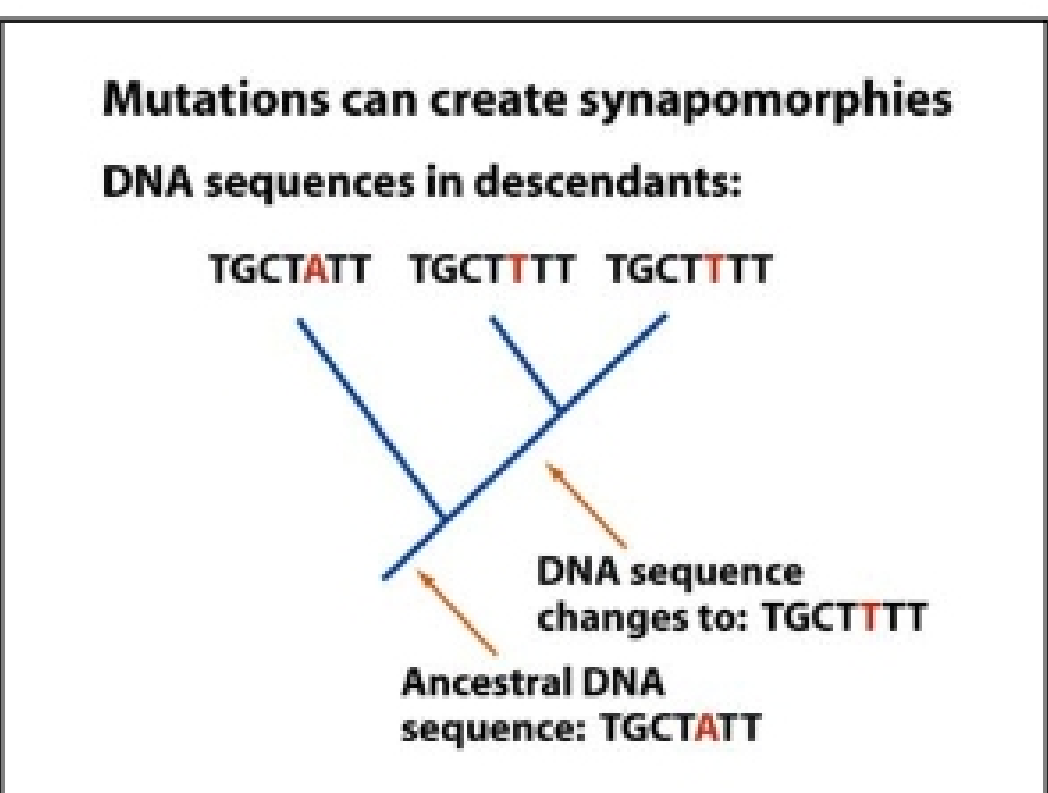
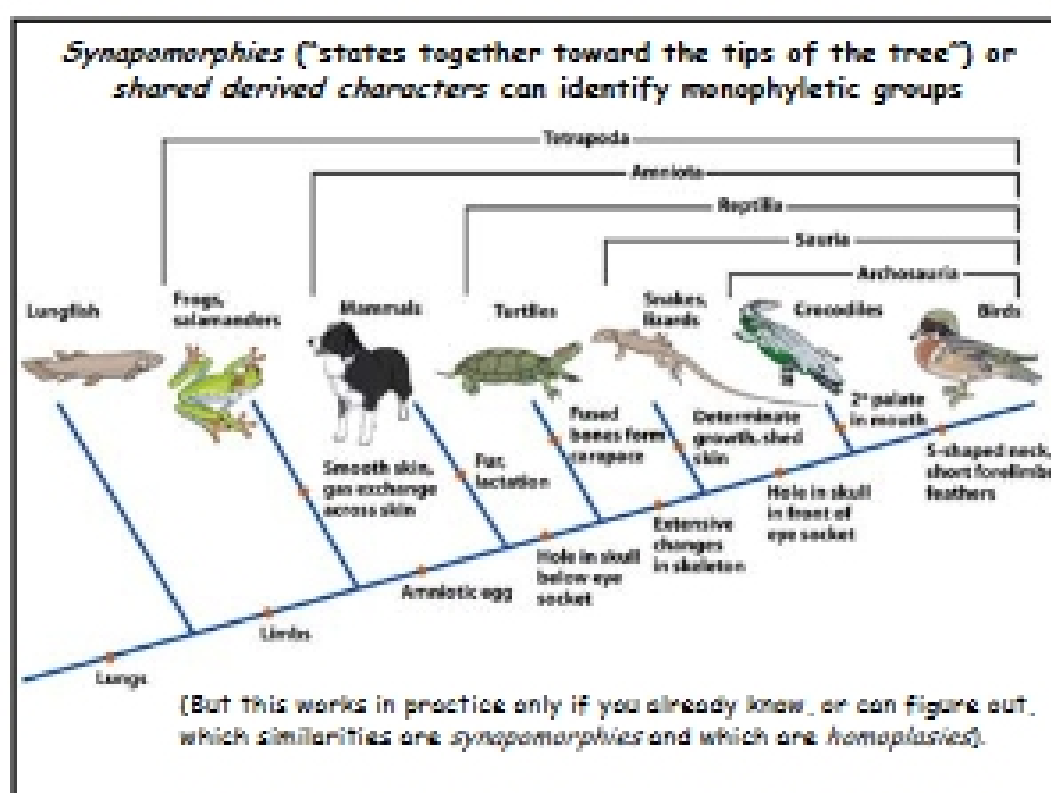
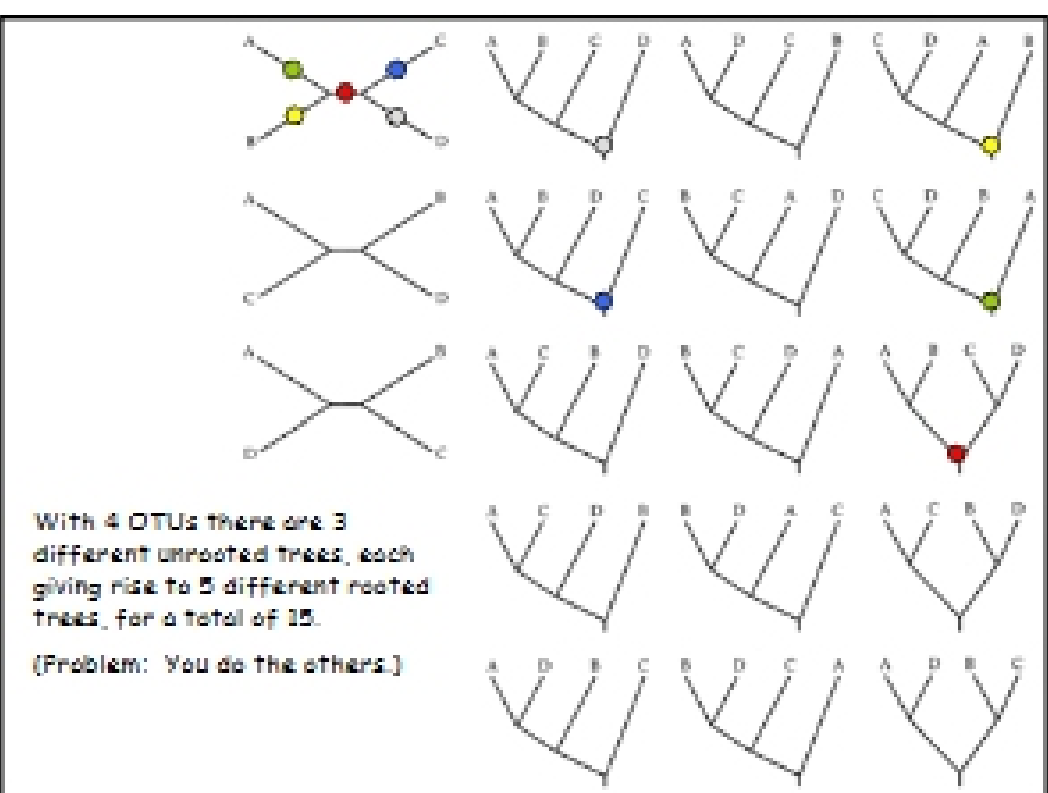
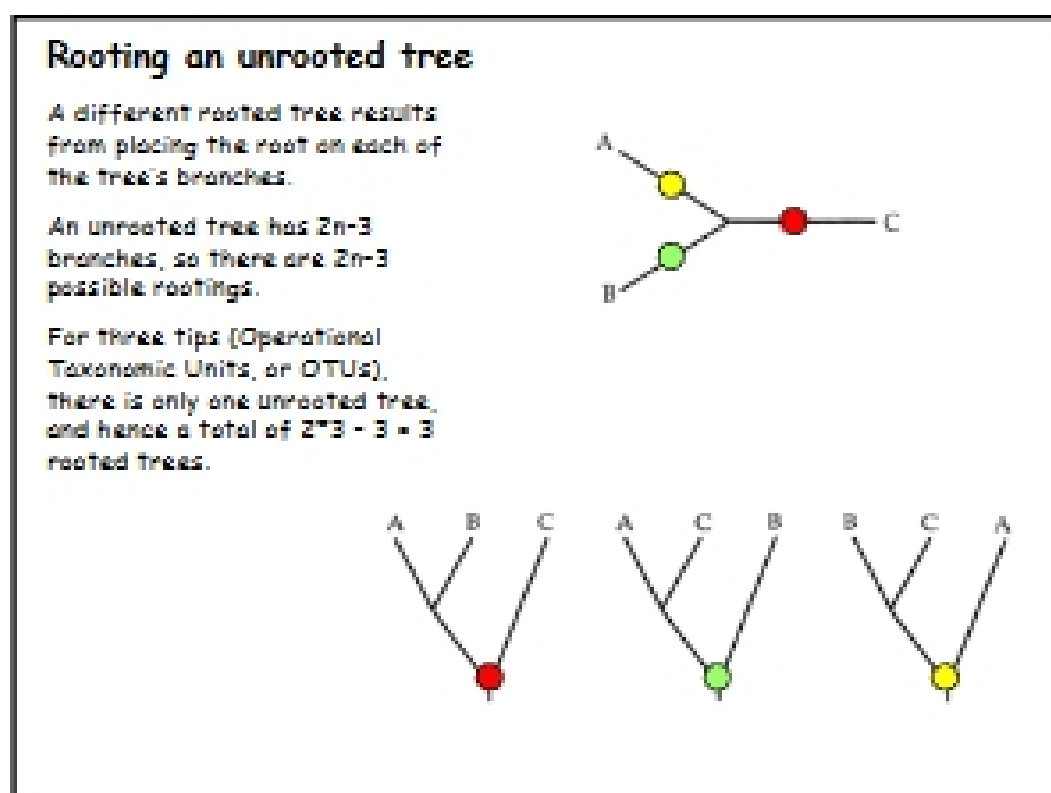
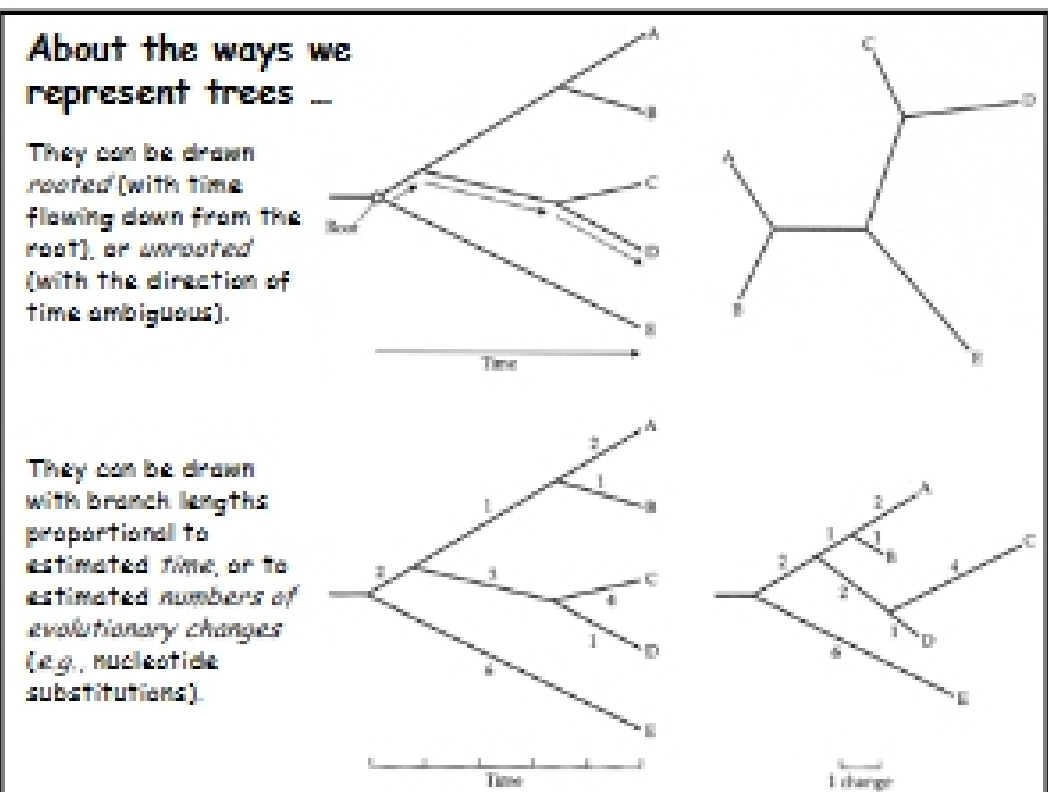
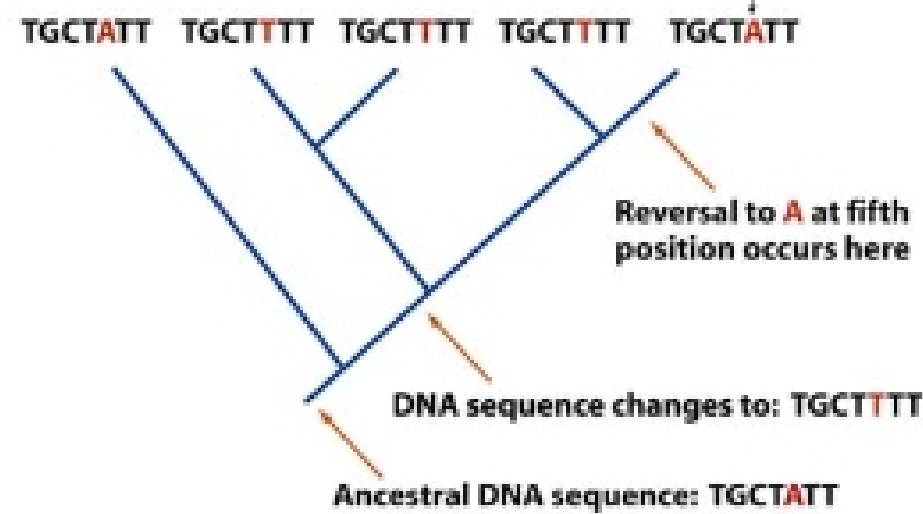




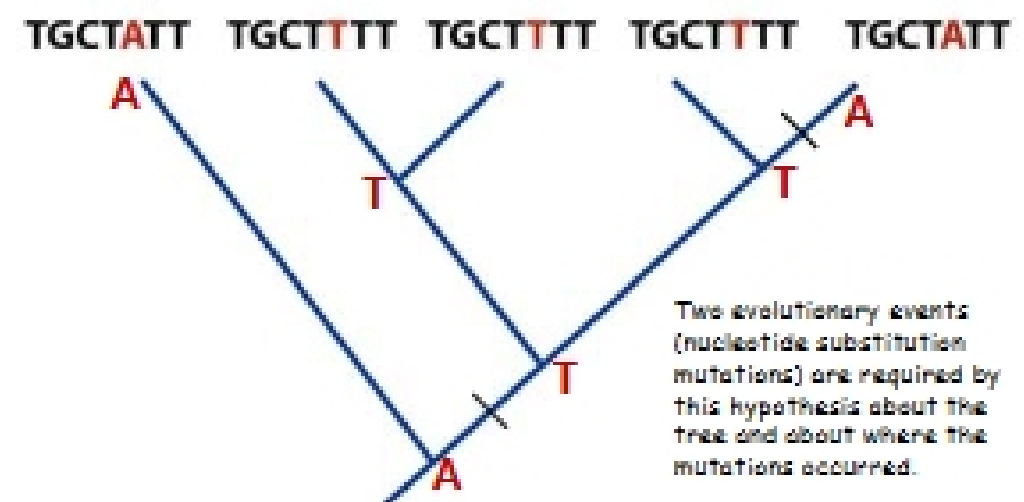
Reversals ("back-mutations") can remove synapomorphies

DNA sequences in descendants:

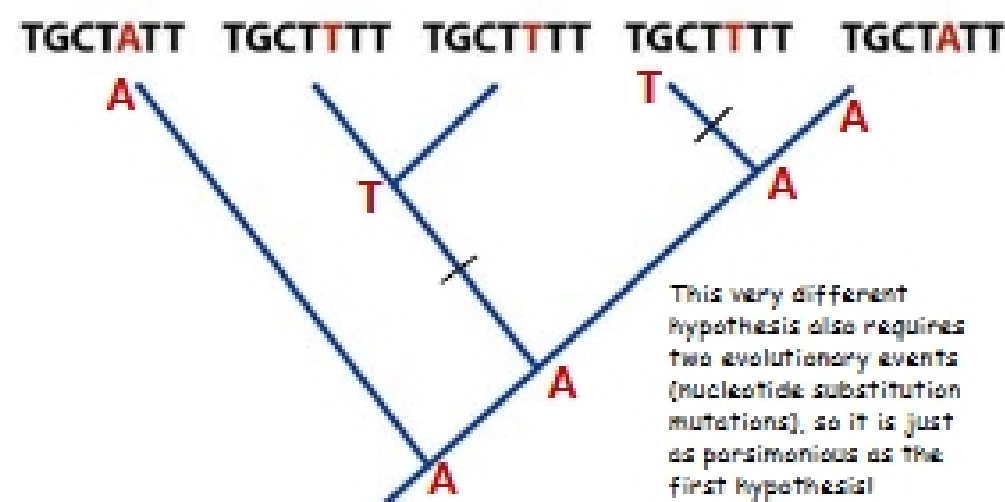
"Homoplasy": Similarity not caused by descent from a shared ancestor



The principle of *parsimony* compares alternative hypotheses about the history of character-state change



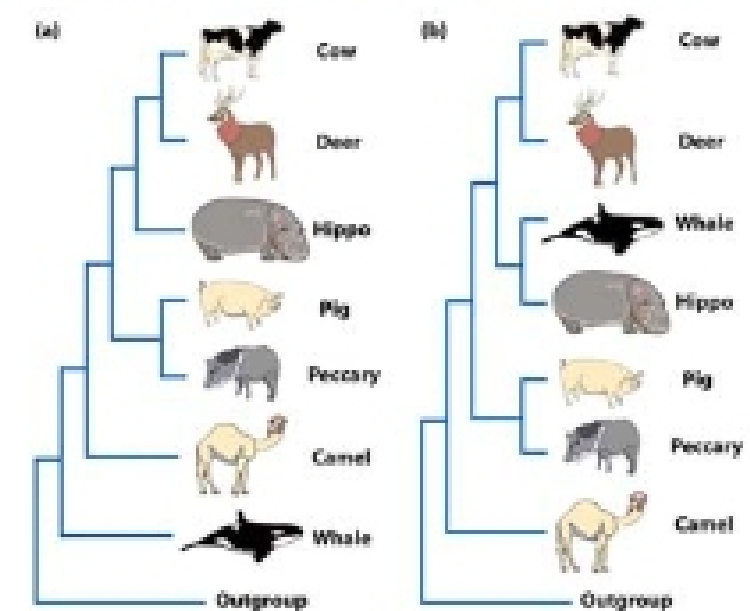
An alternative hypothesis (or reconstruction, or inference)



The *cladistic* method (grouping by shared derived characters) runs into trouble when we can't be sure which is the derived state.

One solution: use characters where you know which states are derived!

Question: Are whales outside or inside the Artiodactyla?



SINEs (Short Interspersed Nuclear Elements) transpose with "borrowed" reverse transcriptase

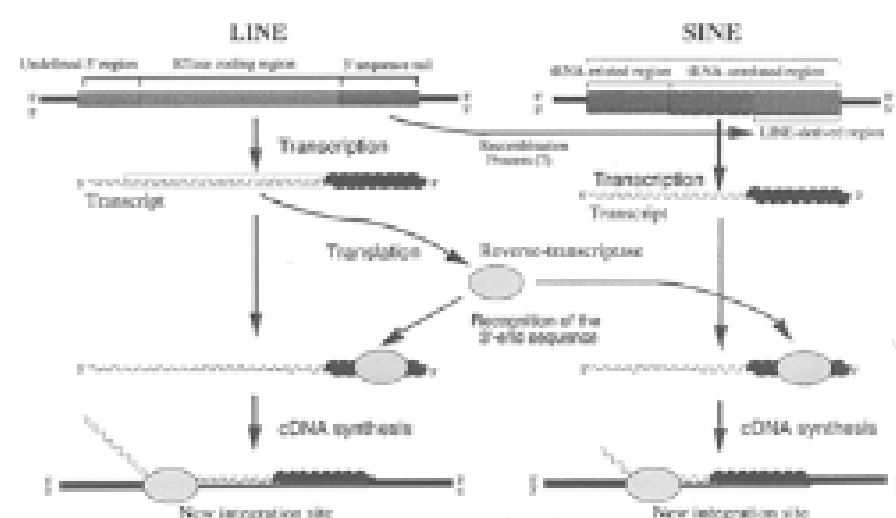


Figure 1. General model for a possible RNA-derived SINE amplification process. Corresponding LINE and SINE components are co-transcribed and share a common region (green) due to a recombination process. Reverse transcriptase (yellow) is generated by a LINE and the corresponding SINE transcript can be recognized by its LINE-derived tail region (bold black T and A). The SINE transcript is then reverse-transcribed into cDNA and integrates into the host genome (red site) by the target DNA-prime mechanism adopted by LINEs.

SINE insertions: unique, irreversible, and easily assayed

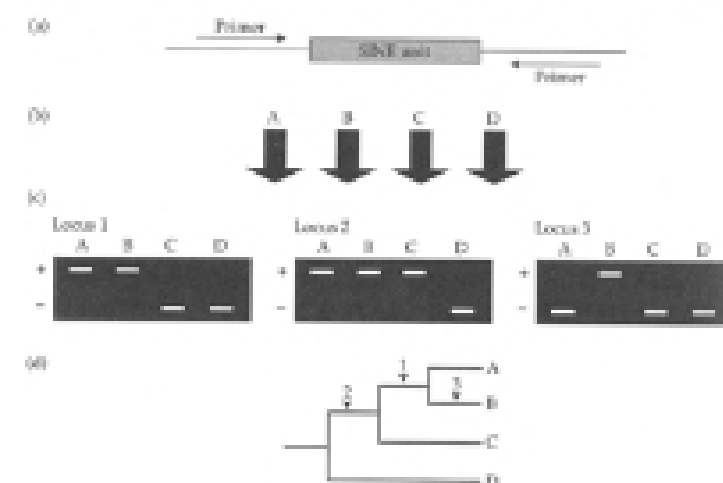


FIGURE 8.32 Inference of phylogeny from insertion patterns of SINEs. (a) The primers identify the genomic location (locus) of a SINE unit. (b) The PCR is used to amplify the homologous loci from the genomic DNA of several species and is assayed (A, B, C, and D). (c) The PCR products are subjected to electrophoresis and separation by length. A long PCR product indicates the presence (+) of a SINE unit; a short PCR product indicates absence (-). (d) Because SINE insertion is essentially an irreversible character state, the presence of a SINE at a certain locus may be treated as a synapomorphy defining monophyletic clades (arrowheads 1 and 2) or as an autapomorphy for a single locus (arrowhead 3). Courtesy of Professor Naohiro Okada.

