The Organization and Functioning of Biochemical Nomenclature*

WALDO E. COHN**
Oak Ridge National Laboratory†, Post Office Box Y, Oak Ridge, Tennessee 37830

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Biochemical nomenclature is presently organized at the international rather than the national level through the IUPAC-IUB Combined Commission on Biochemical Nomenclature (CBN). CBN works closely with the IUPAC Commission on Organic Nomenclature and with the IUB Commission of Editors of Biochemical Journals (CEBJ), to the latter of which it may truly be considered a consulting body. To promote awareness of proper nomenclature in biochemistry, to catalyze and coordinate scattered activities, and to be a source of information for authors, editors and catalogers, the National Academy of Sciences–National Research Council created, last year, the Office of Biochemical Nomenclature (OBN). OBN's role is catalytic, not creative, and is thus complementary to the creative role given to CBN. The organization, working methods, and products of these two agencies, which presently dominate biochemical nomenclature activities, are discussed.

Perhaps because of the dynamic, expanding nature of the field it serves, biochemical nomenclatural activities have recently achieved a degree of organization and effectiveness unique among the several branches of chemistry. For purposes of description, the activities involved in biochemical nomenclature may be called legislative, executive, and "public relations" or catalytic.

The legislative activity—the issuing of recommendations—is carried out by the IUPAC-IUB Combined Commission on Biochemical Nomenclature (CBN). Five members are appointed by the Division of Biological Chemistry of IUPAC and five by the International Union of Biochemistry (the two Unions have a relationship similar to that between the ACS Division of Biological Chemistry and the American Society of Biological Chemists); they represent fields of biochemistry and language groups, but not societies or journals. Meetings, usually three full working days, are held annually, with much being effected by correspondence between meetings. The conclusions of CBN are issued as Tentative Rules (not Definitive Rules)—*i.e.*, as recommended good practice—recognizing that the area of formal, definitive nomenclature belongs to sister commissions, particularly to the Commission on Organic Nomenclature of IUPAC. Implicit here is that CBN deals almost exclusively with nonformal nomenclature (trivial names, abbreviations, acronyms, etc.) and with substances that cannot be named on a formal basis (proteins and other polymers). Most of CBN's recommendations begin with *ad hoc* subcommittees, usually appointed to ensure the widest international representation of active workers in the field in question. The reports of these subcommittees are then worked up by CBN, with frequent reference back to the experts who originated them.

CBN's reports (Tentative Rules) are "approved for publication" by the authorities of the two parent unions (the President of IUB and the President of the Division of Biological Chemistry of IUPAC) and transmitted to two publication sources, the Information Bulletin of IUPAC and the Commission of Editors of Biochemical Journals of IUB (CEBJ). The latter is what I have chosen to call the executive activity. This relatively new organization, while concerned with all problems that beset editors of biochemical journals, has a special interest in nomenclature. This interest manifests itself in at least three ways: referral of problems to CBN; consultation with CBN during the final formulative stages (occasionally CBN and CEBJ meet together, and each always has a representative at meetings of the other); and, most important, acceptance *and publication* of CBN's recommendations in their respective journals.[1] It is the latter that gives the force and effect to biochemical rules that are often missing in other areas of chemistry.

The third aspect of modern biochemical nomenclature, what I have called catalytic, is, in contrast to CBN and CEBJ, national in concept if not in operation. This is the NAS-NRC Office of Biochemical Nomenclature (OBN), established in 1965 with the author as its (part-time) director. The function of OBN is to assist all interested parties, but especially editors, in solving their nomenclatural problems. OBN's role is active as well as passive, in that it seeks to publish and publicize existing rules affecting biochemical nomenclature on its own initiative as well as upon demand. OBN thus assists in the dissemination of CBN's rules and also serves as a

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** Director, NAS-NRC Office of Biochemical Nomenclature, agency administered by the National Academy of Sciences–National Research Council with support from the National Institutes of Health; Secretary, IUPAC-IUB Commission on Biochemical Nomenclature.

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channel in the reverse direction, for input into CBN. Inasmuch as OBN's director and CBN's secretary are, at this moment, the same person, easy contact between the creative and catalytic functions of biochemical nomenclature is assured. The funding of OBN (through a USPHS grant to NAS-NRC for the purpose) accelerates the hitherto slow pace of nomenclatural activities, not only by providing for time and assistance, but also the purchase and distribution of reprints of the published Tentative Rules. (Each such printing carries, as a footnote, the name and address of OBN as a source of reprints, and judging by the response, the footnote is read.)

Besides distributing reprints of CBN's rules and carrying on a very heterodisperse correspondence, OBN has constructed a document (OBN-1) in which are set forth, in addition to all that has been stated above, a complete listing of all nomenclatural rules affecting biochemistry (with source and reference) and a list of committees or commissions having any influence, past or present, on biochemical nomenclature. This document, continuously updated, is also available to anyone requesting it.

It may be of interest to note that the American Chemical Society's Division of Biological Chemistry, unlike so many of the other principal divisions of the Society, has no Nomenclature Committee. This role seems to be filled by the activities of CBN (and CEBJ). Representation of biochemistry on the Society's Nomenclature Committee, headed by Dr. Loening of Chemical Abstracts Service, has been achieved by appointing OBN's Director (who is, as noted above, CBN's Secretary) to that Nomenclature Committee. The contact and responsiveness of this arrangement seem to fill adequately the needs of the Society and the Service with respect to biochemical nomenclature.

APPENDIX

Rules and Tentative Rules Affecting Biochemical Nomenclature

I. Tentative Rules of the IUPAC-IUB Commission on Biochemical Nomenclature.
   1. *Abbreviations and Symbols for Chemical Names of Special Interest in Biological Chemistry (1965 Revision).*[2] J. Biol. Chem., *241*, 527 (1966); Biochemistry *5*, 1445 (1966); Arch. Biochem. Biophys., *115*, 1 (1966); Virology *29*, 480 (1966); Biochem. J., *101*, 1 (1966). Section 5: Biochim. Biophys. Acta *108*, 1 (1965).
   2. *Abbreviated Designation of Amino Acid Derivatives and Polypeptides.*[2] J. Biol. Chem., *241*, 2491 (1966); Biochemistry *5*, 2485 (1966); Biochim. Biophys. Acta *121*, 1 (1966); Biochem. J., *102*, 23 (1967).
   3. Nomenclature of a) *Miscellaneous Compounds of Importance in Biochemistry,*[2] b) *Quinones with Isoprenoid Side Chains,*[2] c) *Folic Acid and Related Compounds,*[2] d) *Corrinoids*[2] (all replacing earlier "Vitamins"). J. Biol. Chem. *241*, 2987 (1966); Biochim. Biophys. Acta *107*, 1, 5, 11 (1965); *117*, 285 (1966); Biochem. J., *102*, 15 (1967).
   4. *Names for Synthetic Modifications of Natural Peptides.*[2] Biochemistry *6*, 362 (1967); J. Biol. Chem., *242*, 555 (1967); Biochim. Biophys. Acta. *133,1* (1967).
   5. Under consideration: Lipids; Synthetic Polypeptides; Carotenoids; Cyclitols; Steroids.

II. Rules of the IUPAC Commission on Biochemical Nomenclature (1947–59).[3]
   1. *Amino Acids.* J. Am. Chem. Soc. *82*, 5575 (1960) plus J. Org. Chem., *28*, 291 (1963).
   2. *Steroids.* J. Am. Chem. Soc., *82*, 5577 (1960). (See I, 5).
   3. *Carotenoids.* J. Am. Chem. Soc., *82*, 5583 (1960). (See I, 5).
   4. *Vitamins.* J. Am. Chem. Soc., *82*, 5581 (1960). *Replaced by I. 3 above.*

III. Rules of Organic Nomenclature (IUPAC; Am. Chem. Soc.-Chem. Soc.).
   1. *Organic.* (Sections A and B) J. Am. Chem. Soc., *82*, 5545 (1960)[3] and Handbook of Chemistry and Physics, 46th Ed., 1965–6, p. C-1. (Section C) Pure and Applied Chem., *11*, Nos. 1–2 (1965).
   2. *Carbohydrates.* J. Org. Chem., *28*, 281 (1963).[3]
   3. *Ring Systems.* "The Ring Index," Second Edition, 1960, and Supplements I-III.[3] A. M. Patterson, L. T. Capell and D. F. Walker. Produced by Chemical Abstracts Service, Columbus, Ohio.
   4. *Groups and Radicals.* "The Naming and Indexing of Chemical Compounds from Chemical Abstracts" (Introduction to Subject Index of vol. 56, 1962, of Chemical Abstracts), pp. 87*N* et seq.[3]
   5. *Stereochemistry.* Cahn, Ingold and Prelog. Angew. Chemie *5*, 385, 1966 (in English); Hansen, J. Am. Chem. Soc., *88*, 2731, 1966.

IV. Drugs and Related Compounds or Preparations.
   1. *United States Adopted Names* (USAN), No. 5, 1965 (U. S. Pharmacopeial Convention, Inc., 46 Park Avenue, New York).
   2. *International Nonproprietary Names* (INN). World Health Organization (WHO), Geneva, 1962 (Nos. 1–11); WHO Chronicle (Nos. 12–14).

V. Inorganic Chemistry (and Physical Chemistry).
   1. J. Am. Chem. Soc., *82*, 5523 (1960); (ibid 5517).[3]
   2. See III, 4 above, pp. 72N-87N.

VI. Enzymes.
   1. Report of the Commission on Enzymes of the I.U.B., 1964 revision (second edition), Elsevier, 1965. (See Science *150*, 719, 1965).

[1] CBN's *Tentative Rules for Abbreviations and Symbols for Chemical Names of Special Interest in Biochemistry (1965 Revision)* has already appeared in six journals in English (three countries) and will shortly appear, in the appropriate languages, in French, German, Russian, and Japanese journals. Other CBN Tentative Rules, of later date, are following the same course. (It should be remembered that English plays an even greater role in biochemistry than it does in other areas of chemistry.) Over 2000 reprint requests, from all over the world, have been received and honored, and these requests indicate that each republication brings fresh awareness of the existence of the rules.

[2] Available from the NAS-NRC Office of Biochemical Nomenclature.

[3] Available from Chemical Abstracts Service, Columbus, Ohio.