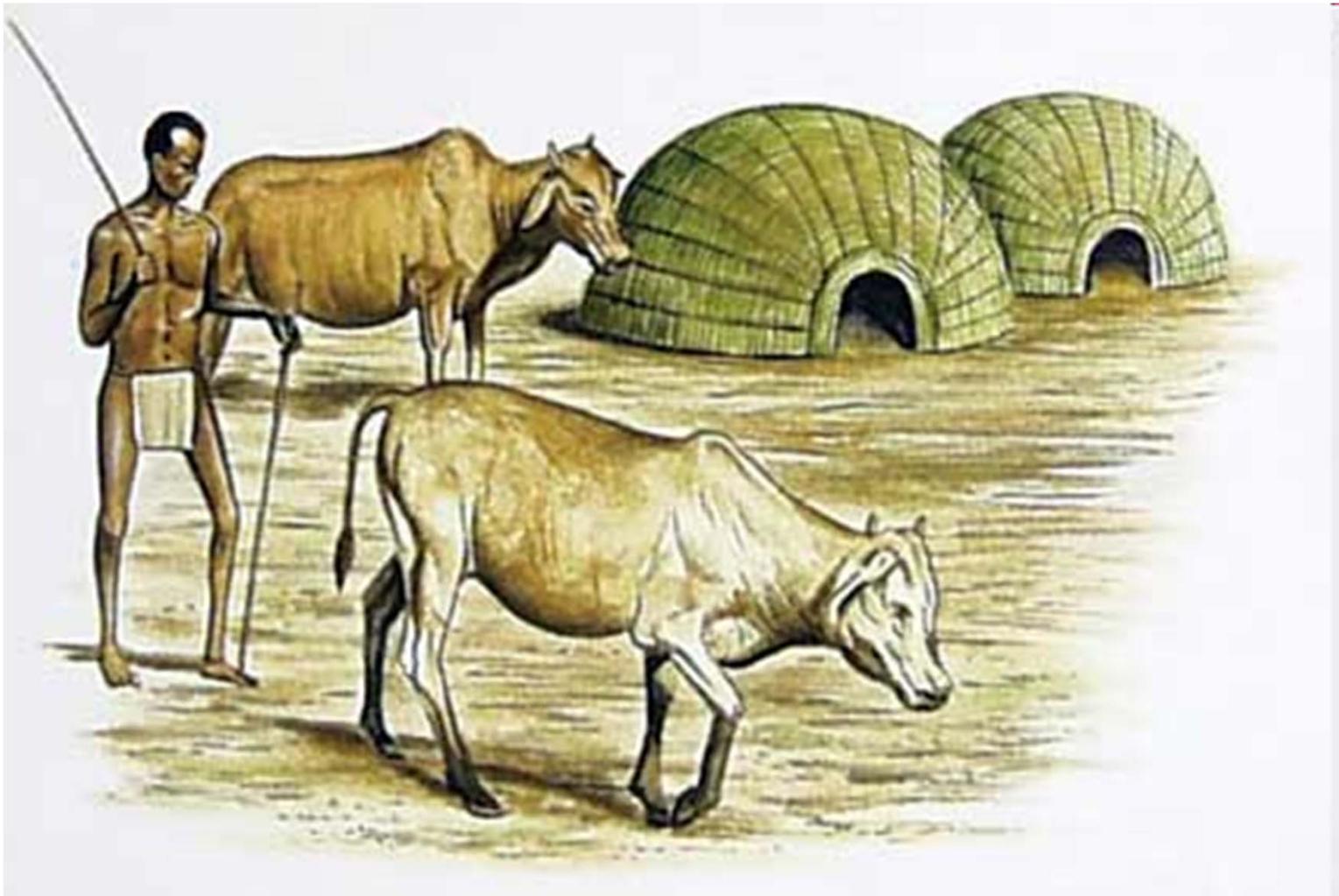


The cow is the enemy of matriliney:

Using phylogenetic methods to study cultural evolution in Africa

Clare Holden & Ruth Mace



The cow is the enemy of matriliney:

Using phylogenetic methods to study cultural evolution in Africa

Matriliney = relatedness through females is culturally more significant than relatedness through males

- Descent or group membership traced through females
- Most altruistic behavior directed towards matrilineal kin
 - Property inheritance, political succession, residence
 - Men transmit wealth, political rights to their sisters' sons

Patriliney = group membership traced through males etc.

Mixed – males and females have roughly equal cultural significance

☞ **Matriliney** rare but recurrent: $31/186 = 17\%$ of cultures in Standard Cross-Cultural Sample (SCCS) vs. **43%** patriliney, **42%** mixed

Hypothesis: adopting cattle leads to the loss of matriliney

Test: 68 Bantu-speaking cultures

- 24 matrilineal, 37 patrilineal, 7 mixed
- 30 have cattle, 38 do not

Statistical test: compare independent model (the 2 states change independently) and the dependent model (the 2 states are correlated) – which fits the data better?

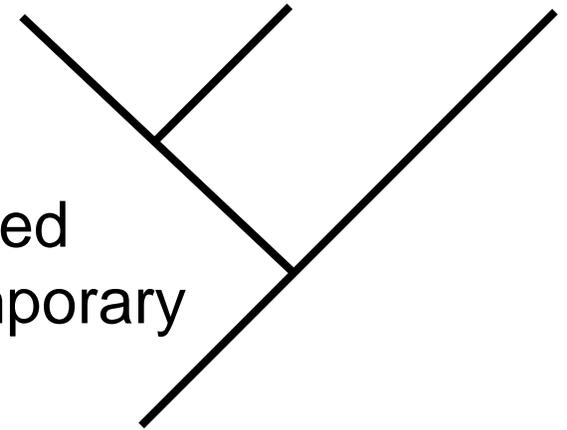
How test the co-evolution of these two cultural traits? Use **evolutionary (phylogenetic) tree** based on the Bantu

Language tree mirrors the spread of farming across central and southern African between 3000 BC and AD 200.

Application of Phylogenetic Methods to Cultural Evolution

To test whether two cultural traits are functionally related, we need to know how many times two traits have **independently co-evolved**, distinguishing correlations **due to shared ancestry (homology)** from those **due to convergent cultural evolution** which are evidence of adaptation.

In a **phylogenetic comparison**, cultures (populations) are placed on a tree that represents past relationships among populations. Past character states are inferred from the distribution of characters in contemporary populations at the tips of the tree.



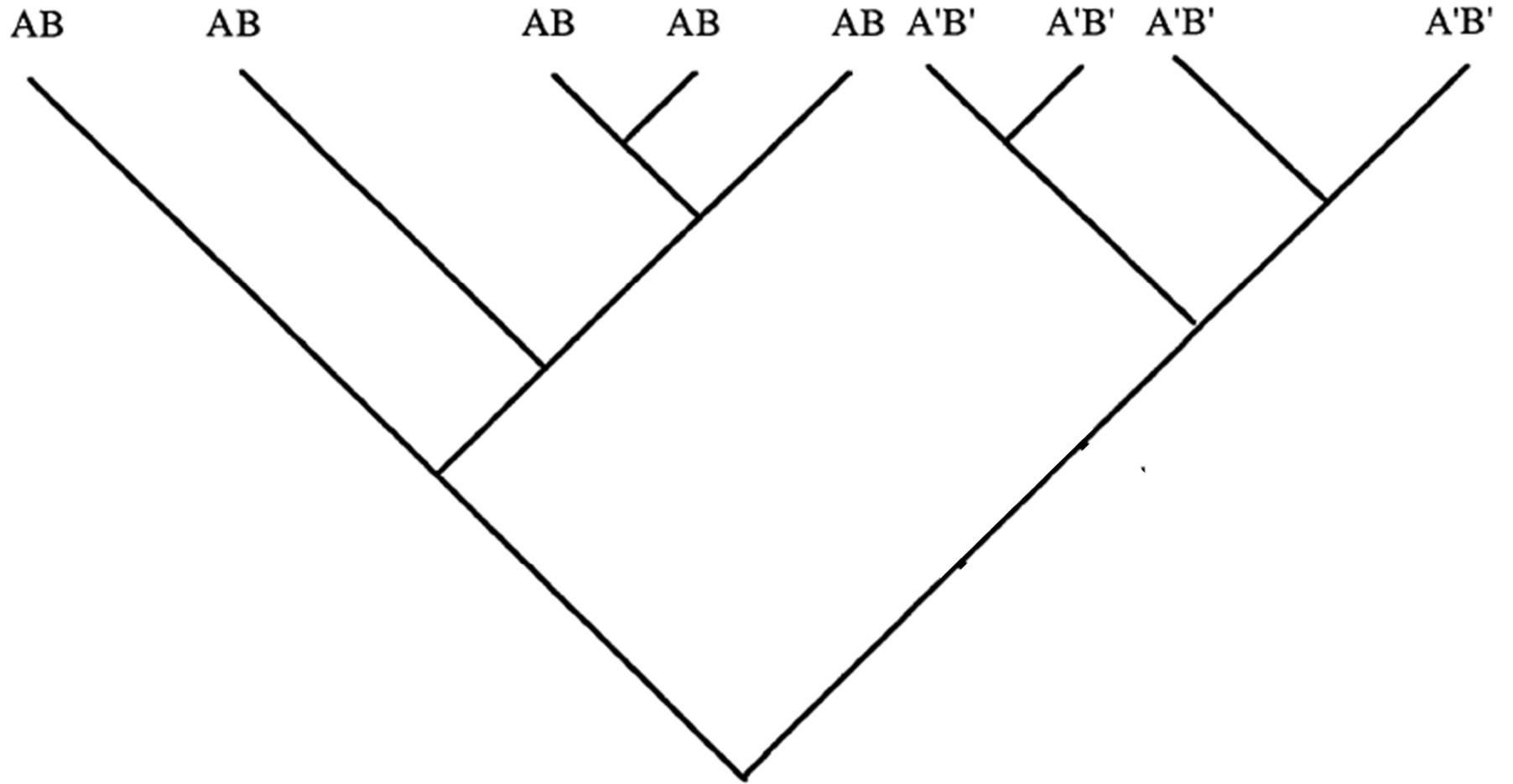
Modern approach: **don't look for correlations at the tips of the tree but instead along the branches of the tree**, because any two branches are independent.

Application of Phylogenetic Methods to Cultural Evolution

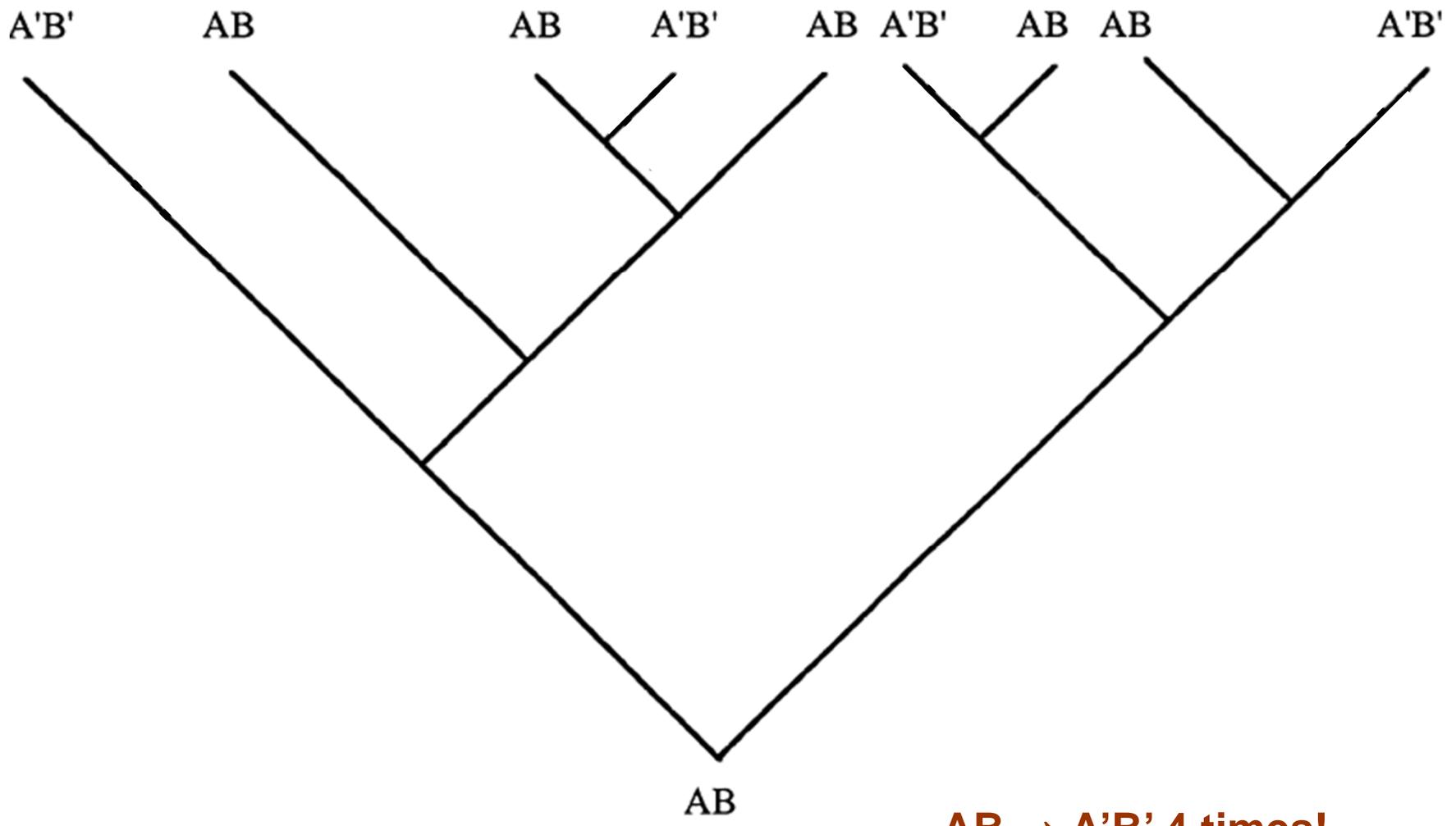
Suppose we are considering a number of different cultures and two cultural traits, and each trait has two forms: A vs. A' and B vs. B'. (In our example, the traits will be matriliney vs. patriliney, and cattle-owning vs. not.)

We observe that the two forms of the two traits are **correlated**: whenever A occurs, B usually does too, and whenever A' occurs, B' usually does too. Suppose that in 9 cultures we find 5 cases of AB, and 4 cases of A'B' (and no AB' or A'B).

Does this correlation permit us to conclude that whether the culture is B or B' is caused by whether it is A or A' (or vice-versa) and that this represents an **adaptive correlation**?

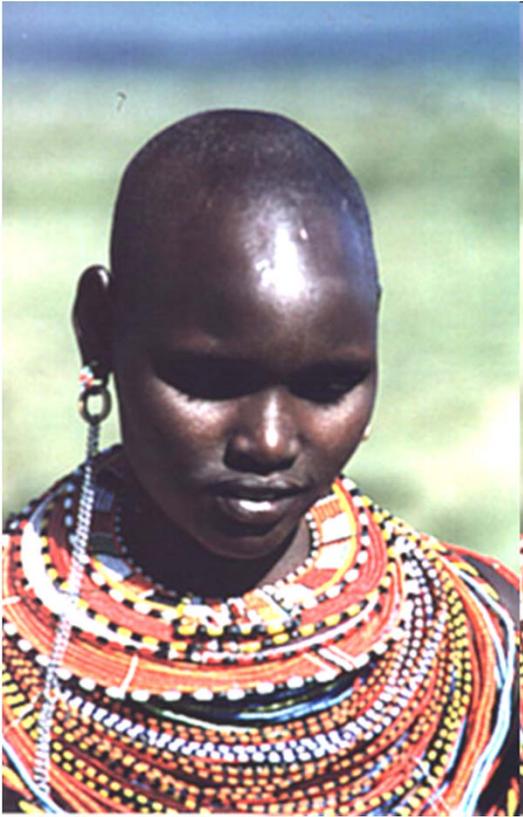


AB → A'B' once only
'Due to' phylogeny (history)



AB → A'B' 4 times!

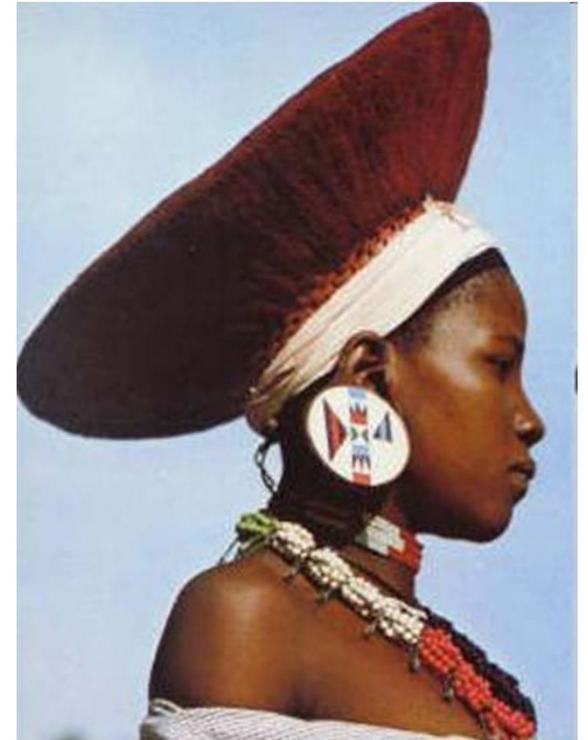
indicates convergent evolution

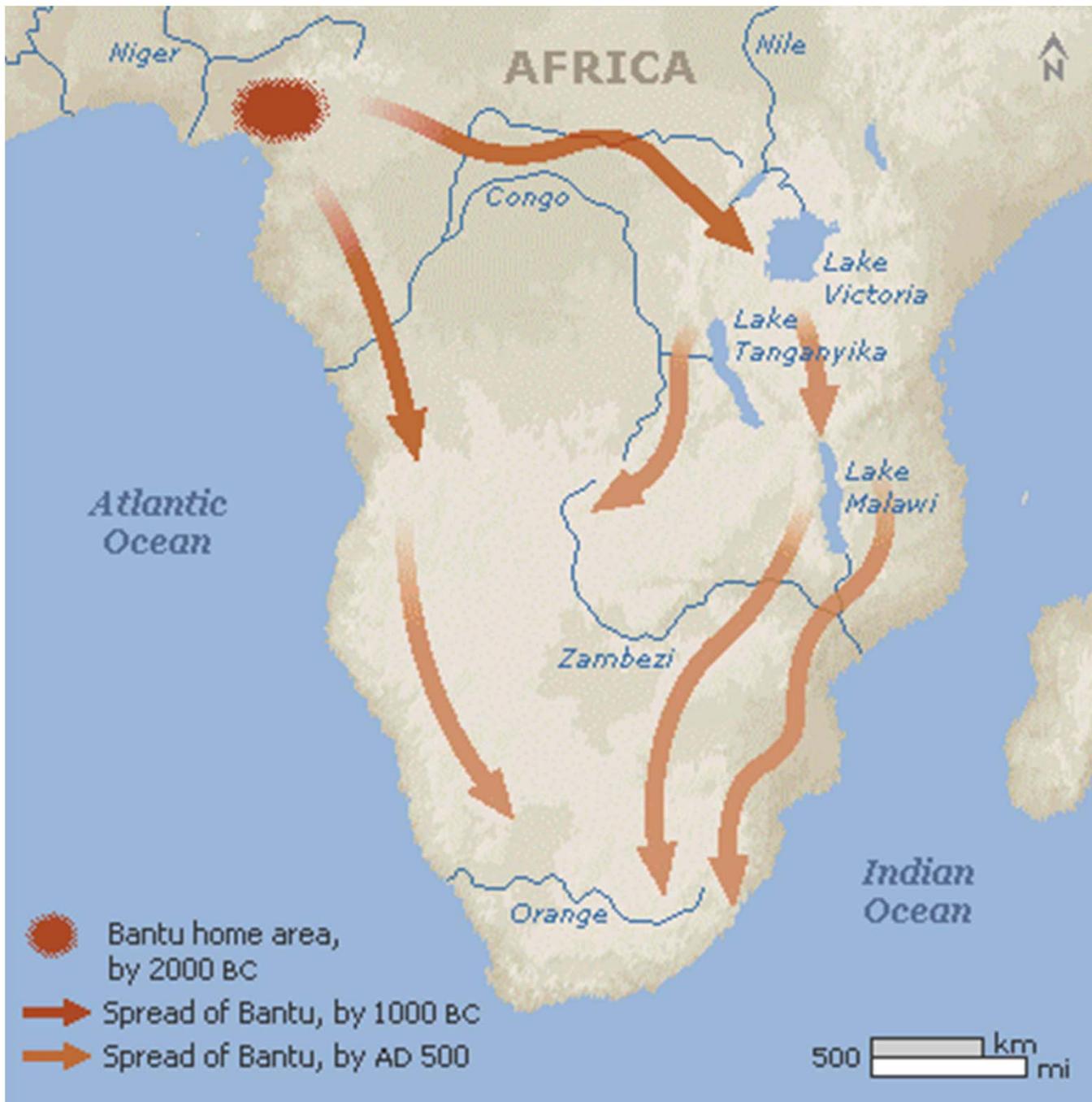


The **Bantu people** make up about 2/3 of Africa's population, inhabit the southern and eastern part of the continent. This group is extremely diverse, **known as a language group not as a distinct ethnic group**. The most widely spoken Bantu-derived language is **Swahili** (50+ million speakers in eastern Africa).

History: The Bantu migrated from Congo or Niger Delta Basin. **One of the largest migrations in human history**. Began ~ 3000-2500 BC for the early expansion within W. Africa, followed by eastwards and southwards migrations beyond W. Africa from ~ 1500-1000 BC.

Bantu-speakers **developed novel methods of agriculture and metalworking** which allowed people to colonize new areas with widely varying ecologies in greater densities than hunting and foraging permitted. Bantu-speakers **adopted livestock husbandry** from other peoples they encountered.





Today, millions of people across the southern half of Africa speak related languages, collectively known as Bantu languages. Root Bantu language emerged in what is now Nigeria and Cameroon by 2000 BC. In a series of migrations, by 1000 BC, Bantu speakers had spread south to the savanna lands of Angola and east to the Lake Victoria region. Over the next 1,500 years they scattered throughout central and southern Africa, absorbing indigenous populations as they spread.

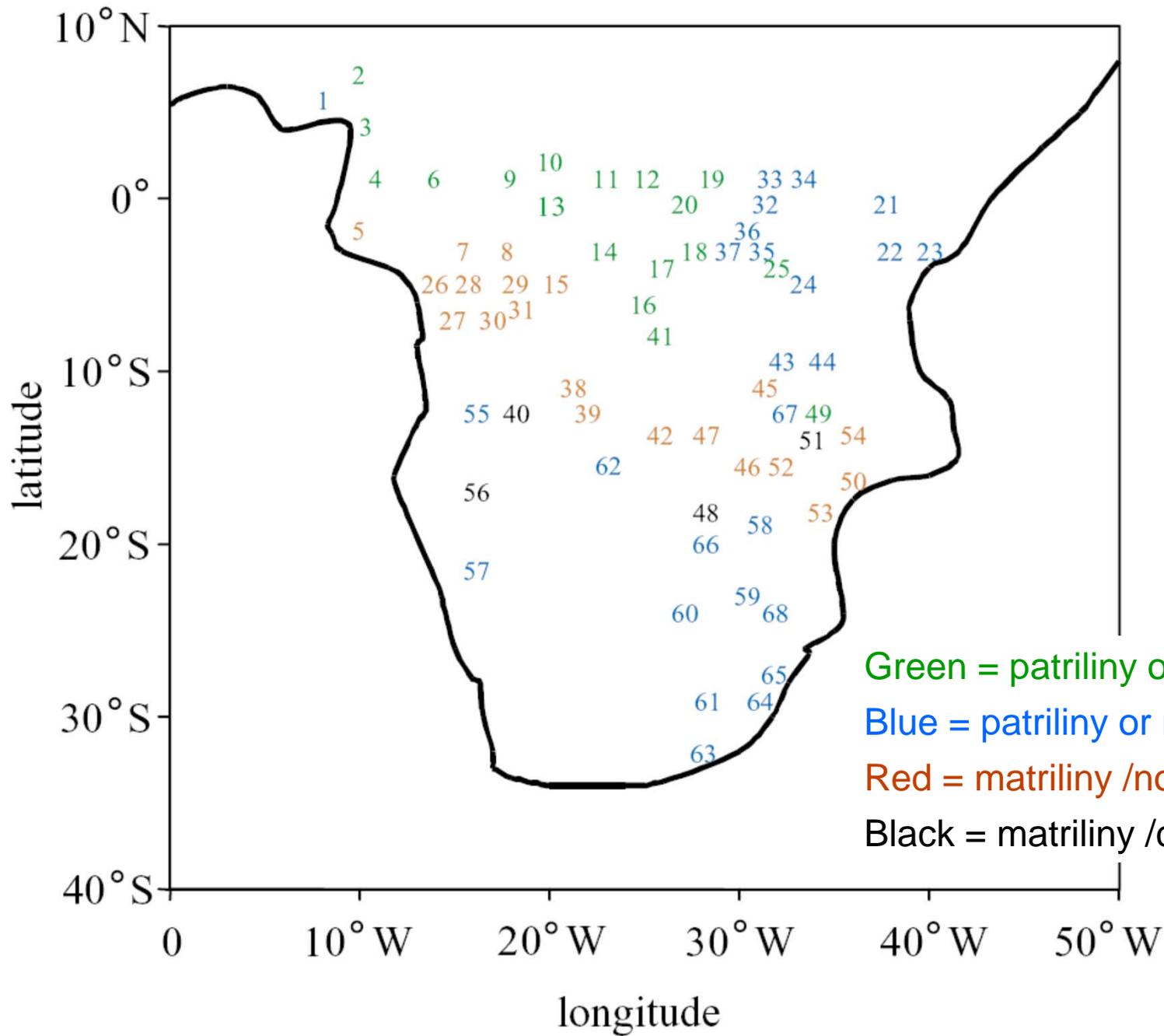


Figure 1

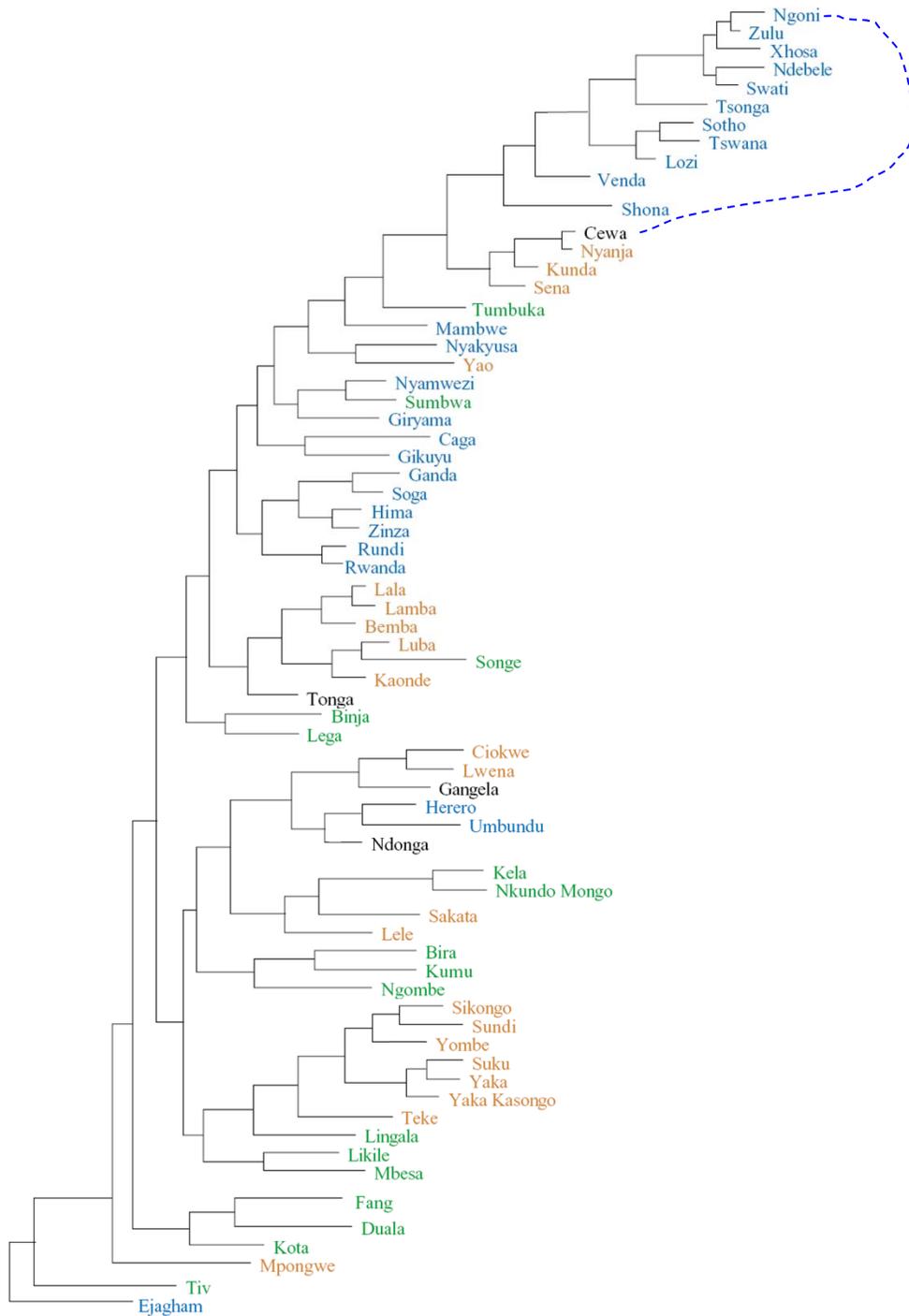


Figure 2

Bantu language tree, used to represent past relationships among 68 cultures in the sample.

Green = patriliney or mixed / no cattle

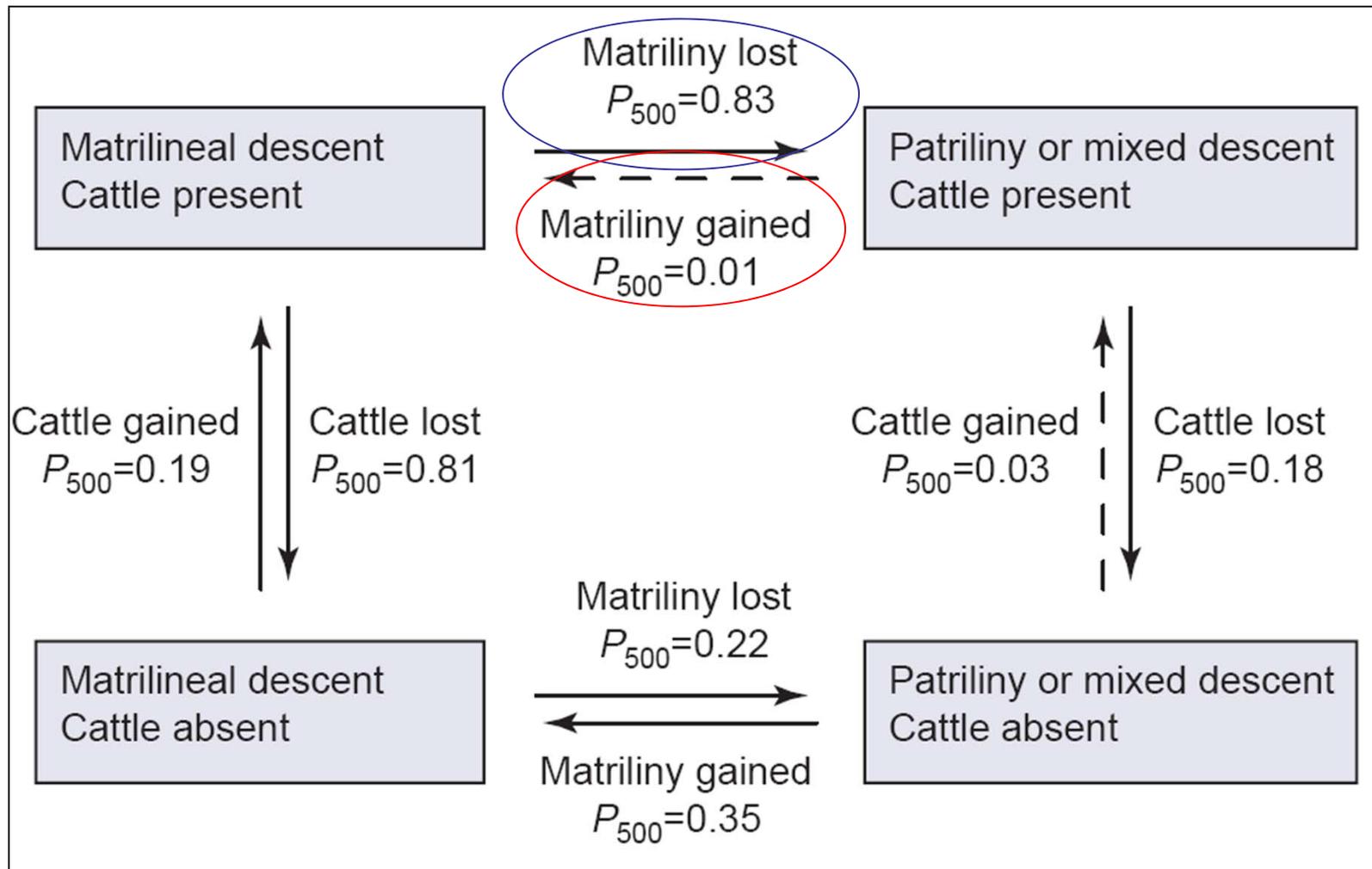
Blue = patriliney or mixed / cattle

Red = matriliney / no cattle

Black = matriliney / cattle

Results (~ Fig 3 – this figure is from later paper, slightly different)

- Can't identify whether matriliney or patriliney is ancestral, but no cattle is ancestral
- Adopting cattle leads to loss of matriliney
- Once get cattle, if keep them, do not lose patriliney/mixed



Why does adopting cattle lead to the loss of matriliney?

Matrilineal social structure arises from daughter-biased investment by parents and/or grandparents.

Patrilineal social structure arises from son-biased investment by parents and/or grandparents.

Why would son-biased or daughter-biased inheritance be favored?

Hints: Two correlates of matrilineal societies:

1. Matrilineal societies tend to be **horticultural** (farmers without ploughs or large domestic livestock), whereas patrilineal societies tend to have significant resources (e.g., cattle) that can be transmitted to children (and they are usually transmitted to sons).
2. Matrilineal societies tend to have **lower levels of paternity certainty**.

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Key variables:

1. Potential for polygyny and extent of resources that can be transmitted to sons.
2. Uncertainty of paternity.

Why does adopting cattle lead to the loss of matriliney?

Son-biased wealth inheritance an adaptive strategy for parents if inherited wealth has a stronger effect on the RS of sons than daughters. This will occur if there is **potential for polygyny** **and** the family controls resources which can be used to acquire brides (**bridewealth**).

But parents need to balance the potential benefits of wealth to sons against the risk the son might be **cuckolded** by his wife and that a nonrelative might inherit their property.

Daughter-biased grandparental or parental investment will be adaptive when risk of paternity uncertainty among sons' offspring outweighs marginal benefits of wealth inheritance to sons.

Why does adopting cattle lead to the loss of matriliney?

Direction of parental sex bias depends on

1. Probability of paternity, P
2. Additional (marginal) benefits of inherited wealth to sons relative to daughters, B_S/B_D

The benefits of wealth to sons and daughters are equal if

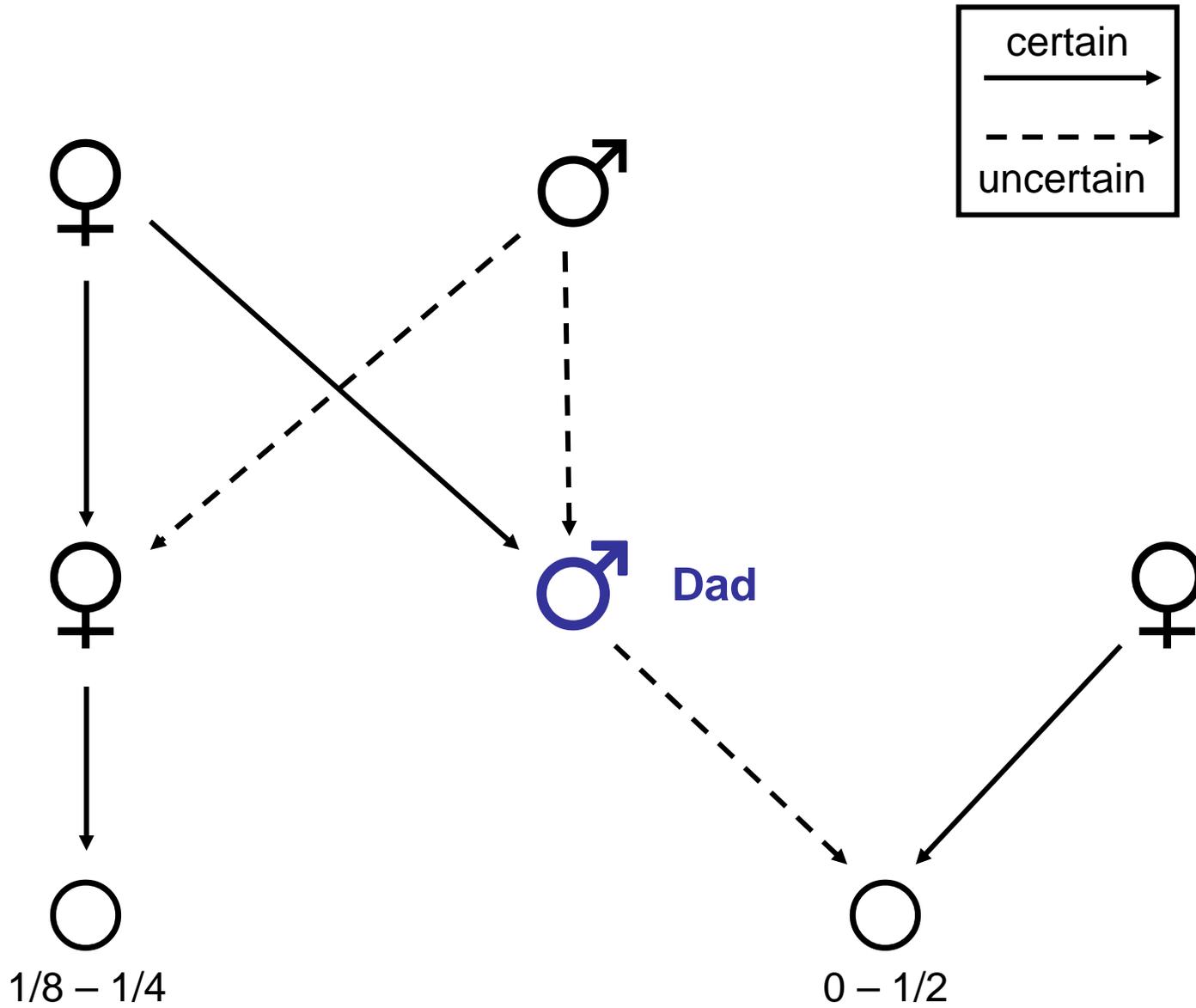
$$B_S/B_D = 1/P$$

If $B_S/B_D > 1/p$, give wealth to sons

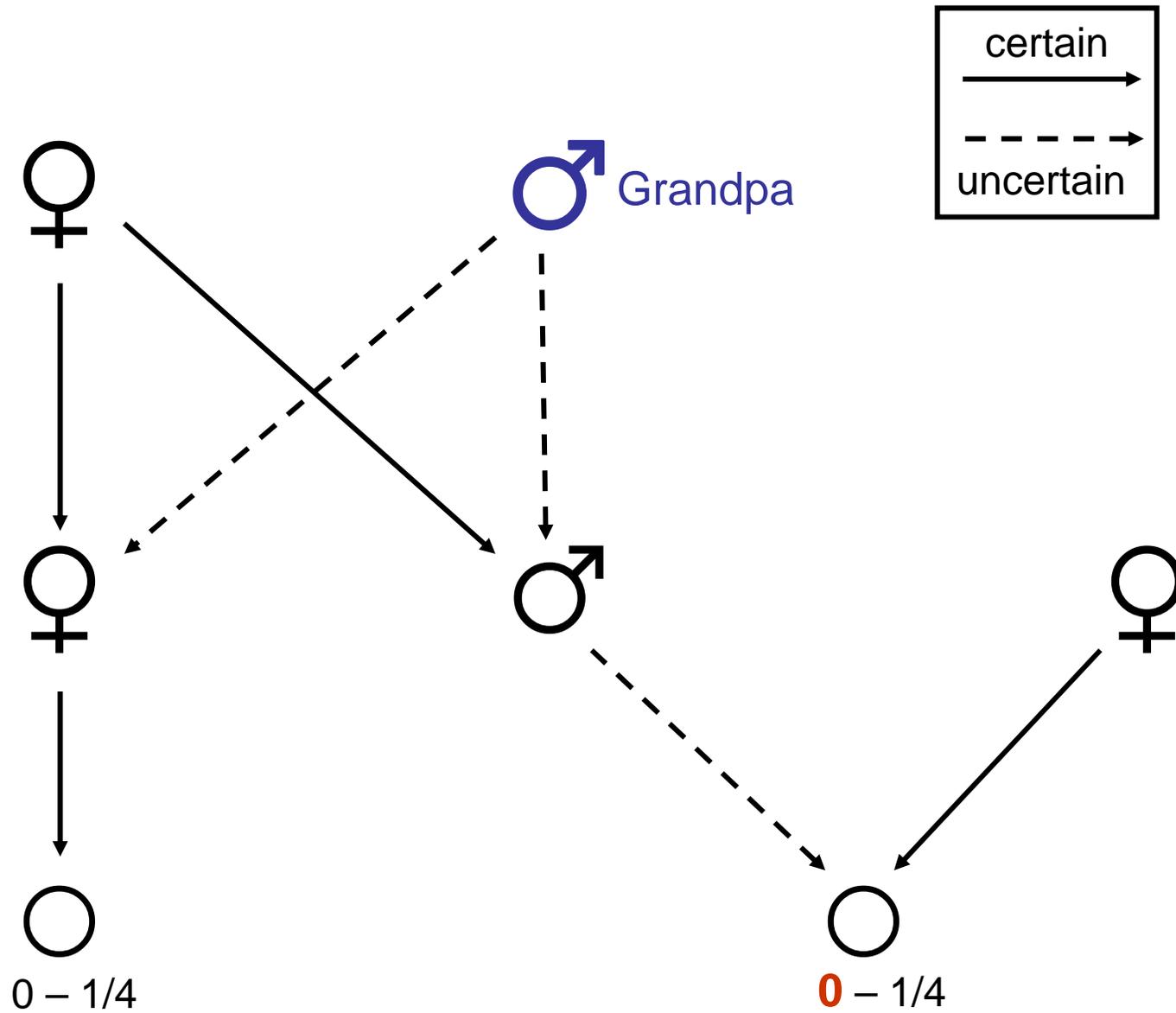
If $B_S/B_D < 1/p$, give wealth to daughters

Question: If $B_S/B_D = 1/p = 1$, which sex should parents favor?

Paternity Uncertainty



Paternity Uncertainty



Paternity Uncertainty

