

Guidelines for interpreting the International Code of Nomenclature of Prokaryotes and for preparing a Request for an Opinion

David R. Arahal¹, Carolee T. Bull², Hans-Jürgen Busse³, Henrik Christensen⁴, Maria Chuvochina⁵, Svetlana N. Dedysh⁶, Pierre-Edouard Fournier⁷, Konstantinos T. Konstantinidis⁸, Charles T. Parker⁹, Ramon Rossello-Mora¹⁰, Antonio Ventosa¹¹ and Markus Göker^{12,*}

Abstract

In this paper the Judicial Commission provides general guidance for interpreting the International Code of Nomenclature of Prokaryotes (ICNP) and specific assistance to authors, reviewers and editors of a Request for an Opinion, or of other suggestions related to the ICNP. The role of the Judicial Commission is recapitulated, particularly with respect to the processing of such Requests. Selected kinds of nomenclature-related proposals are discussed that are unsuitable as the basis for a Request. Particular emphasis is put on Requests for placing names or epithets on the list of *nomina rejicienda*, and a dichotomous identification key is provided to guide potential authors of a Request that targets the name of a species or subspecies because of issues with its type strain. To this end, the criteria for the valid publication of such names under the ICNP are revisited. Aspects of other kinds of Requests are also addressed. The study is based on a comprehensive review of all Judicial Opinions issued since the publication of the Approved Lists in 1980. One goal of this paper is to assist potential authors in deciding whether their concern should be the subject of a Request, and if so, in composing it with the greatest chance of success. It is also clarified how to obtain additional help regarding nomenclature-related issues.

INTRODUCTION

A Request for an Opinion (henceforth called Request) as well as a subsequent Judicial Opinion have to be issued in the *International Journal of Systematic and Evolutionary Microbiology* (IJSEM) and deal with the interpretation of the International Code of Nomenclature of Prokaryotes (ICNP) [1] with respect to specific nomenclature-related issues. One of the tasks of the Judicial Commission of the International Committee of Systematics of Prokaryotes (ICSP) is to interpret each Request with reference to the ICNP and to author corresponding Judicial Opinions [2]. Within the ICNP, General Consideration 6(4), Rule 3 and Rule 4 form the basis of actions of the Judicial Commission in general while other Rules provide for specific tasks of Judicial Opinions. The first Opinion dates back to 1951 [3]; Opinions 97–127 were published during the last 3 years [4–11].

Unfortunately, misinterpretations of the ICNP are common and tend to spread [6, 8, 12–22], a process regrettably now amplified by social media. Accordingly, a variety of Requests recently encountered by the Judicial Commission indicated difficulties regarding the interpretation of the ICNP, particularly those that called for the rejection of names or epithets or for a corresponding clarification of the status of a name [23–40]. While other Requests of that kind did not show such misinterpretations [41–43], the large number of avoidable errors in contemporary Requests slows down the work of the Judicial Commission, increases the

Author affiliations: ¹Departamento de Microbiología y Ecología, Universitat de València, Valencia, Spain; ²Department of Plant Pathology and Environmental Microbiology, Pennsylvania State University, 211 Buckhout Lab, University Park, PA 16802, USA; ³Institut für Mikrobiologie, University of Veterinary Medicine, Veterinärplatz 1, A- 1210 Wien, Austria; ⁴Department of Veterinary and Animal Sciences, University of Copenhagen, Stigbøjlen 4, 1870 Frederiksberg C, Denmark; ⁵The University of Queensland, School of Chemistry and Molecular Biosciences, Australian Centre for Ecogenomics, QLD 4072, Australia; ⁶Winogradsky Institute of Microbiology, Research Center of Biotechnology RAS, Prospect 60-letya Otyabrya 7/2, Moscow 117312, Russia; ⁷UMR VITROME, IHU - Méditerranée Infection, 19-21 Bd Jean Moulin, 13005 Marseille, France; ⁸School of Civil & Environmental Engineering and School of Biological Sciences, Georgia Institute of Technology, Atlanta, Georgia, USA; ⁹Names for Life, LLC, East Lansing, Okemos, Michigan 48805-0769, USA; ¹⁰Department of Animal and Microbial Biodiversity, Institut Mediterrani d'Estudis Avançats, CSIC-UIB, C/Miquel Marqués 21, 07190 Esporles, Illes Balears, Spain; ¹¹Department of Microbiology and Parasitology, Faculty of Pharmacy, University of Sevilla, ES-41012 Sevilla, C/. Prof. Garcia Gonzalez 2, Spain; ¹²Leibniz Institute DSMZ – German Collection of Microorganisms and Cell Cultures, Inhoffenstrasse 7B, D-38124 Braunschweig, Germany.

*Correspondence: Markus Göker, markus.goeker@dsMZ.de

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confusion surrounding the ICNP and causes unnecessary disappointments. On the one hand, Requests are necessary for solving a variety of nomenclature-related problems. On the other hand, issuing a Request that is unlikely to succeed is also a waste of time for its authors. However, the accurate application of the ICNP is possible. This is confirmed by the observation that some publications already interpret the ICNP more appropriately than others. Hence, it seems likely that additional guidance provided by the Judicial Commission can further the understanding of issues of nomenclature.

Appendix 8 of the ICNP [1] is titled 'Preparation of a Request for an Opinion' but the text is very brief. Thus, the purpose of this paper is to provide much more detailed assistance to authors, reviewers and editors of a Request and to make other remarks related to the ICNP, including general guidance for interpreting the ICNP, which could be greatly beneficial for writing other types of articles, too. The work is based on a review of all Judicial Opinions issued since the publication of the Approved Lists [44], a thorough cross-comparison with the wording of the ICNP [1], and a compilation of misjudgements related to nomenclature that were encountered by the Judicial Commission in the recent literature. Care was taken to ensure that the conclusions drawn from the Judicial Opinions are not affected by changes between the distinct revisions of the ICNP on which they were based. The 2022 revision of the ICNP was at the time of writing still in press [45]. Again, care was taken to ensure that all conclusions regarding the ICNP equally apply to both revisions, even in the case of quoted passages which deviate between the two revisions. Exceptions are dealt with explicitly as, e.g., in section 7.1.

The paper is organized as follows: First, guidelines for reading and understanding a complex document such as the ICNP [1] are provided, and the role of the Judicial Commission and other units within the ICSP is recapitulated in this context, particularly with respect to a Request. The crucial topic of the valid publication of names of species and subspecies under the ICNP is then addressed, with focus on the role of the Judicial Commission and the criteria for the valid publication of such names that are relevant for a Request. This is followed by the discussion of selected kinds of nomenclature-related proposals that are unsuitable as a Request. Requests for placing names or epithets on the list of *nomina rejicienda* are then discussed, and a dichotomous identification key is provided to guide potential authors of a Request that addresses the name of a species or subspecies because of issues with its type strain. Finally, aspects of other kinds of a Request are clarified.

1. INTERPRETING THE ICNP

Reading and interpreting nomenclatural texts and especially the regulatory manuscripts such as the ICNP requires practice and different skills than we use to analyse experimental designs and data. Frequently, Requests provide a wealth of well-analysed empirical information but have not interpreted the ICNP correctly. Interpreting the ICNP [1] may indeed often require the skills of a lawyer rather than the skills of the biologist. However, correctly citing the pertinent literature is an important aspect of proper conduct in science, and whenever the nomenclature of prokaryotes is concerned, the ICNP is obviously of central importance.

Below we first reiterate the purpose of the ICNP. To assist in correctly interpreting the ICNP, five major guidelines are then provided, followed by examples which illustrate how failing to adhere to these guidelines may lead to misjudgements about the ICNP. Advice on obtaining help on nomenclature-related issues is then given, followed by a brief discussion of potential improvements of the ICNP and their limitations.

1.1 The significance of the ICNP

As indicated in Article 7(1)(a) of the statutes of the ICSP [2], the Judicial Commission must make its decisions in the light of the ICNP. The Judicial Commission is thus obliged to apply the ICNP [1]; it does not have a mandate to overrule the ICNP. This holds without exceptions. Rule 3 does mention the possibility to 'make exceptions to the Rules', as do General Consideration 6(4) and Appendix 8. However, Rule 3 explicitly refers to Rule 23a. Indeed, Rule 23a Note 4 regulates one type of exception that can be made by the Judicial Commission. These are exceptions from the priority of names, which can be made by placing names on the list of conserved names or on the list of rejected names. Accordingly, the exception that can be made is to overrule one regulation of the ICNP based on another regulation of the ICNP. In an analogous manner, the Note to Rule 30(3)(b) defines exceptions from that Rule. The 2022 revision of the ICNP further defines a possible exception that can be made from Rule 8 [45]. None of these regulated exceptions constitute an actual exception from the need to adhere to the ICNP. For this reason, the major criterion for assessing a Judicial Opinion is not whether its outcome is pleasant but whether the Judicial Commission accurately interpreted the ICNP and the presented facts. Requests that ask for a Judicial Opinion based on the Judicial Commission making an exception to the ICNP are unlikely to be granted.

In addition to the Judicial Commission, the other units of the ICSP are also bound to the ICNP when it comes to interpreting issues of nomenclature. As indicated in Article 6(b)(5) of the ICSP statutes [2], the Subcommittees on Taxonomy must work within framework of the ICNP. The same holds for the entire ICSP, which is obvious from Article 3(b) in conjunction with Article 13(b). Thus, the approach to deal with unpleasant consequences of a regulation made by the ICNP is not to overrule that regulation in an *ad hoc* move, but to propose and vote on an emendation of the ICNP that removes or modifies that regulation.

Occasionally ‘Supplementary Information’ to a Judicial Opinion was separately published by the Judicial Commission, sometimes going far beyond the topics covered by the original Request [46]. The ICSP statutes do not mention ‘Supplementary Information’ but they do not restrict the scope of a Judicial Opinion other than emphasizing that it must include a response to the Request. Targeting other issues that are obviously related to the issue mentioned in the Request may make sense to immediately fix other known problems. Recent Opinions that additionally targeted issues not mentioned in the underlying Request include Opinions 116, 118 and 120 [7]. Such additions do not undermine the ratification process, nor do they generate dangerous precedents for fixing problems that cannot be known. According to Article 7(a)(1) of the ICSP statutes [2], the crucial issue regarding ‘expert advice’ given by the Judicial Commission is not its respective scope but the need to base it on the ICNP [1].

1.2 Guidelines for reading the ICNP

The ICNP [1] is a complex document organized into prefaces, chapters and appendices. The most pertinent chapter, Chapter 3, is in turn organized into sections, which are subdivided into Rules, to which Notes or Examples may be attached. Recommendations are also included. The last revision of the ICNP [1] is available as electronic document, which facilitates the search for terms. (The next revision of the ICNP [45] will also be available as electronic document.) However, quoting this complex document out of context does occur, as do other misleading usages of the ICNP [4, 5, 7, 9, 12, 14, 15, 17–20]. To minimize the risk of misinterpretations, readers are strongly advised to follow the guidelines given below.

- (1) **Read the entire Rule, including its Notes and Examples, if any.** Do not consider only single sentences of the ICNP. Other sentences may define exceptions to the initially considered sentence or may be needed to fully comprehend its meaning. The complete Rule you are referring to is the minimum amount of information to be considered, and if Notes or Examples are given they form an integral part of it.
- (2) **Obtain an overview of the Section you are currently consulting.** Look up the title of that Section, and read the Rules within the same Section that are adjacent to the initially considered Rule. Other Rules may complete the Rule you are currently considering, provide exceptions to it, or be necessary to fully elucidate its meaning. Adjacent Rules within the same Section are often closely related to each other.
- (3) **Follow references to other Rules, if any, and also consult those.** Rules located in other Sections of the ICNP may be necessary to fully elucidate the meaning of the Rule you are currently considering. Likewise, to fully comprehend the General Considerations and the Principles of the ICNP it is often necessary to study the Rules which implement them. The regulations of the ICNP are often strongly interconnected.
- (4) **Infer the meaning of nomenclatural terms from the ICNP itself.** The ICNP may define terms distinctly from their usual meaning in the English language and even from the meaning corresponding to their usage in other scientific publications. The authoritative definition of a term may be given explicitly at another position within the ICNP or only be implicit in the wording of one to several Rules.
- (5) **Strive for a logically consistent interpretation of the ICNP.** If distinct interpretations of the wording of a Rule are possible, prefer those that do not logically contradict other statements made in the ICNP. The ICNP is a historically grown document and the wording of some sentences may be misleading, hence several parts of the ICNP may need to be considered for properly inferring the sense of the clause of interest.

As shown in section 1.3, not adhering to these Guidelines may well cause a misinterpretation of the ICNP. In section 1.4 we explain how to obtain help and in section 1.5 we discuss potential improvements of the ICNP which could render it more easy to interpret. It must be emphasized, however, that the complexity of a code of nomenclature must reflect the diversity of issues that need to be regulated. Accordingly, one should not prematurely lament the intricacy of documents such as the ICNP [1]. In order to determine the ways, if any, in which the ICNP could actually be simplified, one needs to thoroughly study it in the first place, preferentially by adhering to the Guidelines given here. While every scientist has to deal with complexity, one may be tempted to criticize the intricacy of the ICNP because it is man-made. However, even deliberately created complexity may be necessary.

1.3 Examples

Some actual examples are needed to illustrate the value of the guidelines given in section 1.2:

- (1) The misinterpretation of Rule 18c that occurred in several recent Requests [23–26, 28–35, 39] and was analysed in 2016 [18] was probably originally caused by not observing Guideline 1 and by instead using other Requests as templates. Rule 18c does not set a time limit for proposing a neotype but for objecting against such a proposal.
- (2) The misinterpretation of the term ‘*nomen periculosum*’ observed in some other recent Requests [27, 36, 37, 40, 47] was apparently caused by not considering the Note and the Example attached to Rule 56a(5), which restrict the application of the term to a special case of medical or economic relevance [7, 9, 10]. Adhering to Guidelines 1 and 4 would have prevented these problems.
- (3) Similarly, the observed misinterpretation of the term ‘*nomen perplexum*’ [27, 36] seems to be due to not considering the Example attached to Rule 56a(4) and the cross-reference to Rule 57c, which indicates that the term solely refers to similarities in spelling [7]. Here observing Guidelines 1, 3 and 4 would have helped.

Table 1. List of official publications on prokaryotic nomenclature with examples and comments on the scope of each kind of publication

Kind of publication	Scope
ICNP, International Code of Nomenclature of Prokaryotes [1]	Authoritative document on prokaryotic nomenclature. Emendations and also newer revisions are regularly published.
Approved Lists [44]	Starting point of modern prokaryotic nomenclature. Two lists, issued only once in the same publication in 1980.
Validation Lists [56, 173–177]	Inclusion in a validation list is a necessary condition for a name to be validly published if it does not have an effective publication in the IJSEM.
Notification Lists [57, 178–183]	Compilations of taxon names proposed in the IJSEM. Are not decisive regarding the valid publication of names but may contain orthographical corrections.
Announcements of public discussions of proposed emendations of the ICNP [51, 93]	Participation in these debates is an excellent opportunity to learn and contribute.
Reports on the outcome of the votes [76, 184, 185]	Contain information on the interpretation of selected sections of the ICNP and potentially on its scheduled modifications.
Judicial Opinions [4, 5, 7, 9]	Contain information on the interpretation of selected sections of the ICNP and on selected aspects of nomenclature.

- (4) Sometimes the reach of Principle 1(1), the aim at the stability of names, is overestimated [37, 40], which seems to be due to not taking into account other clauses within the same Principle, such as Principle 1(4), and disregarding other Principles, such as Principles 8 and 9 [9, 10]. Guidelines 1, 2 and 5 would have prevented these shortcomings. The aim at the stability of names must be understood in the context of other aims, such as the support for taxonomic freedom.
- (5) Misinterpretation of Principle 1(2) [37], which is concerned with ‘names which may cause error or confusion’, are apparently caused by the same issues and by not considering how the ICNP defines these terms in Rule 56a [9]. Guidelines 1, 2, 4 and 5 would have been useful here. Again, the purpose of Principle 1(2) must be understood in the context of other purposes.
- (6) Leaving aside Requests, the most classical example for misunderstanding the ICNP is probably the wrong interpretation of the term ‘type’ as indicating that a type is supposed to be typical (or representative) for a taxon [13, 16]. However, as made explicit in Rule 15 [1], the purpose of a nomenclatural type is not to be typical or representative. The ICNP does not govern taxonomy [20], as already indicated in General Consideration 4. In contrast, taxonomic considerations determine the composition of a taxon and thus also determine which of its subunits could be typical or representative [13, 16], hence it would even be impossible for the ICNP to conceive a nomenclatural type in that manner. The misunderstanding probably originates from disregarding the actual usage of the term by the ICNP and simply assuming that an entity called ‘type’ must be ‘typical’ [16], thus contravening Guidelines 1, 4 and 5. The actual purposes of nomenclatural types are quite distinct [1, 13, 48].

Some Judicial Opinions issued in the past may have added to the confusion because they should probably have provided slightly more details on the decision, as, e.g., in the case of Opinion 69 [49], which was needlessly challenged recently [47]. Other Opinions may better have applied a distinct terminology, as, e.g., in Opinion 67 [50], as treated in section 5.2. But Opinions cannot replace the ICNP itself, nor can the Judicial Commission predict all possible misunderstandings. A more thorough reading of the ICNP along the Guidelines given in section 1.2 may well yield more accurate interpretations of the text and prevent the generation of confusion caused by quoting the ICNP out of context. The perceived ambiguity of some statements in the ICNP may also be solved by adhering to those Guidelines.

1.4 Obtaining help

Apart from the ICNP itself [1], there are other documents scholars may want to consult when trying to solve a nomenclature-related issue and particularly when composing a statement about nomenclature, either within a Request or otherwise. The official publications on prokaryotic nomenclature are listed in Table 1. Scholars are advised to consult a suitable selection of these official documents for assistance regarding the interpretation of the ICNP, depending on the particular question. In contrast, even a Request that was granted may contain misinterpretations, as mentioned in section 1.3.

The website of the ICSP (www.the-icsp.org) lists publications issued by the committee or associated with the committee. Public debates of the ICSP [51] also contain numerous statements on nomenclature. The ICSP may expand the online platform that was established for public discussions of proposed emendations of the ICNP to enquiries about the interpretation of the current revision of the ICNP. The members of the Editorial Board of the ICNP and the members of the Judicial Commission are listed on the ICSP website and can be contacted individually for help regarding nomenclature. Engaging with these bodies is an excellent opportunity to learn and contribute.

In addition, further resources can be of great help, too. On the List of Prokaryotic names with Standing in Nomenclature, also known as LPSN [52], a glossary is found that covers a variety of nomenclature-related terms. Additional LPSN pages explain topics of relevance in prokaryotic nomenclature and comprehensively list publications of relevance, including a complete list of Judicial Opinions together with each Request for an Opinion.

Researchers are encouraged to make use of such opportunities for obtaining nomenclatural advice. Expert advice itself should be judged according to its adherence to the guidelines given in section 1.2. In the case of regulations actually made by the ICNP it is pertinent to cite the respective General Consideration, Principle, Rule or Recommendation when giving advice. In the case of a statement actually not made by the ICNP it may be difficult to cite a certain clause of the ICNP as proof. However, if an alleged statement made by the ICNP is actually missing from the ICNP one may be able to cite clauses within the ICNP that are in logical conflict with this statement.

1.5 Potential improvements of the ICNP

Given the various nomenclature-related misjudgements observed in the literature, one may wonder whether the ICNP itself [1] could be improved so as to further decrease the probability of misinterpretations. Here one must not confuse brevity with simplicity: removing regulations from the ICNP might render it superficially more simple, but discarding regulations might also cause uncertainty and thus make the application of the ICNP more difficult. Rather, in line with the guidelines listed in section 1.2, the following kinds of additions might be useful:

- **Redundancy over inference.** Some conclusions can only be inferred by combining distinct sections of the ICNP. By introducing some slight redundancy the need for complicated inferences could be reduced.
- **More cross-references.** Some misunderstandings can be prevented by introducing cross-references that connect to other Rules which may easily be overlooked but are relevant for the respective topic.
- **More caveats.** If it is already known that a certain Rule, or a part thereof, is sometimes misinterpreted, it makes sense to add a Note that indicates what is *not* meant directly to that clause.

It must be emphasized, however, that the ICNP already explains certain issues several times; that it already contains cross references; and that it already explicitly clarifies for some aspects of nomenclature how they should *not* be interpreted, as, e.g., within Principle 4 and Rule 15. For this reason, the potential kinds of additions tentatively suggested here could at most gradually improve the comprehensibility of the text. They would also require specific textual suggestions and subsequent legislation [2].

Emendations of the ICNP such as the ones tentatively suggested here would in most cases probably not have to remove actual ambiguity from the ICNP but just make it less easy for the casual reader to overlook something of relevance. To demonstrate an actual ambiguity of a text it appears to be necessary to provide at least two distinct interpretations of that text which are more or less equally plausible. Other things being equal, this option should become less likely once more information from the text is processed, in accordance with the Guidelines given in section 1.2. Improvements of the ICNP [1] are certainly feasible but ultimately the users of the ICNP are responsible for interpreting it as accurately as possible. In the case of manuscripts submitted to scientific journals, authors, reviewers and editors bear this responsibility.

2. VALID PUBLICATION OF A NAME

Taxonomic classification deals with the arrangement of organisms into groups, i.e. taxa, while nomenclature solely deals with the assignment of names to such taxa, given the grouping [1]. For this reason, it is misleading to use terms such as 'validly described species' or 'validly published genus'. There is no status 'validly described' under the ICNP, and only names but not taxa can be validly published. This distinction is not a technicality but a crucial difference in perspective [12]. In the same vein, there are no 'valid names'; a name can be validated by inclusion in a Validation List (Rule 27 Note 1) but such validated names are only a proper subset of the validly published names: not every validly published name was validated. A name proposed in an effective publication in the IJSEM and meeting the other criteria for valid publication does not need to be validated.

According to Principle 7, names have no claim to recognition under the ICNP unless they are validly published. If a name has no claim to recognition anyway, it makes no sense to place it on the list of rejected names, a topic that is considered in detail in section 5.2 and other sections below. Hence, like many other nomenclatural aspects, the potential reasons for rejecting a name must be considered in the context of the requirements for valid publication under the ICNP. An argument put forward for rejecting a name may actually indicate that the name is not validly published, particularly in the case of the name of a species or subspecies. This should be considered in a corresponding Request for an Opinion. Issues related to the valid publication of names are thus reiterated in section 2.1 and the subsequent sections, with particular emphasis on the relation to the work of the Judicial Commission.

Fig. 1 illustrates the relationships between valid publication, legitimacy and rejection of a name, which are nomenclatural status values or actions [1]. Whether or not a name is the correct name as stipulated by Principle 6, Principle 8 and Rule 23a of the ICNP also depends on taxonomic opinion [12]. In set-theoretic terms, the set of legitimate names is a proper subset of the set of validly

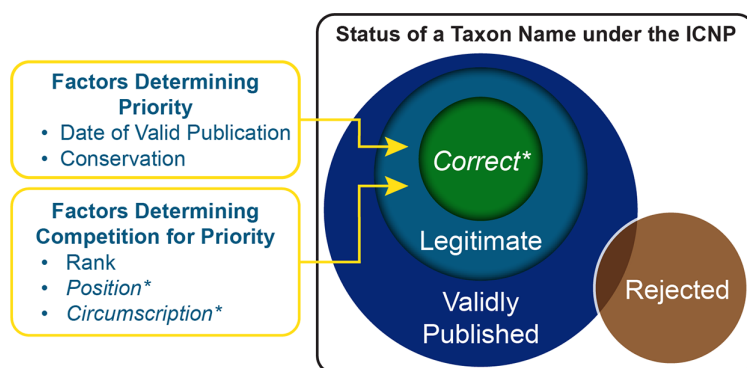


Fig. 1. Status of a name under the ICNP and factors influencing this status. Status values and factors that depend on taxonomic opinion are printed in italics and marked with an asterisk. For details see particularly sections 2.1–2.3. Only validly published names can be legitimate (be in accordance with the Rules) or illegitimate (contravene a Rule). Only a legitimate name can be the correct name of a taxon (the name to be applied under the Rules). Yet a name not regarded as the correct name is not illegitimate for this reason, nor can it be rejected for this reason. A rejected name may not be applied to any taxon. Some names placed on the list of rejected names are not validly published, e.g. because they were not included in the Approved Lists.

published names. That is, all legitimate names are validly published but not all validly published names are legitimate. The set of correct names is a proper subset of the set of legitimate names. That is, all correct names are legitimate but not all legitimate names are regarded as the correct name. An illegitimate name cannot be the correct name of a taxon. The set of rejected names is not a subset of the set of validly published names because some rejected names were not included in the Approved Lists and thus ceased to be validly published [53, 54]. Detailed explanations are provided in sections 2.1–2.5.

2.1 Conditions for valid publication

The conditions under which the name of a species or subspecies is regarded as validly published under the ICNP were often reiterated in Judicial Opinions; see, e.g., Opinion 110 [7]. It is evident from the wording of Rule 27 that the publication of a name in the IJSEM or its predecessors, either in a Validation List or in an effective publication directly in the journal, is only a necessary condition but not a sufficient condition for a name to be validly published [55]. It must be emphasized that the non-availability of type material is not a plausible argument for rejecting a name if this name was never based on type material. This can happen if the name was validly published before 1 January 2001 as indicated in Rule 30(3) [1].

It would be incorrect to assume that the Judicial Commission can actively change the status of a name from being validly published to not being validly published. The Judicial Commission can only recognize a name as not being validly published, and it would not even be needed to involve the Judicial Commission in such cases [56–59], although the Judicial Commission can be asked to clarify the status of a name [60]. This is distinct from the rejection or conservation of a name, which requires an action of the Judicial Commission according to Rules 56a or 56b [1] and not just a clarification.

This review of the Judicial Opinions issued after 1980 revealed a high consistency overall, in line with a strict adherence to the ICNP. The Judicial Commission apparently also followed a *stare decisis* approach, i.e. it used previous decisions as precedents. Opinion 96 [61] stands out because it claimed that the species name *Leifsonia rubra* Reddy *et al.* 2003 was validly published although it did not meet the requirements for valid publication given in Rule 30(3b). This appears to be a mistake, as a justification for this decision was not given in the Opinion while arguments to the contrary were presented. As explained in section 1.1, such an outcome may best be regarded as void because it contravenes the ICNP. Although the type strain was apparently deposited in culture collections after the Request [62] was issued, the decision is likely unjustified because the deposits were not available at the time of publication [1].

The appropriate course of action appears to be to validate the name '*Leifsonia rubra*' by inclusion in a validation list once the necessary deposits were made. The year of valid publication would accordingly be much later, which would in turn affect the priority. This could well be regarded a matter of fairness relative to other names that potentially competed with that name for priority but whose type strains were appropriately deposited. For instance, the name '*Chlorobaculum thiosulfatiphilum*' [63] was published in the IJSEM in 2003 but validated by inclusion in Validation List No. 204 [64] once type-strain deposits were available, yielding the name *Chlorobaculum thiosulfatiphilum* Imhoff 2022.

2.2 Valid publication versus legitimacy

A legitimate name is a validly published name that does not contravene any Rule. Accordingly, there are some Rules which determine the requirements for valid publication, and there are other Rules with which a validly published name can disagree.

Much like valid publication, issues of legitimacy can be clarified by the Judicial Commission but it cannot change the legitimacy of a name, apart from rare cases such as those indicated in Rule 22, which was used in Opinion 119 [9]. Another way to change the legitimacy of a name is a change of the ICNP [1] itself, as treated elsewhere in this paper.

Since Rule 30 only mentions requirements at the time of publication, the later loss of single, several or all type-strain deposits would not make a validly published name illegitimate (Rule 23a Note 5) because this loss does not make the name contravene a rule. If the name was indeed illegitimate it could not be rescued by assigning a neotype, nor would there be a real need to reject the name, as it may not be the correct name anyway according to Principle 6 and Rule 23a [1]. Moreover, Rule 30 defines conditions for the valid publication of a name. As reiterated in Opinion 117 [7], if these requirements were not met a name would not be validly published and, accordingly, have no claim to recognition under the ICNP (Fig. 1). As legitimacy is a status under the ICNP, one wonders how it should apply to a name that is not validly published [65]. The 2022 revision of the ICNP [45] deals more explicitly with these relationships but it was possible to infer them from previous revisions, too [1].

Conversely, because of the options of assigning a neotype and of rejecting a name for cases in which type strains are lost, this cannot be a matter of legitimacy. Moreover, establishing a neotype according to Rule 18c is not a means of changing the status of a name from not validly published to validly published, as emphasized in Opinions 108 [7] and 113 [9], or from illegitimate to legitimate [1].

2.3 Legitimate name *versus* correct name

Another potential source of confusion is the distinction between whether or not a name is the correct name, and whether or not a name is legitimate. Rule 23a Note 5 [1] clearly differentiates between a legitimate name ('in accordance with the Rules') and a correct name ('the name which must be adopted for a taxon under the Rules'). Principle 6, the first sentence of Rule 23a, and Rule 23b clarify that being legitimate is a necessary condition but not a sufficient condition for being the correct name. This in turn means that a name that is not the correct name is not illegitimate for that reason (Fig. 1).

According to General Consideration 4 and Principle 1(4) the ICNP does not rule on taxonomy. Whether or not two taxa with a validly published and legitimate name are considered as heterotypic synonyms is a matter of taxonomic opinion [12], even if it is the currently prevailing taxonomic opinion. If two taxa are considered as heterotypic synonyms, according to Principle 6 and the first sentence of Rule 23a only one of the two names of the taxa can be the correct name. Similarly, if two taxon names are homotypic synonyms derived from the same basonym, they are usually generated to express distinct taxonomic views on the position of a taxon, such as the placement of a species in a genus. Again, a taxonomic choice must be made, and at most one of them can be considered the correct name, depending on that choice [12]. Taxonomic views, on which the ICNP does not rule, can thus play a role in determining the correct name (Fig. 1), since position and circumscription of a taxon are matters of taxonomic opinion. In contrast, the other factors which determine the correct name, such as legitimacy [7], are solely a matter of nomenclature (Fig. 1). This also indicates that a name that is not the correct name is not illegitimate for that reason.

Position and circumscription of a taxon are chosen according to taxonomic opinion. The Rules of nomenclature then determine the correct name, if any, for that taxon with a given position and circumscription (Fig. 1). Selecting a name that is not the correct name as the name for the taxon would certainly contravene the ICNP. However, this does not make that name illegitimate, nor can a name that is not regarded as the correct name be placed on the list of rejected names for that reason. Rather, a validly published and legitimate name that is not regarded as the correct name must simply be regarded as a synonym, either a later synonym or a synonym whose counterpart has been conserved over it by the Judicial Commission (Fig. 1); see also section 7.2.

Whether or not two taxon names are synonyms is solely determined via the positioning of the nomenclatural types of the two taxa, as indicated in Rule 24a Note 3 [1]. In a given hierarchical classification each taxon or strain can be positioned within at most one taxon of a certain category. This also implies that each nomenclatural type can be positioned within at most one taxon of a certain category. For this reason, they cannot be partial synonyms, and the ICNP does indeed not support the concept [1].

A name regarded as a synonym can still be the nomenclatural type according to Rule 15 [66]. This would not be possible if the name was illegitimate, since according to Rule 51a an illegitimate name may not be used [1]. Rules 20a and 21a explain that this extends to the use as nomenclatural type. This again points at the distinction between legitimacy and correctness: an illegitimate name may not serve as nomenclatural type but a validly published and legitimate name that is not the correct name may serve as type. The 2022 revision of the ICNP [45] deals more explicitly with these relationships but it was possible to infer them from previous revisions, too [1].

Among a set of homotypic synonyms derived from the same basonym, the last one that is validly published and legitimate is not automatically the correct name [1, 66, 67]. Similarly, the views on heterotypic synonymy that were published last need not be followed. More recent taxonomic studies may indeed be based on more or better data, which may argue for adopting their view. However, the differences to previous taxonomic arrangements may as well be just based on distinct taxonomic concepts, whereas the mere use of the same data may have yielded the same taxonomic classification as before [67, 68]. Using a previously published

taxonomic arrangement instead of the last one that was put forward in the literature is never arbitrary but just conservative. Be that as it may, neither the ICNP nor the Judicial Commission rule on taxonomic views; see also section 6.2.

2.4 Names validly published until 2000

Whether or not a name is validly published due to its inclusion in the Approved Lists [44] is also often of relevance in the context of a Request for an Opinion [69]. Opinion 95 [70] ruled that names with an effective publication prior to 1980 and not included in the Approved Lists are not validly published even if they should have been included in the Approved Lists; for an alternative outcome see Opinion 83 [71]. Opinion 58 [72] confirmed for the first time that the nomenclatural types chosen in the Approved Lists supersede any others that were previously in use for the same taxon but that the Judicial Commission can still amend these choices.

Rule 30(3)(b) indicates that as 'of 1 January 2001, the description of [...] new combinations previously represented by viable cultures must include the designation of a type strain [...] deposited in at least two publicly accessible culture collections in different countries' [1]. This has the consequence that new combinations cannot be validly published if their basonym was based on a type strain and this strain is not available, or not available any more, from culture collections in at least two distinct countries. This issue mainly affects names of species or subspecies validly published before 1 January 2001 because until then only a single type-strain deposit was sufficient. The situation is probably best addressed by the exchange of cultures between culture collections, similar to the kind of actions reported in Opinion 81 [73]. However, if a name validly published before 1 January 2001 was based instead on a preserved specimen, description or illustration, the ICNP appears to permit the proposal of a new combination without the need for a deposit of the type strain.

The ICNP only briefly explains the term basonym as the original name on which a new combination (which retains an epithet) or, rarely, a *nomen novum* (which does not retain the epithet) is based. In conjunction with Rule 34b, which clarifies that the 'original author' should be cited in parentheses, it is obvious that the basonym is the name which originally used the epithet. That is, a basonym does not itself have a basonym. The Approved Lists [44] include a variety of names whose basonym was not included although the basonym is referred to by citing its authors in parentheses. For instance, *Amoebobacter pendens* (Molisch 1906) Pfennig and Trüper 1971 (Approved Lists 1980) [44, 74] is a validly published name due to its inclusion in the Approved Lists but its basonym '*Rhodotherce pendens*' Molisch 1906 [44, 75] is not validly published. Thus, a basonym has either to be validly published or must have been used as basonym in the Approved Lists.

2.5 Names of *Cyanobacteria*

The integration of the names of *Cyanobacteria* [76, 77] into the ICNP raised questions with respect to the valid publication of new combinations proposed for such names. These emendations of the ICNP implicitly introduced a distinction between names that are validly published under the ICNP because they are validly published under another code on the one hand, and all other names validly published under the ICNP on the other hand. For the purpose of the following discussion, the latter, which still form the majority, will be called 'directly' validly published under the ICNP. The new addition [76] to Rule 30(4) reads:

'Names of taxa of *Cyanobacteria* validly published in conformity with the Rules of the International Code of Nomenclature for algae, fungi, and plants are also validly published in conformity with the Rules of the International Code of Nomenclature of Prokaryotes (see General Consideration 5).'

Similar provisions were made for the recognition of the nomenclatural type of species and subspecies whose names were directly validly published under the International Code of Nomenclature for algae, fungi, and plants (ICN) in Rule 18a. However, none of these regulations apply to new combinations which are attempted to be validly published directly under the ICNP, even if these are names of *Cyanobacteria*. Since the demands for the nomenclatural types are distinct between the ICN [78] and the ICNP [1], particularly as of 1 January 2001, an attempt to validly publish a new combination directly under the ICNP for a basonym validly published for a taxon of *Cyanobacteria* directly under the ICN is expected to fail since Rule 30(3) remained as-is. The solution appears to be to try to validly publish a new combination directly under the ICN whenever the direct valid publication of its basonym was also made under the ICN. If this succeeds (according to the Articles of the ICN), the new combination will automatically be regarded as validly published under the ICNP, too, based on the new regulations [76].

In general, in order to be able to easily determine whether the requirements for valid publication were met under either code, it seems beneficial to mark names of *Cyanobacteria* directly validly published under the ICN as being validly published under the ICN instead of under the ICNP, and *vice versa*. Exactly one of the two codes should be indicated along with the description. Lumping may apparently cause a loss of information. Nomenclatural issues with names originally validly published under the ICN should not normally be reported to the Judicial Commission of the ICSP but treated according to the regulations of the ICN [78].

3. PROPOSALS THAT ARE NOT SUITABLE AS REQUESTS FOR AN OPINION

There are a variety of nomenclature-related actions into which the Judicial Commission needs not be involved or at least needs not directly be involved.

3.1 Proposals for modifying the ICNP

These should *not* be submitted as a Request. A Request makes sense for clarifying the meaning of the current revision of the ICNP [1, 45] regarding a certain issue, or for taking actions such as the conservation or rejection of names (which must also be made in compliance with the ICNP). In contrast, authors are advised to avoid the term ‘Request’ in the title of a manuscript that suggests an emendation of the ICSP. A formal proposal to emend the ICNP as outlined in Article 13(b) of the statutes of the ICSP [2] should be made, marked distinctly from a Request and be placed into the corresponding category of the IJSEM [48, 65, 77, 79–92].

Sometimes proposals for changing the ICNP that are directed to the Judicial Commission are submitted to the IJSEM. The Judicial Commission would then issue an Opinion that may or may not recommend a corresponding change to the ICNP. This step is unnecessary, however, particularly because this step alone would not yield a change to the ICNP, nor would it directly initiate such a change [2]. Moreover, members of the Judicial Commission could comment on the proposal anyway, namely during the subsequent public ICSP debate about the proposal [51]. Members of the ICSP, particularly members of the Editorial Board of the ICNP or members of the Judicial Commission, could also be informally asked for advice prior to submission of a corresponding manuscript, either personally or *via* one of the channels described in section 1.4.

A paper that proposes an emendation of the ICNP should include at least one proposal for the wording the authors wish to have added to the ICNP, or the wording alternative to the wording used in the current revision. The wordings of all suggested changes of the ICNP should be clearly highlighted as such to distinguish them from the rest of the manuscript. If the authors have just one proposal for each suggested emendation of the ICNP, they should publish only this one. If the authors believe that some wordings may be more controversial than others, or just provide an alternative solution of interest, they should provide several ones and highlight the differences [77, 89]. In either case, providing the wording in the publication itself considerably speeds up the processing [51, 93] and increases the probability that the ICNP is emended to as to accurately reflect the goals of the authors. The best way to ensure this is that the authors phrase the intended text themselves.

Authors of proposals for emending the ICNP are strongly advised to search for other sections of the ICNP which could logically contradict their proposed wordings, including definitions given in an Appendix of the ICNP. One should avoid at all cost to introduce wordings into the ICNP that logically contradict other sections of the ICNP, unless these are only of historical interest. In order to properly implement a certain idea, changes at several locations within the ICNP may be necessary [65, 81, 88]. Particularly if several changes are proposed, the format should follow the one used in the latest ICSP debates [51, 93]. That is, a tabular format is advisable with the old text in one column, its newly proposed counterpart in another column, and optional comments in a third column.

3.2 Designation of a type strain in place of a preserved specimen, description or illustration

The designation of a type strain for a name validly published before 1 January 2001 that was based on a preserved specimen, description or illustration according to Rule 18a(1) should *not* be submitted as Request. Rather, such a move [94] must be made as described in Rule 18f [1]. The ICNP does not mention a mechanism by which the Judicial Commission would directly get involved in such a case. As noted in Judicial Opinion 80 [95], ‘a name (epithet) can only be conserved over another name (epithet) or in combination with a particular circumscription’. Accordingly, the Judicial Commission could be requested to conserve a name with a type strain distinct from the one that replaced the preserved specimen, description or illustration, but such an action is not normally needed.

Note that a type strain that replaces a preserved specimen, description or illustration is not a neotype strain. Also note that the loss of a type strain does not mean that the description replaces it as the nomenclatural type; the description may only serve to facilitate the search for a neotype strain as indicated in Rule 18c [1]. As for the rejection of names, the non-availability of a type strain is not a plausible argument for rejecting a name if this name was never based on a type strain. Proper arguments for rejecting a name are treated in several sections below.

3.3 Proposals for assigning a neotype strain

These should *not* be submitted as a Request. Instead, Rule 18c must be followed; see also Rule 19. The Judicial Commission would get involved only in the case of an objection (Rule 18c) or according to Rule 18e [1]. Sometimes the assignment of a neotype is unnecessarily issued as a Request [96, 97]. Opinion 102 [5] granted such as Request, Opinion 100 [5] denied another one. However, objections can be raised during the 2-year period stipulated by 18c instead. This is preferable to requesting the conservation of a name with a distinct type strain or neotype strain afterwards, although such a move is possible [95, 98].

It should be noted that a deposit knowingly derived from a deposit mentioned in the valid publication of a name can simply serve as the type strain for that taxon and is not a neotype [99]. If, in contrast, authors believed that a neotype strain would need to be assigned but cannot be assigned, this can be a reason for requesting the rejection of a name or epithet [100]. In that case the Judicial Commission should be involved but the specific circumstances must be considered in the Request, as outlined in section 5.2.

3.4 Proposals for regarding a name as a heterotypic synonym of another name

This is a matter of taxonomic opinion and should *not* be submitted as a Request for an Opinion (Fig. 1). The Judicial Commission does not rule on taxonomy because the ICNP does not rule on taxonomy either [1, 2, 20, 21]. Sometimes the distinction between the need to reject a name, as discussed in section 6.2, and the mere presentation of it as a synonym, is insufficiently clear. However, rejecting a name is certainly not the only way to remove a name from usage. It may well suffice to reduce it to synonymy and to thus declare it to not be a correct name according to Rule 23a [1]. In fact, this is the much more frequently used mechanism to remove a name from taxonomic usage, albeit not from recognition under the ICNP (Principle 7). The Judicial Commission would only need to be involved to conserve a name or epithet according to Rule 56b, should the alleged synonymy between two names in conjunction with their priorities yield an undesirable result (Fig. 1). Conservation of names is treated in section 7.2.

According to Rule 23a [1], there can be only one correct epithet for a species name in a given position, namely the earliest legitimate epithet. As indicated in Rule 23a Note 1, the priority of a species epithet is independent of the priority of its genus name. As indicated in Rule 23a Note 2, the priority of a subspecies epithet is likewise independent of the priority of its species epithet. This is of practical relevance regarding heterotypic synonyms, particularly heterotypic synonyms of species placed in distinct genera. The proposal of such synonymy relationships can be incorrect regarding the alleged priority. These cases can be fixed by proposing new combinations [101–103]; there is no need to involve the Judicial Commission although it was occasionally asked to clarify the priority of names [104].

4. REQUESTS FOR REJECTING NAMES: GENERAL CONSIDERATIONS

As mentioned in the Introduction section, a Request that calls for the placement of a name or epithet on the list of *nomina rejicienda* is nowadays the most frequent and often also the most problematic kind of Request. In general, one needs to consider that rejecting an epithet has consequences distinct from the rejection of a genus name, as discussed in Opinion 106 [7]. Requests that call for the rejection of a name or epithet can be subdivided into those mainly based on issues with type-strain deposits on the one hand, which form the majority, and all other Requests on the other hand.

As reiterated in Opinion 82 [105], only the Judicial Commission can reject names. In general, a Request is incomplete unless it provides the entire rationale for conducting a certain nomenclatural action or at least for examining a nomenclature-related issue. Such completeness cannot be achieved without specifically referring to the ICNP [1].

For requesting the rejection of a name, the data should be matched to one of the justifications given in the ICNP for rejecting a name. Recent decisions of the Judicial Commission always chose at least one of the reasons given in Rule 56a [1] for placing a name on the list of rejected names. Authors are advised to carefully read this Rule, including its Notes and Examples, to interpret their data in the light of one of the reasons given in Rule 56a, and to explicitly provide the result of this interpretation in the Request for an Opinion. If applicable, several reasons listed in Rule 56a should be given, but one of them would be sufficient if the required evidence related to it was provided in the Request. Although granted by the wording of Rule 56a [1], it is very unlikely that the Judicial Commission will reject a name or epithet for reasons other than those listed in that Rule and those for which a precedent exists [46]; see particularly section 6.2.

Authors of a Request are strongly advised to study the most recent Judicial Opinions in which a name was rejected [4, 5, 7, 9]. Particularly Opinions 106 and 107 [7] should be consulted, as they re-iterate how the distinct reasons in Rule 56a are to be interpreted. One can search for ‘nomen’ (as a word) in the publication and traverse the results. On LPSN [52], a linked compilation of all Judicial Opinions is found. Appendix 5 of the ICNP [1] also lists all Opinions.

If experimental evidence is presented in a Request that was not taken from an earlier publication, the data must be deposited if required by the pertinent publication standards. For instance, if newly obtained sequence data are presented, accession numbers in public databases must be cited and the sequences must be available *via* these accession numbers. These requirements do not differ from those affecting ‘normal’ research papers.

4.1 Consequences of rejecting a name

Appendix 4 of the ICNP [1] differentiates between rejected names of genera or taxa of a rank higher than genus on the one hand and rejected epithets within names of species or subspecies on the other hand. The rejection of a genus name also removes all names of species or subspecies placed within this genus from usage. The rejection of an epithet within the names of a species or subspecies would only remove the genus name from usage if the type species of the genus was affected. In such a situation it may be more appropriate to request the rejection of the genus name.

Opinion 106 [7] argued that the conservation of an epithet over another epithet would not only conserve it within its present genus but also analogously in all future new combinations having the same basonym. This conclusion was based on Rule 23a Note 1, which indicates that the priorities of a species epithet and of its genus name are independent of each other, which in turn suggests that epithets can separately be conserved. One could also refer to Rule 41a, which indicates that a species epithet must per default be retained when transferring a species to another genus.

The same arguments would indicate that the rejection of an epithet within a name causes the rejection of this epithet within all homotypic synonyms of that name that use the same epithet, i.e. in the entire set of names derived from the same basonym. This would also prevent future validly published new combinations of the name from being usable. An exception is if the epithet was conserved within another name. For instance, the epithet in *Yersinia pestis* (Lehmann and Neumann 1896) van Loghem 1944 (Approved Lists 1980) [44, 106] was conserved while the epithet in *Yersinia pseudotuberculosis* subsp. *pestis* (Lehmann and Neumann 1896) Bercovier *et al.* 1981 [107, 108] was rejected [109].

The Approved Lists [44] set a new starting point for prokaryotic nomenclature [1]. Some Judicial Opinions issued afterwards [53, 110, 111] rejected names that were not included in the Approved Lists. While these names were not validly published any longer, their placement on the list of rejected names still had an effect, as rejected names cannot be revived (Rule 28a).

Opinion 121 [9] emphasized that there is no mechanism in the ICNP for ‘unrejecting’ a name once it was placed on the list of rejected names, as already noted in Opinion 121. Likewise, a means for ‘unconserving’ a name is not defined. However, a Judicial Opinion can revisit an earlier Opinion, and this may occasionally lead to treating a name as not being rejected [112] by overturning an earlier Opinion [113]. As yet the ICNP does not seem to provide a mechanism for making a name *temporarily* unavailable, and such an approach may well contravene Principle 1 [1].

5. REJECTING NAMES BECAUSE OF ISSUES WITH TYPE-STRAIN DEPOSITS

Among the Requests for an Opinion that call for the placement of a name or epithet on the list of *nomina rejicienda* the most frequent ones are currently those based on observed problems with type-strain deposits. The relevance of type strains deposited in culture collections is related to the requirements for valid publication under the ICNP [1]. These are defined in general in Rule 27; for regulations affecting the names of species and subspecies Rule 30 must be considered.

In section 5.2, an identification key for writing a Request based on issues with type-strain deposits is provided, including the discussion of further aspects of relevance.

5.1 Availability of type strains

Care must be taken when reporting the unavailability of type-strain deposits as demanded by Rule 30 [1]. If an expected type-strain deposit is not shown in the catalogue of its culture collections, do not immediately assume that it is unavailable. The deposit may be missing for reasons other than being dead, hesitating to grow, or apparently not being authentic. Contact the collection to determine why the deposit is not included and report the response in the Request, providing as much information as possible. If the collection does not respond in time, report this instead.

Conversely, being listed in the catalogue of a culture collection does not mean that a type strain is available. Rule 30(4) is concerned with situations in which type strains are deposited in a culture collection but these deposits are affected by restrictions [19, 114, 115]. In line with General Consideration 4 and Principle 1(4) of the ICNP [1], no limits must be imposed on the possibilities for taxonomic investigations on type strains [116]. As yet the main effect of Rule 30(4) in practice appears to be that taxon names solely based on patent strains are not regarded as being validly published [56–59]. The word ‘solely’ had been included deliberately in Rule 30(4), as patent deposits may at the same time be part of an open collection and, if so, do not present an inherent problem for the purpose of representing a type strain [114]. As treated in Opinion 72 [117], it must also be taken into account which requirements for the valid publication of a name were in effect when this name was proposed.

5.2 Identification key for problems with type-strain deposits

The following dichotomous identification key guides potential authors of a Request through the preparation of such a manuscript, provided it deals with the rejection of the name of a species or subspecies because of problems related to its type strain, or corresponding enquiries for clarifying the status of such a name. Note that the recommendation to not write a Request for an Opinion is one possible outcome. When using this identification key particular emphasis should be laid on the kind of evidence that would need to be provided within the Request.

The identification key given below was simplified by regarding only a single type-strain deposit. The expansion to the current situation that requires the deposit of the type strain in at least two distinct culture collections in two distinct countries should be easy, considering the remarks on the valid publication of names of species or subspecies made in section 2.1. When several type-strain deposits are involved, the history of deposition must usually be taken into account. For instance, it is crucial to

establish which of the alleged deposits of the type strain are affected by the reported problems, and whether or not these problems have affected the deposits mentioned in the effective publication or validation of the name from the beginning, i.e. at the time of publication of the name as indicated in Rule 30 [1]. For example, Judicial Opinion 126 [10] had to deny the Request [39] because a relevant type-strain deposit was not examined.

The numbering in the identification key provided below reflects the steps that are necessary to arrive at a conclusion. The path from one step to the next is indicated by an arrow. The decisions to be made are marked by *a* and *b*, respectively.

1a. The alleged type-strain deposit *D* of species or subspecies *S* is available and reproducibly differs in feature (or set of features) *F* from the statements made in the effective publication of *S* about *F*, and these deviations are too substantial to be attributed to experimental error or biological variability. → **2**

1b. There is no such discrepancy, or the deviations are not substantial and can be attributed to experimental error or biological variability. → **13**

2a. *F* is listed in the description section of *S* within the effective publication of *S*. → **4**

2b. *F* is only mentioned in other sections of the effective publication of *S*. → **3**

3a. You are able to study other features of *D*. **Solution:** Study those features, then set *F* to those features and return to step 1.

3b. You are not able to study other features of *D*. **Solution:** Do not write a Request. If applicable, ask the authors of the effective publication of *S* for publishing an Erratum or Corrigendum. If otherwise, publish the result yourself in a context that makes sense. **Examples:** Opinions 108 [7], 112, 113, 114 [9], 125 [10], which had to deny the respective Request.

4a. You have made a reasonable effort to recognize whether or not *D* is a mixed culture and whether or not the discrepancy regarding *F* is caused by changes in character of *D* during its storage in the culture collection. → **5**

4b. You have not made a reasonable effort to detect such issues. → **3**

5a. You conclude that *D* is a mixed culture. **Solution:** Request the rejection of *S* as a name causing confusion (*nomen confusum*) according to Rule 56a(3); emphasize that *F* does not conform to the original description of *S*. **Examples:** Opinions 63 [118], 107 [7], 115 [9]. (Note that a *nomen confusum* is usually also a *nomen dubium* but that the former term is more specific.)

5b. You conclude that *D* is not a mixed culture. → **6**

6a. You conclude that the discrepancy regarding *F* is caused by changes in character of *D* during its storage in the culture collection. **Solution:** Request the clarification of the status of *D* and *S* by applying Rule 18g.

6b. You conclude that the discrepancy regarding *F* is not caused by changes in character of *D*. → **7**

7a. The name of *S* was included in the Approved Lists of Bacterial Names [44], which selected a type strain distinct from the one chosen in the original description, or in place of the original description. → **8**

7b. The name of *S* was not included in the Approved Lists. → **11**

8a. You have evidence that the selection of the type strain in the Approved Lists of Bacterial Names caused the name of *S* to be used with distinct meanings in the past. **Solution:** Request the rejection of *S* as an ambiguous name (*nomen ambiguum*) according to Rule 56a(1). **Examples:** Opinions 67 [50], 106 [7], 123 [10]. (Note that the case treated in Opinion 67 appears to better fit to the definition of a *nomen ambiguum* rather than to a *nomen dubium* as indicated in the Opinion.)

8b. The name of *S* was not really used with distinct meanings in the past despite the change of the type strain. → **9**

9a. Apart from *D* a deposit of the original type strain of *S* is available. **Solution:** Request a correction of the Approved Lists (Rule 23a Note 4) that replaces *D* with the original deposit of *S*, i.e. conserves *S* with another type strain. **Examples:** Opinions 59 [119], 64 [120], 65 [121], 66 [122], 68 [123], 76 [124], 87 [125], 91 [126], 101 [5], 127 [10].

9b. A deposit of the original type strain of *S* is not available. → **10**

10a. The original description of *S* was not based on a type strain. **Solution:** Request the conservation of *S* with a description, preserved specimen or illustration as the nomenclatural type. **Examples:** Opinion 61 [127].

10b. The original description of *S* was based on a type strain. **Solution:** Do not write a Request. If deemed necessary, publish the results in another context that makes sense.

11a. Due to a mix-up within the text of the publication, *D* was indicated as type-strain deposit for another species or subspecies while another type-strain deposit was indicated for *S*; both deposits were available at the time of publication. **Solution:** Request the correction of the links between the type strains and their species or subspecies. **Examples:** Opinion 93 [128].

11b. The discrepancy regarding *F* is not apparently caused by such a mix-up. → **12**

12a. You conclude that the discrepancy regarding *F* is caused by the deposition of a strain distinct from the type strain of *S* in the culture collection, i.e. that the type strain of *S* designated in the effective publication was not actually deposited. **Solution:** Publish these results and call the status of *S* as being validly published into question because it does not meet the requirements given in Rules 18a, 27(3) and 30(3b). If deemed necessary, request the clarification of the status of the name. However, keep in mind that, in contrast to the rejection or conservation of a name, the status of being validly published cannot be changed by an action of the Judicial Commission; the Judicial Commission can only provide an interpretation of the situation. **Examples:** Opinions 98, 99 [4], 109, 110 [7].

12b. You conclude that the discrepancy regarding *F* is caused by the (probably inadvertent) mix-up of the features of *D* with features of other organisms in the description of *S*. **Solution:** Publish these results and call the status of *S* as being validly published into question by applying Rule 31a. If deemed necessary, request the clarification of the status of the name. Again, keep in mind that, in contrast to the rejection or conservation of a name, the status of being validly published cannot be changed by an action of the Judicial Commission; the Judicial Commission can only provide an interpretation of the situation.

13a. *D* is not available or not available any more, nor are any other culture-collection deposits knowingly representing the same type strain. → **14**

13b. *D* or other culture-collection deposits knowingly representing the same type strain are still available. → **16**

14a. *D* is a culture-collection deposit of the type strain of *S* but was not available at the time of publication of *S* because *D* is a patent deposit or underlies similar restrictions. **Solution:** Publish these results, concluding that *S* is not validly published because it does not meet the requirements given in Rule 30(4). Do not write a Request.

14b. *D* was available at the time of publication of *S* but *D* is not available any more. → **15**

15a. It is likely that a neotype strain can be proposed. **Solution:** Do not write a Request. If possible directly propose the neotype strain according to Rule 18c. **Examples:** Opinions 88 [129], 103, 104 [7], which hesitated to reject a name because assigning a neotype may still be possible.

15b. It is unlikely that a neotype strain can be proposed. **Solution:** Request the rejection of *S* as a doubtful name (*nomen dubium*) according to Rule 56a(2). **Examples:** Opinions 56 [111], 67 [50], 78 [100].

16a. You have sufficient evidence that *D* is a mixed culture. **Solution:** Request the rejection of *S* as a name causing confusion (*nomen confusum*) according to Rule 56a(3); emphasize that features of *D* such as *F* conform to the original description of *S*. **Examples:** Opinions 63 [118], 107 [7], 115 [9]. (Note that a *nomen confusum* is usually also a *nomen dubium* but that the former term is more specific.)

16b. You do not have such evidence. **Solution:** Do not write a Request for an Opinion.

The recommended usage of this identification key is as follows. Once one has arrived at an endpoint, at least one of the Judicial Opinions listed at that endpoint, if any, should be consulted. In the case of time constraints the Judicial Opinion published last should be selected. The underlying Request is cited in the Opinion. The parts of this Request that were approved by the Opinion should then be determined. These parts of the Request may serve as the template for a new Request.

If, however, one has arrived at an endpoint that argues against authoring a Request, this advice should be followed. Finally, if one did not arrive at an endpoint or if any other uncertainties remained, one should attempt to obtain help as detailed in section 1.4.

The identification key also nicely illustrates why regulations implemented in the ICNP might be complex, even if one only considers issues related to type-strain deposits. On the one hand, the ICNP has to cover all potential problems that may occur in this area. On the other hand, the distinct historical phases of the nomenclature of prokaryotes need to be reflected, such as whether or not a name was validly published by inclusion in the Approved Lists [44]. When several factors are involved, the options to consider, respectively, may easily multiply.

6. REJECTING NAMES FOR OTHER REASONS

Whereas not all problems with type-strain deposits justify the rejection of a name or epithet, a name or epithet can be rejected because of other kinds of issues [1]. However, not all kinds of difficulties reported in Requests for an Opinion are nomenclatural problems and warrant the placement of a name or epithet on the list of *nomina rejicienda*.

6.1 The proper interpretation of Rule 56a

As for the rejection of a name as a perilous name (*nomen periculosum*), it must be considered that the note to Rule 56a(5), which is often overlooked, restricts the application of the term ‘perilous name’ to situations in which it is concluded that a ‘taxon be

maintained as a separate nomen species, without prejudice to the recognition or acceptance of its genetic relatedness to another taxon' [9]. Requests to reject a name as a perilous name must only be made in such situations. Requests of that kind were granted in Opinions 60 [109] and 69 [49]. For Requests which incorrectly referred to Rule 56a(5) see section 1.3.

Being a perplexing name (*nomen perplexum*) is sometimes incorrectly given as a reason for rejecting a name. 'Perplexing name' only applies to names whose spelling is similar to the one of other names as indicated in Rule 56a(4) and Rule 57c [7]. (The wording of Rule 57c would imply that names of taxa above genus rank cannot be rejected as perplexing names, which does not necessarily make sense.) Requests to reject a name as a perplexing name must be restricted to such situations. Requests of that kind were granted in Opinions 53 [130] and 56 [111]. For Requests which incorrectly referred to Rule 56a(4) see section 1.3.

6.2 Taxonomic controversies versus rejection of names

As clarified in Opinion 122 [9] and reiterated in section 1.3, the applicability of Principle 1(1) is limited by Principles 1(2), 1(3) and 1(4). Principle 9 provides two acceptable reasons for proposing a name: the replacement of an illegitimate name and the need to propose names as the result of a taxonomic study. Hence, a name proposed for one of these two reasons cannot constitute a useless name as targeted by Principle 1(3). Principle 1(2) is implemented by Rule 56a, hence the Principle only applies to names that match one of the reasons for rejection given in that Rule. In conjunction with Principle 1(4), General Consideration 4 and Principle 8 this means that names resulting from a taxonomic investigation cannot be rejected based on Principle 1(1) or Principle 1(3), and can only be rejected based on Principle 1(2) if they are affected by other problems.

Care must be taken to not confuse taxonomic controversies, which may well arise from reclassifications [131–133], with issues of nomenclature [9, 12]. Only the latter should be brought to the attention of the Judicial Commission. Neither the ICNP nor the Judicial Commission rule on taxonomy [1, 2, 20, 21], and Requests which regard the rejection of names as a means of solving taxonomic disputes [37, 40] need to be denied [9, 10]. Issues regarding the correct name of a taxon that only reflect distinct taxonomic views (Fig. 1) should be directed elsewhere [67]. For instance, curators of public databases [52, 134] could be contacted.

7. OTHER KINDS OF REQUESTS FOR AN OPINION

A Request may also deal with orthographical corrections of names [135–139], with corrections of the authors of a name or epithet [140–142], with the assignment of the nomenclatural type of a genus [143–151] or of a taxon of higher rank [152, 153], or with the legitimacy of names [154–156]. Errors occurring systematically in such Requests were not observed [4, 7, 9, 66, 72, 118, 157–166] with the possible exception of the re-occurring assumption that a taxon whose name is not treated as the correct name can for this reason not serve as the nomenclatural type of another taxon. This is not the case, as treated in section 2.3. In line with the recommendations given in section 1.5, insights from these and other Judicial Opinions may be used to further emend the ICNP.

7.1 Orthographical corrections

Opinion 105 [7] clarified that since an orthographical correction does not create another name but just another spelling of a name, it could not rescue an illegitimate name. That Judicial Opinion also reiterated that an orthographical correction is not mandatory under the ICNP [1] but could be conducted by the Judicial Commission. The wording of the revision of the ICNP in effect at that time (the 2008 revision) indicated that it is a reasonable goal to keep the number of conducted orthographical corrections under control by not generating a precedent of unknown consequences [7]. Opinion 120 also dealt with such issues [9].

Defined cases of orthographical corrections used to be warranted though. In particular, the confusion that may be caused by a change of the spelling of a name may sometimes be outweighed by the confusion caused by the incorrect spelling itself. Opinion 118 interpreted some genus names in that manner while Opinion 116 concluded that the incorrect stems of the name of the nomenclatural type within the names of taxa higher than the rank of genus should be orthographically corrected [9].

As for orthography [86, 92, 167–169], a useful guideline appeared to be this one: the higher the effort needed to figure out that a spelling is wrong in the first place, the lower the need for an orthographical correction; and *vice versa*. For instance, if one needs to look up an appendix of the ICNP or even a Latin or Greek dictionary to figure out that a spelling is wrong, an orthographical correction is probably unnecessary; but if one just needs to look up a single paper or a single Rule of the ICNP and only a handful of taxon names, an orthographical correction may better be conducted [8]. This was an attempt at a balanced approach of the Judicial Commission to determine which orthographical corrections should be conducted that was in line with the wording of Rule 61 that was in effect at that time.

However, an ICSP decision in 2022 removed the last sentence of the Note to Rule 61, thereby approving a proposed emendation of the ICNP [170]. The obtained wording literally reverses an earlier decision [171], which had the explicit purpose of more severely restricting orthographical corrections to defined cases. The resulting Rule 61 only argues against a correction 'especially if the change affects the first syllable and above all the first letter of the name or epithet', in analogy to Article 60.3 of the ICN [78]. The forthcoming revision of the ICNP [45] permits orthographical correction by any author in any kind of publication. The Judicial Commission can still be involved in such cases according to Rules 57c and 58.

7.2 Conservation of names

Finally, a name or epithet can be conserved over another name or epithet (Fig. 1), as regulated by Rule 56b [1, 95], although such Requests can also be denied [172]. The distinction from situations in which the rejection of a name is warranted, which were treated in detail in previous sections, is of relevance here. Recent Judicial Opinions such as Opinion 106 did not agree with the need to conserve a name or epithet while rejecting its counterpart [7]. Rule 56b Note 1 makes the same point. Joint conservation of one name and rejection of its counterpart may only be warranted in special situations [109].

Once placed on the list of rejected names, a name or epithet is removed from usage and does not compete for priority with its counterpart any longer, hence the counterpart does not need to be conserved because of this competition. The conservation of a name or epithet over another name or epithet may best be understood as only solving an issue of unpleasant priority in the case of synonymous names (Rule 23a Note 4). When intrinsic problems of a name or epithet are involved such as those listed in Rule 56a [1], a rejection may well be warranted instead.

Note that Appendix 4 of the ICNP [1] distinguishes between conserved names of genera or taxa of a rank higher than genus on the one hand and conserved epithets within names of species or subspecies on the other hand, in analogy to the way rejected names and epithets are presented. The consequences were treated in detail in section 4.1.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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