

History of Selection From Phenotypes to Economic Indexes

NBCEC Brown Bagger 2012

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Assumptions of Selection

- **Measurable**
 - **Qualitative**
 - **Quantitative**
- **Heritable**
 - **Is there a resemblance between parents and offspring for the trait of interest**

History of Selection

- **Appearance**

Appearance



People's Sexiest Man Alive 2010







History of Selection

- **Appearance**
- **Pedigree Information**
 - **Shorthorn 1846**
 - **Hereford 1880**
 - **Angus 1886**

History of Selection

- **Appearance**
- **Pedigree Information**
- **Data Collection**

Body Composition



Sushi
Rice



Meat
Potatoes

Drugs
Sex
Rock and Roll



Heritability

Trait

h^2

Reproduction

Low

Production

Moderate

Product

High

History of Selection

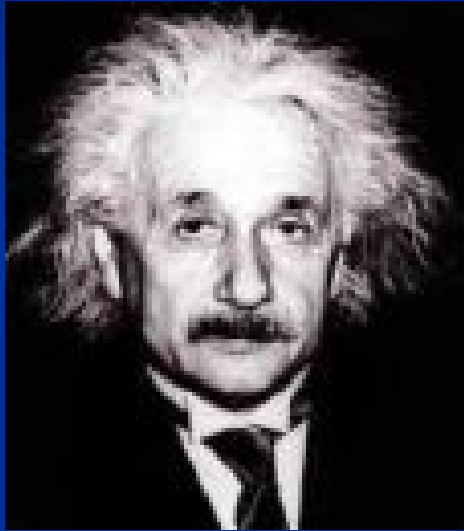
- **Appearance**
- **Pedigree Information**
- **Data Collection**
- **Ratios**

Ratios

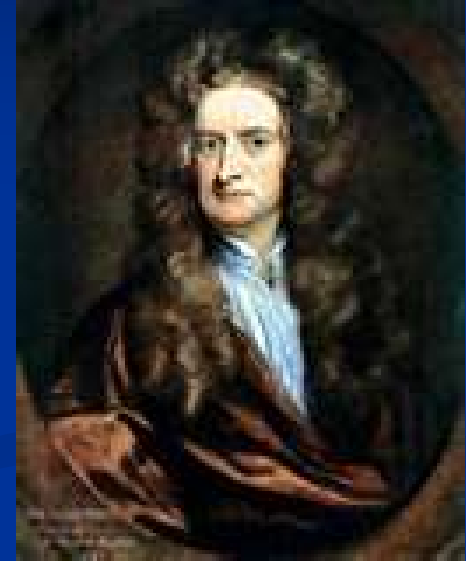
$$\frac{\text{Individual Measurement}}{\text{Contemporary Group Average}} \times 100$$

100 is average

Contemporary Group 1 Physics Test Score

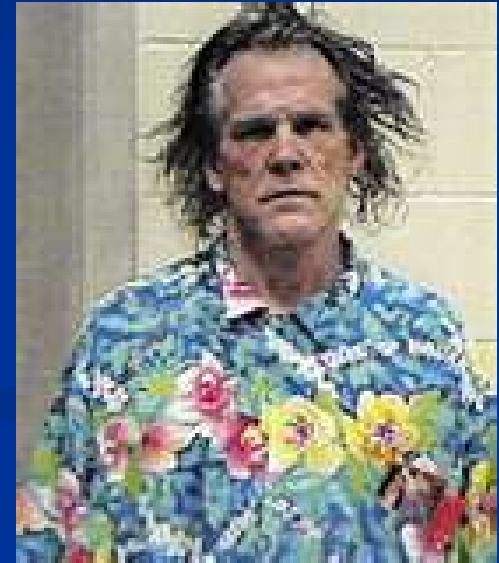
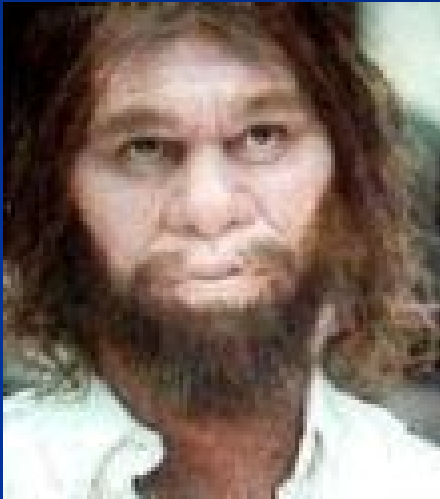


Ratio = 86



Contemporary Group 2

Physics Test Score



Ratio = 116

History of Selection

- **Appearance**
- **Pedigree Information**
- **Measurable Trait**
- **Ratios**
- **Breeding Values – C.R. Henderson**
 - **Pedigree and Phenotype**
 - **Development of EPDs**

EPDs

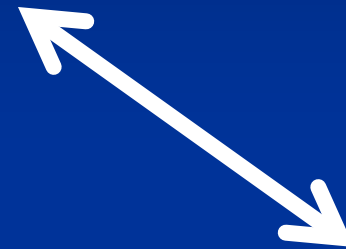
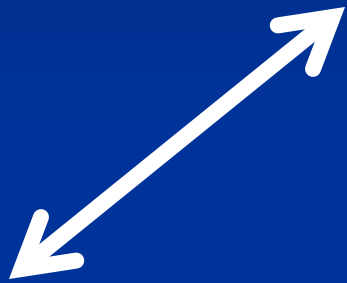
- **A prediction of the genetics a bull will pass on to his calves, when compared to other bulls within the breed**
- **Take into account the actual measurement on the bull, all ancestral measurements and environment**
- **Not a perfect science, so use as risk management tool**

Connectedness

CG 1

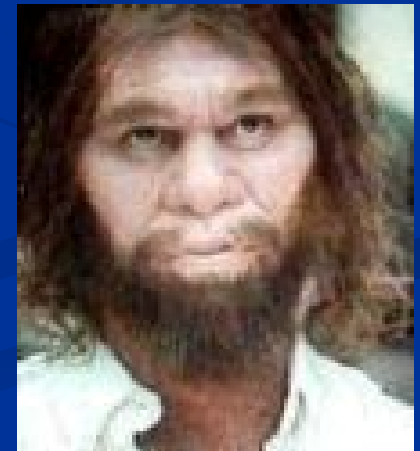
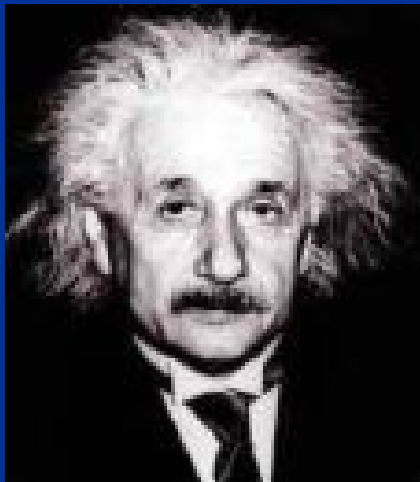


CG 2



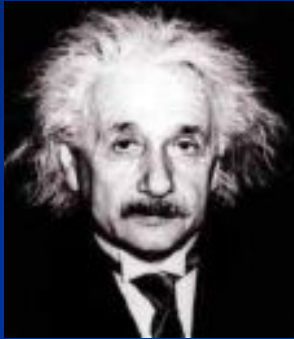
CG 1

CG 2



Expected Progeny Differences

Physics Score EPDs



25 Points

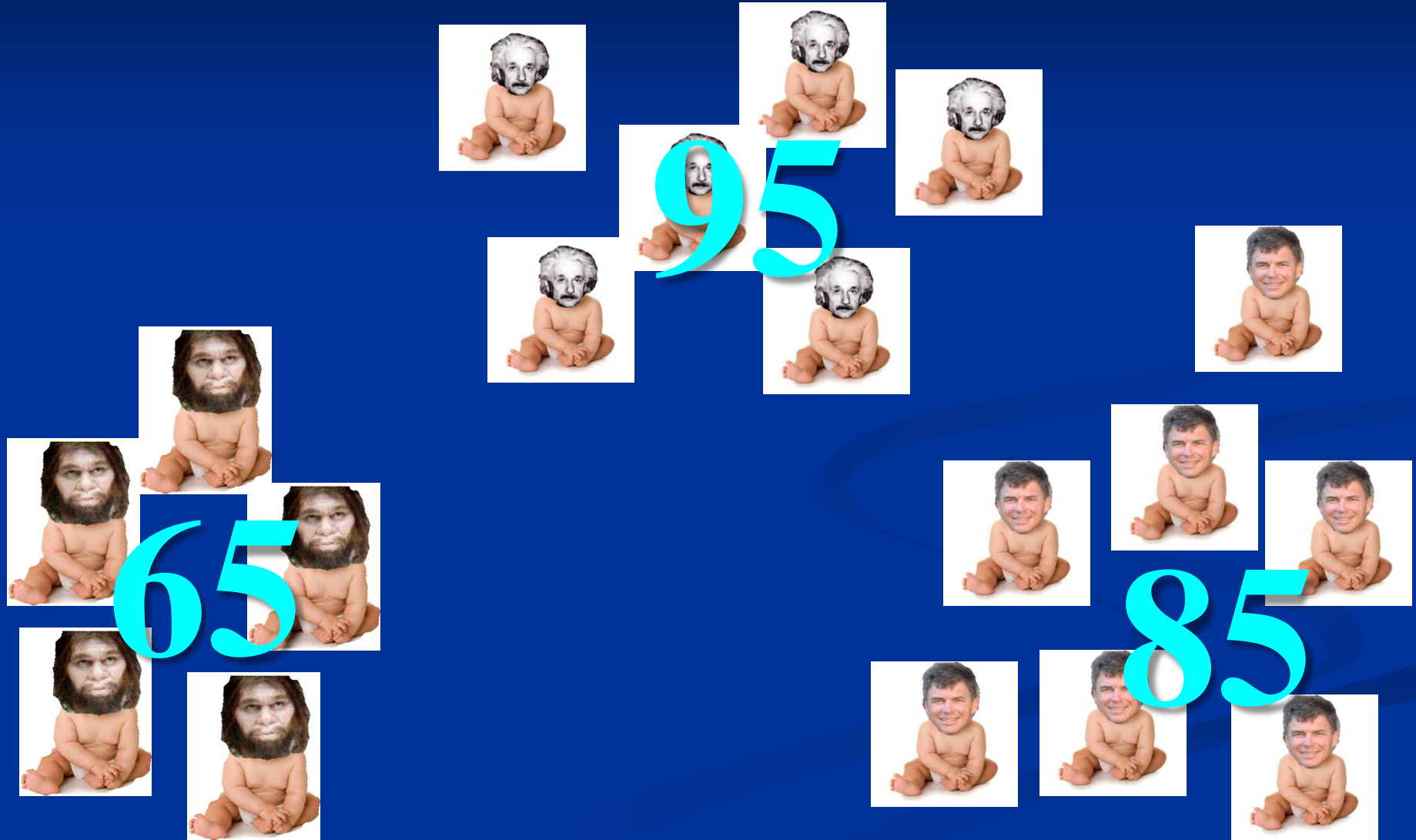


15 Points

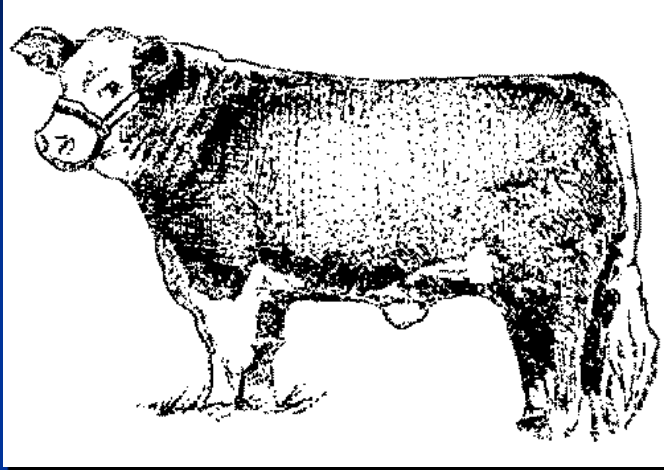


-5 Points

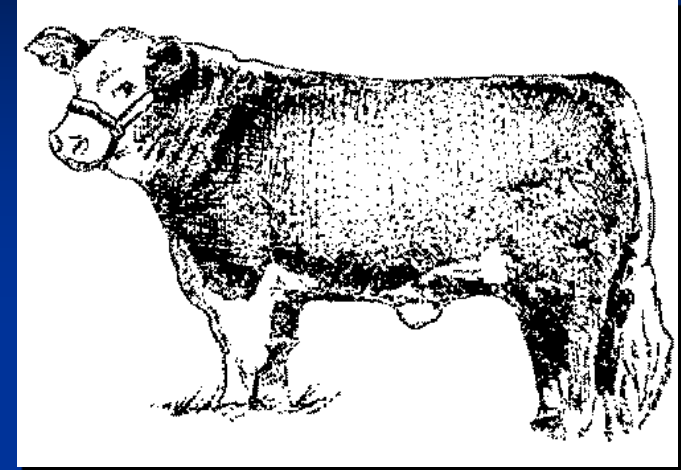
Expected Progeny Differences



EPD

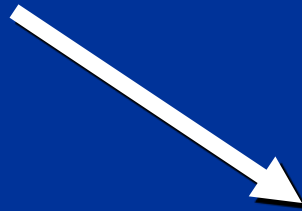


+35 lbs



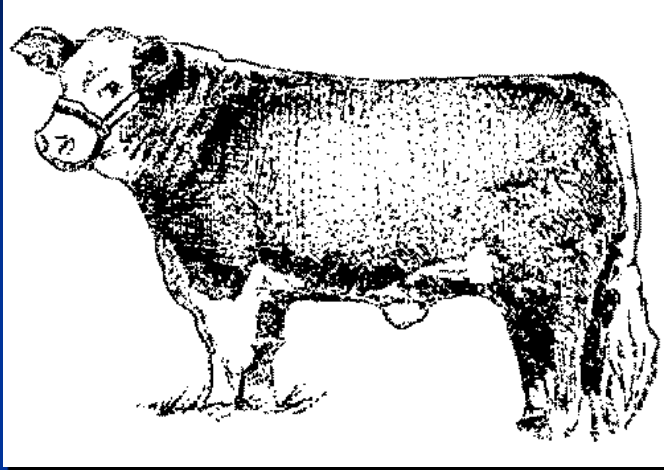
+20 lbs

Direct

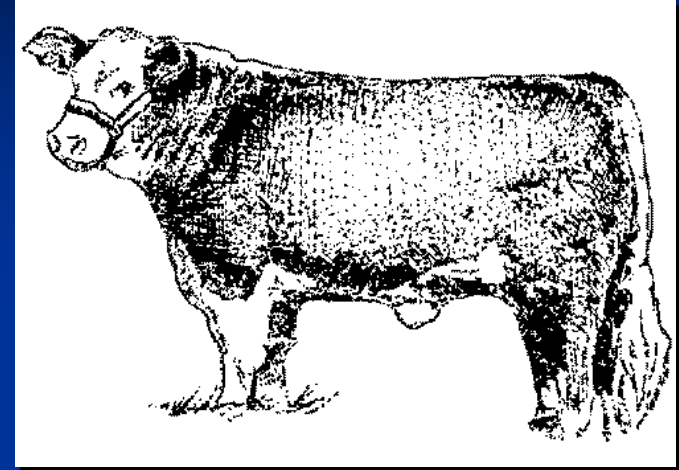


Expect the average difference in offspring to be 15 pounds.

EPD

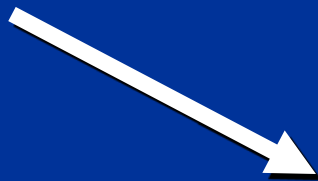


+25 lbs



+15 lbs

Maternal



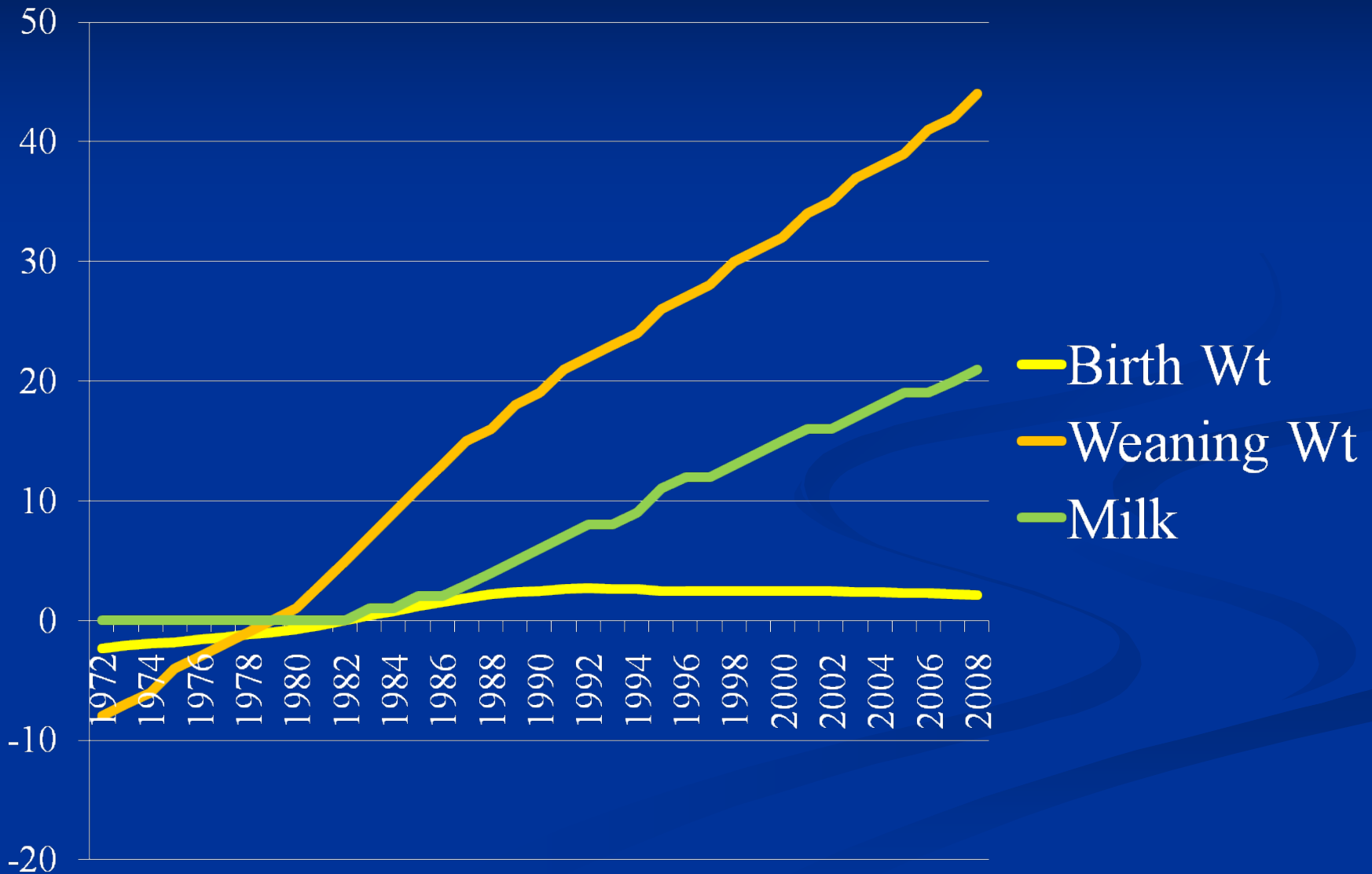
Expect the average difference in offspring of the sires daughters to be 10 pounds.

Has Selection Worked?

■ Genetic Trends

- All breeds show drastic changes in genetic merit of most traits.
- Indicate that simultaneous selection for antagonistic traits is possible.

Angus Genetic Trends



Genomics (in the beginning)



Physics Score MBV = 25 Points



Physics Score EPD = 15 Points

Genomics (now)



Physics Score EPD = 15 Points
Phenotype Acc .15



Physics Score EPD = 20 Points
Phenotype + Genomics Acc .30

Selection Index

- **Allows comparison on single value**
- **Weights traits according to economic importance**
- **Selection index**

$$= a_1\text{EPD}_1 + a_2\text{EPD}_2 + \dots + a_k\text{EPD}_k$$

Male Mate Selection Index

$$\begin{aligned} \$MM &= 4(\text{App EPD}) - 2(\text{Comp EPD}) \\ &+ 1(\text{Int EPD}) + 3(\text{Pers EPD}) \end{aligned}$$

$$\begin{aligned} \$MM &= 4(\text{App EPD}) + 1(\text{Int EPD}) \\ &+ 3(\text{Pers EPD}) \end{aligned}$$

Selection Index

Index Values



35



45



15

Summary

I Win !