Evolution of genetic systems

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Evolution of *evolvability:*

- mutation rate
- sex and recombination
- modularity, robustness, additivity …

How to understand why organisms are as they are?

- "for the good of the species"?
- as a side effect ?
- through selection amongst individuals?
    - modifier alleles

Why sex and recombination?

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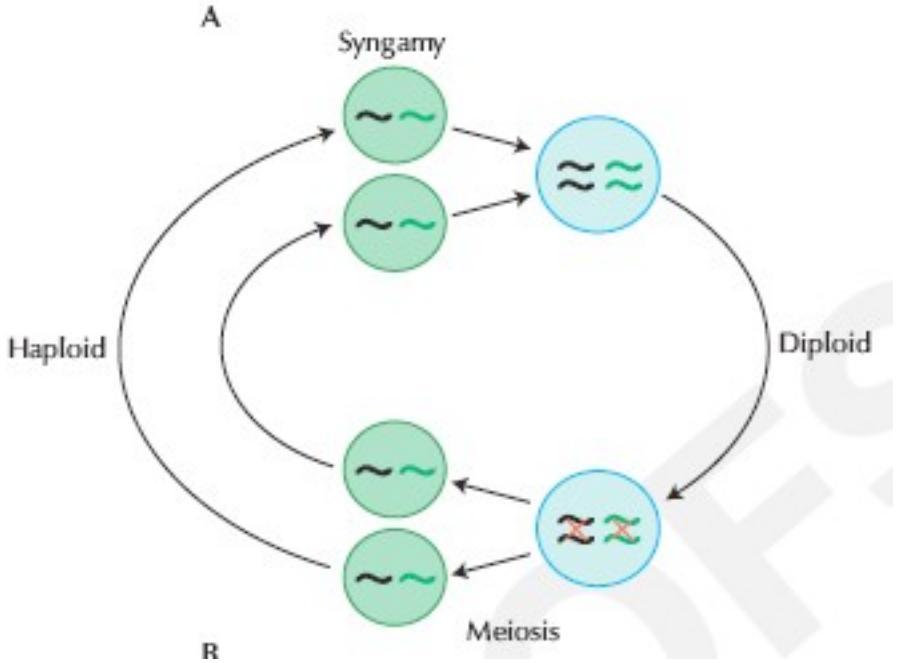
Sex: the mixing of hereditary material to produce new genotypes

- selfing
- outcrossing sex



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Advantage may come from *repair* or *recombination*

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many organisms lack recombination (eg male *Drosophila*)

- Early arguments supposed that sex evolved “for the good of the species”
- Sex is maintained to some extent by selection amongst species:
  - In insects:
    - *Arrhenotoky* evolved ~ 8 times - 5 of these -> families or greater
    - *Thelytoky* arose ~ 1000 times; sporadically distributed

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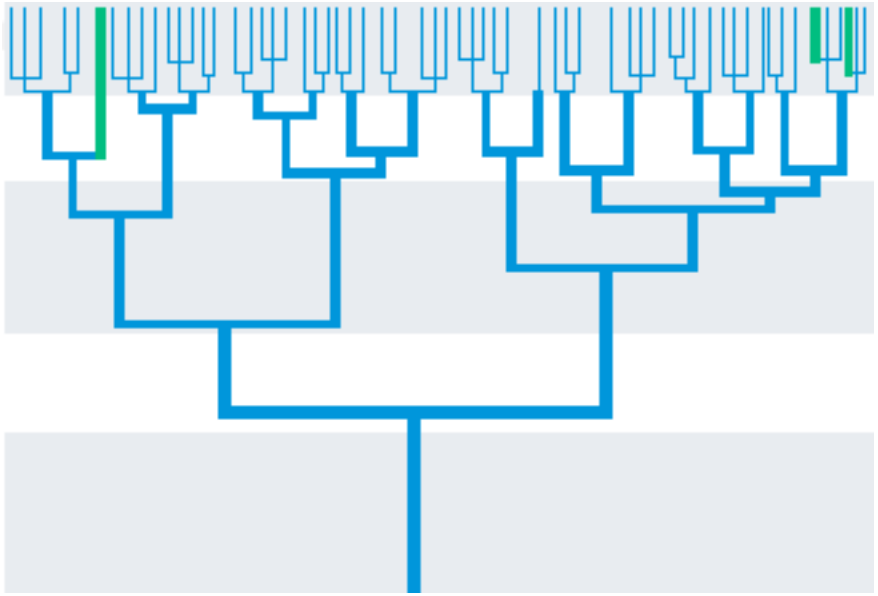

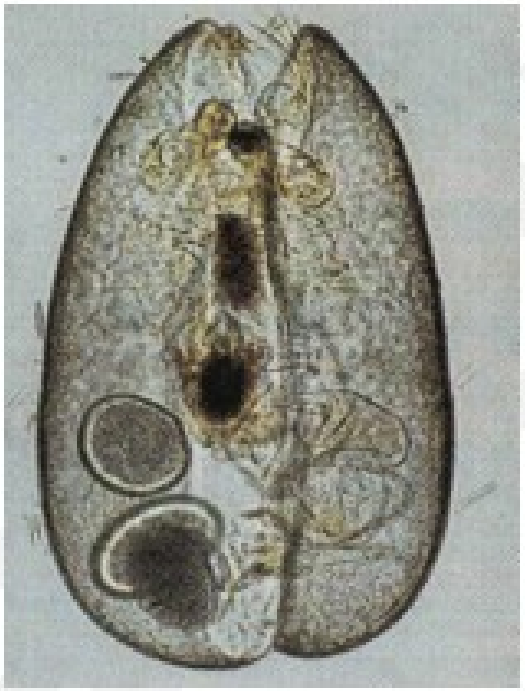

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Selection has reduced recombination:

Y chromosomes, sticklebacks, supergenes…