

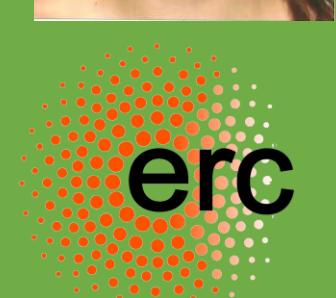
Evolutionary strata and rearrangements in a double haplo-lethal *Microbotryum* fungus

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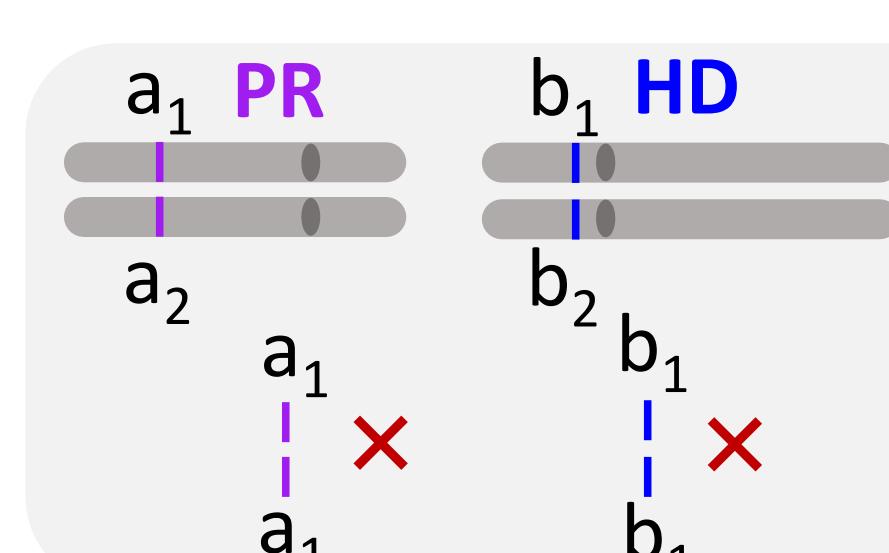
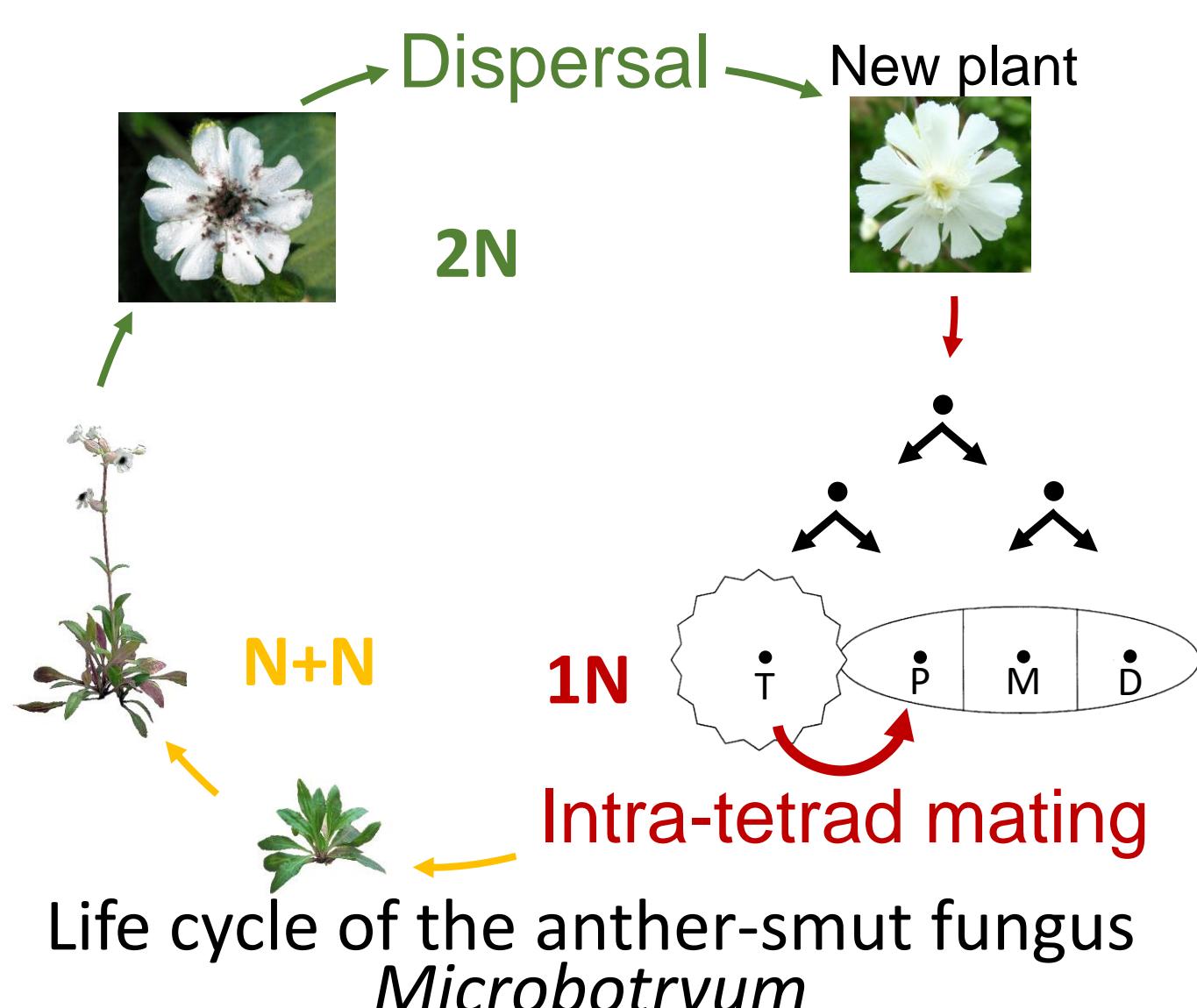
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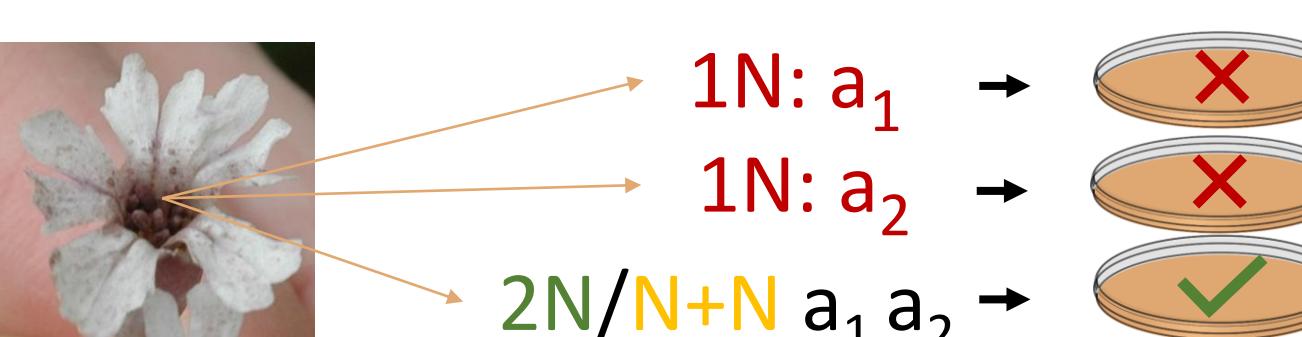
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Evolution of mating-type chromosomes in *Microbotryum* fungi

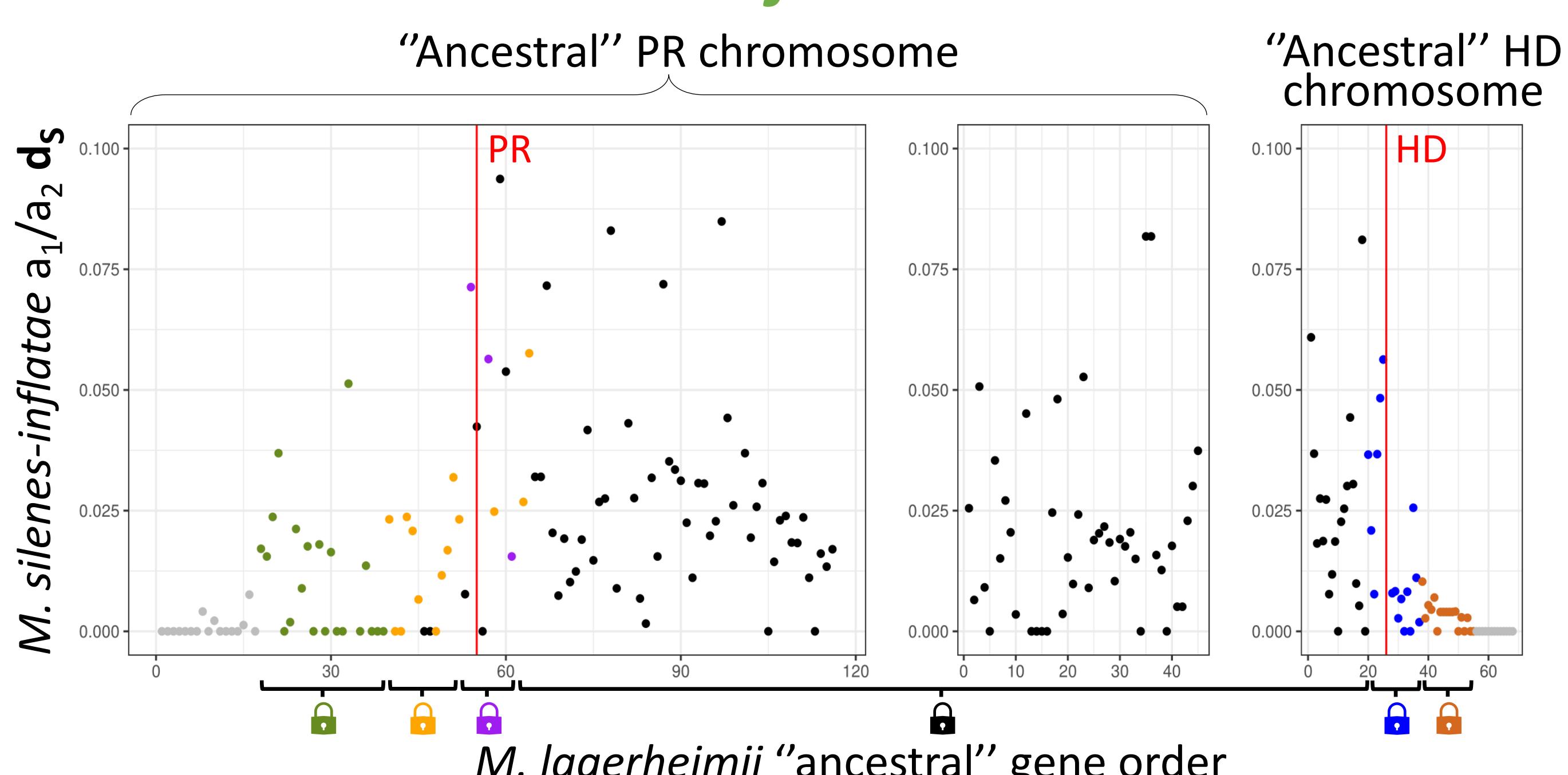


Microbotryum mating-type chromosomes
HD and PR loci control mating compatibility
They must be heterozygous (2 alleles each)



M. silenes-inflatae, a double haplo-lethal: cannot grow as haploid because of deleterious alleles linked to mating-type alleles

New strata in *M. silenes-inflatae*



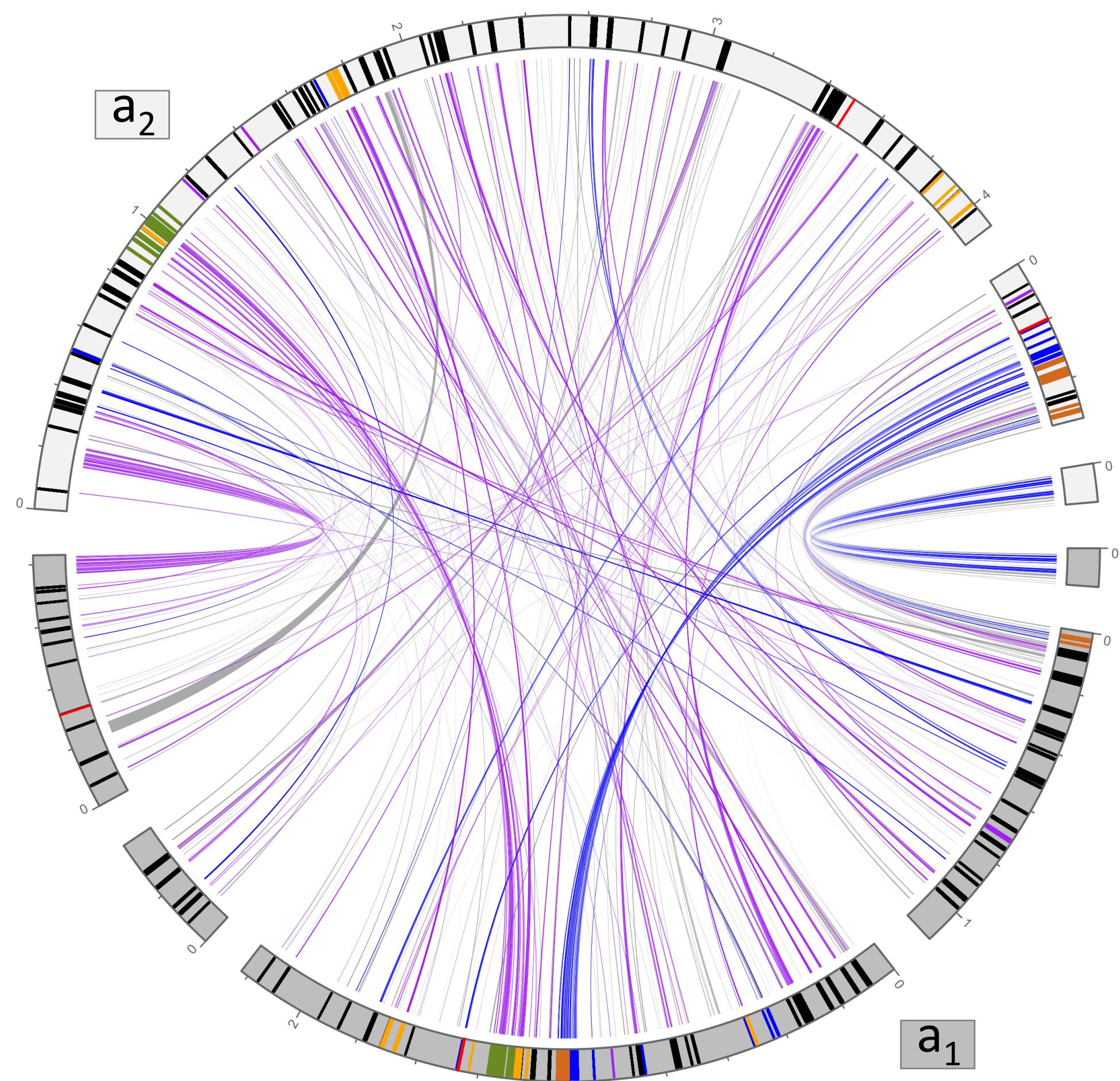
- Use of "ancestral" gene order allows visualization of evolutionary strata
- Older strata: higher d_S
- New strata: intermediate d_S
- Pseudo-autosomal regions: $d_S=0$

Numerous rearrangements in non-recombining regions

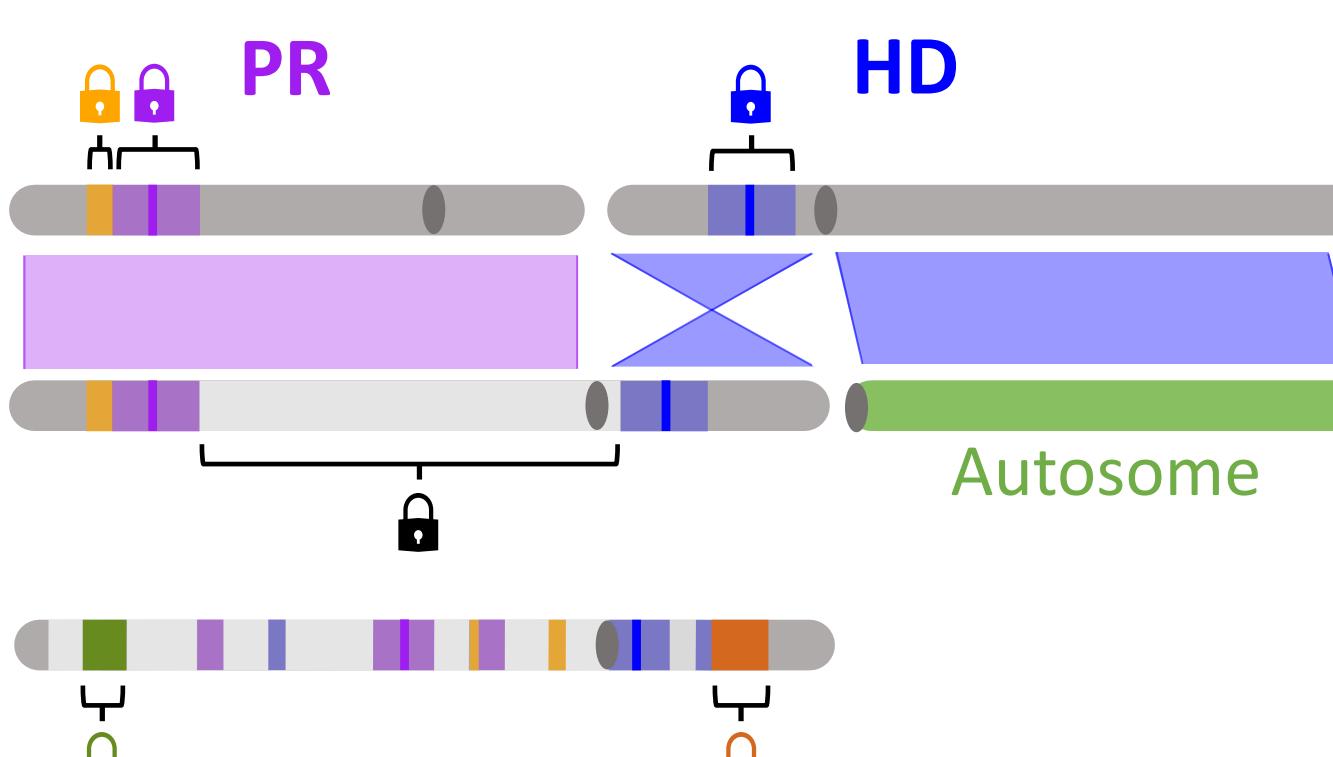
■ *M. silenes-inflatae* a₁ — Belonged to the ancestral HD chromosome

■ *M. silenes-inflatae* a₂ — Belonged to the ancestral PR chromosome

■ Colors on tracks indicate the different evolutionary strata



- A single mating-type chromosome carries both PR and HD genes in *M. silenes-inflatae*
- Absence of **colinearity** between mating-type chromosomes except in the pseudo-autosomal regions
- Two new, **young evolutionary strata**



- Fission and **Fusion** of mating-type chromosomes
- **Extension** of recombination suppression beyond mating-type-determining genes

Why is recombination suppressed in fungi mating-type chromosomes?

