and honesty. We would not discourage any scientist at any career stage from publishing their work in high-impact factor journals in order to enhance their visibility, as long as the scientific quality of the work is adequate.

Some subdisciplines of soil science may be disadvantaged because of the preferential allocation of research funds to areas that often call for greater attention (e.g., glomalin, biochar or the *4per1000* initiative). This apparent "hype" may not necessarily come from inside the scientific community. Rather, research results are sometimes selectively picked up outside academia because they seemingly promise fast and easy solutions. In such cases, it is important that we as scientists do not over-simplify our research in order to meet perceived societal expectations.

From this vantage point, it seems self-evident that we need to develop honest and transparent communication channels to better and proactively communicate the relevance and limits of our hypotheses or findings, so that originally promising ideas are not torn beyond recognition. At the same time, we desperately need to develop teaching tools and build strong relationships between soil scientists and stakeholders, decision makers and the general public to promote what we can do for society.

As peer reviewers, we should provide editors with thorough revisions, addressing any potential bypasses and highlighting hyperbolic claims, and requesting these to be placed into context. As individual researchers, we should feel encouraged to write letters to the editor and participate in post-publishing discussions when the level of "hype" is not justified.

3. | RETHINKING SCIENTIFIC PUBLISHING

We share Baveye's view that the publication system no longer functions in the best interests of presenting the advances of our knowledge. Attempting to rectify its imperfections remains difficult and is somewhat akin to a "prisoner's" dilemma, whereby acting alone is analogous to shooting oneself in the foot. Instead, achieving change commands action from a coordinated ensemble.

As suggested by Baveye (2020a, 2020b), we share the view that editing and reviewing processes must be improved. Naturally, we acknowledge that the thorough screening of manuscripts by editors is a colossal task. Associate editors are often requested by journals to handle 20 to 70 papers per year, if not more, and most of the time with little to no remuneration. Systematic and universal acknowledgement could additionally motivate editors to commit to doing a good job. However, rejecting articles when "the level of hype is insufferable" or when they describe "method-driven (as opposed to the much sounder question-driven) research" (Baveye, 2020b) would be counter-productive. The first opens a Pandora's box of subjectivity, whereas the second implicitly assumes that experimental work aimed at improving specific methods, or illustrating new applications of an established technique, does not merit publication. Rejecting papers that do not present much originality is out of place when these help to support previously published findings. However, repetition of previous work because of one's ignorance or incomplete knowledge of a body of literature on the topic is undesirable when purporting novel insights.

We think that well-conducted studies investigating small sample sizes or finding negative results are absolutely worth publishing in esteemed journals as these may spare fellow researchers a lot of preliminary effort and, in that respect, are highly beneficial to the field. Additionally, unforeseen circumstances (such as the current global pandemic) can lead to less extensive experimental work but still produce publishable data. The problem is that the pressure to publish quantitatively can sometimes lead to the submission of low-quality studies.

We do not think that limiting the number of articles a scientist may publish only by the dissuasive cost of publication in "authors-paying" open-access journals is a sustainable solution, as it may again favour richer research institutions to the detriment of others, especially from developing countries. So far, funding agencies require the publications related to their funded research to be published in open access journals, and many provide funds to

pay for article-processing fees. Developing a publicly funded, not-for-profit publication system to publish research coming from their projects, could be a way forward.

A simple measure to implement would be the general adoption of either open reviews or double-blinded reviews of submitted articles and funding applications. Revealing the list of authors exposes the reviewers to unconscious bias. Another set of issues are derived from relying on the goodwill of reviewers. Traceability and recognition of the reviewers' job seems to be gaining pace (e.g., through platforms such as Publons or with transparent reviewing processes such as the EGU journals). In our view, these mechanisms should become mainstay practices within the publication system. Nevertheless, we maintain that reviewing articles should be a shared responsibility amongst researchers. Journals often grant free access to journal articles for a few weeks in recognition of reviewing work. This could be improved, for instance, by providing longer access and gratuity for publication in open access journals. Furthermore, developing a healthy and constructive post-publication peer-review system, where bypasses and hyperbolic approaches can be identified and discussed, would ultimately boost publication quality and contribute to a more open discourse in soil science.

4. | CONCLUDING REMARKS

Facing the limits of the current publishing system and career evaluation, we as ECRs in soil science feel particularly vulnerable to bypasses and hyperboles. The research community needs to address the culture of fast science that triggers these practices and condemn them while adjusting the publication system. We suggest:

- that topical reviews be written by both senior researchers and ECRs, ideally in collaboration, to stimulate open exchange and critical discussions of the literature and as a way to avoid or minimize old literature being bypassed;
- that open discourse and lively discussions be encouraged at all stages of publication, including post-publishing discussions, and that peer reviewing and editorial activities be more valued and acknowledged as a first step to avoid pernicious hyperbolic statements;
- that the value of an individual researcher be assessed by their wholesome contribution to the community, including teaching, service and outreach activities, as well as the originality of their approaches, besides publication metrics;
- that transdisciplinarity be truly implemented in the soil sciences; and
- that efforts be made to better communicate soil science and closely connect it to the public debate.

CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

O.S. and X.P. were invited to write the letter and contacted all remaining co-authors, who provided their critical opinion. O.S. and X.P. wrote the first draft. All authors reviewed, edited and approved the final manuscript. M.B.R., P.B., R.C., E.C., D.D.D., D.L.E., E.L.F., E.C.H., D.M., L.M.M., C.W.M., M.P., F.R., L.R., H.S., LS. S., C.V. and A.V. contributed equally to the manuscript.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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Letter to the Editor of the European Journal of Soil Science as a reaction to the Russell Review by Phillipe Baveye "*Bypass and hyperbole in soil research: worrisome practices critically reviewed through examples*" and to his follow-up Invited Opinion paper "*Bypass and hyperbole in soil research: a personal view on plausible causes and possible remedies*" and the subsequent Letter to the Editor by Johan Bouma "*Soil challenges beyond publication issues*".

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