REPORT ON THE BOTANICAL NOMENCLATURE COURSE ORGANIZED BY ST. XAVIER'S COLLEGE AT MUMBAI, INDIA

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The St. Xavier College (SXC), Mumbai, held its Botanical Nomenclature Course in February 2023. The course drew about 50 participants from across the State of Maharashtra. Rajendra Shinde, Principal (also known as administrative head) of the college and Director, Blatter Herbarium (BLAT), was the Convener; and Alok Gude, Associate Professor and Head of the Department of Botany, served as the Coordinator and Facilitator. Participants were provided in advance with information on the latest International Code of Nomenclature for algae, fungi, and plants ("the Shenzhen Code") (Turland et al., 2018). Gandhi served as the instructor. He reviewed the physical structure of the Code: ranks, and names of taxa (Articles 1–5 and 16–28 of the Shenzhen Code); status, typification, starting points, conservation, and sanctioning (Articles 6–15); effective publication; validity of names (Articles 29–45); authorship citation (Articles 46–50); rejection of names (Articles 51–59); and orthography (Articles 60–62).

Common Names vs. Botanical Names

Gandhi began the course with his remark that, although the saying "a rose by any other name would smell as sweet," from William Shakespeare's play, *Romeo and Juliet*, is well known, such an expression might not be universally applicable to all biological names. In this regard, Gandhi observed that in ancient and medieval Greek and Latin, fleshy edible fruits of different taxa imported from other countries had "apple" (pome) or "melon" (derived from *Malos* (Greek) or *Malus* (Latin) as part of their names; e.g., Chinese apple (*Citrus* ×*aurantium* L. var. *sinensis* L.), custard apple (*Annona squamosa* L.), Indian apple (*Ziziphus jujuba* Mill.), Persian apple (peach, *Prunus persica* (L.) Batsch), pineapple (*Ananas comosus* (L.) Merr.), poisonous apple (tomato, *Solanum lycopersicum* L., also known as, *Lycopersicon esculentum* Mill.), rage or raging apple (mad apple or eggplant, "*Solanum* ***pomi****ferum fructu oblongo*" (Bauhin 1623: 167); *Solanum "****Melon****gena*" L.; cf., genus name "***Melon****gena* Tourn." (Tournefort 1700: 151), seedy apple (pomegranate, *Punica granatum* L.), thornapple (*Datura Stramonium* L.), and watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai).

Compound Name Formation

Gandhi instructed the participants on how to make compound words or names and how to derive family names from relevant generic names. The first thing to do is find the genitive form of the first term from which its stem can be deduced and used in name formation. If the second term starts with a consonant, a connecting vowel ("o" for Greek words and "i" for Latin words) is needed between the stem of the first word and the whole of the second word. The plural adjectival suffixes, *-aceae*, *-eae*, and *-inaei,* are added to stems of generic names to make family, tribe, and subtribe names, respectively; e.g., *Anacardium* (nominative), *Anacardii* (genitive), *Anacardi* (stem) + *aceae* = Anacardiaceae; *Myrtus* (nominative), *Myrti* (genitive), *Myrt-* (stem) + *aceae* = Myrtaceae; *Rosa* (nominative), *Rosae* (genitive), *Ros-* (stem) + *aceae* = Rosaceae.

For generic names with an "*-is*" ending, the genitive suffix may be *-is* itself; e.g., *Batis* (nominative and genitive) with *Bat-* as the stem, and *Vitis* (nominative and genitive) with *Vit-* as the stem, resulting in the family names Bataceae and Vitaceae, respectively. In contrast, the *-idis*/*itis* genitive suffix applies to some "*-is*" ending names; e.g., *Amaryllis* (*Amaryllidis*, *Amaryllid-* (stem), Amaryllidaceae), *Orchis* (*Orchidis*, *Orchid-* (stem), Orchidaceae), *Oxalis* (*Oxalidis*, *Oxalid-* (stem), Oxalidaceae), *Pteris* (*Pteridis*, *Pterid-* (stem), Pteridaceae, Pteridophyta), *Xyris* (*Xyridis*, *Xyrid-*, Xyridaceae); *Hydrocharis* (*Hydrocharitis*, *Hydrocharit-* (stem), Hydrocharitaceae). For those with an "*-o*" ending, the genitive suffix may be "*-inis*"; e.g., *Borago* (*Boraginis*, *Boragin–* (stem), Boraginaceae), *Plumbago* (*Plumbaginis*, *Plumbagin–* (stem), Plumbaginaceae).

Generic names of Greek origin with endings "*-as*" and "*-ma*" were also mentioned; e.g., *Asclepias* (*Asclepiadis* (genitive), *Asclepiad-* (stem), Asclepiadaceae; and *Cycas* (*Cycadis* (genitive), *Cycad-* (stem), Cycadaceae). The ending, "*-ma*," may denote either feminine or neuter gender; e.g., *Alisma* (neuter; *Alismatis* (genitive), *Alismat-* (stem), Alismataceae), *Sperma* (neuter; *Spermatis* (genitive), *Spermat-* (stem), Spermatophyta); *Hedeoma* (feminine; *Hedeomae* (genitive), *Hedeom-* (stem), Hedeominae (name of subtribe).

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Gandhi added that whether the origin is Greek or Latin, and despite several scholarly publications, determining the genitive form of some generic names ending with *-is* continues to be a daunting task for many botanists, since the genitive form ending may be *-is* itself (i.e., the nominative and genitive forms look alike) or *-idis* or *-inis*. He illustrated this problem with a few examples provided below.

Cannabis L.

In the past, the family name of *Cannabis* was variously spelled Cannabaceae, Cannabiaceae, Cannabidaceae, Cannabinaceae, and Cannabisaceae. Accordingly, the genitive form of the genus name varied. 1) Cannabaceae (widely used): *Cannabis* (genitive), *Cannab-* (stem); 2) Cannabiaceae (Punja et al., 2023): *Cannabii* (genitive), *Cannabi-* (stem)), but this usage is not justifiable; 3) Cannabidaceae (Zabinkova (1968: 26): *Cannabidis* (genitive), *Cannabid-* (stem); 4) Cannabinaceae (Lindley 1846: 265; Lawrence 1951: 463): *Cannabinis* (genitive), *Cannabin-* (stem); and 5) Cannabisaceae (De Candolle (1869: 28 (in synonymy)): *Cannabis* as indeclinable, but no evidence exists for such a concept.

Bullock's proposal (1958: 160) to conserve the family name "Cannabiaceae Endl." was accepted, but what was conserved was Cannabaceae (vide Montreal Code; Lanjouw & al., 1961: 189).

Capparis L.

In the past, the genitive form of *Capparis* was in dispute; i.e., whether it is *Capparidis* with *Capparid-* as stem, or *Capparis* with *Cappar-* as stem. Several authors chose to accept *Capparidis* and spelled the family name as "Capparidaceae"; e.g., Orr (1921: 259), Pax and Hoffmann (1936: 146), Raghavan (1937: 43), Stoudt (1941: 664), and Lawrence (1951: 518). Lanjouw and Sprague (1935: 81) proposed to conserve the family name *Capparidaceae*, and their proposal was listed in Appendix V of the Stockholm Code (Lanjouw et al., 1952: 66). The name was subsequently conserved as *Capparaceae* (vide Montreal Code; Lanjouw & al., 1961: 190). Crosswhite and Iltis's (1966: 205-211) proposal to "correct" *Capparaceae* to *Capparidaceae* was not accepted (Stafleu & al. 1972: 225).

Genders of Generic Names and Intraspecific Names in Flora of British India

In the Flora of British India, genders of generic names and intraspecific names are not consistent with present day standards. For example, Clarke (in Hooker, 1884: 429–477) treated the genus *Strobilanthes* and included 154 species. In this treatment, almost all species names have the masculine ending, -us, as in *S. acuminatus*, *S. heyneanus*, *S. rhamnifolius*, *S. viscosus*, etc. However, as per the Shenzhen Code Art. 62.4, all *-anthes* ending names are feminine.

Clarke (in Hooker, 1884: 345–355) also treated *Didymocarpus* and included 40 species, almost all with the feminine ending, -a, as in *D. aromatica*, *D. oblonga*, *D. pedicellata*, *D. villosa*, etc. As per Art. 62.2, all generic names ending in *-carpus*/*carpos* are masculine.

Hooker, in publications from 1874 to 1885, also "erred" in assigning feminine gender to his adjectival infraspecific names in neuter or masculine gendered genus names; e.g., *Biophytum sensitivum* var. *nervifolia* (Hooker, 1874: 437), *Hieracium umbellatum* var. *lanceolata* (Hooker, 1881: 400), *Ocimum sanctum* var. *hirsuta* (Hooker, 1885a: 609), *Polygonum lapathifolium* var. *laxa* (Hooker, 1885b: 35), and *Rubus niveus* var. *microcarpa* (Hooker, 1876: 335). In his treatment of *Exacum*, Clarke (in Hooker, 1883: 95–99), published *E. axillare* var. *pentamera*, *E. courtallense* var. *travancorica*, *E. tetragonum* var. *stylosa*, and *E. zeylanicum* var. *macrantha*.

Peter Raven (MO, pers. comm. to KNG) remarked that in the past, regardless of the gender of a genus name, it was a convention practiced by some botanists to assign feminine gender to infraspecific names with adjectival epithets.

Nomenclature Stability and Revision of Conserved Names

Gandhi noted that as per the Code, Art. 14.12**, "**The lists of conserved names will remain permanently open for additions and changes …". He gave one example pertaining to a conserved genus name listed in two botanical codes. *Berlin Code (Greuter et al., 1988: 214, 217).*

Pongamia Ventenat, Jard. Malm. t. 28. 1803 (*nom. cons.*).
Typus: *P. glabra* Vent., nom. illegit. (*P. pinnata* (L.) Pierre, *Cytisus pinnatus* L.)
[conserved over *Pongam* Adanson, Fam. Pl. 2: 322, 593. 1763, *nom. rej.*; Typus: *Dalbergia arborea* Willdenow].

Millettia Wight et Arnott, Prodr. 263. 1834 (*nom. cons.*).
Typus: *M. Rubiginosa* Wight et Arnott
[conserved over *Pongam* Adanson (1763) and *Pongamia* Ventenat (1803)]

Gandhi noted that, unless specifically conserved, a conserved name does not have priority over an earlier legitimate name, and that, regardless of priority, a conserved name may be conserved over another conserved name. For example, the conserved genus name *Millettia* (1834) was conserved over the conserved genus name *Pongamia* (1803). Gandhi added that, in the past, some works treated the conserved genus name *Pongamia* (1803) as a heterotypic synonym of *Derris* Loureiro (1790), nom. cons. However, in the next Code (i.e., Tokyo Code), what was previously listed as "*Pongam* Adans." (type: *D. arborea*)" was revised to "*Pongamia* Adans., nom. cons." (type: *Cytisus pinnatus*). Although it was a conserved name, *Pongamia* remained a rejected name vs. *Millettia* Wight & Arn. 1834 (*nom. cons.*), as shown below.

Tokyo Code (Greuter & al. 1994: 244, 246).

Pongamia Adans., Fam. Pl. 2: 322, 593. 1763 ("*Pongam.*"), (nom. & orth. cons.) Typus: *P. pinnata* (L.) Pierre (*Cytisus pinnatus* L.) (typ. cons.)

Millettia Wight & Arn., Prodr. Fl. Ind. Orient: 263. 14 Aug 1834, *nom. cons.* Typus: *M. rubiginosa* Wight & Arnott [conserved over *Pongamia* Adans. (1763)]

Gandhi explained that prior to the Tokyo Code, one could have treated the conserved genus name, "*Pongamia* Vent. (1803)," as a heterotypic synonym of the conserved genus name *Derris* Loureiro (dated 1790), but from the Tokyo Code, *Pongamia* (dated 1763) has priority over *Derris*. In the event of their merging, *Derris* would become a heterotypic synonym, because it is not specifically conserved over *Pongamia*.

Type Citation

As per Art. 8.1 (Turland et al., 2018), the type "(holotype, lectotype, or neotype) of a name of a species or infraspecific taxon is either a single specimen conserved in one herbarium or other collection or institution …". The type specimen "… may be mounted as more than one preparation ..." (vide Art. 8.3). For the validity of post-1957 names of species and infraspecies, the type of the name must be indicated by reference to an entire gathering, or a part thereof (vide Arts. 40.1, 40.2), and from 1990, the indication of the type must include one of the words "typus" or "holotypus," or its abbreviation, or its equivalent in a modern language. Also, the single herbarium, collection, or institution in which the type is conserved must be specified (vide Arts. 40.6, 40.7).

With regard to the above, Gandhi told participants that in a few cases, the protologues may seemingly satisfy the above requirements for valid publications, but the relevant herbaria might not have a single specimen as the holotype, as given in the Code Example shown below.

> "Art. 40 Ex. 3. Radcliffe-Smith (in Gen. Croton. Madag. Comoro: 169. 2016) indicated the type of *Croton nitidulus* var. *acuminatus* Radcl.-Sm. as "Cours 4871 (holotypus P)". In the herbarium P, there are four duplicates of Cours 4871. The name is validly published because a single gathering in a single herbarium was indicated as type. These specimens are syntypes, and one of them was subsequently designated as the lectotype by Berry & al. (in Phytokeys 90: 69. 2017)."

Gandhi remarked that the above protologue did not meet the requirements of Arts. 8.1, 40.6 and 40.7, and that the situation might be addressed in the next Congress. For type citation, listing a single gathering and/or name of a single herbarium is not necessarily an indication of the citation of a holotype. Concrete wording is needed within the protologue, and, in this regard, he provided one example from Art. 9.

> "Ex. 1. When Tuckerman established *Opegrapha oulocheila* Tuck. (Lich. Calif.: 32. 1866) he referred to 'the single specimen, from Schweinitz's herbarium (Herb. Acad. Sci. Philad.) before me'. Even though the term "type" or its equivalent was not used in the protologue, that specimen (in PH) was clearly the one specimen used by the author and is therefore the holotype."

Authorship Citation

For a new taxon, whoever provides the name and description/diagnosis, and accepts the proposed name, is the author of the taxon's name. It was mandatory that the relevant description/diagnosis was in Latin for the validity of names proposed between 1935 and 2011. For a post-1957 name, besides the provision of description/diagnosis, type citation from a single gathering is mandatory for validation of the proposed name. In this regard, for the validity of a name and its authorship citation, the importance of the description over the type citation is explained from Art. 46.

> "*Ex. 23. 'Pancheria humboldtiana'* was published by Guillaumin (in Mém. Mus. Natl. Hist. Nat., Ser. B, Bot. 15: 47. 1964), but not validly so because no type was indicated. Valid publication was effected by Hopkins & Bradford (in Adansonia 31: 119. 2009), who designated "*Baumann-Bodenheim 15515* (P! P00143076)" as the holotype, ascribed the name to Guillaumin, and by citing "*Pancheria humboldtiana* Guillaumin, *Mémoires du Muséum national d'Histoire naturelle,* sér. B, botanique 15: 47 (1964), nom. inval.," provided a full and direct reference to a validating description that is unequivocally associated with Guillaumin. Art. 46.10 notwithstanding, the name is therefore attributed to Guillaumin, not 'Guillaumin ex H. C. Hopkins & J. Bradford' as given by Hopkins & Bradford."

Gandhi emphasized that, although both description and type citation are required for the validity of a post-1957 name, the provision of a description is primary, and, for this reason, Guillaumin is the author of the name validly published in 2009.

FIGURE 1. **A**, Class group picture; **B**, Kanchi N. Gandhi and Rajendra D. Shinde interacting with the course participants during a question and answer session.

Homonymy

Homonyms, regardless of their priority, are valid names, have types, and may be legitimate or illegitimate. Later homonyms are illegitimate, when published, and can become legitimate by conservation. Gandhi added that homonyms of equal priority are legitimate and illustrated the concept with the following example.

> "Art. 53.5. When two or more legitimate homonyms have equal priority (see Note 1), the first of them that is adopted in an effectively published text (Art. 29–31) by an author who simultaneously rejects the other(s) is treated as having priority. Likewise, if an author in an effectively published text replaces with other names all but one of these homonyms, the homonym for the taxon that is not renamed is treated as having priority (see also Rec. F.5A.2).
>
> *Ex. 19*. Linnaeus simultaneously published "10." *Mimosa cinerea* (Sp. Pl.: 517. 1753) and "25." *M. cinerea* (Sp. Pl.: 520. 1753). In 1759 (Syst. Nat., ed. 10: 1311), he renamed species 10 as *M. cineraria* L. and retained the name *M. cinerea* for species 25, so that the latter is treated as having priority over its homonym."

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