

# Nomenclature – what's in a name?



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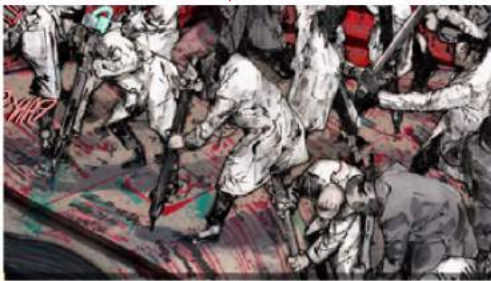


Read Payne 2016



## CHAPTER ONE CLASSIFYING

Published April 07, 2016



CULTURE | SCIENCE PRACTICE

Why Do Taxonomists Write the Meanest Obituaries?

*The open nature of the science of classification virtually guarantees fights.*

By Ansel Payne

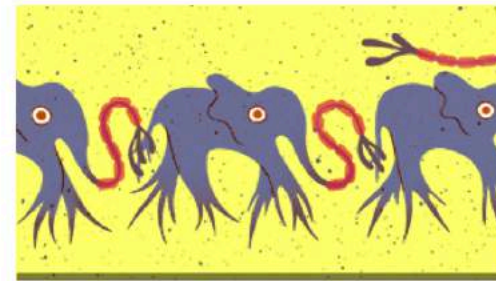


BIOLOGY | PHYSICS

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 Suzana Herculano-Houzel



# Nomenclature – what's in a name?

*Cypripedium reginae*

*Cypripedium hirsutum*

*Cypripedium spectabile*

showy lady's-slipper

queen lady's-slipper

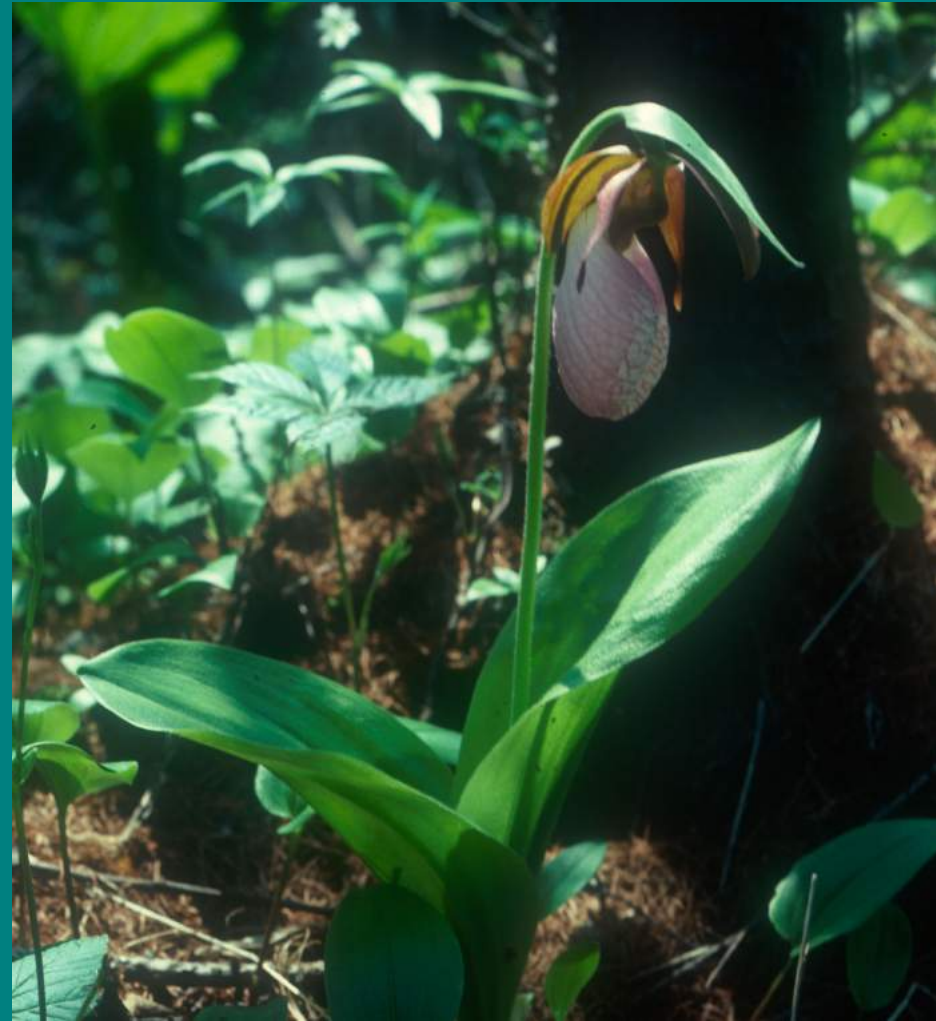
# Nomenclature - Using Names

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
<i>Cypripedium</i>	Genus
<i>Cypripedium acaule</i>	Species

Hierarchical classification



*Cypripedium acaule*  
Stemless lady slipper

# Common Names

## Advantages?

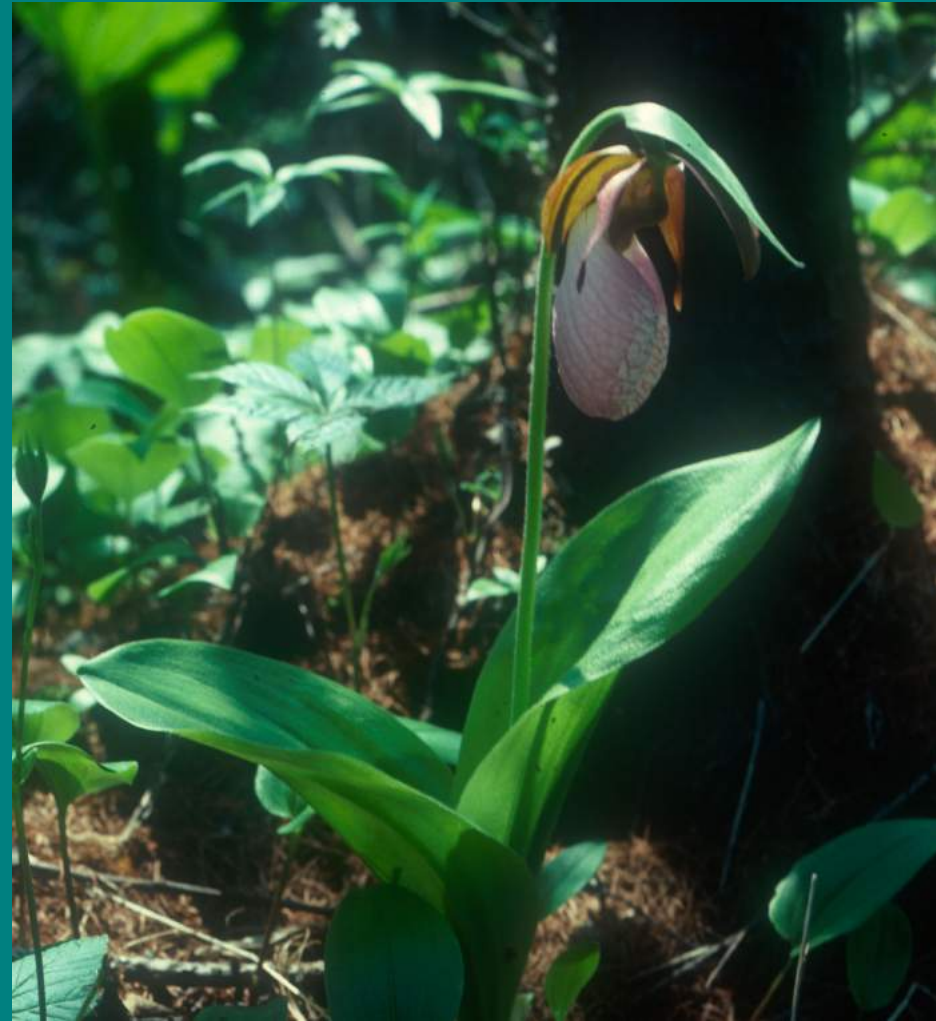
- descriptive, colorful
- easy to remember
- only names for most people

## Disadvantages?

- one species = many common names

Moccasin flower

Pink lady's slipper



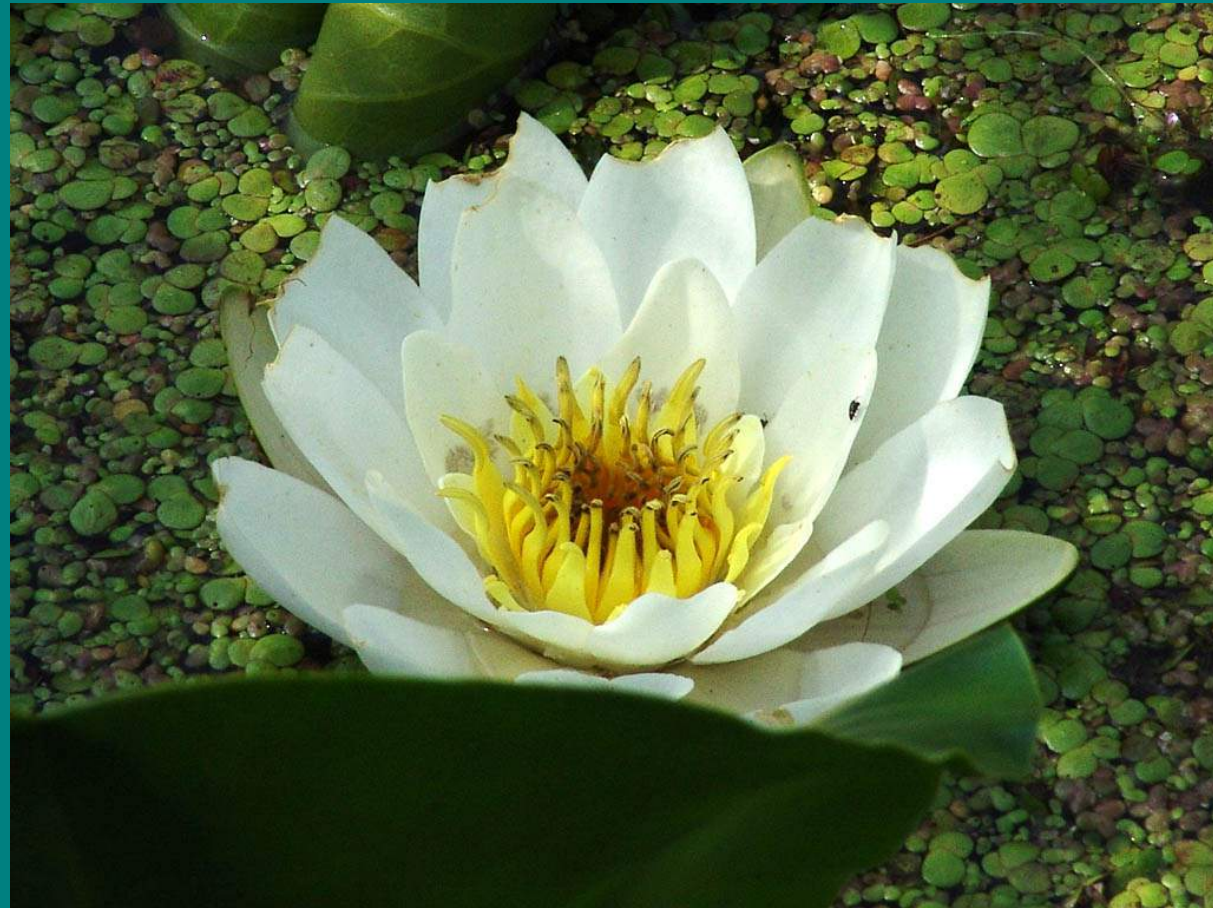
Stemless lady's slipper

# 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

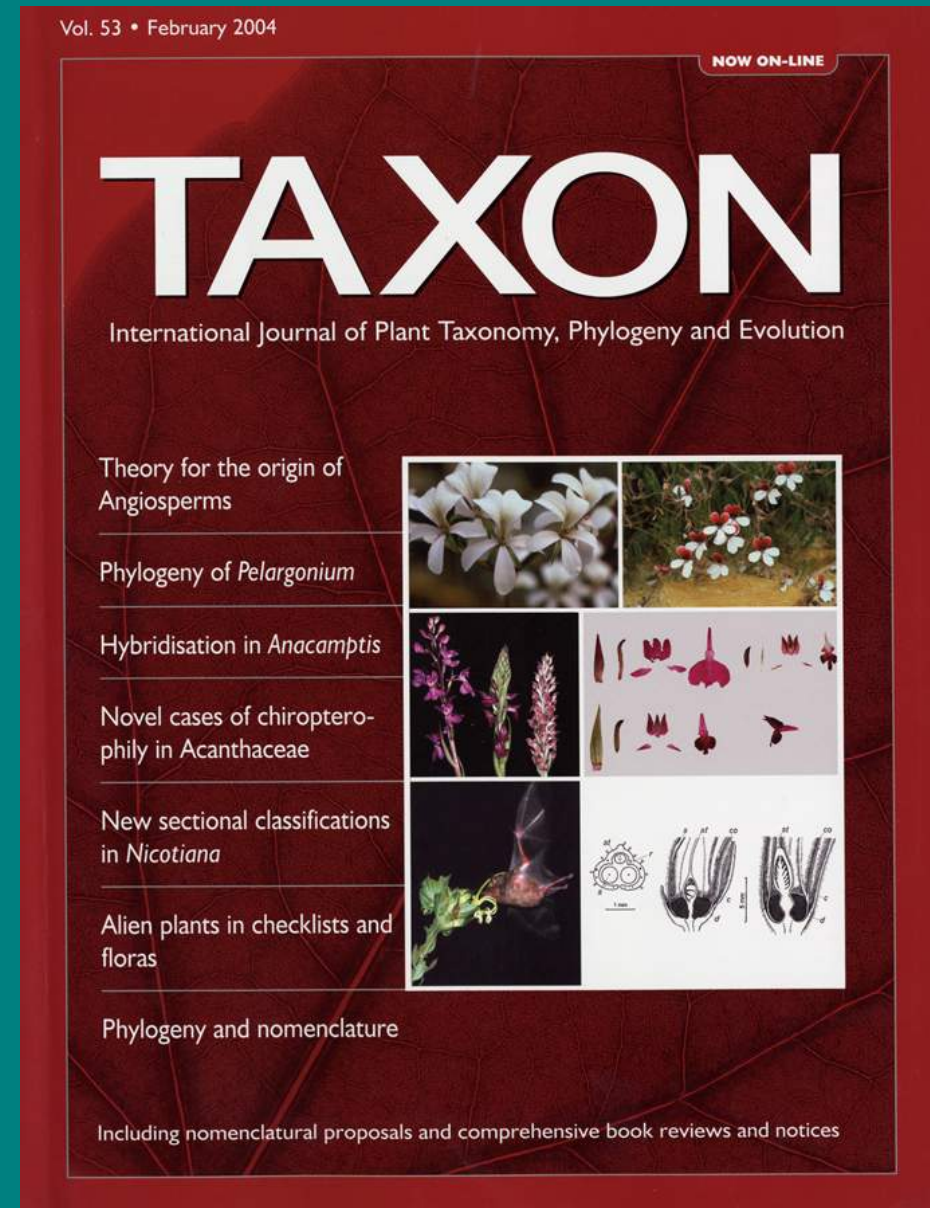


*Arabidopsis thaliana*

# 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”

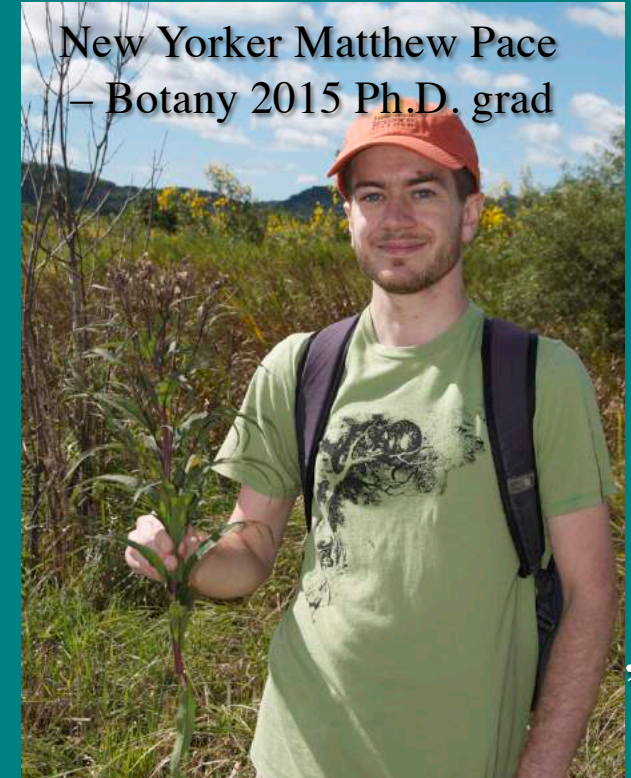


# Scientific Names

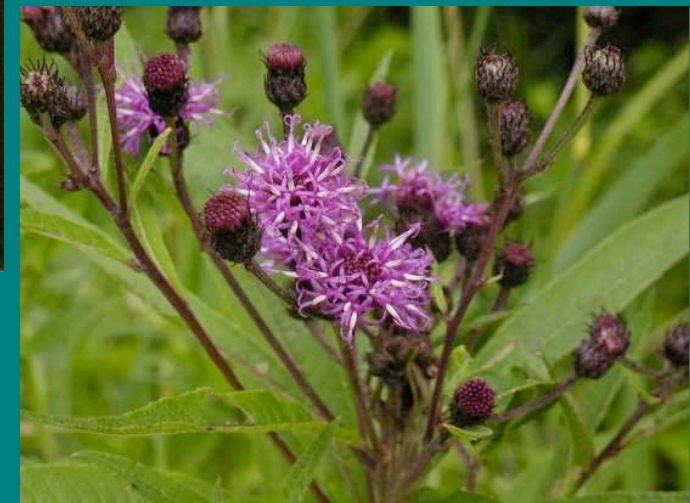
Scientific names - why **binomials**?



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



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





# Scientific Names

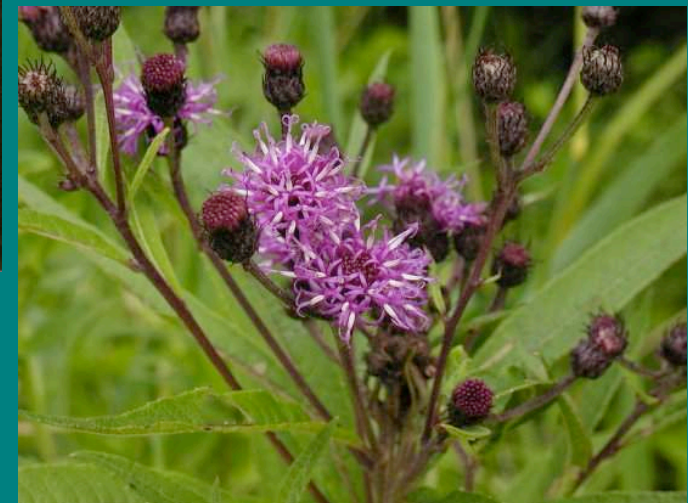
Scientific names - why **binomials**?



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

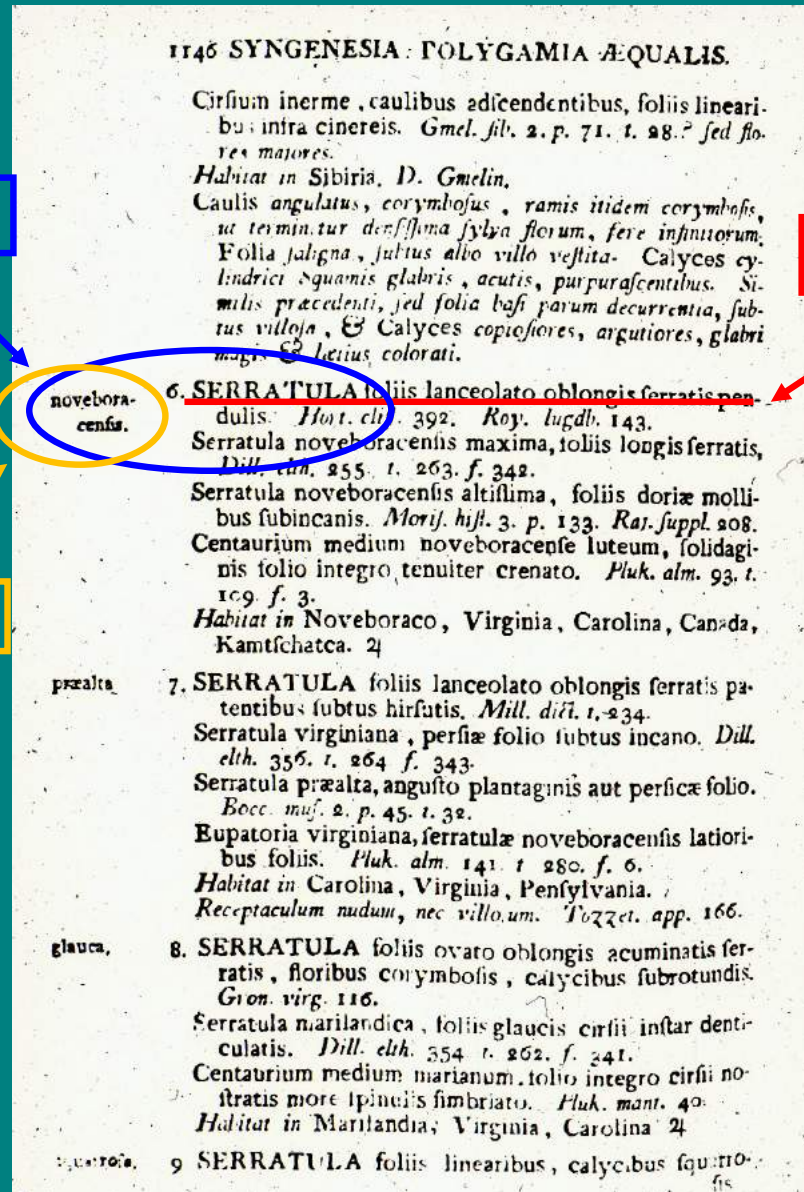
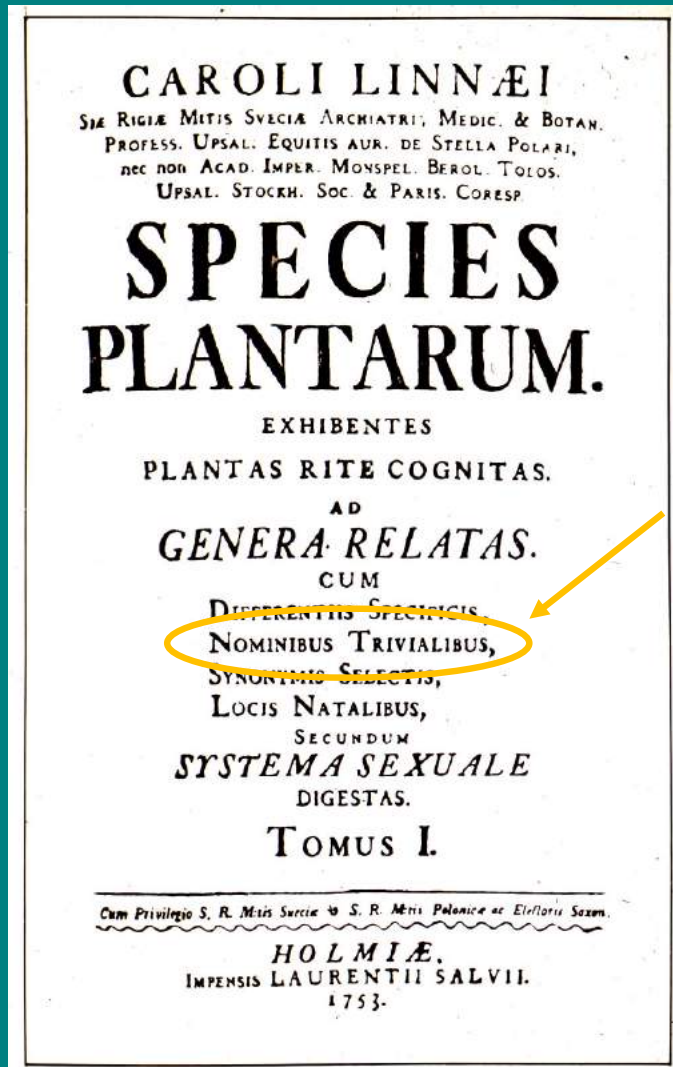
*Serratula foliis  
lanceolato oblongis  
serratis pendulis*

“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**?

binomial

polynomial

Which would you rather learn?

*Serratula foliis lanceolato oblongis serratis pendulis*

or

*Serratula noveboracensis*

## 1146 SYNGENESIA: POLYGAMIA AQUALIS.

Cirsium inerme, caulibus adscendentibus, foliis linearibus infra cinereis. *Gmel. fib. 2. p. 71. t. 28.?* sed foliis majores.

Habitat in Sibiria. D. Gmelin.

Caulis angulatus, corymbosus, ramis itidem corymbosis, ut terminatur densissima sylvia florum, fere infinitorum. Folia salsigna, subtus albo villo vestita. Calyces cylindrici squamis glabris, acutis, purpurascensibus. Similis precedenti, sed folia basi parum decurrentia, subtus villosa, & Calyces copiosiores, argutiores, glabri magis, & laetius colorati.

noveboracensis.

6. SERRATULA foliis lanceolato oblongis serratis pendulis. *Hort. cl. 392. Roy. Lugdb. 143.*

*Serratula noveboracensis maxima, foliis longis serratis.* *Dill. elh. 255. t. 263. f. 342.*

*Serratula noveboracensis altissima, foliis dorae molli- bus subincanis.* *Morij. hist. 3. p. 133. Raj. suppl. 208.*

*Centaureum medium noveboracense luteum, solidaginis folio integro tenuiter crenato.* *Pluk. alm. 93. t. 109. f. 3.*

Habitat in Noveboraco, Virginia, Carolina, Canada, Kamtschatca. 2

præalta

7. SERRATULA foliis lanceolato oblongis serratis patentibus subtus hirsutis. *Mill. dict. 1. 234.*

*Serratula virginiana, persicæ folio subtus incano.* *Dill. elh. 355. t. 264. f. 343.*

*Serratula præalta, angusto plantaginis aut persicæ folio.* *Bocc. mus. 2. p. 45. t. 32.*

*Eupatoria virginiana, serratulæ noveboracensis latioribus foliis.* *Pluk. alm. 141. t. 280. f. 6.*

Habitat in Carolina, Virginia, Pennsylvania. *Receptaculum nudum, nec villosum.* *Tozzet. app. 166.*

glauca.

8. SERRATULA foliis ovato oblongis acuminatis serratis, floribus corymbosis, calycibus subrotundis. *Gron. virg. 116.*

*Serratula marilandica, foliis glaucis cirsii instar denticulatis.* *Dill. elh. 354. t. 262. f. 241.*

*Centaureum medium marianum, folio integro cirsii nostratis more spinulis simbriato.* *Pluk. mant. 40.*

Habitat in Marilandia, Virginia, Carolina. 2

quadrifida.

9. SERRATULA foliis linearibus, calycibus squarosis.

# 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*

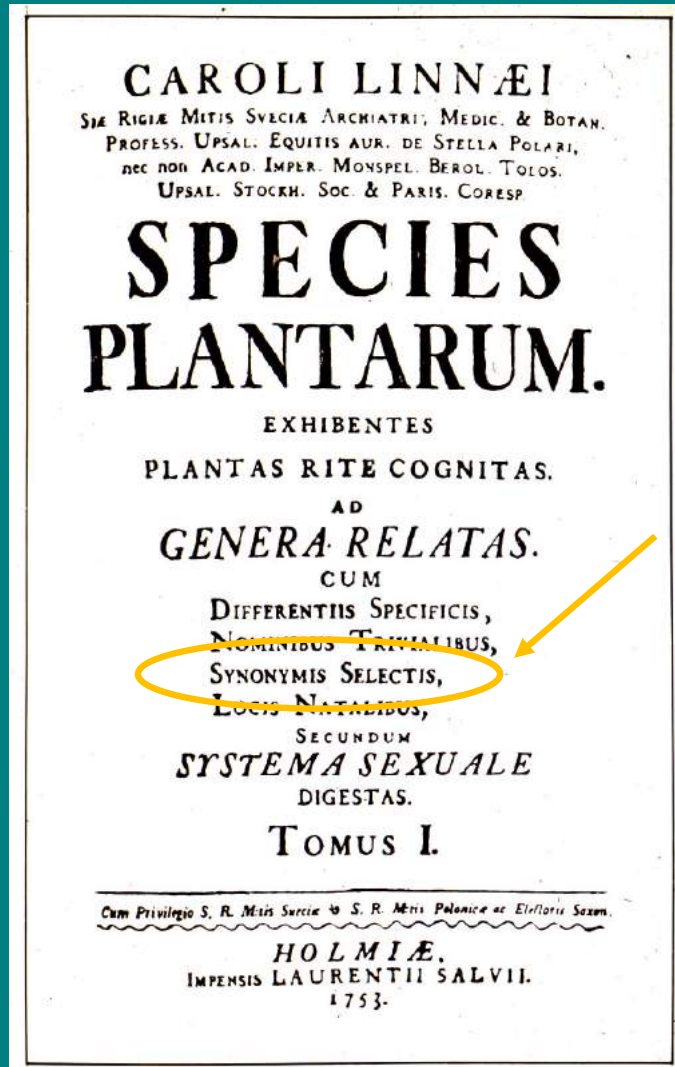
**Authority:** Linnaeus

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



# Scientific Names

Synonyms - duplicate names



synonym

# Scientific Names

**Synonyms** - duplicate names

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



*Serratula tinctoria* L.



*Vernonia noveboracensis* (L.)  
Michx.

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

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



*Serratula noveboracensis* L.

*Vernonia noveboracensis* (L.) Michx.

# Type Method

Because of synonymy - 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 – 3<sup>rd</sup> 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

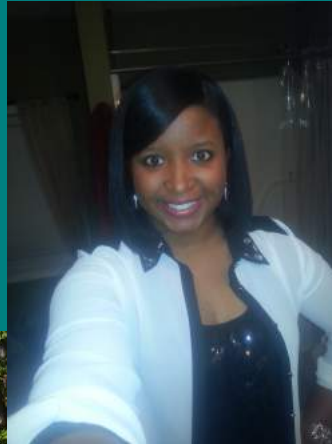
----**type**: other specimens to replace holotype when lost or unknown



# 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. ob*~~X~~*naei*



*C. sy*~~X~~*mae*



*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  $\neq$  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



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



**Italian aster**

*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*



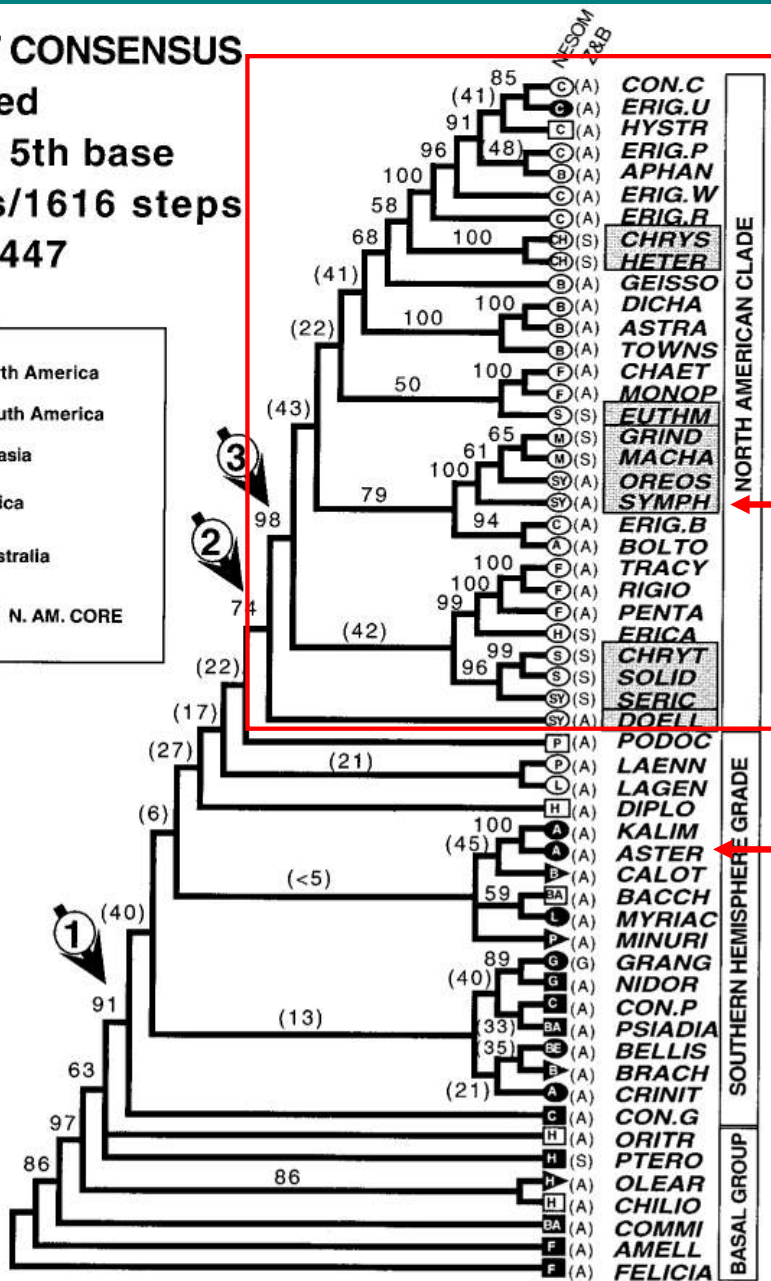
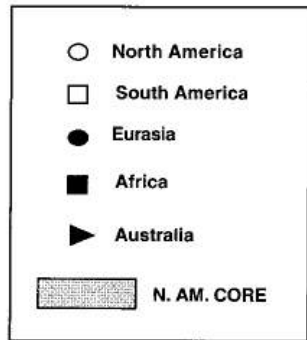
Italian aster



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

# Aster renaming

STRICT CONSENSUS  
weighted  
gaps = 5th base  
6 trees/1616 steps  
CI = 0.447



North American asters related to **other North American genera**



*Aster novae-angliae* – New England aster

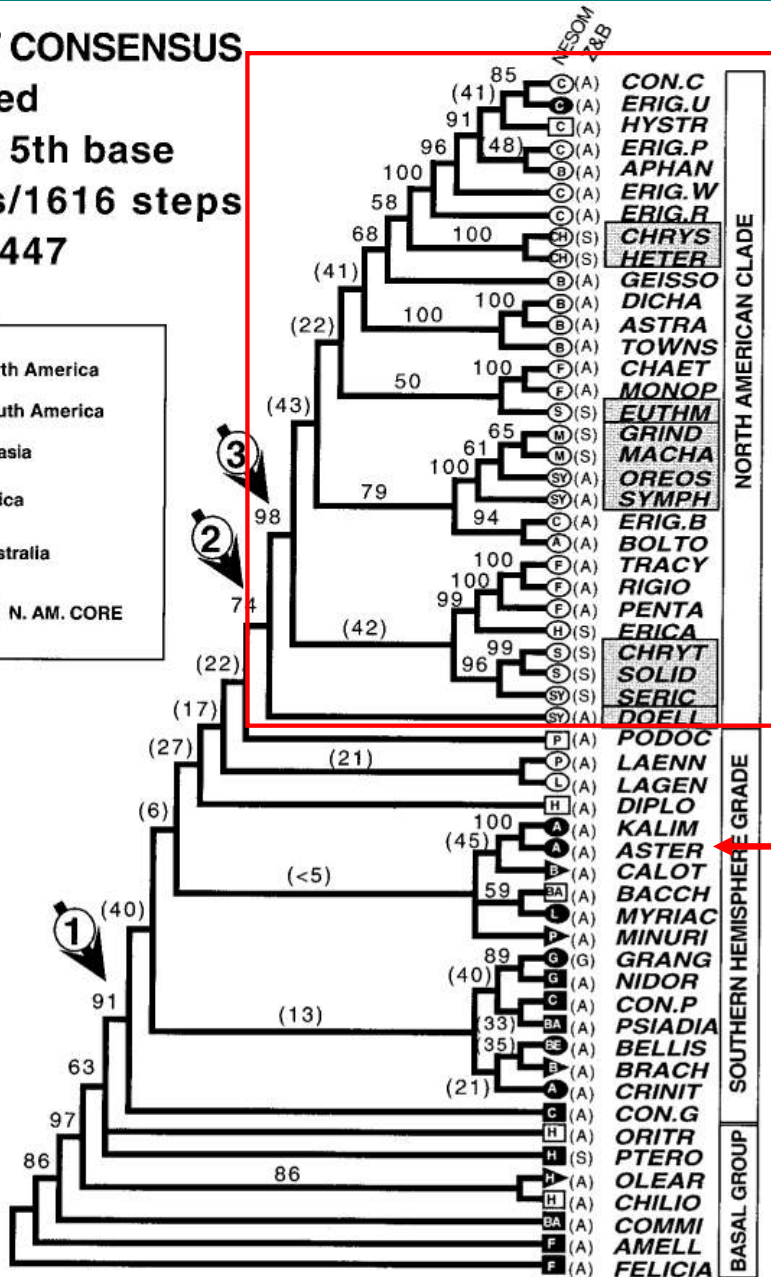
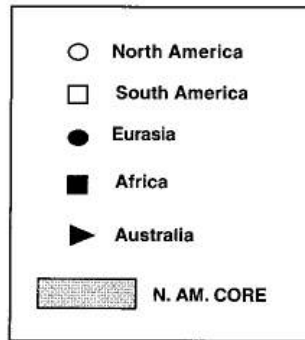
Italian aster related to **other genera in Eurasia**



*Aster amellus* - aster

# Aster renaming

STRICT CONSENSUS  
weighted  
gaps = 5th base  
6 trees/1616 steps  
CI = 0.447



*Erigeron - daisy fleabane*



*Heterotheca - golden aster*



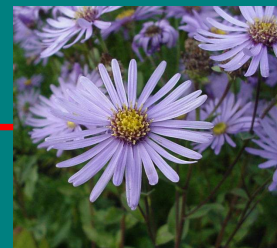
*Grindelia - gunweed*



*Solidago - goldenrod*



*Euthamia - grass-leaved goldenrod*



*Aster amellus - aster*

# Aster renaming



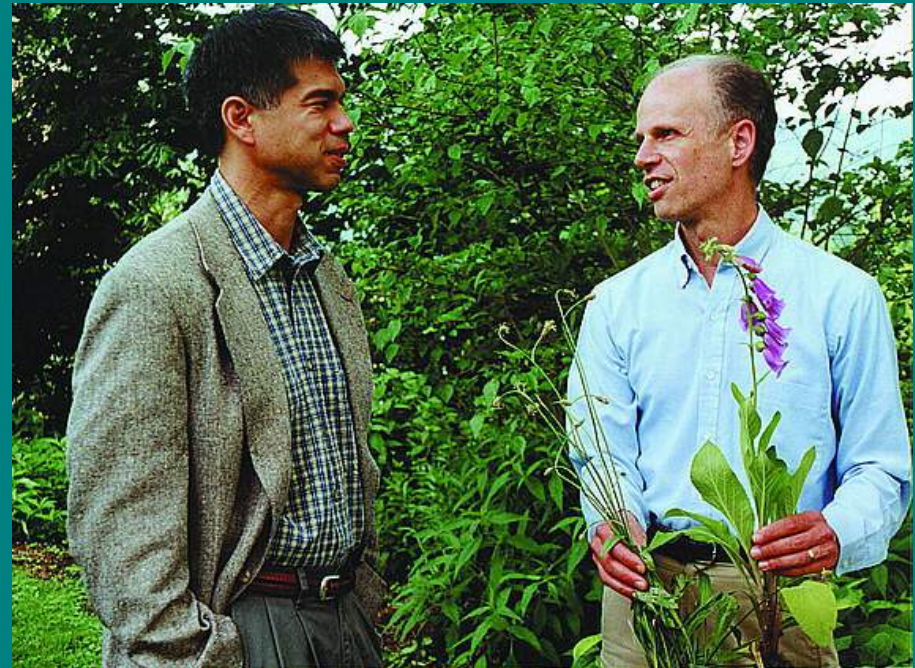
*Aster novae-angliae* L.  
(New England aster)

= *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
Areaceae	— — —	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*)



<i>Penstemon brachyanthus</i> Bauhin	1688
<i>Penstemon formosus</i> Linnaeus	1753
<i>Penstemon micranthus</i> Nutt.	1829
<i>Penstemon procerus</i> Gray	1835
<i>Penstemon tolmiei</i> 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

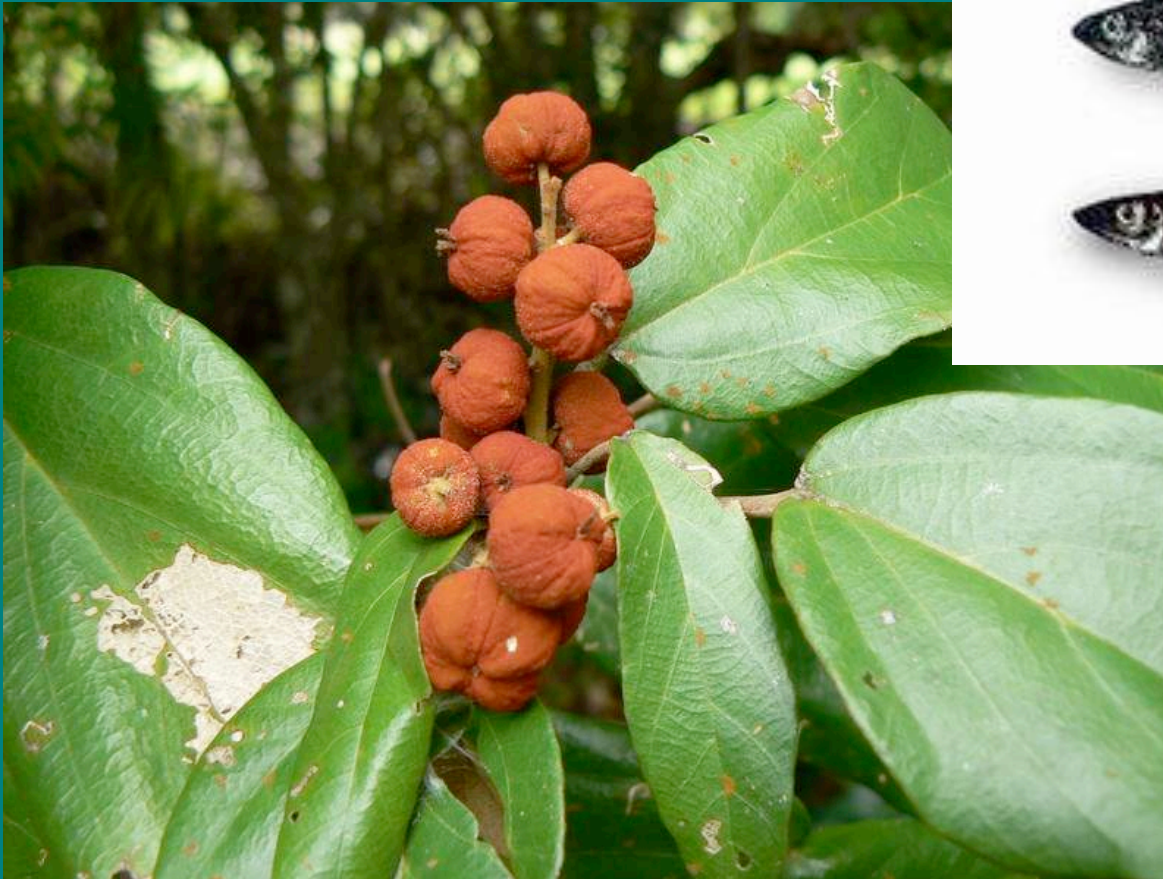


*Anisoptera*



# Rules of Botanical Nomenclature

5. Botanical nomenclature  
**independent** from zoological  
nomenclature



*Mallotus*