

ICSP Frequently Asked Questions (FAQ)



Here we have compiled answers to questions about the activities of the International Committee on Systematics of Prokaryotes (ICSP). Please visit the pages of the ICSP website [<https://the-icsp.org/>] for information on specific topics and please check the “ICSP matters” section of the International Journal of Systematic and Evolutionary Microbiology (IJSEM) to remain up-to-date regarding the activities of the committee.

Executive Board of the ICSP

(FAQ as approved in the ICSP-EB meeting on 27th October 2022, with minor changes made in subsequent e-mails and some minor formal modifications for the purpose of generating a PDF.)

The ICSP in general

What is the purpose of the ICSP?

The ICSP is the international body that governs the nomenclature of prokaryotes. Nomenclature is concerned with how groups of organisms (taxa) are named while taxonomy is concerned with how organisms are arranged into such groups in the first place. The ICSP does not govern taxonomy. Subcommittees of the ICSP may publish minimal standards for the description of new taxa of prokaryotes but these are non-binding recommendations. Scientific journals may have their own requirements for publishing descriptions of taxa.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]

How does the ICSP operate?

The ICSP is responsible for publishing the International Journal of Systematic and Evolutionary Microbiology (IJSEM) and The International Code of Nomenclature of Prokaryotes (ICNP) as well as the Validation Lists are published in the IJSEM. The Judicial Commission, a subcommittee of the ICSP, publishes Judicial Opinions on nomenclatural issues, which rule on matters of dispute submitted to it (as a ‘Request for an Opinion’). The ICSP Subcommittees on Taxonomy publish recommendations (minimal standards) for the description of new taxa in selected groups of prokaryotes. The ICSP and its subcommittees publish meeting minutes in the IJSEM or on the ICSP website. For details, please see the ICSP Statutes and the “ICSP matters” section of the IJSEM.

See also:

- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

What is the difference between the ICSP and the ICNP?

The International Code of Nomenclature of Prokaryotes (ICNP) is one of the major products of the ICSP. The ICNP is not a committee but a set of General Consideration, Principles and Rules that govern the nomenclature of prokaryotes. Most decisions of the ICSP that affect nomenclature are decisions about modifications of the ICNP. The only other kind of decisions by the ICSP that affect nomenclature are decisions on whether to ratify Judicial Opinions, but these do not overwrite the ICNP.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]

Who does the ICSP represent?

The ICSP has a statutory responsibility to “represent the diversity of interests of different microbiological disciplines on matters concerning the nomenclature of prokaryotes”. Its membership is defined in its Statutes. As a subsidiary of the International Union of Microbiological Societies (IUMS), each member society of the Bacteriology & Applied Microbiology (BAM) Division of the IUMS can send a delegate into the ICSP. The ICSP is also able to co-opt members in order to more broadly represent the international community of microbiologists. The ICSP continuously strives to increase its scope, but the outcome also depends on the willingness of societies to join the IUMS (and then nominate delegates) and on the willingness of individuals to serve on the committee.

Interested members of an ICSP member society that does not have a delegated member of ICSP are encouraged to volunteer by contacting their society Secretary. Alternatively, those interested in being co-opted onto the ICSP can contact its Chair or Secretary for further information.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- IUMS [<http://www.iums.org/>]

Can I join the ICSP?

There are several ways for getting involved. To become a voting member of the ICSP, please see above. For making nomenclature-related proposals or for participating in ICSP debates, please see below.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]

Is the ICSP democratic?

Yes. For instance, its decisions on nomenclature are based on the majority of the votes of the voting members of the ICSP. For the composition of the voting members of the ICSP, please see above.

For the debates that are conducted prior to a decision of the ICSP, please see below. For detailed information on the underlying regulations, please see the ICSP Statutes. Moreover, there are a lot of matters which the ICSP does not even attempt to decide about, such as taxonomy. The ICSP is authoritative on certain topics but not authoritarian.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]

Is the ICSP transparent?

Yes. Forthcoming decisions on nomenclature are announced well in advance in the “ICSP matters” section of the IJSEM or on the ICSP website. The rationale for each nomenclature-related proposal is published along with the particular proposal. Results of these decisions are also announced in the IJSEM. Subcommittees of the ICSP also publish meeting minutes, either in the IJSEM or on the ICSP website.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

Is the ICSP open?

Yes. Nomenclature-related debates are announced publicly, as explained above. Nomenclature-related debates are also conducted publicly prior to the subsequent ICSP ballot. Such debates used to be conducted by open e-mail exchanges. As of 2021 the ICSP uses an open channel on the Slack platform to conduct such debates.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]
- Slack [<https://icnp-revision.slack.com>]

Does the ICSP listen?

Yes. Anyone can publish formal nomenclature-related proposals in the IJSEM, such as a proposal for an emendation of the ICNP, and anyone can contribute to an open debate of the ICSP and provide factual arguments for or against a proposal under consideration. One does not need to be a voting member of the ICSP to have an impact on an ICSP decision. In fact, most contributions to recent open ICSP debates were made by participants who are not voting members of the ICSP.

Numerous changes made to the ICNP throughout its existence prove that it had always been possible to adapt it to new circumstances, to criticize its shortcomings and to derive emendations of its wording from such criticisms. However, working on nomenclature-related regulations requires time and effort to familiarize yourself with the current wording of the ICNP and its interpretation.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>],
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]
- Slack [<https://icnp-revision.slack.com>]

Who can make proposals related to nomenclature?

Anyone can make proposals for nomenclature-related changes, either as proposal for modifying the ICNP, or as a Request for an Opinion to be treated by the Judicial Commission. For the sake of transparency, such proposals have to be published in the IJSEM, as specified by the ICSP Statutes. Peer review of manuscripts submitted to the IJSEM is organized by that journal. The ICSP Statutes ensure that sufficient time is devoted to debating such proposals prior to making a decision.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

Are ICSP decisions final?

The processing of a particular proposal to modify the ICNP indeed ends with the ballot of the voting members of the ICSP on this proposal and the subsequent publication of the outcome. However, alternative proposals that are related to denied proposals can be made in the future at any time and may shed a new light on the matters to be decided about.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

The ICSP and taxonomy

Does the ICSP regulate taxonomy?

No. Important disciplines within systematics are classification, identification and nomenclature. The term taxonomy is often used as a synonym of systematics, although the ICNP treats taxonomy like classification and thus as separate from nomenclature.

The ICSP publishes the ICNP, and the ICNP regulates nomenclature but not classification or identification. Classification is about grouping organisms; nomenclature is about assigning names to organisms, given the grouping. Subcommittees of the ICSP may publish minimal standards for the description of new taxa of prokaryotes but these are non-binding recommendations.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]

What is the role of the lists published in the IJSEM?

A prerequisite for a taxon name to be recognized under the ICNP is that the name is published in the IJSEM. Taxon names need not be directly proposed in the IJSEM; they can be published elsewhere (this is called effective publication) and then listed in a Validation List in order to become validly published. (It should be noted there are some fundamental criteria that are required to be fulfilled for taxon names to become validly published.) The IJSEM also includes Notification Lists, which provide an overview on the names published directly in the IJSEM. Lists of Changes in Taxonomic Opinion and *Candidatus* Lists are also published in the IJSEM. These lists do not affect the status of taxon names under the ICNP but are intended as a service to the community.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]
- Role of the List Editors [<https://doi.org/10.1099/ijsem.0.003106>]

Does the ICSP approve or deny taxon names?

No. The ICSP publishes the ICNP, and the ICNP regulates which names of prokaryotes have a claim to recognition under the ICNP. The ICNP also regulates which name has to be used in accordance with its rules for a given taxonomic group under which conditions. The IJSEM List Editors may only deny placing a name on an IJSEM Validation List if it contravenes the rules of the ICNP. The Judicial Commission of the ICSP may place a name on the list of rejected names but this is done rarely, in very specific circumstances and requires a Request for an Opinion. The ICSP does neither control, nor seek to control, the mere proposal of a taxon name.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]
- Role of the List Editors [<https://doi.org/10.1099/ijsem.0.003106>]

Does the ICSP propose taxon names?

No. Taxon names are proposed by individual taxonomists. Some members of the ICSP are also active in taxonomy but when doing so they act as individual taxonomists and not as members of the ICSP. Having distinct roles does not by itself yield a conflict of interest. Rather, an active taxonomist may more rapidly become aware of nomenclatural issues and report them to the ICSP. The ICSP regulates nomenclature mainly by publishing the ICNP, and the ICNP is explicitly devoted to guaranteeing taxonomic freedom.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

Does the ICSP hinder anyone proposing taxon names?

No. Scientific journals may have their own requirements for publishing descriptions of microbial taxa but, with the exception of the IJSEM, these journals are independent of the ICSP. The ICSP does publish the ICNP, and the ICNP regulates which taxon names have claim to recognition under its rules. However, this does not mean that a taxon name that does not (yet) have claim to recognition under the ICNP cannot be proposed. On the contrary, the proposal of a taxon name in a publication is a prerequisite for obtaining a claim to recognition under the ICNP. The ICSP does neither control, nor seek to control, the mere proposal of a taxon name.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]

Does the ICSP replace taxon names by others?

No. Taxon names that are intended to replace other taxon names may be proposed by individual taxonomists. In the majority of cases, this works by proposing new combinations with the purpose of reflecting the placement of a species in another genus (or, less frequently, the placement of a subspecies in another species). Users of taxon names are free to use either the older name or the newer name in such cases, depending on their taxonomic opinion regarding the classification. The same holds for databases, i.e. curators may choose which name is preferred. Even if the proposal of a taxon name is intended to replace a name that is not in accordance with the ICNP, this is done by individual taxonomists, not by the ICSP. The ICSP neither controls, nor seeks to control, the adoption of taxon names by third parties, although it may attempt to clarify which names are in accordance with the ICNP and which names are not in accordance with the ICNP.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

Does the ICSP change the spelling of taxon names?

No. The ICNP regulates which orthographical or grammatical corrections can be made to the spelling of a taxon name and by whom. Corrections of the spelling of a taxon name are proposed by individual taxonomists or by the IJSEM List Editors. The ICNP provides clarity as to whether such corrections are in accordance with its rules. In case of doubt about a spelling, a Request for an Opinion can be directed to the Judicial Commission of the ICSP.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- IJSEM [<https://www.microbiologyresearch.org/content/journal/ijsem>]

Are nomenclature-related regulations published by the ICSP weird?

No. The ICNP is very similar to the ICN (International Code of Nomenclature for algae, fungi, and plants, a.k.a. botanical code), from which it is historically derived. Most of the major terms are the

same, including valid publication, legitimacy, and correctness of names. The ICZN (International Code of Zoological Nomenclature) uses distinct terms but shares many concepts with the ICN and the ICNP.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- ICN [<https://www.iapt-taxon.org/nomen/main.php>]
- ICZN [<https://code.iczn.org>]

Is knowledge of Latin required to propose taxon names?

No. Under the ICNP taxon names are indeed treated as Latin but this does not mean that taxon names have to correspond partially or entirely to known Latin words. Under the ICNP it must be possible to treat a taxon name as if it was Latin but a taxon name can even be formed arbitrarily. There are a variety of rather simple approaches to forming taxon names that can be applied by anyone. Instead of learning Latin it is almost always sufficient to study the pertinent sections of the ICNP, such as Appendix 9, to form taxon names in accordance with the ICNP. Moreover, there are a lot of frequently used and well-known Latin or Greek components of taxon names that can easily be reused by any taxonomist. Of course, if someone intended to express something sophisticated in a taxon name, deeper knowledge of Latin (or Greek) would be required. But that is only natural, and the ICSP does not force anyone to be sophisticated in this respect. Moreover, the IJSEM does have nomenclature reviewers who can provide expert advice on forming names.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Forming names [<https://dx.doi.org/10.1093/femsle/fnaa096>]
- Nomenclature reviewers [<https://www.microbiologyresearch.org/content/journal/ijsem?page=editorial-board>]

Why are taxon names treated like Latin?

One reason for using word components that are Latin is that these components do not change in meaning anymore because Latin is an (almost) dead language. Forming all taxon names in a manner that yields a Latin “look and feel”, even when actually forming names arbitrarily, has the yet great advantage that most taxon names can rather easily be recognized as taxon names even if one has not seen them beforehand. Being able to easily distinguish taxon names from the surrounding text is quite helpful when dealing with scientific literature. Last but not least, all of the three major codes of nomenclature (botanical code – ICN, zoological code – ICZN, microbiological code – ICNP) treat taxon names like Latin, and they have done so for more than a century. For this reason, consistency alone dictates that this practice should continue.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- ICN [<https://www.iapt-taxon.org/nomen/main.php>]

- ICZN [<https://code.iczn.org>]

What is a nomenclatural type good for?

Taxon names proposed in accordance with the ICNP have a nomenclatural type. The nomenclatural type needs not be typical or representative for its taxon. The purpose of a nomenclatural type is to be permanently attached to a taxon name. This is needed to clarify which name to use in certain situations and for reflecting certain taxonomic opinions, e.g. in the case of the dissection of a taxon or in the case of the merging of two taxa. The use of nomenclatural types is particularly elegant in the case of taxa above genus rank, whose names are derived from the name of their nomenclatural type (or the nomenclatural type of their nomenclatural type). In the case of the ICNP, since January 2001, the nomenclatural type of a species or subspecies must be strain available to others to study for taxonomic purposes, which is important for replication and comparative purposes.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- ICN [<https://www.iapt-taxon.org/nomen/main.php>]
- ICZN [<https://code.iczn.org>]

Is the ICNP only for cultured prokaryotes?

No. General Consideration 5 clearly states that it applies to all prokaryotes. While it is true that Rule 30 imposes deposition of type strains in two culture collections, this same rule has a note explaining how and when can exceptions be applied. Not to forget that many species and subspecies names were validated before 2001 with the more flexible wording of Rule 30 and these names have not lost validity even if they do not have any cultured representative.

It should also be highlighted that as-yet-uncultivated taxa can be named as *Candidatus* taxa, under the provisions described in Appendix 11 of the ICNP. Although this is only a provisional status (i.e. doesn't provide a name with standing in nomenclature) the *Candidatus* names are a useful adjunct to names validly published under the ICNP.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Advantages of *Candidatus* names [<https://doi.org/10.1099/ijsem.0.005000>]

The ICSP and phylum names

Did the ICSP replace phylum names?

No. Names of phyla could not be validly published under the ICNP until 2021, when the rank of phylum was introduced into the ICNP. This was followed by the valid publication of 42 phylum names by Oren & Garrity, who acted as individual taxonomists in that case. It was entirely up to them how many phylum names they included in their publication. The 42 validly published phylum names have counterparts that were present in the literature for some time but are not validly published under the ICNP and had no standing in nomenclature. Most of them are very similar in spelling to the validly published phylum names. Notably, Oren & Garrity attributed the validly

published phylum names to the authors of the not validly published counterparts, who did the taxonomic work.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]
- Valid publication of 42 phylum names [<https://doi.org/10.1099/ijsem.0.005056>]
- Notification List [<https://doi.org/10.1099/ijsem.0.005165>]

Was the ICSP decision on phylum names made hastily?

No. The first proposal to include phylum names into the ICNP dates back to a paper by Oren et al. published in 2015. This was just a proposal; an ICSP decision was not made at that time. That paper listed names that could be potentially validly published once the introduction of the new rule into the ICNP was made and also listed the differences to the well-known phylum names that are not validly published. Another publication (by Whitman et al.) followed in 2018, which modified the proposal and reiterated the differences between the phylum names. Again, an ICSP decision was not made at that time. The decision was made by the ICSP in 2021 after an open debate, hence there was plenty of time to comment on the proposals.

In contrast, the inclusion of the phylum rank into the ICNP may be regarded as belated. This is indeed a valid criticism, because it is disadvantageous if a major taxonomic category is in unregulated use for a long time and a standardized naming scheme for it is introduced afterwards. The unregulated usage of taxon names at a certain rank over a prolonged period of time may yield many names that do not conform to a particular scheme. The ICSP has learned from this lesson. The taxonomic usage of major taxonomic categories that were not yet introduced into the ICNP is now closely monitored to initialize further emendations of the ICNP as soon as possible.

See also:

- 2015 paper [<https://dx.doi.org/10.1099/ijsem.0.000664>]
- 2018 paper [<https://dx.doi.org/10.1099/ijsem.0.002593>]
- ICSP debate [https://www.the-icsp.org/images/reports/20210228_Discussion_-_Phylum_Compiled_contributions_-_20201101-20210228-Final.pdf]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]

Was the ICSP decision on phylum names democratic, transparent and open?

Yes. The announcement of the proposals, the debate and the subsequent ballot were conducted as described above. There were plenty of opportunities to comment on the proposals prior to the decision of the ICSP, which was made more than five years after the first proposal for including phylum names into the ICNP.

See also:

2015 paper [<https://dx.doi.org/10.1099/ijsem.0.000664>]

ICSP debate [https://www.the-icsp.org/images/reports/20210228_Discussion_-_Phylum_Compiled_contributions_-_20201101-20210228-Final.pdf]

introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]

Was the ICSP vote on phylum names narrow?

No. The proposal to include the phylum category in the ICNP was accepted by 19 delegates and rejected by just two of them. All considered proposals implied a formation of some phylum names distinct from well-known, not validly published (colloquial) phylum names such as “*Firmicutes*” or “*Proteobacteria*”. It was more controversial whether class or genus should be used as category of the nomenclatural types of phyla (seven delegates supported class, 10 supported genus, three abstained and one returned a blank vote). But this did not matter regarding the deviations of the now validly published phylum names from well-known but not validly published phylum names. For instance, the validly published counterpart of “*Firmicutes*” would have been *Bacillaeota* according to the 2015 proposal by Oren et al., based on the name of a class; *Bacillota* according to the 2018 proposal by Whitman et al., also based on the name of a class; and likewise *Bacillota* according to the implementation into the ICNP in 2021, based on the name of a genus.

See also:

- 2015 paper [<https://dx.doi.org/10.1099/ijsem.0.000664>]
- 2018 paper [<https://dx.doi.org/10.1099/ijsem.0.002593>]
- ICSP debate [https://www.the-icsp.org/images/reports/20210228_Discussion_-_Phylum_Compiled_contributions_-_20201101-20210228-Final.pdf]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]

Why do the validly published phylum names look different to their not validly published counterparts?

The vast majority of taxon names above the rank of genus are derived from the name of a type genus (or the type genus of the type order). All names above genus rank, if regulated by one of the three major codes of nomenclature (botanical code – ICN, zoological code – ICZN, microbiological code – ICNP), are formed by adding a rank-specific ending to the stem of the name of a type genus. The naming scheme for phyla that was introduced into the ICNP is consistent with the approach used for other names above genus rank, just with a new ending (-*ota*) specific for that category. The codes of nomenclature (ICN, ICZN, ICNP) do not regulate classification. For this reason, it is logical and useful to derive the name of a taxon above genus rank from the name of the nomenclatural type. The nomenclatural type is the only element guaranteed to be permanently associated with the taxon for which it serves as type. Deriving a name in that manner has no implications whatsoever regarding the total number of genera taxonomically placed within a taxon above genus rank. Most of the validly published phylum names are very similar in spelling to the respective not validly published phylum name. A clear advantage of the new names is that their category can easily be inferred from the name.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- ICN [<https://www.iapt-taxon.org/nomen/main.php>]
- ICZN [<https://code.iczn.org>]

Why are there validly published phylum names which more obviously differ from their not validly published counterparts?

Substantial deviations between the new, validly published names of phyla and their old, not validly published counterparts are unfortunate but inevitable given the rules of the ICNP. The phylum names “*Actinobacteria*”, “*Crenarchaeota*”, “*Euryarchaeota*”, “*Firmicutes*”, “*Proteobacteria*”, “*Tenericutes*” and “*Thaumarchaeota*” are not validly published and thus have no claim to recognition under the ICNP. These names were not derived from the name of a nomenclatural type and thus do not fit to the scheme now envisaged for forming phylum names, which is well justified. (Other not validly published phylum names did not have the *-ota* ending either but were at least derived from the name of a genus.) Because their category cannot be recognized from the name, these not validly published names of phyla caused further problems. For instance, *Actinobacteria* is also the name of a class and even validly published (albeit illegitimate) as such. Similarly, *Proteobacteria* is a validly published but illegitimate name at the rank of class. The name “*Crenarchaeota*” was used at the levels of kingdom, phylum, subphylum and class. The name “*Euryarchaeota*” was used at the levels of kingdom, phylum and subphylum. The naming scheme for phylum names now implemented into the ICNP avoids such problems.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Class *Actinobacteria* [<https://doi.org/10.1099/00207713-47-2-479>]
- Class *Proteobacteria* [<https://doi.org/10.1099/00207713-38-3-321>]
- Kingdoms “*Crenarchaeota*” and “*Euryarchaeota*” [<https://doi.org/10.1073/pnas.87.12.4576>]
- Class *Crenarchaeota* [<https://doi.org/10.1099/00207713-52-1-7>]
- Subphylum “*Euryarchaeota*” [<https://doi.org/10.1017/s0006323198005167>]

Could the more obviously deviating phylum names be formed in a less deviating way?

No. One of the cornerstones of the ICNP is the status “valid publication”. Names that are not validly published do not have claim to recognition under the ICNP. The phylum names “*Actinobacteria*”, “*Crenarchaeota*”, “*Euryarchaeota*”, “*Firmicutes*”, “*Proteobacteria*”, “*Tenericutes*” and “*Thaumarchaeota*” are not validly published. For this reason, a hypothetical approach to form validly published phylum names by adding *-ota* to the stem of these names could not be justified under the ICNP. In fact, as of 2022 it was not even attempted to implement phylum names in that manner. Moreover, deriving a name above genus rank from the name of the type genus (or the type genus of the type order) has distinct advantages, as explained above. Notably, the ICSP does not form names, nor can it change names at will. Rather, the ICSP publishes general regulations for how to form names by including them into the ICNP.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]
- ICSP response to criticism of new phylum names [<https://dx.doi.org/10.1038/s41579-022-00706-z>]
- Second ICSP response to criticism of new phylum names [<https://dx.doi.org/10.1128/mbio.01479-22>]

Is it difficult to recognize the synonymy between the validly published phylum names and their not validly published counterparts?

We don't think so. Obviously, the exchange of names in databases or in the literature can be irritating at first sight. However, such an exchange could only cause significant problems for users or readers if the synonymy between the names remained unclear. There are two ways of knowing that two names are synonymous: remembering the synonymy or being able to infer it. Remembering the synonymy between one to six pairs of taxon names is a task most trained scientists may master anyway, particularly if they frequently work with the respective taxonomic group. However, the synonymy between the phylum names could also be inferred with ease although some other knowledge would be required. We argue that this does not place an additional burden on users of phylum names because having this knowledge would be beneficial for them anyway. Users would need to be aware of the following aspects:

1. The standardized ending *-ota* is used for phylum names. As there is a standardized ending for phylum names, every microbiologist who deals with phylum names should benefit from being able to recognize a phylum name from having that ending. But once it is apparent that the ending *-ota* indicates a phylum it is also possible to recognize the first part of such a phylum name, which is obtained by removing *-ota*.
2. It is helpful for anyone who deals with taxonomic nomenclature to understand that a nomenclatural type is permanently associated with the taxon for which it serves as the nomenclatural type. It is also useful to understand that names of taxa above genus rank are almost exclusively formed by appending a rank-specific suffix to the stem of the name of a nomenclatural type.
3. When a microbiologist has used, or is using, a phylum name, that microbiologist would benefit from knowing at least some taxa of lower rank that were classified in that phylum. For instance, we suppose that every microbiologist trained during the last two decades knows that *Actinomyces* was classified in “*Actinobacteria*”, that *Bacillus* was classified in “*Firmicutes*”, etc. It is now easier to make sense of phyla in that manner.

Someone who has that knowledge can easily infer the synonymy between each pair of phylum names. For instance, once the name *Bacillota* is recognized as having the phylum suffix *-ota*, one can infer that the stem of the name is *Bacill-*, which is also used in the names *Bacilli*, *Bacillales*, *Bacillaceae* and *Bacillus*. One only needs to know that one of these taxa was classified in the

phylum “*Firmicutes*” in order to link *Bacillota* with “*Firmicutes*”. We conclude that everything that would be needed to recognize the synonymy between each of the pairs of phylum names would better be known anyway by everyone who needs to be able to recognize that synonymy. Thus, the exchange of phylum names in databases or in the literature may be somehow confusing at first sight but we don't think we are dealing with a significant problem here. We believe that the long-term advantages of the new standardized phylum names outweigh the short-term irritation they may cause.

See also:

- ICSP Statutes [<https://dx.doi.org/10.1099/ijsem.0.003117>]
- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]
- ICSP response to criticism of new phylum names [<https://dx.doi.org/10.1038/s41579-022-00706-z>]
- Second ICSP response to criticism of new phylum names [<https://dx.doi.org/10.1128/mbio.01479-22>]

Did names of archaeal phyla ever have the suffix *-archaeota*, or should they have that suffix?

No. Names like “*Crenarchaeota*” may indeed make the impression that they have a suffix *-archaeota*. This is not the case, however. The name is composed as follows: *Cren-* (stem of *krênê* when Latinized, Greek *κρήνη*, genitive *κρήνης*) + *archae-* (stem of *archaeum*, originally from Greek *ἀρχαῖος*) + *-ota* (adjectival suffix). Thus, *-archaeota* is not a suffix; *-ota* is. Moreover, assuming one would wish to implement the suffix *-archaeota* for archaeal phyla and then derive a phylum name from, e.g., a type genus with the name *Halarchaeum*. This would yield *Halarchaearchaeota* (*sic*), hardly a pleasant outcome. One must consider that the *archae-* component of names such as “*Crenarchaeota*” is not part of a suffix, i.e. *-archaeota* is not actually a suffix but the penultimate component of the taxon name plus the actual suffix. If a genus name that ends in *-archaeum* was chosen as type genus, then this would already yield a phylum name that ends in *-archaeota*. No change of the standardized ending for archaeal phylum names is necessary to achieve this effect.

In general, it is unwise to encode the taxonomic affiliation to a taxon of higher rank into a name above species rank. The regular derivation of names above genus rank under the ICNP works in the opposite direction: they are derived from the name of a genus. Since this genus is the nomenclatural type (or the nomenclatural type of the nomenclatural type), it is guaranteed to be permanently associated with the taxon for which it directly or indirectly serves as a type, whether treated as correct name or as synonym. In contrast, the affiliation of a taxon to a superordinate taxon, such as the one of the class *Deltaproteobacteria* to “*Proteobacteria*” (*Pseudomonadota*), is a matter of taxonomic opinion. Since many taxonomists nowadays assign *Deltaproteobacteria* to a phylum distinct from the one to which *Alpha-*, *Beta-* or *Gammaproteobacteria* are assigned, the situation may be confusing (although modifying the names would be even more unfortunate). Such problems

only occur because the name of the superordinate taxon was encoded in the name of the subordinate taxon. This way of forming names is not permitted anymore under the ICNP.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Judicial Opinion 116 [<https://dx.doi.org/10.1099/ijsem.0.005481>]
- Kingdoms “*Crenarchaeota*” and “*Euryarchaeota*” [<https://doi.org/10.1073/pnas.87.12.4576>]

Does the name *Actinomycetota* indicate fungi?

Not really. The validly published name *Actinomycetota* denotes the phylum that was previously known as “*Actinobacteria*” – a problematic name because it is not derived from the name of nomenclatural type and because it is eponymous to the validly published (albeit illegitimate) name of a class. The name *Actinomycetota* is derived from *Actinomyces*, and the *-myces* component of this genus name indeed indicates a fungus. However, we suppose most microbiologists are well aware that genera such as *Actinomyces* and *Streptomyces* are bacteria. While using the *-myces* component in prokaryotic names is not permitted by the ICNP (2022 Revision), there are historical reasons for the occurrence of these names. The phylum name *Actinomycetota* also fits much better than “*Actinobacteria*” to the validly published and legitimate names used at the ranks of class, order, family and genus: *Actinomycetes*, *Actinomycetales*, *Actinomycetaceae*, *Actinomyces*. Their replacement by names not indicating fungi has no basis in the ICNP and would cause much more problems than the currently used names themselves. Under the botanical code (ICN) names of fungal phyla have the suffix *-mycota*. Deriving a phylum name from *Actinomyces* under that code would yield *Actinomycetomycota* or *Actinomycota*. Thus, confusion is unlikely.

See also:

- ICNP [<https://dx.doi.org/10.1099/ijsem.0.000778>]
- Introduction of phylum category [<https://dx.doi.org/10.1099/ijsem.0.004851>]
- Judicial Opinion 119 [<https://dx.doi.org/10.1099/ijsem.0.005481>]
- ICN [<https://www.iapt-taxon.org/nomen/main.php>]