

Topic 01 Introduction to Plant Systematics



I. What is Systematics?

A. Definition & Objectives

1. Study of biodiversity and its many facets
 - diversity & distribution of its species and other taxa
 - evolutionary history
 - taxonomic classification
 - uses (ethnobotany / economic botany)



I. What is Systematics?

B. Important products

1. Taxa (species, genera, families, etc.)
2. Taxonomic Keys
3. Taxonomic monographs & floras (manuals, field guides)



I. What is Systematics?



B. Important products

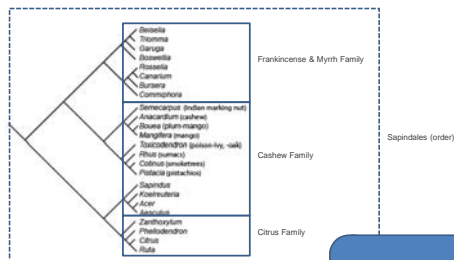
1. Taxa (species, genera, families, etc.)
2. Taxonomic Keys
3. Taxonomic monographs & floras (manuals, field guides)
4. Phylogenies & phylogenetic methods

Primary use of phylogenies in systematics: doing taxonomy



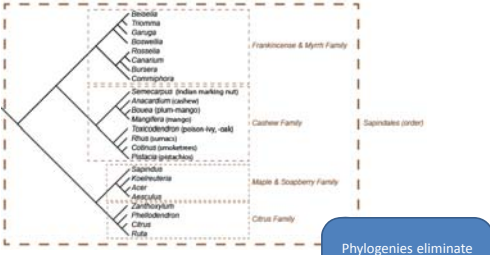
How to classify these 24 genera ?

A bad taxonomy because it misrepresents the phylogeny



Phylogenies eliminate some possibilities and help identify plausible alternatives.

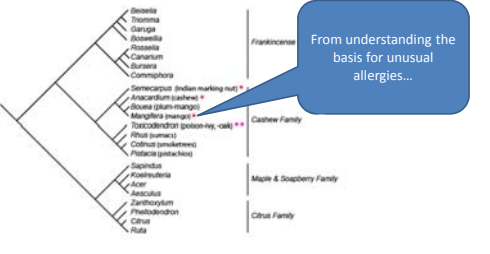
Good taxonomy



Phylogenies eliminate some possibilities and help identify plausible alternatives.

The diagram shows a phylogenetic tree of the Sapindales order. The tree is rooted on the left and branches out to the right. The branches are labeled with various genera and families. A dashed box encloses the tree, and a callout box points to it with the text: "Phylogenies eliminate some possibilities and help identify plausible alternatives." The tree is organized into several groups: Frankincense & Myrrh Family (including Buxus, Trichema, Garrya, Boswellia, Rosellea, Canarium, Bursera, Commiphora), Cashew Family (including Semeocarpus (Indian marking nut), Anacardium (cashew), Bixa (dium mango), Mangifera (mango), Toxicodendron (poison ivy, oak), Rhus (sumac), Colinus (smoketree), Pistacia (gum arabic)), Maple & Soapberry Family (including Sapindus, Rhus, Acer, Anacardium, Zanthoxylum, Phellodendron, Citrus), and Citrus Family (including Citrus, Ruta).


Broader impacts of phylogenies:



From understanding the basis for unusual allergies...

The diagram shows a phylogenetic tree of the Sapindales order, similar to the one in the first slide. A callout box points to the branch leading to the Cashew Family with the text: "From understanding the basis for unusual allergies...".

Broader impacts of phylogenies:

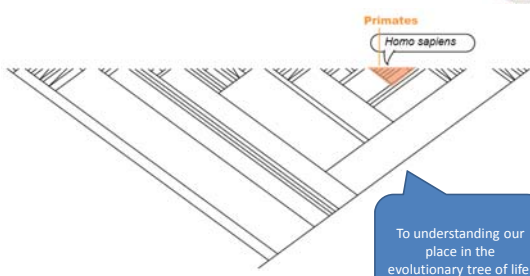


Homo sapiens

To understanding our place in the evolutionary tree of life.

The diagram shows a phylogenetic tree of the tree of life, with a callout box pointing to the branch leading to Homo sapiens with the text: "To understanding our place in the evolutionary tree of life." The tree is rooted on the left and branches out to the right, showing the relationships between various groups of organisms.

Broader impacts of phylogenies:

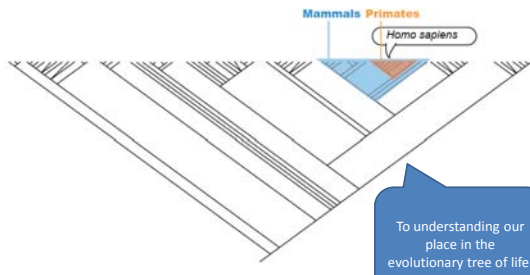


Primates
Homo sapiens

To understanding our place in the evolutionary tree of life.

The diagram shows a phylogenetic tree with a circular inset in the top right corner. A specific lineage is highlighted in orange, starting from a common ancestor and leading to a node labeled 'Primates'. From this node, a single branch leads to a terminal node labeled 'Homo sapiens'.

Broader impacts of phylogenies:

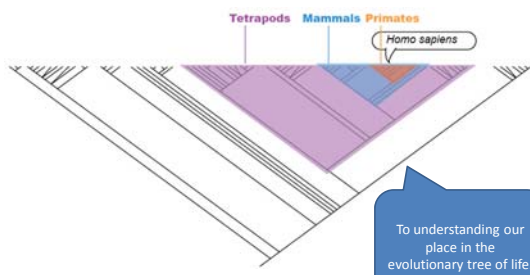


Mammals Primates
Homo sapiens

To understanding our place in the evolutionary tree of life.

The diagram shows a phylogenetic tree with a circular inset in the top right corner. A lineage is highlighted in blue, starting from a common ancestor and leading to a node labeled 'Mammals Primates'. From this node, a single branch leads to a terminal node labeled 'Homo sapiens'.

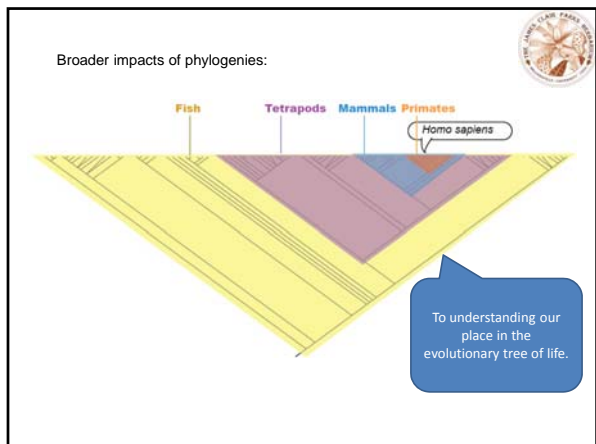
Broader impacts of phylogenies:



Tetrapods Mammals Primates
Homo sapiens

To understanding our place in the evolutionary tree of life.

The diagram shows a phylogenetic tree with a circular inset in the top right corner. A lineage is highlighted in purple, starting from a common ancestor and leading to a node labeled 'Tetrapods Mammals Primates'. From this node, a single branch leads to a terminal node labeled 'Homo sapiens'.



I. What is Systematics?

C. Terms

1. Plant Systematics = Systematic Botany

I. What is Systematics?


C. Terms

1. Plant Systematics = Systematic Botany
2. Plant Systematist = Systematic Botanist

II. Herbaria

A. Herbarium specimens & important herbaria

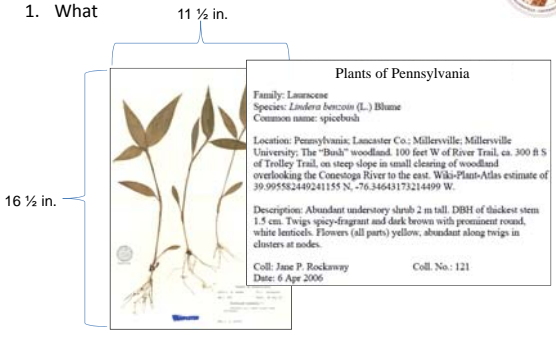
1. What



II. Herbaria

A. Herbarium specimens & important herbaria

1. What



11 1/2 in.

16 1/2 in.


Plants of Pennsylvania

Family: Lauraceae
Species: *Lindera benzoin* (L.) Blume
Common name: spicebush

Location: Pennsylvania, Lancaster Co.: Millersville, Millersville University; The "Bush" woodland, 100 feet W of River Trail, ca. 300 ft S of Trolley Trail, on steep slope in small clearing of woodland overlooking the Conestoga River to the east. Wiki-Plant-Atlas estimate of 39.995582449241155 N, -76.34643173214499 W.

Description: Abundant understory shrub 2 m tall. DBH of thickest stem 1.5 cm. Twigs spicy-fragrant and dark brown with prominent round, white lenticels. Flowers (all parts) yellow, abundant along twigs in clusters at nodes.

Coll: Jane P. Rockaway Date: 6 Apr 2006 Coll. No.: 121



II. Herbaria



II. Herbaria



2. Important herbaria (after Index Herbariorum)

- MVSC (ca. 15 thousand)
- P (8 million)
- NY (7.3 million)
- K (7 million)
- MO (5.9 million)
- US (4.3 million)

II. Herbaria



3. Zoological analogs of herbaria



II. Herbaria

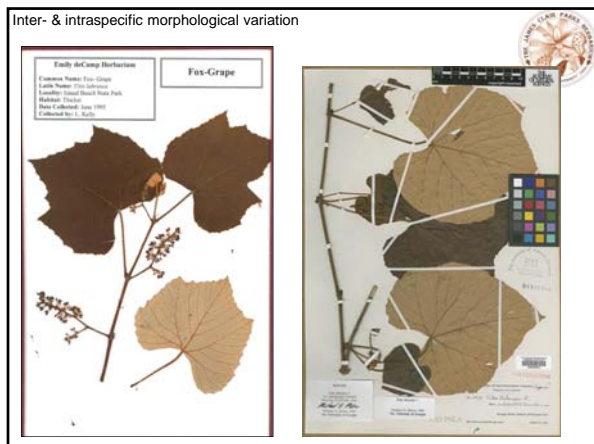


B. Use of specimens

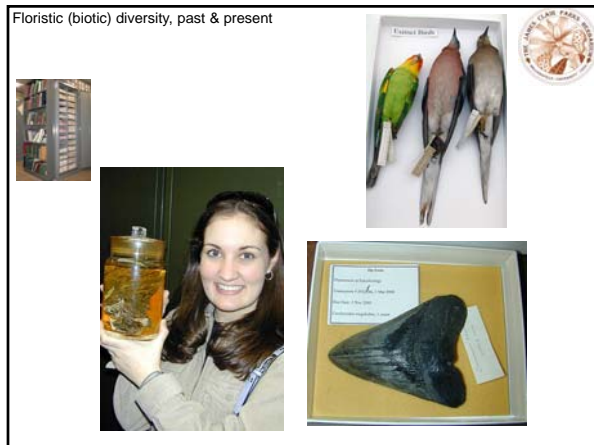


1. document patterns of morphological and geographical variation in plant diversity: past, present, and future

Inter- & intraspecific morphological variation



Floristic (biotic) diversity, past & present







II. Herbaria

B. Use of specimens

2. the basis for new species descriptions and other taxonomic studies.

PhytoKeys 13:5–14 (2012)
doi:10.3897/phytokeys.13.2670
www.phytokeys.com

RESEARCH ARTICLE

PhytoKeys
International Journal of Open Access Taxonomic Research

Two new species of Gingers (Zingiberaceae)

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Corresponding author: Vinita Goudil

ACKNOWLEDGEMENTS. We would like to thank the faculty and staff at the following herbaria for providing loans or facilitating herbarium visits or fieldwork required for this study: AAU, AMAZ, B, BH, BM, CAS, COL, CR, CUZ, DUKE, E FTG, GH, HBG, HUA, K, M, MICH, MO, NY, PMA, QCA, QCNE, S, SEL, STRI, TEX, U, UC, US, and USM. Tana Acton provided the illustrations (excluding the seeds) for *Plexamianthus perforans*. Alice Tangerini provided the illustration of the flower for *P. grandifolius*. Douglas Daly kindly provided the photograph used for Figure 12C. Urs Jauch assisted with the scanning electron microscopy of stigmas. Deborah Bell, David Brenner, Robert Dressler and the late

This is what the new species look like....

Description. Medium herb to 85 to 130 cm in height; rhizomes compact, yellow internally, with numerous white tubers (yellow internally). Leafy shoots loosely clumped, disarticulating during dry season, 3 to 5-leaved, with basal sheaths green with red speckles, glabrous, 20–22 × 4–5 cm. Plane of distichy parallel to rhizome. Leaves 60–70 cm in length, glabrous and coriaceous; petiole 19–23 0.7–0.8 cm, glabrous, green with small red speckles, deeply grooved in cross-section, margin entire, smooth; ligule medium-sized, 1.5–3.2 cm in length, bi-lobed, thin and translucent, pale yellow green, glabrous; blade 43–49 × 17–20 cm, narrowly ovate, midrib below green with sparse red speckles, glabrous, base cordate, subequal, apex caudate, adaxial surface dark green. Inflorescence terminal on relatively long leafy shoot, erect 19–25 cm in height; peduncle 2–5 cm in length, glabrous, green to deep maroon red; rachis short; inflorescence bracts 25–30 per inflorescence, 2.4–2.9 × 2.5–3.4 cm, spirally arranged and imbricate, each fused at base to adjacent members ("pouched"), 40–50° from vertical axis, glabrous, green basally to deep red maroon distally; no coma. Cincinni one per bract containing 3–4 flowers, maturing from base to apex of inflorescence; bracteoles not tubular, 13–15 × 4–6 mm, translucent,

This is how to tell the new species apart (a dichotomous key)....

- Key to Species of Geogomphium*
1. Leaf lamina variegated above, strongly bullate (resembling see-sucker fabric) ... *G. poopygigi*
 1. Leaf lamina neither variegated and not bullate
 2. Aerial shoots terminated by a single (rarely 2) rotund leaf, stems prostrate to very weakly ascending *G. calista*
 2. Aerial shoots ending in a rosette of 3 or typically more leaves, lamina elliptic, stems usually distinctly erect
 3. Pedicels short (less than 5 mm long), inflorescence with > 2 alternate cincinni *G. braggadoculatus*
 3. Pedicels very long (> 15 mm long), inflorescence with 1-2 terminal cincinni *G. rizzardi*

This is where they grow and where you'll find them....



II. Herbaria

B. Use of specimens

3. teaching aids,



II. Herbaria

B. Use of specimens



- 4. reference specimens for applications requiring accurate species identification (e.g., forensics or taxonomic and floristic surveys)



II. Herbaria

B. Use of specimens



- 4. reference specimens for applications requiring accurate species identification (e.g., forensics or taxonomic and floristic surveys)

January 15, 2009

advice:
Stay inside today

Wind chill of minus 20 predicted tonight

BY DEN KRAFF

By Monday high temperatures should be just below freezing. All but the most rugged of birds, those that probably have wintered in the mountains, probably should stay in their nests or huddle up to the birds remaining.

A flock of mountain bluebirds is expected to stay until at least 10. But with winds blowing to the west, the birds are still best observed in the mountains.

The temperature tonight will dip to about zero, with a wind chill equivalent of about zero.

Tom Smith, chief of the Idaho Department of Fish and Game, said that the birds are still in the mountains.

"The temperature can drop to about 10 below zero, but the birds are still in the mountains," Smith said. "The birds are still in the mountains."

People who are interested in birds should check the weather report and avoid the mountains.

The birds are still in the mountains and are still in the mountains.

The birds are still in the mountains and are still in the mountains.

From HealthWatch

On with the show

Page B1

bonsai

Pruning is a small part of maintaining these artistic plantings

Page A4

Wing and a prayer

Pilot puts disabled plane in river; all survive



Passengers standing on the wreckage of a jetliner that ditched in the water. New York's Hudson River Thursday will be picked up by a ferry.

BY DANIEL R. CARRON — based on Charles O'Connell's report for the New York Times. Photo by AP/Wide World.

and MASHA ZHANKINA — took of both during the flight. The jetliner was on the Hudson River, a passenger.

III. Lecture vs. Lab



A. Lecture

- Theory and practice of systematics
- Principles of Taxonomy & Classification
- The Pennsylvania Flora
- Familiarization with important families & higher taxa

B. Lab

- Use of keys to ID species
- Principles & practice of key construction
- Genus & Family recognition
