The purebred-crossbred correlation in broilers and layers: a review

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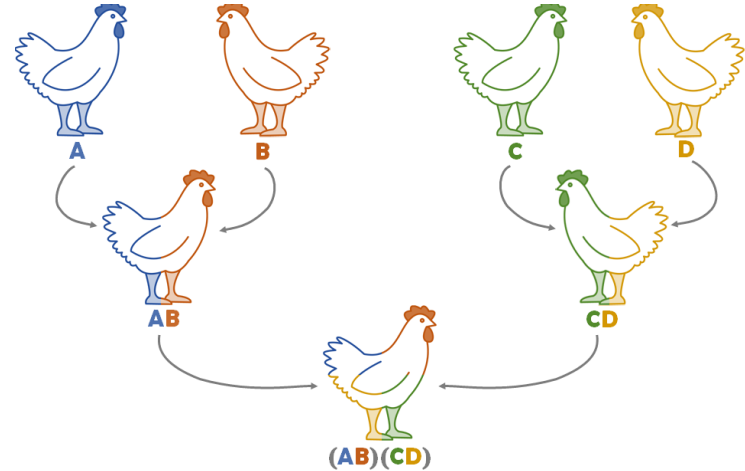UNIVERSITY & RESEARCH

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Acknowledgements

- Joas Bos

Why this review?

Purebred-crossbred correlation (r_{pc}) is an important parameter

- Selection on purebred or crossbred performance?
- Predict response to selection

The purebred-crossbred genetic correlation: r_{pc}

r_{pc} is a genetic correlation depending on:

- Differences in genetic background ($r_{GG(pc)}$)
    - Genotype by genotype interaction (GxG)
- Differences in environment ($r_{GE(pc)}$)
    - Genotype by environment interaction (GxE)
- Differences trait definitions ($r_{TD(pc)}$)

$$r_{pc} = r_{GG(pc)} \times r_{GE(pc)} \times r_{TD(pc)}$$

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Overview of studies used

- In total 14 studies with 128 r_{pc} estimates were used
  - 10 studies on layers
  - 4 studies on broilers

- Published since 1965
  - Most layer studies *before* 2000
 - Most broiler studies *after* 2000

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r$_{pc}$ values per trait (category)
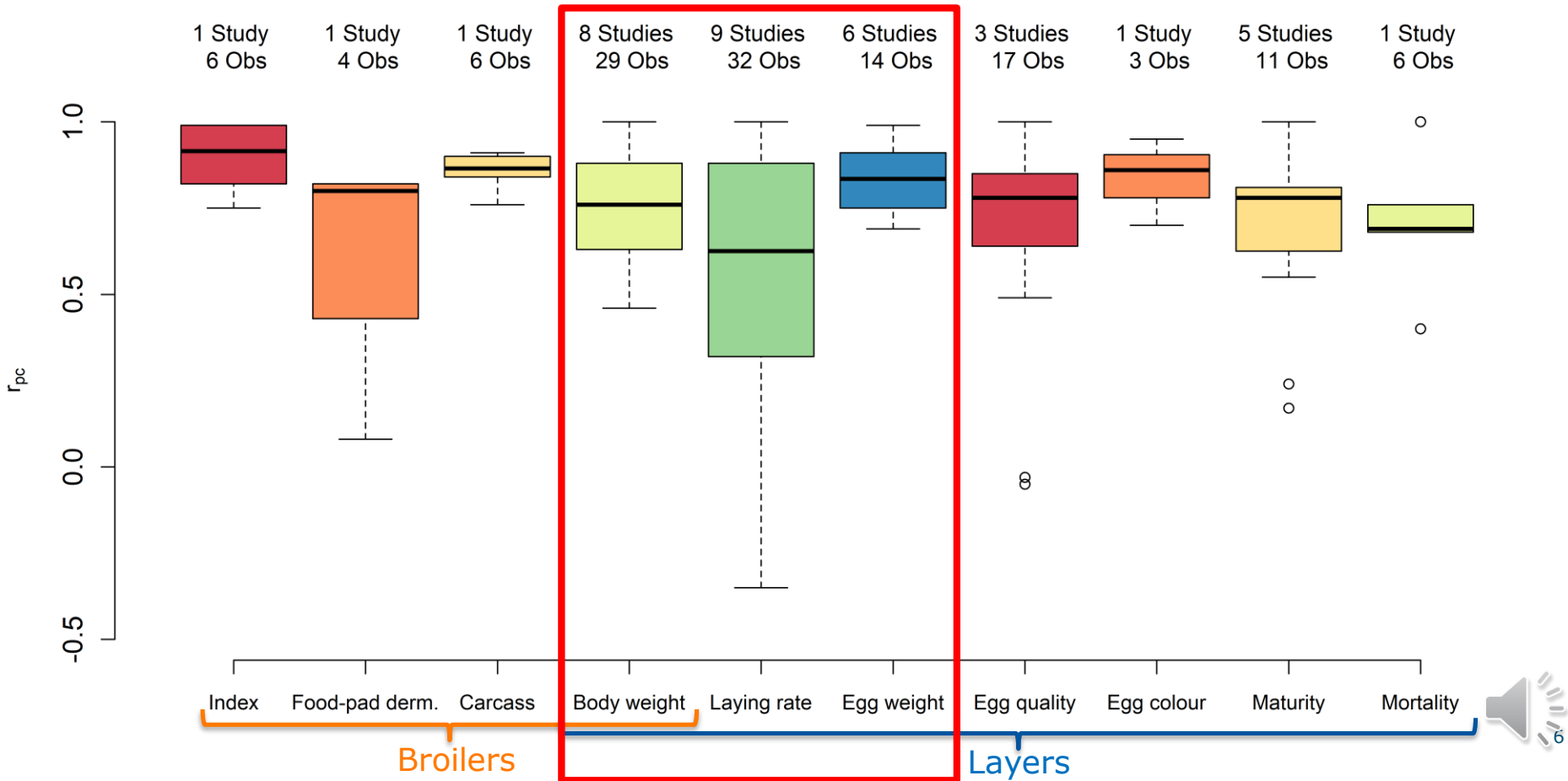
GxE and GxG included in experimental designs?

Including	Animals[1]	Environment	Number of studies	
			Broilers	*Layers*
GxE only	PB	Different	3	-
GxG only	PB & CB	Same	1	5
Both	PB & CB	Different	-	5

[1]PB = purebred; CB = crossbred

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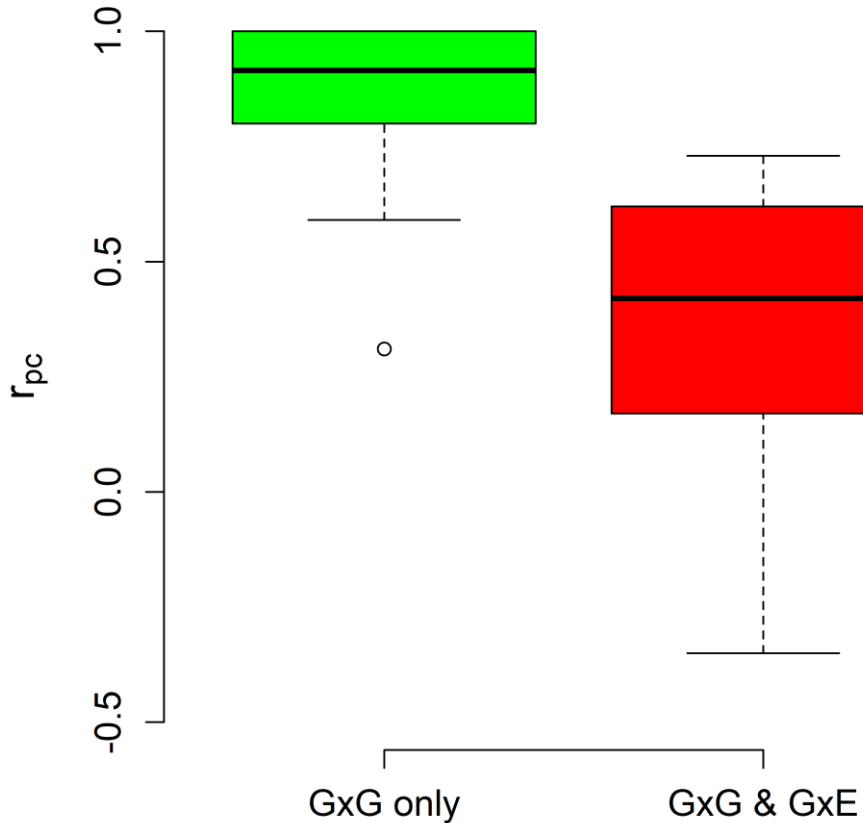UNIVERSITY & RESEARCH

GxE – egg weight (layers; 6 studies)
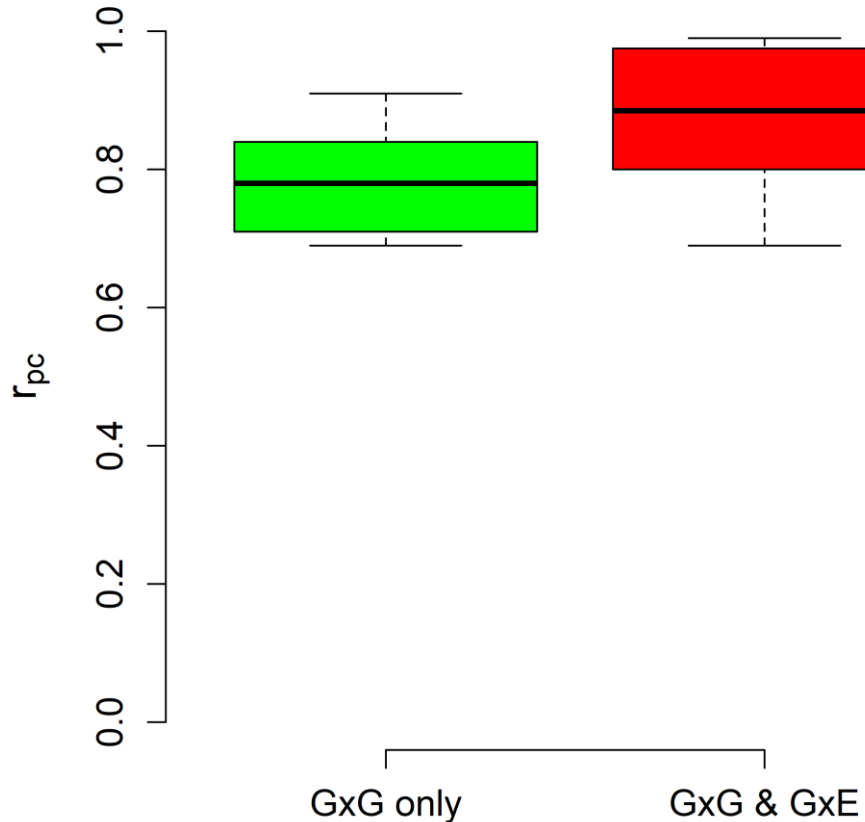
- Overall high r_{pc} values

- Not affected by GxE (?)

GxE – laying rate (layers; 9 studies)

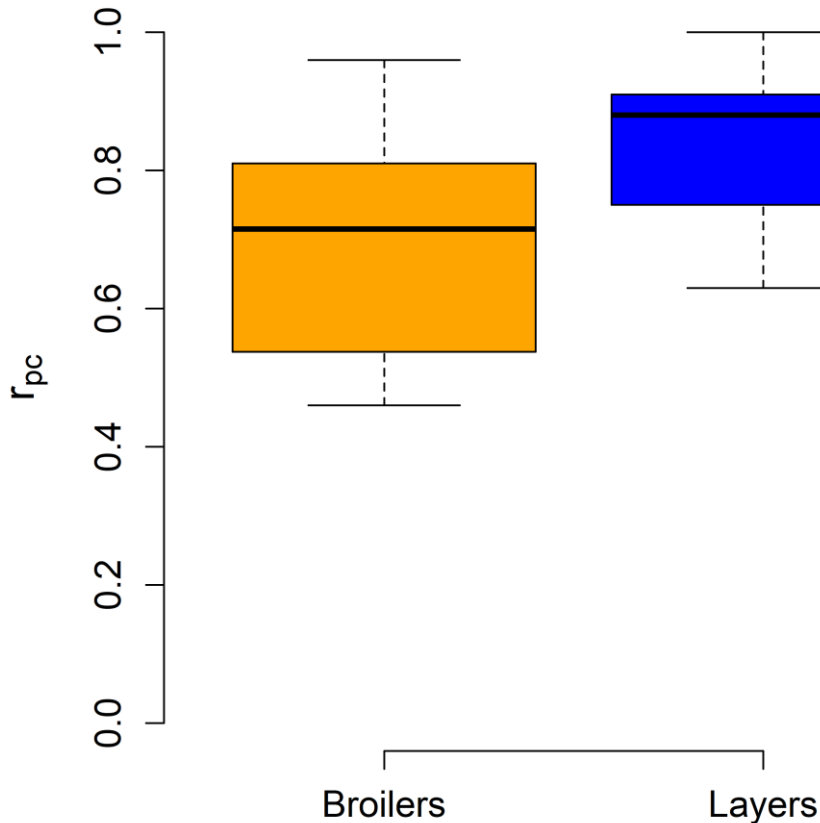- Very high r_{pc} without GxE
  - Impact GxG limited

- Relatively low r_{pc} with GxE

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Broilers *versus* layers: Body weight (8 studies)

Effectively different traits:

- Broilers: 5-6 weeks
  - With GxE: lower r_{pc} values
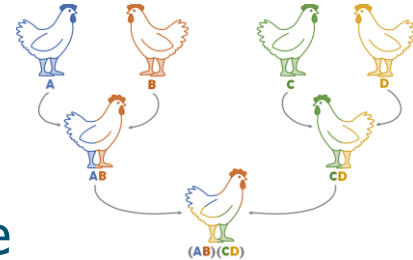- Layers: ~18 weeks
  - With GxE: r_{pc} still high

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Implications

- Crossbreds used in 11 studies
    - 2-way in all 10 layer studies
    - 3-way in 1 broiler study

- Only 5 out of the 14 studies included *both* GxE & GxG

- In practice:
    - 4-way crossbreds; always GxE & GxG
    - r_{pc} values may be lower than reported here

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Conclusions

Using crossbred performance in breeding program:

- Especially relevant ($r_{pc} \leq 0.7$):
    - Layers: laying rate, egg quality, maturity, mortality
    - Broilers: foot pad dermatitis, body weight

- Limited benefit ($r_{pc} \geq 0.8$):
    - Layers: egg weight, egg colour, body weight
    - Broilers: carcass traits

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