Nomenclature – what’s in a name?

Read Payne 2016

CHAPTER ONE
CLASSIFYING
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CULTURE | SCIENCE PRACTICE
Why Do Taxonomists Write the Meanest Obituaries?
The open nature of the science of classification virtually guarantees fights.
By Ansel Payne

BIOLOGY | PHYSICS
Why Nature Prefers Hexagons
The geometric rules behind fly eyes, honeycombs, and soap bubbles.
By Philip Ball

BIOLOGY | NEUROSCIENCE
The Paradox of the Elephant Brain
With three times as many neurons, why doesn’t the elephant brain outperform ours?
By Susana Herculano-Houzel
Nomenclature – what’s in a name?

*Cypripedium reginae*

*showy lady’s-slipper*

*Cypripedium hirsutum*

*queen lady’s-slipper*

*Cypripedium spectabile*
Two of the goals for Systematics:

1. **Identify and name species**
2. **Classify** or place the species in groups

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**Hierarchical classification**

- **Plantae**
- **Magnoliophyta**
- **Liliopsida**
- **Asparagales**
- **Orchidaceae**
- **Cypripedium**
- **Cypripedium acaule**

**Cypripedium acaule**

Stemless lady slipper
"Latin is a language as dead as dead can be. First it killed the Romans, and now its killing me!"

(previous Bot 400 student)
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names

Moccasin flower
Pink lady’s slipper

Stemless lady’s slipper
Common Names

- 15 names in English
- 44 in French
- 81 in Dutch
- 105 in German

245 common names but only 1 Latin name

*Nymphaea alba* L.

European white waterlily
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names
• one common name = 2+ species
  e.g., fireweed

Chamerion — evening primrose family
Erectites — aster family
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names
• one common name = 2+ species

e.g., loosestrife

Lythrum — loosestrife family
Lysimachia — primrose family
Common Names

Advantages?

- descriptive, colorful
- easy to remember
- only names for most people

Disadvantages?

- one species = many common names
- one name = 2+ species
- names can be confusing

Sweet fern
(not a fern!)
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names
• one name = 2+ species
• names can be confusing

Pineapple
(not a conifer or apple!)
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names
• one name = 2+ species
• names can be confusing

Welcome-home-husband-no-matter-how-drunk-ye-be
(also called Hen & chicks)
Common Names

Advantages?

• descriptive, colorful
• easy to remember
• only names for most people

Disadvantages?

• one species = many common names
• one name = 2+ species
• names can be confusing
• most plants have no common name

? Buxbaum’s sedge

Carex buxbaumii
Scientific Names

Necessary

- all species need names
- uniform system of naming to avoid confusion

Carex buxbaumii Wahlenb.
Scientific Names

Necessary

• all species need names

• uniform system of naming to avoid confusion

• facilitates information retrieval

Arabidopsis thaliana
Scientific Names

Necessary

• all species need names
• uniform system of naming to avoid confusion
• facilitates information - retrieval

• **International Code of Nomenclature** for fungi, algae, and plants (ICN) adopted – 2011 Melbourne
Scientific Names

Descriptive! (at least some times)

May-apple

*Podophyllum peltatum* - “umbrella foot leaf”
Scientific Names

Scientific names - why binomials?

Carolus Linnaeus on a field trip - using polynomials – describing the New York ironweed

New Yorker Matthew Pace – Botany 2015 Ph.D. grad
Scientific Names

Scientific names - why binomials?

**Serratula foliis lanceolato oblongis serratis pendulis**

“The species of *Serratula* with leaves oblong to lanceolate shaped, serrate edged, and drooping”

Carolus Linnaeus on a field trip - using polynomials – describing the New York ironweed
Scientific Names

Scientific names - why binomials?

CAROLI LINNAEI

SPECIES PLANTARUM.

EXHIBENTES PLANTAS RITE COGNITAS.

AD GENERA RELATAS.

CUM DIFFERENTIIS SPECIFICIS. NOMINIBUS TRIVIALIBUS, SYNNONIMI Selectis, LOCIS NATALIBUS, SECUndUM SYSTEMA SEXUAle DIGESTAS.

TOMUS I.

HOLMIÆ. IMPRENSIS LAURENTII SALVI.

1753.

POLYNOMIAL

BINOMIAL

TRIVIAL NAME
Scientific names - why binomials?

Which would you rather learn?

**Serratula foliis lanceolato oblongis serratis pendulis**

**Serratula noveboracensis**
Scientific Names

The species name

Species name = binomial (2 names): *Serratula noveboracensis*

**Genus name:** *Serratula*
- capitalized
- italicized or underlined
- plural = genera

**Specific epithet or trivial name:** *noveboracensis*
- not capitalized
- italicized or underlined
- Latin ending agrees in gender with genus name

*Serratula noveboracensis* L.
Scientific Names

The scientific name

Scientific name = species name + authority: *Serratula noveboracensis* L.

**Species name:** *Serratula noveboracensis*

**Authority:** Linnaeus

• (abbreviated “L.”) - the name of the person or persons who provided this binomial for this species
Scientific Names

**Synonyms** - duplicate names

French botanist Andre Michaux transfers New York ironweed to genus *Vernonia*

*Vernonia noveboracensis* (L.) Michx.

**Authority = Michaux**
(came up with this binomial)

**Parenthetical authority = Linnaeus** (first used the specific epithet for this species)
Because of synonomy - proliferation of scientific names - the **type method** is used to track names and lessen confusion.

Every species name must be linked to an **herbarium specimen** and deposited in an herbarium.

**Holotype**: the particular specimen designated by the author, which automatically fixes the application of the name.

**---type**: other specimens to replace holotype when lost or unknown (e.g., syntype, neotype, lectotype, paratype).
Type Method

The Berlin Herbarium – 3rd largest herbarium in the world – lost over 20,000 holotypes in May 1944 due to Allied bombing

**Holotype:** the particular specimen designated by the author, which automatically fixes the application of the name

----**type:** other specimens to replace holotype when lost or unknown
Melody and Kelsey think they collected a new species of *Cannabis*
Type Method

Required steps in authoring a name for a putative new species of *Cannabis*:

- Find binomial not already taken

Specific epithets *occupied* in *Cannabis*

- *Cannabis americana*
- *Cannabis chinensis*
- *Cannabis erratica*
- *Cannabis foetens*
- *Cannabis generalis*
- *Cannabis gigantea*
- *Cannabis indica*
- *Cannabis intersita*
- *Cannabis kafiristanica*
- *Cannabis lupulus*
- *Cannabis macrosperma*
- *Cannabis ruderalis*
- *Cannabis sativa*
Type Method

Required steps in authoring a name for a putative new species of *Cannabis*:

- Find binominal not already taken

Name after someone important?

- *C. obamaei*  
- *C. trumpii*
Type Method

Required steps in authoring a name for a putative new species of *Cannabis*:

- Find binomial not already taken
  *Cannabis trumpii* Sain & Huisman

- Make a type specimen & deposit in Wisconsin State Herbarium
  Sain & Huisman 3162 (WIS)

- Latin or English description of new species

- Publish in journal or visible paper product seen in libraries OR now electronically!

= VALID species name, but not necessarily “good” or ACCEPTED species name!
Type Method

Required steps in authoring a name for a putative new species of *Cannabis*:

- Published ≠ Accepted

Specific epithets occupied in *Cannabis*

*Cannabis americana*
*Cannabis chinensis*
*Cannabis erratica*
*Cannabis foetens*
*Cannabis generalis*
*Cannabis gigantea*
*Cannabis indica*
*Cannabis intersita*
*Cannabis kafiristanica*
*Cannabis lupulus*
*Cannabis macrosperma*
*Cannabis ruderalis*
*Cannabis sativa – only accepted*
*Cannabis trumpii – ?*
The type method means that there is a type specimen for every named species. *Solidago canadensis* L. has a type specimen in the Linnean collection in London.
The type method continues up the hierarchical system of classification!

*Solidago canadensis* L. is the first named species of the genus *Solidago*

the Linnean type specimen for the species is also the type specimen for the genus *Solidago*
Solidago belongs to family Asteraceae, typified by the genus Aster.

This herbarium specimen of Aster amellus also typifies the order Asterales and the subclass Asteridae.

Aster amellus L. - type specimen from Linnaeus’ collection in London.

Aster amellus - type species of the genus Aster AND family Asteraceae.
Aster renaming

... and here the story gets messy!

What if “Aster” is not “natural”? – then only *Aster amellus* and relatives remain in genus *Aster*

*Aster amellus* L. - type specimen from Linnaeus’ collection in London
Aster renaming

North American asters related to other North American genera

Italian aster related to other genera in Eurasia
Aster amellus - aster

Grindelia - gumweed

Solidago - goldenrod

Heterotheca - golden aster

Euthamia - grass-leaved goldenrod

Erigeron - daisy fleabane
Aster novae-angliae L.
(New England aster)

= Symphyotrichum novae-angliae (L.) Nesom

Confusion can be an issue with ICN rules of synonymy and ranks
Phylocode – lessens confusion?

• Alternative nomenclatural code enacted in Paris, 2004

• Rankless, only phylogenetic lineages or clades named above species level

• Therefore, no genus, family & therefore no “binomial” necessary

• More on this later . . .

Kevin DeQueiroz & Phil Cantino
2 architects of the Phylocode
Rules of Botanical Nomenclature

1. Names based on nomenclatural types

   Species
   Genus
   Family
   etc.
In this classification system, what species is the type for flowering plants?

*Magnolia virginiana* L.

A special species from SE United States — represents the type specimen for the phylum *Magnoliophyta* or flowering plants . . . as well as other “groups” in the hierarchy (*Magnoliopsida, Magnoliidae, Magnoliales, Magnoliaceae, Magnolia*)
**Rules of Botanical Nomenclature**

Family names based on type genus:
- Magnoliaceae for *Magnolia*

8 families are allowed to keep old names not based on type method:

<table>
<thead>
<tr>
<th>Family</th>
<th>— — —</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asteraceae</td>
<td>— — —</td>
<td>Compositae</td>
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<tr>
<td>Poaceae</td>
<td>— — —</td>
<td>Gramineae</td>
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<tr>
<td>Brassicaceae</td>
<td>— — —</td>
<td>Cruciferae</td>
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<tr>
<td>Apiaceae</td>
<td>— — —</td>
<td>Umbelliferae</td>
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<td>Fabaceae</td>
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<td>Lamiaceae</td>
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<td>Clusiaceae</td>
<td>— — —</td>
<td>Guttiferae</td>
</tr>
<tr>
<td>Arecales</td>
<td>— — —</td>
<td>Palmae</td>
</tr>
</tbody>
</table>
Rules of Botanical Nomenclature

2. Only **one accepted name** for a taxonomic group:

   *Vernonia noveboracensis* (L.) Michx.

Others are **synonyms**:

*Serratula noveboracensis* L.

*Serratula noveboracensis* L.  
*Vernonia noveboracensis* (L.) Michx.
Rules of Botanical Nomenclature

3. Names must be treated as **Latin**, but a lot of latitude!

*Allium* *Muilla* by Sereno Watson
4. Nomenclature based on rule of priority

- 1st published binomial for a species in a genus is the accepted name (starting point: *Species Plantarum* 1753)
Rules of Botanical Nomenclature

4. Nomenclature based on rule of priority

• 1st published binomial for a species in a genus is the accepted name (starting point: *Species Plantarum* 1753)

Penstemon *brachyanthus* Bauhin 1688

*Penstemon formosus* Linnaeus 1753

*Penstemon micranthus* Nutt. 1829

*Penstemon procerus* Gray 1835

*Penstemon tolmiei* Cronquist 1958
5. Botanical nomenclature independent from zoological nomenclature

*Cecropia*
Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Pieris
Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Anisoptera

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Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Mallotus
5. Botanical nomenclature independent from zoological nomenclature

*Heliconia & Heliconius*