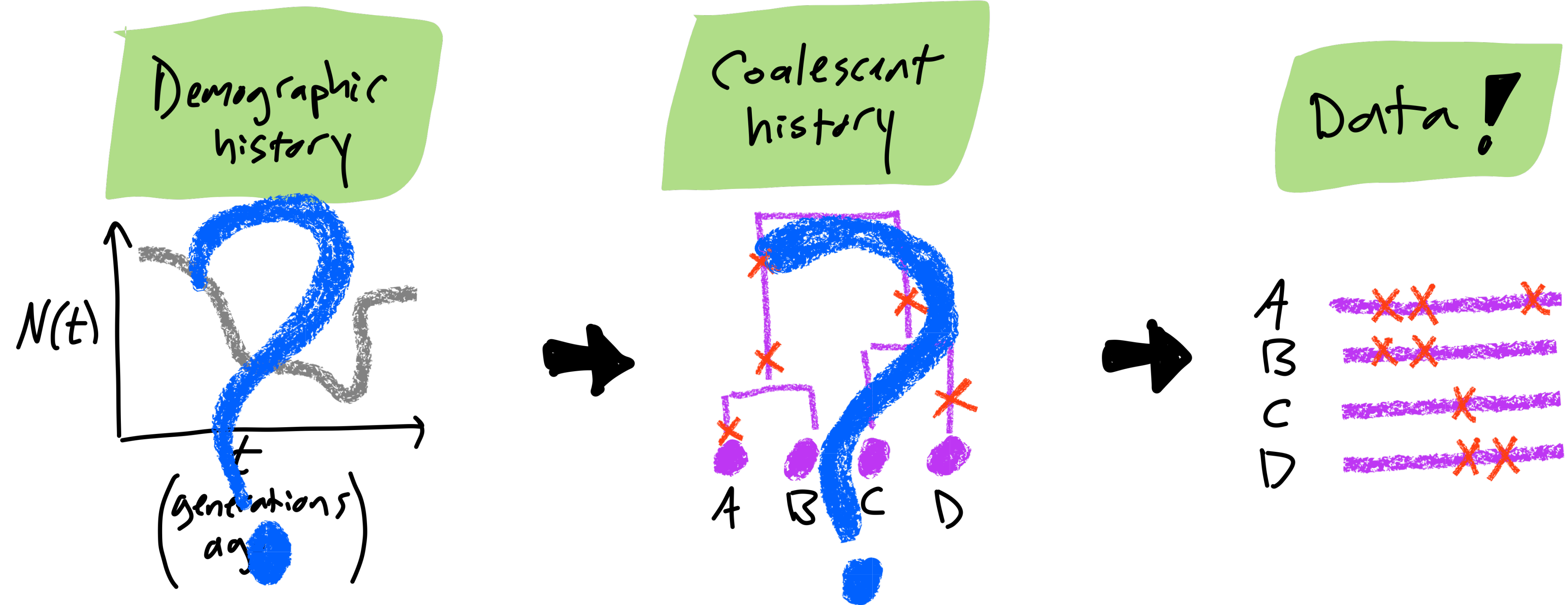# Coalescent theory
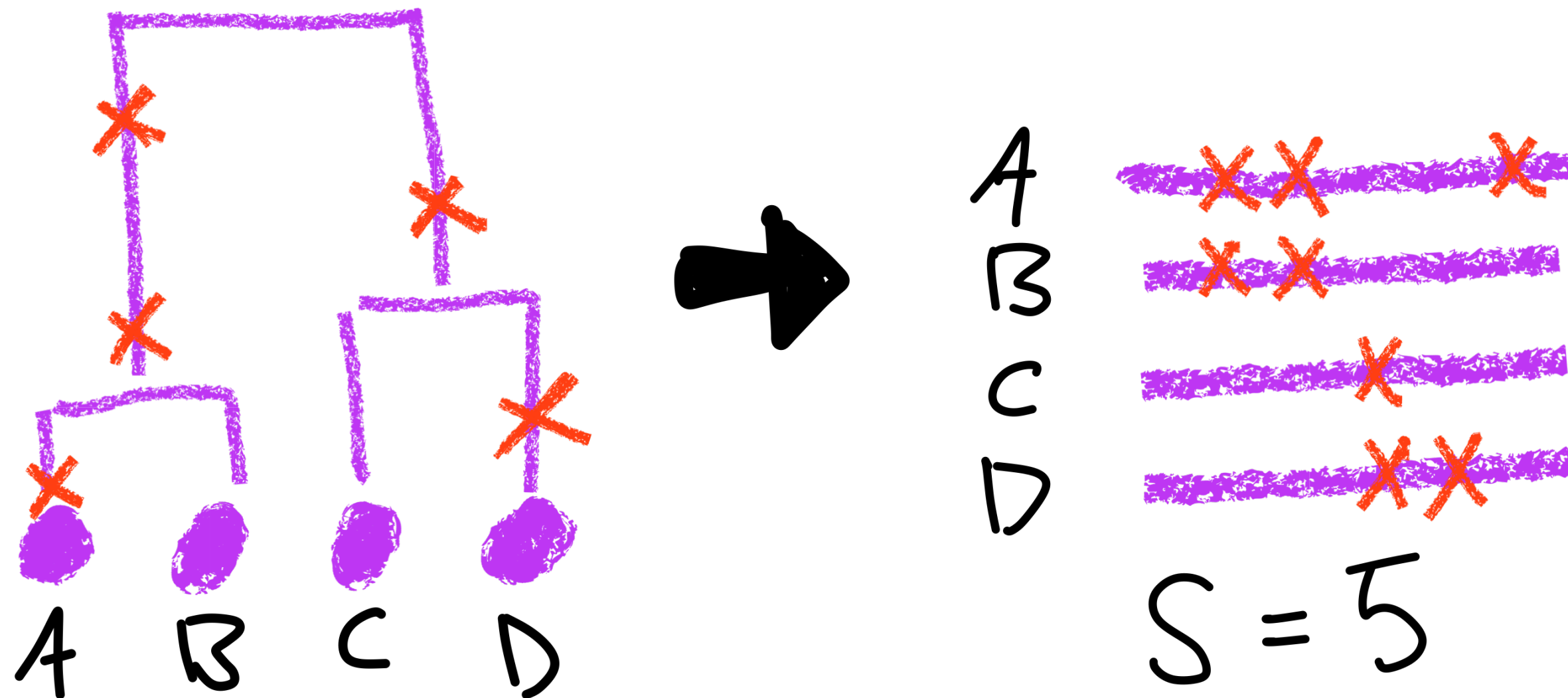## Genetic diversity

Coalescent theory
Genetic diversity

segregating sites, S, equals # mutations in the samples history (infinite sites approximation)

$S = 5$

Constant N case:

total branch length

$$\mathbb{E}[S] = \mu\, \mathbb{E}[T_{total}]$$

$$= \mu \sum_{i=2}^{n} i\, \mathbb{E}[T_i]$$

$$= \mu \sum_{i=2}^{n} i\, \frac{2N}{\binom{i}{2}}$$

$$= 4\mu N \sum_{i=1}^{n-1} \frac{1}{i}$$