QTL mapping in multi-parent populations

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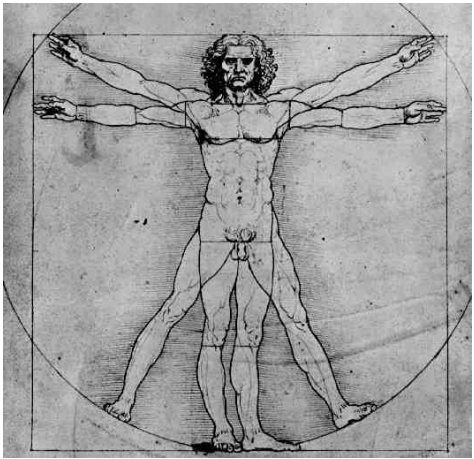
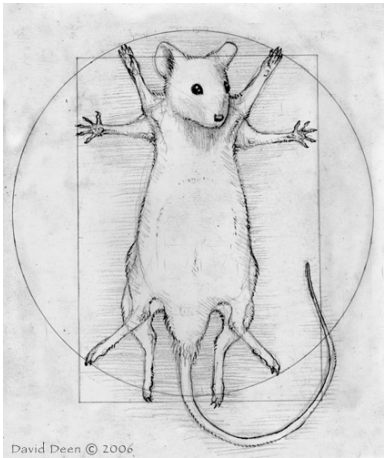
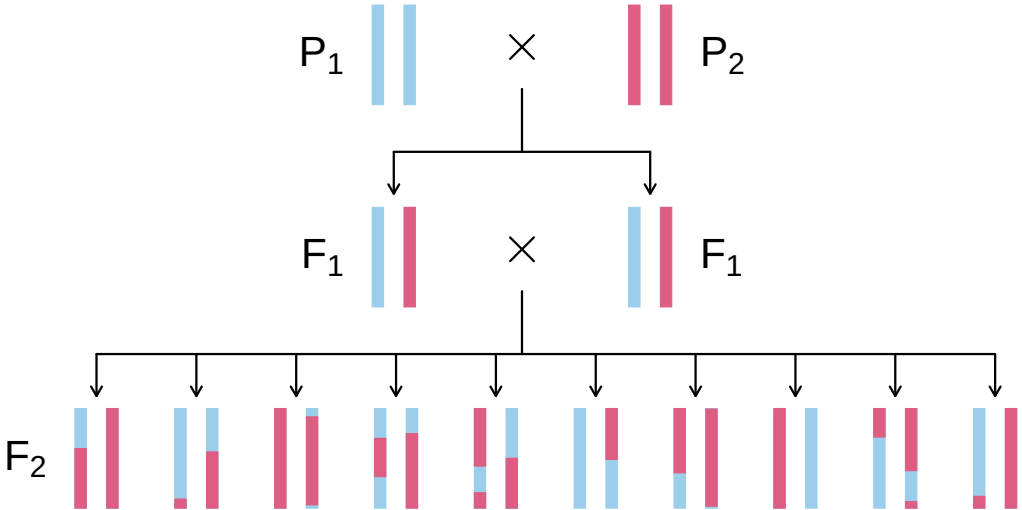
kbroman.org/Teaching_UWStatGen2022



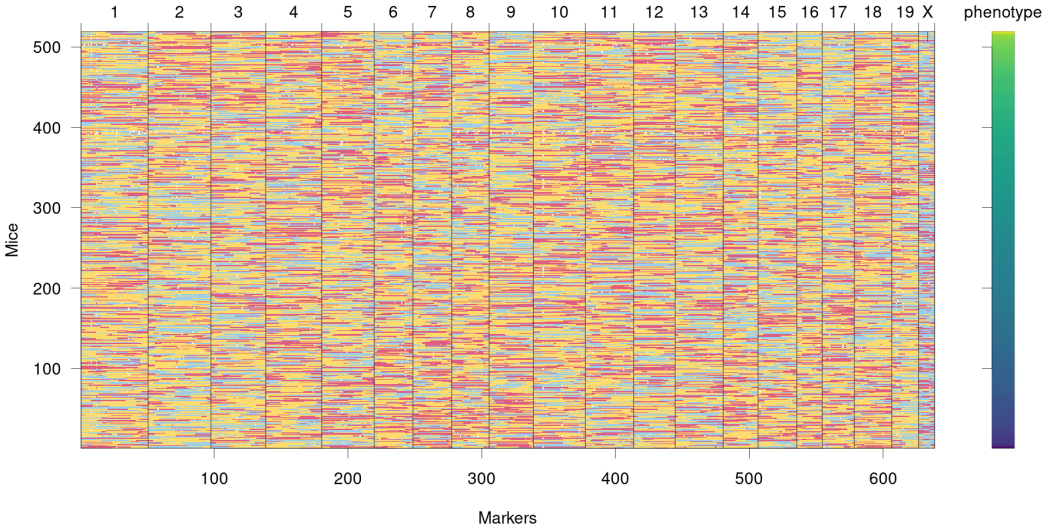


daviddeen.com

Intercross



Data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X
phenotype
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Mice
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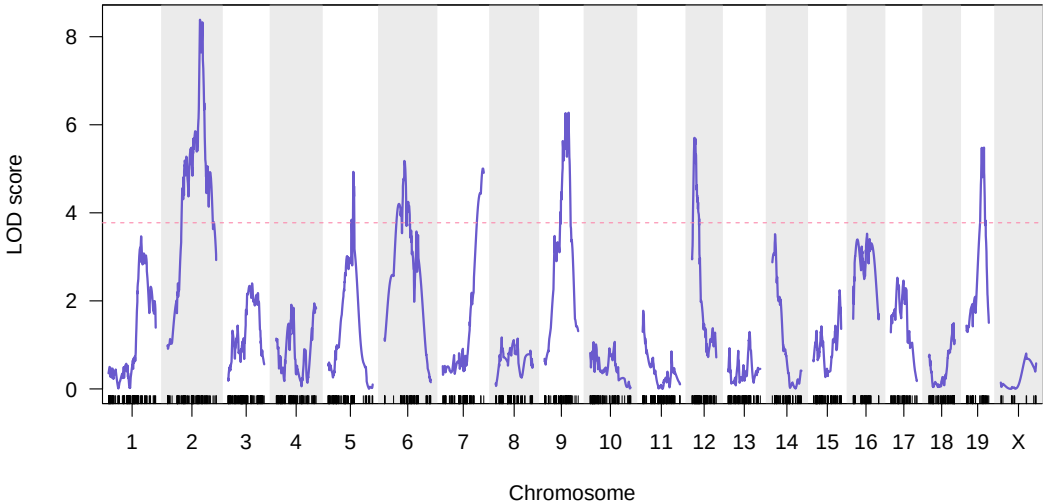
600
Markers

Genome scan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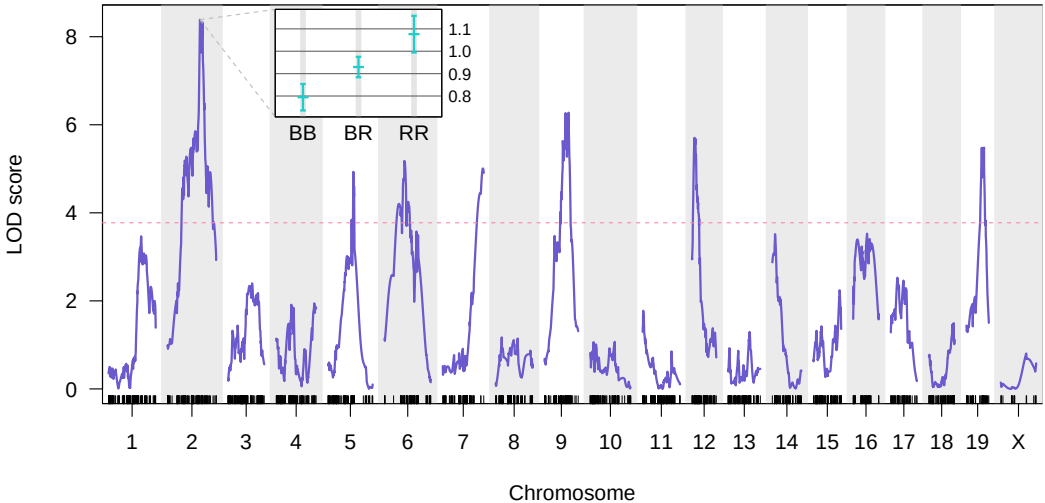
Chromosome

Genome scan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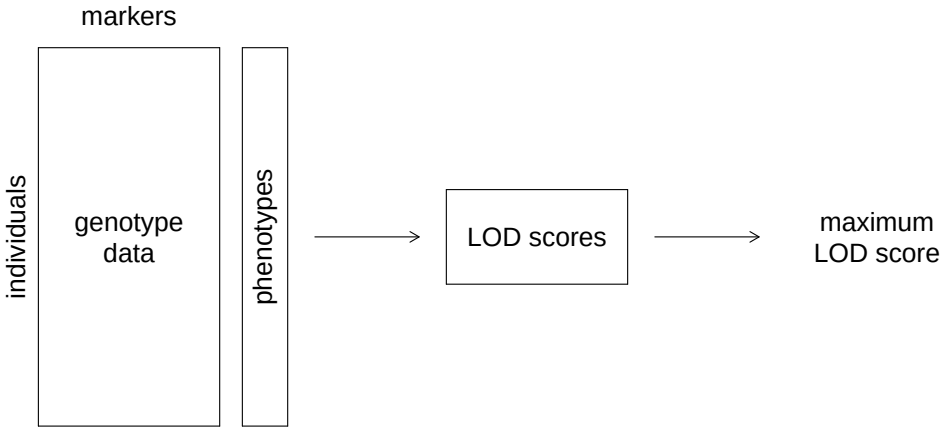
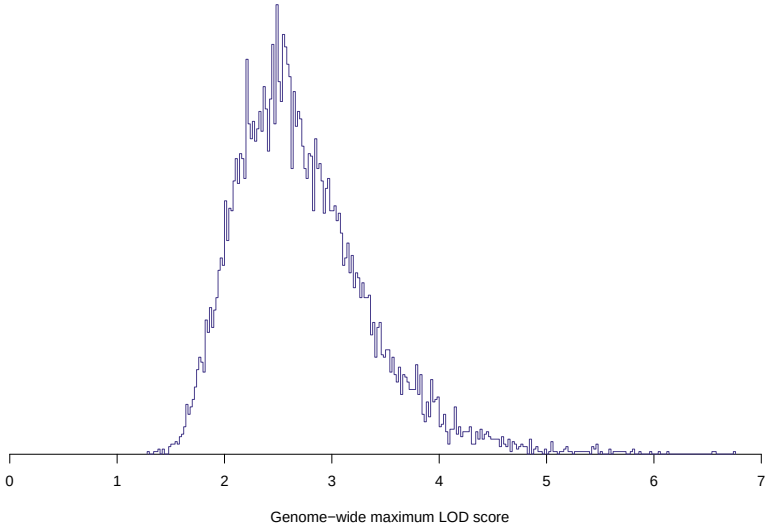
Chromosome

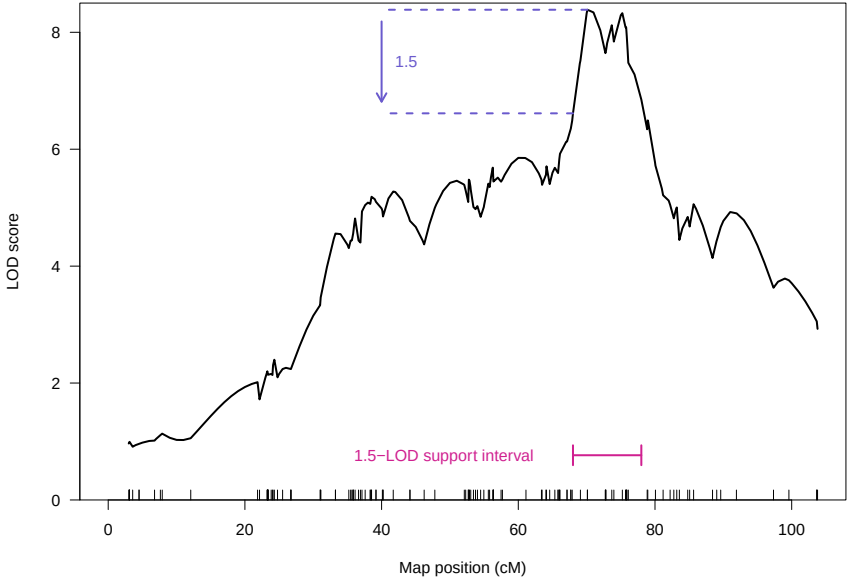
Permutation test



Permutation distribution



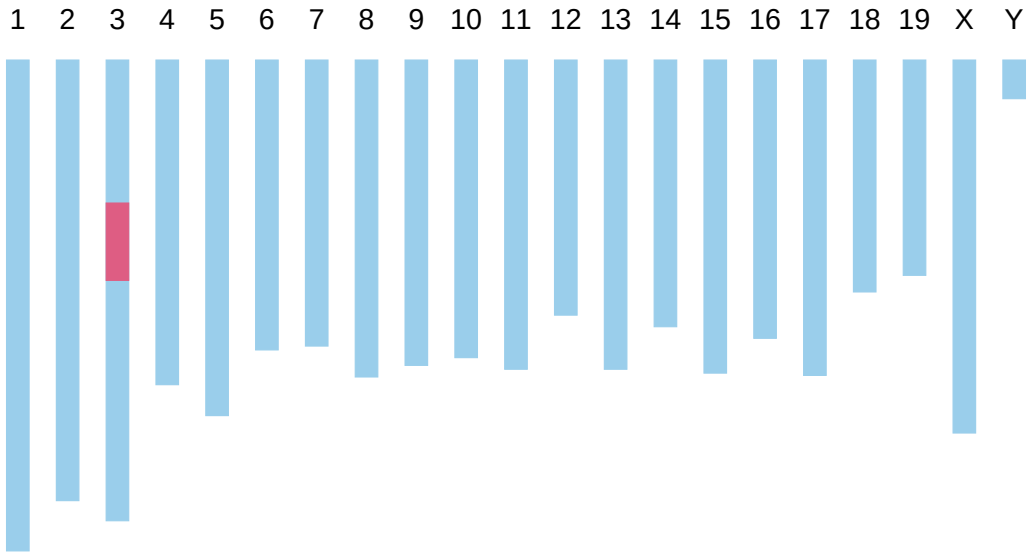
QTL intervals



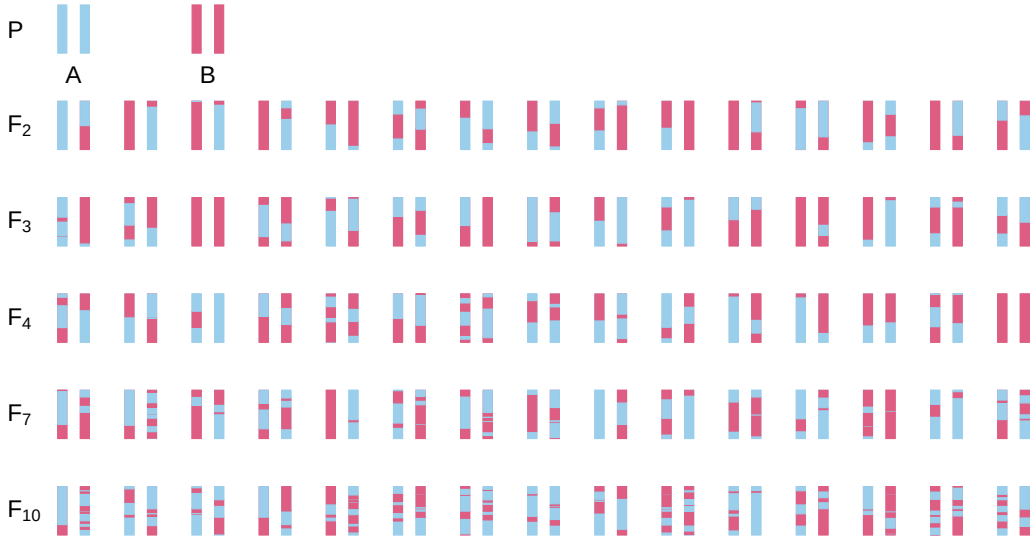
Multiple QTL models

- Reduce residual variation $\longrightarrow$ greater power
- Separate linked QTL
- Identify interactions (epistasis)

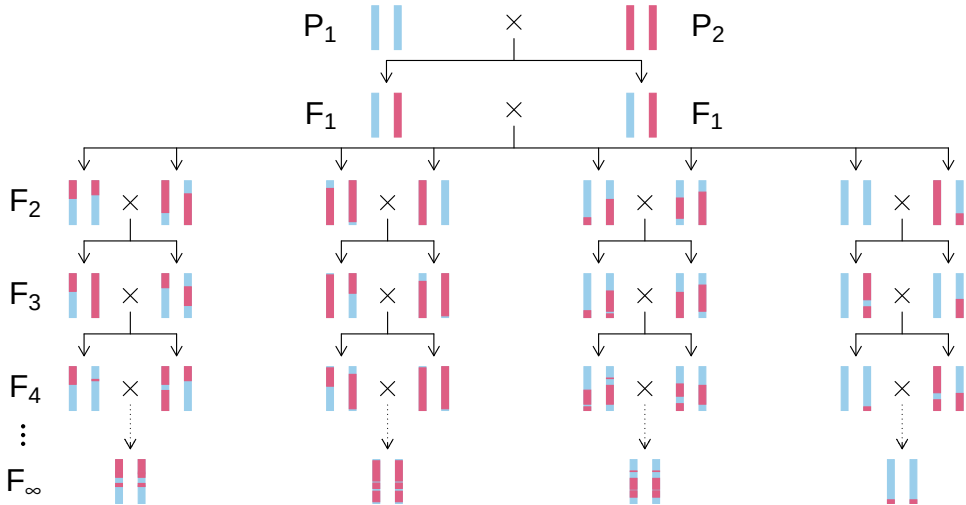
Congenic line



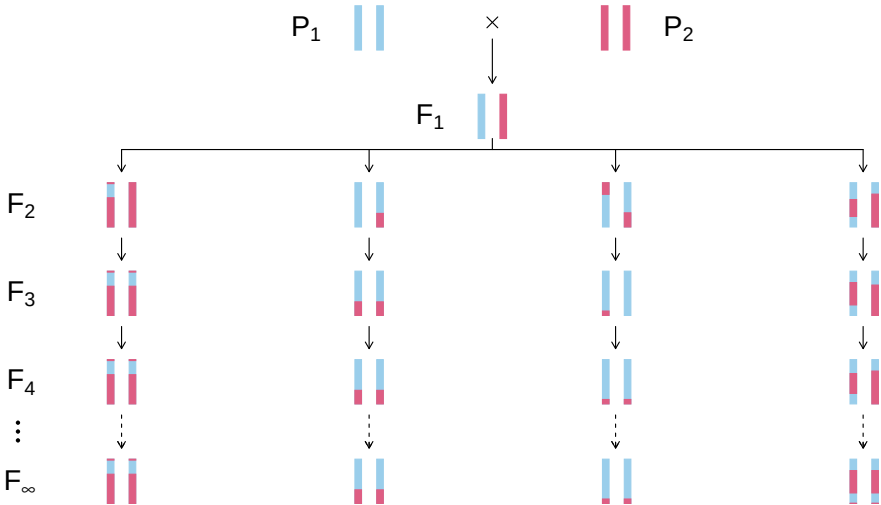
Advanced intercross lines



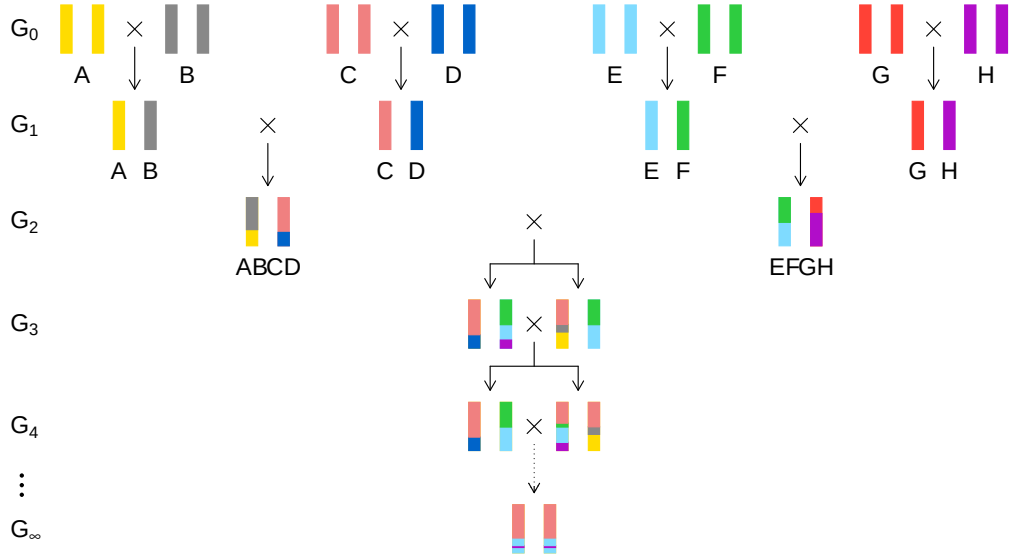
Recombinant inbred lines



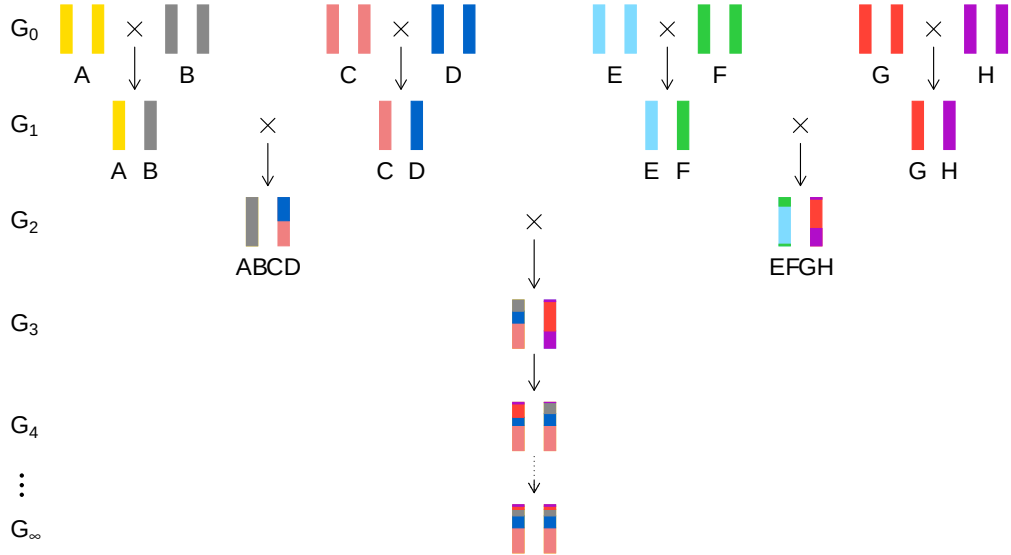
Recombinant inbred lines (selfing)



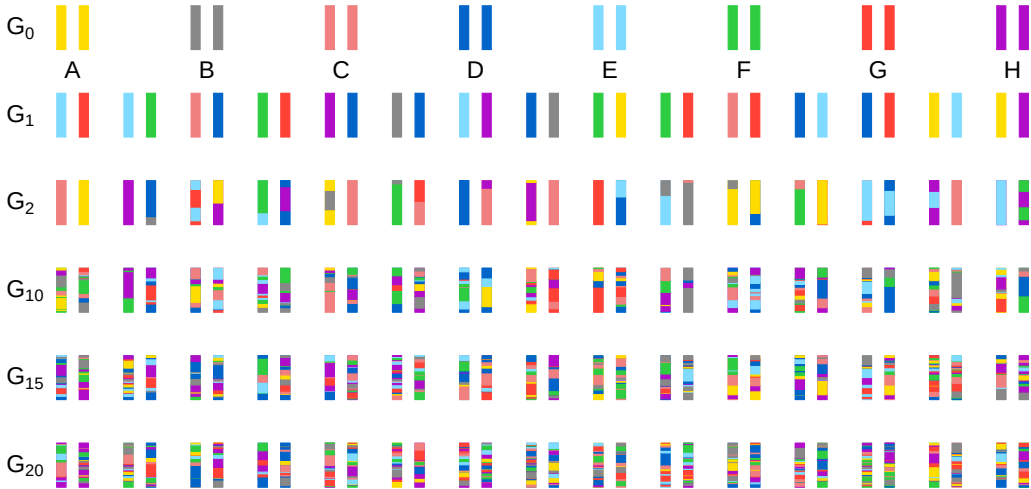
Collaborative Cross



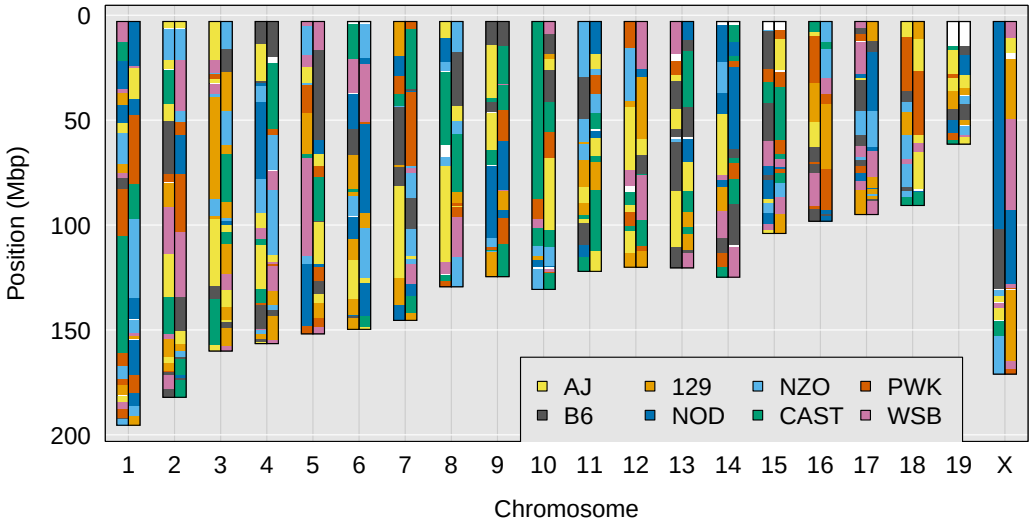
MAGIC lines



Heterogeneous Stock/Diversity outbreds



DO genome


Position (Mbp)
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X
Chromosome
AJ
B6
129
NOD
NZO
CAST
PWK
WSB

QTL analysis in DO

- Genotype reconstruction
- Kinship correction
- Treatment of QTL genotype

Genotype reconstruction

Linear mixed model

Treatment of QTL genotypes

Research topics

- Identifying the causal polymorphisms
- Joint analysis of high-dimensional outcomes
- Use of intermediate biochemical traits
- Cross-species analyses

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