

# **Economic Botany**

## **Biology 460**

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# Taxonomy: D.I.N.C.

**Description**

**Identification**

**Nomenclature**

**Classification**

# Description

Assignment/listing of features or attributes to a  
taxon

character

= a feature

e.g., “flower color”

character states

= two or more forms of a character

e.g., “white,” “red,” “yellow”

# Identification

- Associating an unknown taxon with a known one  
E.g., determining a plant species by means of:
  - taxonomic key
  - comparing to a photograph/illustration
  - comparing to an herbarium specimen
  - asking an expert

# Key (dichotomous/indented):

1 Stamens fused at base into a tube ..... *Dichelostemma*

1' Stamens not fused at base into a tube

*Lead:* 2 Fertile stamens 3 ..... *Brodiaea*

*Lead:* 2' Fertile stamens 6

3 Stamens strongly winged at base ..... *Bloomeria*

3' Stamens not strongly winged at base ..... *Muilla*

*Couplet* = two *Leads*

# Dichotomous key

1. Fertile stamens 3 or 1 (Subfamily Haemodoroideae)
  2. Ovary superior
    3. Fertile stamen 1.....***Pyrrorhiza***
    - 3' Fertile stamens 3
      4. Corolla actinomorphic
        5. Inflorescence a simple raceme; functional carpel 1; ovule 1; style subterminal....***Barberetta***
        - 5' Inflorescence an elongate thyrse with lateral monochasial cymes; functional carpels 3; ovules 20-30 per carpel; style terminal.....***Xiphidium***
      - 4' Corolla zygomorphic
        6. Stamens unequal, the 2 latero-posterior anthers reduced; ovules 3-4 per carpel.....***Schiekia***
        - 6' Stamens equal; ovule 1 per carpel.....***Wachendorfia***
  - 2' Ovary inferior
    7. Ovule 1 per carpel.....***Dilatris***
    - 7' Ovules 2 or more per carpel
      8. Ovules 2 per carpel; perianth glabrous.....***Haemodorum***
      - 8' Ovules 5-7 per carpel; perianth abaxially tomentose.....***Lachnanthes***
- 1' Fertile stamens 6 (Subfamily Conostylidoideae)
  9. Flowers actinomorphic; perianth not splitting along mid-anterior line
    10. Perianth glabrous to glabrate.....***Phlebocarya***
    - 10' Perianth lanate to tomentose
      11. Perianth lanate; trichomes simple to sparsely branched, white-whitish; anthers with broad, apical connective appendage.....***Tribonantes***
      - 11' Perianth tomentose, trichomes dendritic, yellow, whitish, reddish, pink, orange, or purplish; anthers without broad, apical connective appendage
        12. Flowers pendulous; perianth reddish to pink-orange.....***Blancoa***
        - 12' Flowers generally ascending; perianth usually yellow or whitish, rarely orange to purplish.....***Conostylis***
  - 9' Flowers zygomorphic; perianth tube splitting along mid-anterior line
    13. Ovule 1 per carpel; perianth trichomes black.....***Macropidia***
    - 13' Ovules >1 per carpel; perianth trichomes red, yellow, orange or green.....***Anigozanthos***

# Nomenclature

Formal means of naming life.

E.g., binomial nomenclature for species names:

For *Adenostoma fasciculatum*

*Adenostoma* = genus name

*fasciculatum* = specific epithet

*Adenostoma fasciculatum* = species name

# Scientific names preferable to common (vernacular) names:

- 1) Only scientific names are universal, used the same world-wide; e.g., *Ipomoea*: Woodbind (UK) versus Morning-Glory (US)
- 2) Common names are not consistent.
  - a) A taxon may have more than one common name (e.g., *Ceratonia siliqua*: carob, St. John's Bread).
  - b) One common name may refer to more than one taxon (e.g., "hemlock" can refer to a conifer or to a poisonous herb).
- 3) Common names tell nothing about rank (genus, family, order, etc).
- 4) Many, if not most, organisms have no common name in any language.

# Rank

Classification in which a higher rank is inclusive of all lower ranks

## Ranks:

<b>Kingdom</b>	(various)	Plantae
<b>Phylum [Division]</b>	-phyta	Anthophyta
<b>Class</b>	-opsida	Magnoliopsida
<b>Order</b>	-ales	Asterales
<b>Family</b>	<b>-aceae</b>	<b>Asteraceae</b>
<b>Genus</b>	(various)	<i>Helianthus</i>
<b>Species</b>	(various)	<i>Helianthus annuus</i>

# Nomenclature

Family names: all end in “-aceae”

Rosaceae = Rose family

Fabaceae (Leguminosae) = Bean/Pea family

Poaceae (Gramineae) = Grass family

Asteraceae = Daisy family

Brassicaceae = Mustard family

Orchidaceae = Orchid family

## Alternative family names:

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

## Alternative subfamily name:

Papilionoideae = Faboideae

# Classification

- Placing objects, e.g., life, into some type of order.
- Taxon = a taxonomic group (plural = taxa).

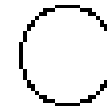
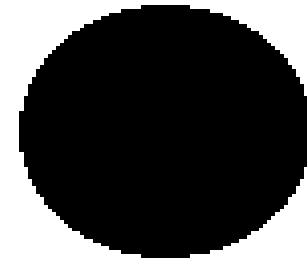
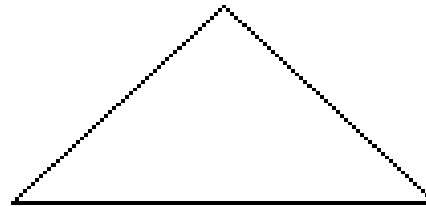
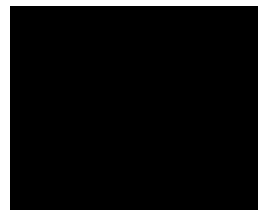
# How to classify life

## ■ Phenetic classification

- ◆ Based on overall similarity
- ◆ Those organisms most similar to one another are classified more “closely” together.

# Problem with phenetic class.:

- Can be arbitrary,  
e.g., classify these:



# Phylogenetic classification

- Based on known (inferred) evolutionary history.
- Advantage:
  - ◆ Classification reflects pattern of evolution
  - ◆ Classification not ambiguous

# What is Systematics?

Includes **Taxonomy**

Goal is to infer evolutionary history of life  
(phylogeny)

Using all types of evidence

# Systematics founded on evolution

**Evolution = descent with modification**

**Descent** = transfer of genetic information  
from parent to offspring generation after  
generation

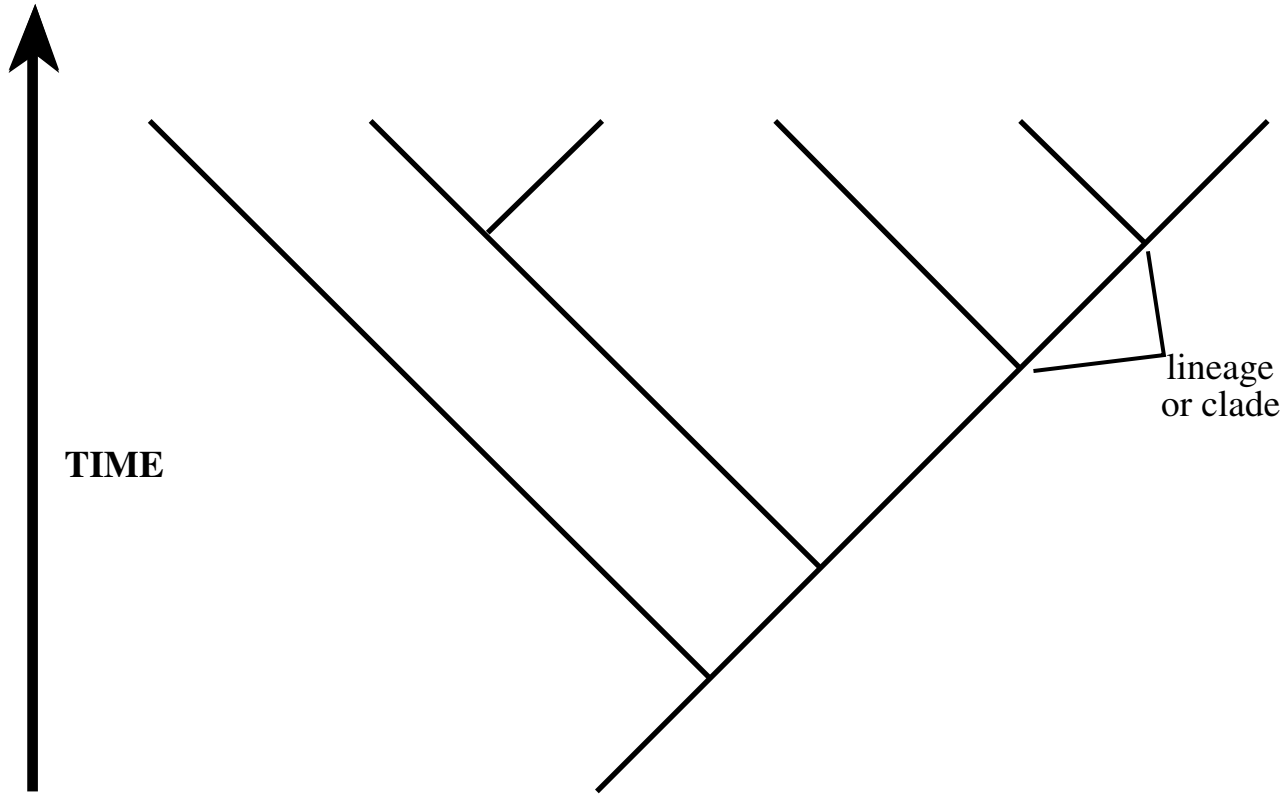
**Modification** = change in DNA

# Classification based on recog. of **monophyletic groups**

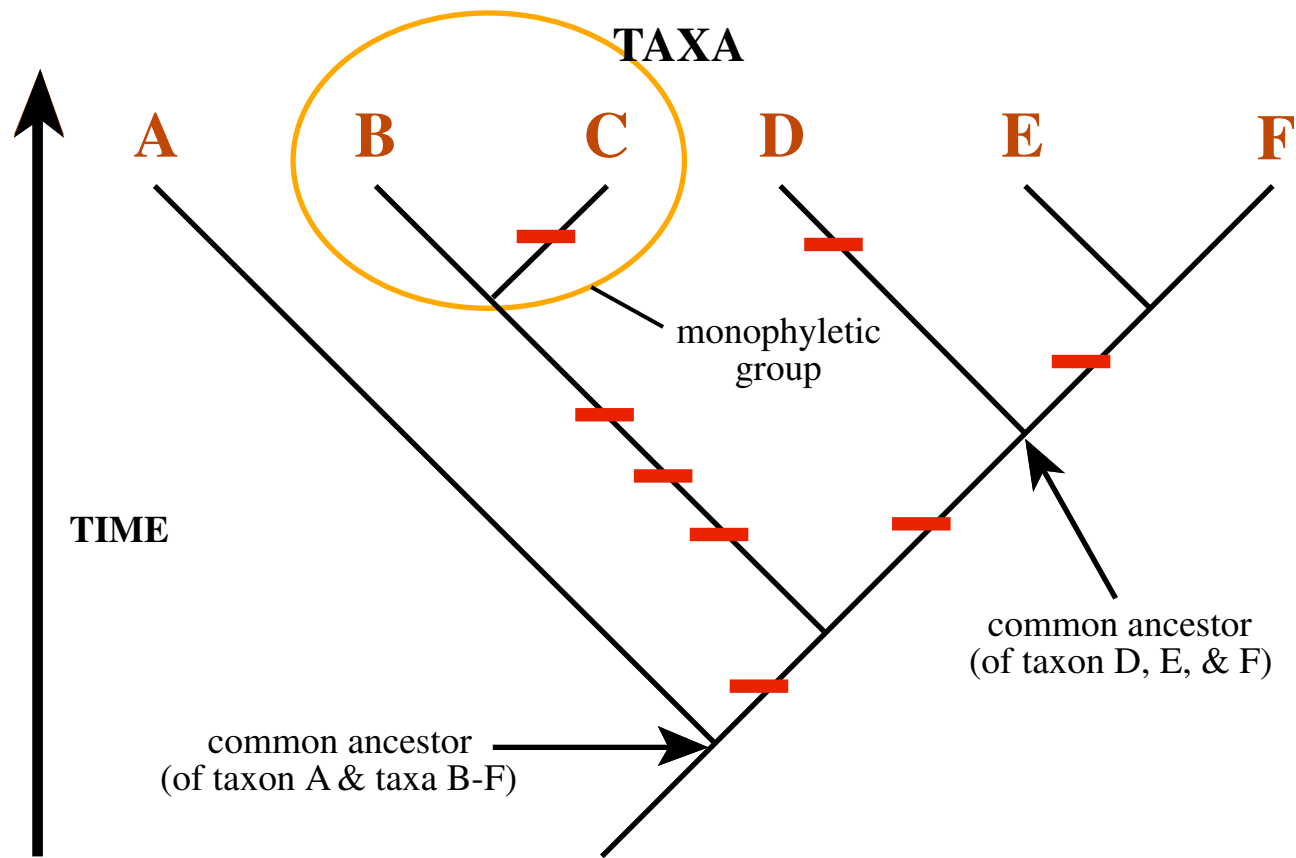
## **Monophyletic group**

= a common ancestor +

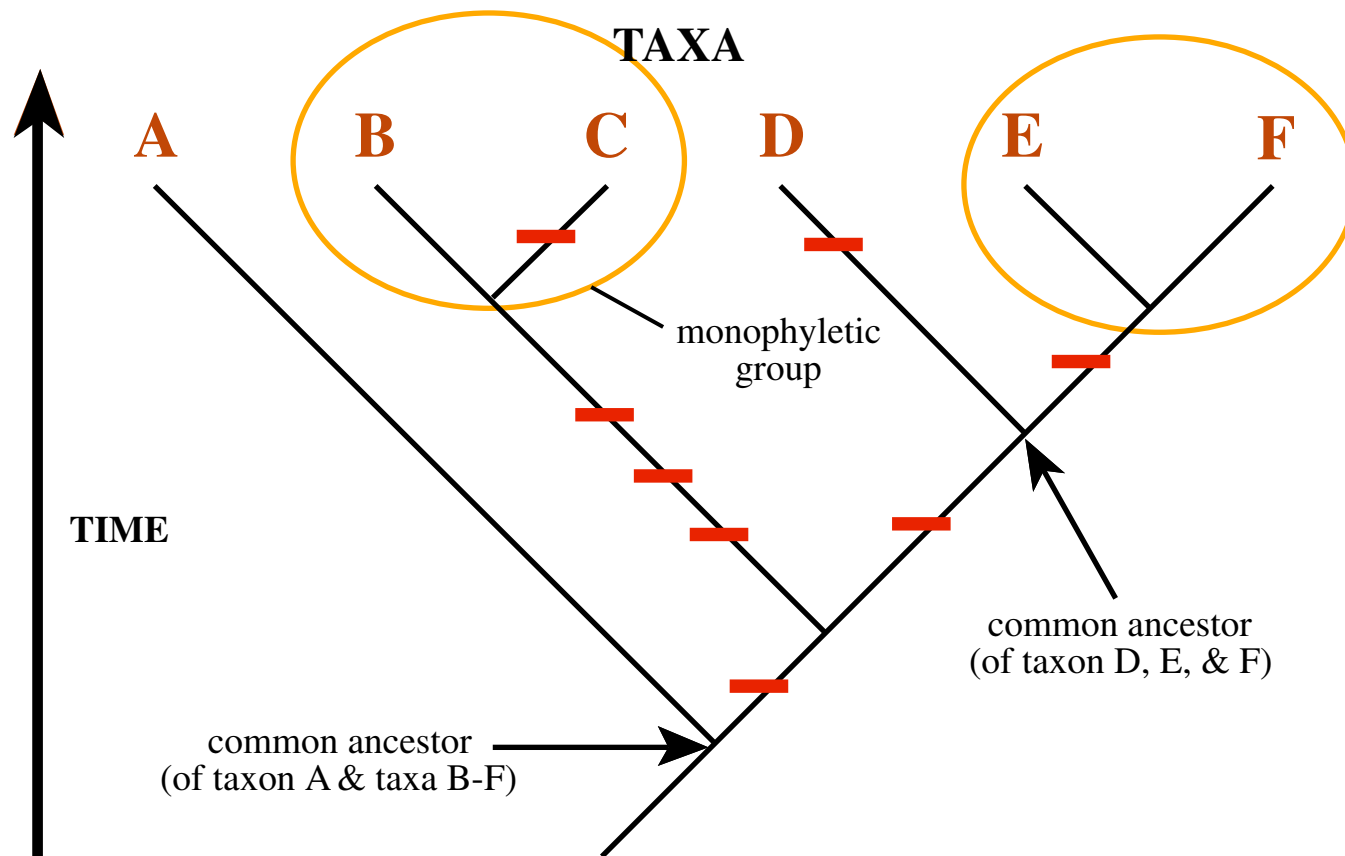
all descendents of that common ancestor.



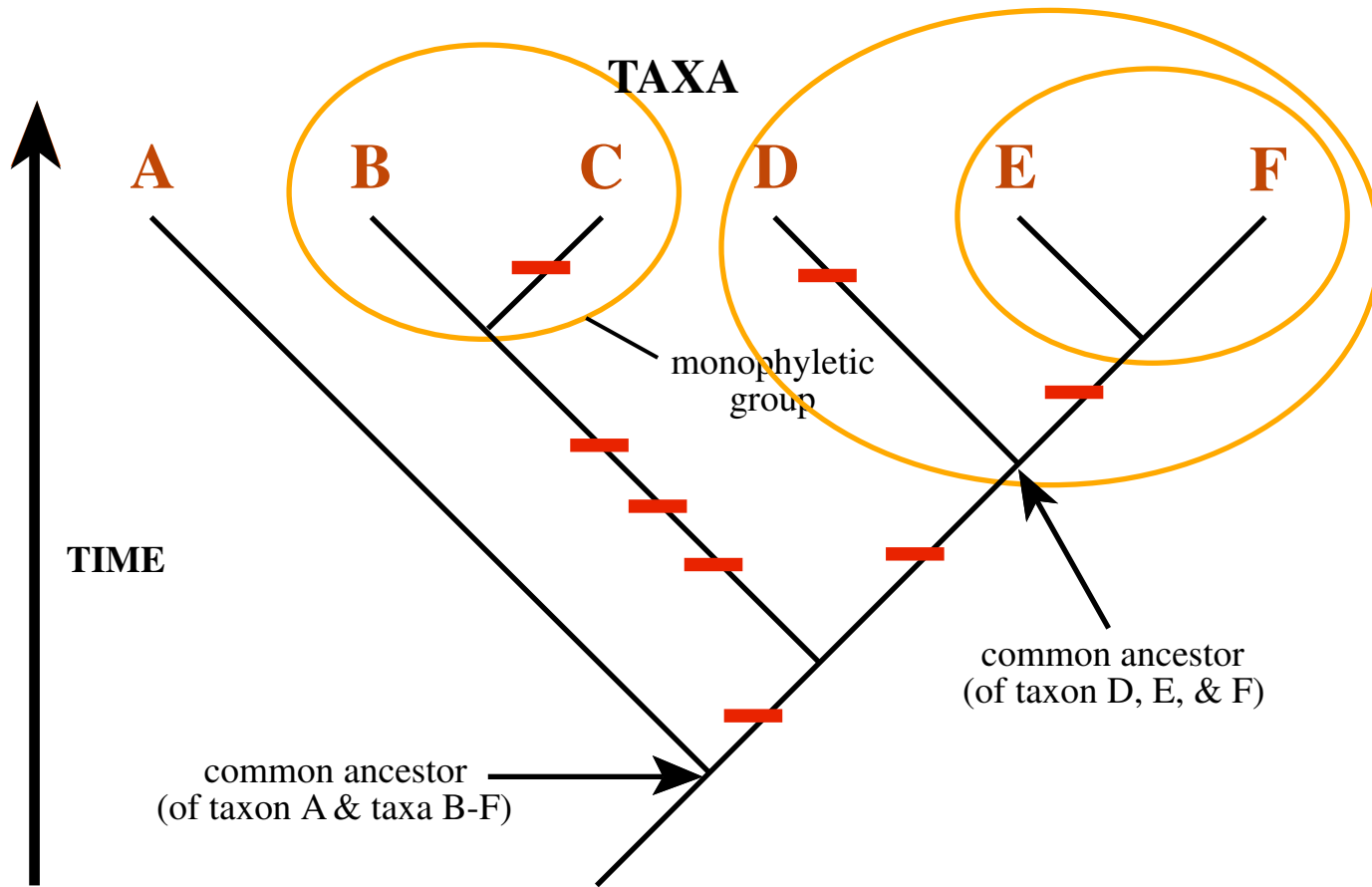
**Cladogram or Phylogenetic Tree**



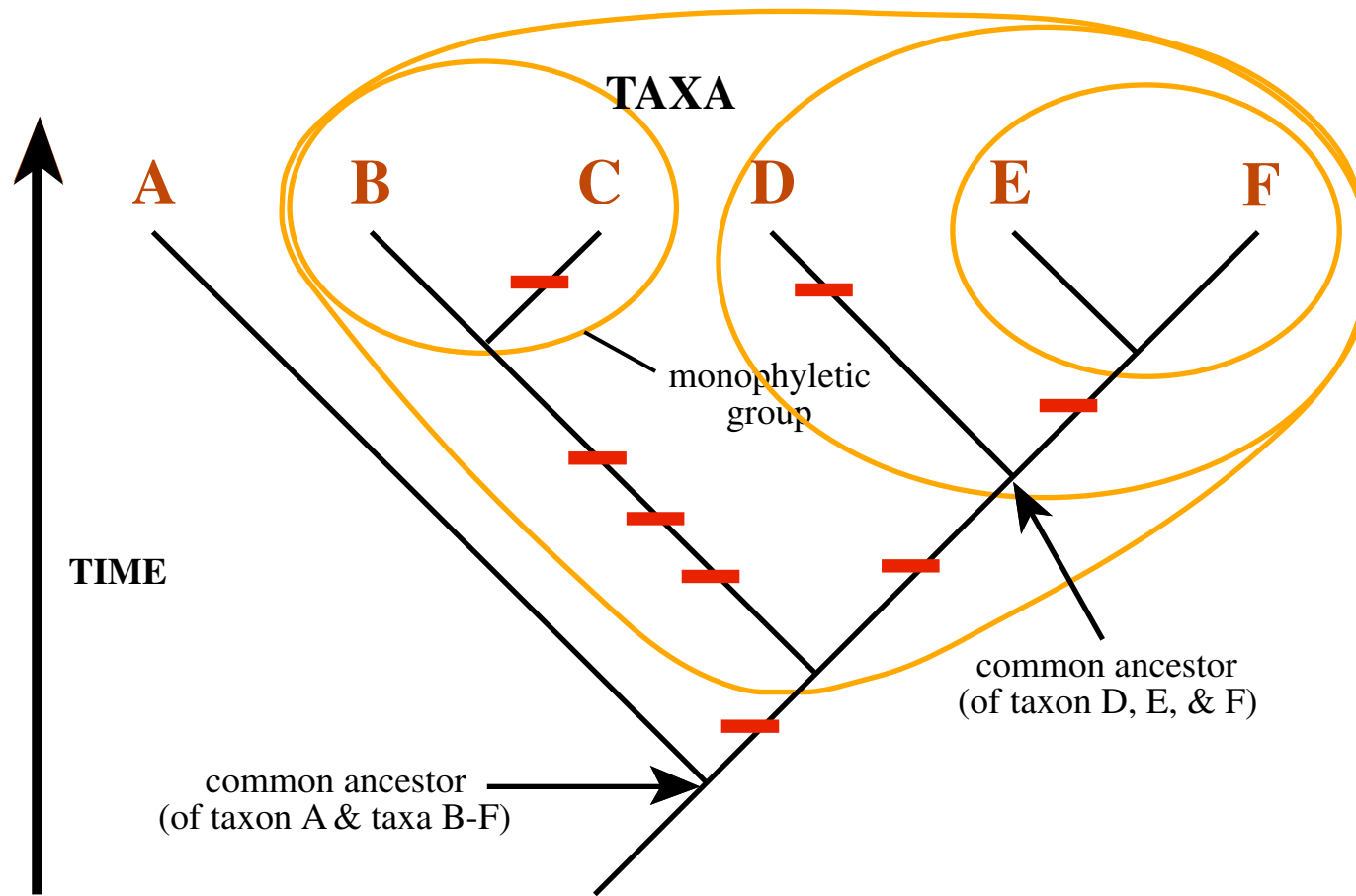
**Cladogram or Phylogenetic Tree**



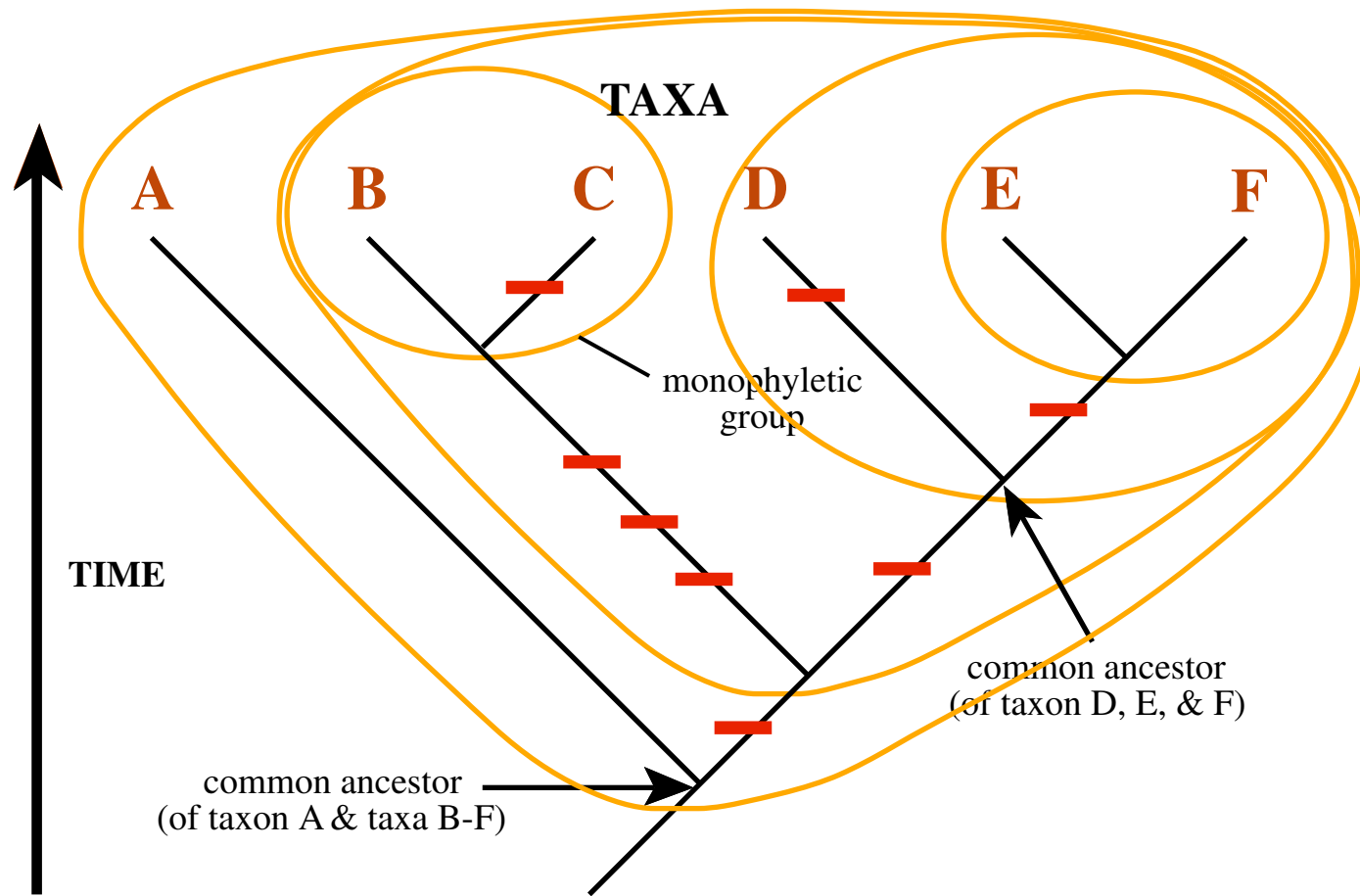
**Cladogram or Phylogenetic Tree**



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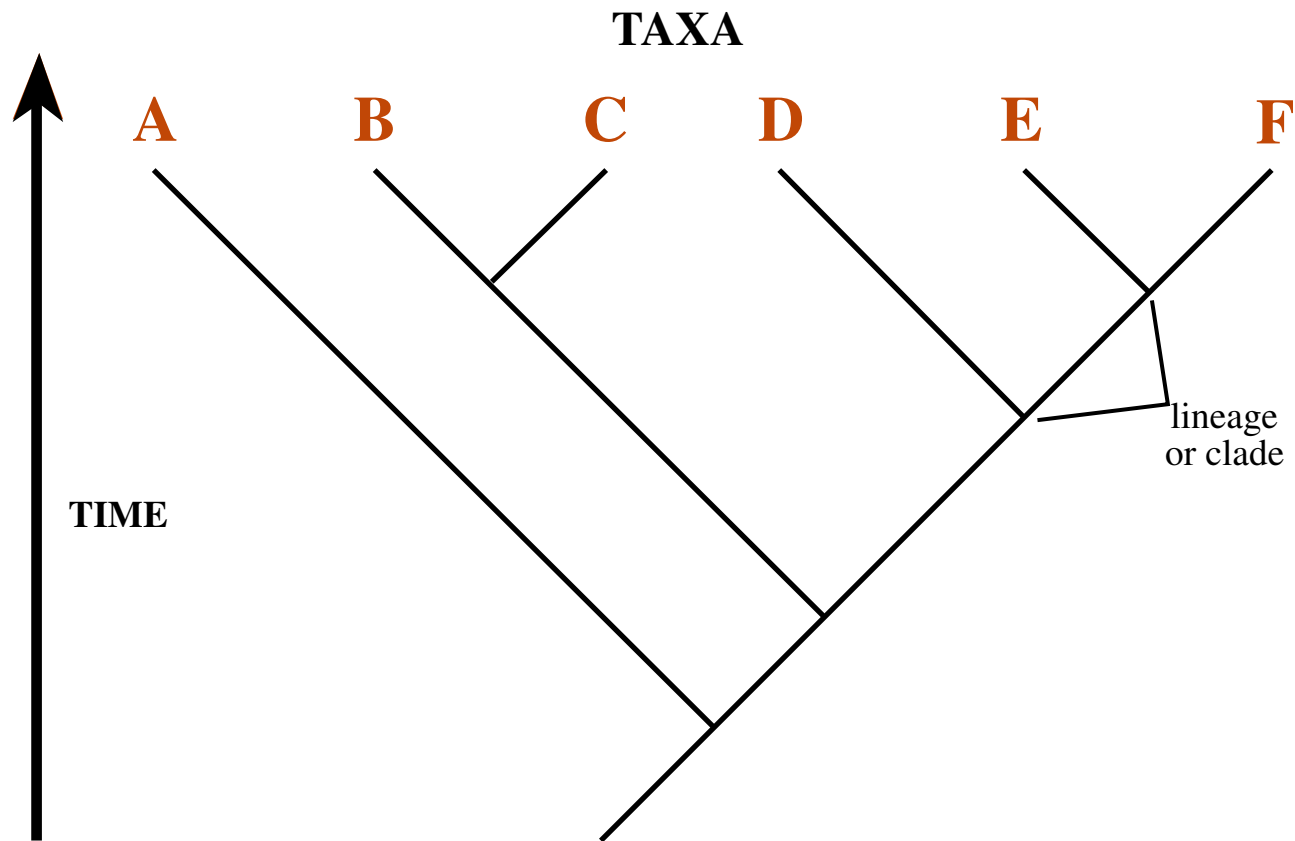


**Cladogram or Phylogenetic Tree**



**Cladogram or Phylogenetic Tree**

# All of life is interconnected by descent.



**Cladogram or Phylogenetic Tree**

