Botanical Nomenclature

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Botanical Nomenclature

- Nomenclature is not new
- Many ways to classify and name organisms
  - Appearances
  - Uses
  - Flavors
  - Medicinal properties, Etc.
- Greek nomenclature, primarily medicinal, gave rise to modern nomenclature

Botanical Nomenclature

- *Common names* arise naturally within a particular language, in a particular culture, and within a particular region.
- *Why not use common names?*
- Many common names are ambiguous for several reasons:
  - The same species will have a different common name in every language.
  - In North America more than three languages for any one species: English, Spanish, and French
  - What about all the Native American Indian languages?
  - What about a species common throughout the world, as many weeds are?

Botanical Nomenclature

- The vast majority of organisms are ***un***common, and many are rare.
- If the average person is totally unaware of a species, there will be no common name.
- **So *there are no common names for hundreds of thousands of organisms*.**
- Even when there are common names available, there are problems.
- Within the *same* language, *even within a single country*, a single species can have more than one common name.
- Honey locust, for example, has at least **13 common names in English.**

Botanical Nomenclature

- The same common name may apply to more than one species, and they might not even be closely related!
  - In England “corn” refers to several grains such as wheat and oats. (They use the word "maize" to refer to our "corn.“)
  - Whereas Buttercup in East Texas is *Oenothera speciosa*, Buttercup elsewhere is the genus *Ranunculus*, in a very different family. (Both have yellow flowers.*)*
  - In Arizona “greasewood” refers to two species in different unrelated families, one in northern Arizona, one in southern.

Botanical Nomenclature

Common Names might be misleading

- Seep-willow is *not* a willow (is related to sunflowers)
- Feather-geranium is also called jerusalem-oak (but it is related to beets, *not* oaks or geraniums!)
- Ground-pine is *not* a pine (is related to ferns)
- Spanish-moss is *not* a moss (is a flowering vascular plant related to pineapples)
- Clearly, a universal, standardized naming system is needed.

Botanical Nomenclature

- During the Middle Ages, plant names were actually short ***descriptions*** of the plants, often a string of 6 to 12 Latin words.
  e.g., one species name translated from Latin:

  low-growing, round-leaved, alpine buttercup with smaller flowers

- That name is a *polynomial* (meaning "many names" or many-parted name).

- From one author to the next those names might differ because the author chose some different words.

- Learning the names was extremely tedious, even if only 2000–4000 species were known

Botanical Nomenclature

As specimens of new species were flooding into Europe from the New World, the number of polynomials to learn soon became overwhelming.

In 1753, Karl Linné (Swedish physician and naturalist; 1707--1778), wrote *Species Plantarum* ("the kinds of plants"). The whole book was written in Latin, including the author's name: *Carolus Linnaeus*.

He also published a classification of animals.

Botanical Nomenclature

In these two works he devised a simple way of *indexing* names.

He still used the polynomial, but in the margin he added a "handle" for it.

That handle became the *binomial* (meaning "two names" or two parts to the name).

Botanical Nomenclature

- Using the earlier example, the plant previously named (in Latin):
  low-growing, round-leaved, alpine buttercup with smaller flowers

Became: ***Ranunculus alpinus*** **(alpine buttercup)**

- Closely related plants (other buttercups) were included in *Ranunculus*.
  Ranunculus hispidus **(hairy buttercup)**

The first part is now called the generic name; the second is the specific epithet.

Notice that the second word is an *adjective* modifying the generic name.

Botanical Nomenclature

A couple of other authors had used binomials previously, but were very inconsistent. Most of their names were still polynomials.

But Linnaeus (Karl Linné) used the binomial “indexing tool” throughout his works.

The convenience of it was obvious.

The system of Linnaeus was soon widely adopted and used worldwide.

Botanical Nomenclature

- As others continued to use the Linnaean system, numerous complications arose.

- For example, if you name a species, and later realize a different epithet would better describe the species, should you change it?

- Changing the name might make a more accurate name, but could lead to confusion (several names per plant, just like with common names!).

- And it would *not* promote stability of nomenclature.

Botanical Nomenclature

To stabilize the names of plants, Augustin Pyramus de Candolle made a first attempt at an international code of nomenclature (early 1800s).

A hundred years later, ***two*** codes existed – American vs. European.

After decades of arguing, the first **International Code of Botanical Nomenclature** (ICBN) was achieved by the international botanical congress in 1930.

International Code of Botanical Nomenclature (ICBN)

- ✓ Since then, subsequent international botanical congresses (every 6 years) discuss and vote on proposals to modify the Code.
- ✓ The last code resulted from the 17th International Botanical Congress meeting in Vienna, Austria, 2005 .
- ✓ Each edition of the ICBN is published in English, French and German. Recently Slovak versions have become available.
- ✓ The most recent (2006 Vienna Code) will be available online, in English.

International Code of Botanical Nomenclature (ICBN)

- The basic premises of the ICBN are listed in the PREAMBLE.
- A summary of those premises:
  - There must be a precise yet simple means by which plants are given scientific names that can be used and accepted throughout the world.
  - There is a set of principles which must be followed.
  - There shall be rules governing the naming of plants.
  - Names that are contrary to the rules can not be maintained.

International Code of Botanical Nomenclature (ICBN)

- Those rules shall be arranged into articles, sometimes with recommendations on how or what to do in certain situations.
- There also may be examples demonstrating how the rules are to be interpreted.
- Unlike rules which must be followed, it is hoped that recommendations will be followed wherever possible.
- There must be a means for making changes to the rules governing the naming of plants.

International Code of Botanical Nomenclature (ICBN)

- The Code covers the names of all organisms formerly classified as plants: green plants, fungi, blue-green algae, and some groups of photosynthetic and related non-photosynthetic protists.
- The Code applies to fossil ***and*** extant species.
- However, the Code ***does not*** deal with the names of bacteria or other prokaryotic groups. [There is an International Code of Nomenclature of Bacteria (ICNB) for those]
- Unless specifically stated, all rules apply to the nomenclature of all groups of plants.
- **Cultivated plants** have a special nomenclature governed by specialized rules.

International Code of Botanical Nomenclature (ICBN)

- **There are two reasons scientific names of plants may change.**

1. New studies may provide a better understanding of the group

   However, taxonomists may have different interpretations of the available evidence regarding plant relationships. They are free, therefore, to arrive at their own conclusions. This allows for differing taxonomic judgments or opinions and others to evaluate it. *Acceptance or rejection of a taxonomic conclusion is a matter of individual opinion.*

International Code of Botanical Nomenclature (ICBN)

…two reasons scientific names of plants may change.

2. A name may be contrary to the rules.

   Nomenclatural matters are governed by the Code and all names must be based on provisions in the Code.

   Individuals are ***not*** free to pick and choose among its provisions, or to conduct practices contrary to the Code.

International Code of Botanical Nomenclature (ICBN)

- When there is no specific rule governing a matter, the established custom should be followed.
- Each new edition of the Code supersedes all previous editions.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

I. Botanical nomenclature is independent of zoological and bacteriological nomenclature.

II. The application of names of taxonomic groups is determined by means of **nomenclatural types**.

III. The nomenclature of a taxonomic group is based upon **priority of publication**.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

IV. Each taxonomic group (e.g., family or genus or species) can bear only **one correct name**: **the *earliest*** that is in accordance with the Rules, except in specified cases.

V. Scientific names of taxonomic groups are ***treated as Latin*** regardless of their derivation.

VI. The Rules of nomenclature are ***retroactive*** unless expressly limited.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Below are details on what each of the principles means and how that applies to "real botany."

Principle I. Botanical nomenclature is independent of zoological and bacteriological nomenclature.

Many of the rules in the Zoological Code differ from those in the ICBN. Likewise the Bacterial Code is very different.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle I. Botanical nomenclature is independent of zoological and bacteriological nomenclature.

Example: In zoology, only the originally-publishing author is given:

Melanerpes erythrocephalus (L.)
Melanerpes formicivorus (Swainson)
Melanerpes Swainson

In botany would be:

Melanerpes erythrocephalus (L.) Swainson
Melanerpes formicivorus (Swainson) Swainson
Melanerpes Swainson

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle II. A nomenclatural type establishes the application of a name.

For names of species (and lower ranks, except for autonyms) the nomenclatural type is a specimen (sometimes an illustration is okay), called the type specimen.

How is a type specimen used?

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle II.

Example: The type of the species *Magnolia virginiana* is a single **specimen** in the Clifford Herbarium at the Natural History Museum in London.
Often, especially in older publications, descriptions are not quite adequate to understand which species the author was describing!

If a later researcher wants to understand the concept Linnaeus had for the species ***Magnolia virginiana***, he or she can go look at the type specimen in the Clifford Herbarium at the Natural History Museum in London, and see what species that specimen it really is.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle II.

Above the rank of species, a nomenclatural type is typically a **name**.

The type of the genus *Magnolia* is the name *M. virginiana*.

The type of *Magnoliaceae* is the genus name *Magnolia*.

The type of the order *Magnoliales* is *Magnoliaceae*.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle III.
The nomenclature of a taxonomic group is based upon the priority of publication. Example of Principle of Priority.
Consider the following names:

Cannabis sativa L. 1753
Cannabis indica Lam. 1785
Cannabis ruderalis Janischevsky 1924

When 3 names refer to a single species, or when 3 species are lumped into 1 comprehensive single entity, the entity must bear the earliest ***published*** name - *Cannabis sativa* L. But retroactive only to 1 May 1753, the date of Linnaeus' ***Species Plantarum***

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle IV. Each taxonomic group can bear only **one correct name**, **the *earliest*** that is in accordance with the Rules, **except in specified cases.**
Returning to our example:

Cannabis sativa L. 1753
Cannabis indica Lam. 1785
Cannabis ruderalis Janischevsky 1924

Only one of these names can be the correct, accepted name for the species, and that must be the earliest name published on or after 1 May 1753.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle IV. **Exceptions** are certain names that were in very wide usage for a very long time. Such names can be given artificial priority--"conserved"--protecting them from being replaced by relatively unknown names that were actually published earlier.

Example:

Dicentra Bernh. published in Linnaea 8: 457, 468. 1833.

Typus: *D. cucullaria* (L.) Bernh. (*Fumaria cucullaria* L.)

Is conserved against:

Diclytra Borkh. published in Arch. Bot. (Leipzig) 1(2): 46. 1797.

...which would otherwise have priority, but is rejected instead.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle IV. Each correct specific epithet must be unique **within** a genus. The same specific epithet is permitted within a different genus.

Apiaceae	*Cryptotaenia canadensis* (L.) DC.
Apiaceae	*Sanicula canadensis* L.
Asteraceae	*Conyza canadensis* (L.) Cronquist
Asteraceae	*Lactuca canadensis* L.
Caprifoliaceae	*Lonicera canadensis* Marshall
Cornaceae	*Cornus canadensis* L.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle V. Scientific names of taxonomic groups are treated as Latin regardless of the derivation.

The genus name is a Latinized noun, always capitalized, often abbreviated, and can be taken from any source.

Examples: *Quercus*, Latin name for “oak”
Marshall johnstonia, named after Marshall Johnston
Guazuma, taken from a Native American plant name

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle V. Scientific names of taxonomic groups are treated as Latin regardless of the derivation.

Nouns in the Latin language have gender, and gender of species epithets should agree with gender of the genus name.
Species epithets can be derived from any source, often a descriptive adjective, always Latinized.

Examples:

Quercus alba, Latin, literally “white oak”
Quercus muhlenbergii, named for the German botanist, Gotthilf Henry Ernest Muhlenberg 1753–1815

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle V. Scientific names of taxonomic groups are treated as Latin regardless of the derivation. Gender is indicated by the word's ending.

Examples:

Amaranthus albus L.
Brassica alba (L.) Rabenh.
Plagiobothrys hirtus (Greene) I.M.Johnston
Rudbeckia hirta L.

International Code of Botanical Nomenclature (ICBN)

PRINCIPLES

Principle VI. All rules are retroactive unless expressly limited.
Just as priority is retroactive to 1 May 1753, various other rules are retroactive to other dates.
New rules often have a modern starting date.

Example:
"Article *35.1.* A new name or combination published on or after 1 January 1953 without a clear indication of the rank of the taxon concerned is not validly published."

Botanical Nomenclature

Species:

Fallugia paradoxa

Genus or Generic name:

Fallugia

Specific Epithet:

paradoxa

Synonyms:

Fallugia mexicana

Fallugia paradoxa var. *acuminata*

Fallugia micrantha

Fallugia acuminata

Fallugia acuminata var. *micrantha*

Botanical Nomenclature

In botanical nomenclature, the author(s) of a name is/are always credited, and often abbreviated:

Fallugia Endl.

Fallugia paradoxa (D.Don) Endl.
[authors are: David Don 1799–1841; and
Stephan Friedrich Ladislaus Endlicher 1804–1849]

Fallugia paradoxa var. *acuminata* Wooton
[author is: Elmer Ottis Wooton 1865–1945]

Quercus rubra L.
[author is: Carl von Linne, also known as Carolus Linnaeus 1707–1778]

Botanical Nomenclature

Authors in parentheses are the original describing authors.

Fallugia paradoxa (D.Don) Endl.

was originally described as:

Sieversia paradoxa D. Don
D. Don originally described the species in 1825.

And it was later transferred to a different genus:

Fallugia paradoxa (D.Don) Endl.
Endlicher made the recombination in 1840.
Endlicher is the recombining author.

Sieversia paradoxa D. Don is the basionym of *Fallugia paradoxa*

Botanical Nomenclature

- Sometimes the change is made within the same rank, as above, where it remained within the rank of species.

- Other times the name is transferred to a different rank, as below, where it was moved from the rank of variety to the rank of species:

Fallugia paradoxa (D.Don) Endl. var. *acuminata Wooton*
Wooton described a new variety of *Fallugia paradoxa* in 1898.

Fallugia acuminata (Wooton) Cockerell
Cockerell transferred *acuminata* to the rank of species in 1903.

Wooton was the original describing author. Cockerell was the recombining author.

Botanical Nomenclature

In any given publication, each species will have only one accepted name:

Fallugia paradoxa (D.Don) Endl.

All other names that have been applied to the same plant are referred to as synonyms:

Sieversia paradoxa D.Don,

Fallugia mexicana Walp.

Fallugia paradoxa (D.Don) Endl. var. *acuminata* Wooton

Fallugia micrantha Cockerell

Fallugia acuminata (Wooton) Cockerell

Fallugia acuminata (Wooton) Cockerell var. *micrantha* (Cockerell) Cockerell

(Look at authorship of above line!)

Botanical Nomenclature

When you write a botanical name, you **must** include **both** the original describing author **and** the recombining author.

(This differs from zoological rules.)

Fallugia paradoxa (D.Don) Endl.

Also, you must either **underscore** the binomial name of the species, or **italicize** if italic fonts are available.

Fallugia paradoxa (D.Don) Endl.

Fallugia paradoxa (D.Don) Endl.