



Árboles filogenéticos

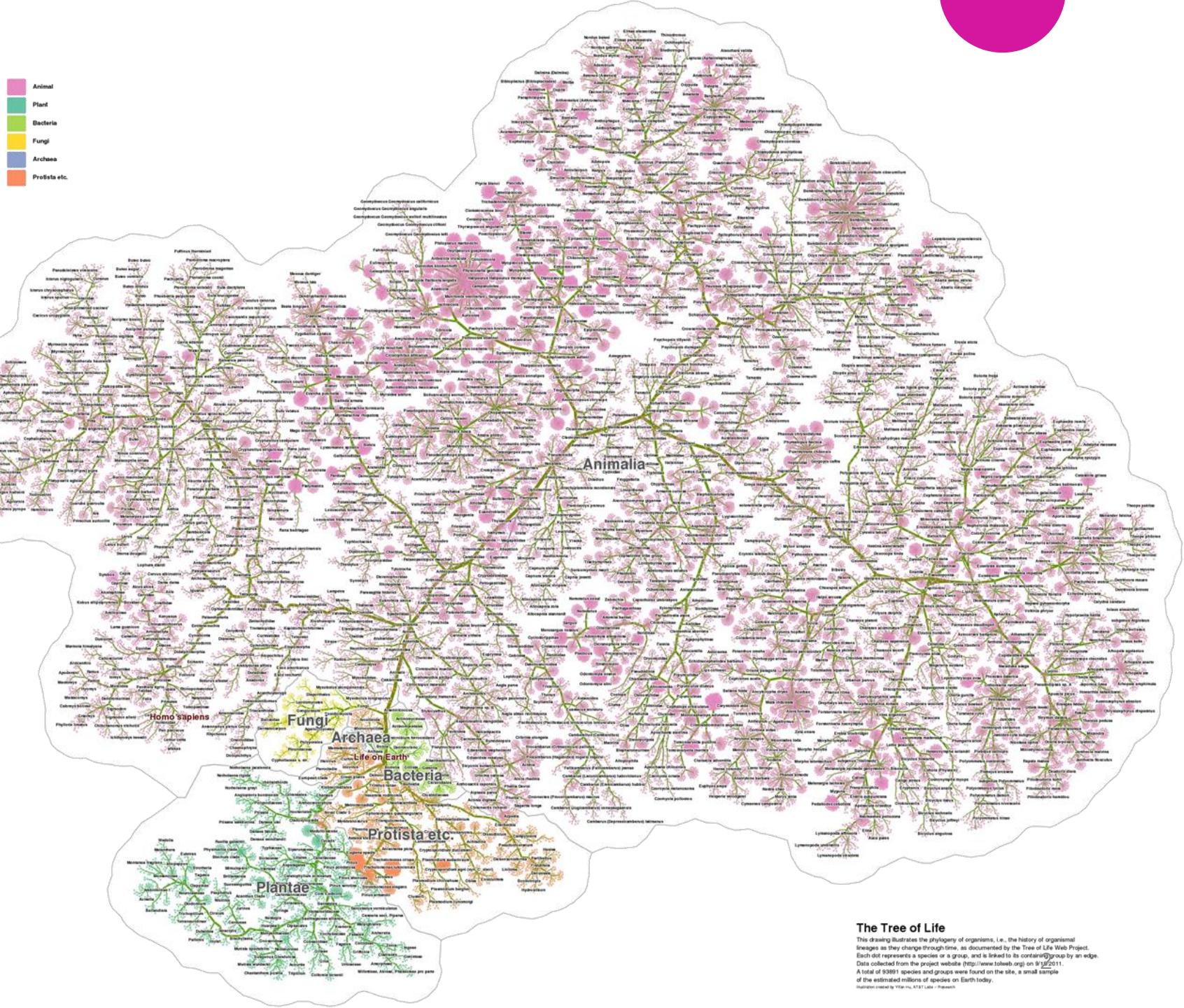
Árboles

Sistemática y biología evolutiva

Un árbol es una representación de las relaciones de diferentes especies y sus ancestros

Biología molecular

Un árbol es una representación de las relaciones de secuencias de genes o proteínas con sus secuencias ancestrales.

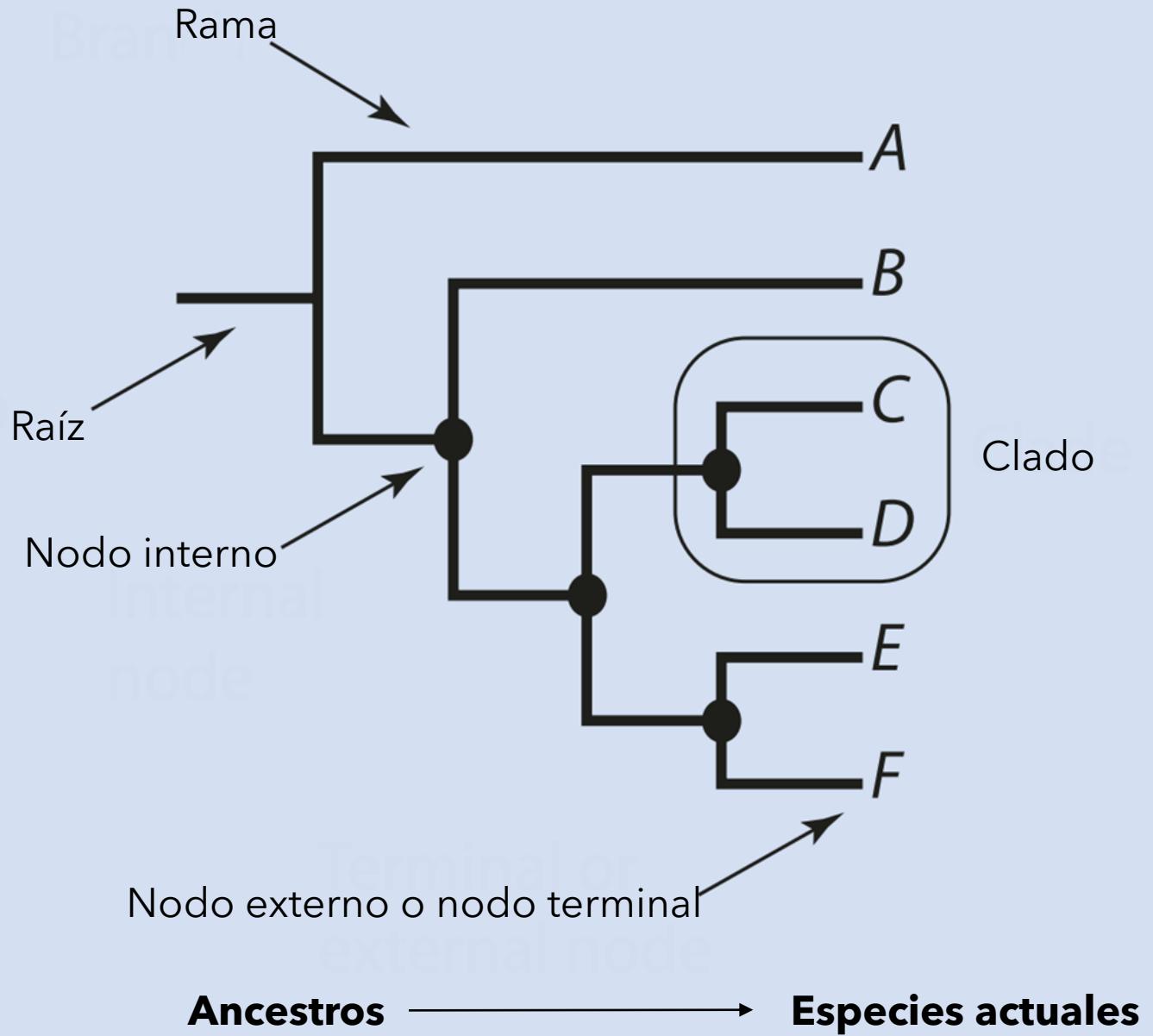


Phylogenomics

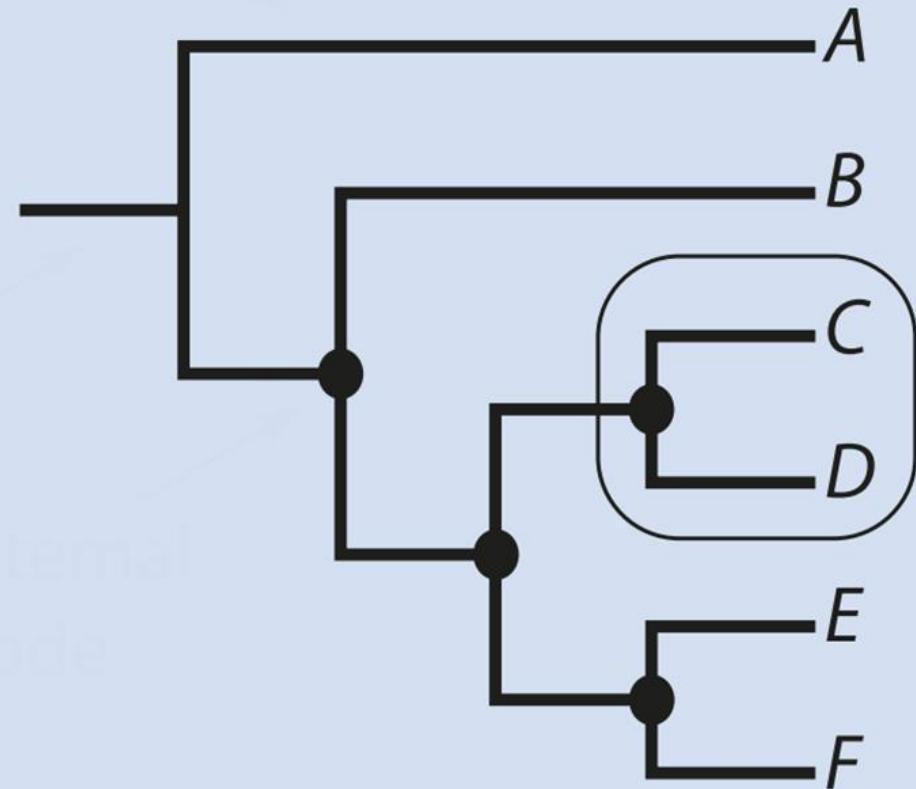
An Introduction

Springer

Christoph Bleidorn



- “Un grupo monofilético es un grupo de especies descendientes de una simple especie que incluye todos los descendientes de esta especie troncal”.

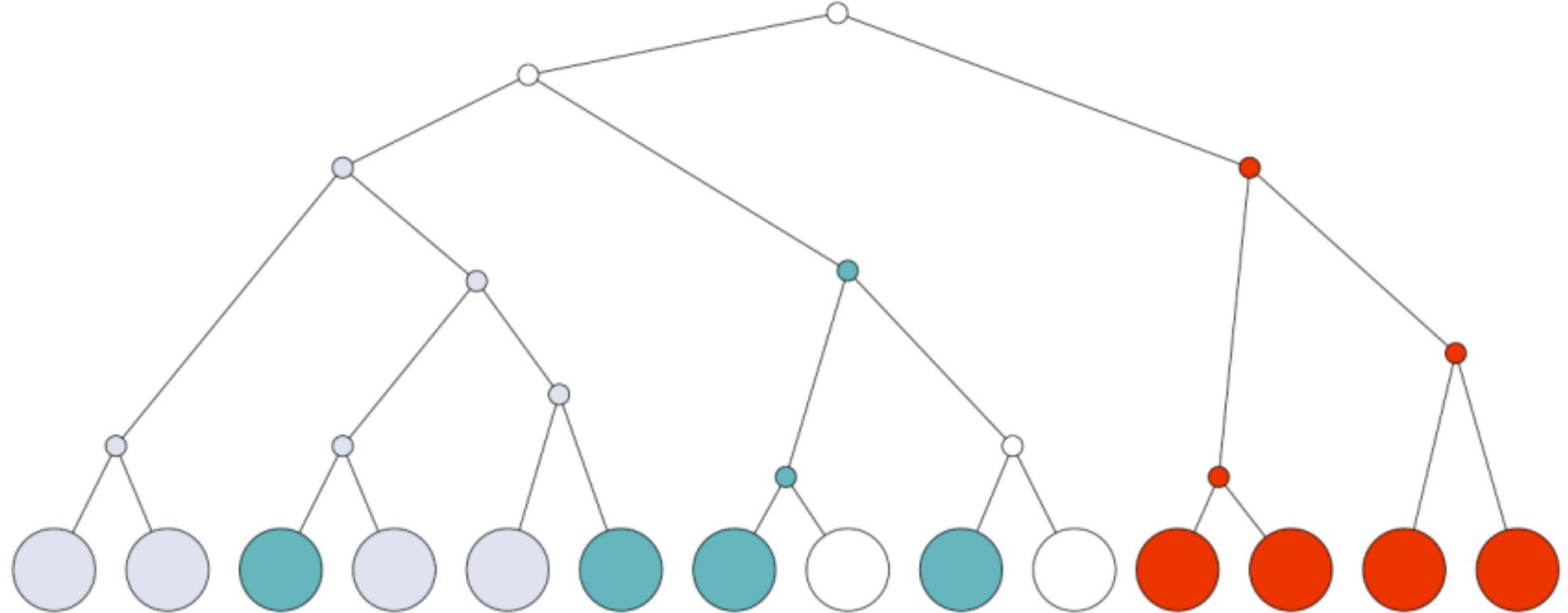


Grupos monofiléticos: (CD), (EF), ((CD)(EF)), (B((CD)(EF))
Grupos no monofiléticos (BC) o (AC)

- **Taxón**

Un taxón es un grupo de organismos a los que se da un nombre. En principio cualquier rango taxonómico es un taxón.

- **Taxón natural.** Es un grupo de organismos que existe en la naturaleza. En el ámbito de la Sistemática Filogenética se entiende a una especie particular o a cualquier grupo de organismos monofilético. Son los únicos aceptados por la sistemática filogenética.
- **Taxón artificial:** Son aquellos que no existen en la naturaleza. Son grupos de organismos no monofiléticos. Son absolutamente descartados por la sistemática filogenética, aunque tolerados en la práctica real por su evidente utilidad en los casos de filogenias excesivamente complejas.



Monophyletic group:

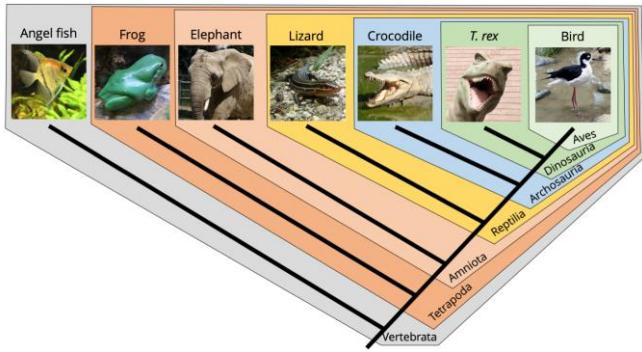
a *Clade* – a node and all of its descendants.

Paraphyletic group:

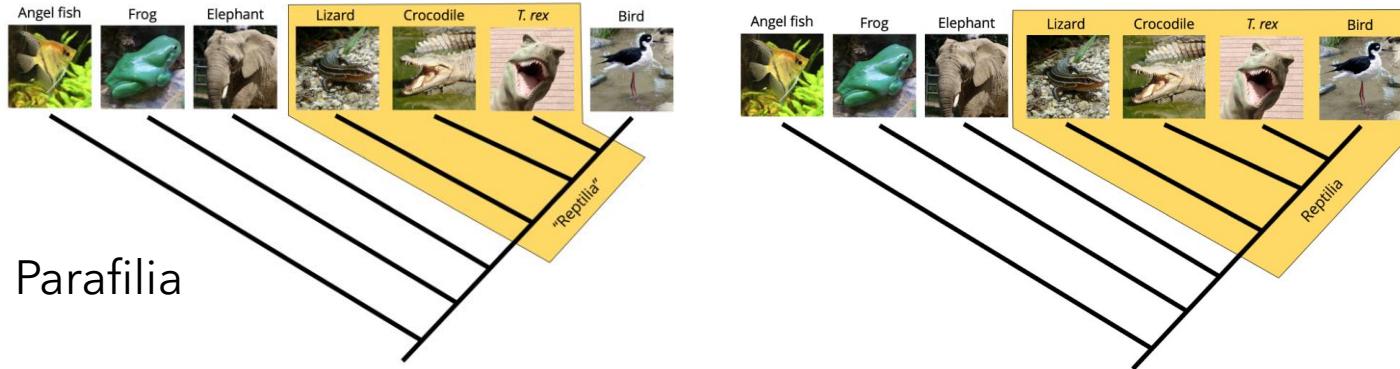
a clade minus some of its members.

Polyphyletic group:

members of several clades, perhaps grouped by a convergent feature or other superficial similarity. 6



Monofilia



■ Monophily
■ Paraphyly
■ Polyphyly

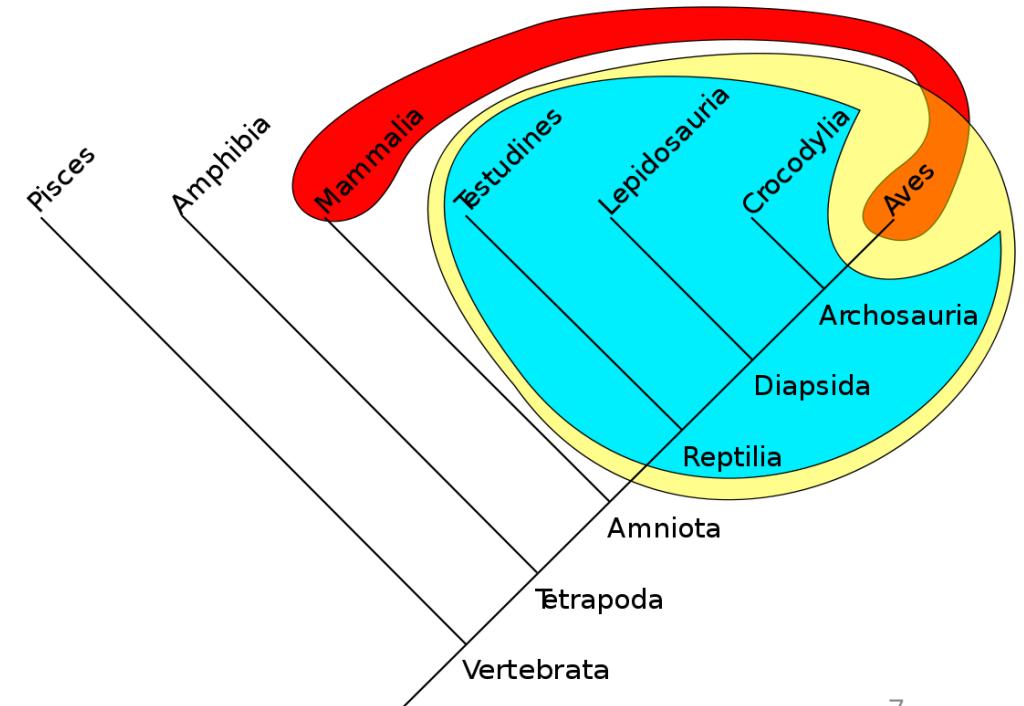
Parafilia

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Text-Book of Palaeontology, Vol. II.

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Parafilia

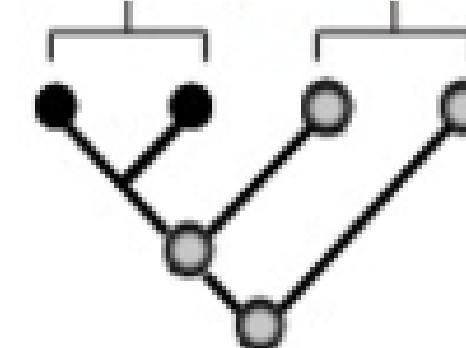


Apomorfía

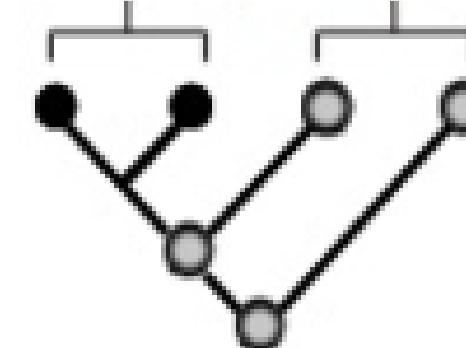
estado derivado de un carácter. Este estado podría catalogarse como “novedoso” si se le compara con un grupo ancestral próximo.

- **Sinapomorfías:** aquellas apomorfías compartidas por dos o más grupos.
- **Autapomorfías:** aquellas apomorfías que solo aparecen en un grupo.

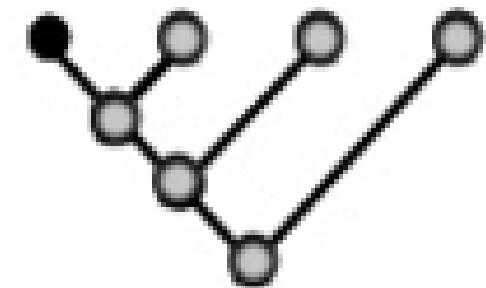
Apomorfía



Plesiomorfía



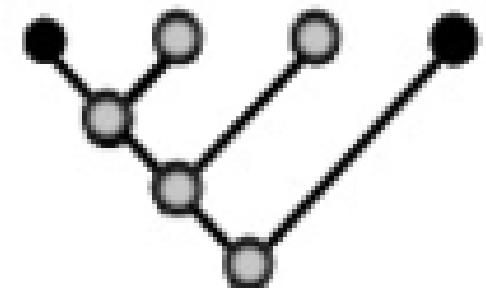
Autapomorfía



Sinapomorfía



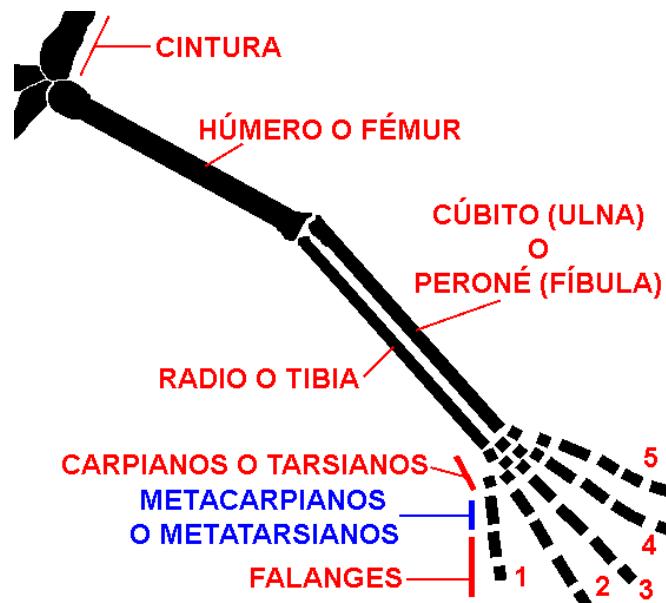
Homoplasia



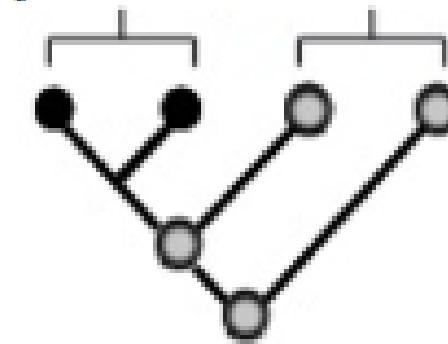
Carácter ancestral (○)

Carácter derivado (●)

Plesiomorfia es el estado ancestral o primitivo de un carácter. El concepto se opone al de apomorfía, que es el estado derivado de dicho carácter.

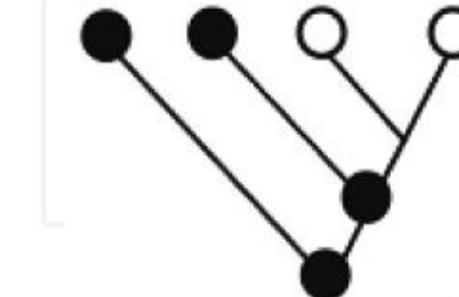


Apomorfia Plesiomorfia

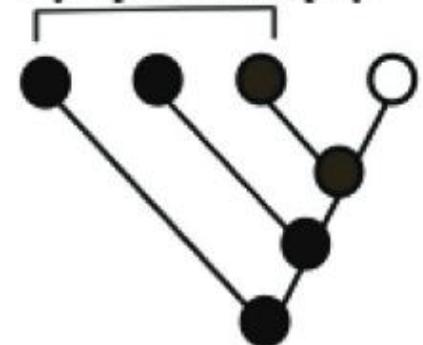


Carácter ancestral (○)
Carácter derivado (●)

Plesiomorphy

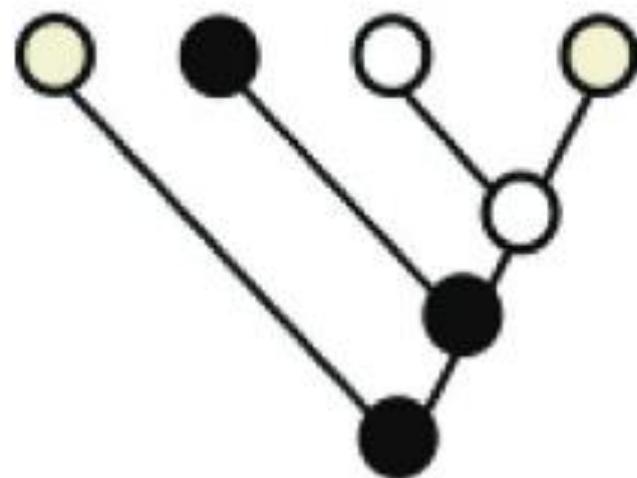


Symplesiomorphy



○ Derived trait
● Ancestor trait

Homoplasy

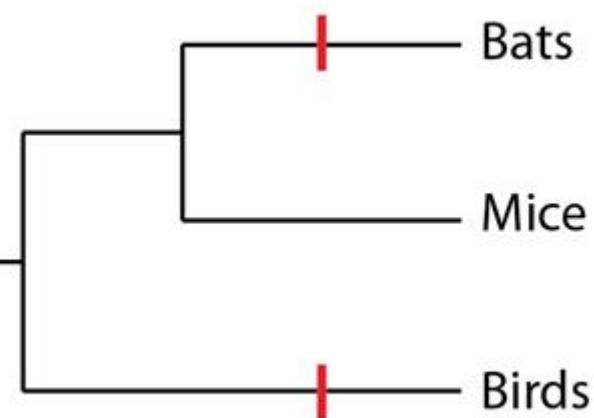


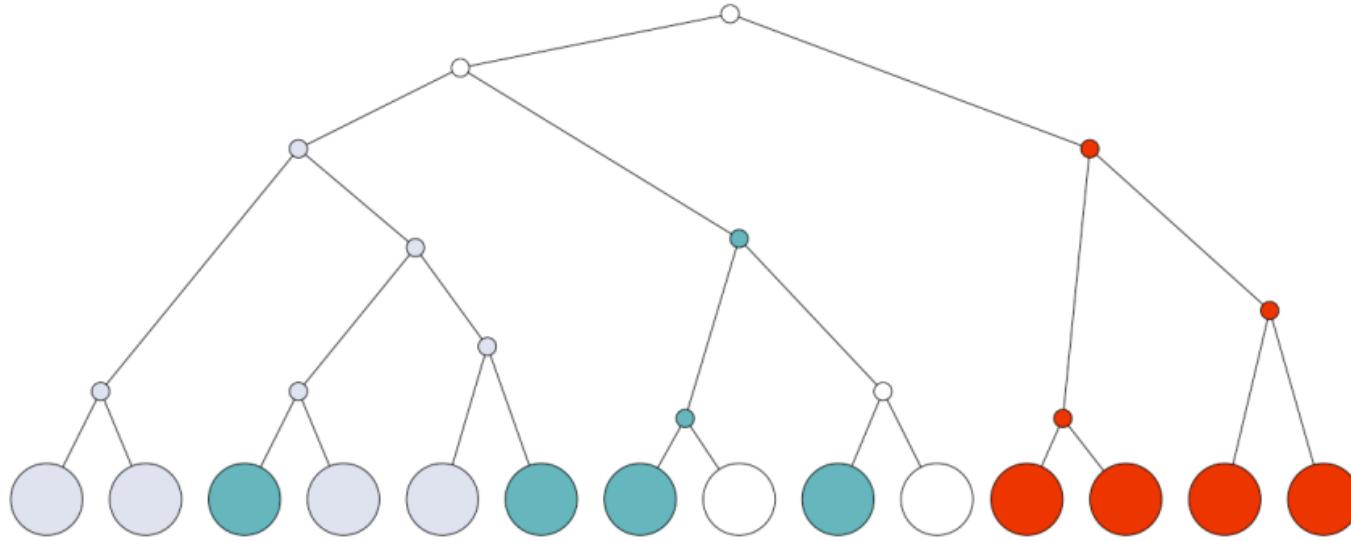
- Derived trait
- Ancestor trait
- Evolutionary novelty



| = powered flight

Common
ancestral
population



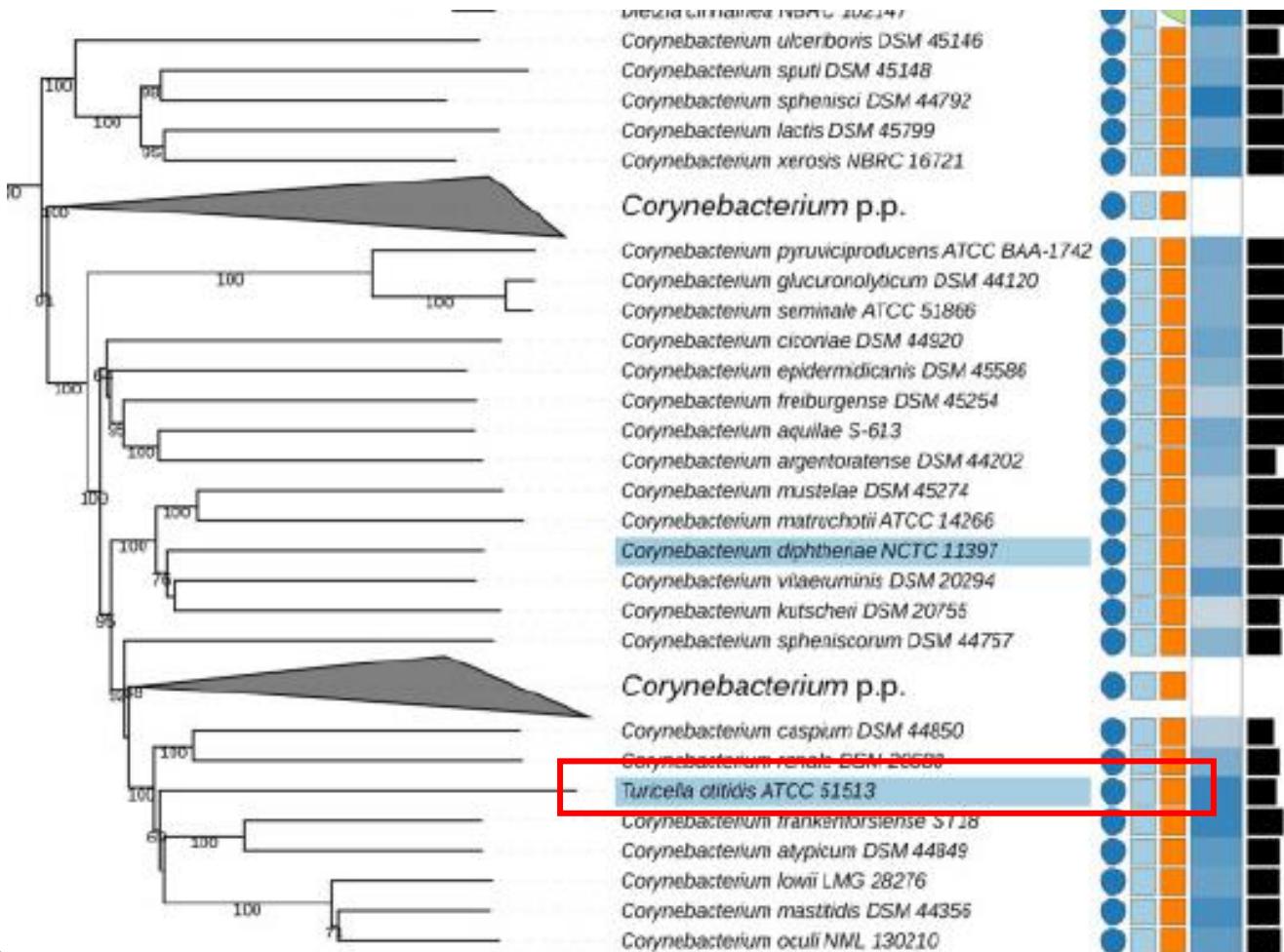


Monophyletic group: a *Clade* – a node and all of its descendants.

Paraphyletic group: a clade minus some of its members.

Polyphyletic group: members of several clades, perhaps grouped by a convergent feature or other superficial similarity.

Based On	
Monophyletic	Monophyletic is a group based in synapomorphy .
Paraphyletic	Paraphyletic is a group based in symplesiomorphy .
Polyphyletic	Polyphyletic is a group based on convergence.



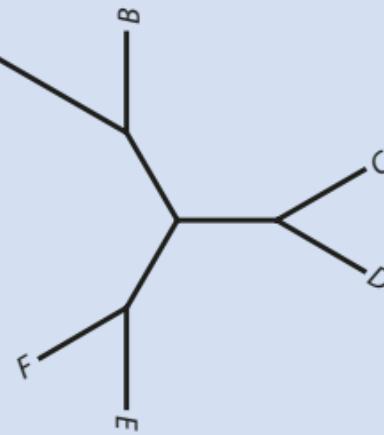
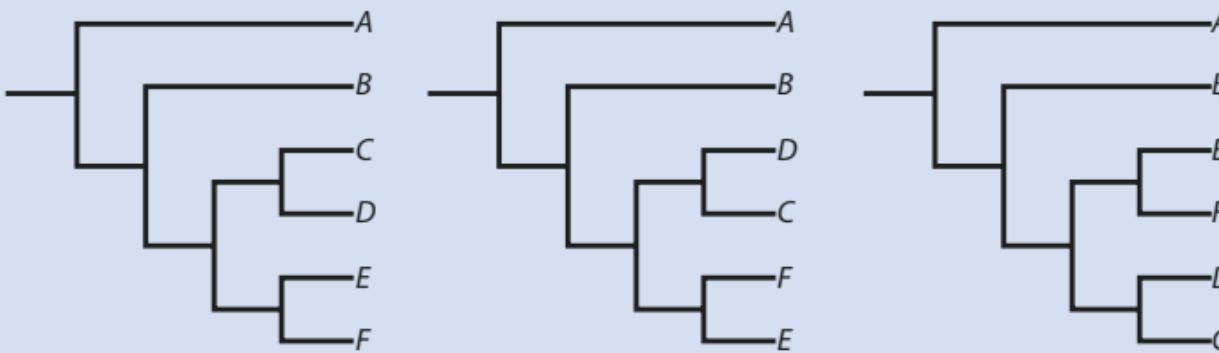
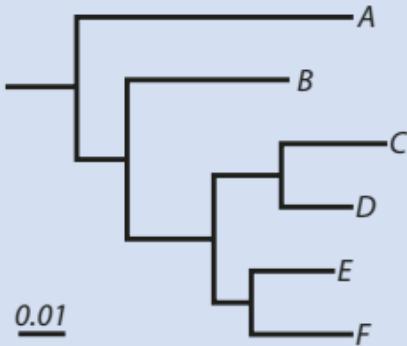
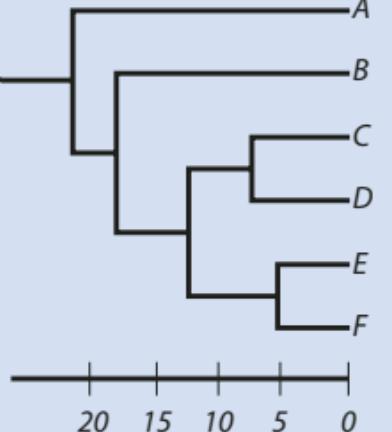
Phylogeny Trumps Chemotaxonomy: A Case Study Involving *Turicella* *otitidis*

Inwoo Baek^{1,2}, Mincheol Kim³, Imchang Lee^{1,2}, Seong-In Na^{2,4}, Michael Goodfellow⁵ and Jongsik Chun^{1,2,4*}

The genus *Turicella* was proposed to harbor clinical strains isolated from middle-ear fluids of patients with otitis media. 16S rRNA phylogeny showed that it belonged to the mycolic acid-containing actinobacteria, currently classified in the order *Corynebacterales*, and was closely related to the genus *Corynebacterium*. A new genus was proposed for the organisms as unlike corynebacteria they lacked mycolic acids and had different menaquinones. Here, we carried out large-scale comparative genomics on representative strains of the genera *Corynebacterium* and *Turicella* to check if this chemotaxonomic classification is justified. Three genes that are known to play an essential role in mycolic acid biosynthesis were absent in *Turicella* and two other mycolate-less *Corynebacterium* spp., explaining the lack of mycolic acids resulted from the deletion of genes and does not confer any phylogenetic context. Polyphasic phylogenetic analyses using 16S rRNA, bacterial core genes and genes responsible for synthesizing menaquinones unequivocally indicate that *Turicella* is a true member of the genus *Corynebacterium*. Here, we demonstrate that menaquinone and mycolic acid that have been used as critical taxonomic markers should be interpreted carefully, particularly when genome-based taxonomy is readily available. Based on the phylogenetic analysis, we propose to reclassify *Turicella otitidis* as *Corynebacterium otitidis* comb. nov.

a

$(A, (B, ((C,D), (E,F))));$
 $(A:0.01, (B:0.002, ((C:0.009,D:0.005):0.004,$
 $(E:0.002,F:0.003):0.1):0.45):0.3)$

b**c****d****e**

Diferentes formas de representar la misma topología de árbol.

a Un formato Newick.

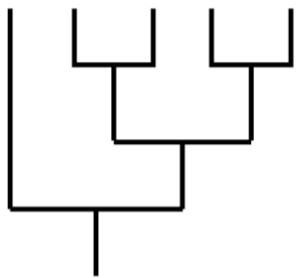
b Árbol sin raíces.

c Tres representaciones diferentes de la misma topología que un cladograma.

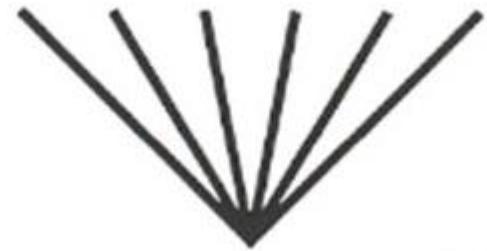
d Filograma.

e Árbol ultramétrico con eje de tiempo.

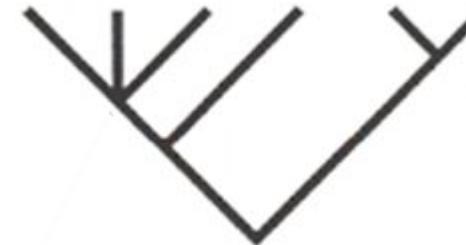
Politomias



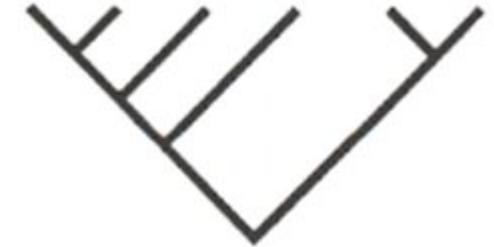
Dicotomia



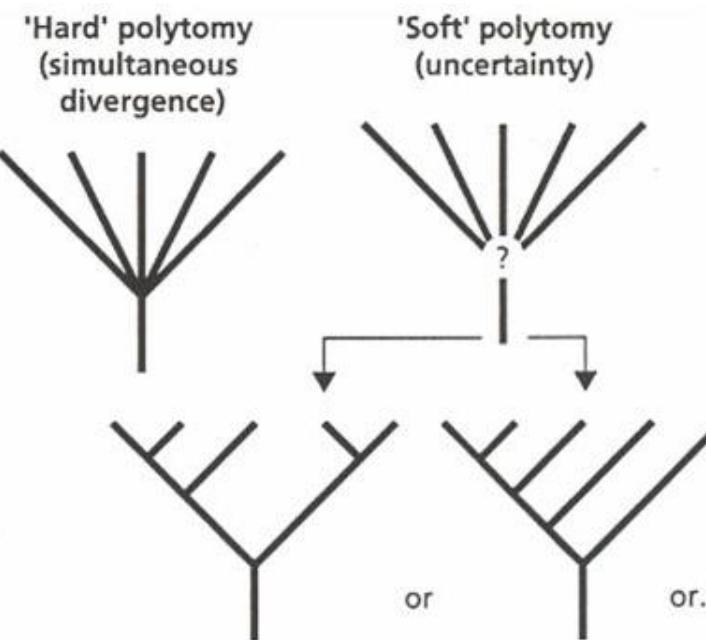
Politomia



Parcialmente
resuelto



Completamente
resuelto



Cómo se construye un árbol filogenético

