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Forum

Protecting stable biological nomenclatural systems enables universal communication: A collective international appeal

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Abstract

The fundamental value of universal nomenclatural systems in biology is that they enable unambiguous scientific communication. However, the stability of these systems is threatened by recent discussions asking for a fairer nomenclature, raising the possibility of bulk revision processes for "inappropriate" names. It is evident that such proposals come from very deep feelings, but we show how they can irreparably damage the foundation of biological communication and, in turn, the sciences that depend on it. There are four essential consequences of objective codes of nomenclature: universality, stability, neutrality, and transculturality. These codes provide fair and impartial guides to the principles governing biological nomenclature and allow unambiguous universal communication in biology. Accordingly, no subjective proposals should be allowed to undermine them.

Taxonomy is the science that aims to classify and describe the biodiversity of the planet. As such, taxonomy provides a foundation necessary for other sciences; knowing biodiversity is the first step needed for any biology-based discipline or service to develop. Taxonomic names are transmitted to the rest of the scientific community through regulated, internationally agreed-on protocols: the nomenclatural systems. Biological nomenclature enables science and society to apply shared, unambiguous names when referring to species and other taxa.

The fundamental value of universal nomenclatural systems in biology—and the key to their success—is that they have enabled unambiguous scientific communication among and across different cultures. These binomial or binominal systems (hereafter, *nomenclatural systems*) are codified in sets of rules for zoology (the International Code of Zoological Nomenclature; ICZN 1999), botany (the International Code of Nomenclature [ICN] for algae, fungi and plants; Turland et al. 2018), and other branches of biology (e.g., the International Code of Nomenclature of Prokaryotes; Oren et al. 2023). Such systems have helped advance biological research (including paleontology) for more than 250 years. However, the very principles and fundamental conventions of biological nomenclature are now being questioned, and its stability compromised. Recent discussions and debates on biological nomenclature have asked for fairer, more inclusive and socially just scientific nomenclature for species and other taxa, with a possible collective aim to heal some of the wounds that colonialism, sexism, racism, casteism, and other human failings have inflicted in communities all over the planet (e.g., Hammer and Thiele 2021, Smith et al. 2022, Thiele et al. 2022, Tracy 2022, Wright and Gillman 2022, Guedes et al. 2023, Harris and Xavier 2023, Mabele et al. 2023, Roksandic et al. 2023, Sanderson 2024). These debates have also led to the suggestion that bulk revisions should be advanced to remove "inappropriate" names, such as eponyms dedicated to controversial people or words perceived as offensive in certain languages or regions. It is evident that such contentions come from very deep feelings, but it is unclear whether the consequences of some of these proposed revisions have been thoughtfully pondered, considering whether the intended good could be

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outweighed by negative effects. Taking into account the diverse societal and geographical backgrounds of the proponents of such name changes, the number of names affected over time could easily be in the hundreds of thousands (Ceríaco et al. 2023), including eponyms, toponyms, racial slurs, names reflecting colonialism, and so forth.

Claimants for nomenclatural justice have moved some legitimate, nonscientific, social concerns into the scientific arena, where other considerations should prevail, in the spirit of cross-cultural, international understanding. Although their intentions are undoubtedly good and their pursuit laudable, most of these revisionist authors seem not to realize that their proposals try to address alleged problems mostly built on post hoc premises and attack the foundations on which biological nomenclature is built. These proposals essentially disregard that present nomenclatural systems are intended to allow transcultural communication through a shared, operationally neutral system of scientific names that is stable over time, already serving as a vehicle of social justice. These benefits may not be maintained if efforts to address injustice destabilize the nomenclatural systems and undermine the pillars of universal scientific communication and mutual understanding.

Recent proposals, suggestions, and demands for extensive change dominate the discourse of critics who, by narrowly focusing on particular facets or by holding local perspectives of a much broader and complex picture, fail to acknowledge the critical importance of our current nomenclatural systems at global scale. Although the legitimacy of the authors' aspirations is beyond reproach, it is paradoxical that their relative impact on the discussion of biological nomenclature is amplified by several scientific journals that have allowed subjective appreciations to develop. Proposals to modify current nomenclature on the basis of ethical arguments have consistently met resistance from nomenclatural practitioners, who provide practical and technical counterarguments (e.g., Mosyakin 2022, Ceríaco et al. 2023, Garbino 2023, Katumo et al. 2023). However, the discussion arena has been unequal so far. The papers fueling the controversy receive coverage in transdisciplinary journals with wide audiences, whereas technically argued opposing views are largely published in specialized journals with narrower audiences.

In this article, we present a response that aims at uniting a much more widespread concern that has remained in the background: that the functionality of communication within the scientific community and across society is the greatest contribution of the nomenclatural systems and that this benefit may become jeopardized. Many of us, researchers in taxonomy, systematics, evolutionary biology, and other biological sciences, are concerned about well-intentioned but ill-considered and irresponsible opinions published on the subject that may irreparably damage biological communication that unites us all and, thereby, the fundamental discipline that underlies and connects all others: taxonomy. In contrast to previous replies, which provided detailed responses to the multiple technical flaws in the well-meaning proposals, we would like to make explicit four essential, nontechnical considerations that arise from the very reason we have and need shared codes of nomenclature with objective rules: universality, stability, neutrality, and transculturality. These considerations, implicit in our nomenclatural systems, seem to go unnoticed by many non-taxonomists, who inadvertently undermine these systems in an attempt to solve pervasive social or political problems that transcend the scope of biological nomenclature.

The authors call on the scientific community to endorse the considerations we enumerate below on the grounds that they provide rational guides to the principles governing the current systems and practice of biological nomenclature and that they allow unambiguous universal communication in biology and related disciplines, as well as transfer of taxonomic knowledge to the wider society. Accordingly, no subjective, politically motivated, or opinion-based proposals should undermine them.

Universality: Biological nomenclature must be shared across the entire planet

Universality of nomenclature is the most efficient way to ensure cross-cultural, universal communication. The biological nomenclatural systems were adopted for the reason that they avoid the conundrum that multiple vernacular names present for effective global communication. The current nomenclatural systems strive for each species to have a single and unique two-word disambiguator as the species name to be used in scientific contexts within every language on the planet. This is a practicality devoid of any colonial, racial, national, regional, cultural, or other nonuniversal legacies other than the *de facto* Linnaean origin of the systems in Europe. To avoid conflict among different scientific names applying to a same taxon, biological nomenclature utilizes nomenclatural priority: Older scientific names should prevail over more recently coined names.

The principle of priority is a convention conceived to apply to scientific names within their regulated contexts, not to be expanded to vernacular names, which would be highly disruptive. Extending the principle of priority to vernacular and scientific names has been proposed on the grounds that vernacular names predate scientific ones (Gillman and Wright 2020, Wright and Gillman 2022, Rivas et al. 2024). Replacing existing scientific names with new names based on vernacular names poses a situation with no single fair solution: Among all the possible competing native names for the same taxon, which one should be used and based on which language? It goes without saying that most species do not have a local name, and if local names are available, we often have several in different languages for the same species when its geographic range spreads over several linguistic communities. In fact, most European common names—which are, by definition, indigenous names—are not used as the generic or specific epithet for the corresponding taxa. Moreover, no living language should have an objective priority over another when it comes to naming taxa.

All these issues have already been contemplated by scientists (see Palma and Heath 2021, McGlone et al. 2022, Mosyakin 2023b) and have been solved by diligently respecting nomenclatural priority (older scientific names should prevail over more recently coined names), which is a core principle in all of the current international biological nomenclatural systems. Recently, it has been suggested that to compensate for any perceived bias and move toward cultural inclusion, the scientific names proposed in the future will be the ones for which local terms should be considered (see Hayova et al. 2023). There is no barrier to honoring local vernacular names: the codes make provisions for names to be derived from any language, proactively avoiding any potential language-based discrimination when coining new names and, therefore, not banning the use of local terms in scientific naming. Indeed, Heard and Mlynarek (2023) compiled examples of scientific names based on a variety of languages, including Norwegian, Quechua, te reo Māori, Tselagi, Afrikaans, and Russian.

However, creating a scientific name from an indigenous language must not be considered a justification for disregarding

available older names. Recently, the extension of the principle of priority to vernacular names was misapplied in a high-profile case of a newly recognized species of green anaconda (Rivas et al. 2024). Rivas and colleagues acknowledged that potential scientific names exist for the taxon, but instead of studying the case in detail, they dismissed all of them, presuming priority of the indigenous name they chose. As a result, the validity of their new name is in doubt from its inception, worsening the already complicated nomenclatural situation.

Stability: Biological nomenclature must be stable over time, now and in the future

Stability is the most efficient way to ensure transgenerational communication. Critics argue that a bulk revisionary process should happen within the nomenclatural systems to help heal the open wounds of colonialism in science (e.g., Wright and Gillman 2022, Guedes et al. 2023, Mabele et al. 2023). These authors seem to think that this process will solve the complex problem posed by judging the past by today's standards, forgetting that their views and grievances will likewise be subject to future judgment. It is entirely possible that, in the future, other people will see the decisions we are making now as unfair, resulting in never-ending revisionary processes. This likelihood of future grievance threatens transgenerational communication and, therefore, stability in scientific names. The stability in scientific names and their use over time is specifically addressed by our codes and implemented on a case-by-case basis, when universal communication is threatened (e.g., conserved types under the ICN, Turland et al. 2018; reversal of precedence under the ICZN, ICZN 1999).

Preserving the stability of our universal nomenclatural systems seems the most reasonable and responsible way to ensure that names for taxa will be protected over time against the evolution of future grievances.

Neutrality: Biological nomenclature must be understood simply as a universal operational system of disambiguators for taxa

Most members of society perceive scientific names as names only and devoid of any explicit or implicit content. Names can be an arbitrary combination of letters, although in many cases, they are derived from Latin or Ancient Greek. Being either idiosyncratically composed or (mostly) based on largely dead languages, the vast majority of scientific names make as little sense to the general public as do personal names, making them neutral in their meaning and use. This is true in most cases, even for speakers of Latin-derived languages. Despite this situation, proponents of nomenclatural change claim that some scientific names contain or embody targeted oppressive or offensive messages that are perceived by parts of society. Offense is not generally a component of a given scientific name, although it may occur in rare instances (e.g., *Centaurea latronum* Pau, meaning "thieves' *Centaurea*," targeting several colleagues of Pau who gave preferential treatment to another botanist).

Although biological scientific names were initially intended to act as descriptors and bear a meaning, names do not have to make semantic sense, to the point that they can be wrong or confounding but still act as valid and available or accepted and legitimate names as long as they fulfill relevant code regulations. For example, toponymic specific epithets created in error are well known. The tree *Quercus canariensis* Willd., believed to have been collected in the Canary Islands, is absent from these; the geophyte *Scilla peruviana* L., an Old-World species, does not exist in Peru; and the moss *Bryoxiphium norvegicum* (Brid.) Mitt. was described from Iceland and is apparently absent from Norway. The biological nomenclatural systems have unquestionably evolved from an initial intention of creating short descriptors to names being simply understood as taxonomic disambiguators.

Scientific names that include or are derived from terms that may be perceived as an offensive word in certain languages are, in most cases, a matter of coincidence. These names now considered offensive may be perceived as such by decontextualizing the moment in which they were coined and either predate negative connotations or simply refer to something different (e.g., *niger*, the Latin word for black color is not intended to be used as a racial slur in biological nomenclature; the epithet *marica,* referring to a mythological nymph and certainly unrelated to the homonymous derogatory term in Spanish for homosexual men). In the particular case of eponyms, although they are coined to honor particular people, such meaning is rarely understood beyond the immediate expertise field. Eponyms are also to a great extent devoid of any connotations for laypeople, who are more likely to think that *Magnolia* derives from the Latin root *magnus* (big), rather than being eponymic to the French botanist Pierre Magnol. Names based on pop culture, such as the fern genus *Gaga* Pryer et al. and the fly *Scaptia beyonceae* Lessard (named after the artists Lady Gaga and Beyoncé, respectively) or the sedge *Carex leviosa* Míguez et al. (referring to a spell from the Harry Potter universe), were coined with the intention of raising attention among the general public and policymakers, who clearly perceive them with a conspicuous meaning, creating some immediate interest (Blake et al. 2023). Accordingly, these names are not neutral at present. But the duration of such a semantic sense through time is unlikely, and although the dedication is understood at present, the connotations will inevitably be diluted over time as most of the personalities and references progressively sink into oblivion.

For all these reasons, we believe that neutrality in the meaning of scientific names is the rule; offensive content in scientific names is the exception or needs to be actively sought beyond its author's original intentions and, in such cases, is therefore the product of decontextualization. According to our consideration, a revision of potentially offensive scientific names might be doomed to find a large number of false positives of inappropriateness.

Transculturality: Biodiversity and its associated scientific nomenclature must be understood as a universal heritage, and this fact should take precedence over any locally biased interest

At its very essence, the value of biodiversity is universal and transcultural and must transcend political boundaries to be shared across all cultures. So too must be the associated nomenclatural system that we use to refer to it. Nature and its parts, as abstract entities, are shared world heritage (not to be confused with material resources derived from nature). Conversely, issues with nomenclature arising within or involving particular cultures or countries (e.g., the Anglosphere) should in no way affect the otherwise neutral globality of nomenclatural codes. Science goes far beyond the views imposed by our immediate cultural spheres, historical moments, and personal contexts. Observing the principle of nomenclatural priority that has so far governed codes—with some precisely outlined exceptions—rather than regarding every

name as susceptible to change is the only fair way to avoid encouraging nationalist or even chauvinist stances in biology and the extreme consequences of gravely disrupting biology.

Conclusions

We acknowledge and agree that the pervasive problems derived from colonial, imperial, totalitarian, racist, casteist, sexist, and other regrettable legacies are still present in society and should be addressed in science. We must work together to avoid perpetuating them and to reform society prospectively. In addition, where productive for the common good and nomenclatural stability, we must provide the codes of biological nomenclature with appropriate tools to promote fairness and sensitivity in future developments (e.g., Mosyakin 2023a, 2023c, Orr et al. 2023) while not disturbing the existing fundamental nomenclatural procedures. Some straightforward measures that may add better opportunities for equity and inclusion in nomenclatural practice could be the incorporation of cultural references in newly coined names (e.g., vernacular names, local terminology, and cultural traditions); active consultation with knowledgeable collaborators when choosing names, to avoid inaccurate or offensive use of terms (e.g., naming organisms deemed as repulsive after sacred entities could be considered inappropriate); honoring local researchers, naturalists, environmentalists, and field experts (Jost et al. 2023); and including and suggesting vernacular names in scientific publications, preferably in local scripts (Marinho and Scatigna 2022). Some examples of names already coined following such good practices are the ant *Pheidole klaman* Gómez et al. (the term *klaman* referring to the beauty of the Akan tribe of West Africa), the dinosaur *Yi qi* Xu et al. (from the Chinese 奇翼, "strange wing," referring to its odd-looking appearance), and the thistle *Cirsium tukuhnikivatzicum* Ackerf. (honoring indigenous peoples and cultures in western North America). Current and future generations of taxonomists must have the right to be free to decide the names we will create but should also take responsibility for being thoughtful, fair, and considerate, paying attention to ethics to avoid harm or upset in the future. Actions toward such more-inclusive and up-to-date nomenclature will certainly arise by collaboration and exchange with local scientists, especially from the Global South.

We understand that a revision process for existing names may be considered by some in rare, exceptional instances—for example, as redress for flagrant direct violations of human rights. Nevertheless, these decisions must each be made very carefully and deliberately, under the technical provisions of the relevant codes and the corresponding governing bodies, and in consultation with stakeholders, weighing the potential confusion caused to communication against any positive reinforcement of these human rights, but certainly not as a bulk process.

Above all else, we must preserve the immense value of the current nomenclatural systems and their universality and stability, which have withstood the tides of time for more than 250 years, enabling universal communication and contributing to the unprecedented development of the biological sciences. Raising the issue and acknowledging the problems derived from past legacies is important, and we must find ways to compensate and, at the same time, progress. However, such endeavors cannot become impediments to the ongoing scientific process. Science is universal and, if a common technique or procedure can be maintained for the benefit of all, it is worth protecting. Attempts to retrospectively revise and correct perceived mistakes of the past are as emotionally tempting as they are futile, and maintaining published scientific names is not an endorsement of the intention behind the names but a practical and functional consideration that rests on the principle of priority as the fairest and most impartial of solutions. Moreover, every act of coining a new name increases the load of synonyms and adds noise to the nomenclatural frameworks, making it more difficult to trace taxa across published works and checklists. The potential number of name changes based on ethical grounds would add many new names with the subsequent nomenclatural noise, and still, the removed name could not be entirely expunged, because it will necessarily persist in synonymy lists. That should not be mistaken for nomenclatural changes derived from systematic reasons, which, albeit sometimes perceived as annoying, are necessary for achieving natural classifications.

Currently, humanity faces urgent challenges like global climate change, deforestation, and species extinction but also a diminishing interest in biodiversity and ecology. Meanwhile, basic biodiversity exploration struggles to survive under unfavorable scientific climates (e.g., Löbl et al. 2023). A bulk revision of scientific names could too easily divert the scarce human and economic resources allocated for taxonomy into an endless process that will backfire on all of us as scientists (Antonelli et al. 2023) and on taxonomists in particular. Especially those from the Global South would be affected, because this region of the planet hosts the richest biological diversity and often suffers from even more lack of economic and trained human resources. Moreover, the possible destabilization of biological nomenclatural systems threatens the applications of the life sciences and risks the correct understanding not only of scientific texts but also of technical reports and laws. To avoid dire consequences for the rest of human society, nature needs to be understood and named in a stable, universal, and operationally neutral and transcultural manner.

Supplemental material

Supplemental data are available at *BIOSCI* online.

Supplementary material S1. List of the 1543 additional coauthors. Co-authors who contributed revising translations are listed first. Then, the rest of the coauthors are listed according alphabetic order of countries/territories.

Supplementary material S2. Automatic revised translations to Arabic, Chinese, Farsi, French, German, Korean, Polish, Russian, Spanish, Portuguese and Turkish.

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Author contribution

Pedro Jiménez-Mejías and Saúl Manzano conceived the idea and wrote a first version of the text. Vinita Gowda , Frank-Thorsten Krell, Mei-Ying Lin, Santiago Martín-Bravo, Laura Martín-Torrijos, Gonzalo Nieto Feliner, Sergei L. Mosyakin, Robert F.C. Naczi, Carmen Acedo, Inés Álvarez, Jorge V. Crisci, Modesto Luceño Garcés, John Manning, Juan C. M. Saiz, A. Muthama Muasya,

Ricarda Riina, Andrea Sánchez Meseguer, and Daniel Sánchez-Mata commented on this early version, providing critical feedback, and rendering it to a pre-definitive form. The rest of the 1,534 additional co-authors received the text and either expressed agreement or provided additional feedback in the form of comments or corrections. Pedro Jiménez-Mejías, Saúl Manzano, Vinita Gowda , Frank-Thorsten Krell, Mei-Ying Lin, Santiago Martín-Bravo, Laura Martín-Torrijos, Gonzalo Nieto Feliner, Sergei L. Mosyakin, Robert F.C. Naczi, Carmen Acedo, Inés Álvarez , Jorge V. Crisci, Modesto Luceño Garcés, John Manning, Juan C. M. Saiz, A. Muthama Muasya, Ricarda Riina, Andrea Sánchez Meseguer, and Daniel Sánchez-Mata discussed all the feedback received to consider its inclusion in the final form of the text. This final form was again distributed among all the co-authors for their approval. Language was thoroughly edited by Frank-Thorsten Krell and Robert F.C. Naczi. Translations were edited by the co-author listed in the corresponding version of the text.

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