Outline for today

1. Coalescent
2. Multispecies coalescent
3. Multispecies network coalescent
4. (Multiple testing)

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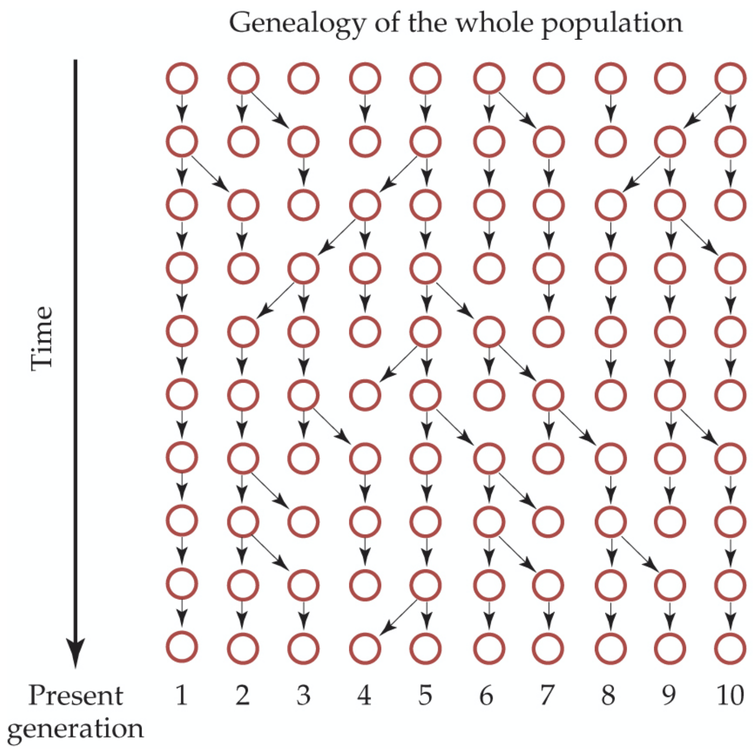
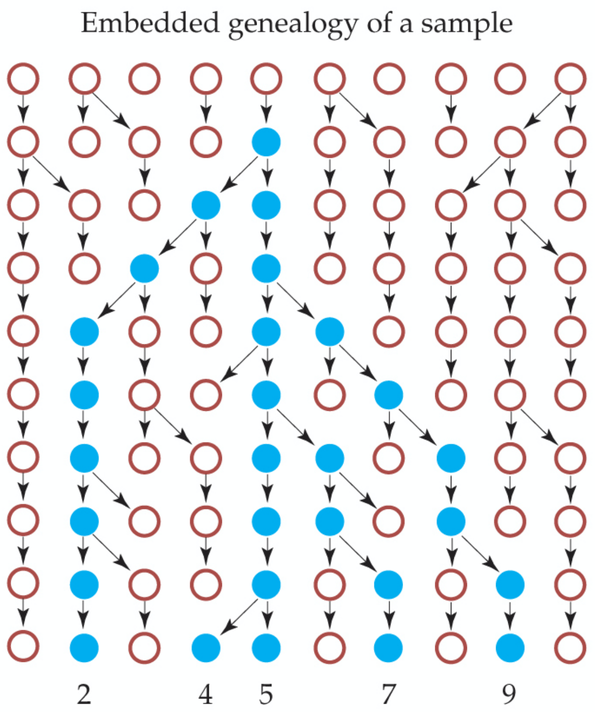
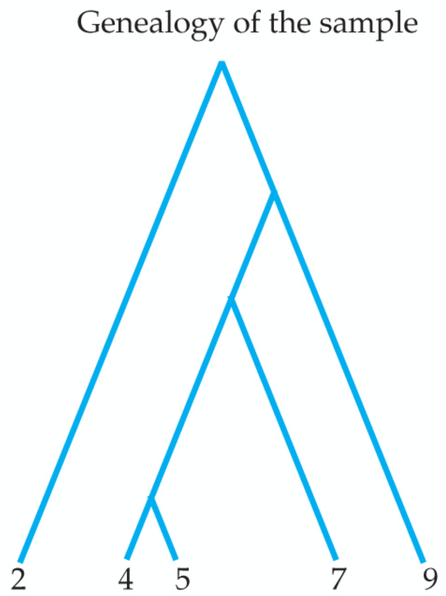
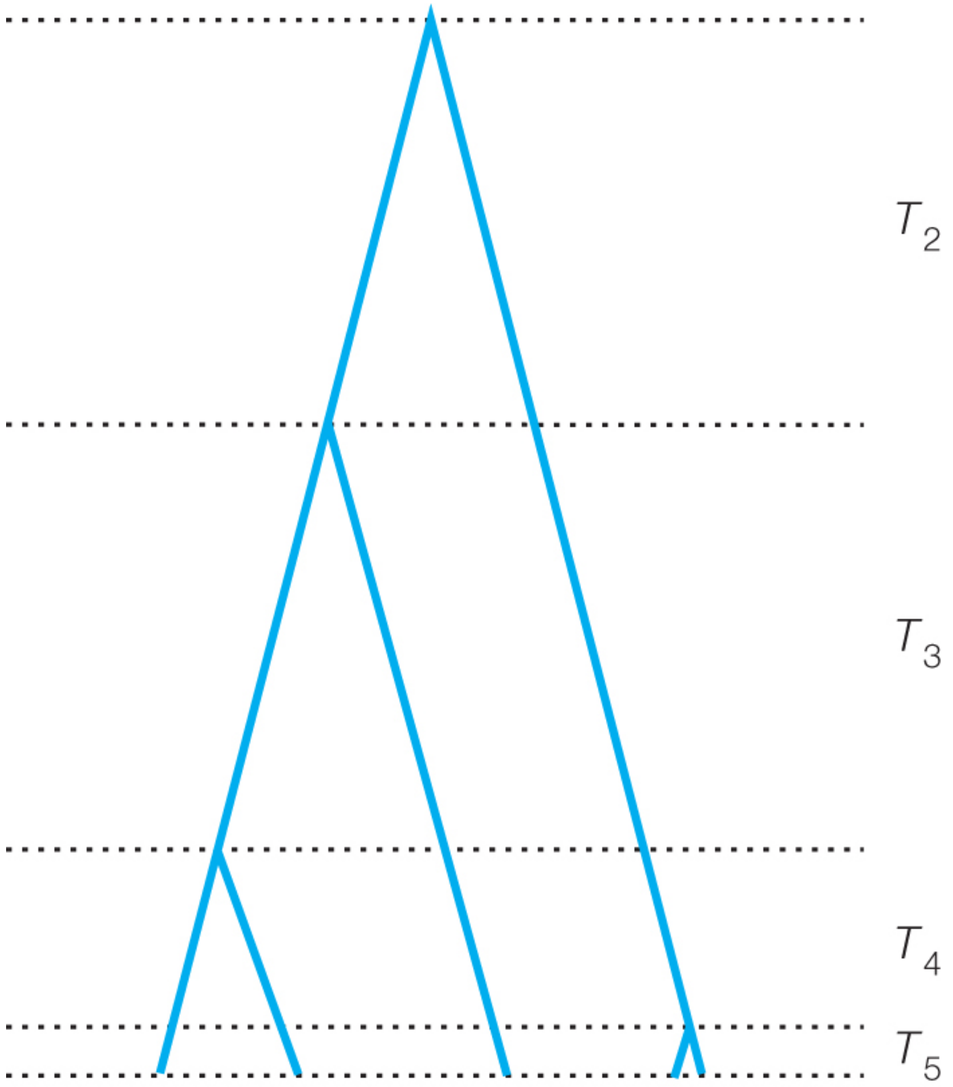
@3rdreviewer

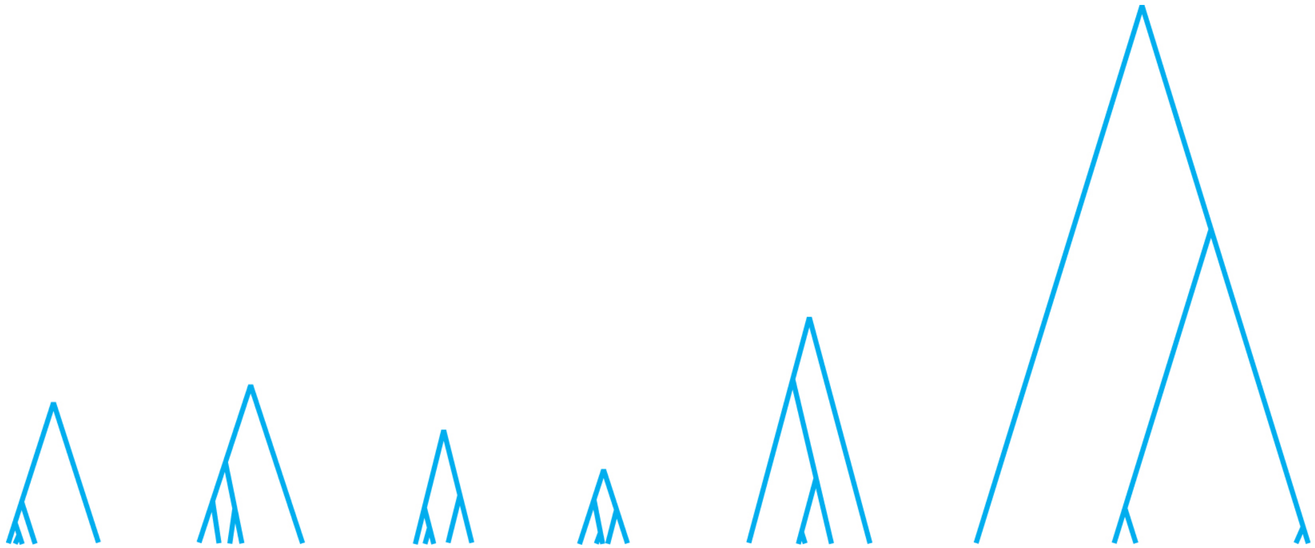
Why do we need the coalescent model?

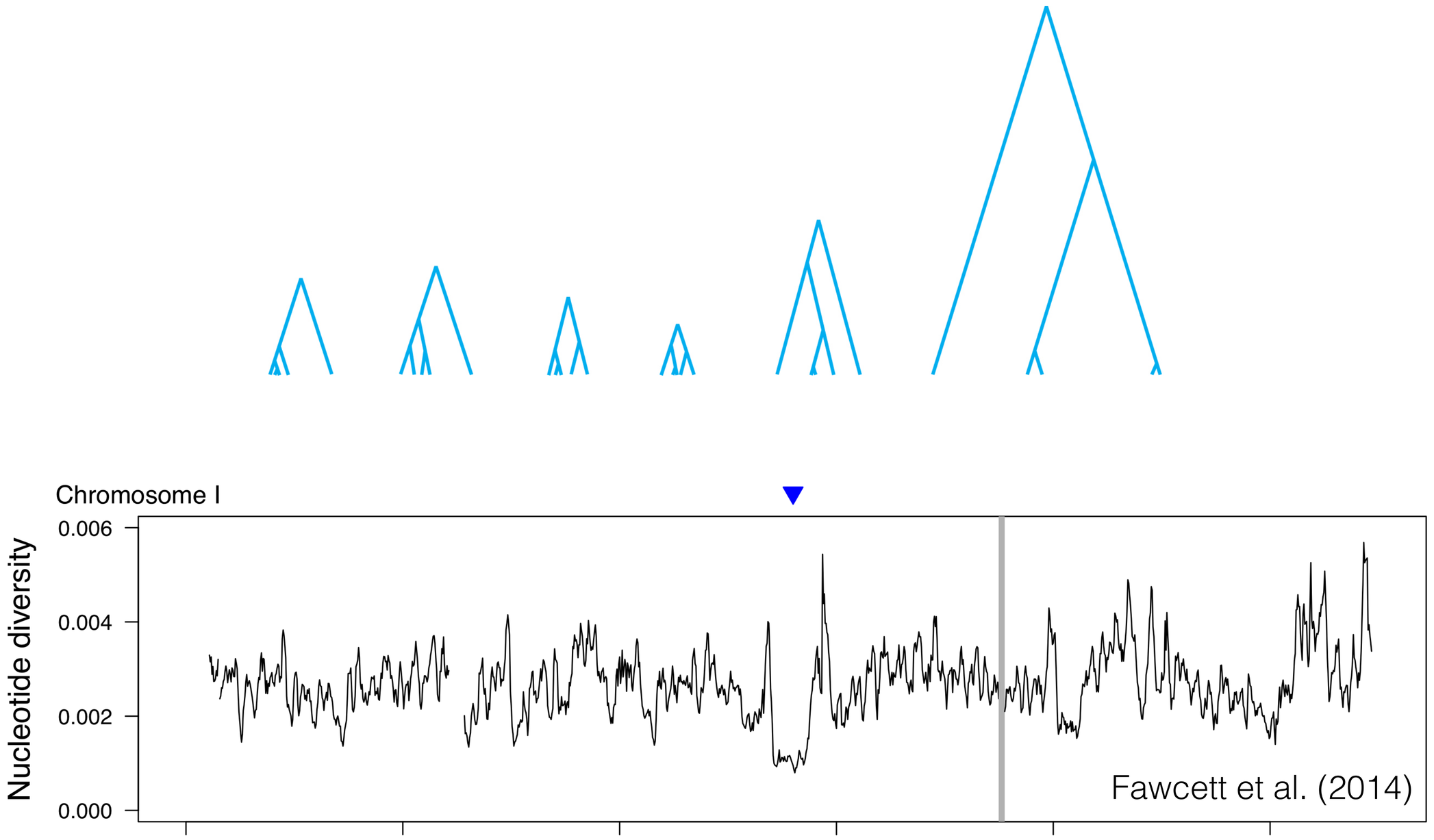




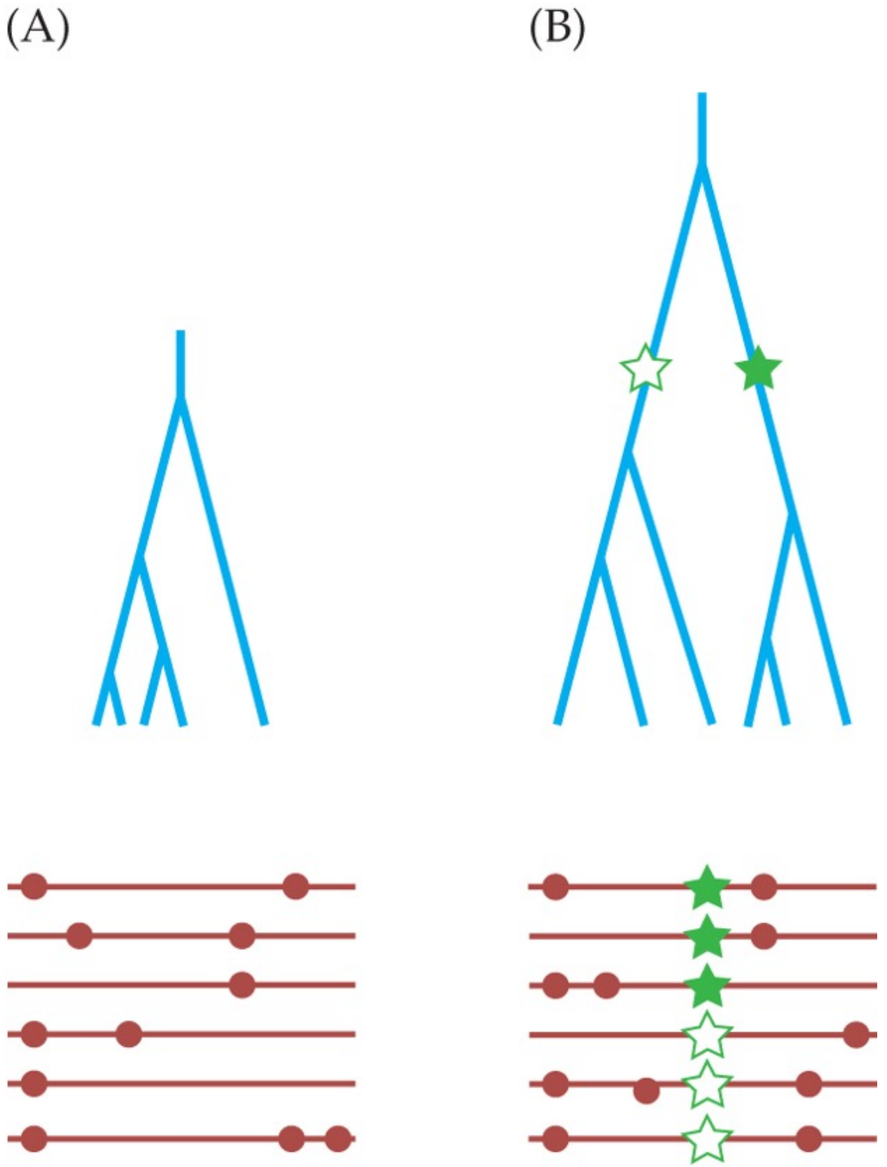


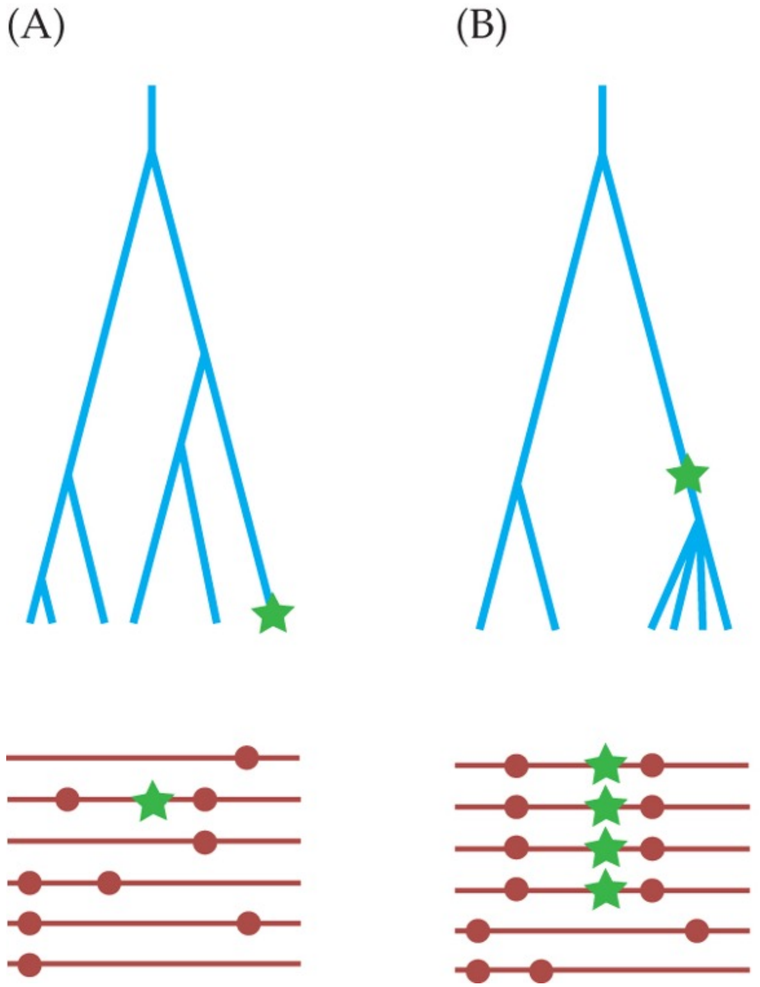

T_2
T_3
T_4
T_5

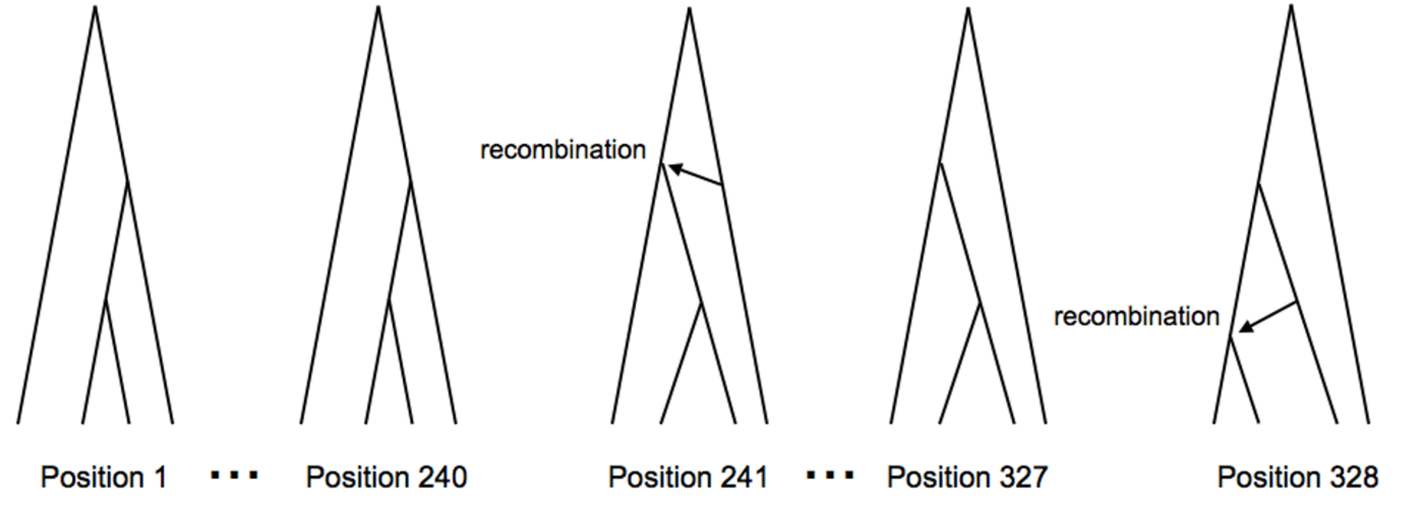


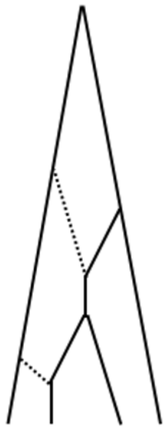

Chromosome I
Nucleotide diversity
0.006
0.004
0.002
0.000
Fawcett et al. (2014)

https://bedford.io/projects/coaltrace/


(A)
(B)

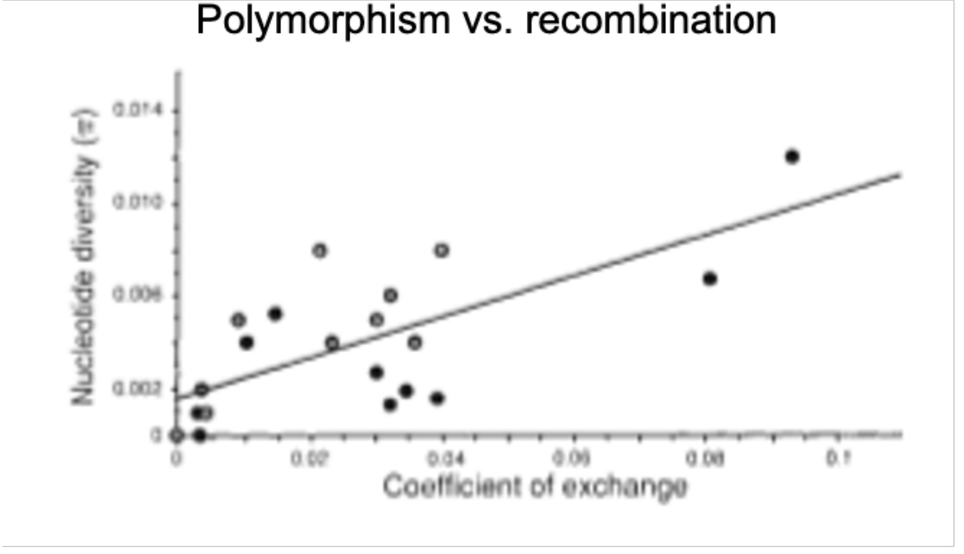

(A)
(B)



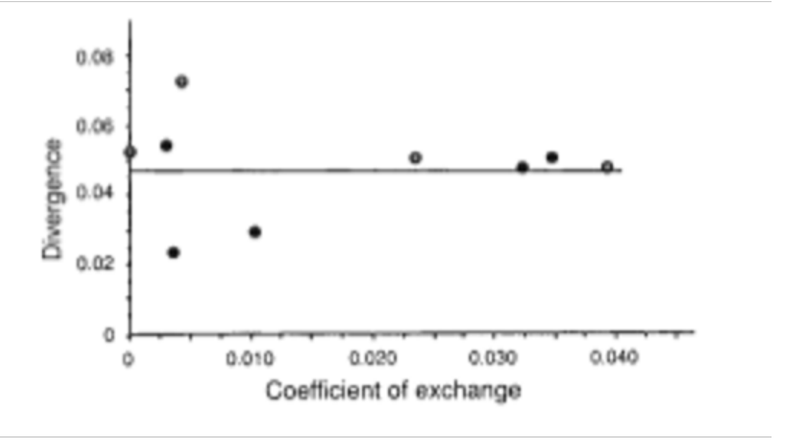


Ancestral recombination graph

Polymorphism vs. recombination



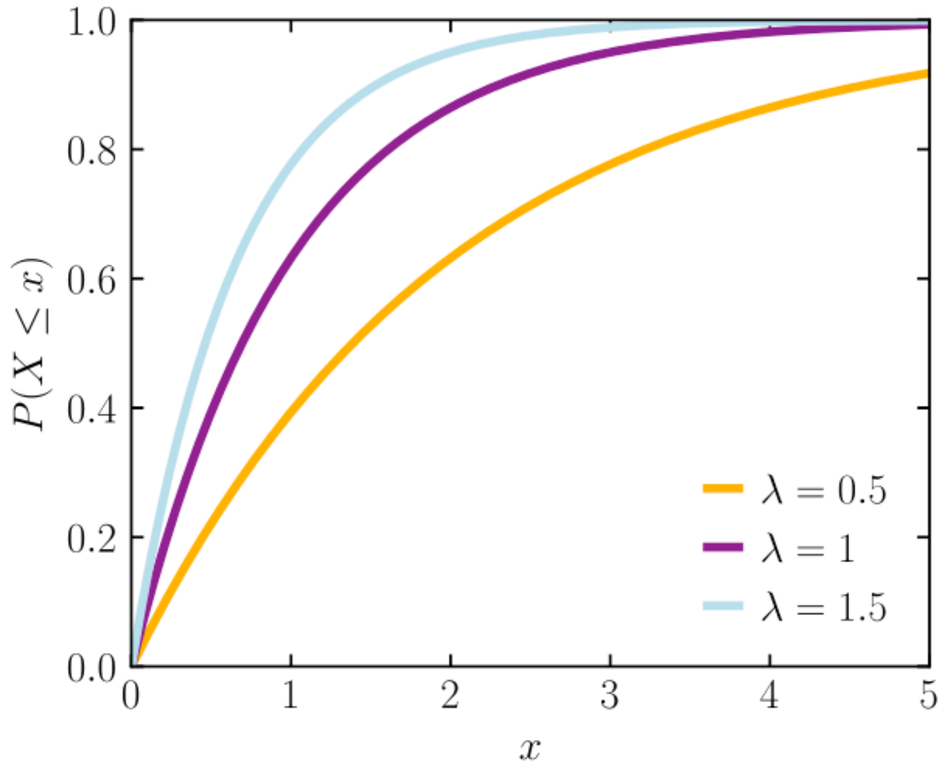
Divergence vs. recombination



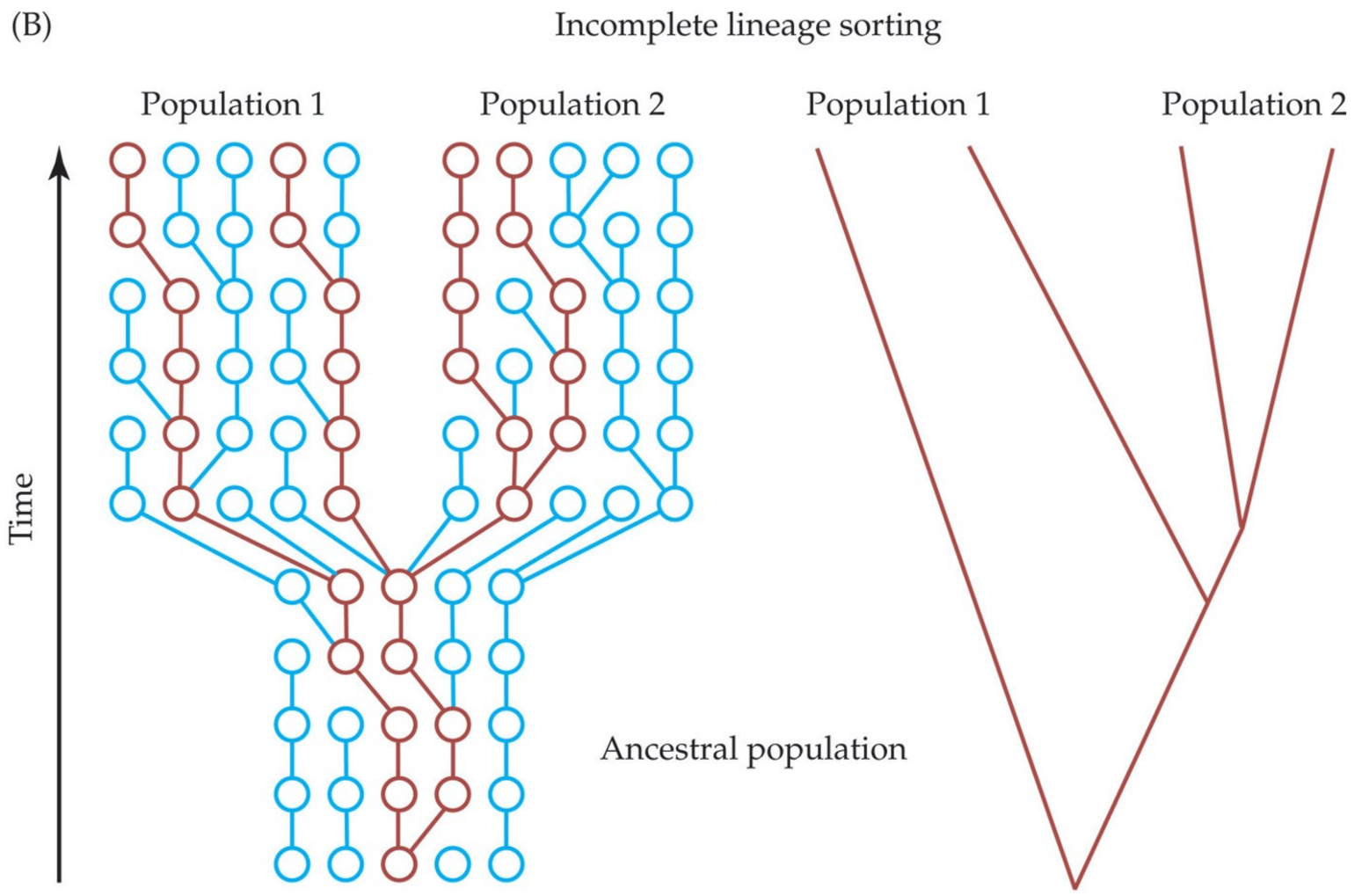
Begun and Aquadro (1992)

Cumulative distribution function of exponential: $1-e^{-\lambda x}$

(For coalescent, lambda=1)

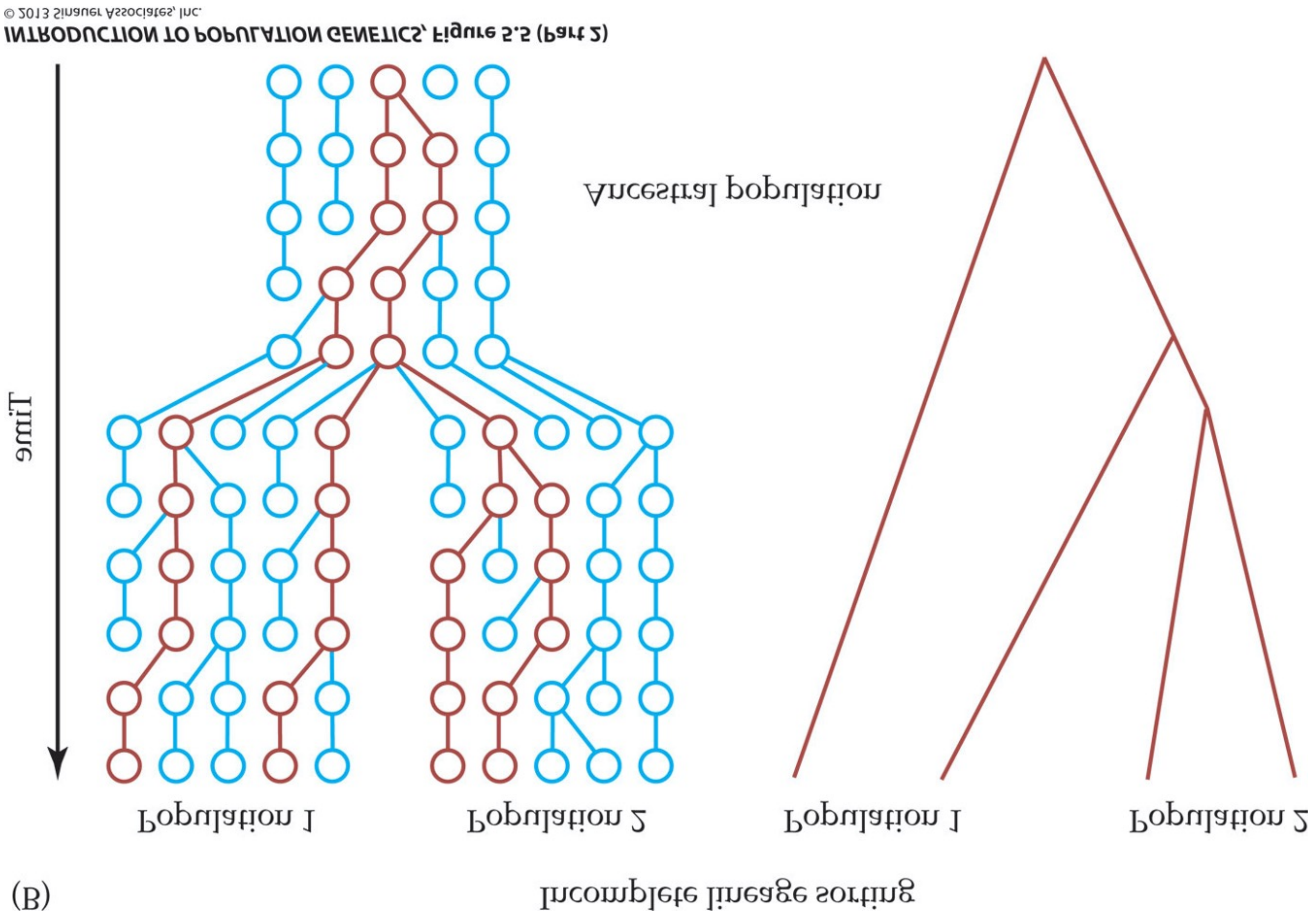


Wikimedia

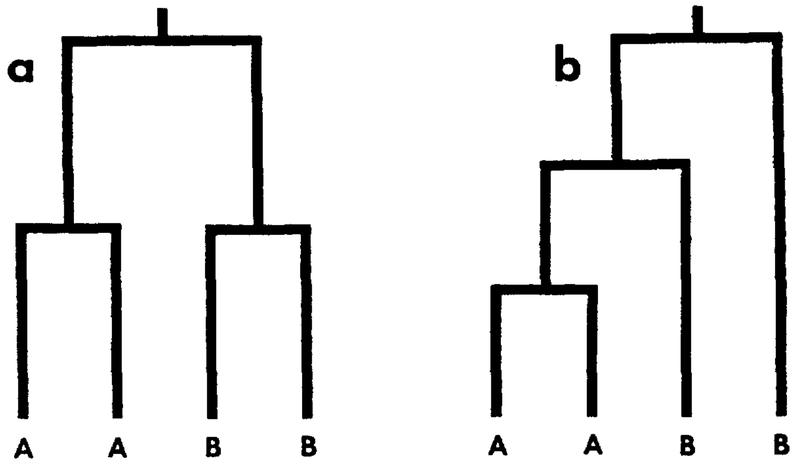


***INTRODUCTION TO POPULATION GENETICS,* Figure 5.5 (Part 2)**

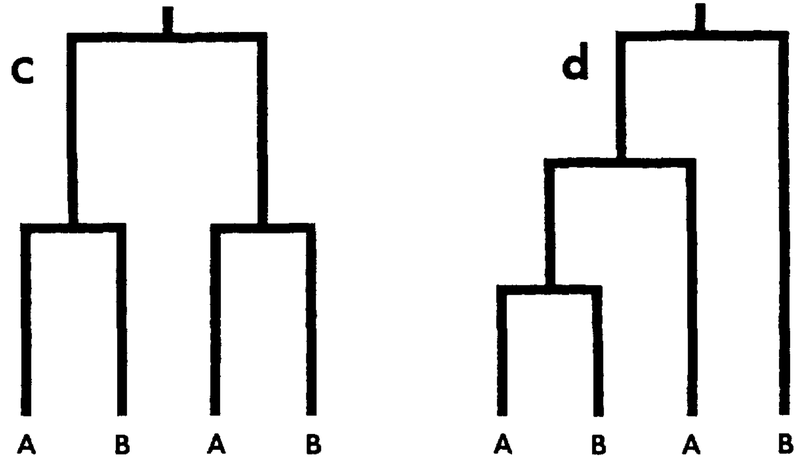
Nielsen and Slatkin (2013)



Nielsen and Slatkin (2013)

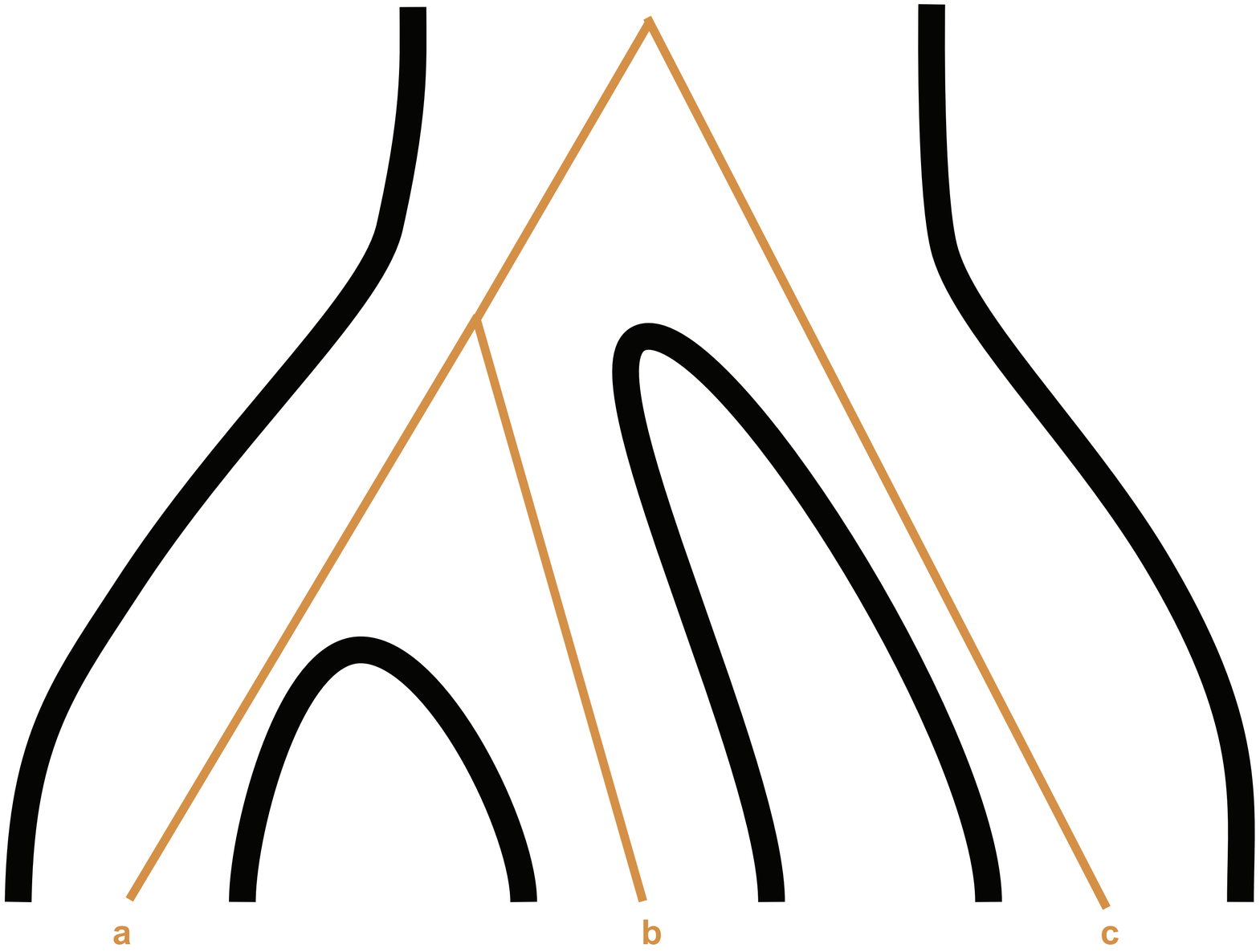


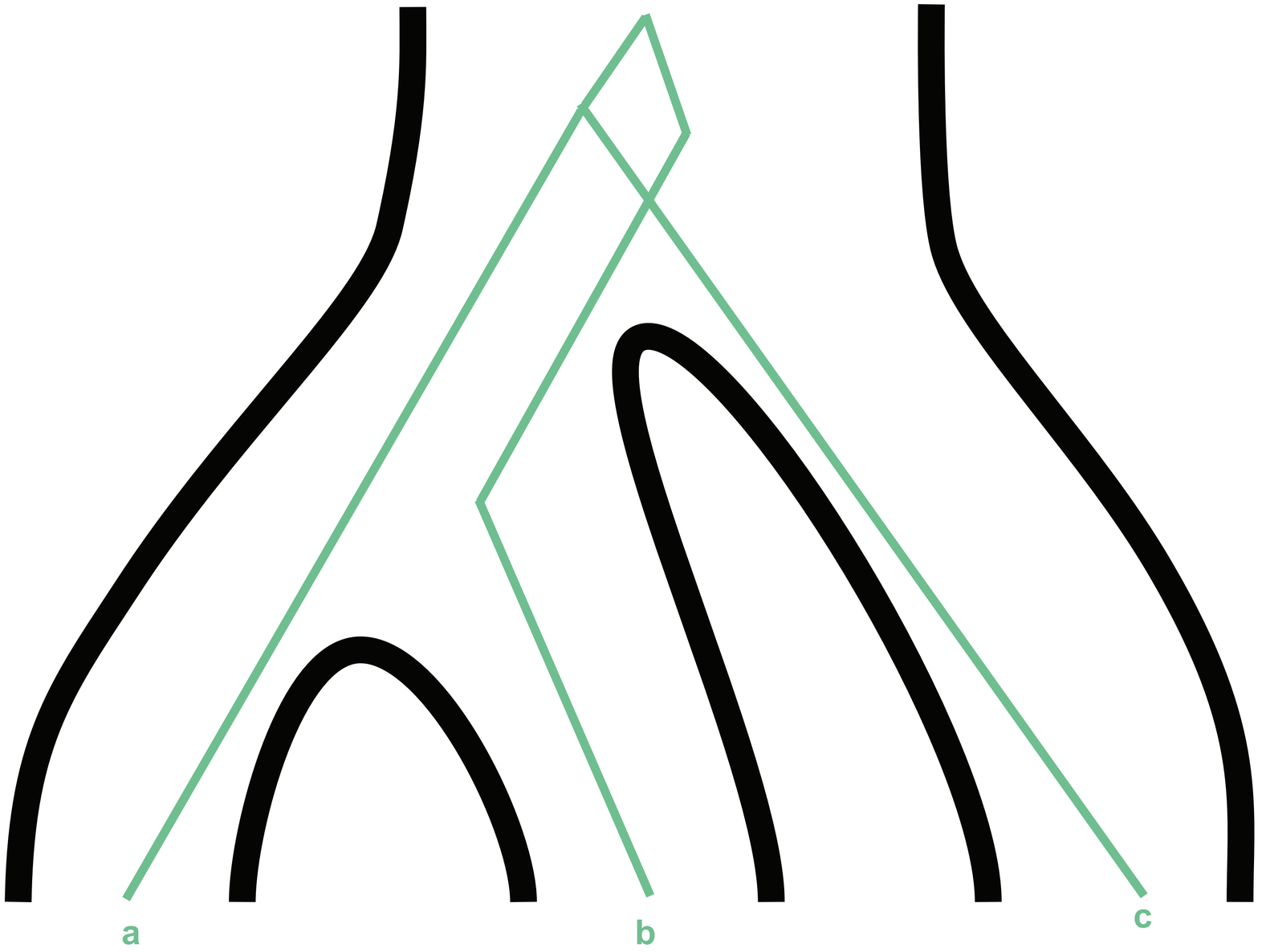
$$P = \left(1 - \frac{2}{3}e^{-\frac{t}{2N}}\right)^2 \qquad P = \frac{4}{3}e^{-\frac{t}{2N}}\left(1 - \frac{5}{6}e^{-\frac{t}{2N}}\right)$$

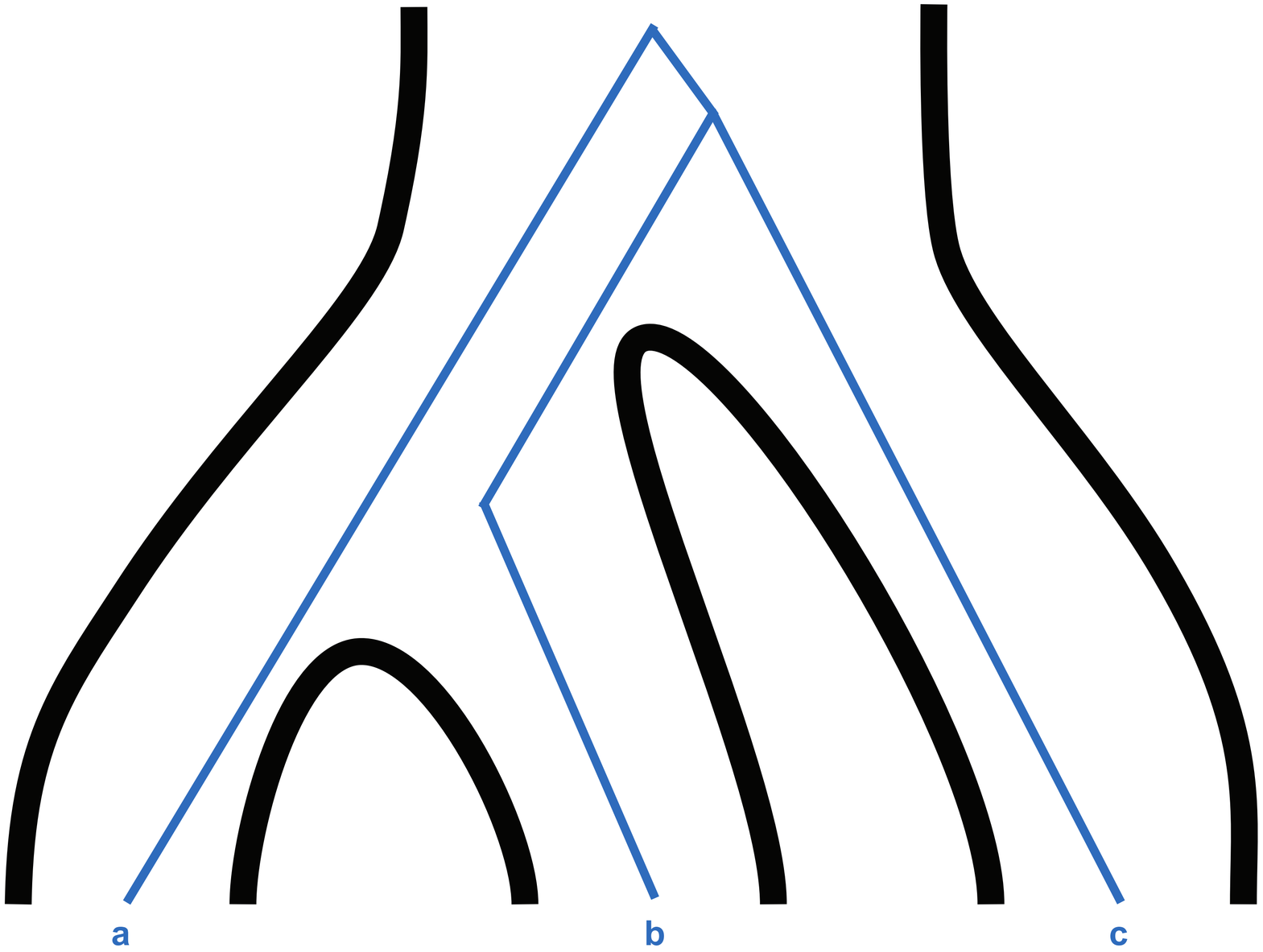


$$P = \frac{2}{9}e^{-\frac{t}{N}} \qquad P = \frac{4}{9}e^{-\frac{t}{N}}$$

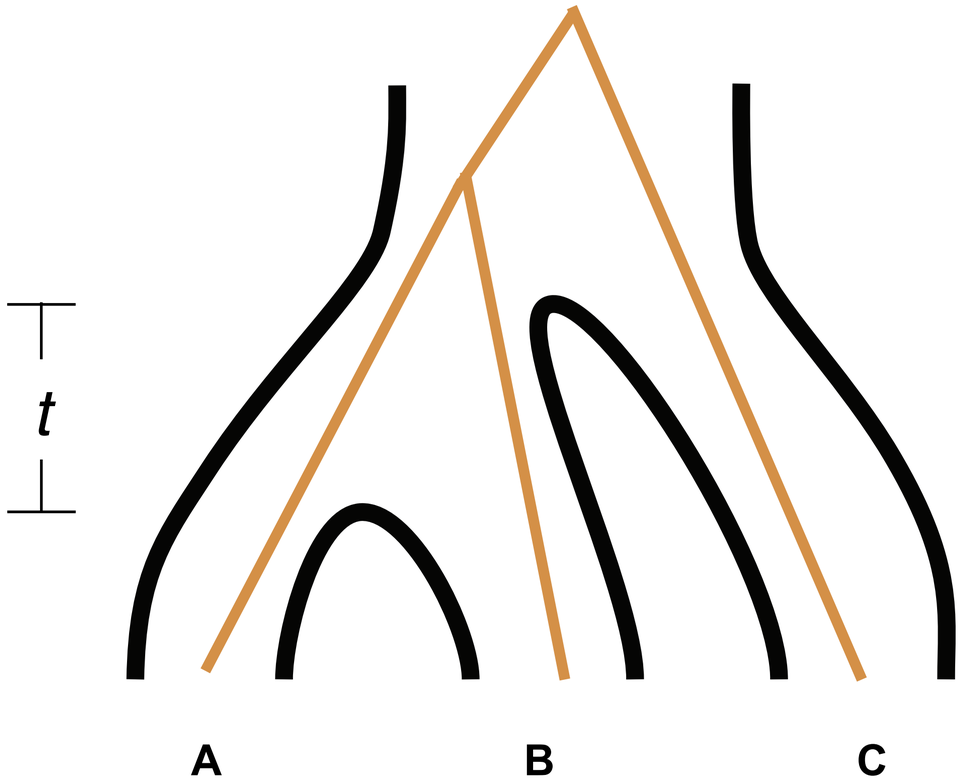
Tajima (1983)


a
b
c


a
b
c


a
b
c

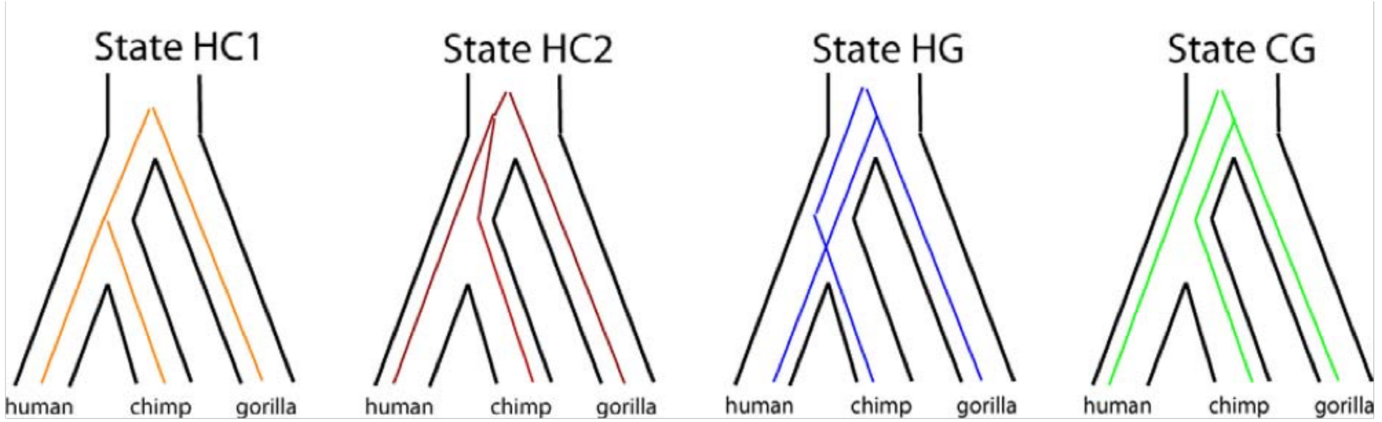
The multispecies coalescent model

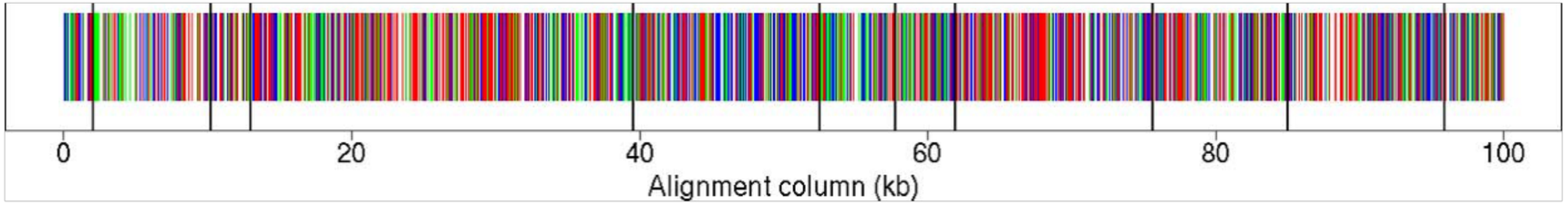


$1-(2/3)e^{-t}$

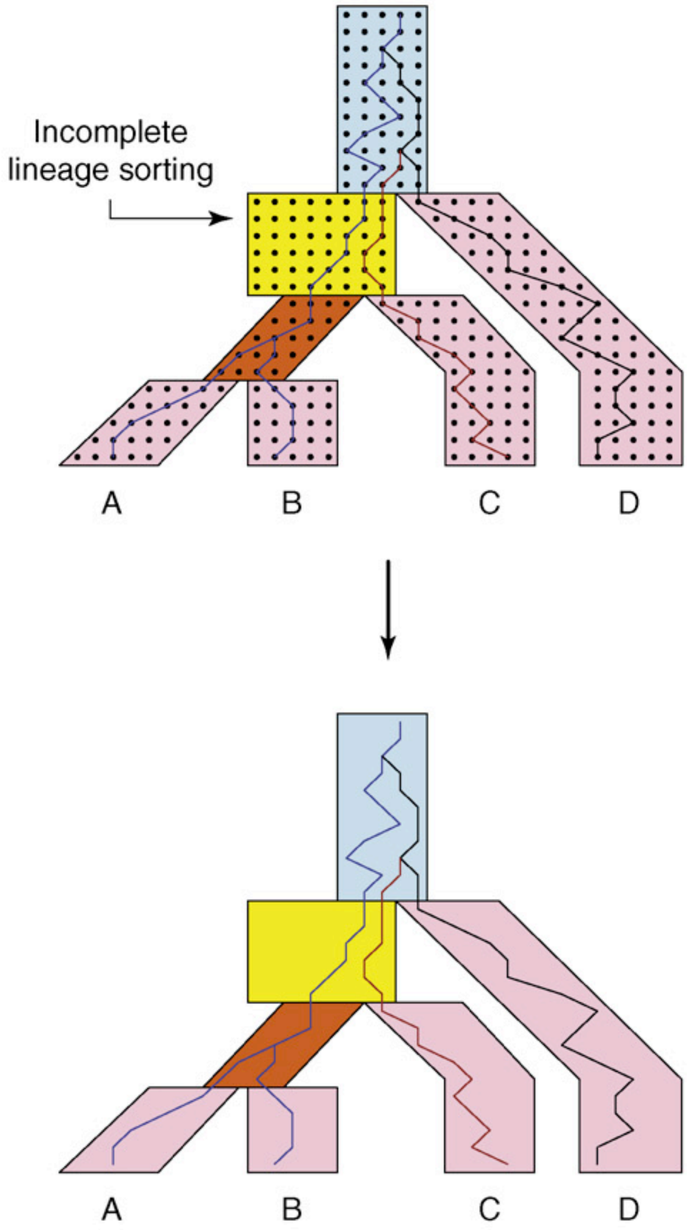
$(1/3)e^{-t}$

$(1/3)e^{-t}$

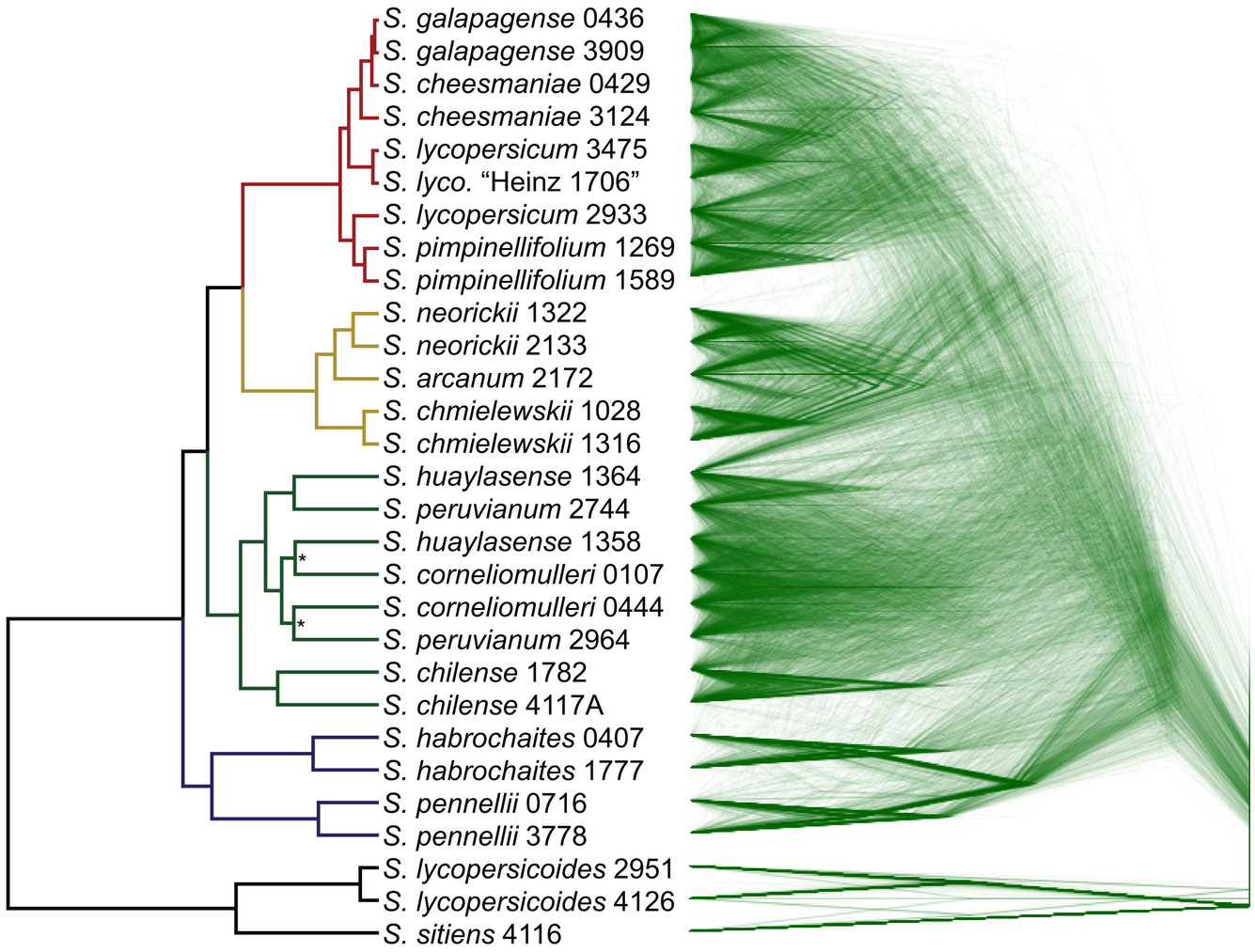




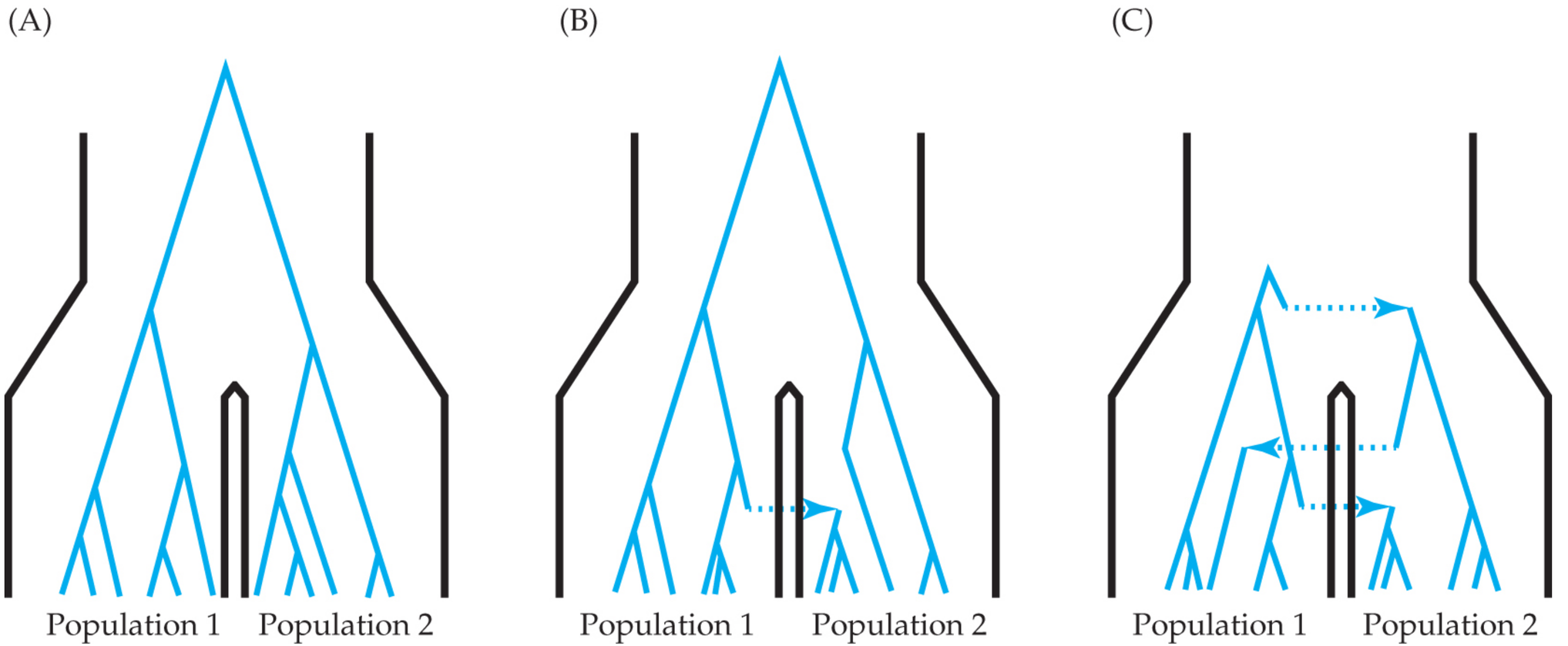
Hobolth et al. (2007)



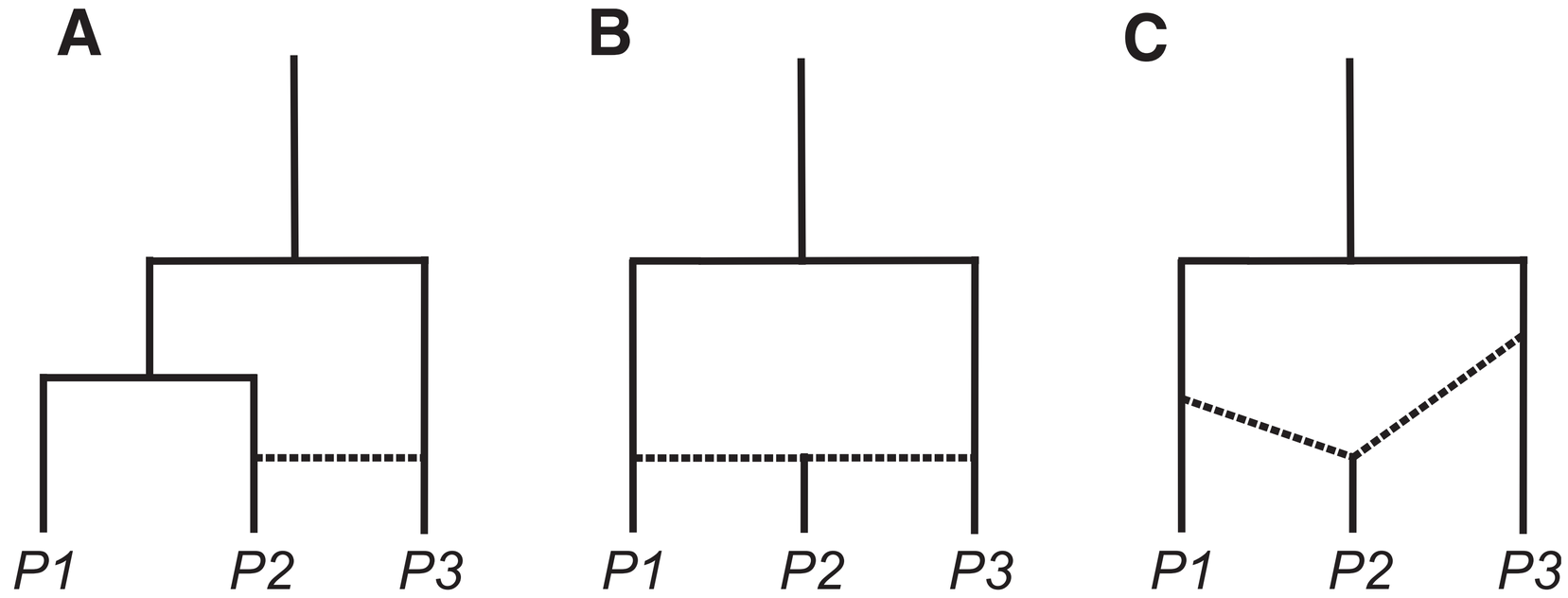
Degnan and Rosenberg (2009)

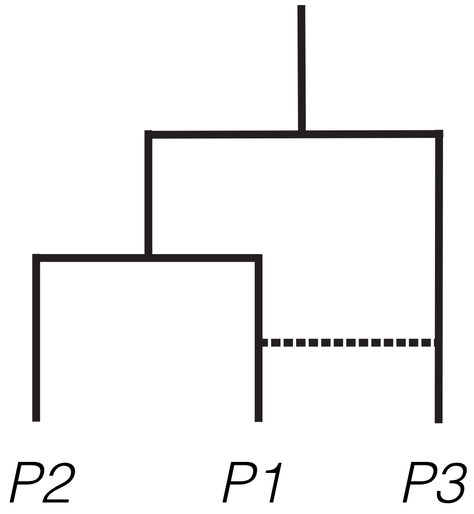


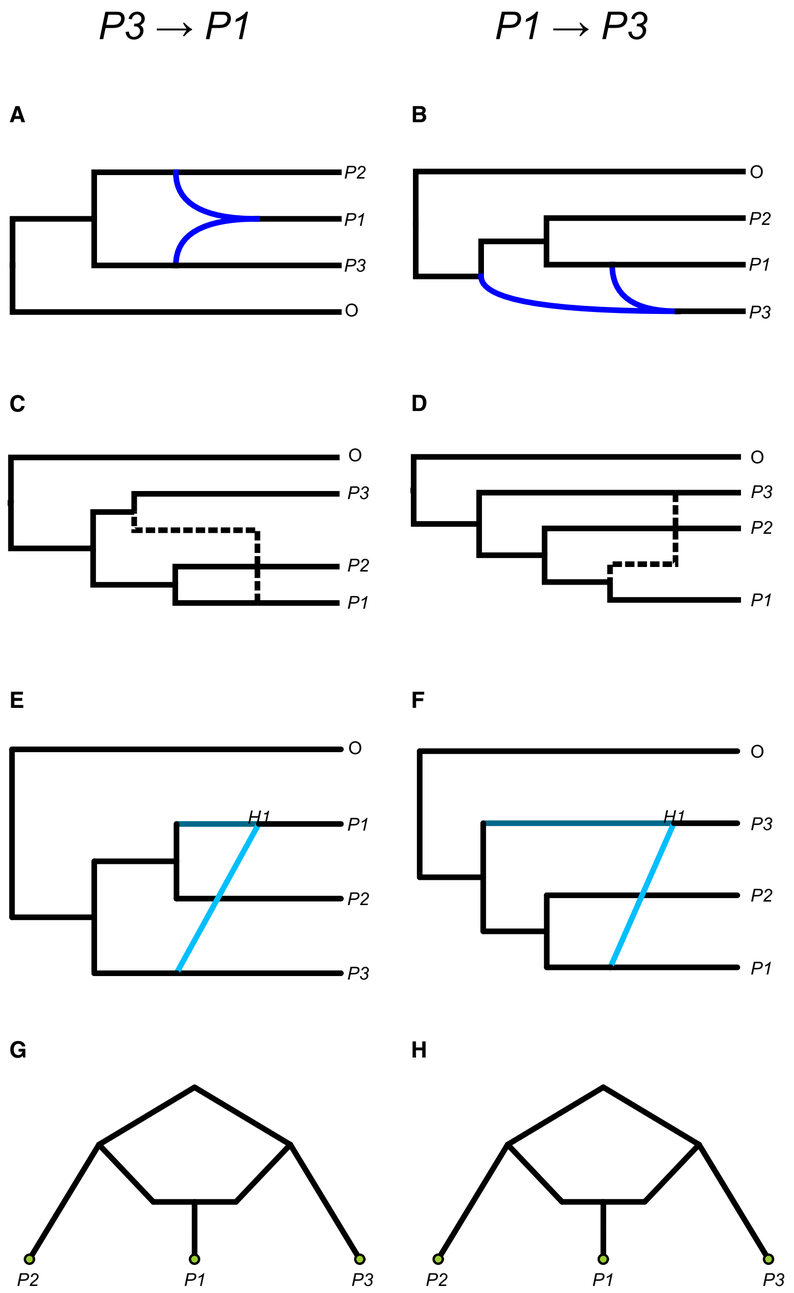
Pease et al. (2016)



More migration —>


A
B
C
P1
P2
P3
P1
P2
P3
P1
P2
P3


P2
P1
P3


P3 → P1
P1 → P3
A
P2
P1
P3
O
B
O
P2
P1
P3
C
O
P3
P2
P1
D
O
P3
P2
P1
E
O
H1
P1
P2
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O
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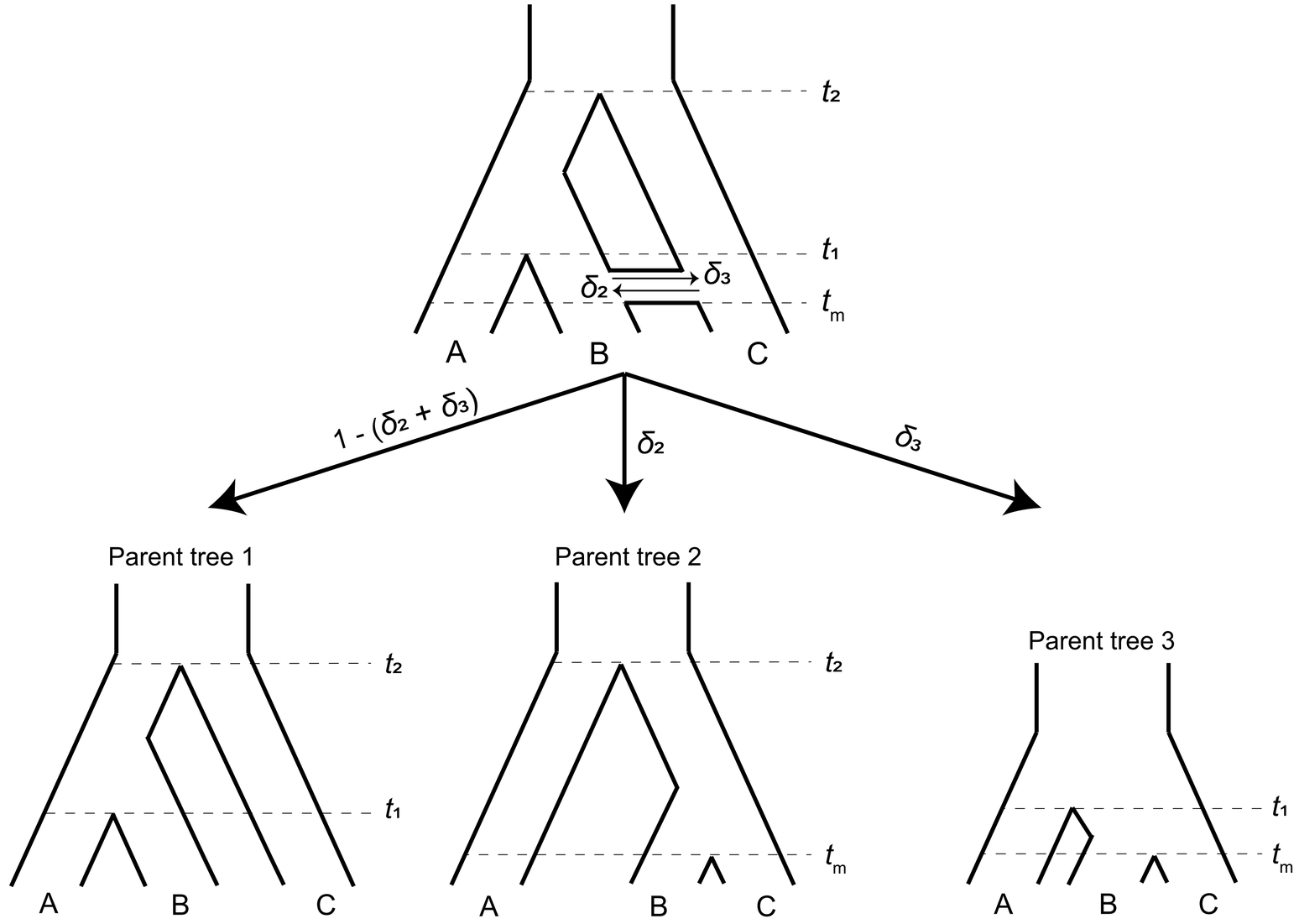
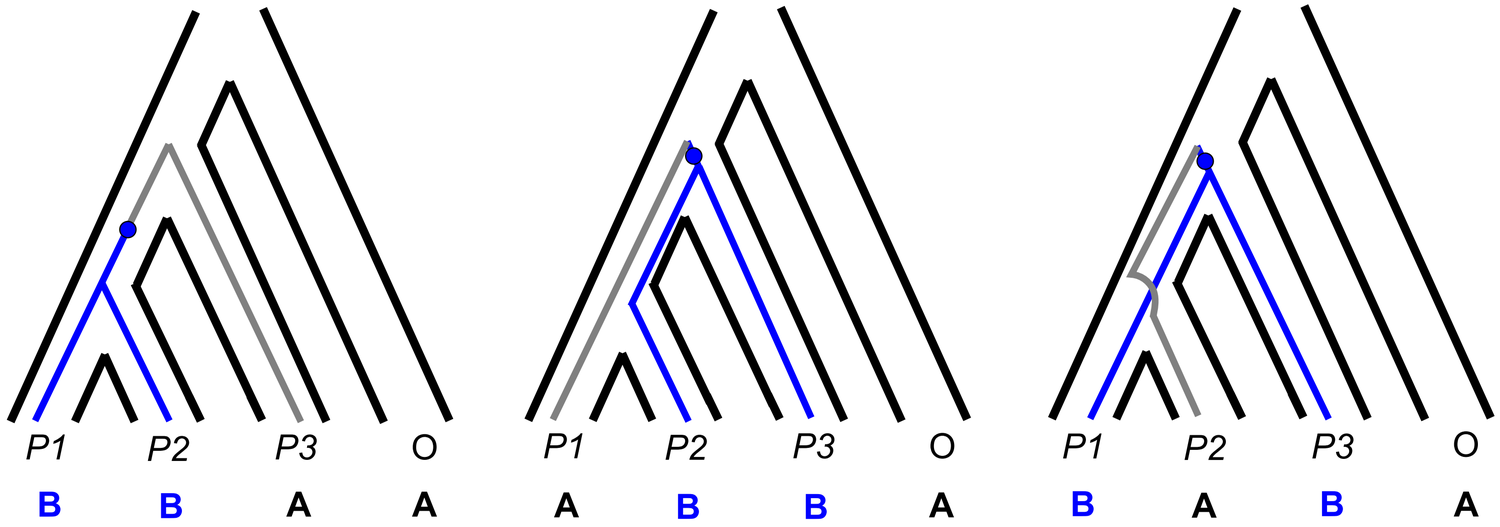
P3
P2
P1
G
P2
P1
P3
H
P2
P1
P3


t_2
t_1
t_m
δ_2
δ_3
A
B
C
$1 - (\delta_2 + \delta_3)$
δ_2
δ_3
Parent tree 1
Parent tree 2
Parent tree 3

ILS only:



ILS + introgression: