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Palaeotrends

The structure of species, outcomes of speciation and the 'species problem': ideas for paleobiology

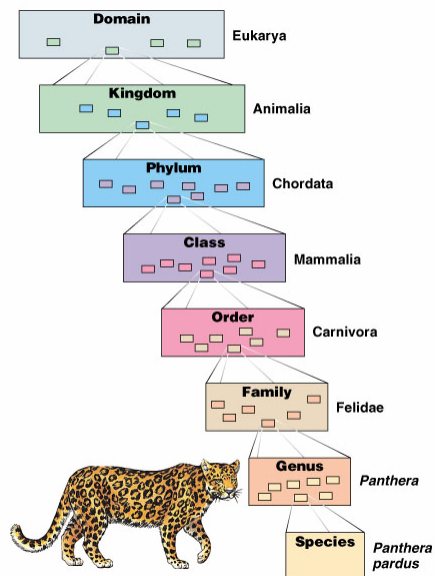
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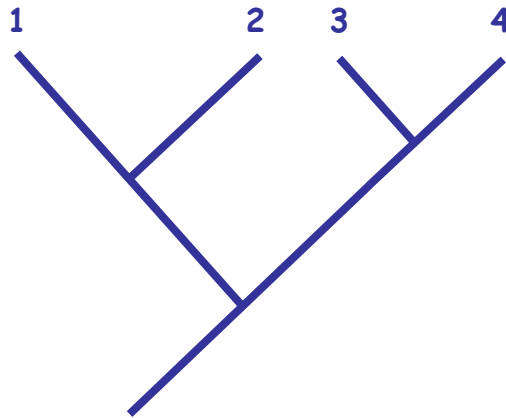
Abstract

Species as units: Taxonomy

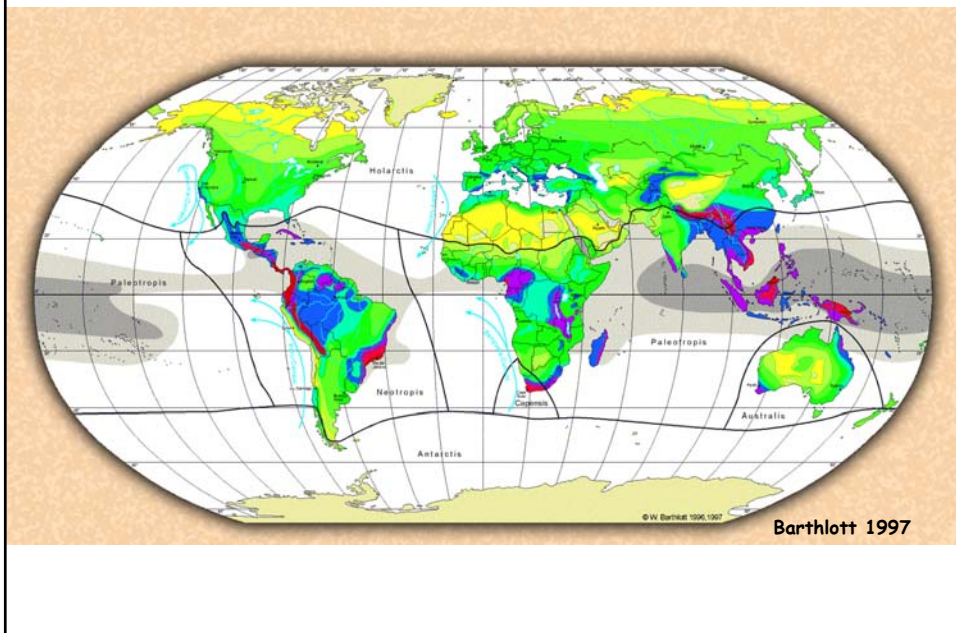


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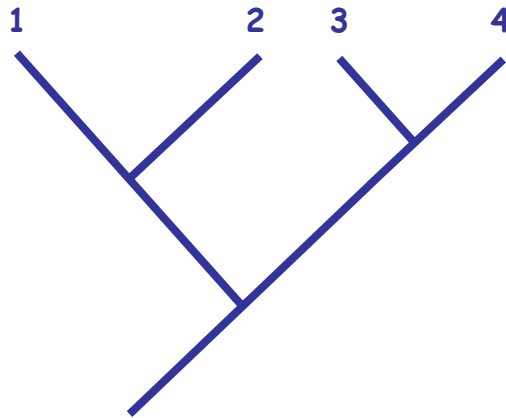
Species as units: Phylogenetics



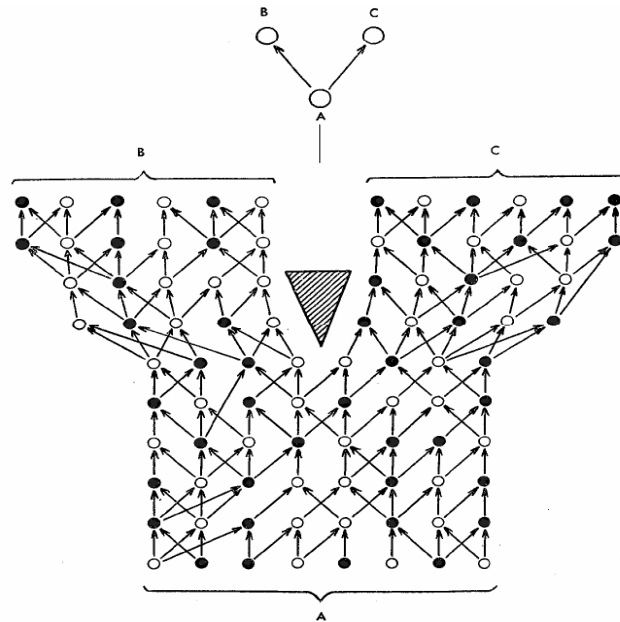
Species as units: Biodiversity Studies & Conservation



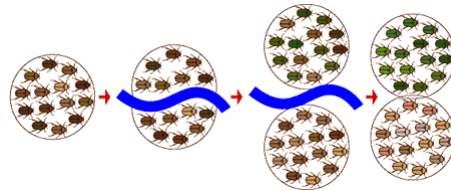
Speciation: A cladogram perspective



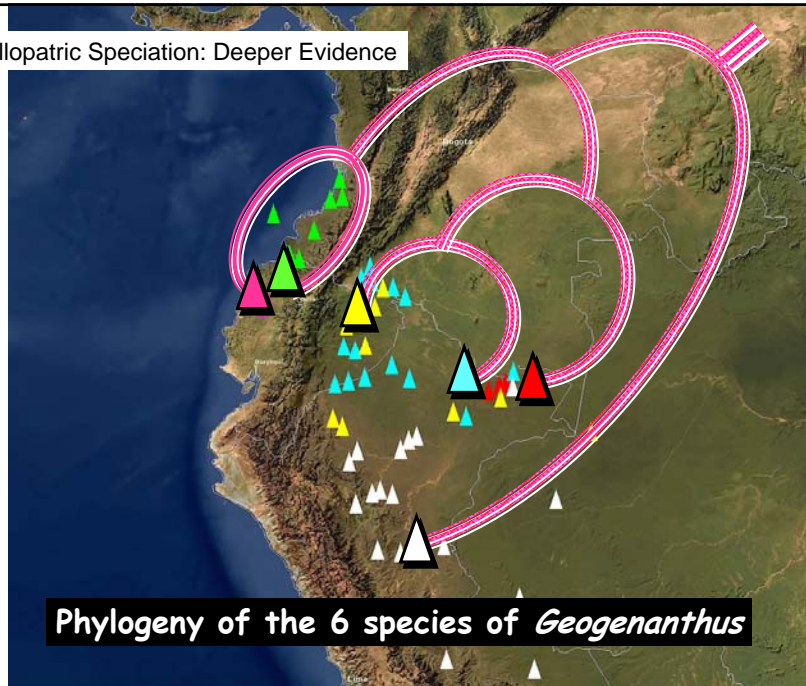
Speciation: A cladogram perspective



Geographic barriers to gene flow: e.g., vicariance



Allopatric Speciation: Deeper Evidence



Non-Geographic barriers to gene flow: e.g., ethological (involving pollination)

Mimulus cardinalis and *M. lewisii*



Mimulus cardinalis: hummingbird pollinated

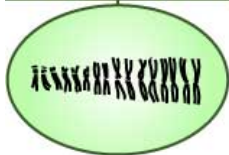


Photo: Jeff Abbas

Mimulus lewisii: bumblebee pollinated

Non-Geographic barriers to gene flow: e.g., polyploidy

Anemone



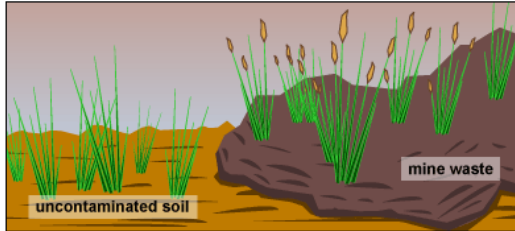
1.) Mistake during cell division in meristem (c-some duplication without mitosis or cytokinesis).
2n to 4n.

2.) 4n plants can mate with other 4n.
Offspring are 4n and fertile.

3.) 4n plants can mate with 2n plants.
But offspring are 3n. Irregular pairing of homologous c-somes during meiosis.
Offspring sterile.

4.) 4n plants are isolated from 2n plants.

Ecological Speciation: Evidence

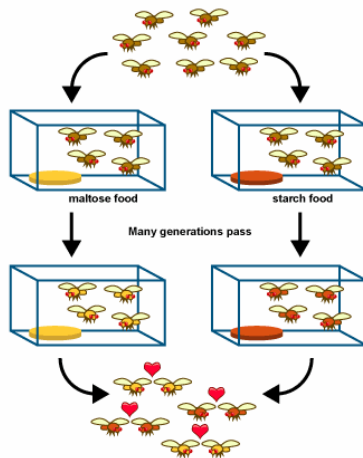


Although continuously distributed, different flowering times have begun to reduce gene flow between metal-tolerant plants and metal-intolerant plants.

Anthoxanthum odoratum



Ecology mediated geographic speciation: Evidence from empirical studies.
Dodd (1989)



1.) dispersal across or emergence of a barrier.

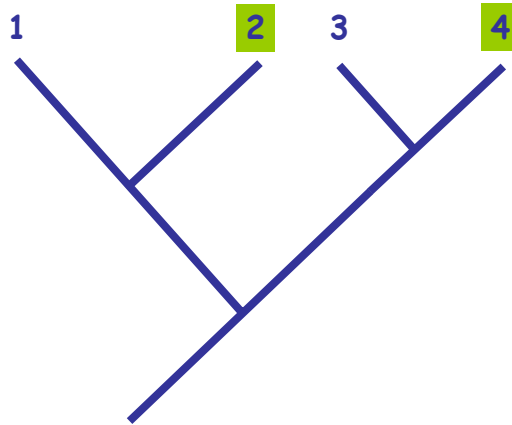
2.) change via drift or drift + selection.

Over generations, change in enzyme production.

Mating selection to restrict gene-flow.

3.) Remix, groups don't mix.

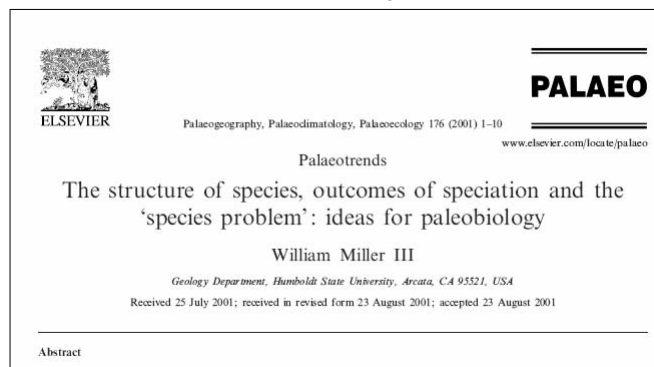
Allopatric Speciation: Evidence from Cladograms



III. Species concepts

A. Species as category vs. Species as concept vs. species as entities

-Vast and somewhat confusing literature.



III. Species concepts

A. Species as category vs. Species as concept vs. species as entities

-Vast and somewhat confusing literature.

“If we accept the assumption of most systematists and evolutionists that species are real things in nature, and if the sets of species specified by different concepts do not overlap, then it is reasonable to conclude that real entities of the world are being confused.”

Cracraft, 2000

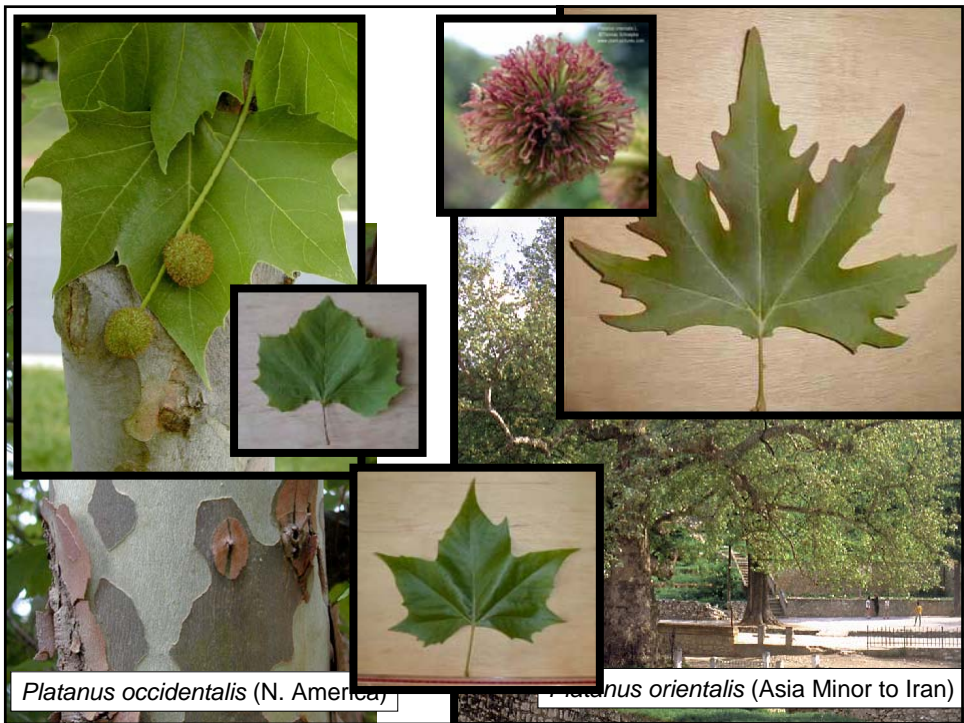
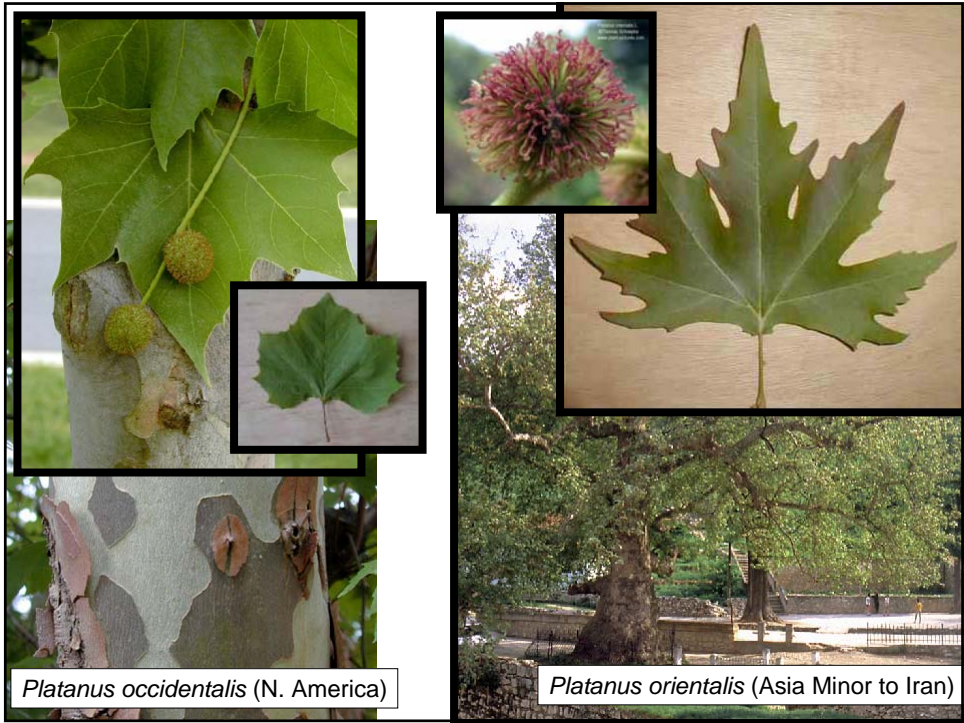
III. Species concepts

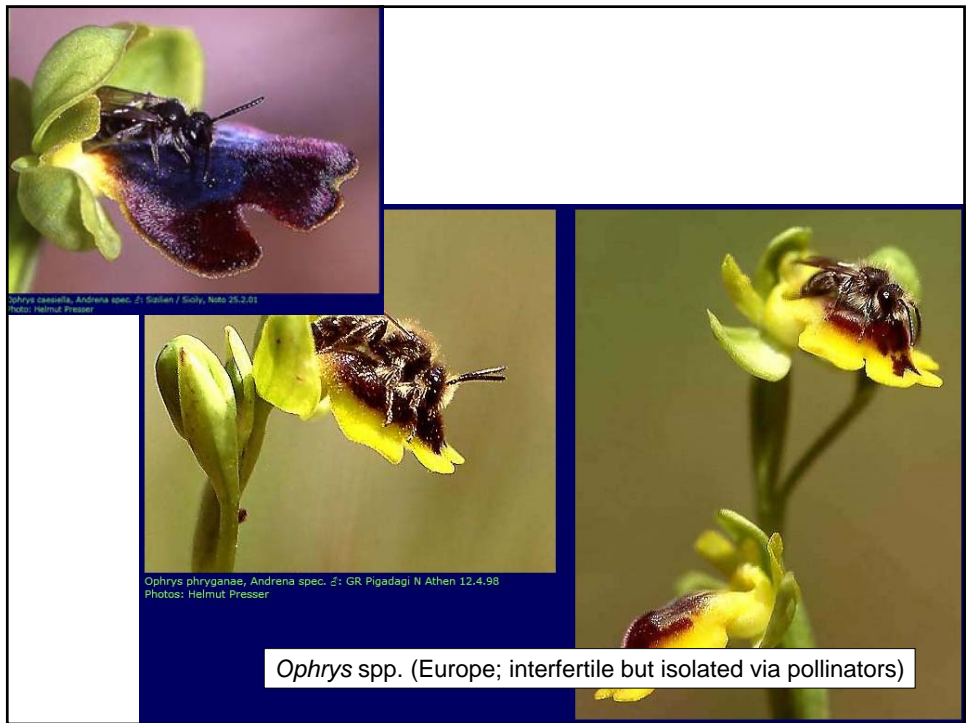
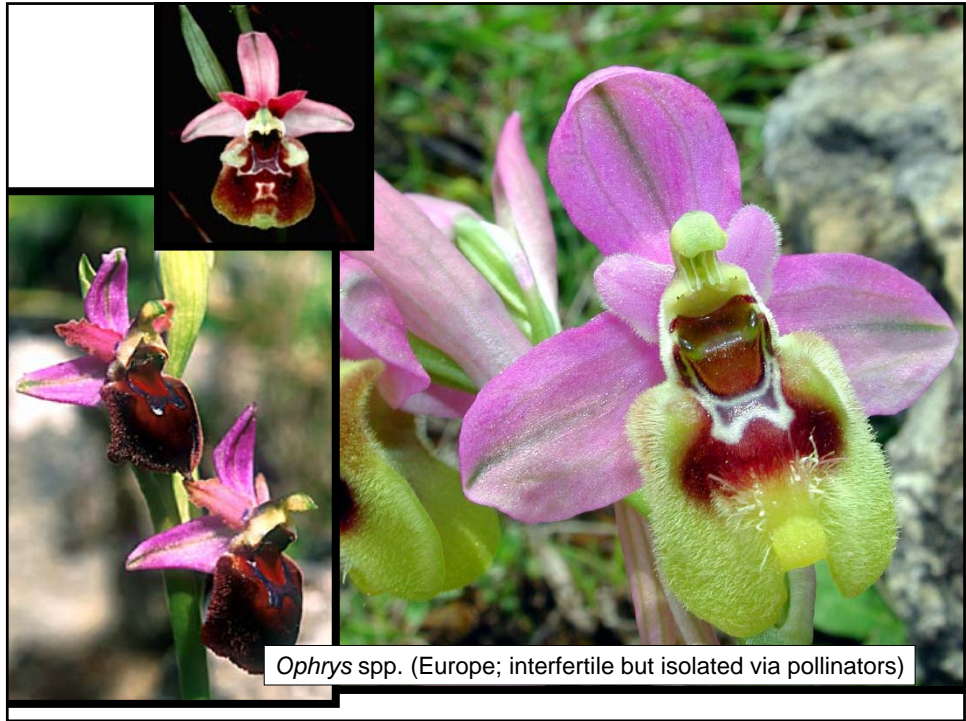
A. Species as category vs. Species as concept vs. species as entities

-Vast and somewhat confusing literature.

“The problem is that no single definition of the species category has proved optimal for all of its different uses. Consequently, although one definition or class of definitions has often come to be favored for a certain period of time or by a certain group of biologists, none of them has enjoyed universal endorsement within biology as a whole. This situation has come to be known as ‘the species problem’.”

de Queiroz, 1998



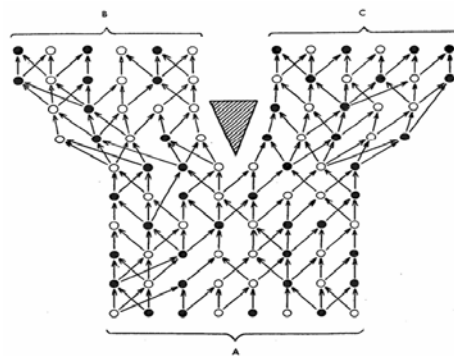




Ophrys arachniformis, Colletes concolorata 2: F 8, Cyr-sur-le-Rhône 3/95 Photo: Nicolas J. Veroncken

Ophrys spp. (Europe; interfertile but isolated via pollinators)

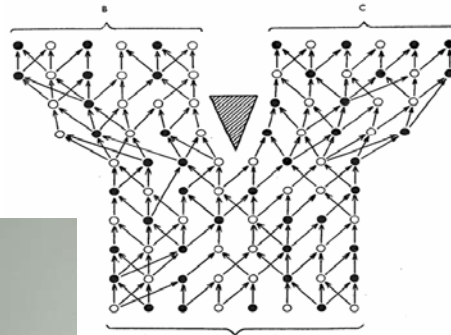
3) Phylogenetic Species Concept
Hennig (1950; 1966)



3) Phylogenetic Species Concepts
 contributors to its practice



Cracraft (1983)



Nixon & Wheeler (1990)

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SCIENCE & SPACE

OFFBEAT NEWS MORE OFFBEAT NEWS

Bush has slime-mold beetle named after him

Thursday, April 14, 2005 Posted: 6:34 PM EDT (2234 GMT)

ITHACA, New York (AP) -- Not just anybody can say he has a slime-mold beetle named in his honor. But George W. Bush, Dick Cheney and Donald H. Rumsfeld can.

Entomologists Quentin Wheeler and Kelly B. Miller, who recently had the task of naming 65 newly discovered species of slime-mold beetles, named three species after the president, vice president and defense secretary.

The monikers: Agathidium bushi Miller and Wheeler, Agathidium cheneyi Miller and Wheeler, and Agathidium rumsfeldi Miller and Wheeler.

G. W. Bush

4) Ecological species concept:
Van Valen (1976)

Difficult species like *Taraxacum officinale*
more easily accommodated under this concept.

