- Use of LME lets us account for ancestral relationships between animals.

Because with fixed effect model:

$$y_{ijk} = \mu + \beta_j + u_i + e_{ijk}$$

u_i: breeding value as fixed effect, there is no possibility to account for ancestral relationships. Ancestral relationship means that for animals i and j which are related, the $\text{cov}(u_i, u_j) \neq 0$

Example: Animals 26 and 27 are full sibs

$$\Rightarrow \text{cov}(u_{26}, u_{27}) \neq 0$$

- $\text{cov}(x,y) = \sum_x \sum_y (x - E(x))(y - E(y)) f(y)$ discrete random variables

$$\text{cov}(x,y) = \iint (x - E(x))(y - E(y)) \cdot f(x) \cdot f(y)$$