

# Puzzle

(Strimmer, von Haeseler)

```
INPUT: Taxa  $1, \dots, n$ 
for  $i=1$  to  $\binom{n}{4}$  {
    construct and store  $T_i$ 
    //  $T_i$  is  $i$ -th maximum likelihood 4-taxon tree
    let  $L_i$  be set of leaves of  $T_i$ 
    derive and store neighbor relation  $N_i$  on  $L_i$ 
     $N_i$  is of the form  $N_i(a, b; c, d)$ 
    //  $a, b$  have common parent, as do  $c, d$ 
    use as look-up table below
}
```

```

for k=1 to m {
  randomly permute order of species to produce list
     $a_1, \dots, a_n$ 
  let  $P$  be quartet on  $a_1, a_2, a_3, a_4$ 
  for i=1 to n {
     $e = a_i$ 
    let  $L$  be set of leaves of  $P$ 
    if  $e \notin L$ 
      // insert species  $e$  into phylogenetic tree  $P$ 
      label all edges of  $P$  by 0
      for j=1 to  $\binom{n}{4}$ 
        if  $L_j \subseteq L \cup \{e\}$  and  $e \in L_j$  {

```

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    let  $a, b, c, e$  be leaves of  $T_j$ 
    let  $N_j$  be of form  $N_j(a, b; c, e)$ 
    add 1 to each edge label in path
        from  $a$  to  $b$  in  $P$ 
    }
    choose edge  $\{u, v\}$  of  $P$  with minimum edge label
        // if more than one, randomly choose
    adjoin  $e$  in tree  $P$  by splitting edge  $\{u, v\}$ 
    }
    set  $P_k = P$ , and output  $P_k$ 
}
output majority consensus of  $P_1, \dots, P_m$ 

```