


# ALIGNMENT

## Recall:

Aligning  $n$  sequences  
is  $n$ -dimensional (ugh)

(Almost) all multiple alignment  
programs use a **guide tree**   
that determines the order  
of addition of sequences  
(Feng and Doolittle)

Doesn't this bias any  
phylogenetic result in favor  
of the guide tree, or something  
very much like it?

## Problems:

- will not investigate ties
- will not permit revision of early bad decisions  
that necessarily are suboptimal later

**Malign:** search for most parsimonious alignments



**Optalign:** subroutine in MALIGN

treat the search for the most parsimonious alignment as the optimality criterion for finding the best tree



**POY**



## How does it work?

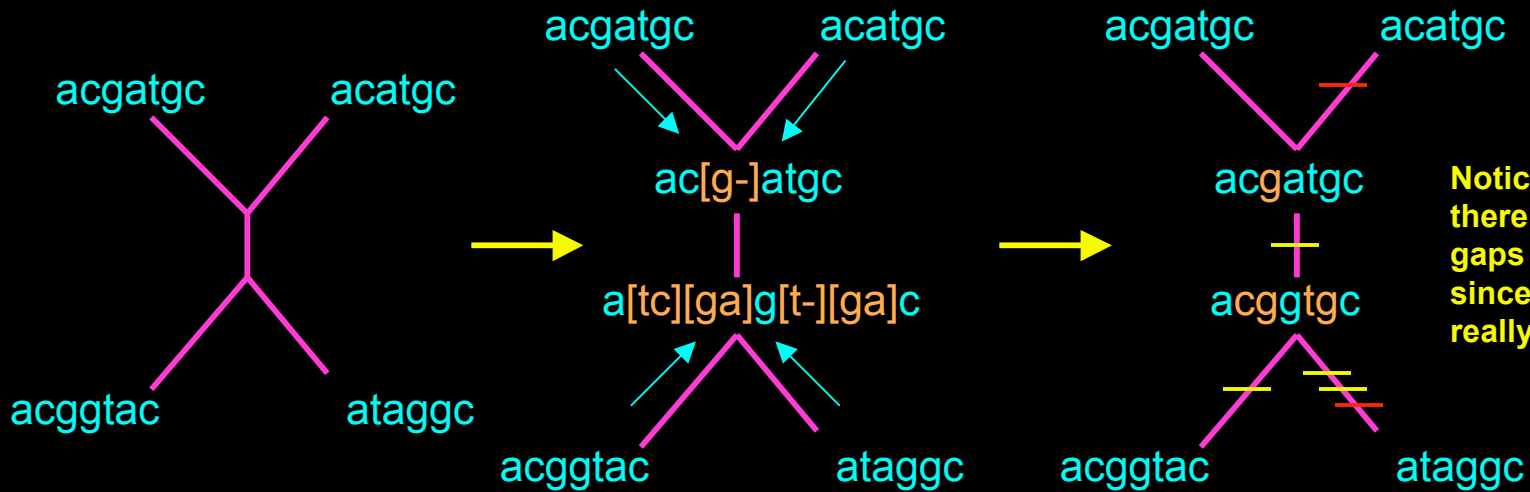
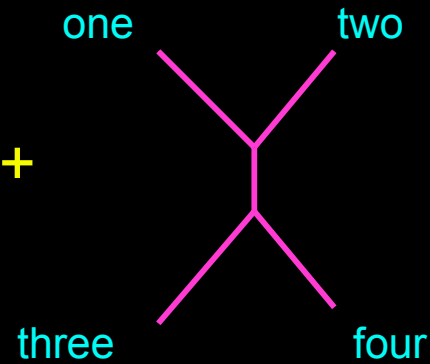
Find the most parsimonious solution to an alignment problem on a particular tree.

one    acgatgc  
two    acatgc  
three acggtac  
four   ataggc

+

Nt sub = 1  
Indel = 1

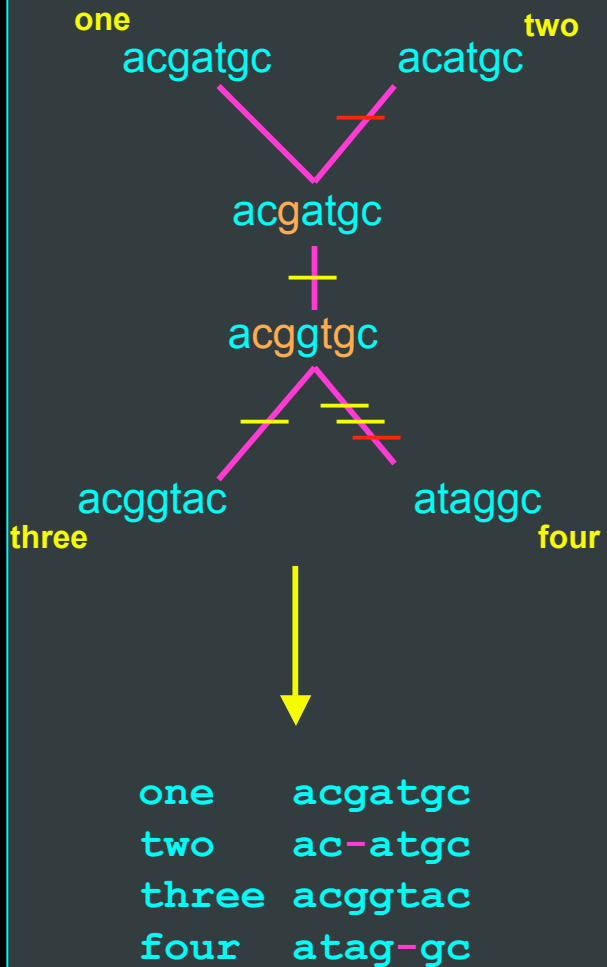
+



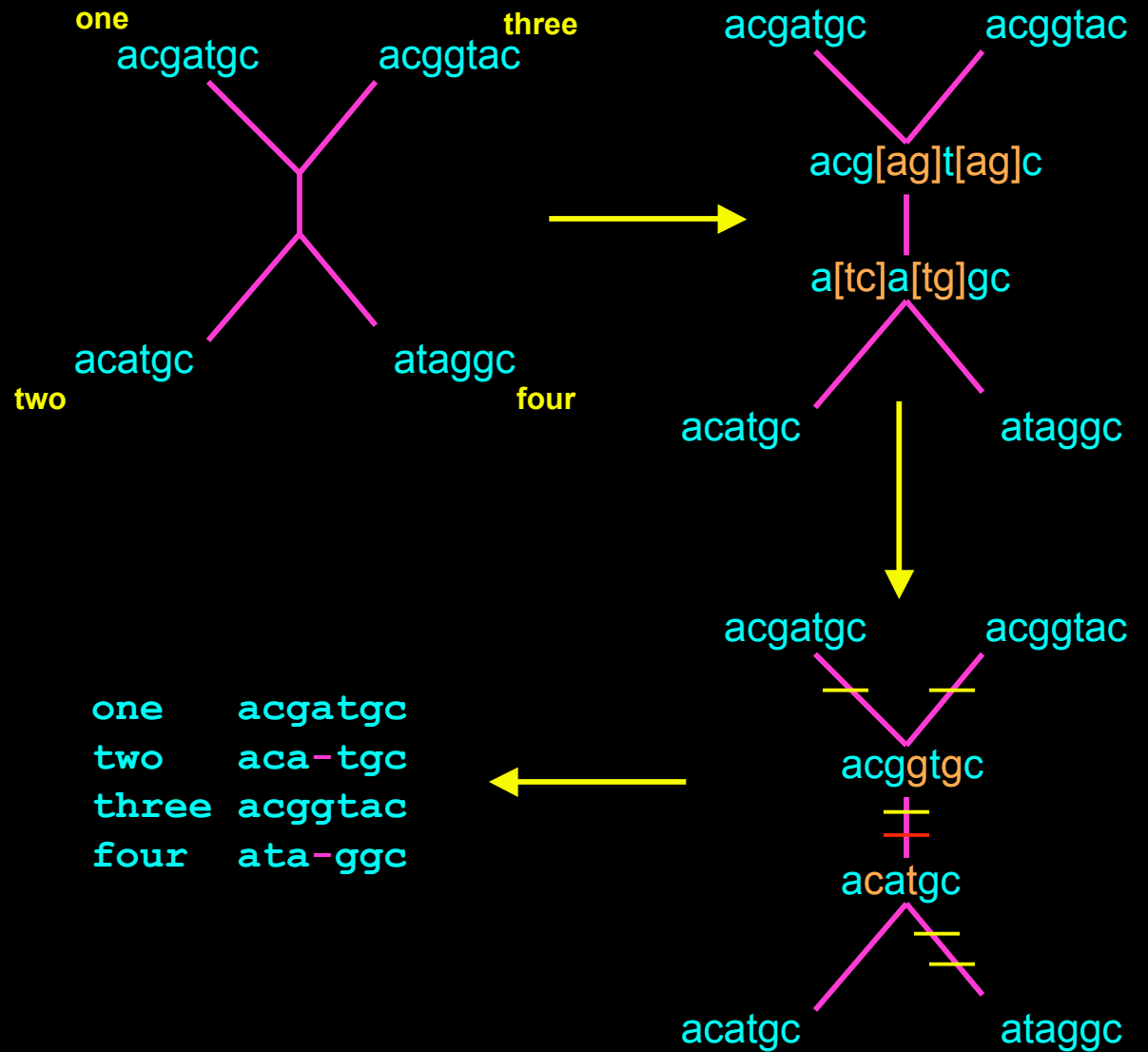
Optimize ancestral sequences at nodes

# Implied alignments.

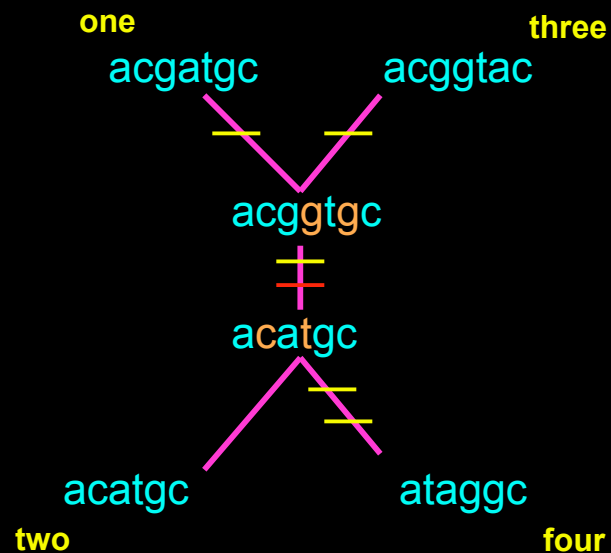
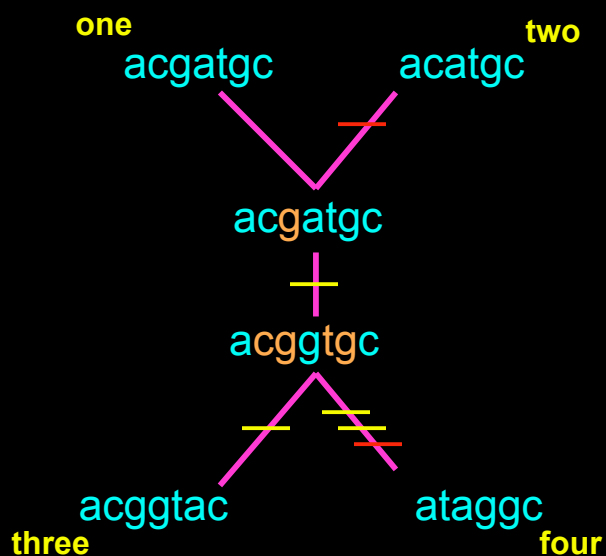
## Previous page



## Alternative tree



Which tree is preferred?



If subst:indel = 1:1  
left = 6 right = 6 no preference

If subst:indel = 1:2  
left = 8, right = 7 right tree preferred

If ti:tv:indel = 1:2:4  
left = 12, right = 10 right tree preferred

## Direct Optimization

Different trees imply different events.

Different trees imply different patterns of insertion/deletion  
and of base substitution.

There is no such thing as a single best static alignment.

Treat the alignment problem and the tree search problem as  
a single epistemological procedure

**This just in...**

*Syst. Biol.* 54(3):401–418, 2005

Copyright © Society of Systematic Biologists

ISSN: 1063-5157 print / 1076-836X online

DOI: 10.1080/10635150590947041

## **Joint Bayesian Estimation of Alignment and Phylogeny**

BENJAMIN D. REDELINGS AND MARC A. SUCHARD

*Department of Biomathematics, David Geffen School of Medicine at UCLA, Los Angeles, California 90095-1766, USA;  
E-mail: msuchard@ucla.edu (M.A.S.)*