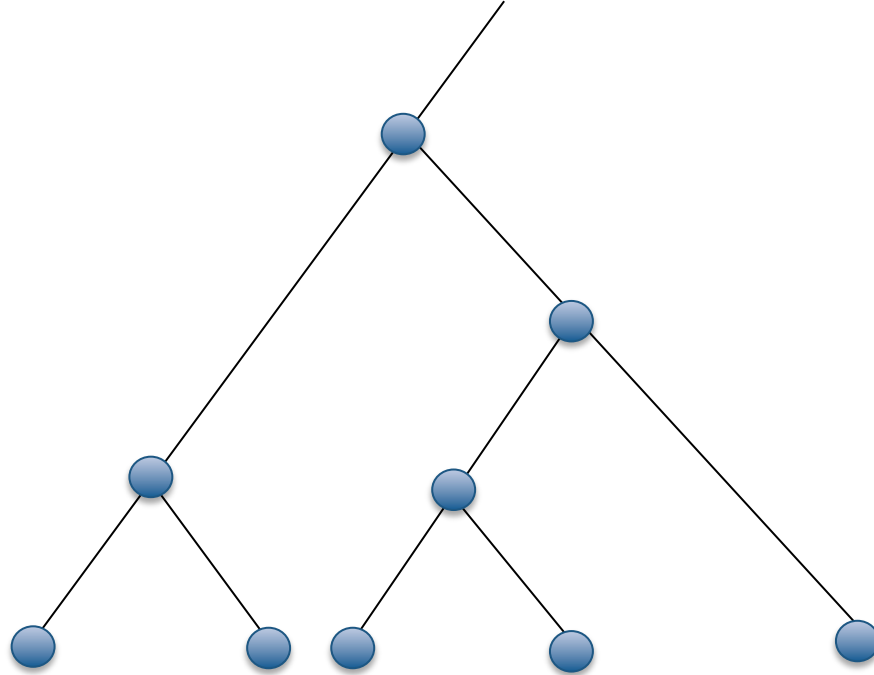


# 5. Phylogenetic trees

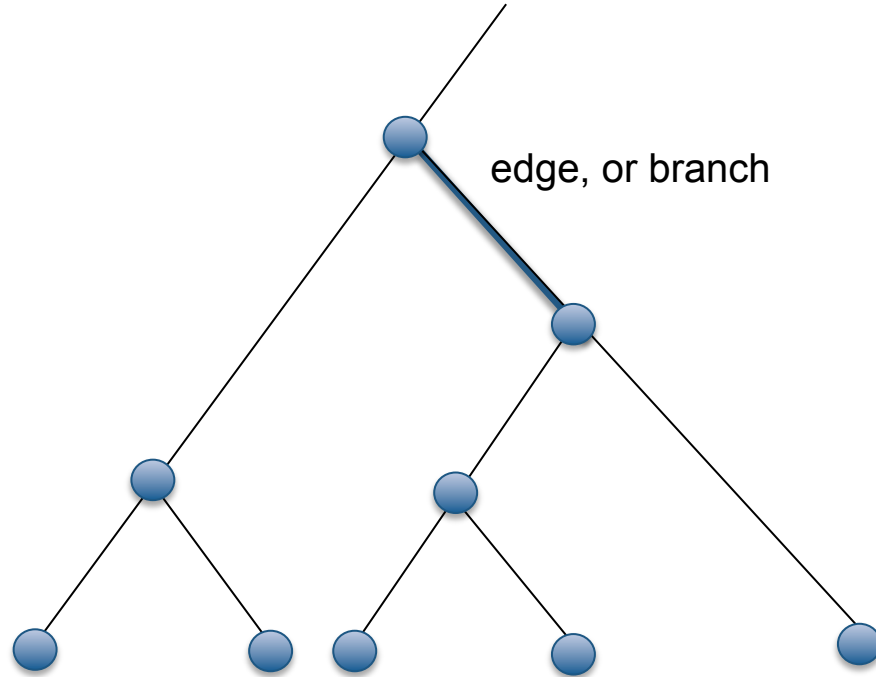
- The tree of life
- **The tree, an abstract object**
- Building an array of distances
- The UPGMA algorithm
- Differences are not always what they look like
- The diversity of bioinformatics algorithms
- The application domains in microbiology



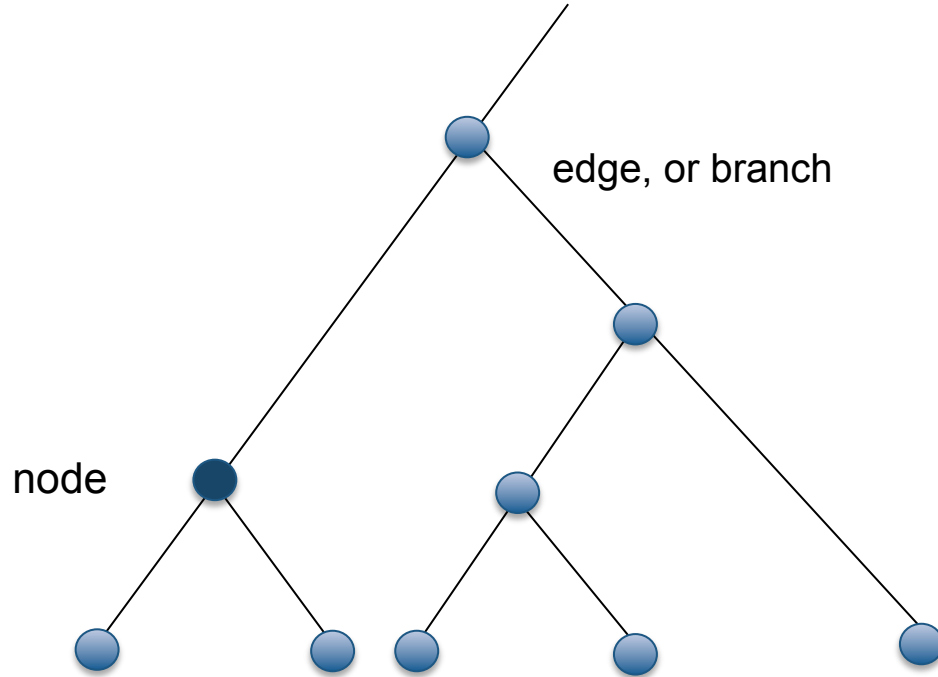
# The tree, an abstract object



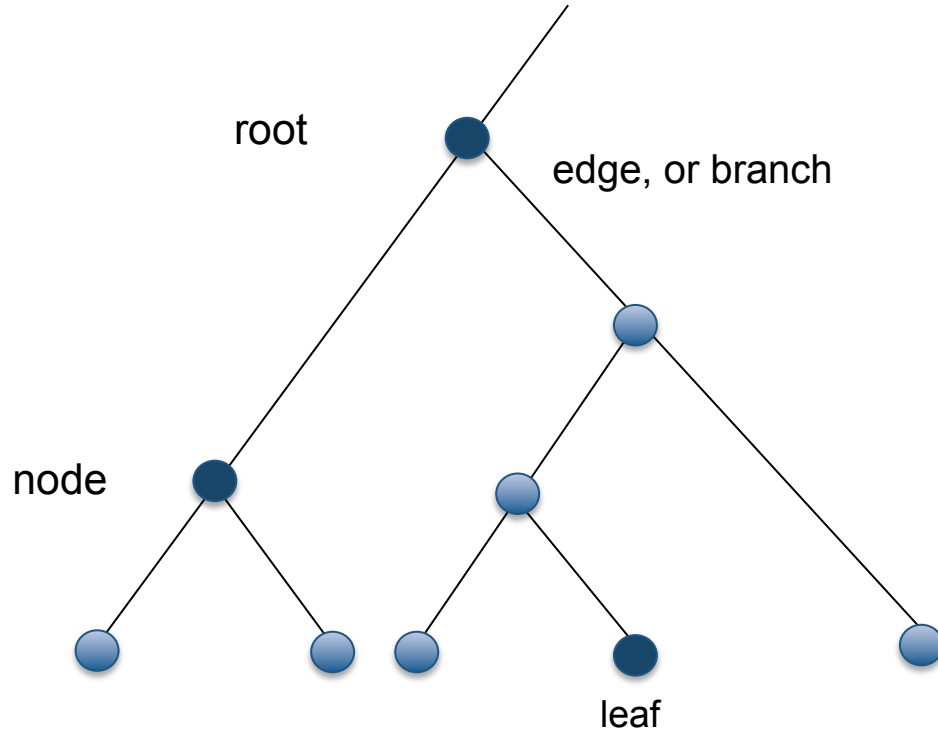
# The tree, an abstract object



# The tree, an abstract object

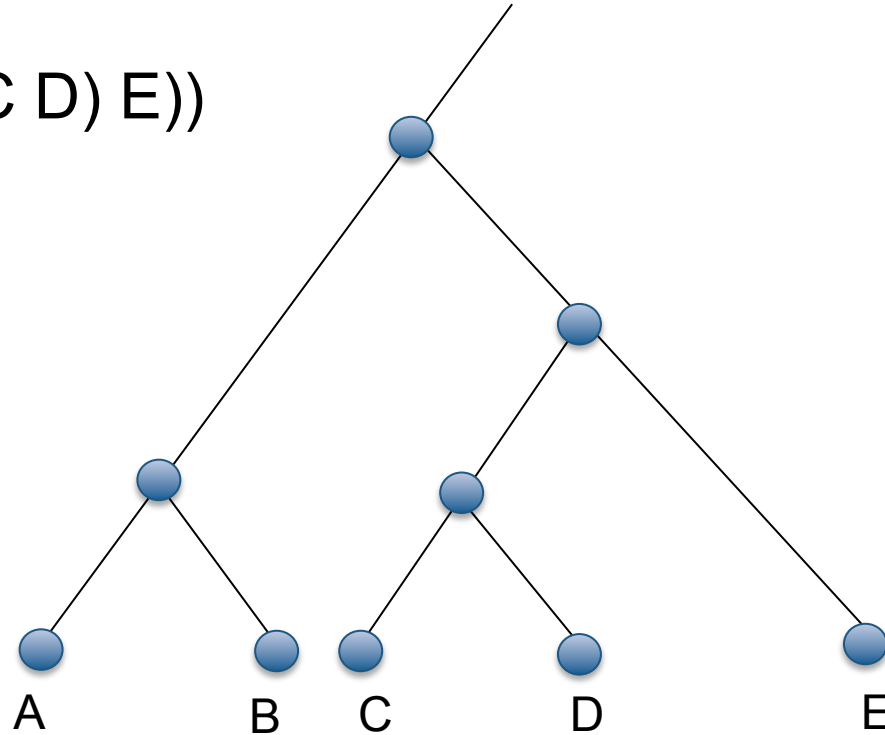


# The tree, an abstract object



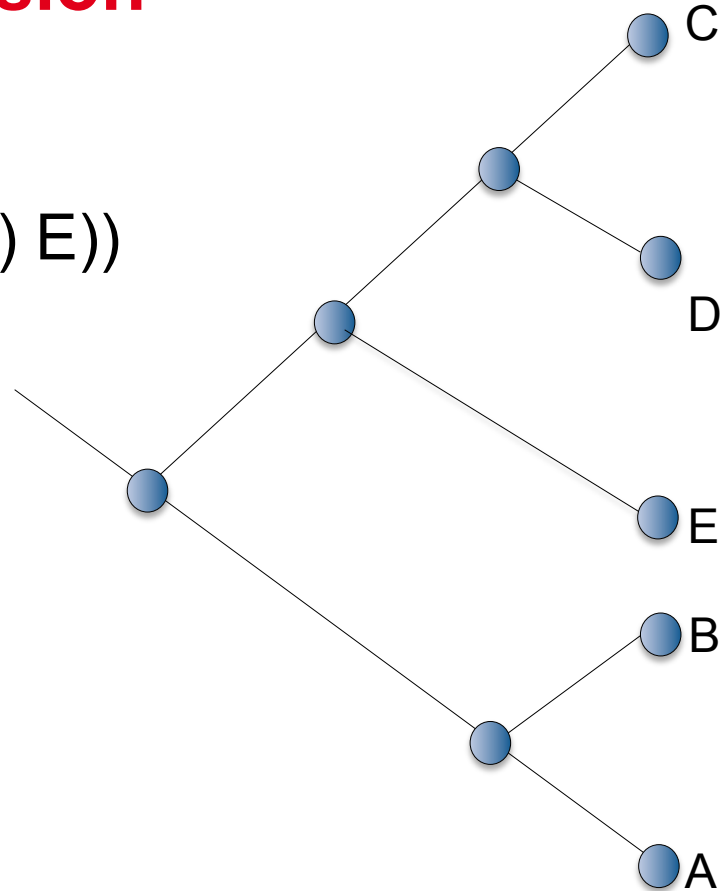
# A tree expression

$((A\ B)\ ((C\ D)\ E))$



# A tree expression

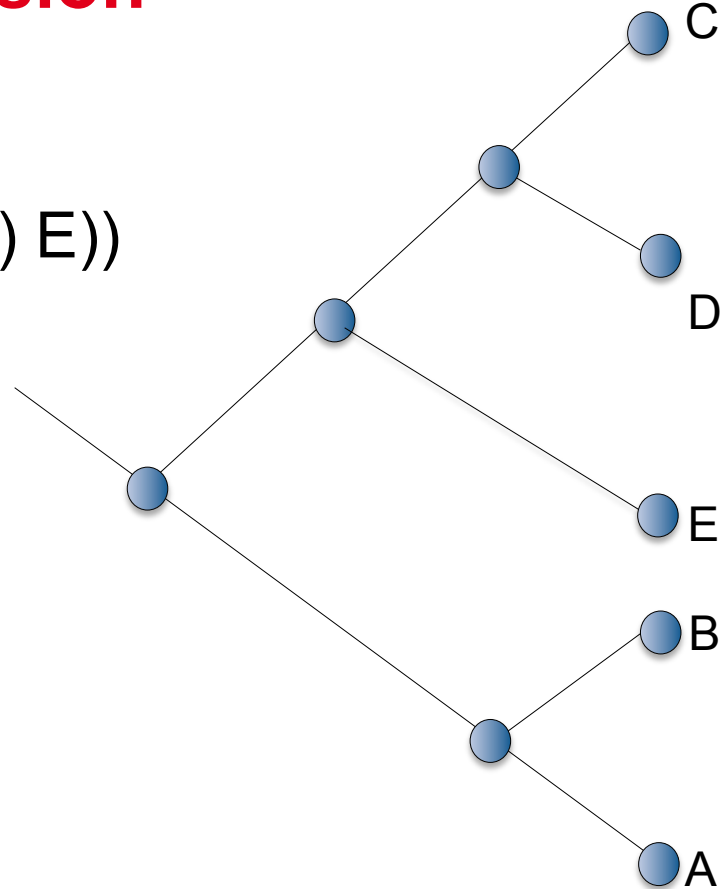
((A B) ((C D) E))





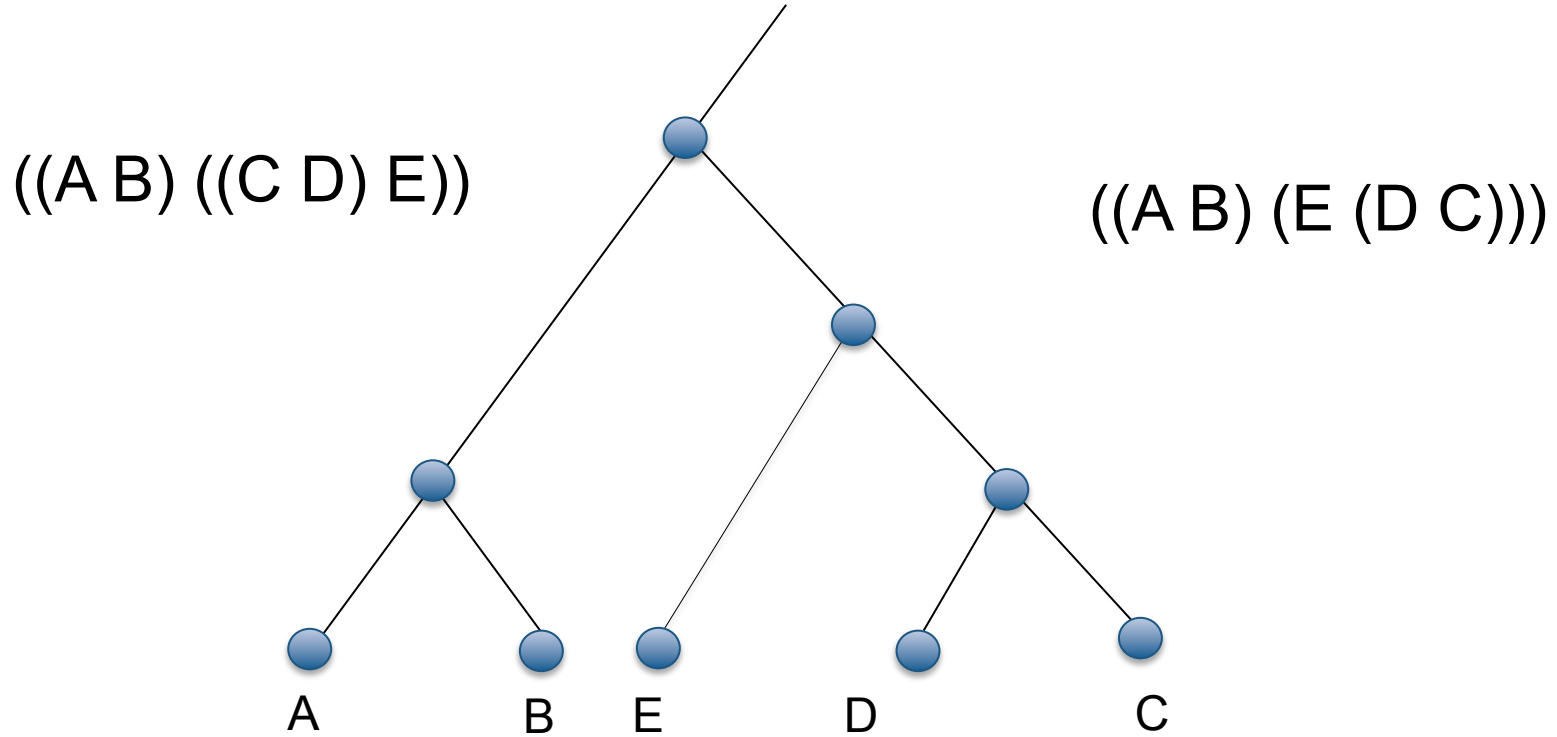
# A tree expression

`((A B) ((C D) E))`

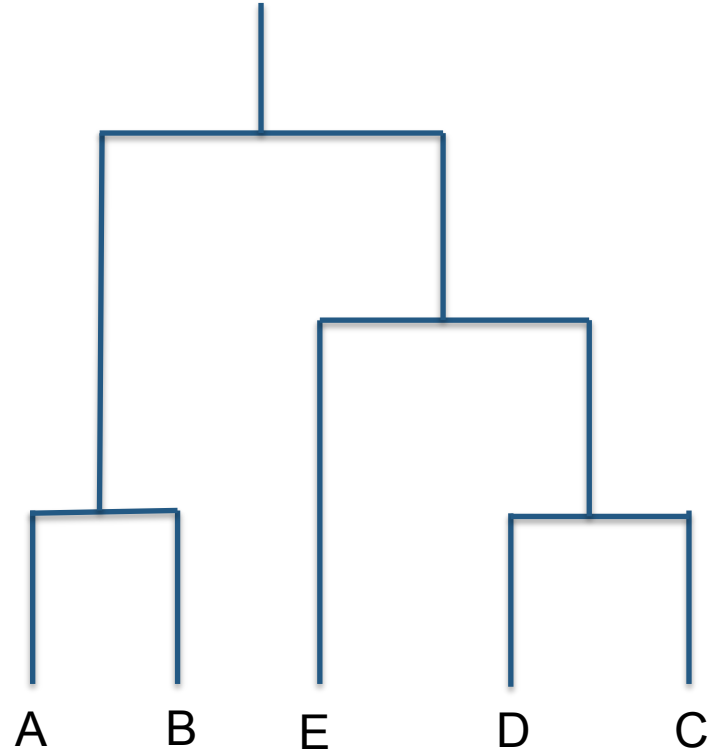
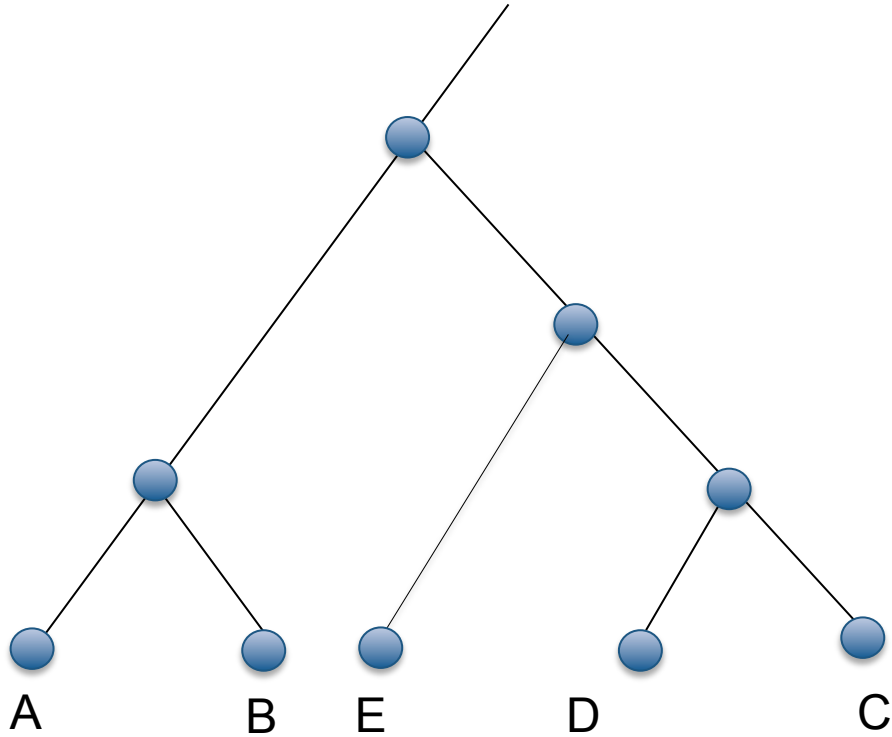


`((A B) (E (D C)))`

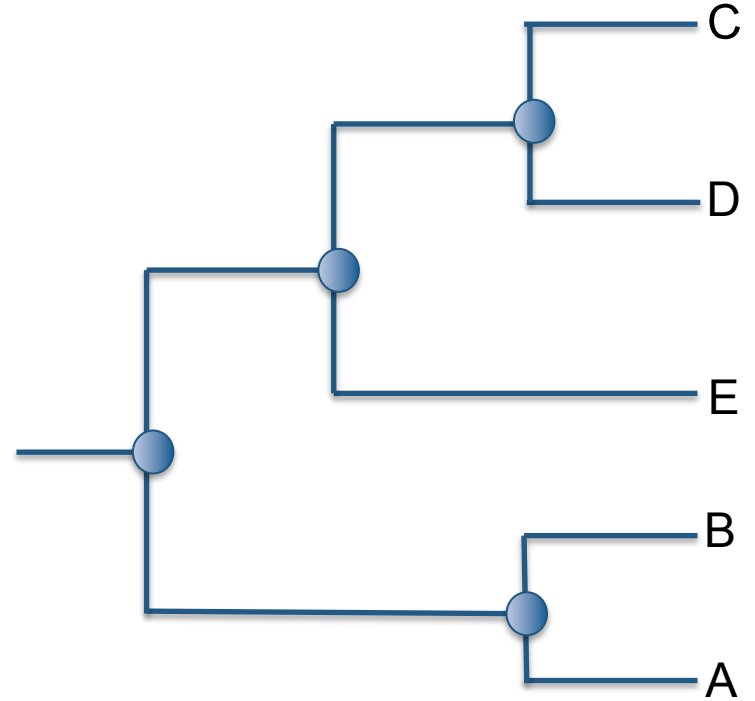
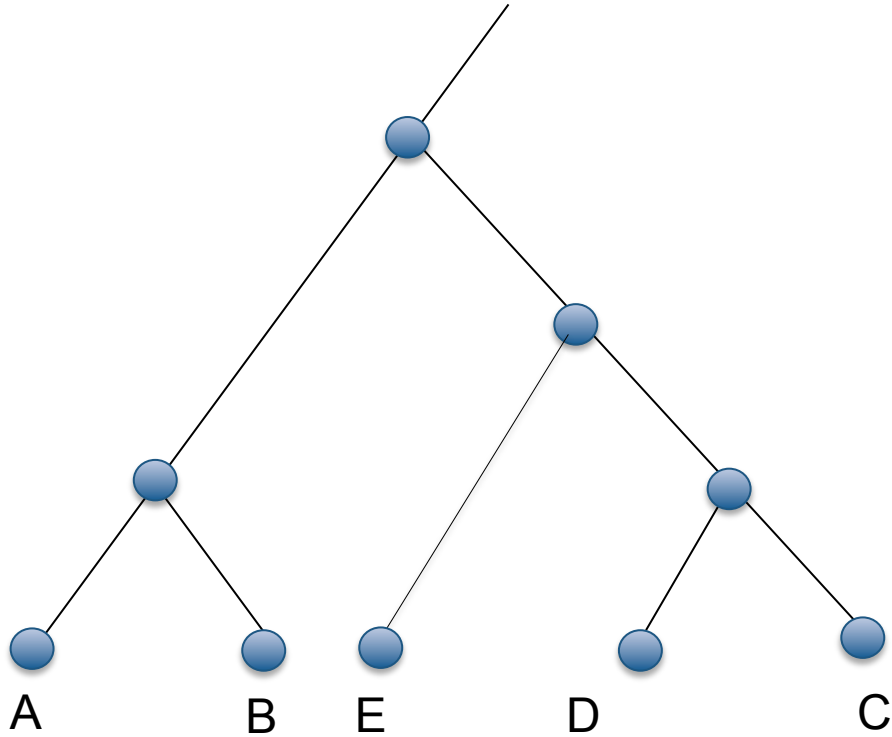
# A tree expression



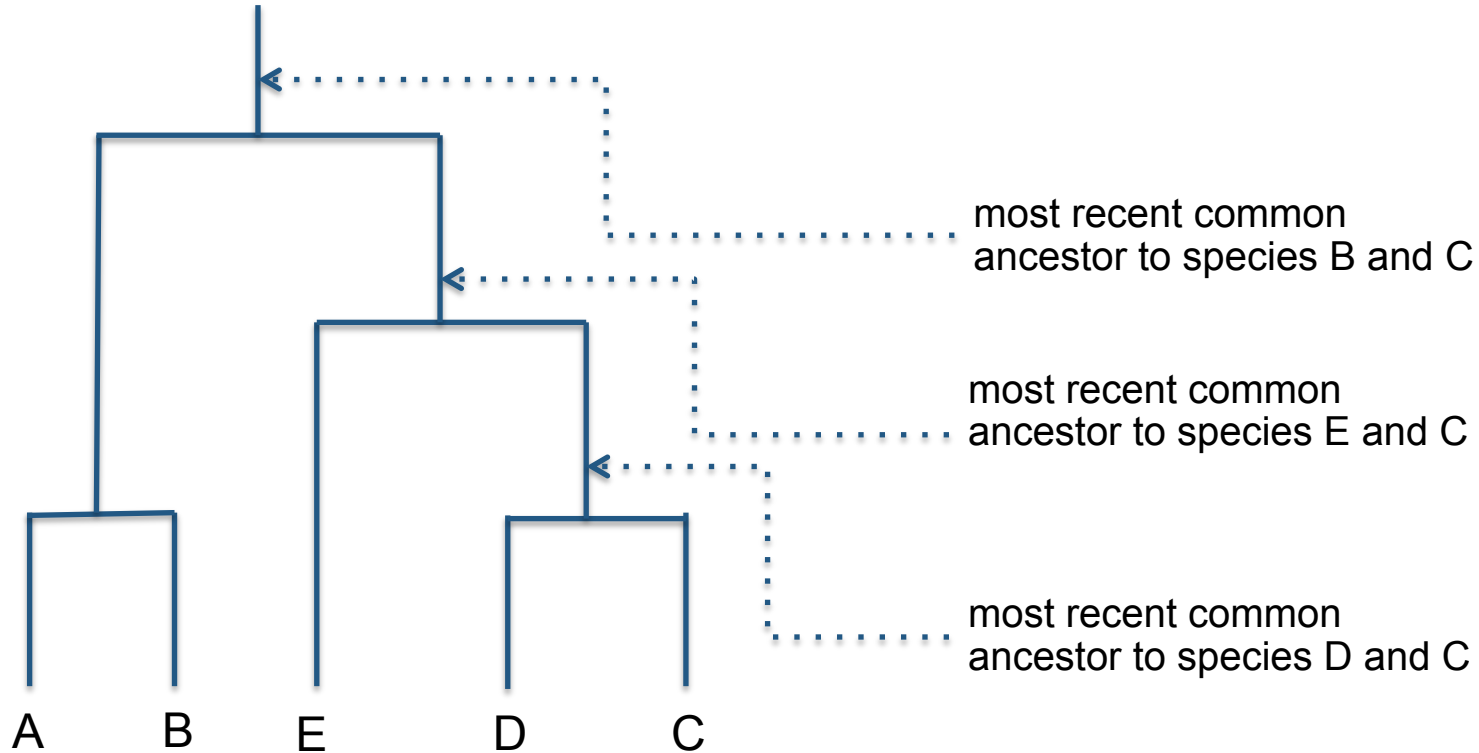
# Different drawings, same tree



# Different drawings, same tree



# Interpreting a phylogenetic tree



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