

International Committee on Systematics of Prokaryotes

Subcommittee on the taxonomy of phototrophic bacteria

Minutes of the meetings, 28 August 2000, Barcelona, Spain

Session 1. Closed meeting

Minute 1. Call to order. The closed meeting was held on 28 August 2000 at the University of Barcelona, Spain. It was called to order by the chairman, J. F. Imhoff, at 19:00.

Minute 2. Record of attendance. The members present were R. W. Castenholz (Eugene, OR, USA), P. Caumette (Pau, France), F. Garcia-Pichel (Tempe, AZ, USA), L. Giovannetti (Florence, Italy), V. M. Gorlenko (Moscow, Russia), M. Herdman (Paris, France), A. Hiraishi (Toyohashi, Japan), J. F. Imhoff (Kiel, Germany), M. T. Madigan (Carbondale, IL, USA), A. Oren (Jerusalem, Israel), J. Overmann (München, Germany), H. G. Trüper (Bonn, Germany), S. Ventura (Florence, Italy) and A. Wilmotte (Belgium). Apologies were received from E. I. Friedmann (Tallahassee, FL, USA), J. Komárek (Trebón, Czech Republic) and J. B. Waterbury (Woods Hole, MA, USA).

Minute 3. Approval of agenda. The agenda of the meeting was approved.

Minute 4. Minutes of previous meeting. The minutes of the previous meeting, held in Vienna, Austria, on 10 September, 1997, were approved.

Minute 5. Chairman's report. The chairman referred to his Newsletter 1999 mailed by March 2000 wherein a recent update on new species and taxonomic changes of phototrophic bacteria was included. He specifically pointed out the problems with lost type strains included in Minute 12 of the last meeting [Trüper & Imhoff, *Int J Syst Bacteriol* **49** (1999), 925–926]. None of the strains listed as lost were reported to exist, except the type strain of *Pelodictyon phaeoclathratiforme*, which is available according to J. Overmann.

He also reported that other subcommittees have followed the suggestion put forward at our last meeting, Minute 13 [Trüper & Imhoff, *Int J Syst Bacteriol* **49** (1999), 925–926], to use a three-letter code for genus abbreviations [Minute 16 of the meeting of the subcommittee on the taxonomy of *Halobacteriaceae*; Oren & Ventosa, *Int J Syst Evol Microbiol* **50** (2000), 1405–1407]. It was emphasized that the code was proposed to achieve clarity in publications and to allow precise notation of species names, particularly in publications dealing with different species, because confusion results from one-letter abbreviations in cases with different genera having the same first letter in the genus name (and in some cases even the same species epithet). Unfortunately, the three-letter abbreviations have not been adopted by many journals that tend to maintain the one-letter abbreviation, even in cases where this causes ambiguities regarding the genus assignment. In a short discussion of this point, it was agreed that usage of the three-letter abbreviation is useful in situations when several genera are being

studied or discussed in one paper, otherwise one-letter abbreviations may be sufficient.

Minute 6. Changes in membership. No changes in membership of the subcommittee were suggested.

Minute 7. Varia. The progress of *Bergey's Manual of Systematic Bacteriology* and the treatment of higher taxa of phototrophic bacteria were discussed.

Minute 8. Adjournment. The closed meeting was adjourned at 19:30.

Session 2. Open meeting

Minute 9. Call to order. The open meeting was held on 28 August 2000 at the University of Barcelona, Spain. It was called to order by the chairman, J. F. Imhoff, at 19:45.

Minute 10. Record of attendance. All present at the closed meeting participated in the open meeting. The meeting was also attended by R. de Wit (France), C. Rathgeber (Canada), R. Rippka (France), D. Robert (France), M. Wood (USA) and V. Yurkov (Canada).

Minute 11. Status of the taxonomy of phototrophic bacteria. Brief updates were given on each major group of phototrophic prokaryotes.

Cyanobacteria. Six orders of cyanobacteria are now recognized, as reported by M. Herdman, including the *Prochlorales*. The heterocystous cyanobacteria represent a fairly tight phylogenetic group, whereas the *Prochlorales* do not. Two new genera have been described, *Cyanobacterium* and *Cyanobium*. F. Garcia-Pichel pointed out that certain physiological properties of cyanobacteria, for example, their salt requirements and tolerances, may be in better congruence with phylogeny than other characteristics, such as morphological properties.

Chloroflexaceae. R. Castenholz reported on a new genus and species, *Roseiflexus castenholzii*, which is a filamentous anoxygenic phototrophic bacterium and may be abundant in Yellowstone hot springs [Hanada, Takaichi, Matsuura & Nakamura, *Int J Syst Evol Microbiol* **52** (2002), 187–193]. It is well differentiated both phylogenetically and phenotypically from *Chloroflexus aurantiacus* and *Heliothrix oregonensis*. V. Gorlenko reported on a new family, the *Oscillochloraceae*, to include *Oscillochloris* and *Chloronema*, which are phylogenetically distinct from *Chloroflexus*. Discussion ensued as to the availability of cultures of these bacteria.

Heliobacteria. As reported by M. Madigan, currently four genera and seven species of heliobacteria are recognized, including the newly described genera *Heliophilum*, which forms bundles of cells that are motile as a unit, and *Heliorestis*, a genus of extremely alkaliphilic heliobacteria. The three-letter abbreviations *Hrs.* for *Heliorestis* and *Hph.* for *Heliophilum* were suggested.

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Chlorobiaceae. The description of a new species *Chlorobium ferrooxidans* was reported by J. Overmann [Heising, Richter, Ludwig & Schink, *Arch Microbiol* **172** (1999), 116–124]. This bacterium can grow autotrophically with ferrous iron as electron donor. In addition, descriptions have appeared of major consortia of green sulfur bacteria. He pointed out that species of *Chlorobiaceae* seem to be phylogenetically shallow both by comparative 16S rRNA sequencing and by inter-transcribed spacer analysis. Further discussion followed on this topic and whether or not cultures of green sulfur bacteria reflect natural populations.

Purple sulfur bacteria. Several new genera and species have been described and several new combinations have appeared in the last 3 years, as reported by P. Caumette. *Amoebobacter roseus* has been transferred to *Thiocapsa rosea* comb. nov., *Amoebobacter pendens* to *Thiocapsa pendens* comb. nov., and *Amoebobacter pedioformis* to *Thiolamproyrum pedioforme* comb. nov. [Guyoneaud, Süling, Petri, Matheron, Caumette, Pfennig & Imhoff, *Int J Syst Bacteriol* **48** (1998), 957–964]. *Amoebobacter purpureus*, at first incorrectly maintained as an *Amoebobacter* species [Guyoneaud, Süling, Petri, Matheron, Caumette, Pfennig & Imhoff (1998), *Int J Syst Bacteriol* **48**, 957–964], was transferred to *Pfennigia purpurea* [Tindall, *Int J Syst Evol Microbiol* **49** (1999), 1307–1308], but due to its close phylogenetic relationship to *Lamprocystis roseopersicina*, it was later included in this genus as *Lamprocystis purpurea* [Imhoff, *Int J Syst Evol Microbiol* **51** (2001), 1699–1701]. Additional transfers include those of *Chromatium minus* to *Thiocystis minor* comb. nov., of *Chromatium violascens* to *Thiocystis violascens* comb. nov., of *Thiocapsa pfennigii* to *Thiococcus pfennigii* comb. nov., of *Thiocapsa halophila* to *Halothiocapsa halophila* comb. nov., of *Chromatium salexigens* to *Halochromatium salexigens*, of *Chromatium glycolicum* to *Halochromatium glycolicum* comb. nov., of *Chromatium gracile* to *Marichromatium gracile* comb. nov., of *Chromatium purpuratum* to *Marichromatium purpuratum* comb. nov., of *Chromatium tepidum* to *Thermochromatium tepidum* comb. nov., of *Chromatium minutissimum* to *Allochromatium minutissimum*, of *Chromatium warmingii* to *Allochromatium warmingii* comb. nov., and of *Chromatium buderi* to *Isochromatium buderi* comb. nov. [Imhoff, Petri & Süling, *Int J Syst Bacteriol* **48** (1998), 1129–1143].

New species and genera described are the following: *Thiocapsa litoralis* [Puchkova, Imhoff & Gorlenko (2000), *Int J Syst Evol Microbiol* **50**, 1441–1447], *Thioflavococcus mobilis* [Imhoff & Pfennig, *Int J Syst Evol Microbiol* **51** (2001), 105–110] and *Thioalkalicoccus limnaeus* [Bryantseva, Gorlenko, Kompantseva & Imhoff, *Int J Syst Evol Microbiol* **50** (2000), 2157–2163]. In addition to *Halorhodospira* and *Ectothiorhodospira*, a third genus of the *Ectothiorhodospiraceae*, has been described with the new species *Thiorhodospira sibirica* [Bryantseva, Gorlenko, Kompantseva, Imhoff, Süling & Mityushina, *Int J Syst Bacteriol* **49** (1999), 697–703].

Purple non-sulfur bacteria. A. Hiraishi reported on new genera and species of the purple nonsulfur bacteria. The new genera were *Rhodobaca* and *Roseospirillum* and the new species included *Roseospirillum parvum* [Glaeser & Overmann, *Arch Microbiol* **171** (1999), 405–416], *Rhodobaca bogoriensis* [Milford, Achenbach, Jung & Madigan, *Arch Microbiol* **174** (2000), 18–27], *Rhodopseudomonas rhenobacensis* [Hougardy, Tindall & Klemme, *Int J Syst Evol Microbiol* **50** (2000), 985–992], *Rhodovulum iodolum* and *Rhodovulum robiginosum* [Straub, Rainey & Widdel, *Int J Syst Bacteriol* **49** (1999), 729–735] and *Rhodofera*

antarcticus [Madigan, Jung, Woese & Achenbach, *Arch Microbiol* **173** (2000), 269–277]. The following transfers have been proposed: *Rhodospirillum fulvum* to *Phaeospirillum fulvum* comb. nov., *Rhodospirillum molischianum* to *Phaeospirillum molischianum* comb. nov., *Rhodospirillum salinarum* to *Rhodovibrio salinarum* comb. nov., *Rhodospirillum sodomense* to *Rhodovibrio sodomensis* comb. nov., *Rhodospirillum salexigens* to *Rhodothalassium salexigens* comb. nov. and *Rhodospirillum mediosalinum* to *Roseospira mediosalina* comb. nov. [Imhoff, Petri & Süling, *Int J Syst Bacteriol* **48** (1998), 793–798].

Aerobic bacteriochlorophyll-containing (ABC) bacteria. As reported by V. Yurkov, several new species and genera have been described. The newly described species include *Roseateles depolymerans* [Suyama *et al.*, *Int J Syst Evol Microbiol* **49** (1999), 449–457], *Craurococcus roseus* and *Paracraurococcus ruder* [Saitoh, Suzuki & Nishimura, *Int J Syst Bacteriol* **48** (1998), 1043–1047], *Roseovarius tolerans* [Labrenz *et al.*, *Int J Syst Bacteriol* **49** (1999), 137–147], *Roseivivax haloterans* and *Roseivivax halodurans* [Suzuki, Muroga, Takahama & Nishimura, *Int J Syst Bacteriol* **49** (1999), 629–634], *Rubrimonas cliftonensis* [Suzuki, Muroga, Takahama, Shiba & Nishimura, *Int J Syst Bacteriol* **49** (1999), 201–205], *Citromicrobium bathyomarimum* [Yurkov, Krieger, Stackebrandt & Beatty, *J Bacteriol* **181** (1999), 4517–4525], *Roseibium denhamense* and *Roseibium hamelinense* [Suzuki, Muroga, Takahama & Nishimura, *Int J Syst Evol Microbiol* **50** (2000), 2151–2156].

Minute 12. Problems in the taxonomy of anoxygenic phototrophic bacteria. The species correctly named *Rhodobacter blasticus* was incorrectly listed in Validation List 51 [*Int J Syst Bacteriol* **44** (1994), 852] as *Rhodobacter blastica*. This has now been corrected and returned to the original and correct name of *Rhodobacter blasticus*.

The bacterium *Roseobacter algicola*, which was incorrectly assigned to this genus, has been renamed *Ruegeria algicola* [Validation List no. 68, *Int J Syst Bacteriol* **49** (1999), 1–3].

There was considerable discussion on the question of whether *Ectothiorhodospira marismortui* should be regarded as synonym of *Ectothiorhodospira mobilis* and *Ectothiorhodospira vacuolata* as a synonym of *Ectothiorhodospira shaposhnikovii* as proposed by Ventura *et al.* [*Int J Syst Evol Microbiol* **50** (2000), 583–591]. No decisions were made on how to proceed with this matter.

Discussion pursued concerning the taxonomic status of *Blastomonas ursincola* [Hiraishi, Kuraishi & Kawahara (2000), *Int J Syst Evol Microbiol* **50**, 1113–1118] known as *Erythromonas ursincola* [Yurkov, Stackebrandt, Buss, Vermiglio, Gorlenko & Beatty (1997), *Int J Syst Bacteriol* **47**, 1172–1178].

Minute 13. Minimal standards. The chairman denominated working groups to further develop the minimal standards for the description of oxygenic and anoxygenic phototrophic prokaryotes. R. W. Castenholz, F. Garcia-Pichel, M. Herdman, J. F. Imhoff, S. Ventura and R. Rippka were proposed for the minimal standards of cyanobacteria and P. Caumette, V. Gorlenko and J. F. Imhoff for the minimal standards of anoxygenic phototrophic bacteria. It was envisaged to prepare drafts before the next meeting of the subcommittee.

Minute 14. Adjournment. The open meeting was adjourned at 21:30.

J. F. Imhoff, *Chairman*
M. T. Madigan, *Secretary*