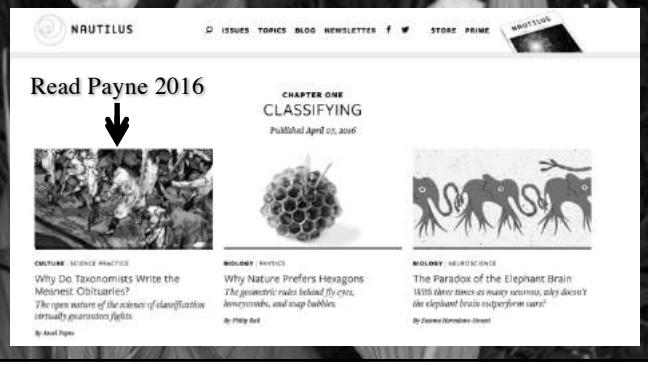
Nomenclature – what's in a name?



Read Payne 2016

Nomenclature – what's in a name?

Cypripedium reginae

Cypripedium hirsutum

Cypripedium speciabile

showy lady's-slipper

queen lady's-slipper

Nomenclature - Using Names

Two of the goals for Systematics:

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

Plantae	Kingdom
Magnoliophyta	Phylum
Liliopsida	Class
Asparagales	Order
Orchidaceae	Family
Cypripedium	Genus
Cypripedium acaule	Species

Hierarchical classification

Cypripedium acaule
Stemless lady slipper

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

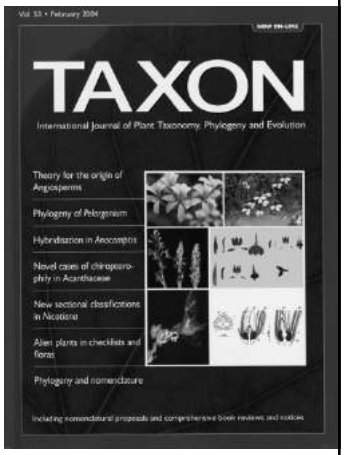
- all species need names
- uniform system of naming to avoid confusion
- facilitates information - retrieval

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

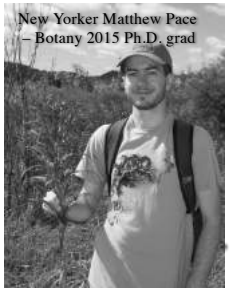
Podophyllum peltatum - "umbrella foot leaf"

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?

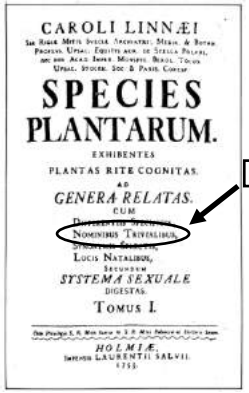
Carolus Linnaeus on a field trip - using polynomials – describing the New York ironweed

Serratula foliis lanceolato oblongis serratis pendulis

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

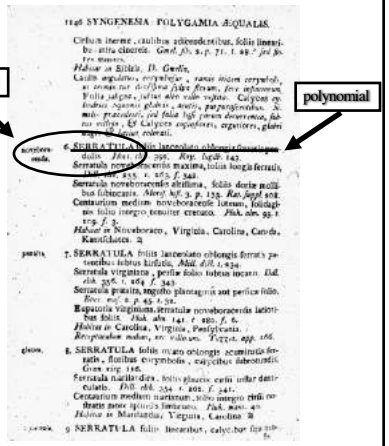
Scientific Names

Scientific names - why binomials?



Scientific Names

Scientific names - why binomials?



Which would you rather learn?

Serratula foliis lanceolato oblongis serratis pendulis

or

Serratula noveboracensis

Scientific Names

The species name – 2 names

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

Scientific Names

The scientific name - 3 names

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

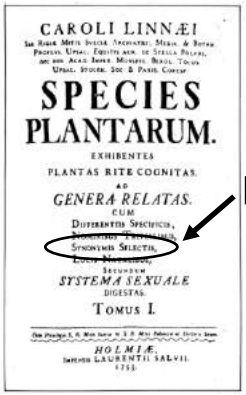
Species name: *Serratula noveboracensis*

Authority: Linnaeus
• (abbreviated "L.") - the name of the person or persons who provided this binomial for this species

Serratula noveboracensis L.

Scientific Names

Synonyms - duplicate names



CAROLI LINNÆI

SPECIES PLANTARUM.

EXHIBENTES PLANTAS RITE COGNITAS, AD GENERA RELATAS. CUM DIFFERENTIIS SPECIFICIS, SYNONYMIS SELECTIS.

SECUNDUM SYSTEMA SEXUALE DIGESTAS.

TOMUS I.

HOLMIÆ, IMPENSIS LAURENTII SALVII. 1753.

synonym

Serratula noveboracensis L.
Vernonia noveboracensis (L.) Michx.

Scientific Names

Synonyms - duplicate names

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

Serratula tinctoria L.

Serratula noveboracensis L.
Vernonia noveboracensis (L.) Michx.

Vernonia noveboracensis (L.) Michx.

Authority = Michaux (came up with this binomial)

Parenthetical authority = Linnaeus (first used the specific epithet for this species)

Type Method

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

Type Method

So, how do you name a new species?

Melody thinks she 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 binomial not already taken

  Name after someone important?

C. obamaei X

C. sylvanae X

Cannabis trumpii

Type Method

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

- Find binomial not already taken
  Cannabis trumpii Sain
- Make a type specimen & deposit in Wisconsin State Herbarium
  Sain 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 – ?

Type Method

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

Type Method

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*

Type Method

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

Italian aster

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

Aster amellus - type species of the genus *Aster* AND family Asteraceae

Aster renaming

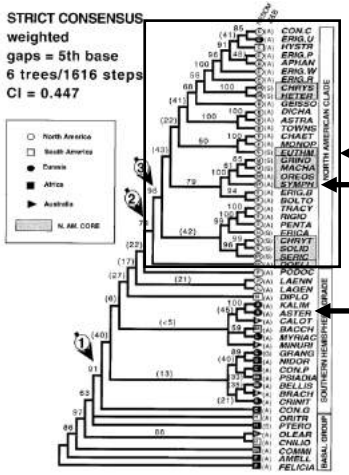
. . . and here the story gets messy!

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

Italian aster

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

Aster renaming



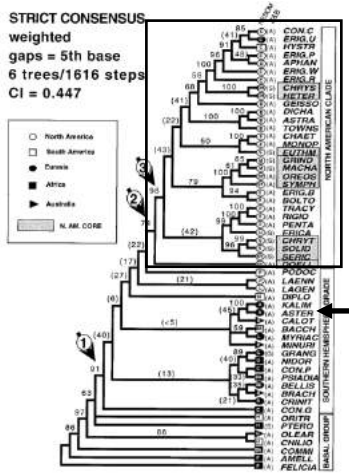
North American asters related to other North American genera

Aster novae-angliae – New England aster

Italian aster related to other genera in Eurasia

Aster amellus - *aster*

Aster renaming



Erigeron - daisy fleabane

Heterotheca - golden aster

Grindelia - gumweed

Solidago - goldenrod

Euthamia - grass-leaved goldenrod

Aster amellus - *aster*

Aster renaming

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.

Rules of Botanical Nomenclature

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:

Asteraceae	— — —	Compositae
Poaceae	— — —	Gramineae
Brassicaceae	— — —	Cruciferae
Apiaceae	— — —	Umbelliferae
Fabaceae	— — —	Leguminosae
Lamiaceae	— — —	Labiatae
Clusiaceae	— — —	Guttiferae
Arecaceae	— — —	Palmae

Rules of Botanical Nomenclature

2. Only one accepted name for a taxonomic group:

Vernonia noveboracensis (L.) Michx.

Others are synonyms:

Serratula noveboracensis L.

Rules of Botanical Nomenclature

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

Allium *Muilla* by Sereno Watson

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)

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

Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Cecropia

Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Pieris

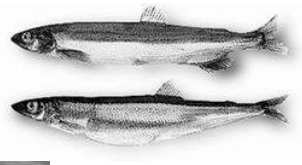
Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature

Anisoptera

Rules of Botanical Nomenclature

5. Botanical nomenclature independent from zoological nomenclature



Mallotus