

Minutes

Johannes F. Imhoff, *Chairman*
Annick Wilmotte, *Secretary*

International Committee on Systematics of Prokaryotes

Subcommittee on the taxonomy of phototrophic bacteria

Minutes of the meetings, 11 August 2009, Montreal, Canada

Session 1. Closed meeting

Minute 1. Call to order. The closed meeting was held at the Delta Centre-Ville Hotel, Montreal (Canada) on 11 August 2009. It was called to order by the Chairman at 19:00.

Minute 2. Record of attendance. The subcommittee members present were F. Garcia-Pichel (Tempe, AZ, USA), V. M. Gorlenko (Moscow, Russia), J.F. Imhoff (Chairman, Kiel, Germany), J. Overmann (Braunschweig, Germany), Ch. Sasikala (Hyderabad, India), S. Ventura (Florence, Italy), A. Wilmotte (secretary, Liege, Belgium), V. Yurkov (Winnipeg, Manitoba, Canada). Apologies were received from R.W. Castenholz (Eugene, OR, USA), P. Caumette (Pau, France), L. Giovanetti (Florence, Italy), M. Herdman (Paris, France), A. Hiraishi (Toyohashi, Japan), J. Komárek (Trebou, Czech Republic), M.T. Madigan (Carbondale, IL, USA), A. Oren (Jerusalem, Israel), R. Rippka (Paris, France), B. Whitton (Durham, England).

The Chairman gave a special welcome to the new member, Ch. Sasikala, and introduced her as an experienced taxonomist who had isolated and described many new anoxygenic phototrophic purple bacteria in recent years.

Minute 3. Approval of agenda. The proposed agenda was approved.

Minute 4. Approval of the minutes of the previous meeting. The minutes of the previous meeting, held in Pau, France, on 29 August 2006, were approved.

Minute 5. Chairman's report. The Chairman reported on correspondence with Jiri Komarek on aspects of cyanobacterial taxonomy (see Minute 12). He also reported that, in addition to his own experience, several cases have arisen where problems with the deposition of type strains severely retarded the valid description of species or made this impossible. This concerned mostly green sulfur bacteria, but in some cases, purple sulfur bacteria. Apparently, many culture collections cannot handle these bacteria properly or are not interested in keeping such problematic organisms. Undoubtedly, the *Cyanobacteria* are already known to be a highly problematic group of bacteria in this respect (see Minute 13).

Minute 6. Change in membership. The subcommittee had lost one of its members, Imre Friedmann, who died on 11 June 2007 and who had made important contributions to research on cyanobacteria over many years. The Chairman expressed appreciation for his contributions to the work of the subcommittee.

Two new members were proposed. The first was Muriel Gugger, who is curator of the Pasteur Collection of *Cyanobacteria* and has been involved in cyanobacterial taxonomy for many years. She indicated her willingness to become a member of this subcommittee. Katarzyna Palinska was also proposed as a member. She has made important contributions to the identification of herbarium species of *Cyanobacteria* by the application of 16S rRNA gene sequencing. It was proposed that the election of both would be carried out at the next subcommittee meeting.

It was proposed that in future, members who repeatedly do not respond to mail and who do not attend meetings without sending apologies would be dismissed.

Minute 7. Next meeting of the subcommittee. The next regular meeting of this subcommittee was scheduled to be held, in association with the 14th International Symposium on Phototrophic Prokaryotes, in Porto (Portugal) in August 2012.

Minute 8. Adjournment. The closed meeting was adjourned at 19:27 on 11 August 2009.

Session 2. Open meeting

Minute 9. Call to order. The open meeting was called to order by the Chairman at 19:31 on 11 August 2009.

Minute 10. Record of attendance. All those present in the closed meeting were present. In addition, Dr M. Gugger (Paris, France), Dr V. Thiel (Kiel, Germany) and M. Tank (Kiel, Germany) joined the meeting.

Minute 11. New taxa of anoxygenic phototrophic bacteria. Ch. Sasikala reported on new species and new combinations described within the past 3 years (2006–2009):

New phototrophic *Alphaproteobacteria* were: *Rhodospirillum sulfurexigens* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **58** (2008) 2917–2920]; *Phaeospirillum chandramohanii* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **59** (2009) 2089–2093]; *Roseospira visakhapatnamensis* sp. nov. [Chakravarthy et al., *Int J Syst Evol Microbiol* **57** (2007) 2453–2457]; *Roseospira goensis* sp. nov. [Chakravarthy et al., *Int J Syst Evol Microbiol* **57** (2007) 2453–2457]; *Rhodovastum atsumiense* gen. nov., sp. nov. [Okamura et al., *J Gen Appl Microbiol* **55** (2009) 43–50]; *Rhodobacter aestuarii* sp. nov. [Ramana et al., *Int J Syst Evol Microbiol* **59** (2009) 1133–1136]; *Rhodobacter changlensis* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **57** (2007) 2568–2571]; *Rhodobacter maris* sp. nov. [Ramana et al., *Int J Syst Evol Microbiol* **58** (2008) 1719–1722]; *Rhodobacter megalophilus* sp. nov. [Arunasri et al., *Int J Syst Evol Microbiol* **58** (2008) 1792–1796]; *Rhodobacter ovatus* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **58** (2008) 1379–1383]; *Rhodobacter vinaykumarii* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **57** (2007) 1984–1987]; *Rhodobaca barguzinensis* sp. nov., [Boldareva et al., *Mikrobiologiya* **77** (2008) 206–218; English translation **77** (2008) 241–254]; *Rhodovulum imhoffii* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **57** (2007) 228–232]; *Rhodovulum kholense* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **58** (2008) 1723–1726]; *Rhodovulum lacipunicei* sp. nov. [Chakravarthy et al., *Int J Syst Evol Microbiol* **59** (2009) 1615–1619]; *Rhodovulum marinum* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **56** (2006) 1651–1656]; *Rhodovulum visakhapatnamense* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **57** (2007) 1762–1764]; *Rhodoblastus sphagnicola* sp. nov. [Kulichevskaya et al., *Int J Syst Evol Microbiol* **56** (2006) 1397–1402]; *Rhodoplanes serenus* sp. nov. [Okamura et al., *Int J Syst Evol Microbiol* **59** (2009) 531–535]; *Rhodoplanes pokkaliisoli*, sp. nov. [Lakshmi et al., *Int J Syst Evol Microbiol* **59** (2009) 2153–2157]; *Rhodobium gokarnense* sp. nov. [Srinivas et al., *Int J Syst Evol Microbiol* **57** (2007) 932–935] and *Rhodobium pfennigii* sp. nov., [Caumette et al., *Int J Syst Evol Microbiol* **57** (2007) 1250–1255].

New phototrophic *Betaproteobacteria* were *Rubrivivax benzoatilyticus* sp. nov. [Ramana et al., *Int J Syst Evol Microbiol* **56** (2006) 2157–2164].

New phototrophic *Gammaproteobacteria* (purple sulfur bacteria) were: *Marichromatium fluminis* sp. nov. [Sucharita et al., *Int J Syst Evol Microbiol* **60** (2010) 1103–1107]; *Marichromatium bheemlicum* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **57** (2007) 1261–1265]; *Thiocapsa imhoffii*, sp. nov. [Asao et al., *Arch Microbiol* **188** (2007) 665–675]; *Allochromatium renukae* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **58** (2008) 404 – 407]; *Allochromatium phaeobacterium* sp. nov. [Srinivas et al. *Int J Syst Evol Microbiol* **59** (2009) 750 – 753]; *Thiohalocapsa marina* sp. nov. [Kumar et al. *Int J Syst Evol Microbiol* **59** (2009) 2333–2338]; *Thiocapsa bogorovii* sp. nov. [Tourova et al., *Mikrobiologiya* **78** (2009) 281–292]; *Thiophageococcus mangrovi* gen. nov., sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **58** (2008) 2660–2664]; *Thiorhodococcus bheemlicus* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **57** (2007) 2458–2461]; *Thiorhodococcus*

kakinadensis sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **57** (2007) 2458–2461]; *Thiorhodococcus mannitoliphagus* sp. nov. [Rabold et al., *Int J Syst Evol Microbiol* **56** (2006) 1945–1951]; *Halochromatium roseum* sp. nov. [Kumar et al., *Int J Syst Evol Microbiol* **57** (2007) 2110–2113] and *Ectothiorhodospira variabilis* sp. nov. [Gorlenko et al., *Int J Syst Evol Microbiol* **59** (2009) 658–664].

The following new species of Chlorobacrae (green sulfur bacteria) were described: *Chlorobaculum chlorochromatii* sp. nov. [Vogl et al., *Arch Microbiol* **185** (2006) 363–372]; *Chlorobaculum macestae* sp. nov. [Koppen et al., *Mikrobiologiya* **77** (2008) 79–88, engl. Translation 69–77] and *Prosthecochloris indica* sp. nov. [Kumar et al., *J Gen Appl Microbiol* **55** (2009) 163–169].

New combinations proposed were *Rhodoplanes cryptolactis* nom. rev., comb. nov. (transferred from *Rhodopseudomas*) [Okamura et al., *J Gen Appl Microbiol* **53** (2007); 357–361], *Afifella marina* gen. nov., comb. nov. (transferred from *Rhodobium*) [Urdaian et al., *Syst Appl Microbiol* **31** (2008) 339–351] and *Afifella pfennigii* comb. nov. (transferred from *Rhodobium*) [Urdaian et al., *Syst Appl Microbiol* **31** (2008) 339–351]. In addition, *Rhodoferax ferrireducens* was reclassified as *Albidoferax ferrireducens* [Ramana and Sasikala, *J Gen Appl Microbiol* **55** (2009) 301–304].

A thermotolerant biotype of *Marichromatium gracile* was described, biotype *thermosulfidiphilum* [Serrano et al., *Syst Appl Microbiol* **32** (2009) 1–7].

Minute 12. Current aspects of cyanobacterial taxonomy.

The critical situation of the nomenclature and taxonomy of *Cyanobacteria* was discussed. It was recognized that the treatment of *Cyanobacteria* with two codes, the ICNP (International Code of Nomenclature of Prokaryotes) and the Botanical Code (International Code of Nomenclature of algae, fungi and plants) causes severe problems. Though the Botanical Code accepts valid bacteriological names, the reciprocity is only in this direction. As there is a strong desire among cyanobacteriologists to have a clear nomenclatural system for *Cyanobacteria* that would be valid under both Codes, a group of scientists was proposed at the previous subcommittee meeting to start working towards harmonization of the Codes. The following steps were considered important in the process of harmonization of the Codes:

- 1) Preparation of an approved list of species names as a starting point.
- 2) The deposition of type material and cultures.
- 3) Recommended standards for description of species.

The correspondence with Jiri Komarek and the list of genera prepared by him and Thomas Hauer were discussed (see the online database of cyanobacterial genera, <http://www.cyanodb.cz/>). Though this list is considered of extraordinary value and a solid basis for the future consideration of cyanobacterial taxonomy, how to use this

list of genera remained open to debate. The Chairman proposed having a separate meeting of all persons interested in cyanobacterial systematics the following spring to discuss this matter in detail.

It was proposed to use Komarek's list as a starting point.

It was regarded to be of primary importance to agree on a list of species, and to define a set of rules to check the names and ensure that new ones are added. It was also considered highly important to use molecular marker sequences, whenever available, for the identification of species and strains, and to have solid sequence information (complete 16S rRNA gene sequences are desirable) available for all nomenclatural type strains. It should also be noted that the classical botanical taxonomy of *Cyanobacteria* is based on morphology, although most *Cyanobacteria* have simple forms and so cannot be confidently distinguished according to morphology.

Minute 13. Deposition of type strains in culture collections. Problems with the deposition of anoxygenic phototrophic bacteria in recognized culture collections apparently continued or were even increasing. Consequently, increasing difficulties occurred with the validation of new species names of these bacteria. The situation was discussed and almost everybody contributed negative experiences. Examples were given by Ch. Sasikala; ATCM was unable to accept strains of phototrophic purple bacteria and similar statements were made by JCM. She also outlined that her

request to the Judicial Commission for the deposition of a type strain in only one culture collection was rejected. The DSMZ was regarded as a safe method of deposition and able to treat purple and green sulfur bacteria properly. However, in this and other cases the DSMZ did not manage to cultivate and maintain the strains, hence the species names cannot be validly described.

The deposition of purple and green sulfur bacteria is most problematic. Poor experiences regarding green sulfur bacteria were also reported by J. Overmann with the DSMZ, ATCM and the Spanish Culture Collection. He failed to obtain two safe depositions of new green sulfur bacteria and was, therefore, unable to validly publish the new species names.

It was noted that, unfortunately, the same or even greater problems relate to the deposition of *Cyanobacteria* in culture collections. Many or even most culture collections are unable to keep them and/or refuse to accept *Cyanobacteria*. Ferran Garcia-Pichel raised the point that many *Cyanobacterial* strains are unicyanobacterial, but not axenic. There was a general agreement among the members that a case-by-case decision for allowing the deposition of these bacteria in one culture collection is not acceptable (referring to purple and green sulfur bacteria as well as *Cyanobacteria*).

Minute 14. Adjournment. The open meeting was adjourned at 21:41 on 11 August 2009.