

The evolutionary potential of plastic responses: a meta-analysis

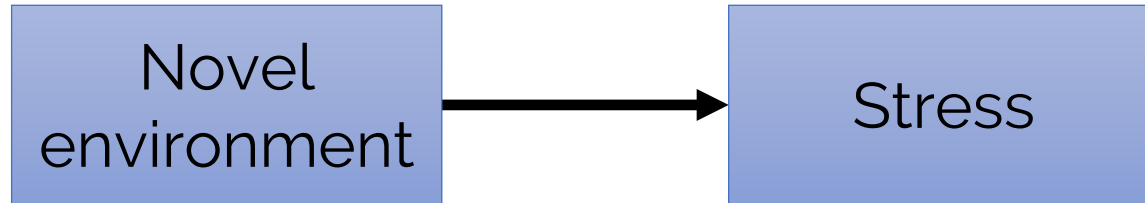
Reinder Radersma¹, Dan Noble², Tobias Uller¹

¹Lund University, SE

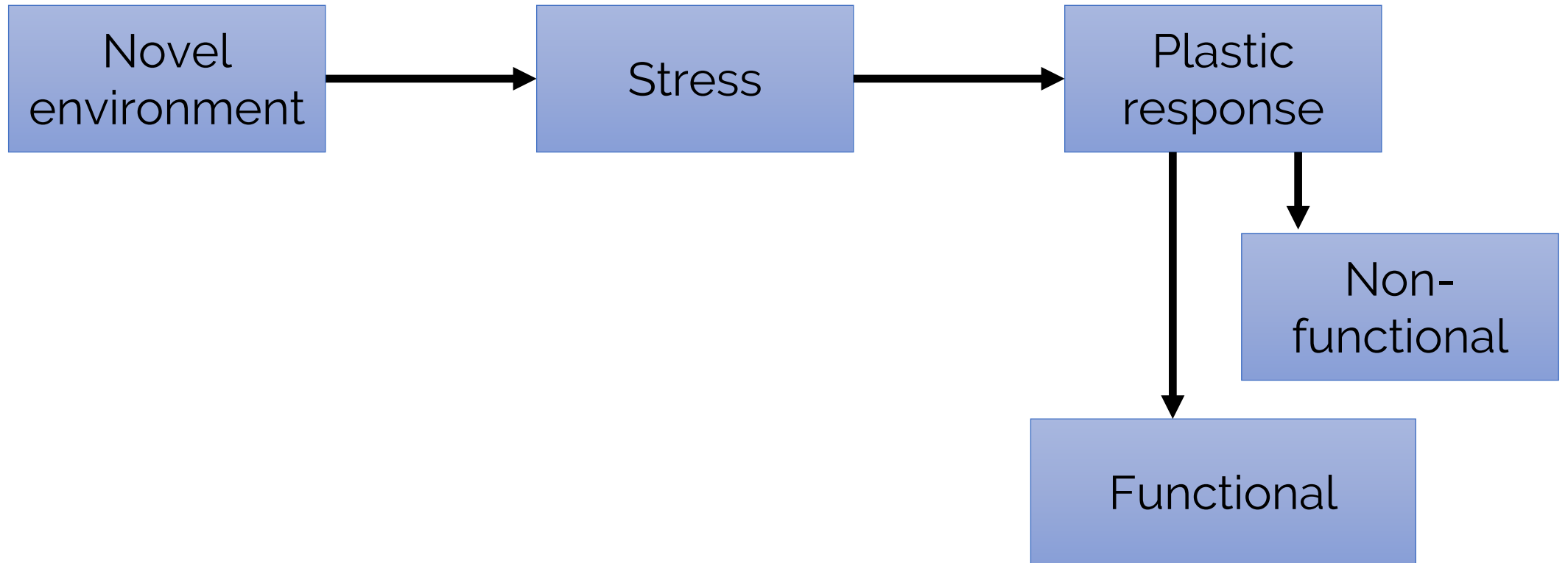
²The University of New South Wales, AU



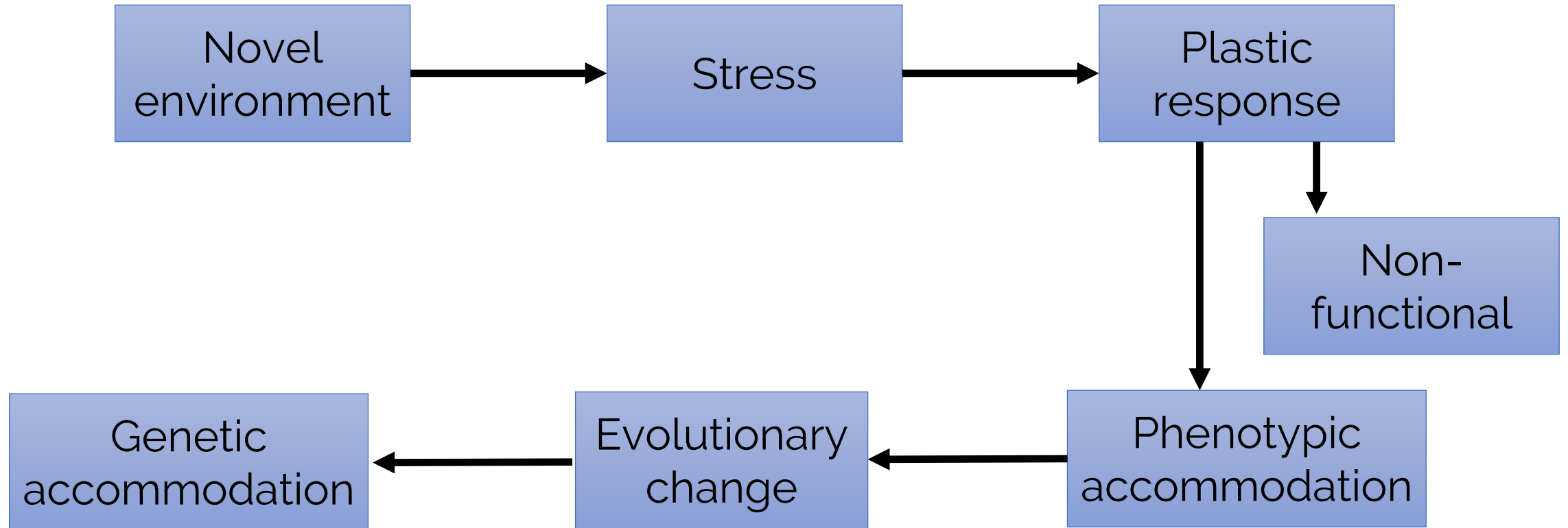
Plasticity first hypothesis



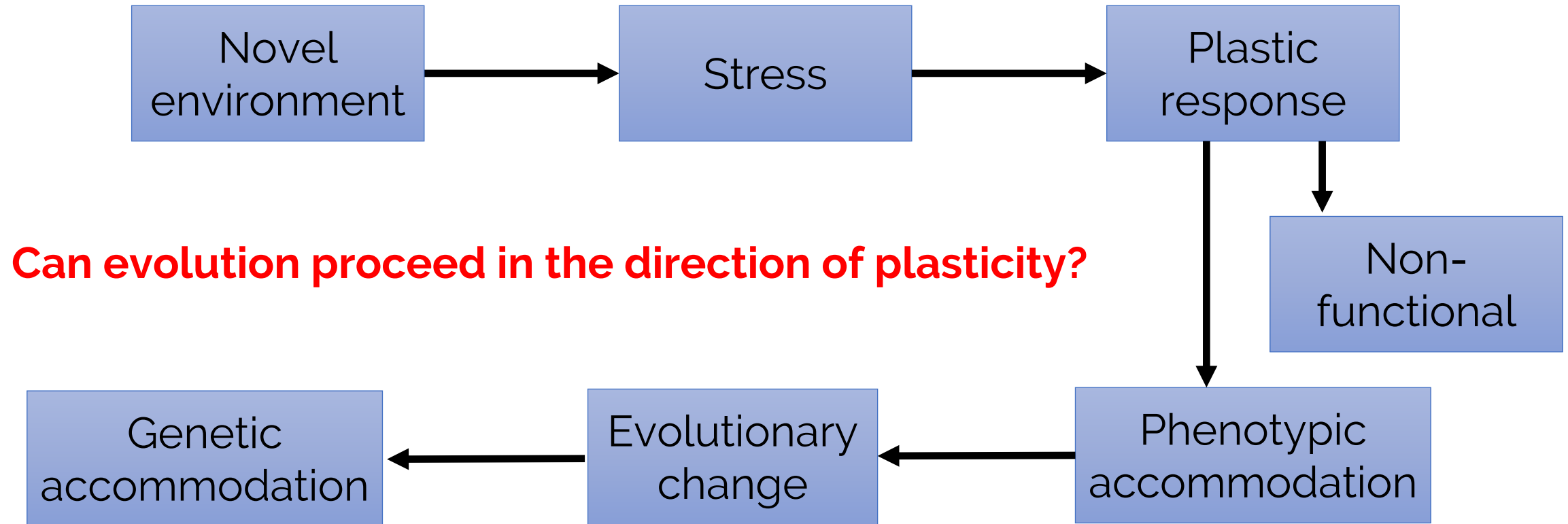
Plasticity first hypothesis



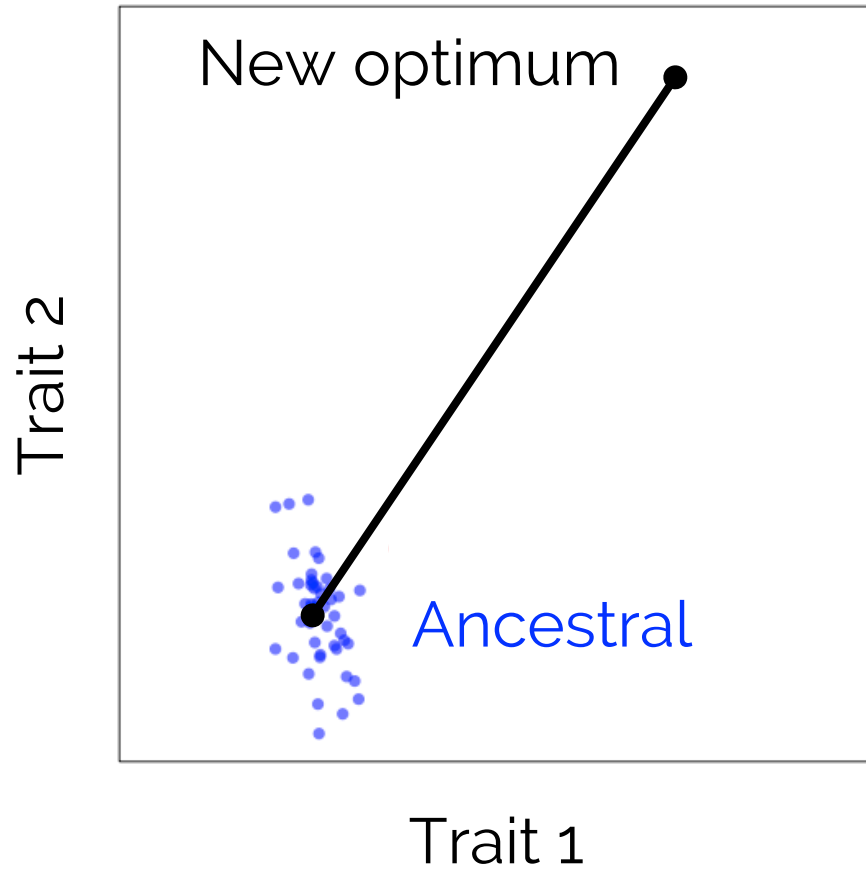
Plasticity first hypothesis



Plasticity first hypothesis

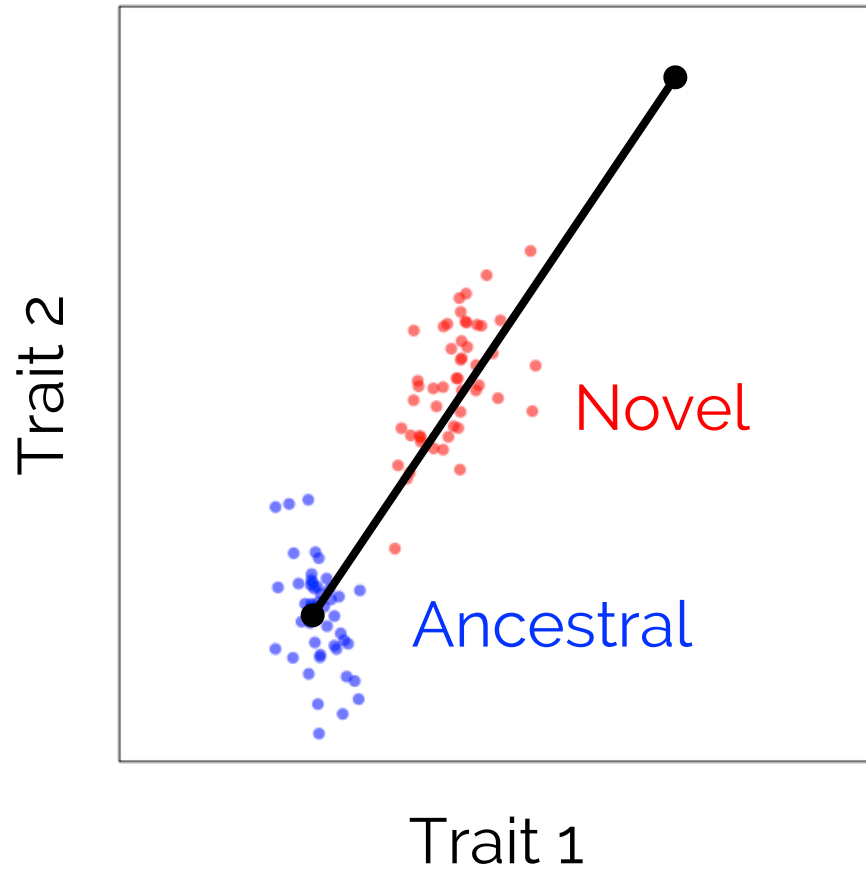


Quantitative genetics perspective



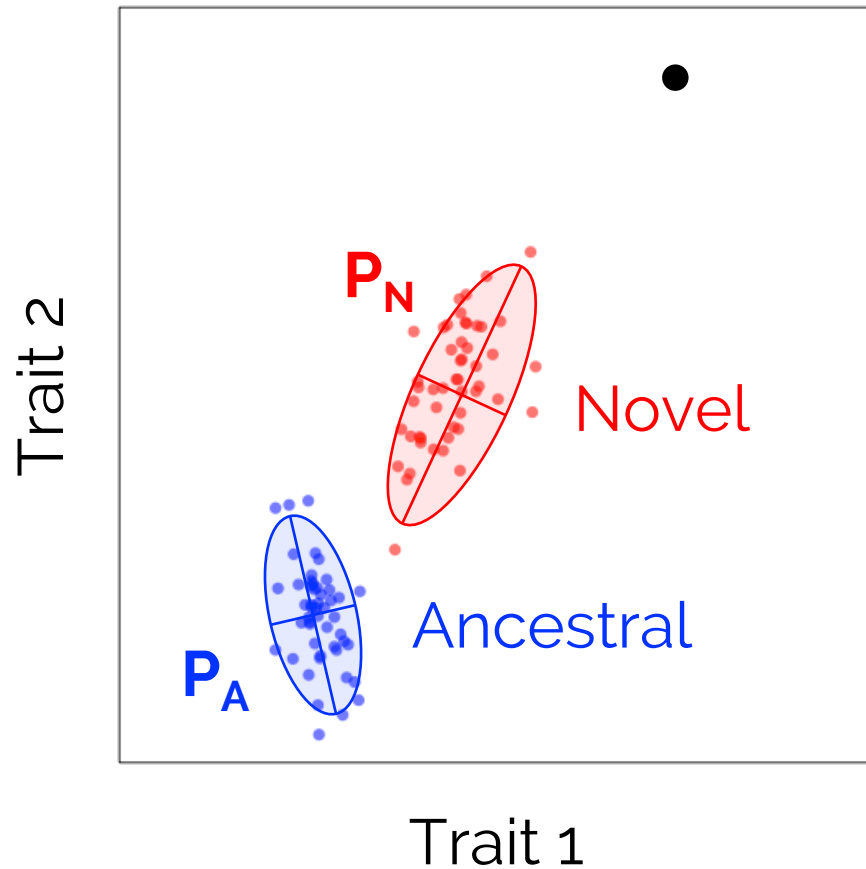
- Stressful environment

Quantitative genetics perspective



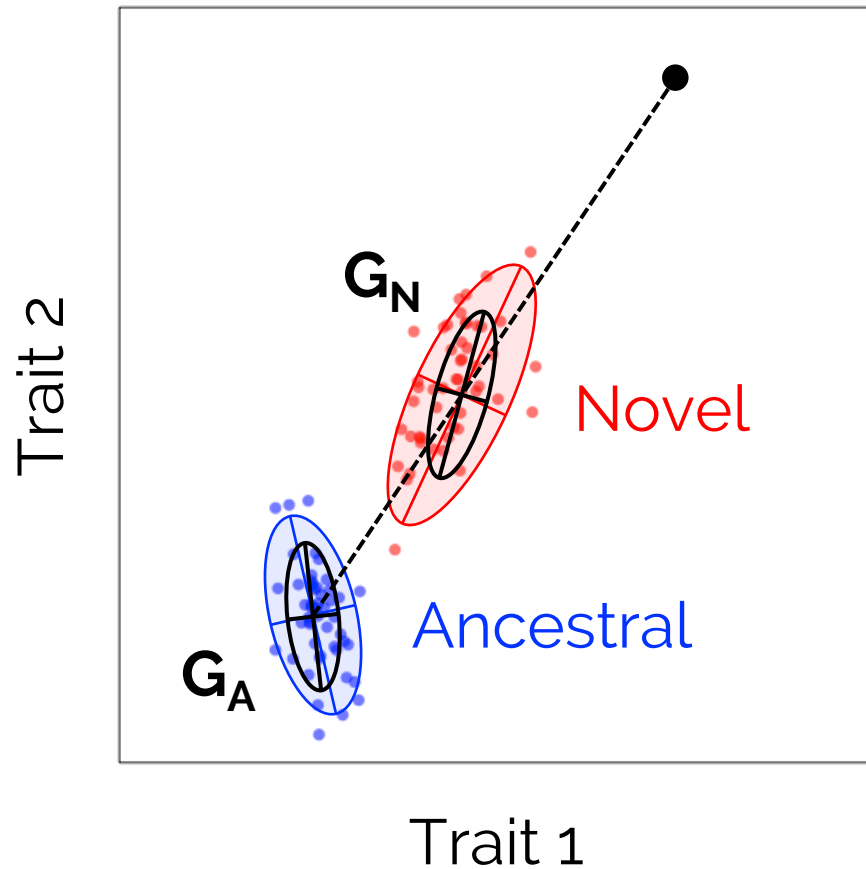
- Stressful environment
- Plastic response

Quantitative genetics perspective



- Stressful environment
- Plastic response
- Leads to evolutionary change in the direction of plasticity?

Quantitative genetics perspective

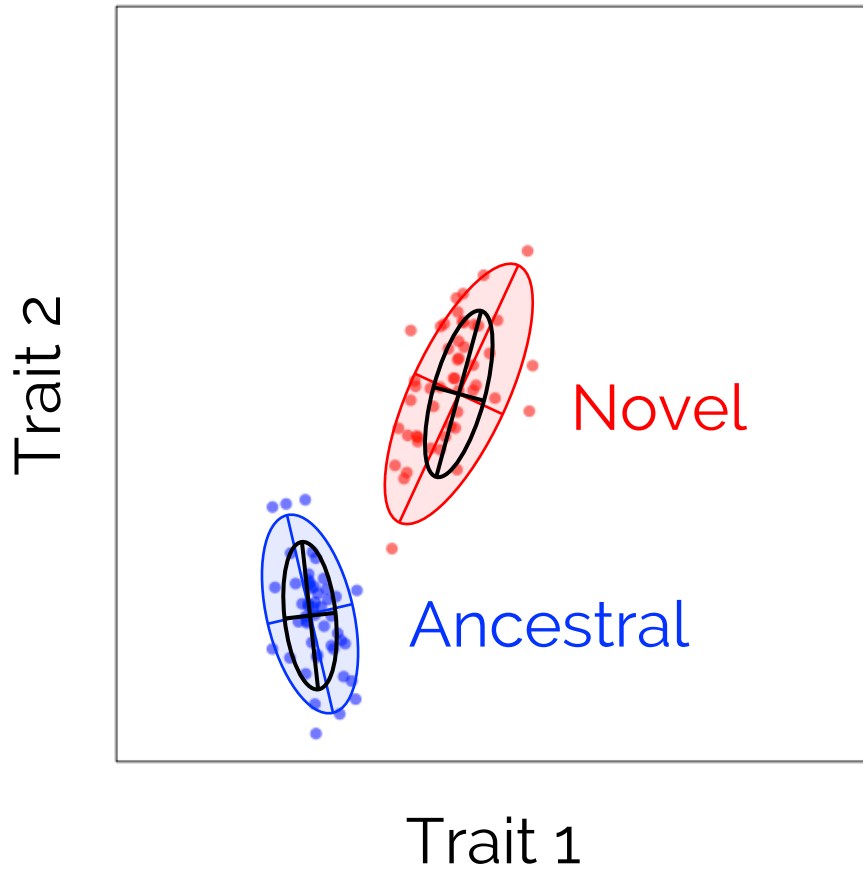


- Stressful environment
- Plastic response
- Leads to evolutionary change in the direction of plasticity?

Quantitative genetics framework

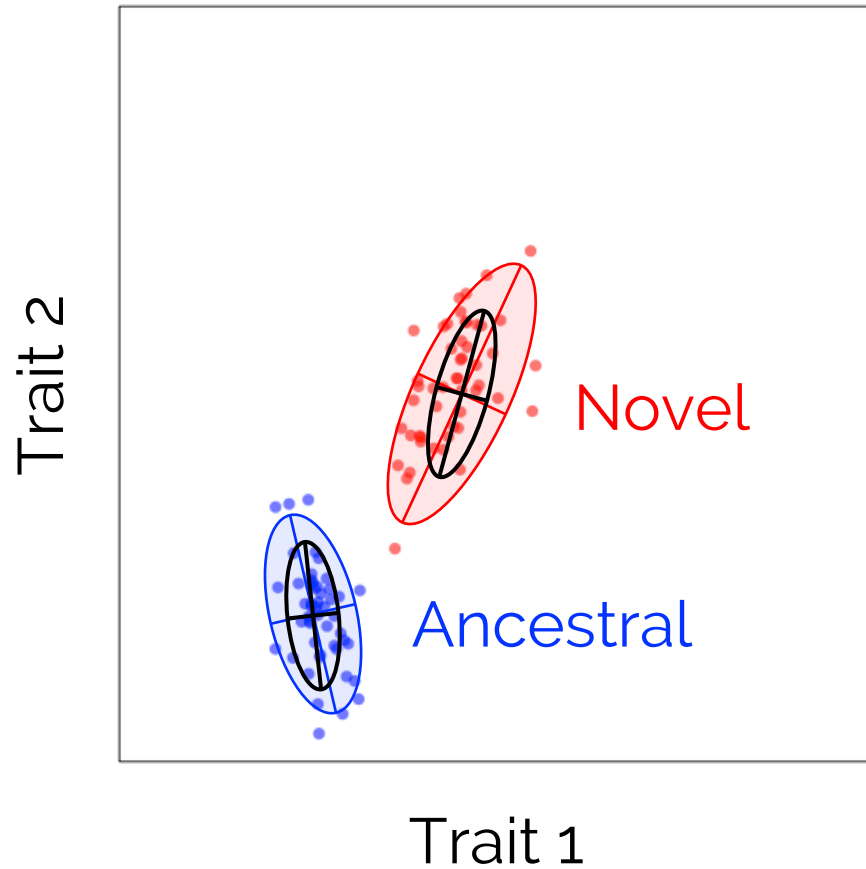
- Heritable variation?
- Does **G**-matrix align?

Which studies do we need?



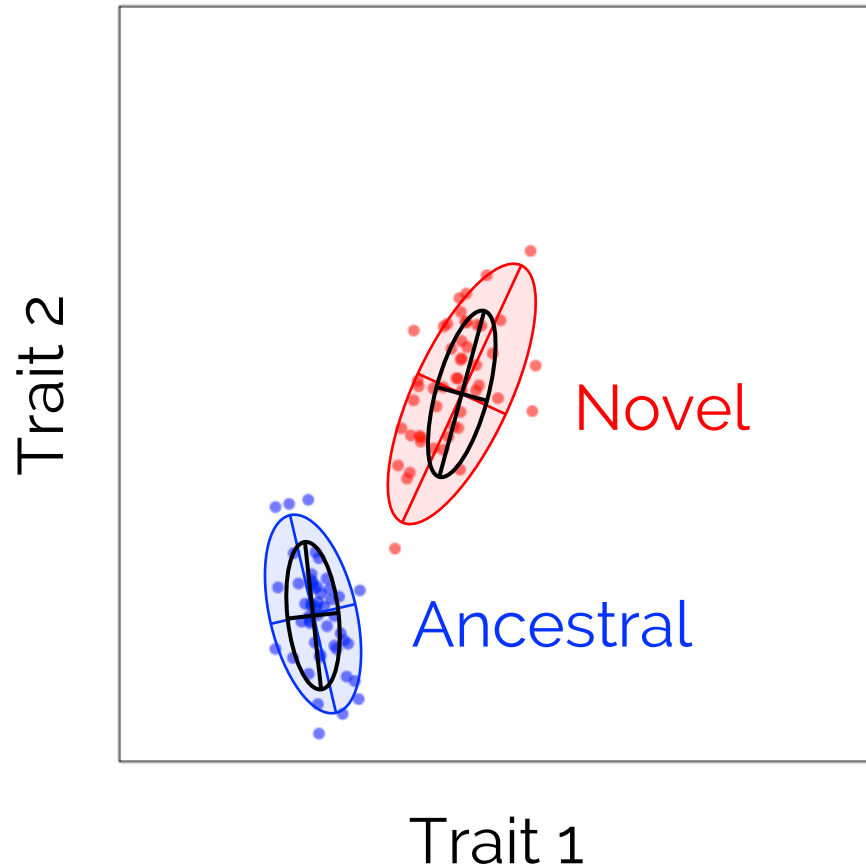
- Experimental studies
- No selection

Which studies do we need?



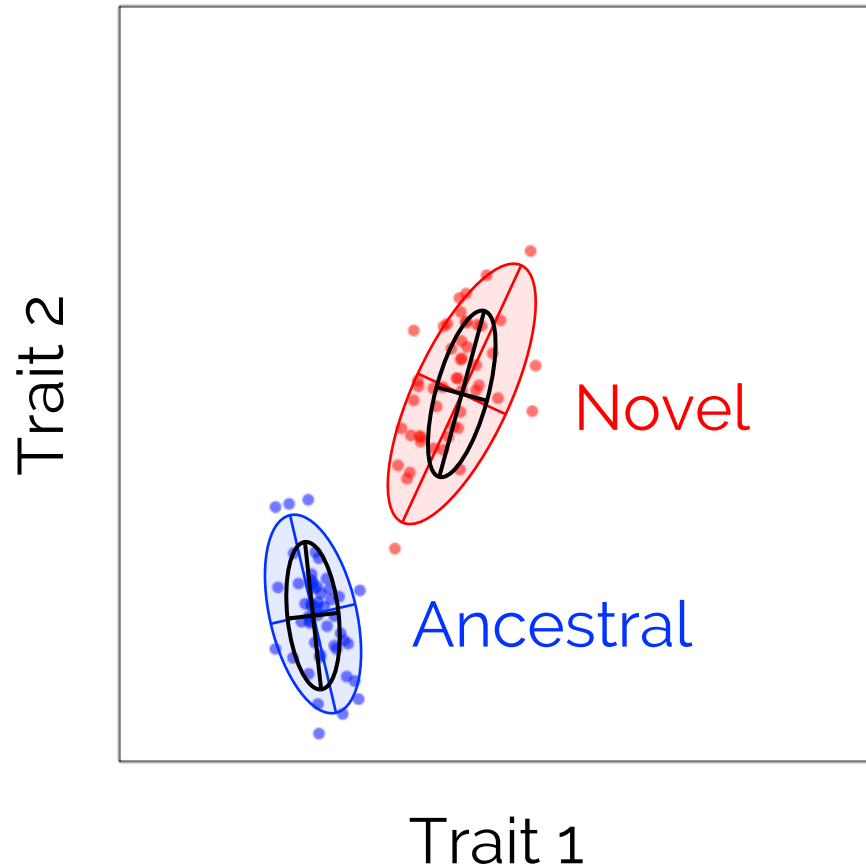
- Experimental studies
- No selection
- ≥ 2 environments
 - *e.g. Diet*
 - *e.g. Temperature*
 - *e.g. Location*

Which studies do we need?



- Experimental studies
- No selection
- ≥ 2 environments
 - *e.g. Diet*
 - *e.g. Temperature*
 - *e.g. Location*
- ≥ 2 traits
 - *e.g. Morphological*

Which studies do we need?



- Experimental studies
- No selection
- ≥ 2 environments
 - *e.g. Diet*
 - *e.g. Temperature*
 - *e.g. Location*
- ≥ 2 traits
 - *e.g. Morphological*
- Estimates for **P** and **G** matrices

Data collection

- Literature searches
 - Wood & Brodie 2015
 - Rowsinski & Rogell 2017
- 21 studies
- Mainly plants and invertebrates
- 2-4 environments
- 2-11 traits

ORIGINAL ARTICLE

doi:10.1111/evo.12795



Environmental effects on the structure of the G-matrix

Corlett W. Wood^{1,2} and Edmund D. Brodie III¹

¹Mountain Lake Biological Station, and Department of Biology, University of Virginia, Charlottesville, Virginia 22904

²E-mail: corlett.wood@utoronto.ca

ORIGINAL ARTICLE

doi:10.1111/evo.13201



Environmental stress correlates with increases in both genetic and residual variances: A meta-analysis of animal studies

Piotr K. Rowiński^{1,2} and Björn Rogell^{1,3}

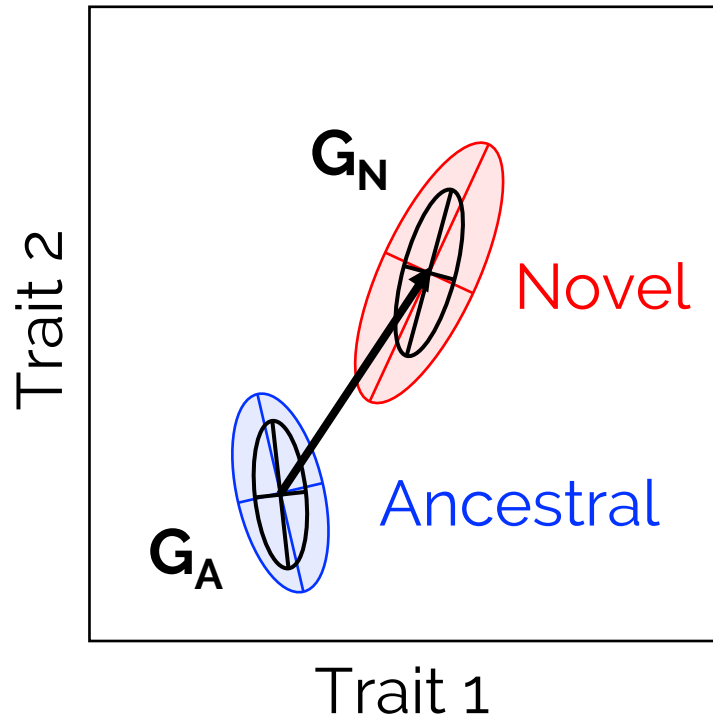
¹Department of Zoology, Stockholm University, Svante Arrhenius väg 18B, 106 91 Stockholm, Sweden

²E-mail: Piotr.Rowinski@zoologi.su.se

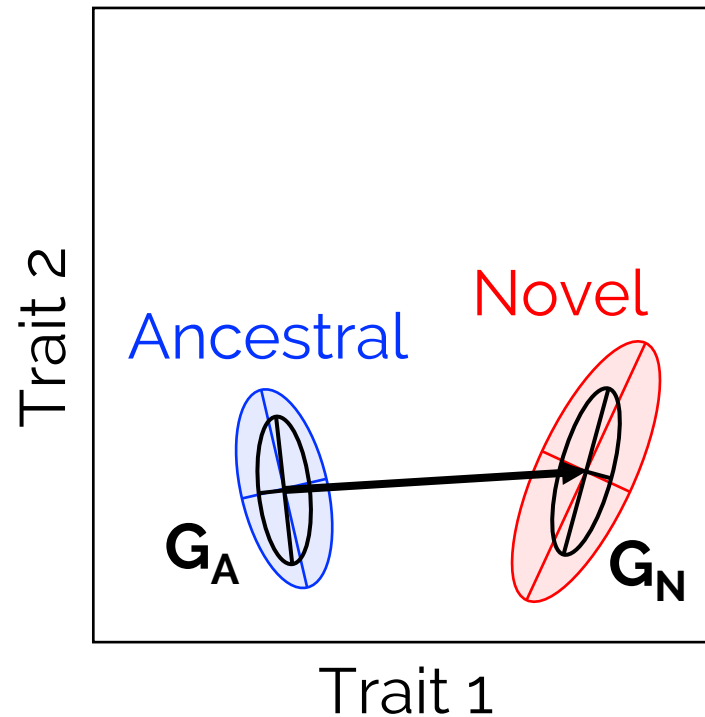
³E-mail: Bjorn.Rogell@zoologi.su.se

Do genetic variation and plastic response align?

High evolutionary potential
in the direction of plasticity

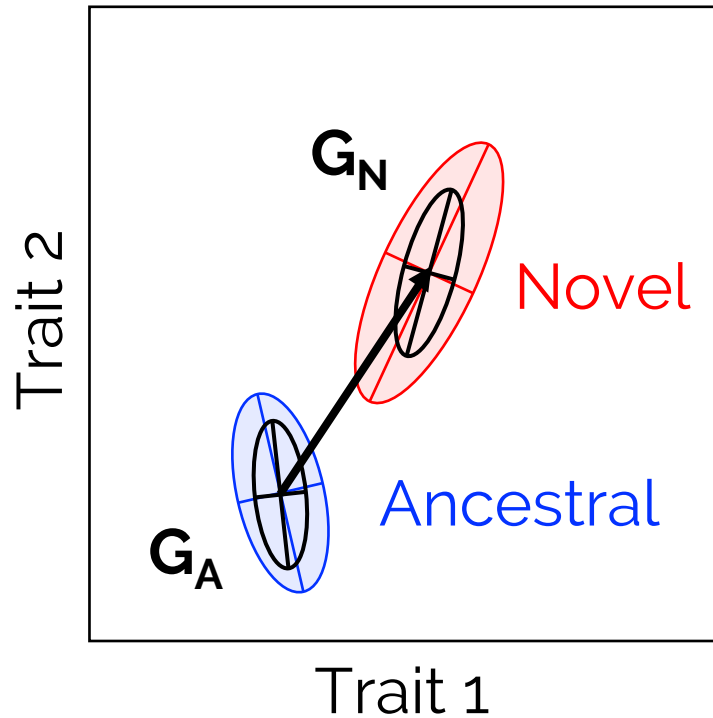


Low evolutionary potential
in the direction of plasticity

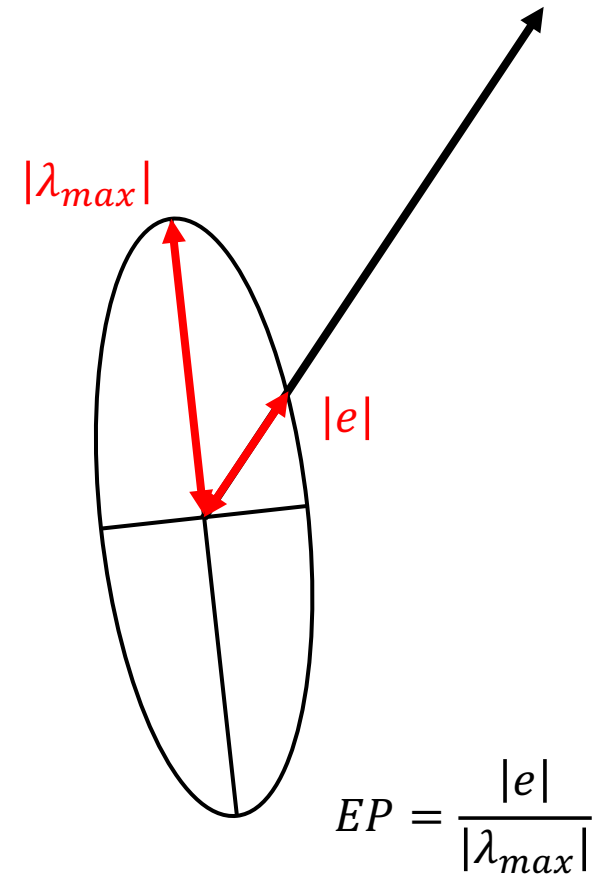
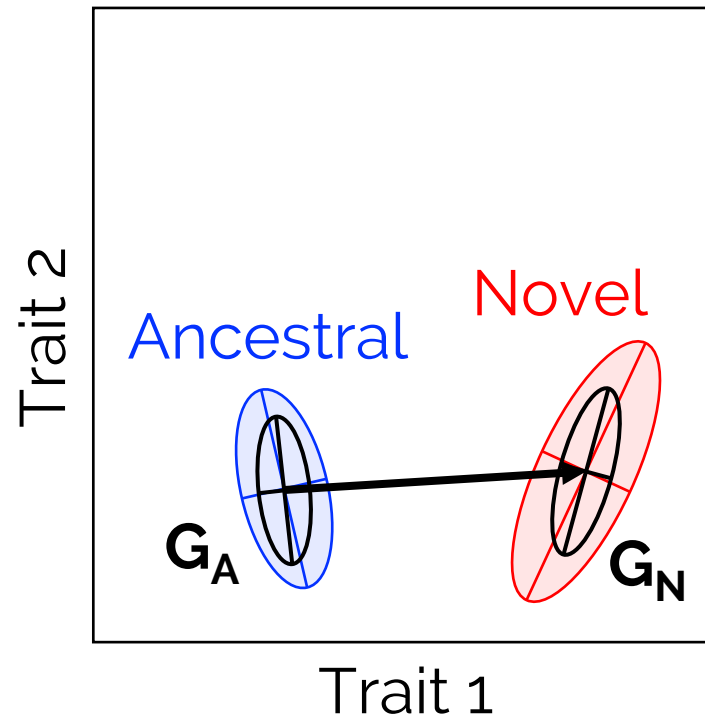


Do genetic variation and plastic response align?

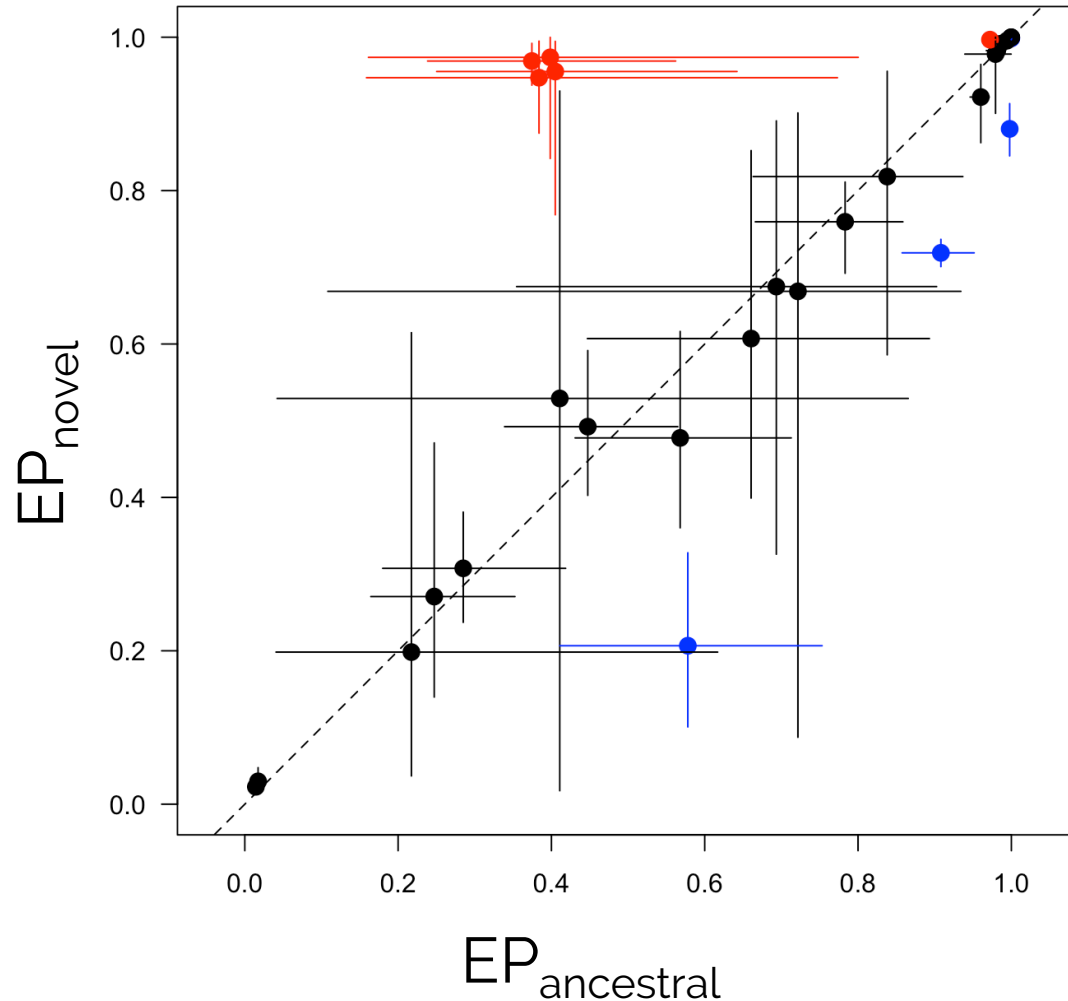
High evolutionary potential
in the direction of plasticity



Low evolutionary potential
in the direction of plasticity

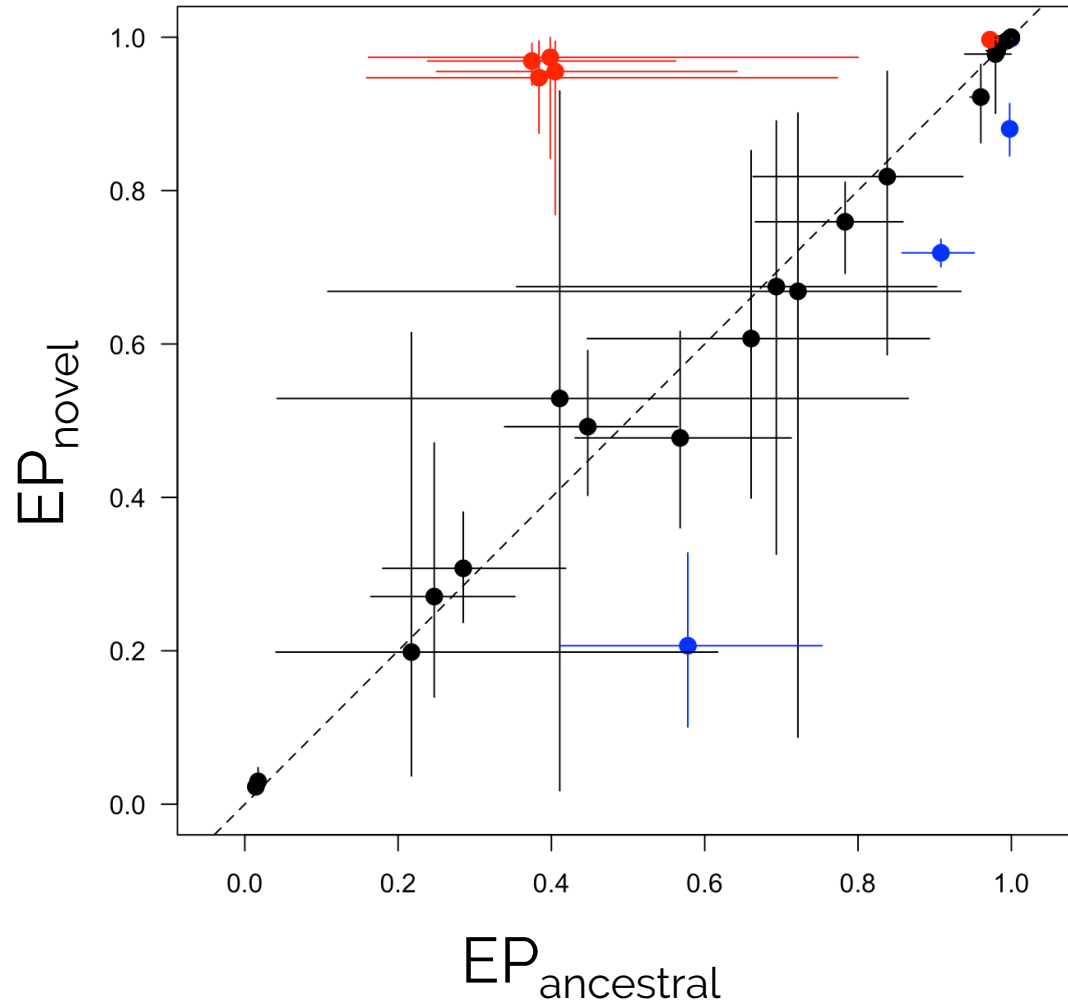


Do genetic variation and plastic response align?

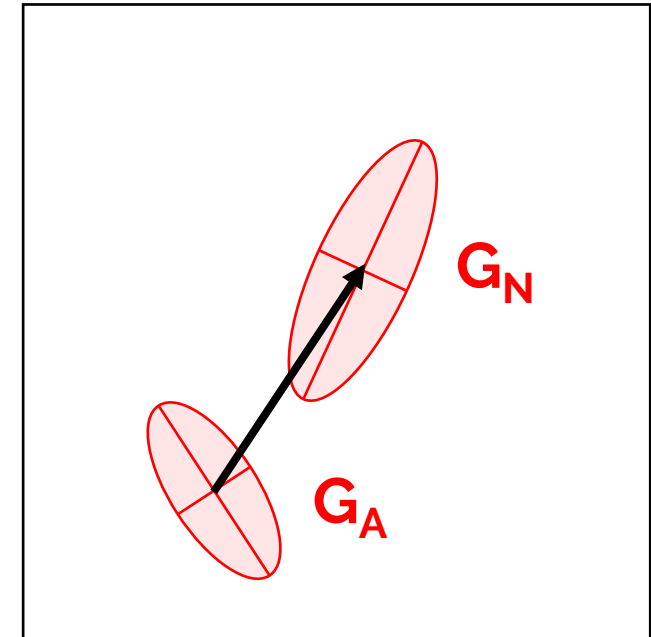


- Substantial variation in the quantitative genetic variation along the dimension of plasticity
- No change in alignment between plasticity vector and **G** matrix

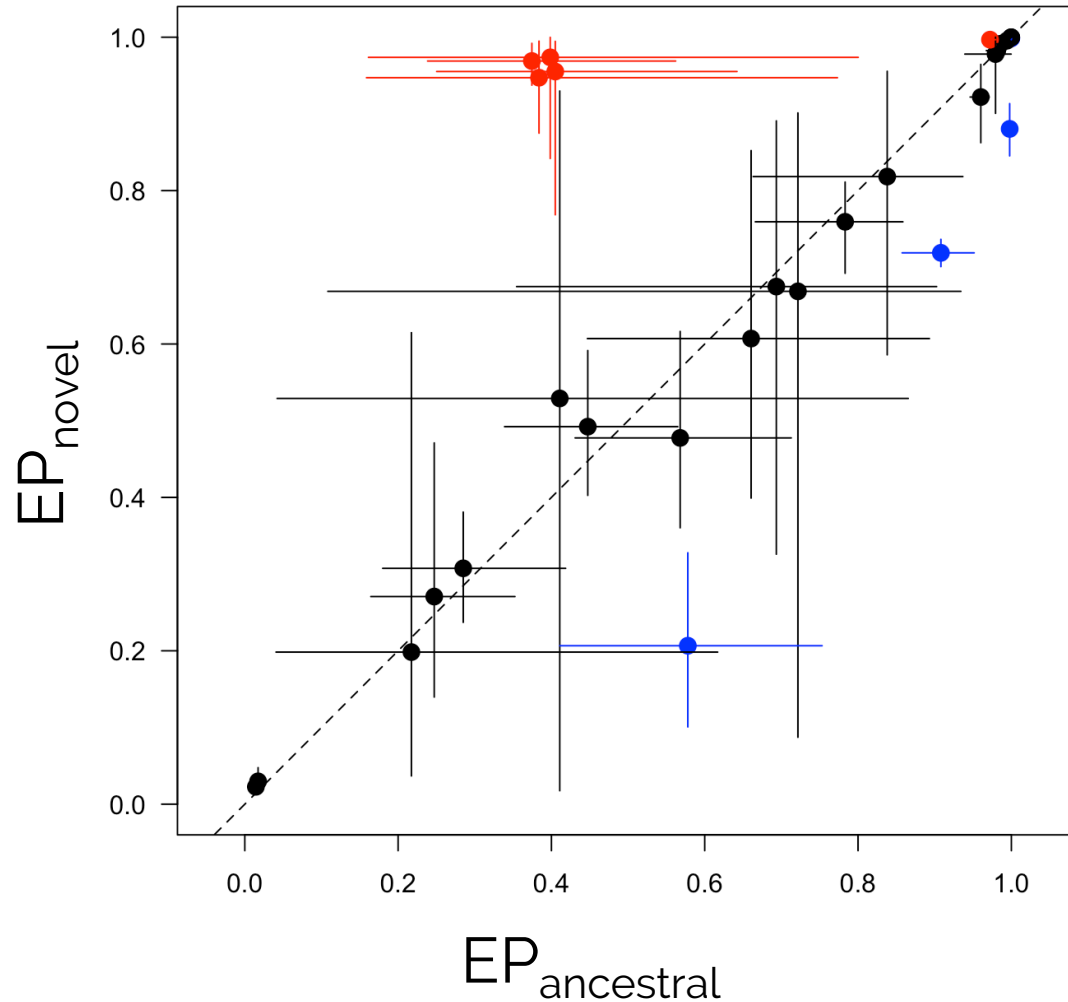
Do genetic variation and plastic response align?



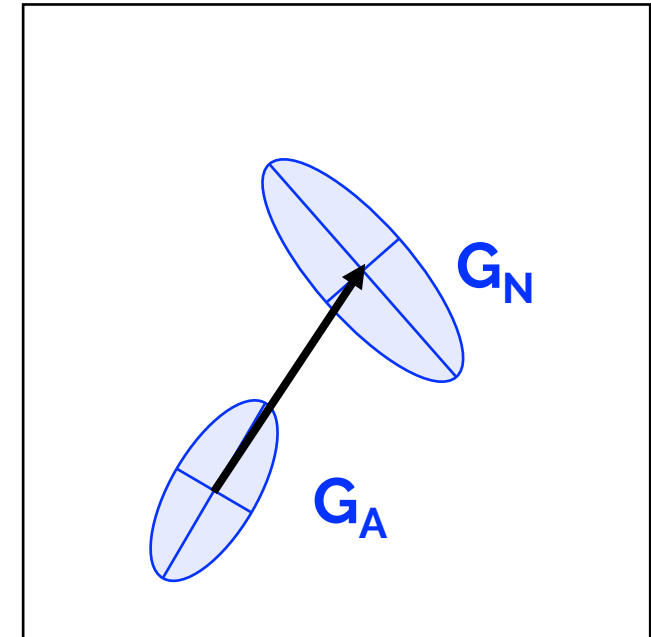
Improved evolutionary potential
in the direction of plasticity



Do genetic variation and plastic response align?



Worsened evolutionary potential
in the direction of plasticity



Conclusions and discussion

In general:

- Substantial variation in evolutionary potential of plastic responses
- Alignment of **G**-matrices and plastic response does not change

Conclusions and discussion

In general:

- Substantial variation in evolutionary potential of plastic responses
- Alignment of **G**-matrices and plastic response does not change

Specific cases:

- The 'evolutionary potential' in the direction of plasticity can both improve or worsen – the reasons for different responses is subject to future work

Acknowledgements



Uller group

ullergroup.se

Extended Evolutionary Synthesis

extendedevolutionarysynthesis.com

