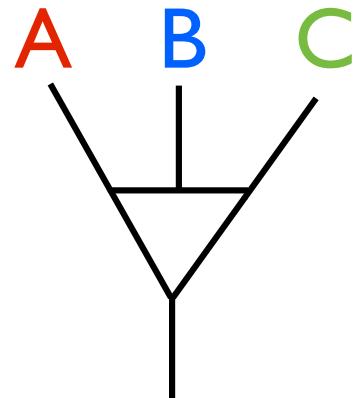
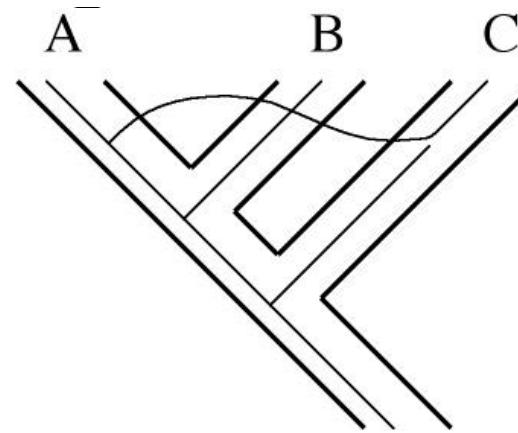


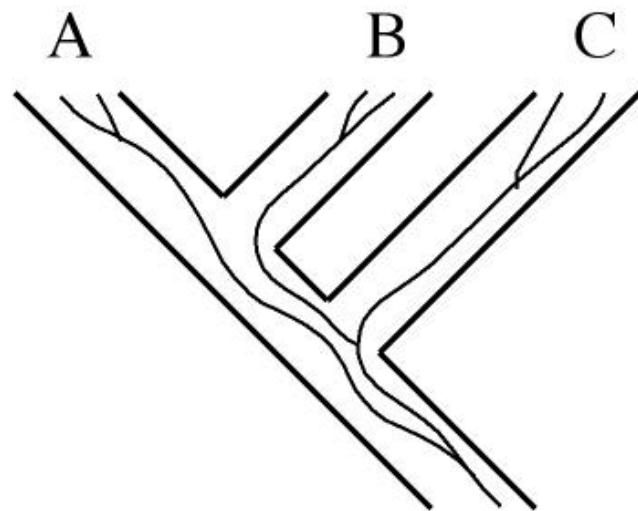
Inferred Phylogenies Differ Across Genes



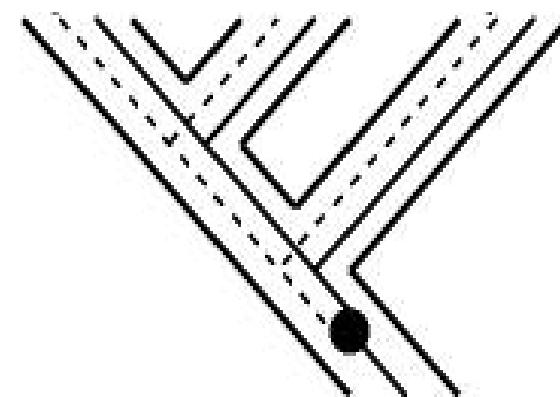
Hybridization



Lateral Gene Transfer

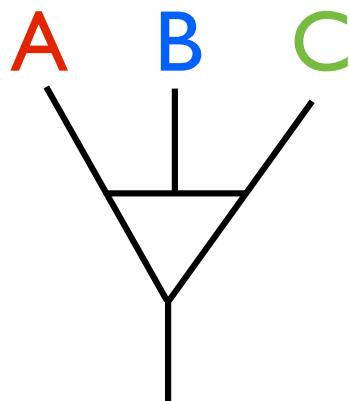


Incomplete Lineage Sorting

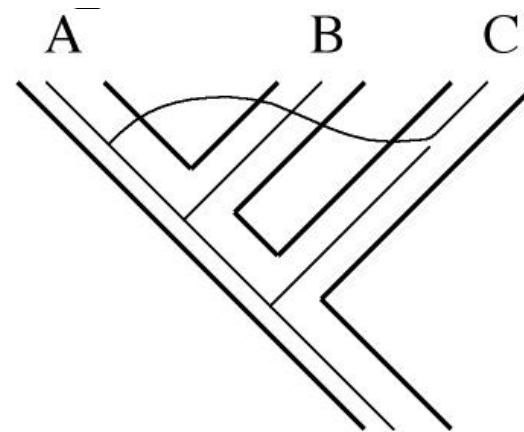


Gene Duplication

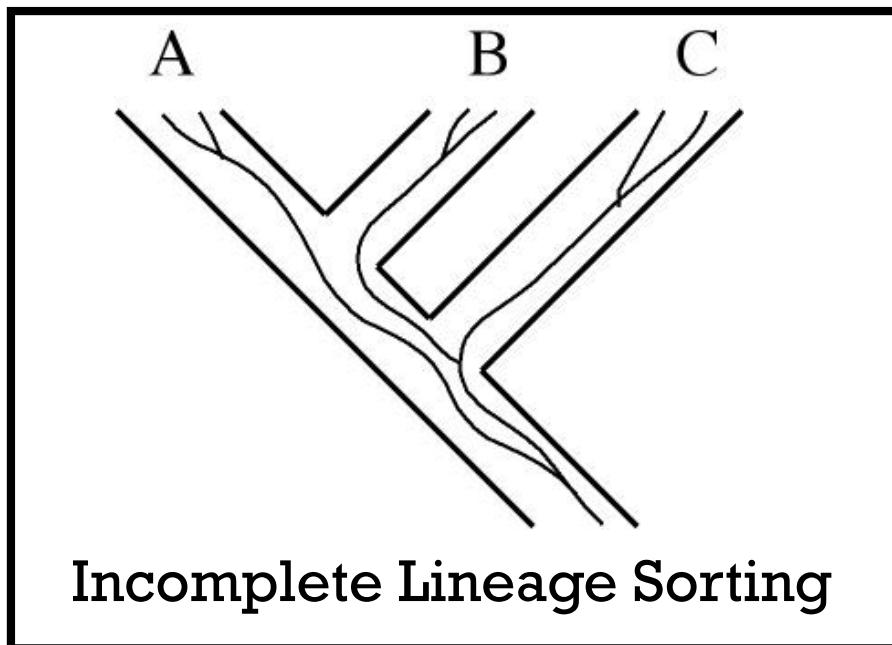
Inferred Phylogenies Differ Across Genes



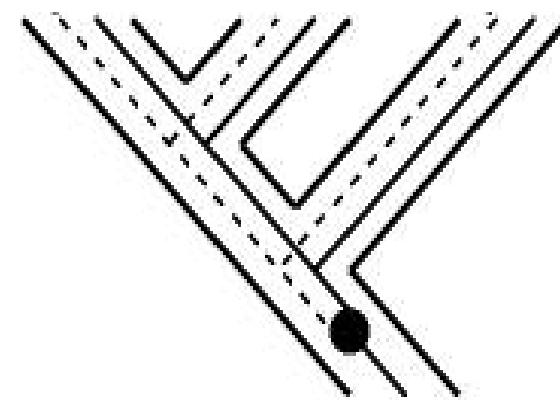
Hybridization



Lateral Gene Transfer

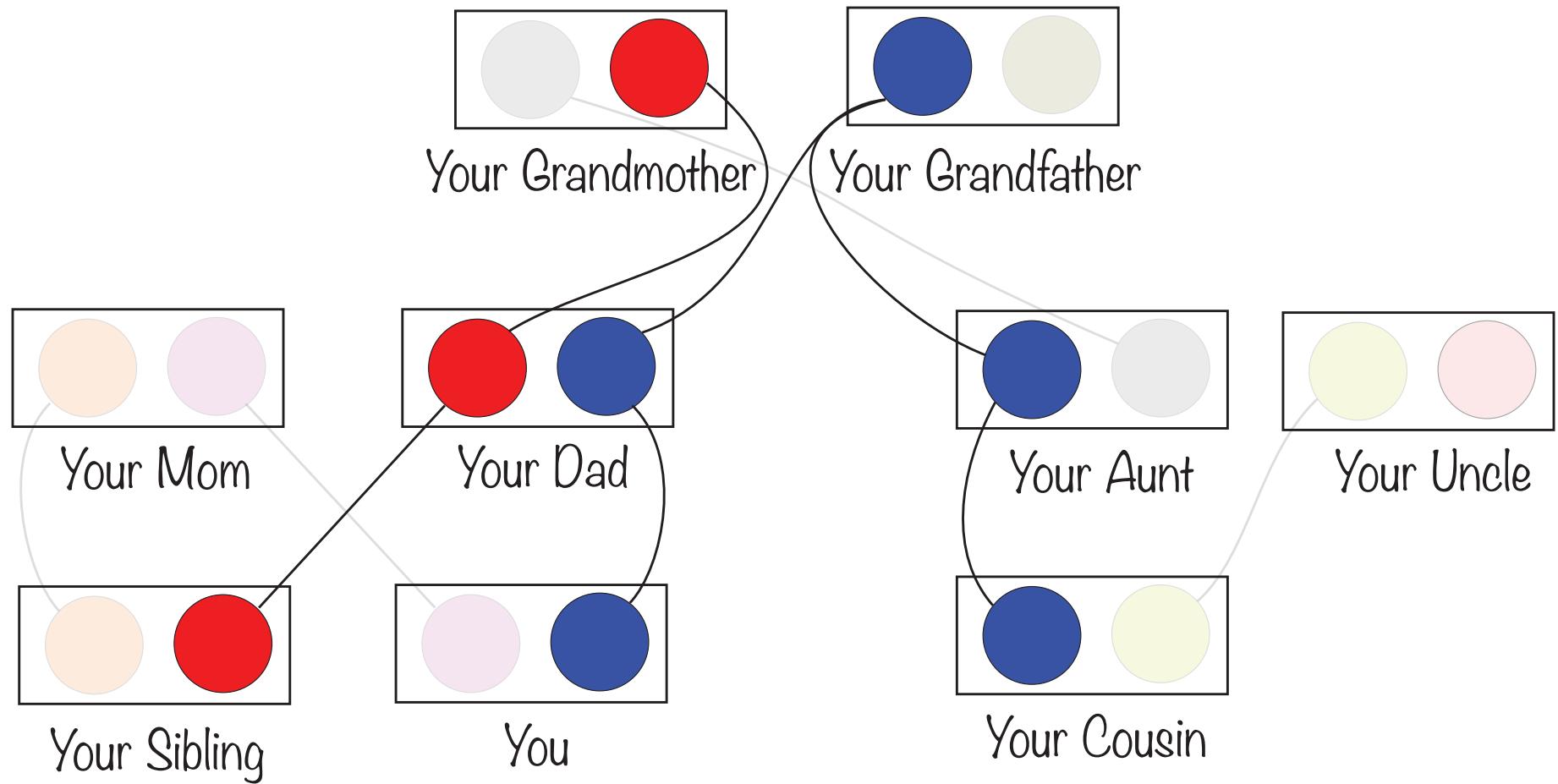


Incomplete Lineage Sorting



Gene Duplication

Genealogical Analogy to Incomplete Lineage Sorting



Incomplete Lineage Sorting

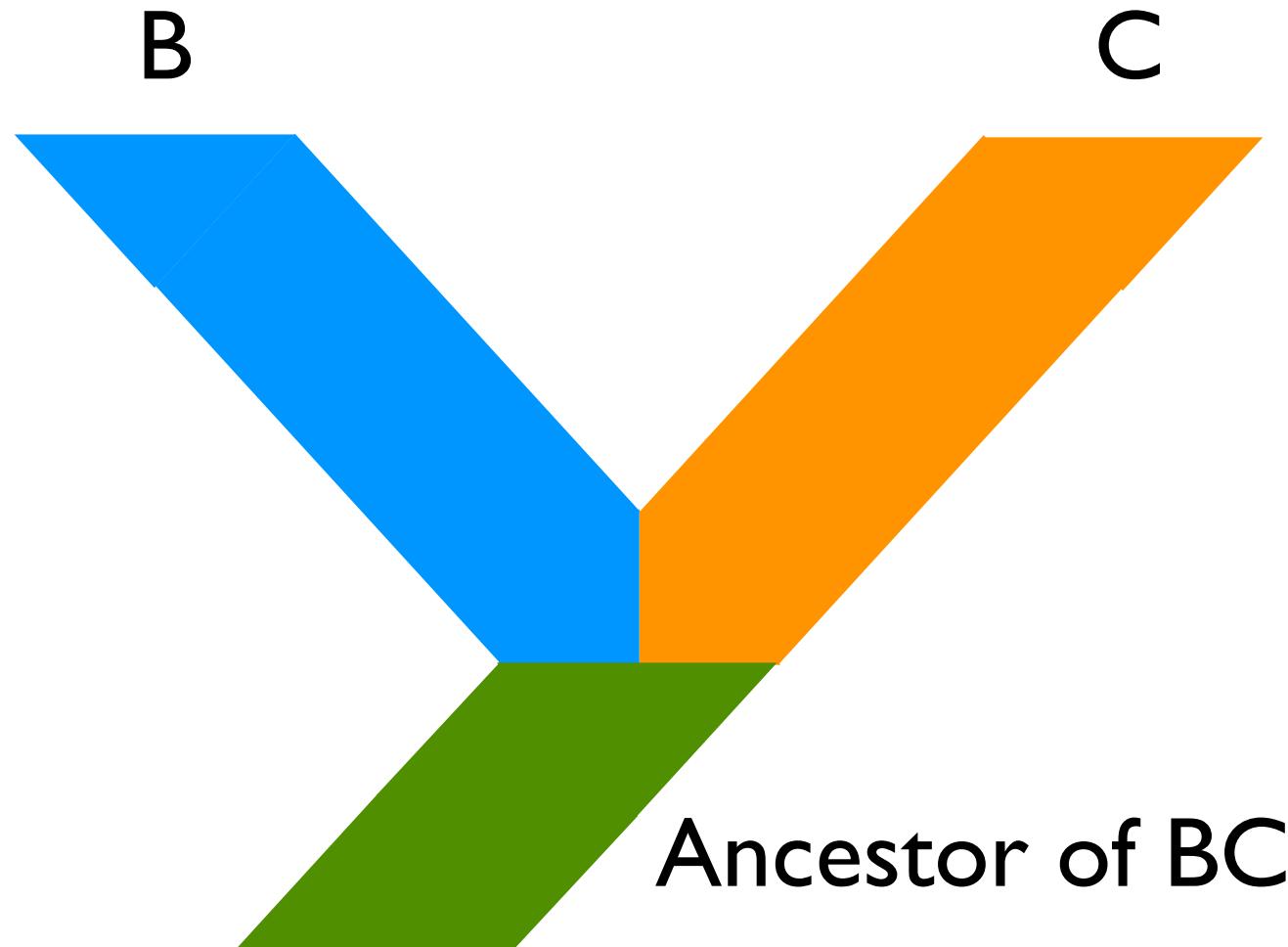


Image taken from R.Thomson

Incomplete Lineage Sorting

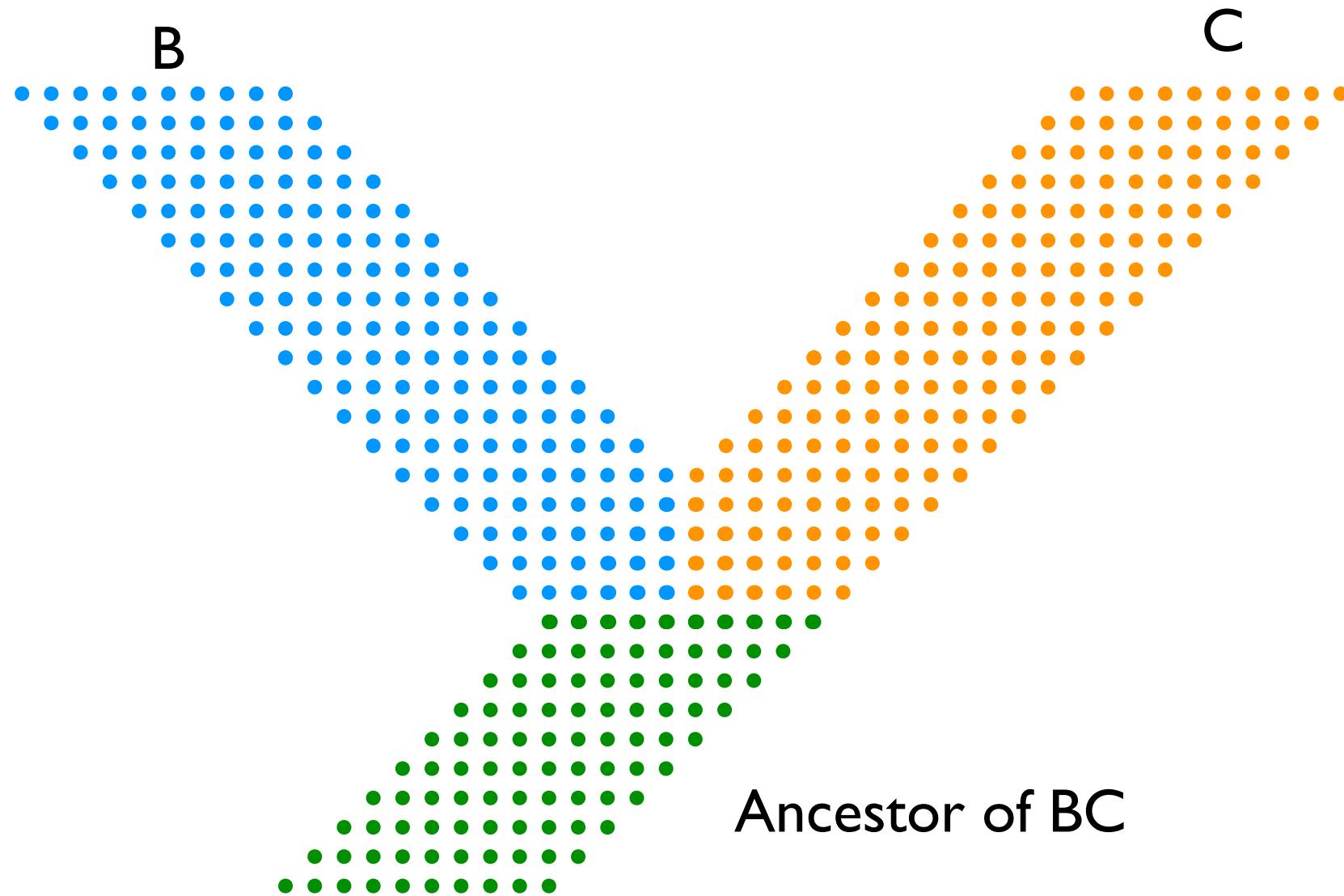


Image taken from R.Thomson

Incomplete Lineage Sorting

- If we sample 2 alleles, they have some probability of coalescing before the population ‘ends’ at the ancestor

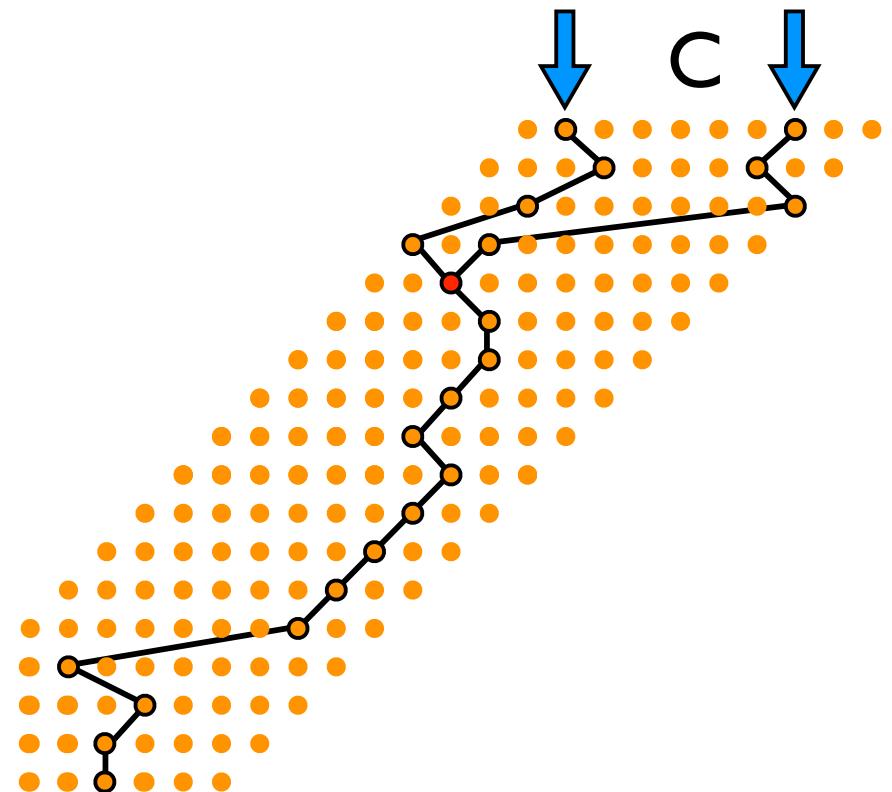
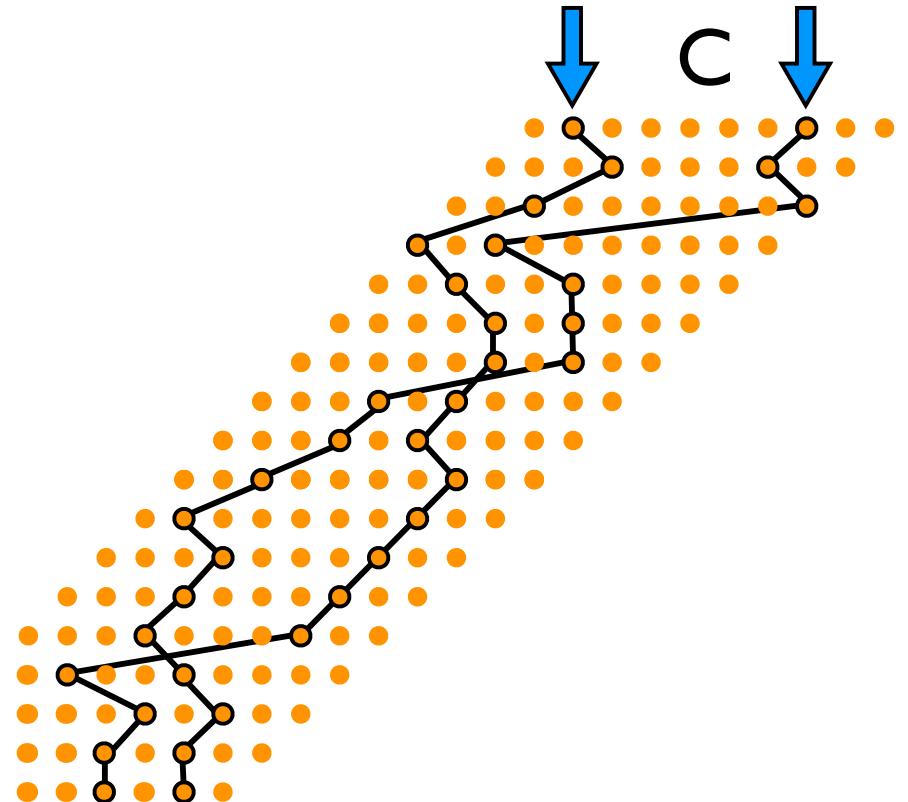


Image taken from R.Thomson

Incomplete Lineage Sorting

- If we sample 2 alleles, they have some probability of coalescing before the population ‘ends’ at the ancestor
- Which means they also have some probability of not coalescing
 - Depends on the population size and the number of generations



Incomplete Lineage Sorting

- Likewise, if we sample one allele from each of two different species, there is some probability that the two alleles will coalesce in the ancestor

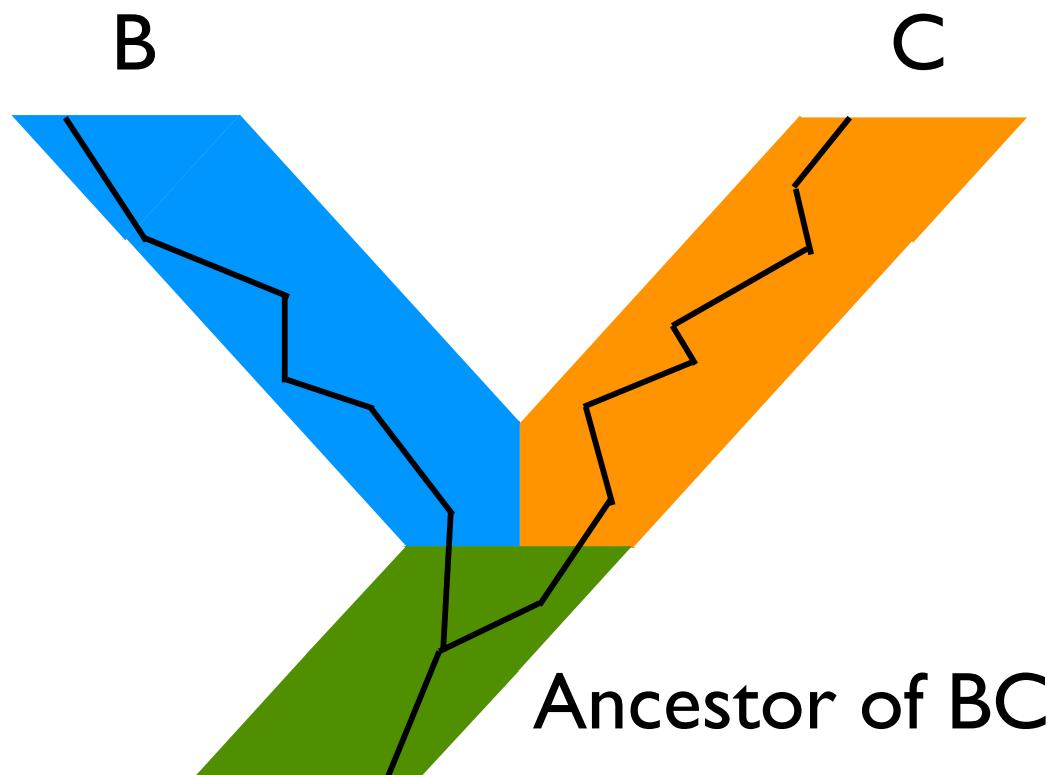


Image taken from R.Thomson

Incomplete Lineage Sorting

- But there is also some probability that they will not.
 - This is called incomplete coalescence
- What does the probability depend on?

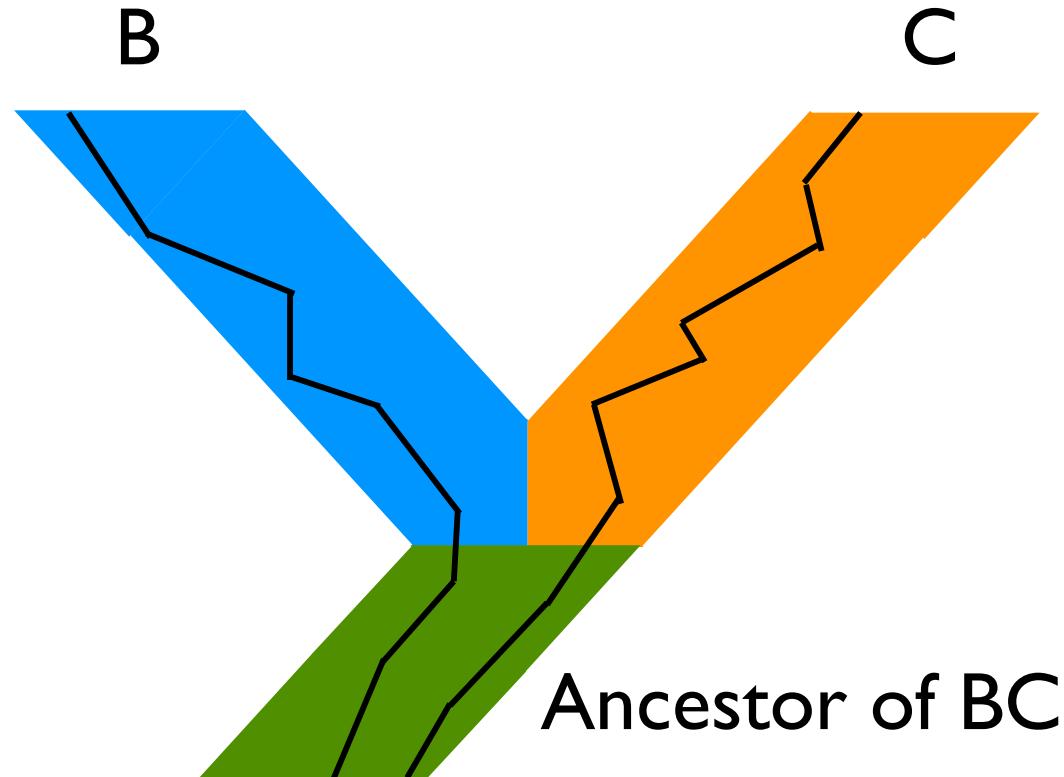


Image taken from R.Thomson

Incomplete Lineage Sorting

- If they don't coalesce within the ancestor, they move down into the next ancestral population

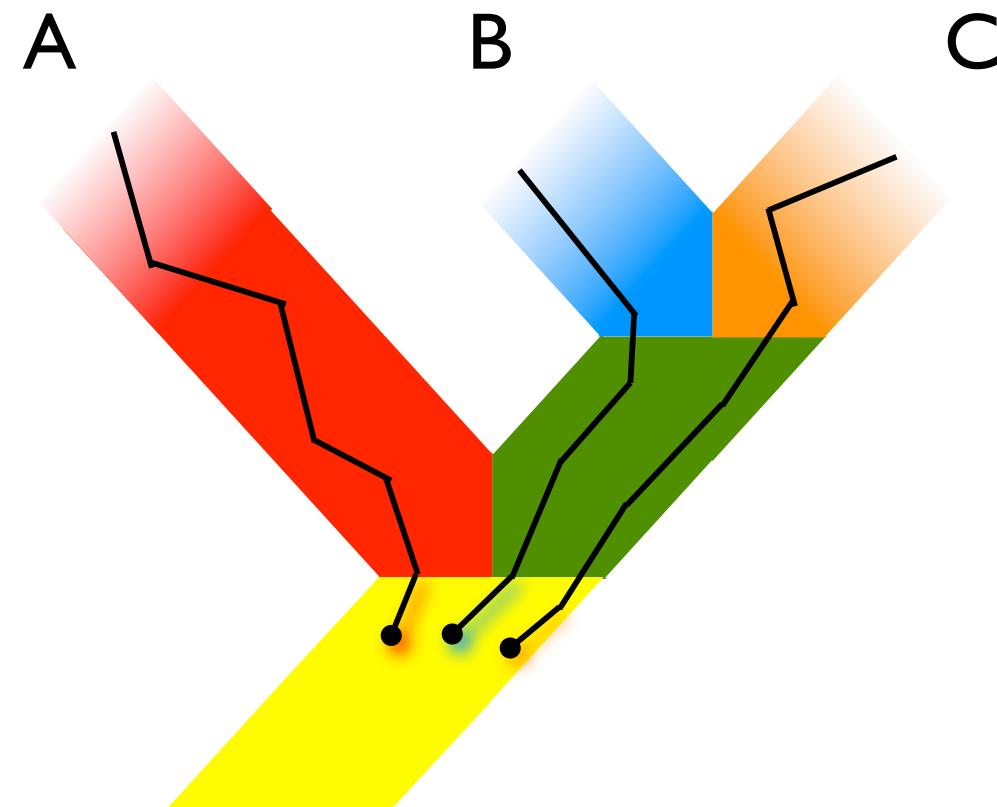


Image taken from R.Thomson

Incomplete Lineage Sorting

- Now they can coalesce in 3 different ways with equal probability!

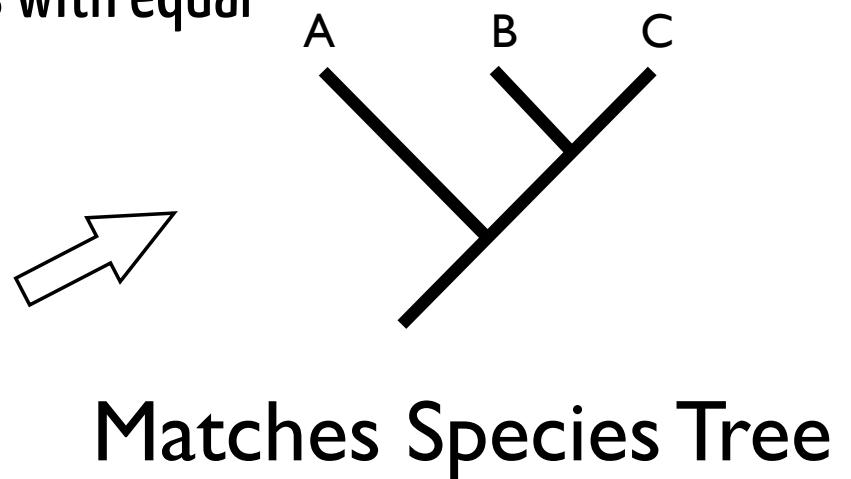
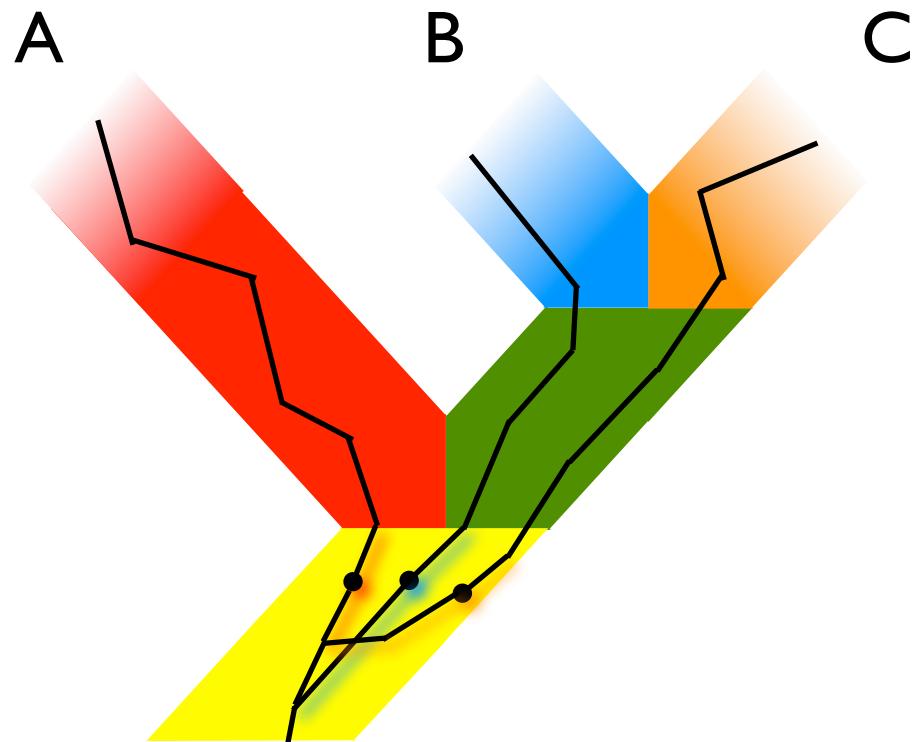


Image taken from R.Thomson

Incomplete Lineage Sorting

- Now they can coalesce in 3 different ways with equal probability!

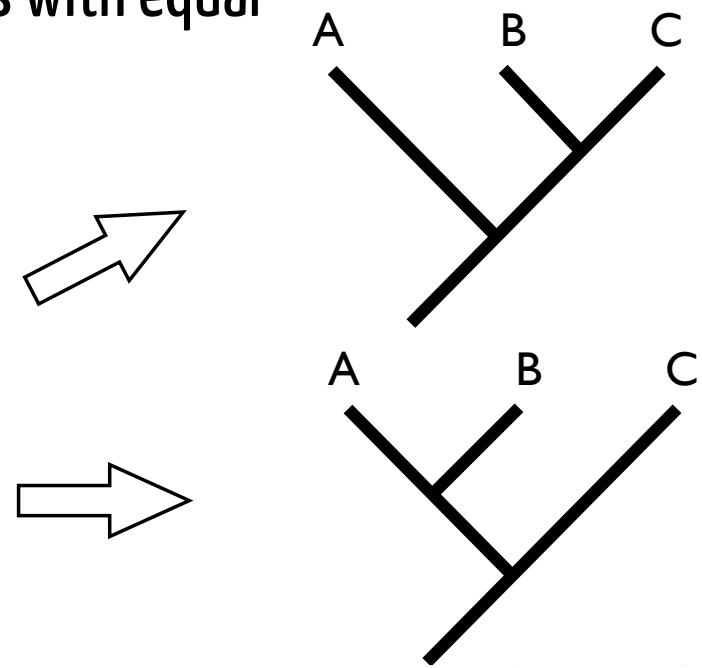
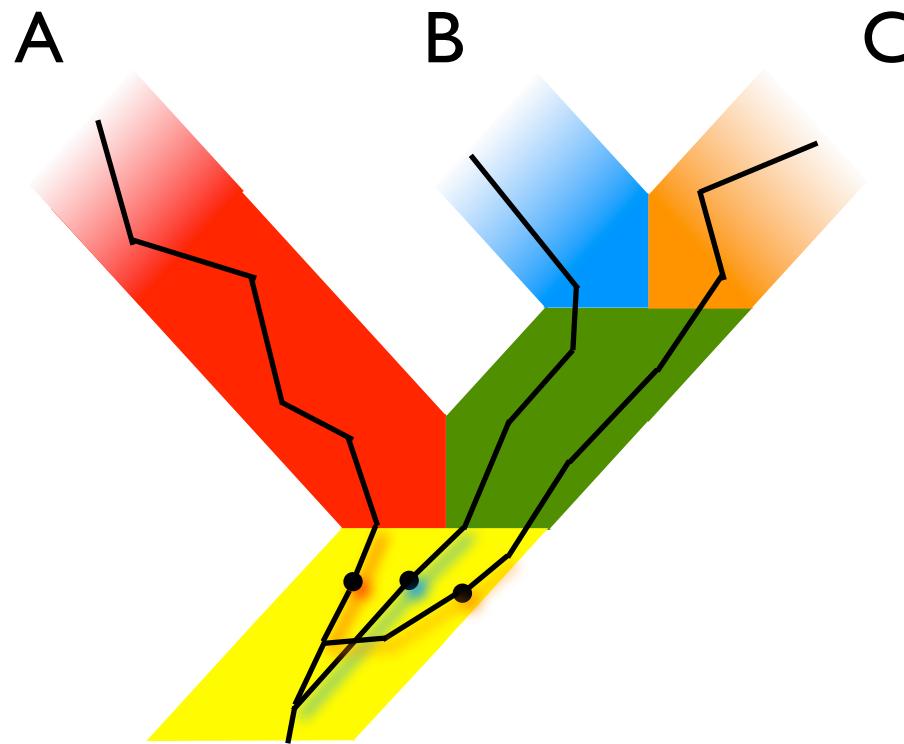


Image taken from R.Thomson

Incomplete Lineage Sorting

- Now they can coalesce in 3 different ways with equal probability!

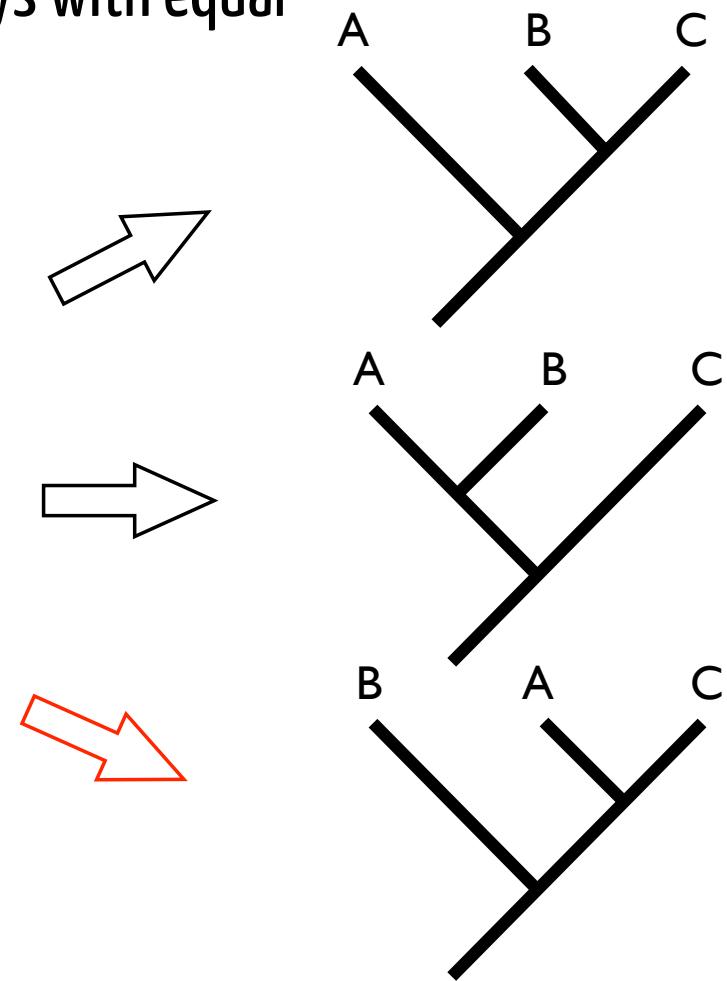
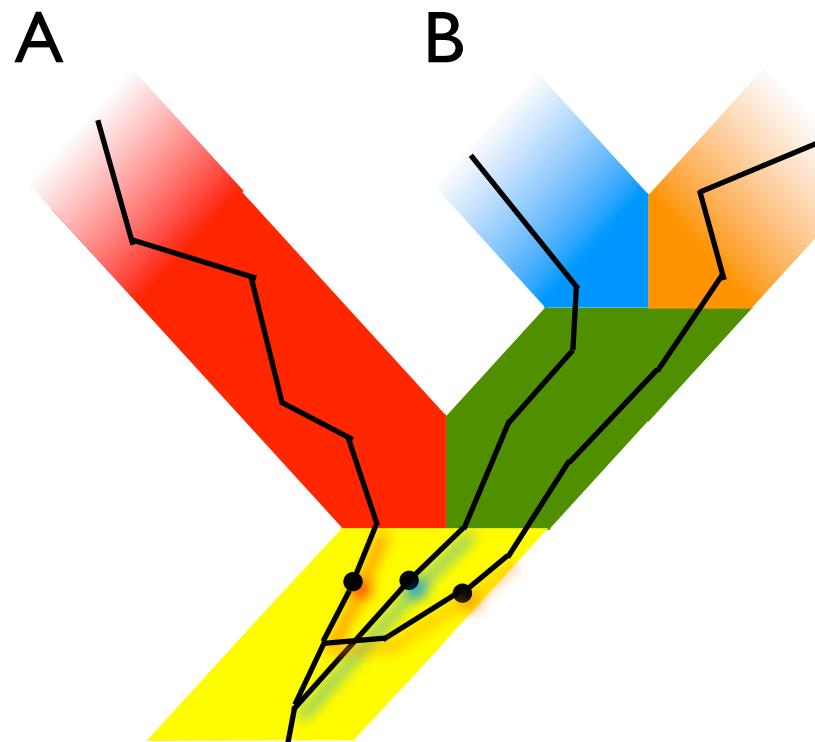
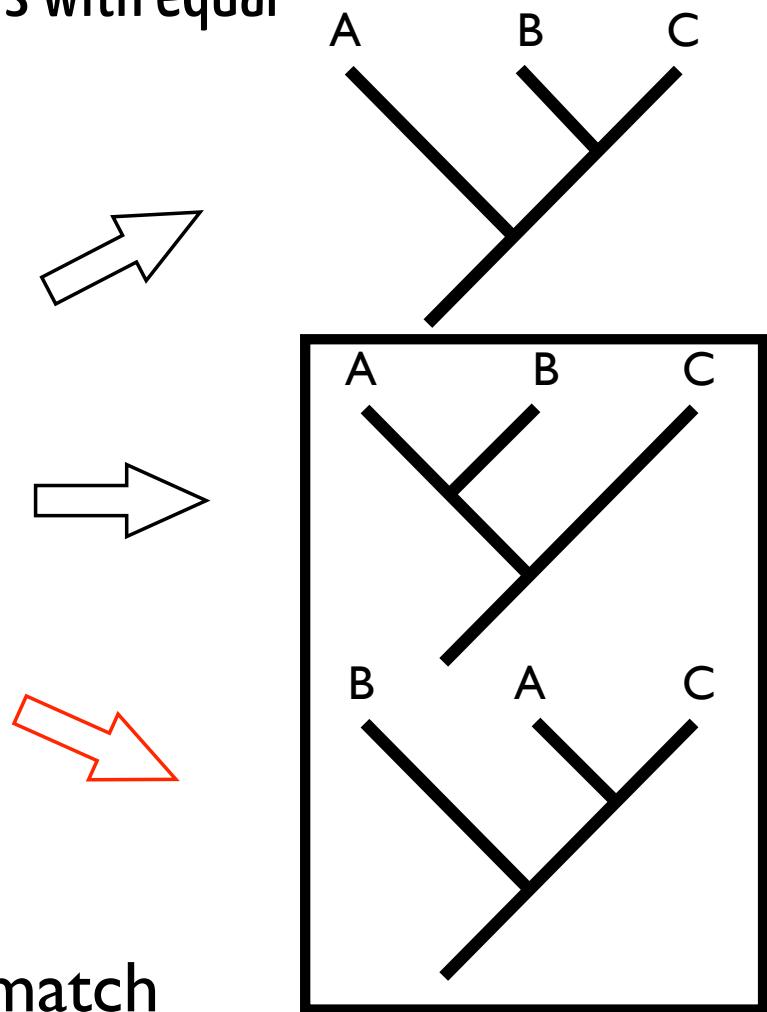
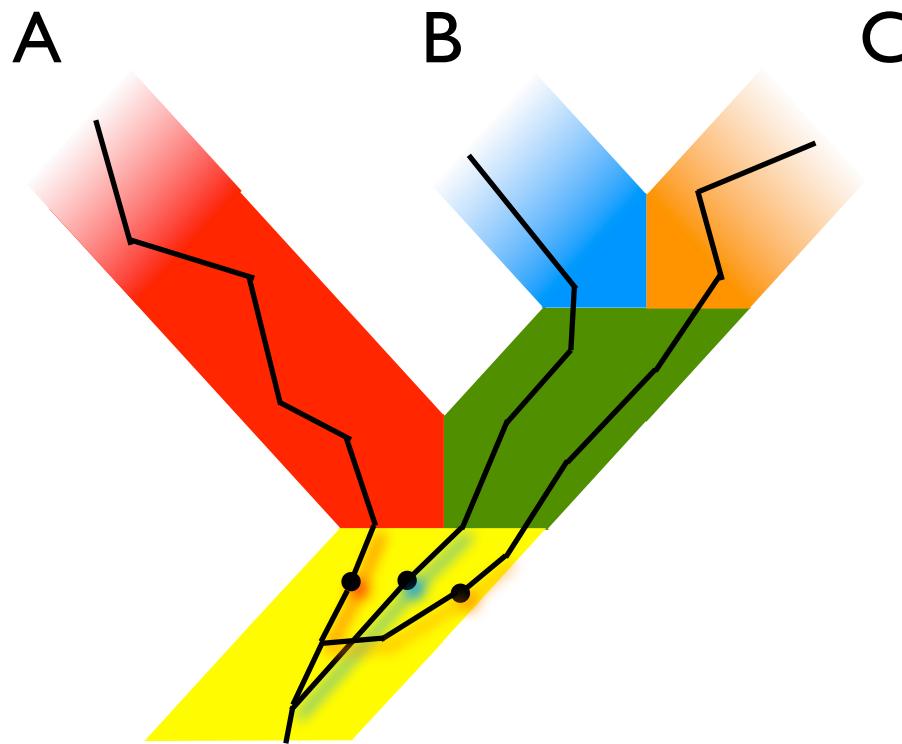


Image taken from R.Thomson

Incomplete Lineage Sorting

- Now they can coalesce in 3 different ways with equal probability!

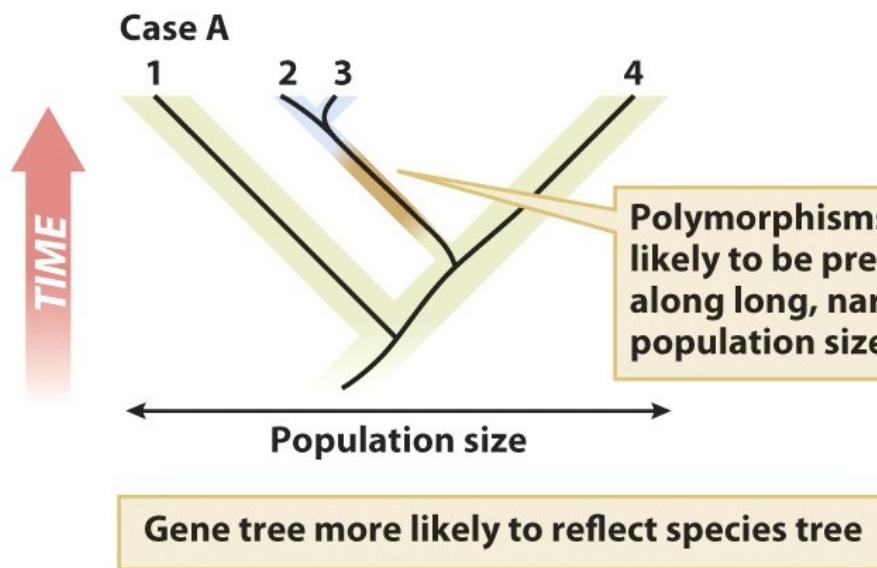


Probability of gene trees that don't match species tree goes up as divergences are closer in time and population sizes get larger.

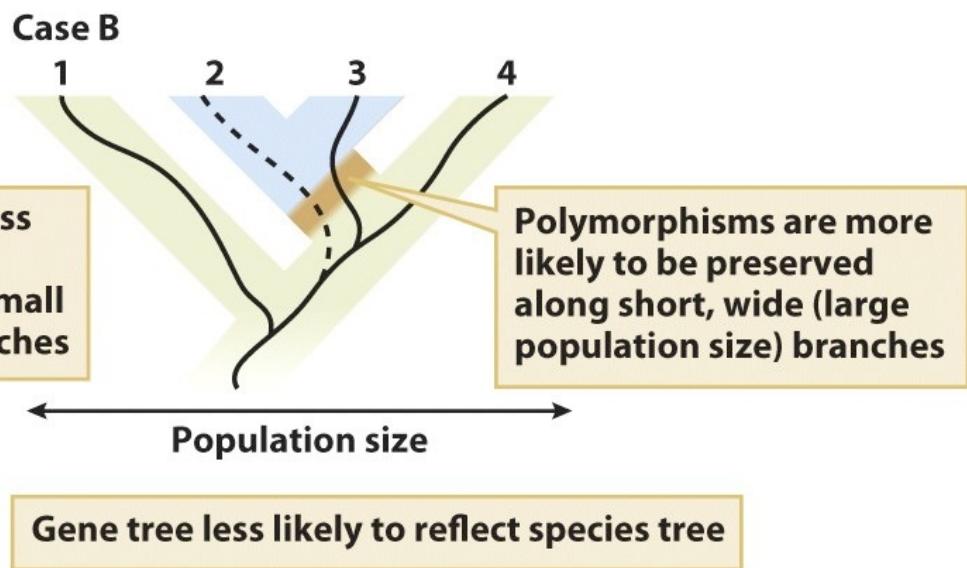
Image taken from R.Thomson

Incomplete Lineage Sorting (ILS)

Less ILS



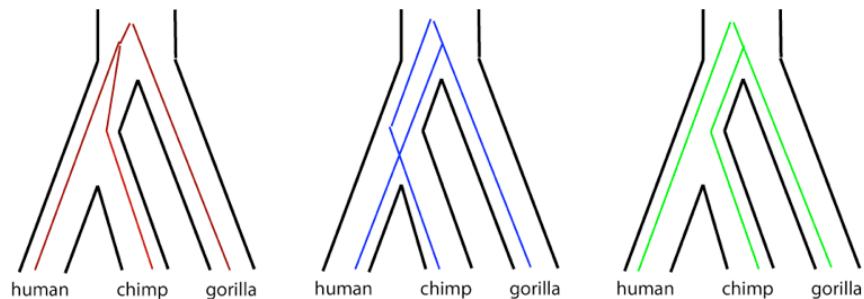
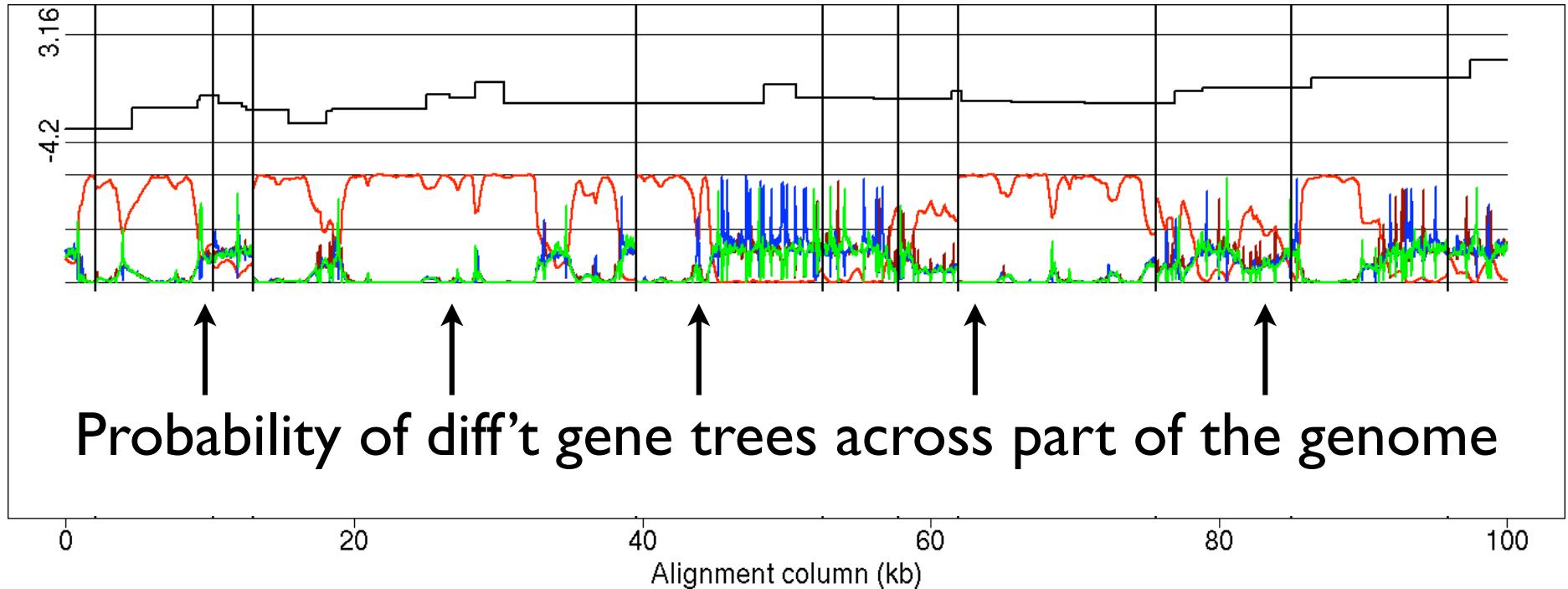
More ILS



Evolution, 1/e Figure 14.31

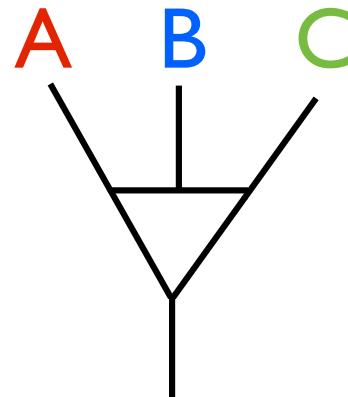
© 2012 W. W. Norton & Company, Inc.

Incomplete Lineage Sorting in the Primate Phylogeny

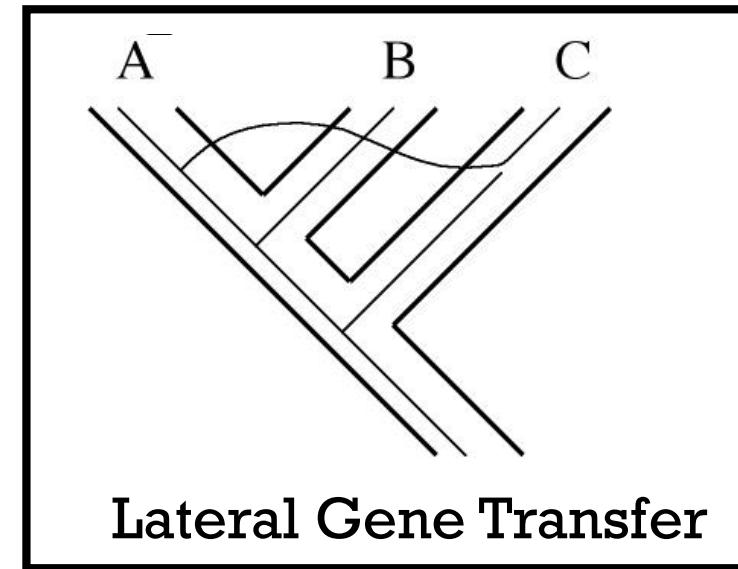


What can we learn about the ancestor of humans and chimps from these patterns?

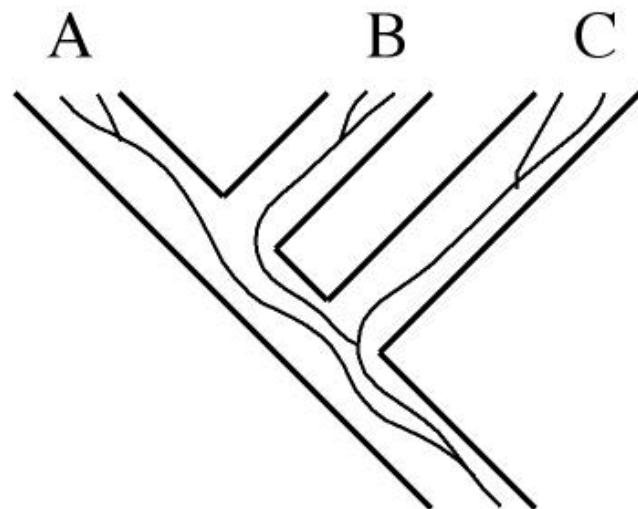
Inferred Phylogenies Differ Across Genes



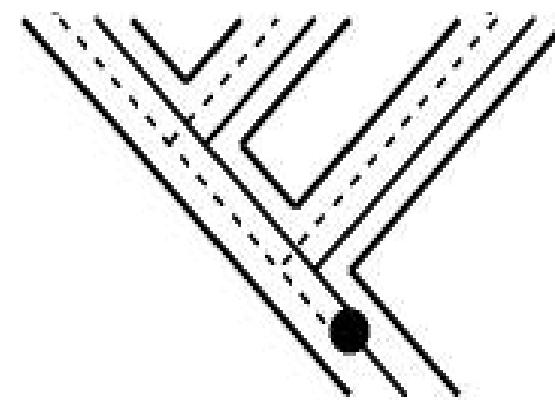
Hybridization



Lateral Gene Transfer

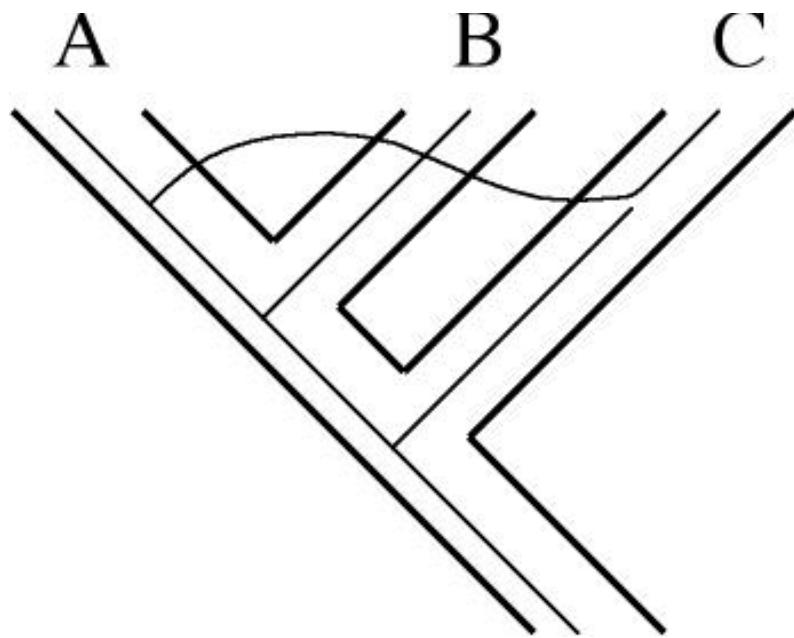


Incomplete Lineage Sorting

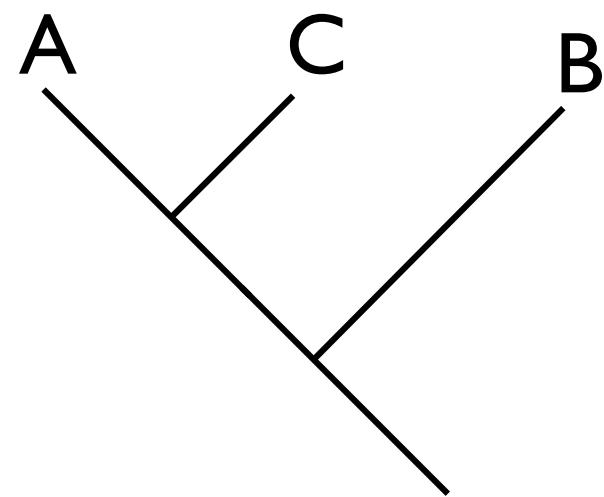


Gene Duplication

Horizontal (Lateral) Gene Transfer



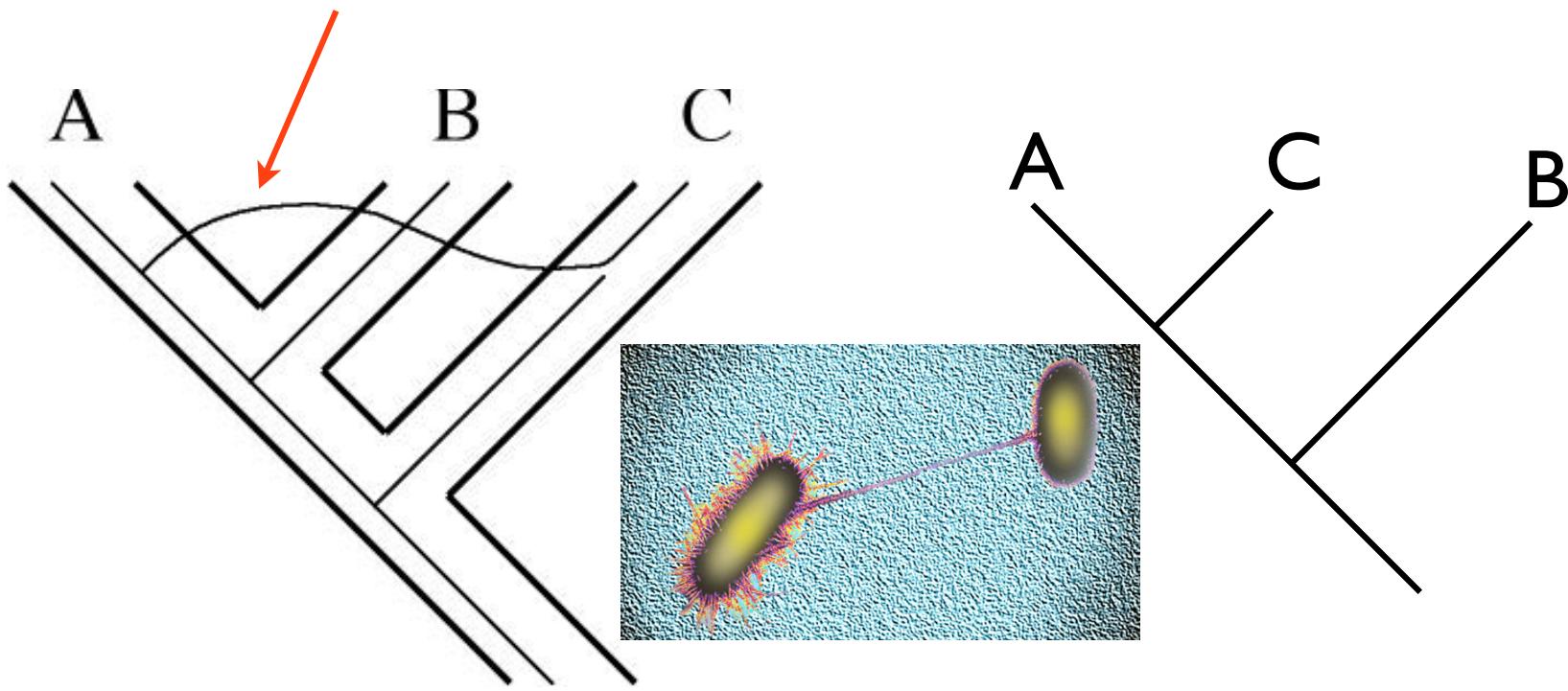
Species Tree



Gene Tree

Horizontal (Lateral) Gene Transfer

Transfer via hybridization, vector, conjugation, etc.



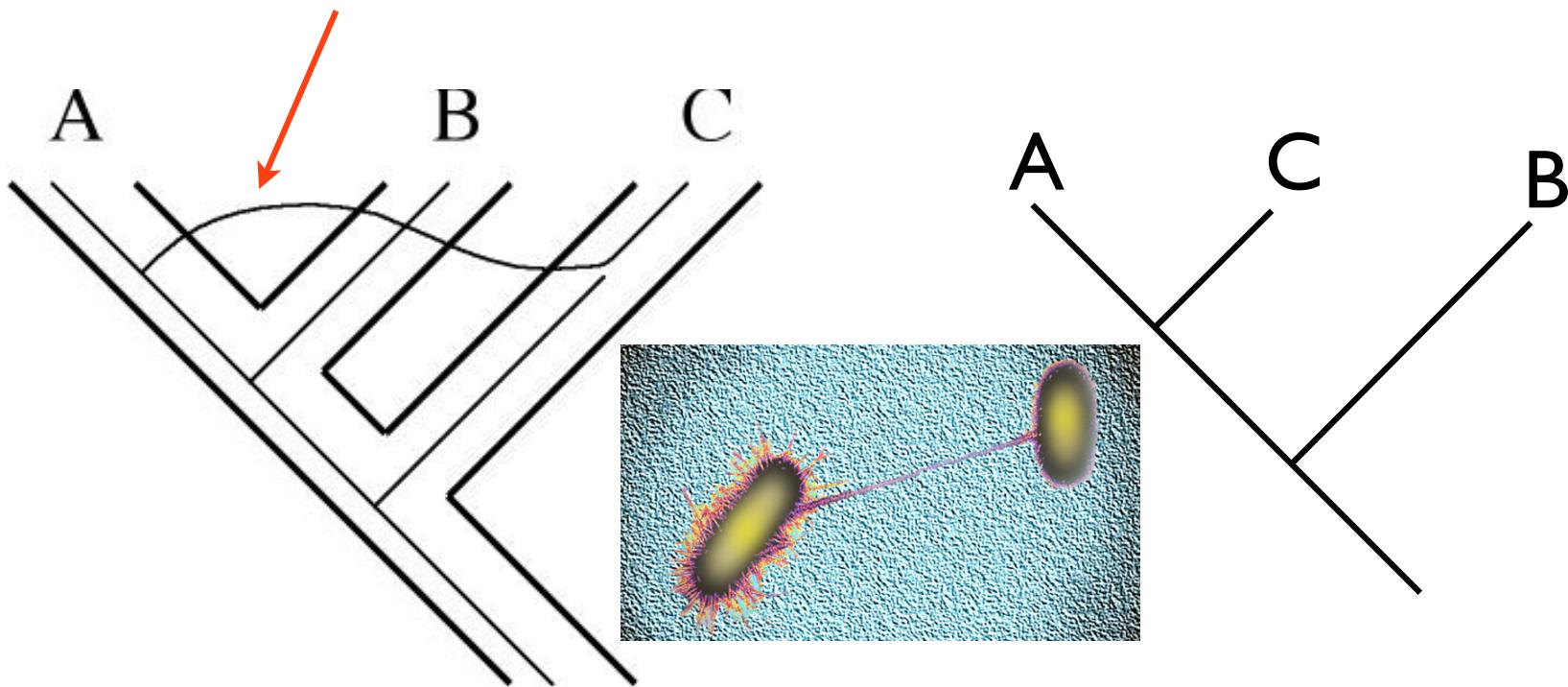
Species Tree

Gene Tree

Most common in prokaryotes,
but can happen in eukaryotes.

Horizontal (Lateral) Gene Transfer

Transfer via hybridization, vector, conjugation, etc.



Species Tree

Gene Tree

HGT frequently occurs with antibiotic resistance genes.

Photosynthetic Sea Slugs

November 18, 2008 | vol. 105 | no. 46 | pp. 17589–18072

PNAS

Proceedings of the National Academy of Sciences of the United States of America

www.pnas.org

Mollusc photosynthesis



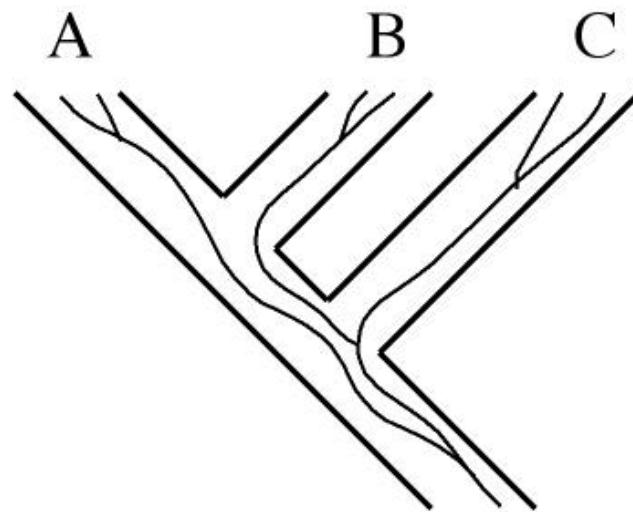
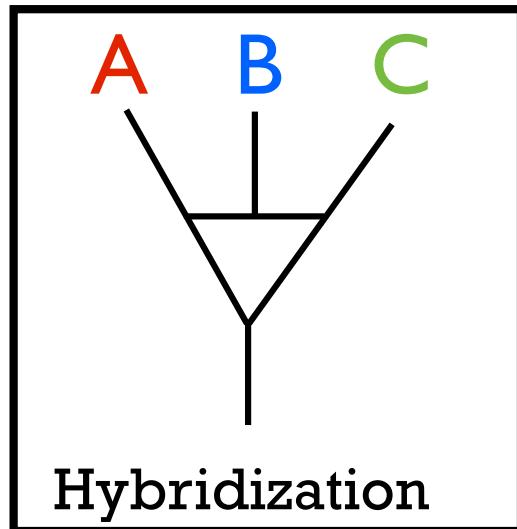
Perfect bulk diamonds

Biogenic magnetite

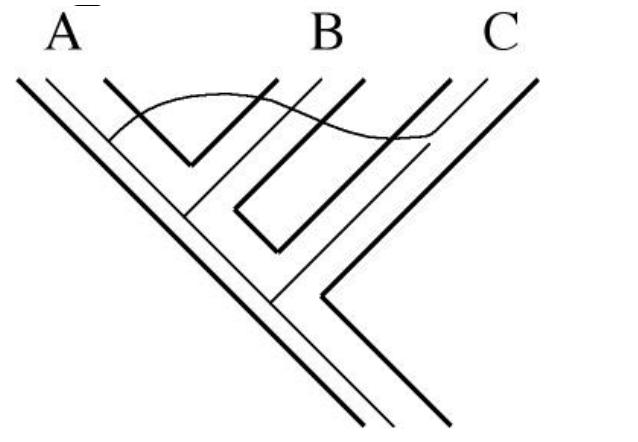
Predicting cholera epidemics

Corn signatures in fast food

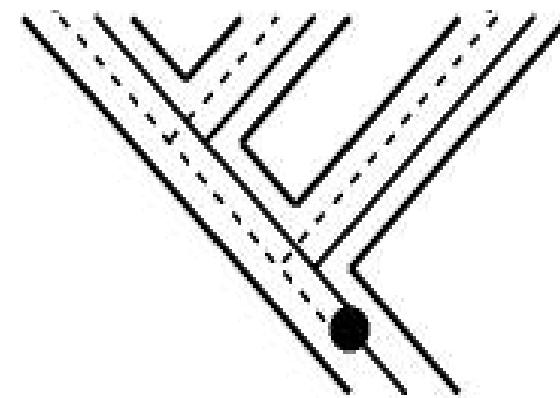
Inferred Phylogenies Differ Across Genes



Incomplete Lineage Sorting

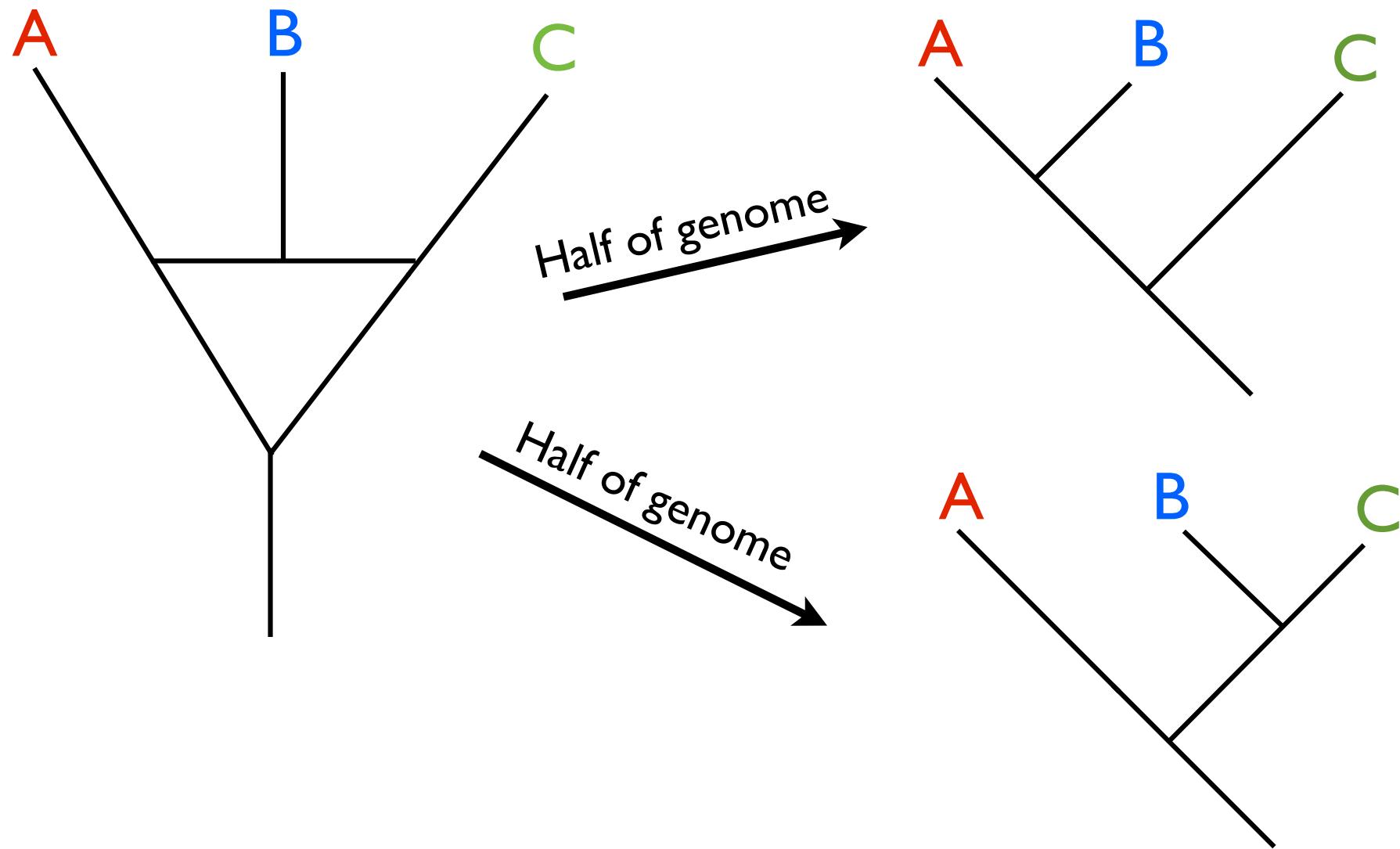


Lateral Gene Transfer



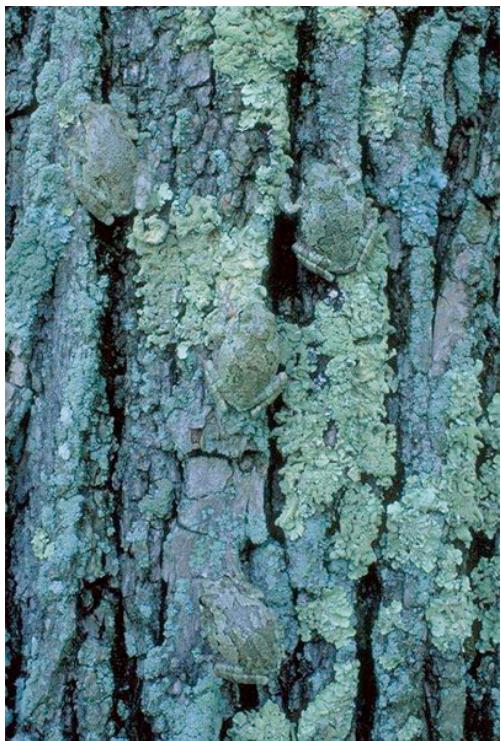
Gene Duplication

Speciation via Hybridization



Speciation via Hybridization

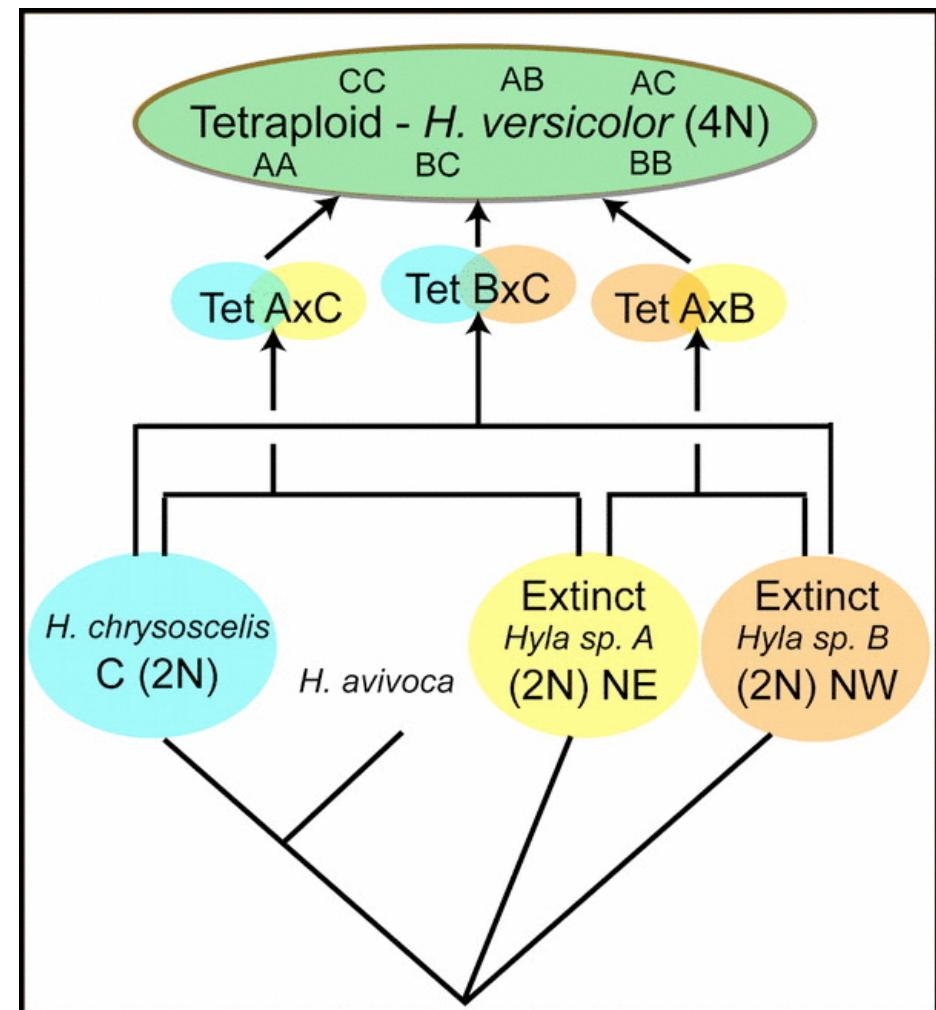
Gray Tree Frogs



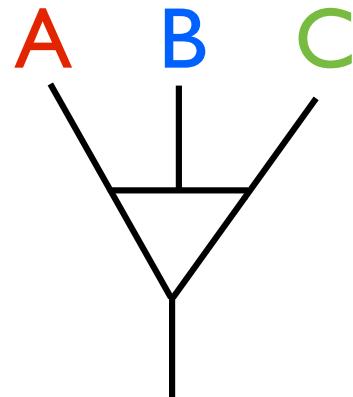
Hyla versicolor



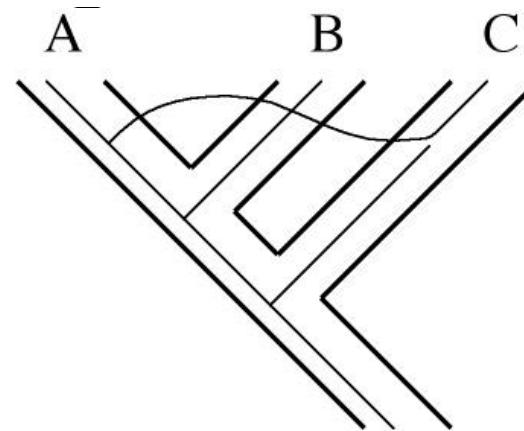
Hyla chrysocelis



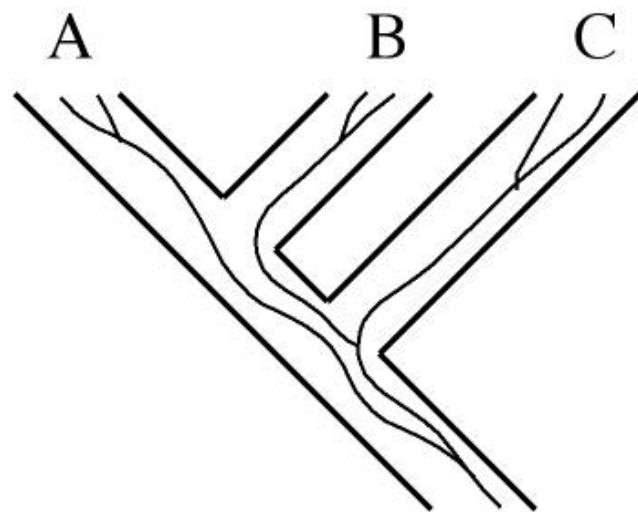
Inferred Phylogenies Differ Across Genes



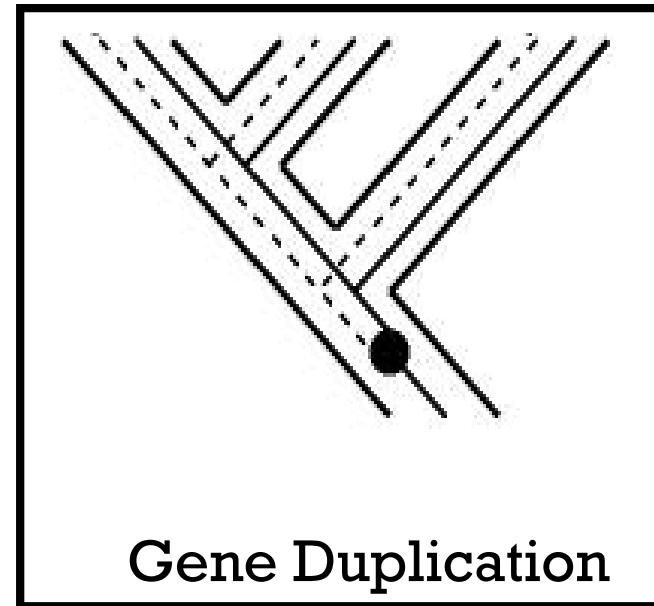
Hybridization



Lateral Gene Transfer

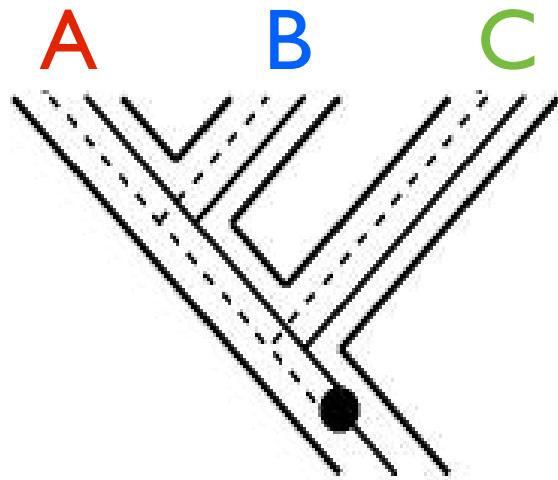


Incomplete Lineage Sorting



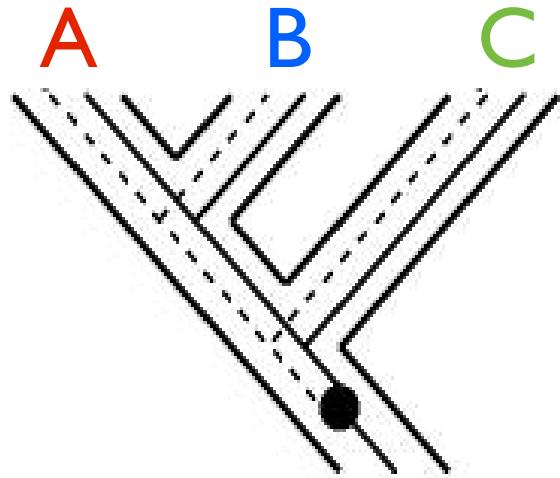
Gene Duplication

Gene Duplication

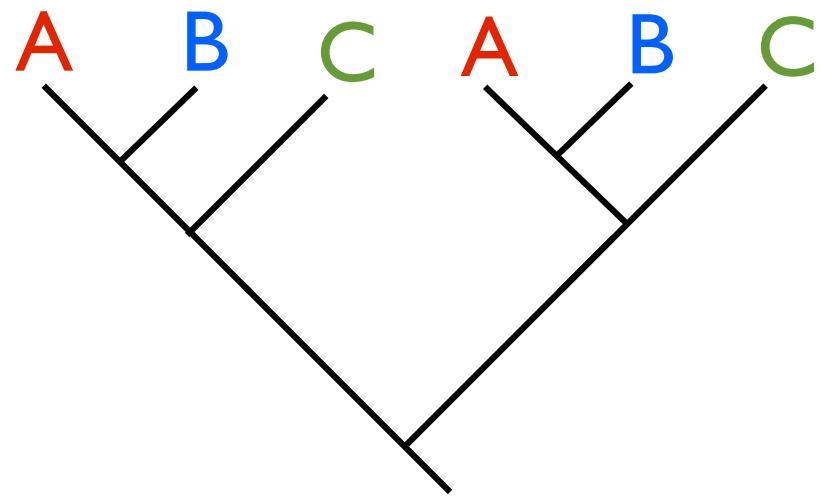


Gene Duplication

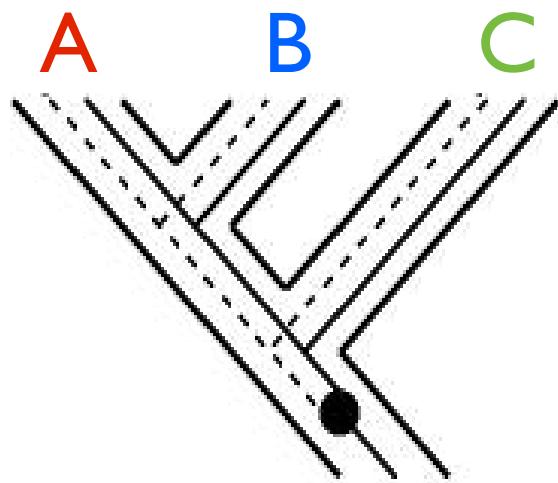
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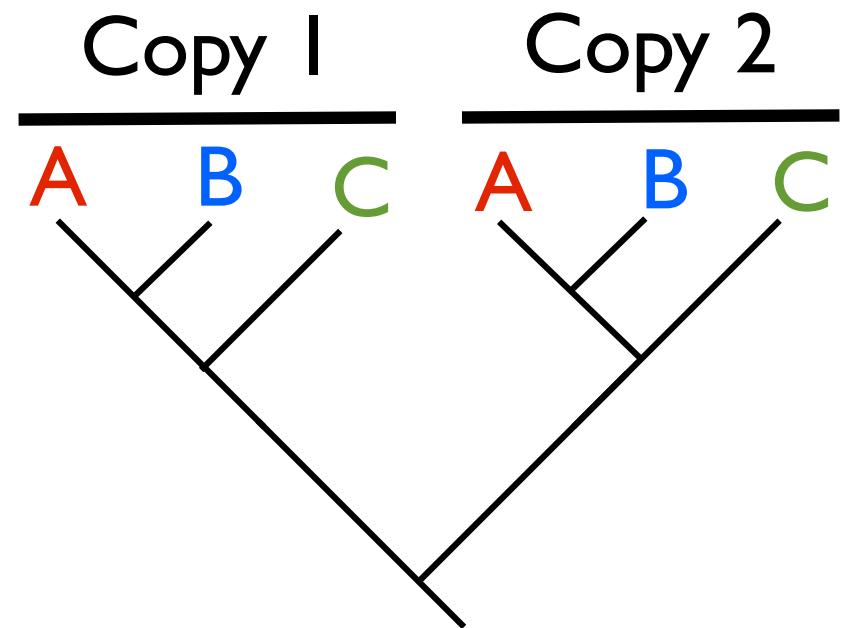
Gene Duplication



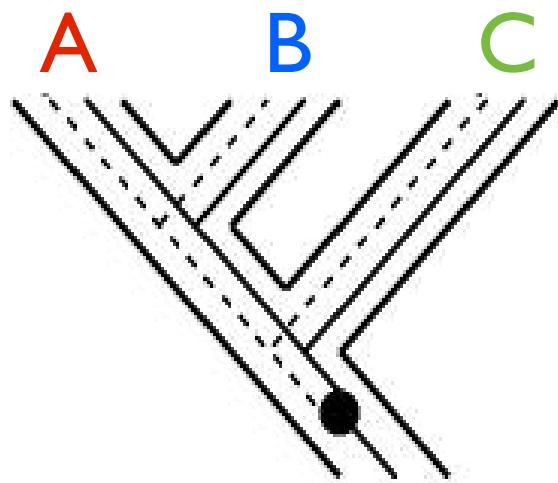
Gene Duplication



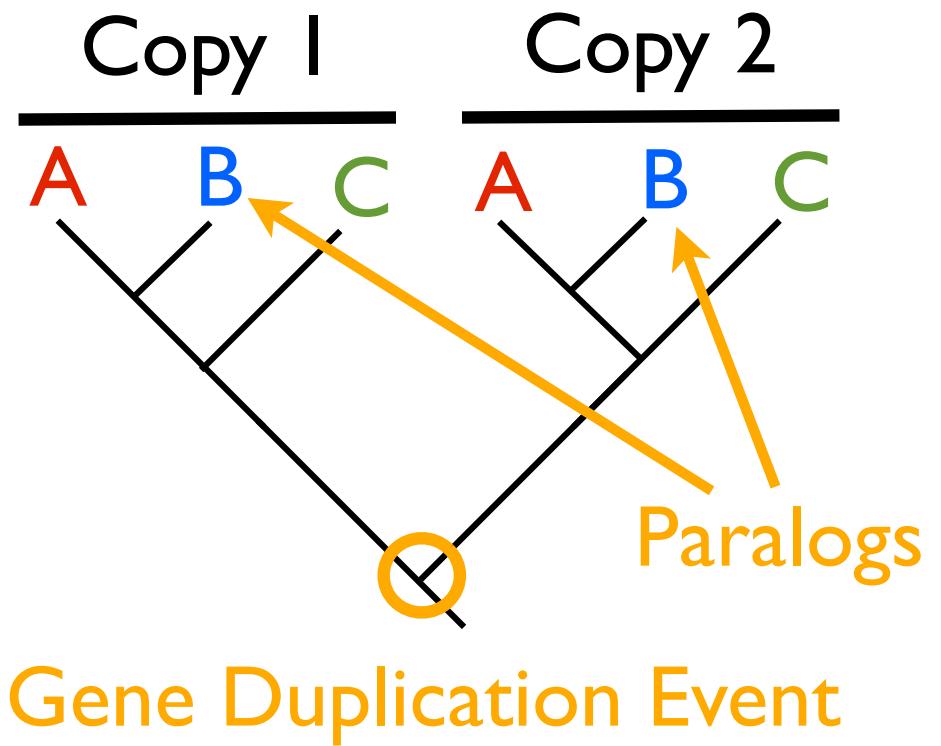
Gene Duplication



Gene Duplication

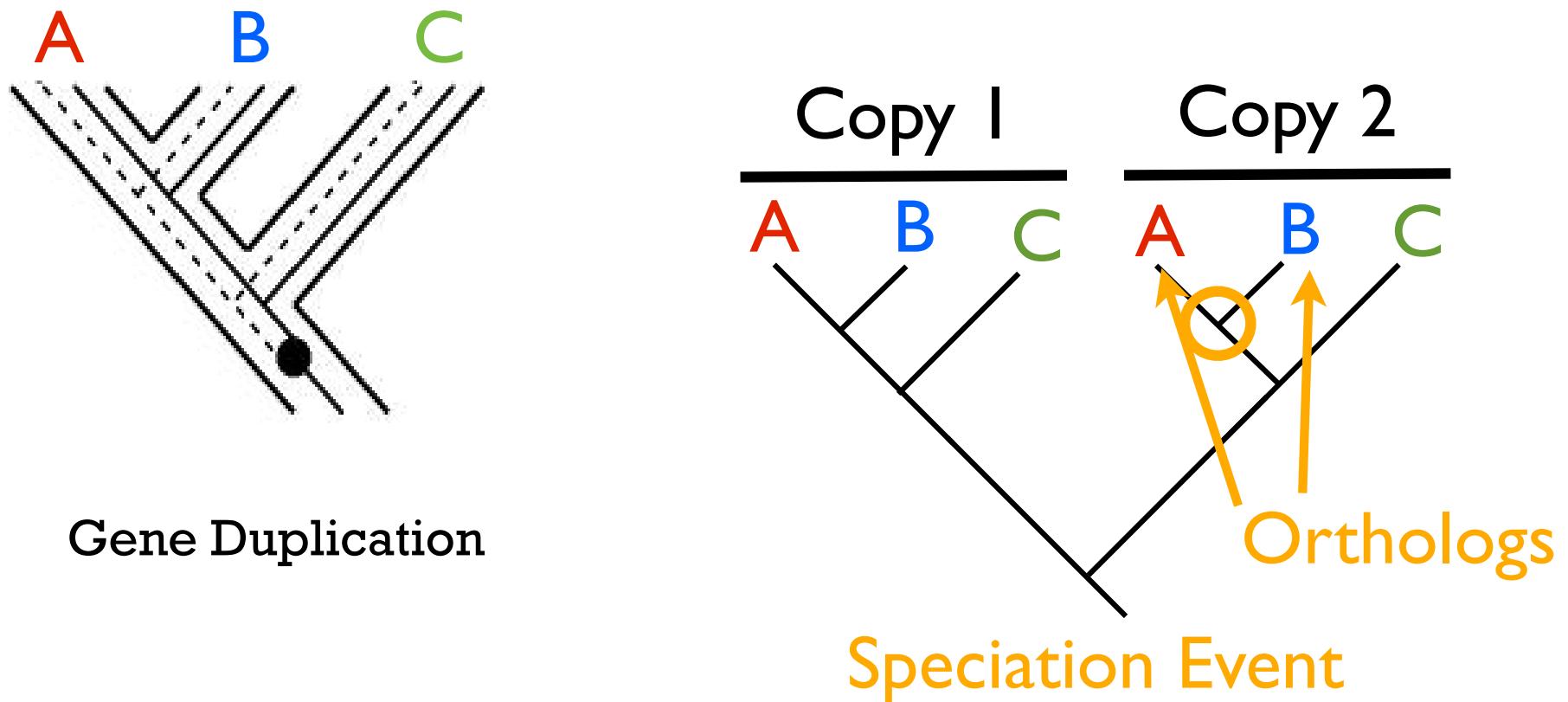


Gene Duplication

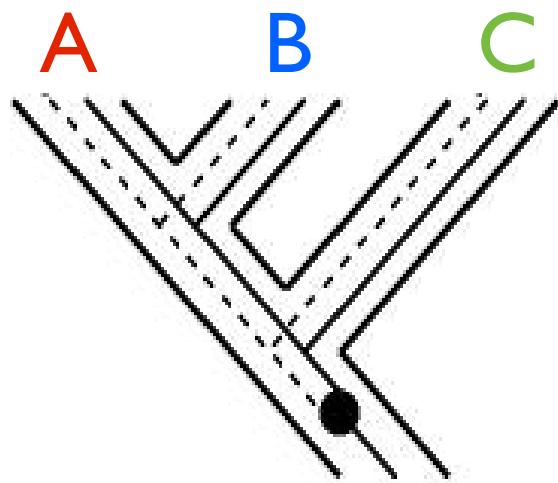


Gene Duplication Event

Gene Duplication

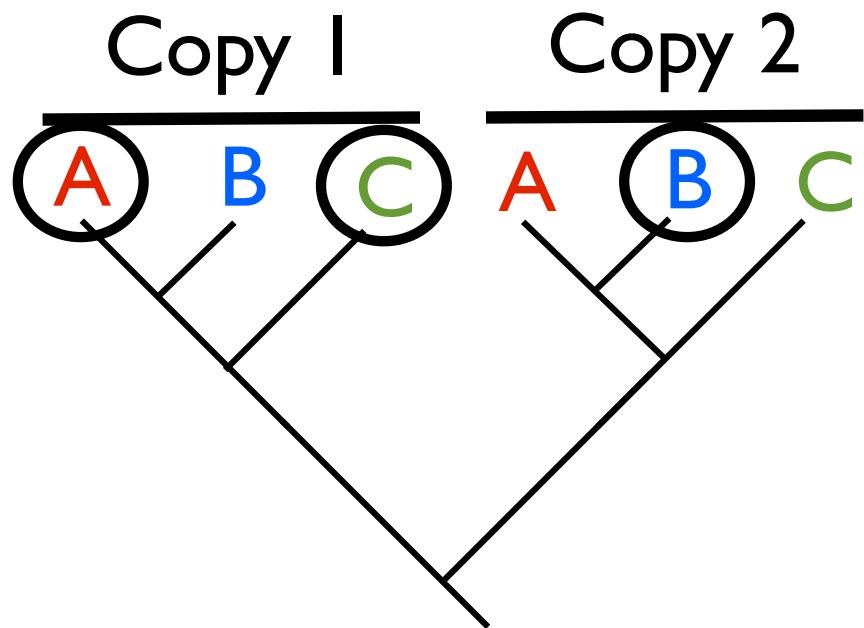


Gene Duplication

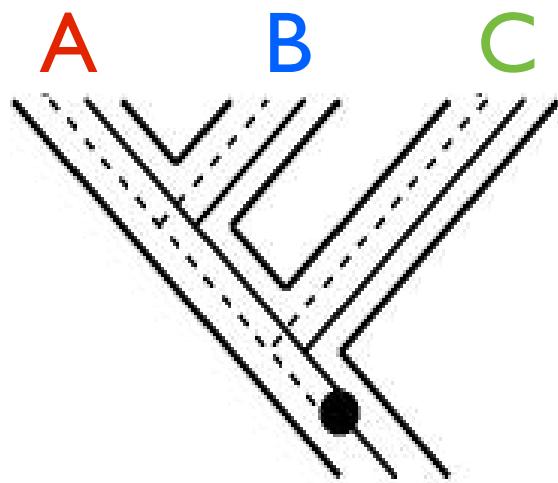


Gene Duplication

Paralogs

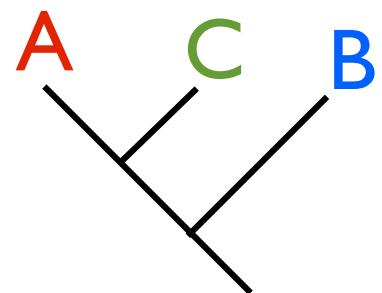
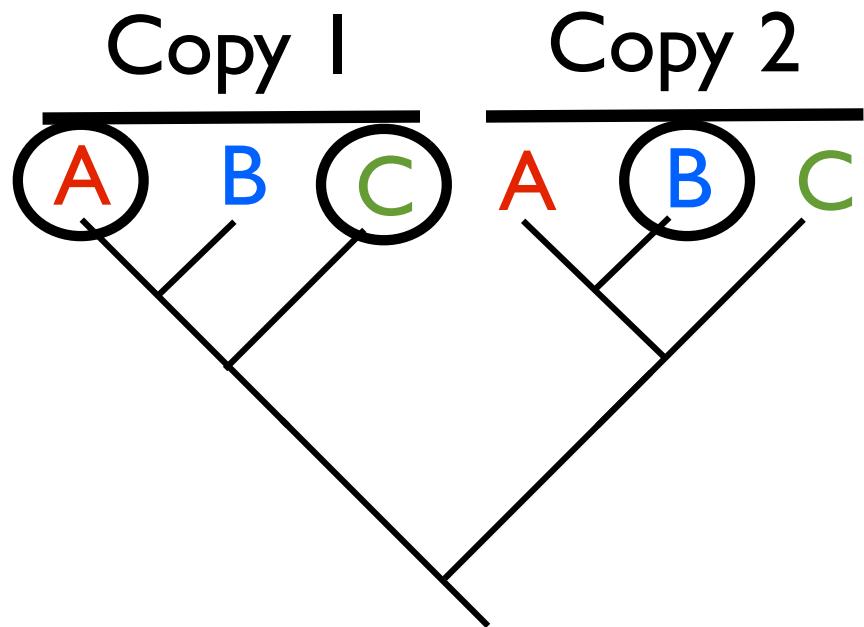


Gene Duplication



Gene Duplication

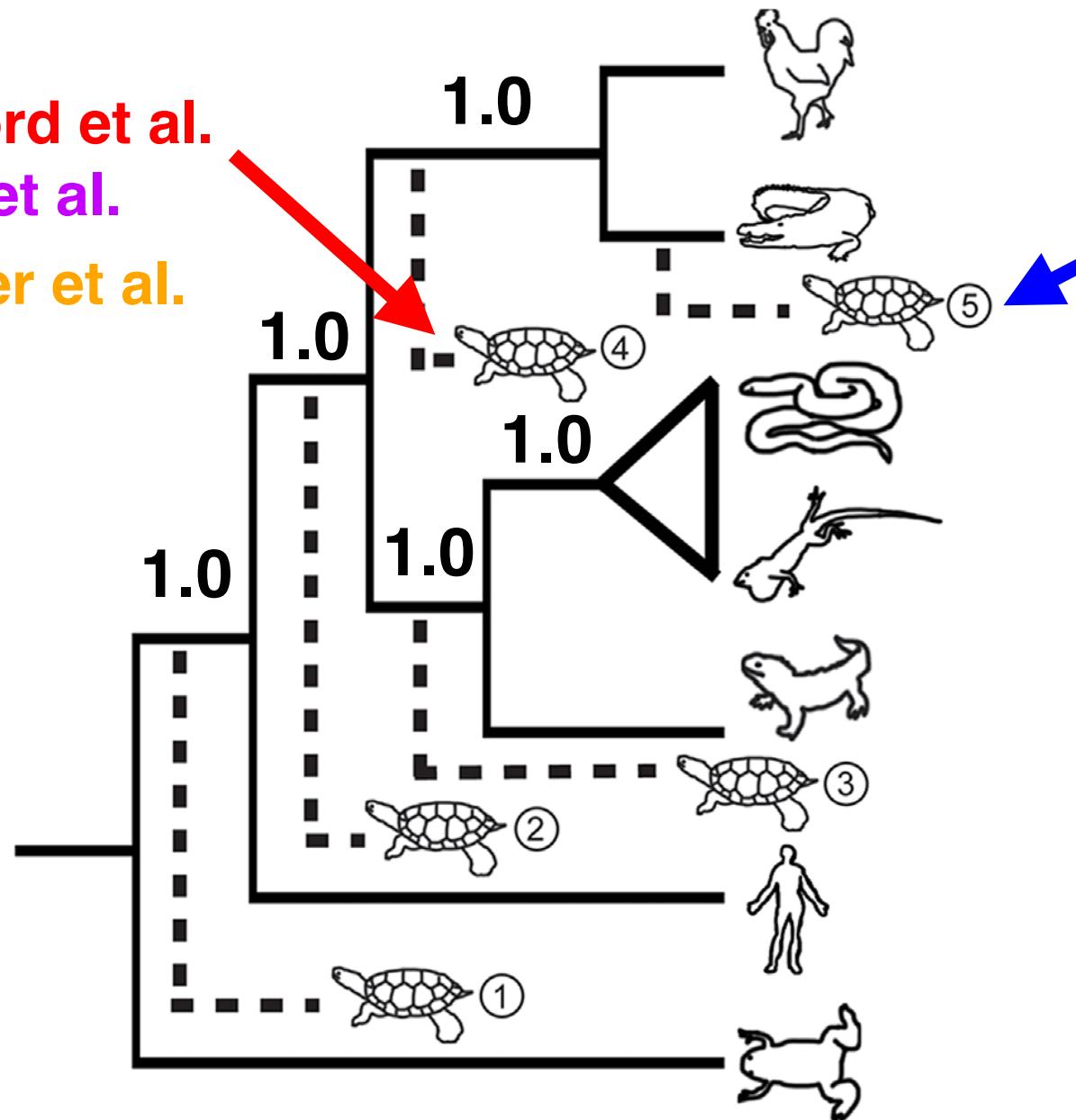
Paralogs



Turtle Identity Crisis

Crawford et al.
Lu et al.
Shaffer et al.

Chiari et al.
Fong et al.
Wang et al.



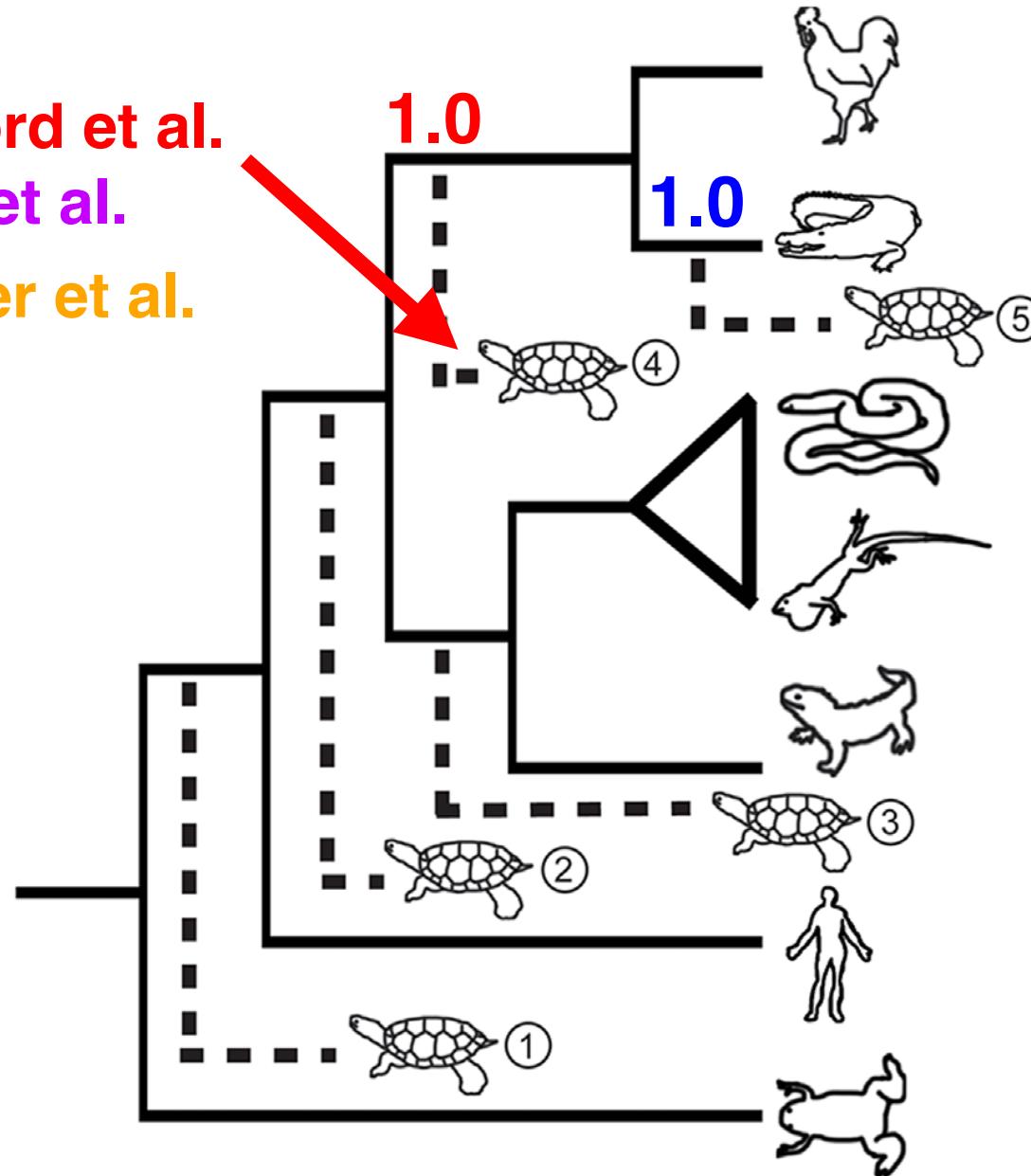
Turtle Identity Crisis

Crawford et al.
Lu et al.
Shaffer et al.

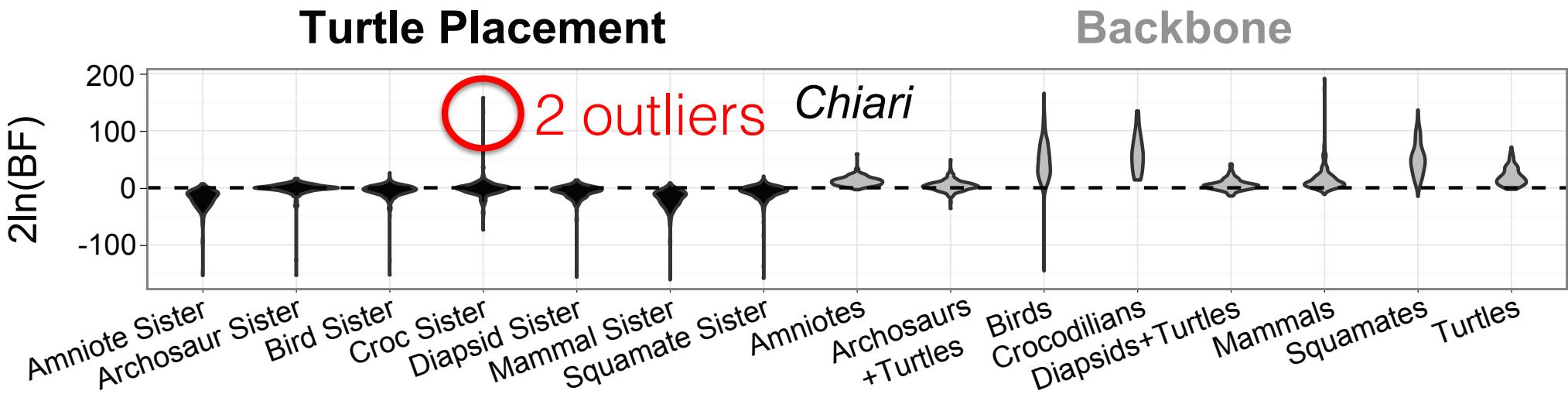
1.0

1.0

Chiari et al.
Fong et al.
Wang et al.



Turtle Identity Crisis

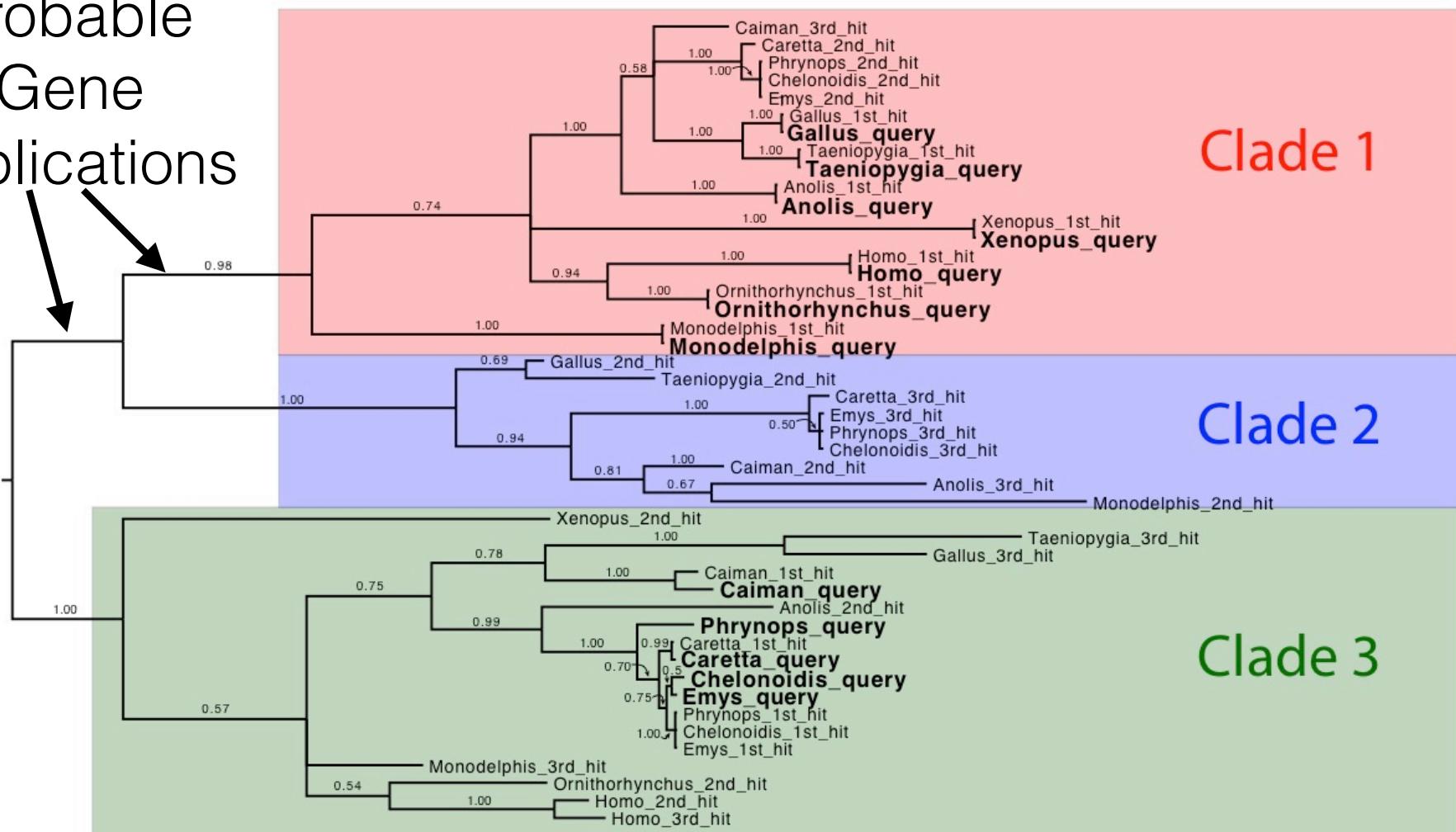


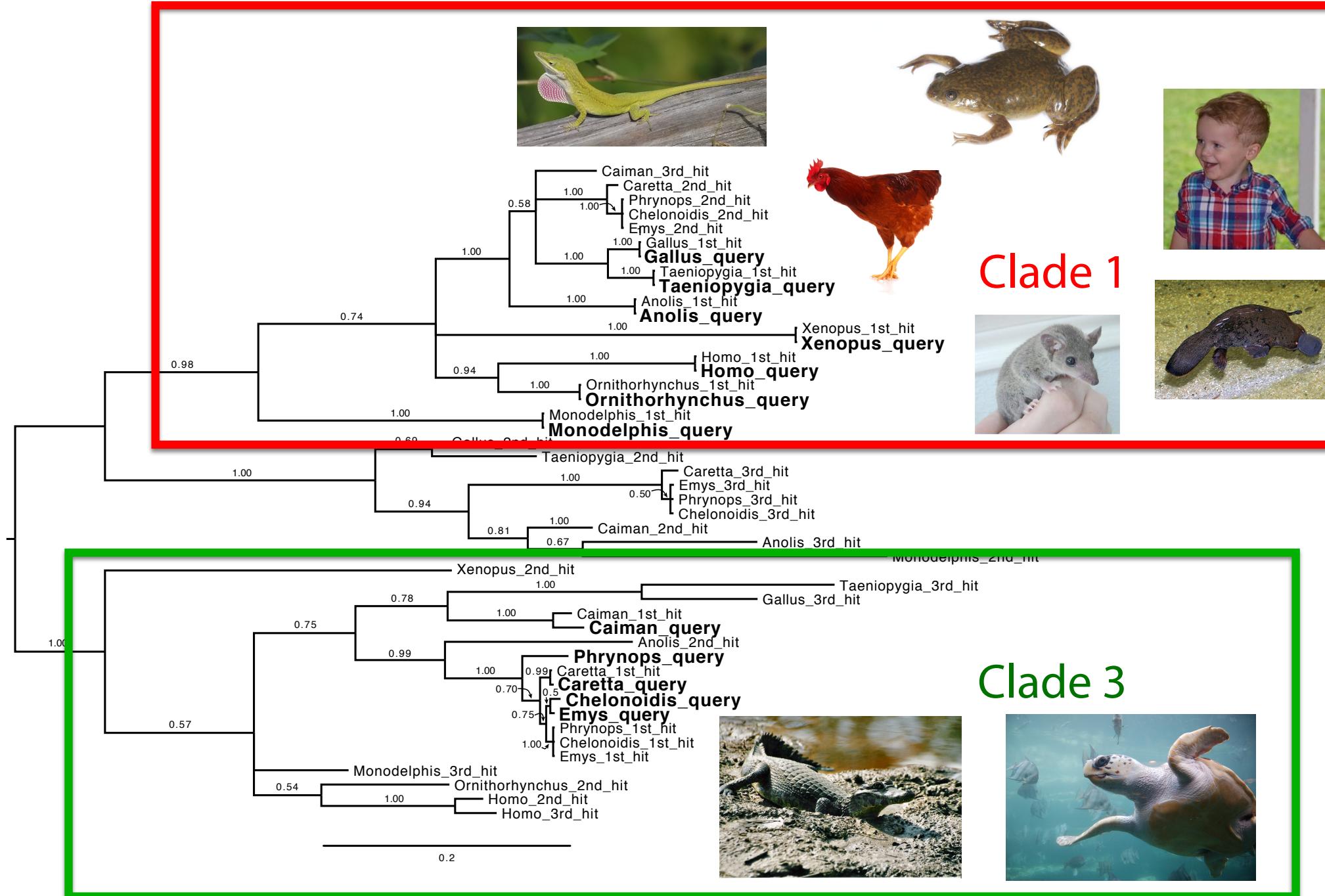
This dataset supports turtles as sister to crocodilians.
But what's up with these outliers?
How influential are they?

Chiari et al. 2012. BMC Biology.

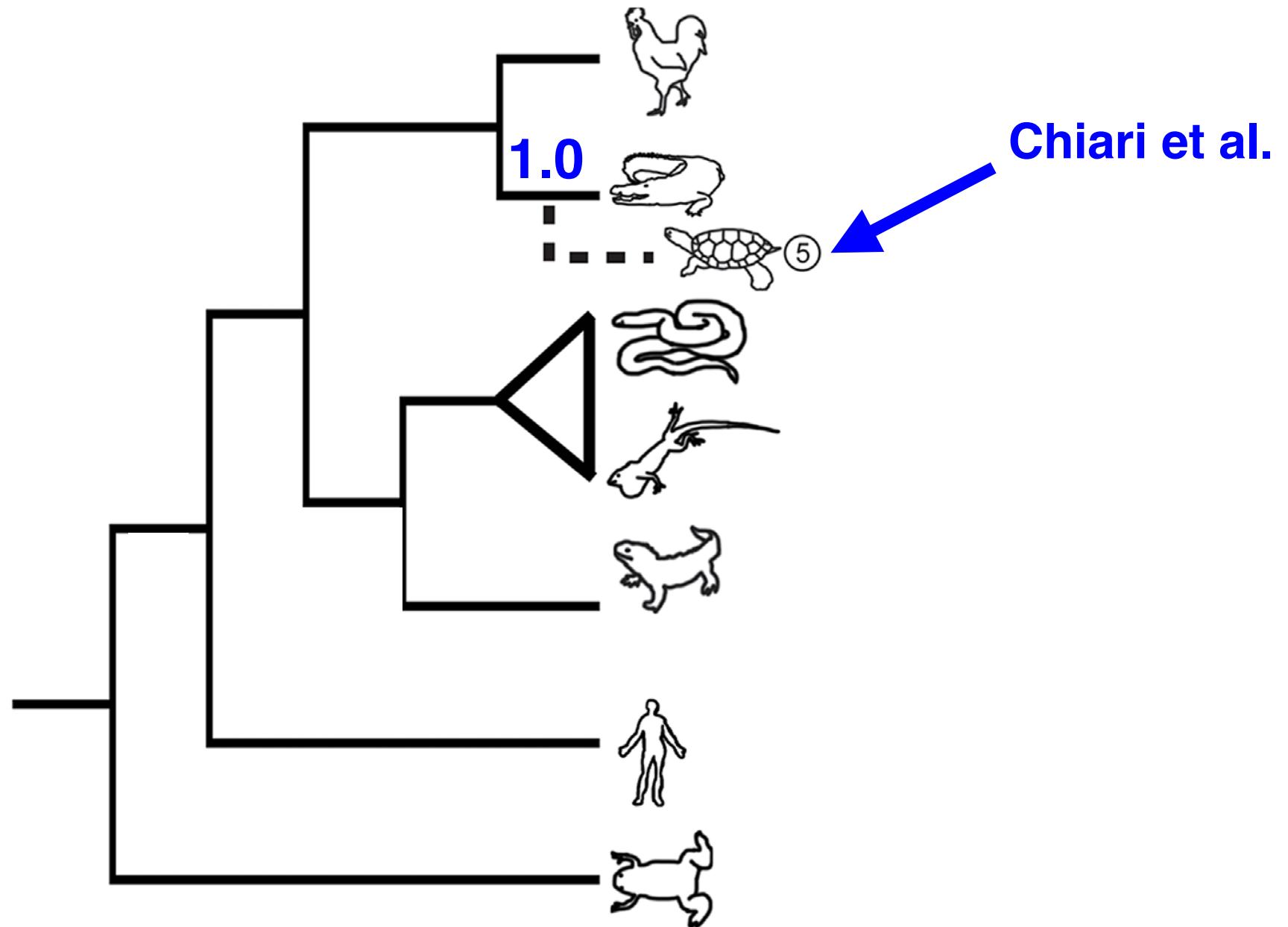
Turtle Identity Crisis

Probable
Gene
Duplications





Turtle Identity Crisis



Turtle Identity Crisis

