

**Nomenclature Committee of IUBMB (NC-IUBMB) and IUPAC-IUBMB Joint Commission on Biochemical Nomenclature (JCBN)**

Minutes for the Annual NC-IUBMB and JCBN Nomenclature Meeting

*Braunschweig, Germany, May 13<sup>th</sup> 2015, 9:00*

Present: Gerard Moss (GPM, Chairman); Ron Caspi (RC, Secretary); Kristian Axelsen (KA); Ture Damhus (TD); Marcus Ennis (ME); Karl-Heinz Hellwich (KHH); Masaaki Kotera (MK); Andrew McDonald (AGM); Dietmar Schomburg (DS); Ida Schomburg (IS); Hans Vliegenthart (JFGV).

**1) The chairman welcomed the participants.**

Apologies have been received from the following persons who were unable to attend:

Richard Cammack (DC), Derek Horton (DH), Amélia Rauter (AR), Keith Tipton (KFT), and Sameer Velankar (SV).

**2) The agenda was approved.**

**3) Approval of the minutes of the Utrecht meeting, May 2014**

The minutes from the 2014 meeting in Utrecht were accepted in principle. KHH asked for more time to review the document. It was agreed that he would notify the committee within two weeks in case he would like to make any changes. As the minutes are published on the web, attendants were encouraged to verify that no confidential information is included. After final approval RC will transfer the document to TD to be published on the IUPAC website.

**4) Date and Place of the 2016 Meeting**

KA and TD will investigate whether suitable facilities could be found to meet in Copenhagen, Denmark on May 25-27. The meeting will comprise a carbohydrate team meeting on the 25<sup>th</sup>, an enzyme taskforce meeting on the 26<sup>th</sup>, and a general meeting on the 27<sup>th</sup>. The carbohydrate team meeting is tentative, depending on whether additional funding can be secured by extension of the current project. Otherwise, the meeting will occur only on May 26-27. In case difficulties arise arranging for the meeting in Copenhagen, the committee will explore the option of meeting in Lisbon, Portugal.

**5) Matters arising**

There were no matters arising.

**6) Reports**

a) Chairman's Report (GPM)

GPM reported that the throughput of the enzyme taskforce was somewhat lower than that of the previous year. However, with a total of 338 processed entries (including new,

modified, transferred and deleted entries) the throughput was more than acceptable. He elected not to comment on other projects at this point, as they would all be discussed at a greater detail later in the meeting.

b) Treasurer's Report (RC)

RC reported that in August 2014 he had contacted several members of the IUBMB Executive Committee to request renewal of funding for the JCBN. He had prepared a memo describing the JCBN's activities over the past three years and sent it along with the minutes of the 2012 and 2013 meetings. The committee had subsequently approved three more years of funding at \$6000/year and had requested that a detailed report of the JCBN activities over the past triennium be submitted. RC has prepared such a report and has submitted it to Avadhesh Surolia, who is in charge of publications. Dr. Surolia has acknowledged the achievements of the JCBN over the past three years, and has asked that in the future a report be submitted on an annual basis.

c) IUBMB Report

Since no IUBMB representative attended the meeting (and none had been invited), no such report was presented. The chairman and secretary will ensure that an invitation to participate is sent to the IUBMB in future years.

d) IUPAC Division VIII Report (KHH and TD)

- i) KHH reported that the errata list for the new Blue Book (Nomenclature of Organic Chemistry, IUPAC Recommendations and Preferred Names 2013) has reached over 900 entries. This list is currently available at <http://www.chem.qmul.ac.uk/iupac/bibliog/BBerrors.html>. The new Blue Book is available (for a fee) on the web in PDF format. Unfortunately, the text of this document is not searchable, and contains the same errors as the printed book. GPM and KHH are looking into preparing and publishing a corrected and searchable PDF, and are in contact with the chair of ICTNS (Interdivisional Committee of Terminology, Nomenclature and Symbols) and the IUPAC Secretariat to ensure that similar situations do not occur with future projects.
- ii) Production of the Brief Guides to Inorganic Nomenclature and Organic-chemical Nomenclature has been delayed. The former has been copy-edited and a first proof prepared; however this was rejected because changes that were introduced in the process resulted in self-inconsistencies within the document.
- iii) Progress has been achieved on two long lasting and strategically important polymer nomenclature projects. At the beginning of this year "Nomenclature and graphic representations for chemically modified polymers (IUPAC Recommendations 2014)" was published in [Pure Appl. Chem. 87\(3\), 307 - 319 \(2015\)](#). In addition, a new draft of the source-based nomenclature of polymers was prepared after a breakthrough has been achieved in a long discussion (since 2008) between members of the SPT

(Division IV Subcommittee on Polymer Terminology) and Division VIII, regarding the continued use of obsolete names for monomers in polymer nomenclature.

- iv) A recently submitted project proposal by Martin Reaney intends to provide recommendations on naming homodetic cyclic peptides. KHH, who performed a preliminary review of the project, suggested that GPM should join the proposed task group, and his suggestion was accepted. The revised project proposal is now under review. A major task of GPM in the project would be to ensure that the recommendations will be systematic and consistent with the general principle of an unambiguous correlation between name and structure.
- v) Dr. Lynn Soby has been the new IUPAC Managing Director since August. Two of the Secretariat positions are not staffed at the moment. The next General Assembly and Congress will take place in Busan, Korea, in August 2015.
- vi) The IUPAC website is still in an unsatisfactory shape, despite a few minor issues that have been resolved over the past year. The installed ad-hoc task group that has been assigned to define the requirements for the website provided their recommendations to the Bureau and the President last summer. Programming work for the new website should have started by now.
- vii) As noted in last year's minutes, in January 2014 the IUPAC journals Pure and Applied Chemistry and Chemistry International were contracted with the publishing house De Gruyter. This has resulted in several undesired consequences. For example, no deviations from De Gruyter's layout style are accepted by Pure Appl. Chem. In addition, proofs are not always provided to authors, potentially resulting in publication of errors introduced during copy-editing. Errors that were detected have not always been corrected before printing, despite timely notification of the editors.
- viii) TD described progress of some of the different InChI projects. For the sake of completeness, the summary below has been extracted from the report provided by the Division VIII InChI Subcommittee in 2014. The project for large biomolecules and polymers, which had been approved in October 2013, had its first meeting at the NIH (which has recently joined the InChI Trust) in October 2014. A proposal for funding a working group extending InChIs to inorganic compounds had been approved in 2013, but there has not been any progress report yet. A project named "redesign of handling of tautomerism for InChI V2" was approved for funding and held its first working group meeting at the ACS New Orleans meeting in April 2013. A project for the use of InChI with organometallics is making progress. A new working group for the extension of InChI code to allow for the canonical encoding of positional isomers, chaired by Christoph Steinbeck, has been formed. An initial project proposal is currently being prepared by the group. Another project proposal had been submitted recently for evaluating which additional information (e.g. safety data) could be included during the development of QR code (2D barcode) equivalents to InChIs. The project would be chaired by Richard Hartshorn. Chad

Allen, a student of Jonathan Goodman in Cambridge, has developed a standard facility for using InChI to specify chemical reactions (RInChI).

- ix) A project named "Preferred names for inorganic compounds" has seen minimal progress over the past year. Progress had been made on a document on the selection of central atoms. A document on the extension of the kappa method for specifying ligand-to-central atom bonds needs minor repairs. A task remaining is to provide a list of retained non-systematic or not fully structural names that would be selected as PINs, although it is debated whether such PINs are actually needed.

## 7) Report from the Carbohydrate Nomenclature Group (JFGV)

JFGV described the progress made by members of the carbohydrate group. The team has in principle finished the update of the 2-Carb document up to section 33. The rest of the document should in principle be easier to update, although there are some challenges; for example, structures that contain fused rings. It may be advantageous to use carbohydrate nomenclature to describe these parts, but there is a need to consult with synthetic organic chemists. Many of the proposed changes have been recorded by DH, who did not attend the meeting. JFGV will gather the comments from DH, and will prepare a new version of the document, to be named 3-Carb. The document will be circulated among JCBN members.

In glycoinformatics the group has been discussing the definition of a basic carbohydrate moiety that could be recognized by computer software. Coming up with this definition has proven more difficult than anticipated, but the group is getting closer to a definition that will bridge the gap between the requirements of glycoinformaticists and what is acceptable from a nomenclature point of view.

Iconic representation of complex oligosaccharides is becoming a common practice. Although no official standard format has been officially agreed upon, a large part of the community uses the GlycoCT format, and a proposal for the expansion of the library of standard icons is in its final stages. The list of new icons will be included in the third edition of [Essentials of Glycobiology](#). It is intended to include this list also in the 3-Carb document.

A suggestion to replace the arrows in systematic names with regular hyphens was mentioned. This would require consultation with more experts in the field, and if met positively, a proposal could be made in a publication.

In general, the project has made significant progress, but is not completed yet. JFGV will ask for an extension to allow for a meeting during the 2016 JCBN meeting. In order to apply for the extension, a document describing the progress should be prepared and submitted to IUPAC, along with the draft of the new Carb-3 document.

## 8) Enzyme Nomenclature and Classification

- a) Report on enzymes classified during the past year (AGM)

AGM presented some statistics about the activity of the enzyme taskforce during the last year. During this time 6 new sub-subclasses and 246 new enzyme entries were created. In addition, 63 existing entries were modified, 20 were transferred, and 9 were deleted. Over 100 additional entries are currently in the pipeline. Following some discussion it was clarified that upon completing the creation of a new entry, the author of the entry should indicate that the entry is ready to advance through the review and approval process by formally approving it.

- b) Report from the enzyme taskforce meeting (DS)
- i) From now on JCBN members who are not members of the enzyme taskforce will be informed of new batches of enzymes entering internal review by email, ensuring that they have ample time to go over the entries and make comments before they move to public review.
  - ii) During the past year entries classified under x.x.98 and x.x.99 classes were reviewed, and many errors were corrected. The common names of these classes were updated, and entries that were misclassified under these classes were moved to the appropriate class. In some cases this required the creation of new sub-subclasses.
  - iii) The committee deliberated whether single turnover enzymes should be classified as enzymes, and came to the conclusion that indeed they should.
  - iv) Criteria for classification of new enzymes: the taskforce recognized that the web portal used for submission of classification requests by the community does not provide adequate guidelines explaining the requirements for classification. These guidelines will be defined and posted on [ExplorEnz](#) as a FAQ item, and will be easily accessible from the submission form. In addition, the current rules state that an enzyme must act on physiological substrates. This may be unclear, as many enzymes have evolved to act on substrates that are present in the environment only due to human activity. Thus the terminology would be changed from physiological substrates to compounds that are encountered *in vivo*. The taskforce also discussed whether the absolute configuration of reactants is essential for defining a new entry, and concluded that this is not the case, as the configuration is often unknown. Such information should be added to the entry when it becomes available. On the other hand, entries should not be created unless all of the reactants and products are fully known (e.g. whether the enzyme forms water or hydrogen peroxide).
  - v) It was agreed that new sub-subclasses should be created whenever applicable, even for the classification of a single enzyme.
  - vi) The taskforce discussed the issue of very long accepted names, for example for glycosyltransferases involved in the synthesis of large polymers. The community often solves the problem by using the gene name. However, the taskforce does not endorse the use of gene names as accepted names, as they are often ambiguous. There is no solution to the problem, although the use of abbreviations (e.g. Glc for D-glucose) is encouraged in such names to make them somewhat shorter.

- vii) News Items. The current list of news items is very old, and some of the items are of very minor significance, conveying the false impression that little is done by the Enzyme Commission. The current items on the list should be moved to an archive and replaced with new items. A draft for the first item has been written by DS and concerns discouraging the use of gene names for enzyme names. It will be posted following review by taskforce members. Other news items should include discussion of classification rules, a definition of heme thiolate enzymes and discussion of their relation to cytochrome P-450 enzymes, the reason for using “a ferredoxin FeS cluster” instead of “a ferredoxin” in reactions, announcements of relevant publications, etc. Announcements when new enzymes enter public review or become official should be routinely posted as news items.
- viii) The classification rules document has become outdated and is rather difficult to follow. The document will be rewritten by DS and potentially KFT, and reviewed by other members. This project should be started within two months.
- ix) The enzyme taskforce reiterates the need for new members, particularly in the fields of carbohydrate and nucleic acid enzymology. Dr. Bernard Henrissat from Aix Marseille Université, an expert in carbohydrate enzymology who was unable to attend this meeting a few times in the past, will be invited again to attend the 2016 meeting. A potential candidate who may be able to help with nucleic acid enzymology is Janusz M. Bujnicki from the International Institute of Molecular and Cell Biology in Warsaw. He will be invited to attend as well. A third potential candidate is described below under “Membership of the Committee”.
- x) Reactions that involve ferredoxins should be converted to specify “a ferredoxin FeS cluster” instead of “a ferredoxin”. By using this form, the reactions could be balanced and be accurate for all organisms, regardless of the type of ferredoxins that occur in the organism. When known, the type of ferredoxin in a particular organism should be mentioned in the entry’s comment.
- xi) The taskforce has clarified the two 10 % rules that are used in classification. One of those has been defined incorrectly in the 2014 minutes. Rather than all substrates, it only applies to NAD(P) usage, meaning that an enzyme is defined as NAD(P)-dependent if activity with one cofactor is at least 10 % of the activity with the other. The rule does NOT require reactions to be listed for every substrate used by the enzyme. Multiple reactions with alternative substrates are only specified when there is a compelling reason (i.e. the enzyme catalyses two important reactions within a single pathway).
- xii) The term bicarbonate will not be used any more. Since the taskforce had difficulty deciding whether the new term should be hydrogen carbonate or hydrogencarbonate, it was decided to simply use  $\text{HCO}_3^-$ . In addition, the taskforce will identify other compounds that use the undesired “bi” (e.g. bisulfite) and their replacement terms will be discussed by email or at the 2016 meeting. TD will initiate this effort.

- xiii) The taskforce has approved KFT's proposal for creating a new sub-subclass for conformational isomerases and reclassification of several current entries under the new class. KFT is to implement the change.

KHH brought up the question of accepted names that contain outdated terms (e.g. mercaptoethanol instead of 2-sulfanylethanol). GPM explained that the accepted names originate in the literature, do not constitute a recommendation by the Enzyme Commission, and are only changed if they are ambiguous or incorrect. **It was decided to include this discussion on the agenda of the 2016 meeting.**

#### **9) Progress on the Small Molecule Glossary Project**

The project's leader, DC, has unfortunately been suffering from health problems, halting progress on the project. In order to move the project forward, it may be needed to transfer leadership. ME has been tentatively nominated as a new leader, provided DC approves. GPM will discuss the subject with DC and inform the committee about the decision. The main remaining task is writing a publication.

#### **10) Progress on the Flavonoid Project (KHH)**

KHH reported that the project went through ICTNS and public review and was reviewed extensively by ca. 25 reviewers. The task group addressed the many comments during the 2014 Utrecht meeting, and a revised draft was subsequently prepared by AR and sent to the other members asking for comments. However, not much has happened since then, despite the fact that the deadline for resubmission had already passed.

#### **11) Progress on the Phosphoryl Transferases Project (GPM)**

GPM described a Division III project that aims to standardize the numbering of atoms in crystal structure models of different phosphoryl transferases. The project is of interest to PDB, and GPM brought it to their attention.

#### **12) Progress on the Conjugates Project (KHH)**

KHH provided a description of the proposal, which was submitted at the end of last year by a polymer chemist who is a member of SPT (Subcommittee of Polymer Terminology). The proposal, termed "Nomenclature for polymeric carriers bearing chemical entities with specific activities and names", aims at preparing recommendations for naming conjugates of active compounds, such as drugs, pesticides and dyes, and pends approval. GPM is a member of the proposed working party. KHH opined that the project has significant strategic importance because it will also provide the basis for extensions towards the development of nomenclature recommendations for other conjugates.

#### **13) Update on Action Items from the Minutes of the 2014 Meeting**

##### **a) Phosphorus Document**

A revision to the phosphorus document, started by Hal Dixon and never published, is now too old to be published, and needs to be revised itself. GPM has the document in

electronic form, although it is currently saved in several files, some of which in portrait mode and some in landscape mode. Combining the individual files into a single file is a trivial task. However, revising the document, particularly to make it consistent with the new Blue Book, is a significant task which is unlikely to be performed in the near future.

- b) AGM reminded the group that he and KFT co-authored a document about enzyme nomenclature last year (at the time referred to as a 'brief guide' to enzyme nomenclature), and they were considering whether it should be published, and if so, where and in which format.

#### **14) Reports from Databases**

Three members of the committee (ME, RC and KA) presented their respective databases ([ChEBI](#), [MetaCyc](#) and [Rhea](#)). Each presented the scope and content of the database, introduced its online features and described recent changes and enhancements.

#### **15) Recent Biochemical Nomenclature Publications of Interest**

Some relevant publications have already been discussed earlier. AM has mentioned a publication written by himself and KT and published in January 2014:

McDonald, A. G. and Tipton, K. F. [Fifty-five years of enzyme classification: advances and difficulties](#). FEBS Journal (2014) 281(2):583-92. PMID 24103004, doi:10.1111/febs.12530.

A list of some publications relevant to the Enzyme Commission is available at the ExplorEnz website at <http://www.enzyme-database.org/publications.php>.

#### **16) Membership of the Committee**

DS and IS mentioned that they have been in touch with Janet Thornton, the director of EMBL-EBI, who is about to retire. Janet has expressed an interest in potentially joining the enzyme taskforce. GPM has met with her once, and will meet again to describe the taskforce's activities and discuss future collaboration.

- 17) GPM thanked DS and IS on behalf of the committee for their generous help in hosting and organizing the meeting.

The meeting was adjourned at 13:13.