Opinion

Names at the rank of class, subclass and order, their typification and current status: Supplementary information to Opinion 79.

Judicial Commission of the International Committee on Systematics of Prokaryotes

B. J. Tindall

Leibniz Institute-DSMZ – Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH, Inhoffenstrasse 7b, 38124 Braunschweig, Germany

The attention of the Judicial Commission was drawn to issues relating to the use of names at the rank of class, subclass and order and the nomenclatural type of names at the rank of class and subclass that were not covered by Opinion 79. The Judicial Commission ruled that names at the rank of class and order proposed by Cavalier-Smith (Int. J. Syst. Evol. Microbiol., 52, 7–76, 2002) are to be placed on the List of Rejected Names (nomina rejicienda) and the use of names proposed in that publication above the rank of class is to be actively discouraged. In addition a list of names at the rank of class, subclass and order is given where the nomenclatural type, description or circumscription is unclear or where they otherwise appear to be not in accordance with the Rules of the International Code of Nomenclature of Bacteria.

At its meetings in 2008 at the IUMS Bacteriology and Applied Microbiology Congress in Istanbul, the Judicial Commission of the International Committee on Systematics of Prokaryotes ruled that based on information presented to it and also on a previous Request for an Opinion by Euzéby & Tindall (2001) some of the issues raised had not been fully covered in Opinion 79 (Trüper, 2005) and that additional evaluation was needed. In particular, names proposed by Cavalier-Smith (2002) at the rank of class and order needed to be considered in more detail. Based on careful consideration of the facts, the Judicial Commission came to the conclusion that a significant number of names proposed by Cavalier-Smith (2002) were not in accordance with the Rules of the International Code of Nomenclature of Bacteria (Lapage et al., 1992). Consequently it was ruled that to avoid further confusion the names at the rank of class and order proposed by Cavalier-Smith (2002) are to be placed on the List of Rejected Names (nomina rejicienda).

The following names published by Cavalier-Smith (2002) are to be placed on the List of Rejected Names (nomina rejicienda):

At the rank of class:

- Acidobacteria Cavalier-Smith 2002
- Alphabacteria Cavalier-Smith 2002
- Arabobacteria Cavalier-Smith 2002
- Archaeoglobae Cavalier-Smith 2002
- Arthrobacteria Cavalier-Smith 2002
- Chlamydiae Cavalier-Smith 2002
- Chlorobacteria Cavalier-Smith 2002
- Chlorobea Cavalier-Smith 2002
- Chromatibacteria Cavalier-Smith 2002
- Chroobacteria Cavalier-Smith 2002
- Crenarchaeota Cavalier-Smith 2002
- Deltabacteria Cavalier-Smith 2002
- Epsilobacteria Cavalier-Smith 2002
- Ferrobacteria Cavalier-Smith 2002
- Flavobacteria Cavalier-Smith 2002
- Gloeobacteria Cavalier-Smith 2002.
- Hadobacteria Cavalier-Smith 2002
- Halomebacteria Cavalier-Smith 2002
- Hormoneae Cavalier-Smith 2002
- Methanothermea Cavalier-Smith 2002
- Picrophilea Cavalier-Smith 2002
- Planctomycea Cavalier-Smith 2002

Correspondence

B. J. Tindall
bti@dsz.de
At the rank of class:

Actinomycetes Krassilnikov 1949
Reference: Krassilnikov (1949)

– Type Actinomycetales Buchanan 1917. The name remained in use and essentially had the same circumscription as Actinobacteria Stackebrandt et al., 1997, a name proposed without the designation of a type to replace the name Actinomyces Krassilnikov 1949, contravening Rules 15 (Table 2), 22, 27 (3), 51b and 55 of the International Code of Nomenclature of Bacteria (Lapage et al., 1992).

Bacteria Haeckel 1894
Reference: Haeckel (1894)

– No identifiable type, not currently used as a class name; as applied by Haeckel (1894) the name encompasses all prokaryotes.

Microtatobiotes Philip 1956
Reference: Philip (1956)

– No identifiable type, not currently used as a class name; as applied by Philip (1956) the name encompasses the viruses and rickettsias.

Mollicutes Edward and Freundt 1967
Reference: Edward & Freundt (1967)

– Type order Mycoplasmales Freundt 1955, but not included on the Approved Lists of Bacterial Names. The name remains in use today and has essentially the same circumscription as in use today.

Photobacteria Gibbons and Murray 1978
Reference: Gibbons & Murray (1978)

– Type order Rhodospirillales Pfennig and Trüper 1971 defined in Gibbons and Murray 1978, but not included on the Approved Lists of Bacterial Names. Not currently used as a class name; as applied by Gibbons & Murray (1978) the name encompasses those Gram-negative (i.e. Gram-stain-negative) prokaryotes that are capable of growing by oxygenic or anoxygenic photosynthesis. On the basis of the current classification of the type order, this class would overlap with the class name Alphaproteobacteria (Garrity et al., 2005, 2006). The class Photobacteria Gibbons and Murray 1978 has the same type as the class Anoxyphotobacteria Murray 1988.

Schizomycetes Naegeli 1857
Reference: von Naegeli (1857)

– No identifiable type, not currently used as a class name; as applied by Naegeli (1857) the name encompasses both fungi and bacteria. Note that the citation on the Approved Lists of Bacterial Names states ‘in Caspari’, but the original spelling is Caspary.

Scotobacteria Gibbons and Murray 1978
Reference: Gibbons & Murray (1978)

– No identifiable type, not currently used as a class name; as applied by Gibbons & Murray (1978) the name encompasses those Gram-negative (i.e. Gram-stain-negative) prokaryotes that are not capable of growing by oxygenic or anoxygenic photosynthesis.
At the **rank** of subclass:

**Anoxyphotobacteria** Gibbons and Murray 1978

Reference: Gibbons & Murray (1978)

– Type order *Rhodospirillales* designated in Gibbons & Murray (1978), but not included on the Approved Lists of Bacterial Names. Not currently used as a class name; as applied by Gibbons & Murray (1978) the name encompasses those Gram-negative (i.e. Gram-stain-negative) prokaryotes that are capable of growing by anoxygenic photosynthesis. This name was later raised in rank to that of a class and has the same type as that of the order *Photobacteria* Gibbons and Murray 1978 (Murray, 1984, 1988).

Note that the subclass name ‘Oxyphotobacteria’ Gibbons and Murray 1978 was not included on the Approved Lists of Bacterial Names.

In addition to the names at the rank of class and subclass listed on the Approved Lists of Bacterial Names (Skerman *et al.*, 1980, 1989) the following names at the rank of class and order may also contravene the Rules of the International Code of Nomenclature of Bacteria (Lapage *et al.*, 1992):

**Oxyphotobacteria** Murray 1988

References: Murray (1984, 1988)

Class. Type cited on Validation List 25 as *Chroococcales* [with the footnote ‘type previously established (Gibbons and Murray, *Int J Syst Bacteriol* 28: 1–6, 1978)’]. However, Gibbons & Murray (1978) proposed the order *Cyano-bacteriales* Stanier ord. nov. as the type order. Neither of the names of these orders has been **validly published** under the International Code of Nomenclature of Bacteria (Lapage *et al.*, 1992), nor have the genus names on which they are based been validly published.

**Anoxyphotobacteria** Murray 1988

References: Murray (1984, 1988)

Class. Type order *Rhodospirillales* Pfennig and Trüper, 1971. This is the same type designated for the class *Photobacteria* Gibbons and Murray 1978.

**Archaed** Murray 1988

References: Murray (1984, 1988)

Class. Type order: *Methanobacteriales* Balch and Wolfe 1981. This name is not currently used at the **rank** of class but it may be used in a fashion similar to *Archaeeae* or *Archaea* at the highest taxonomic **ranks**.

**Methanobacteria** Boone 2002


**Bacilli** Ludwig *et al.*, 2010.


**Proteobacteria** Stackebrandt *et al.*, 1988.

Reference Stackebrandt *et al.* (1988)

Class. Proposed without a type and contravene Rules 15, 22 and 27 (3) of the International Code of Nomenclature of Bacteria (Lapage *et al.*, 1992). As currently defined it encompasses the classes *Alphaproteobacteria*, *Betaproteobacteria*, *Gammaproteobacteria*, *Deltaproteobacteria* and *Epsilonproteobacteria*.

**Actinobacteria** Stackebrandt *et al.*, 1997

Reference: Stackebrandt *et al.* (1997)

Order. Proposed without a type and as a replacement name for the order name *Actinomyces* Krassilnikov 1949, contravening Rules 15 (Table 2), 22, 27 (3), 51b and 55 of the International Code of Nomenclature of Bacteria (Lapage *et al.*, 1992).

**Xanthomonadales** Saddler and Bradbury 2005

References: Saddler and Bradbury (2005a, b); Tindall (2014)


As currently in use (De Vos, 2009) the order *Bacillales* Prévot 1953 contains the genus *Caryophanon* Peshkoff 1939, the type genus of the order *Caryophanales* Peshkoff 1939, which has priority.

This list may not be comprehensive, but outlines some of the outstanding issues to be resolved when dealing with the names at the rank of class and order.

Opinion compiled on behalf of the Judicial Commission by B.J. Tindall.

**Declaration of a potential conflict of interest**

The author is employed by an organization that offers commercially both taxonomic services and biological material to the scientific community. This may be perceived as a potential conflict of interest.

**References**


Tindall, B. J. (2014). The family name Solimonadaceae Lossey et al. 2013 is illegitimate, proposals to create the names ‘Sinobacter soli’ comb. nov. and ‘Sinobacter variicoloris’ contravene the Code, the family name Xanthomonadaceae Saddler and Bradbury 2005 and the order name Xanthomonadales Saddler and Bradbury 2005 are illegitimate and notes on the application of the family names Solibacteraceae Zhou et al. 2008, Nevskiacaeae Henriot and Johnson 1935 (Approved Lists 1980) and LysoLactobacaceae Christensen and Cook 1978 (Approved Lists 1980) and order name Lysobacteriales Christensen and Cook 1978 (Approved Lists 1980) with respect to the classification of the corresponding type genera Solibacter Zhou et al. 2008, Nevskia Faminzitn 1892 (Approved Lists 1980) and LysoLactobacter Christensen and Cook 1978 (Approved Lists 1980) and importance of accurately expressing the link between a taxonomic name, its authors and the corresponding description/circumscription/emendation. Int J Syst Evol Microbiol 64, 293–297.
