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ICSP response to Lloyd and Tahon "Science depends on nomenclature, but nomenclature is not science"

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The Executive Board of the International Committee on Systematics of Prokaryotes (ICSP) read with much interest the *Nature Reviews Microbiology* Comment "Science depends on nomenclature, but nomenclature is not science" by Lloyd and Tahon¹. The authors raise various criticisms of recent ICSP activities to which we respond here.

Lloyd and Tahon¹ highlight some consequences of the recent decision by the ICSP to revise the International Code of Nomenclature of Prokaryotes (ICNP)² to recognise the taxonomic rank of phylum³. This decision, voted on by the ICSP in early 2021, redressed a historic oversight in that the rank of phylum was not included in earlier versions of the ICNP. This revision is important as, before then, any names for prokaryotic phyla were by definition colloquial and thus lacked standing in nomenclature (weren't 'validly published names'). In contrast, phyla can now be given validly published names. As a result, Oren and Garrity validly published names for 42 phyla⁴. However, following the new ICNP Rules for how phylum names should be formed (specifically, taking a stem from the name of a contained genus, combined with the suffix -ota) means some of the historic colloquial names (such as *Firmicutes*) cannot be adapted into readily recognisable (homophonic) validly published phylum names. Regrettably, in taking issue with some of the names proposed by Oren and Garrity⁴, Lloyd and Tahon¹ muddle the action of these authors as independent individuals with the actions of the ICSP in revising the ICNP: amending the ICNP to permit the naming of phyla is one thing; proposing names for phyla in accordance with the Rules of the ICNP completely separate. The ICSP recognizes that Oren and Garrity⁴ proposing replacements for some commonly used colloquial names may cause some short-term displeasure or misunderstanding but also emphasise that this will be offset by the clear long-term benefit to the research community of now being able to name prokaryotic phyla under the ICNP. Moreover, once names are proposed the community still decides which to adopt, although experience suggests that the scientific community will rapidly adjust. Similarly, how names are listed in databases is a matter of choice for their curators (although ICSP naturally encourages the use of correct names, as defined in the ICNP²).

In addition, Lloyd and Tahon¹ take issue with the ICSP decision in 2020 (by 17 votes to 6) to reject proposals to accept DNA sequence as type⁵, thereby reinforcing the centrality of culture and deposit of type strains to the process of naming prokaryotes and, conversely, excluding the as-yet-uncultivated 'microbial dark matter' from being named under the ICNP. The reasons underpinning the ICSP commitment to publicly accessible type strains are a commitment to standardization and reproducibility, with type strains as the gold standard for use as a reference in future studies. It should be noted that the voting of the members of the ICSP took place after several years of discussion in various fora and a vigorous public email discussion, which has been minuted⁵. Furthermore, those working with uncultivated taxa do at least have the opportunity to provide them with placeholder *Candidatus* names, as

described in Appendix 11 of the ICNP^{2,6}. Although these names are not recognized within the Rules of the ICNP, and therefore lack standing in nomenclature, it is clear that they facilitate communication and, thus far, most names have been retained when *Candidatus* taxa have been cultured and their names validly published⁶. The ICSP agrees that it is important to promote the use of *Candidatus* names and to encourage stability in nomenclature (and respectful science) by retaining such names if the taxa are eventually cultured. Lloyd and Tahon¹ also note that the ICNP Rules regarding type strain accessibility present challenges for some researchers in countries where their governments may impose restrictions on sharing strains, as recently raised elsewhere⁷. The ICSP has already acknowledged this challenge and is willing to work with affected scientists⁸.

Finally, Lloyd and Tahon¹ criticize the lack of diversity in the ICSP members. This is a valid criticism, albeit one that the ICSP was already alert to. The ICSP membership is primarily comprised of delegates from member societies of the International Union of Microbiological Societies (IUMS), as specified in our Statutes⁹. Ideally, ICSP would have better representation both from parts of the world that are currently under-represented and from a wider range of scientific ‘end-user’ communities, such as environmental microbiologists. Addressing this will likely require discussion with IUMS about how we can structure our membership and we commit to undertake this. Moreover, any interested party can propose emendments to the ICNP by following the process outlined in the ICSP Statutes⁹. We also emphasise that the ICSP is committed to openness through publication of its minutes, either in the *International Journal of Systematic and Evolutionary Microbiology* or on our website, and now conducts its discussions using electronic forums, including the Slack platform^{3,5,10}.

Regrettably the Comment by Lloyd and Tahon¹ also contains extensive factual errors about the workings of the ICSP and concerning the relationship between classification and nomenclature. The ICSP only governs nomenclature, via maintaining the ICNP^{2,9}, whereas classification is left to the scientific community. One example is: “The ICSP relies on strict nomenclature rules and experts in microbial subgroups to ensure that nomenclature is stable and follows a polyphasic classification combining phenotype and genotype”. In fact, the ICNP makes no comment on how classification should be performed and indeed Principle 1(4) of the ICNP² very prominently protects freedom of ‘taxonomic opinion’, whilst the ICSP Statutes⁹ specify that the Subcommittees on Taxonomy (‘subgroups’) “cannot legislate on classification but may contribute materially towards the general acceptance of a classification”. Decisions regarding appropriate methodological approaches (including the need for ‘polyphasic classification’) rest with Editors (and peer reviewers) of journals publishing taxonomic studies. Multiple other errors are documented in a Table that can be accessed on the ICSP website (<https://www.the-icsp.org/publications>).

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Competing interests

The authors declare no competing interests.