□ Minimize R:

$$R = \bar{E}_u^2 + b^T P b \neq 2b^T G$$

$$\frac{\partial R}{\partial b} = 0 + 2b^T P \neq 2G^T = \emptyset$$

$$\Leftrightarrow 2Pb - 2G = \emptyset$$

$$Pb = G \quad ; \text{ because } P \text{ is}$$

a variance-covariance matrix it is positive-definite, i.e. its inverse exist

$$\Rightarrow \quad \underbrace{P^{-1} P}_{I} b = P^{-1} \cdot G$$

$$b = P^{-1} \cdot G$$

□ Summary: Selection Index theory provides a method to predict breeding values using all available information.

□ Problem: · Find appropriate population means to correct phenotypic observations
· How to find μ such that $y^* = (y - \mu)$ for all possible data scenarios

□ Requirement for μ: Based on model: $y = \mu + u + e$
compute average $\bar{y}$: $\bar{y} = \bar{\mu} + \bar{u} + \bar{e}$
because u and e are deviations, $\bar{u} = \bar{e} = \emptyset$
$\Rightarrow \bar{y} = \mu$