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Traces of past transposable element presence in Brassicaceae genome dark matter

Hadi Quesneville

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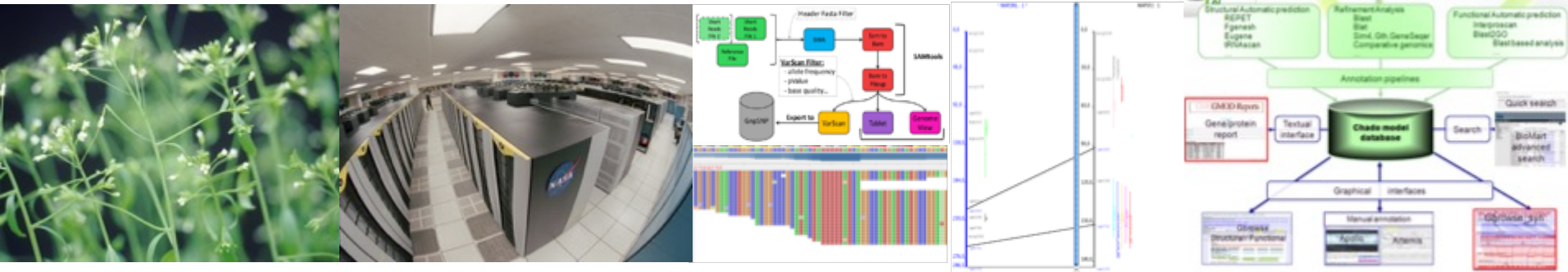
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Traces of past transposable element presence in *Brassicaceae* genome dark matter

Hadi Quesneville

Alphy, 7 February 2019

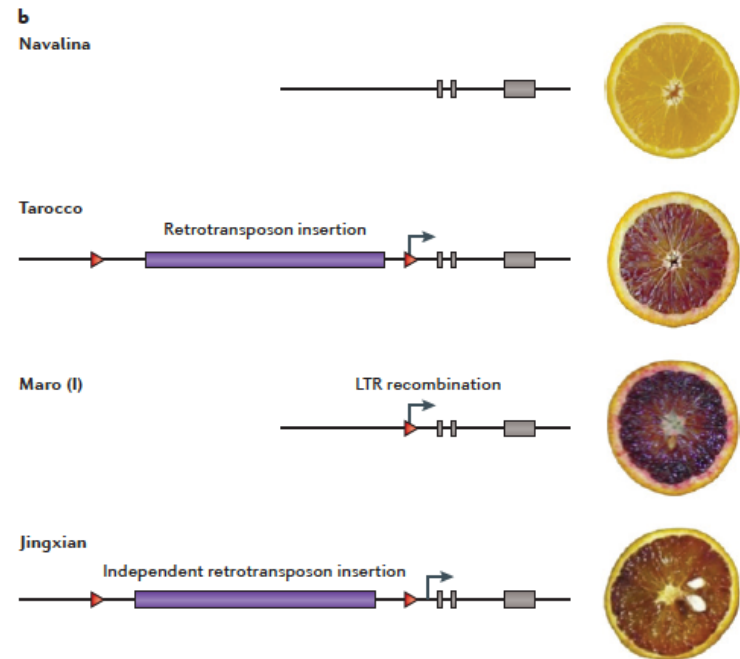


TEs are key players of genome evolution

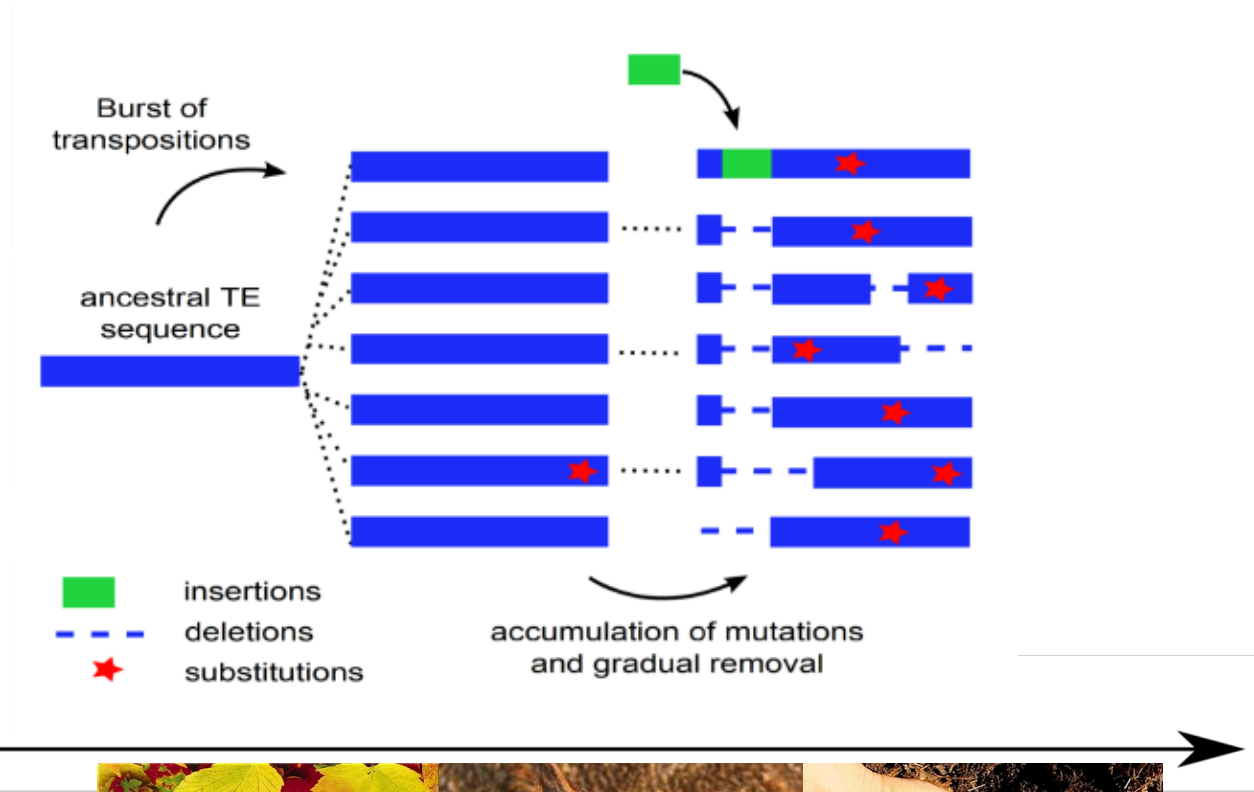
How important are transposons for plant evolution?

Damon Lisch

NATURE REVIEWS | GENETICS | VOLUME 14 | JANUARY 2013 | 59



TE dynamics



Scientific questions

TEs participate to the DNA turnover forming the raw material for genetic innovations.

→ How to recognize very old and degenerated repeated sequences up to 40 Myr old.

→ Search whether they played key evolutionary roles.

Cross-species TE annotation



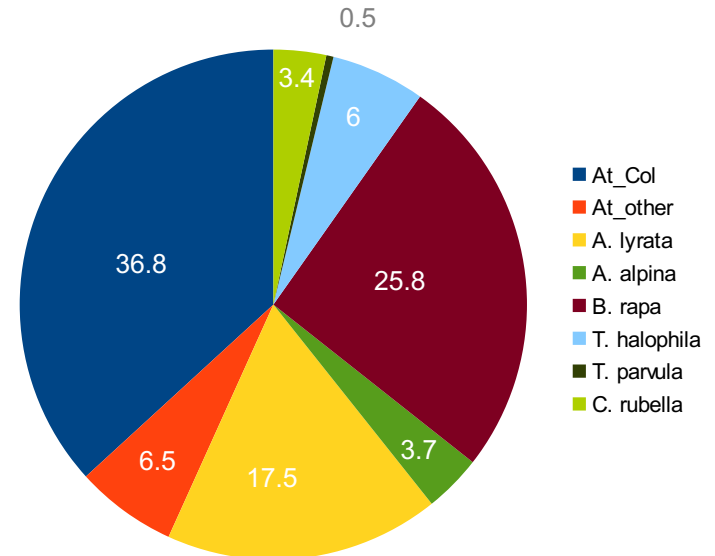
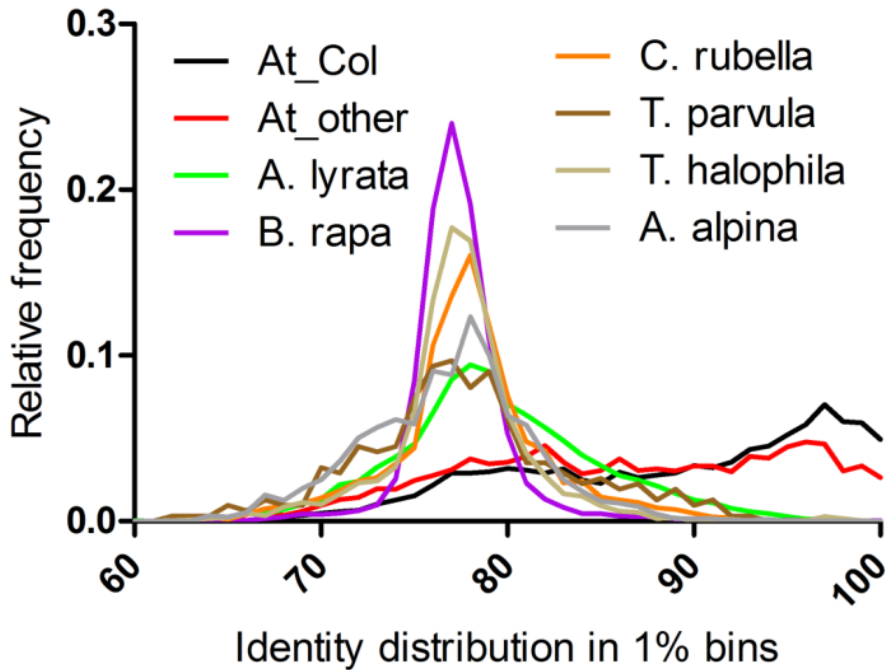
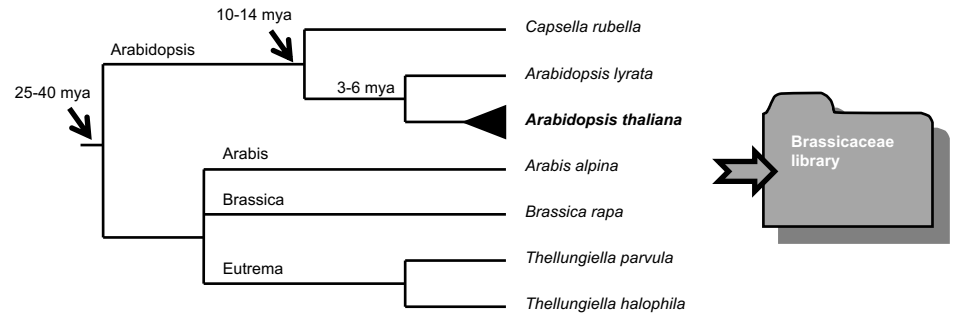
ARTICLE

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DOI: 10.1038/ncomms5104

Ancestral repeats have shaped epigenome and genome composition for millions of years in *Arabidopsis thaliana*

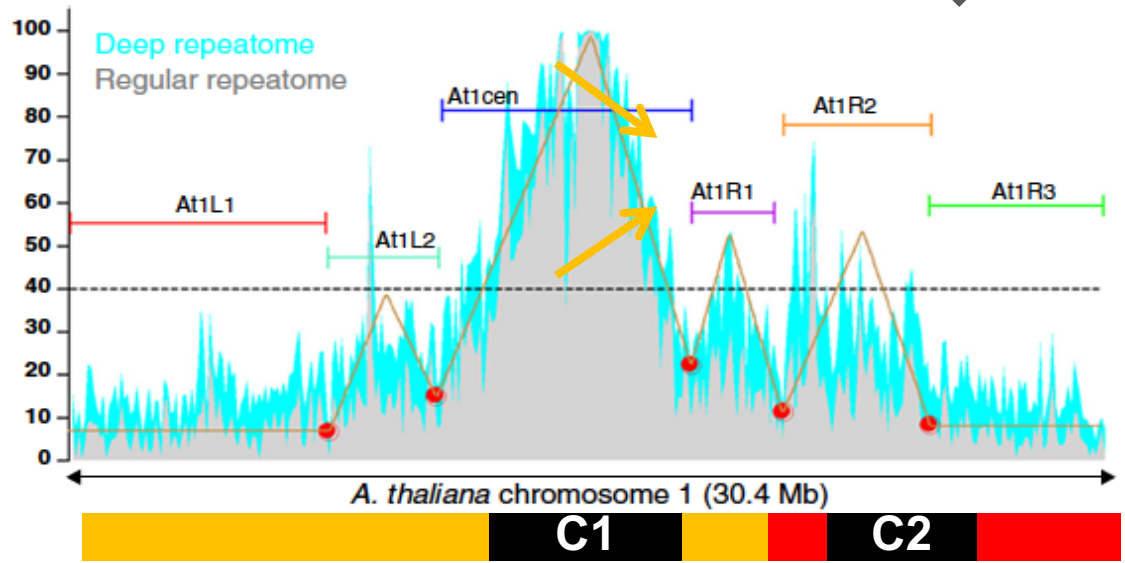
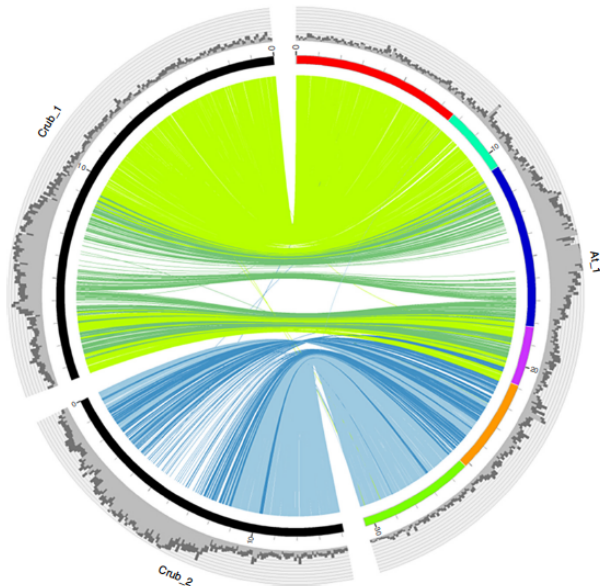
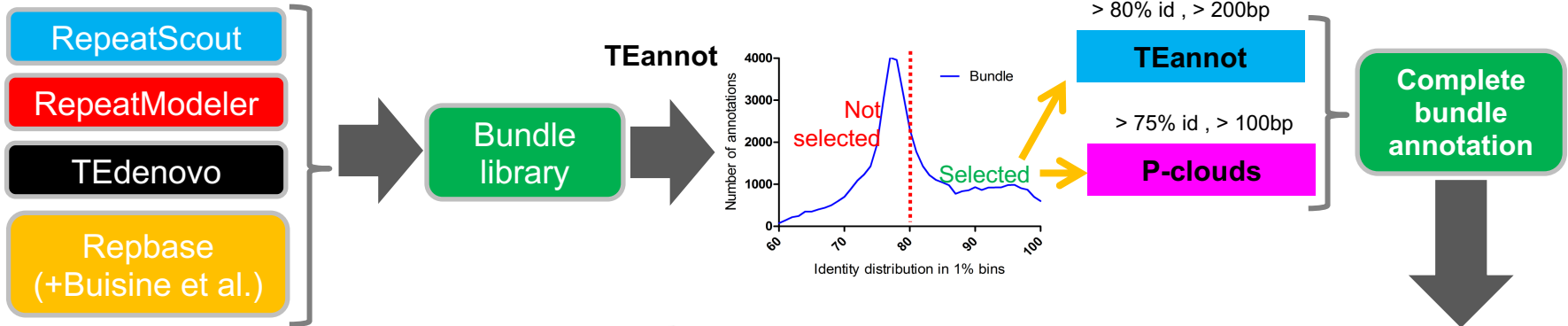
Florian Maumus¹ & Hadi Quesneville¹



Hadi Quesneville

Deep Investigation of *Arabidopsis thaliana* Junk DNA Reveals a Continuum between Repetitive Elements and Genomic Dark Matter

Florian Maumus*, Hadi Quesneville*
 UR1164 URGI - Research Unit in Genomics-Info, INRA, Versailles, France



Fusion of two ancestral chromosomes

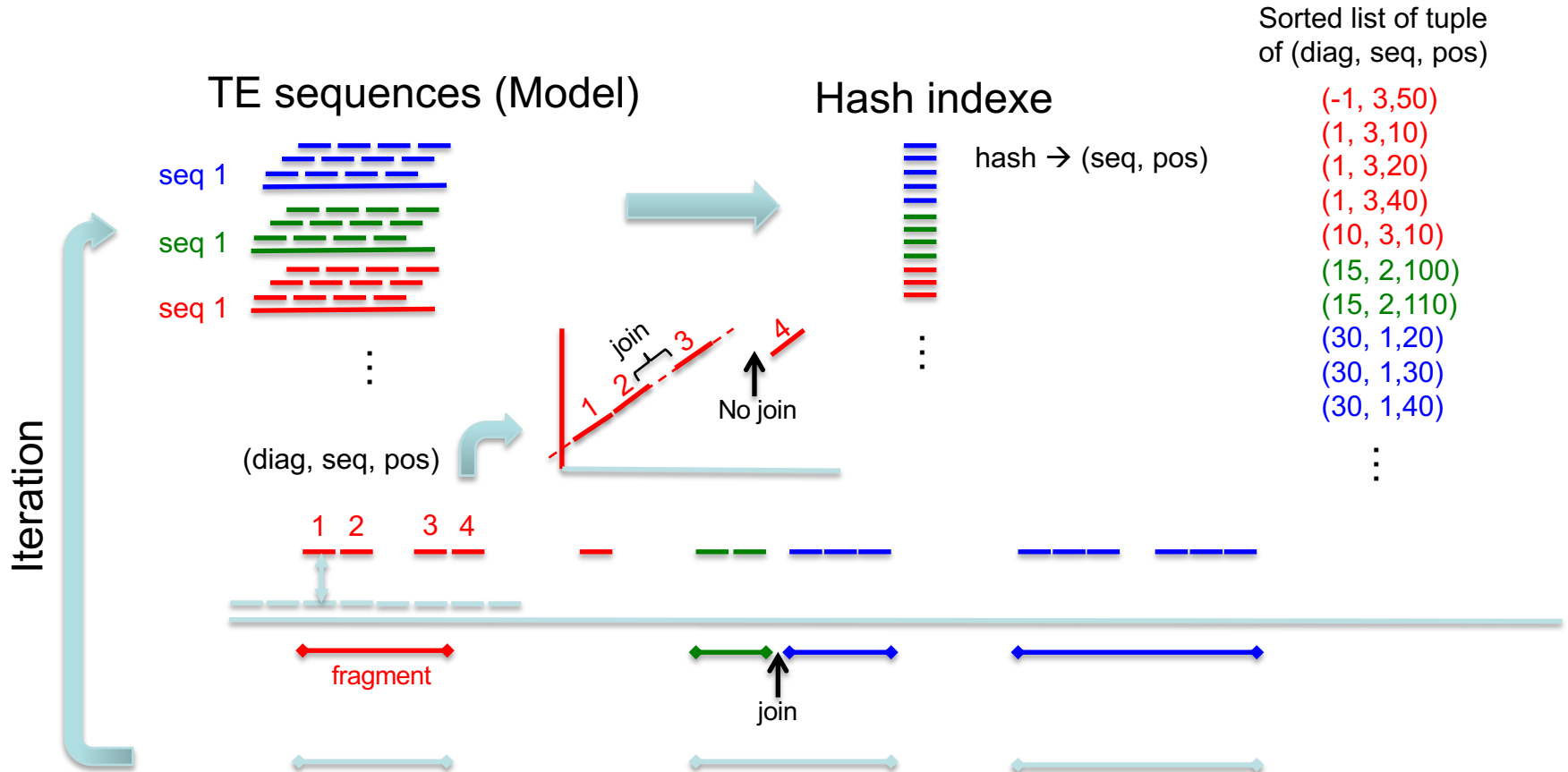
Hadi Quesneville

Mixed strategy

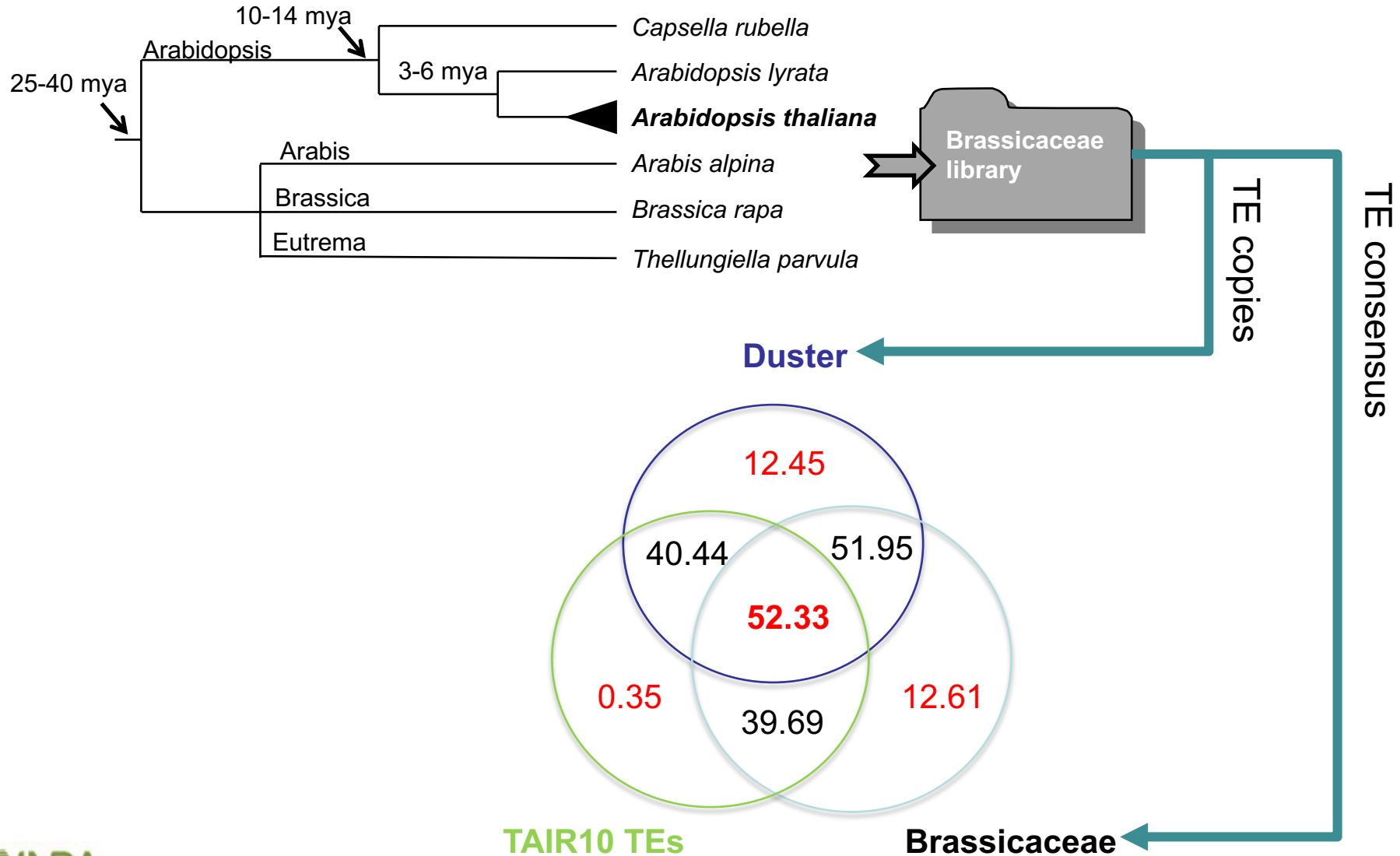
- Use TE copies instead of TE consensus for annotation
 - Use annotation from many related species to take advantage of « cross-species annotation strategy »
- Need efficient algorithm for massive comparisons

Duster algorithm

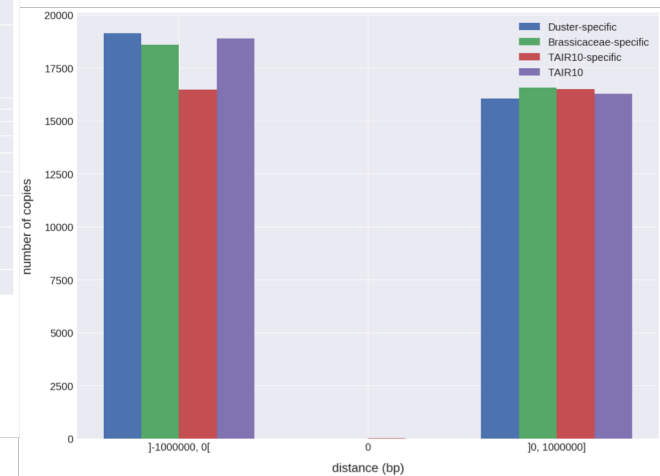
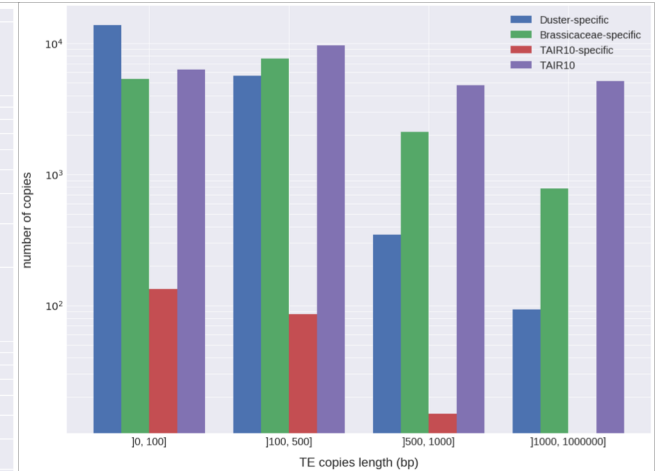
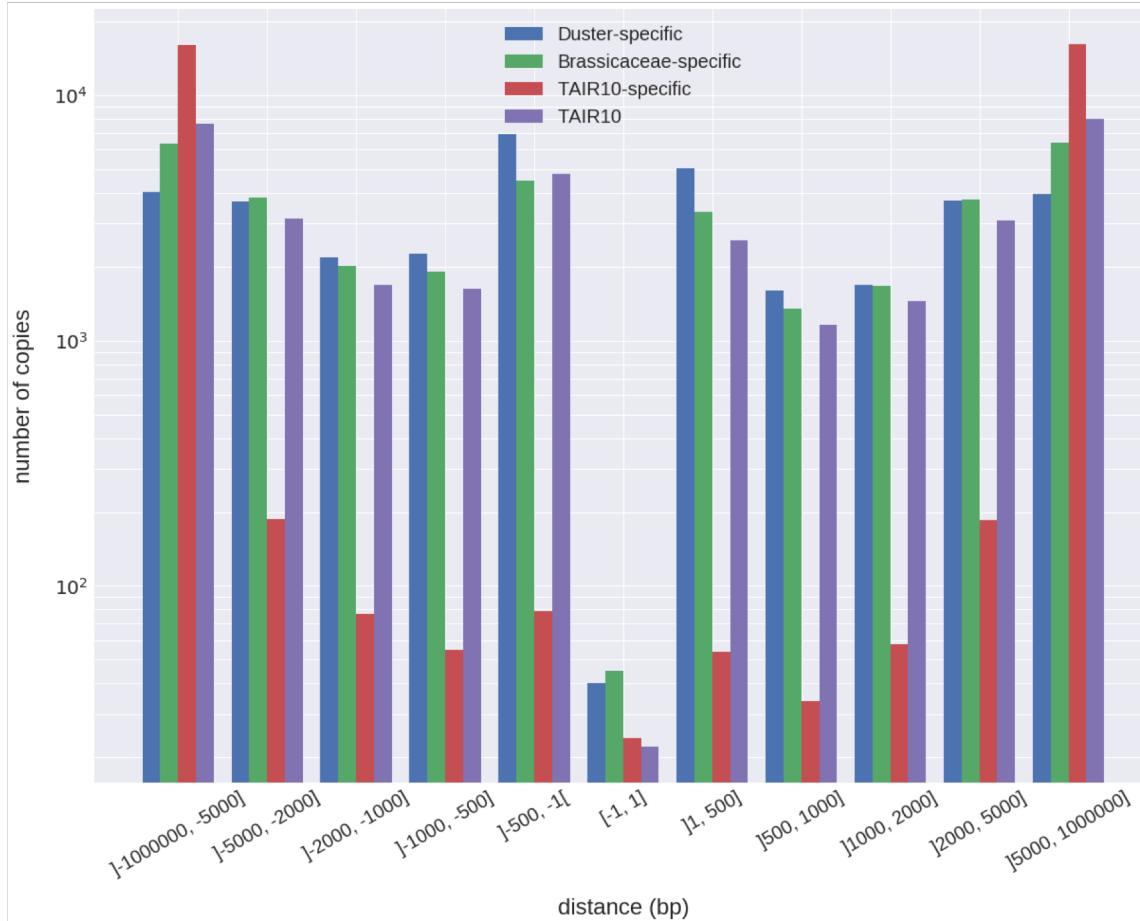
k-mer with regularly spaced holes



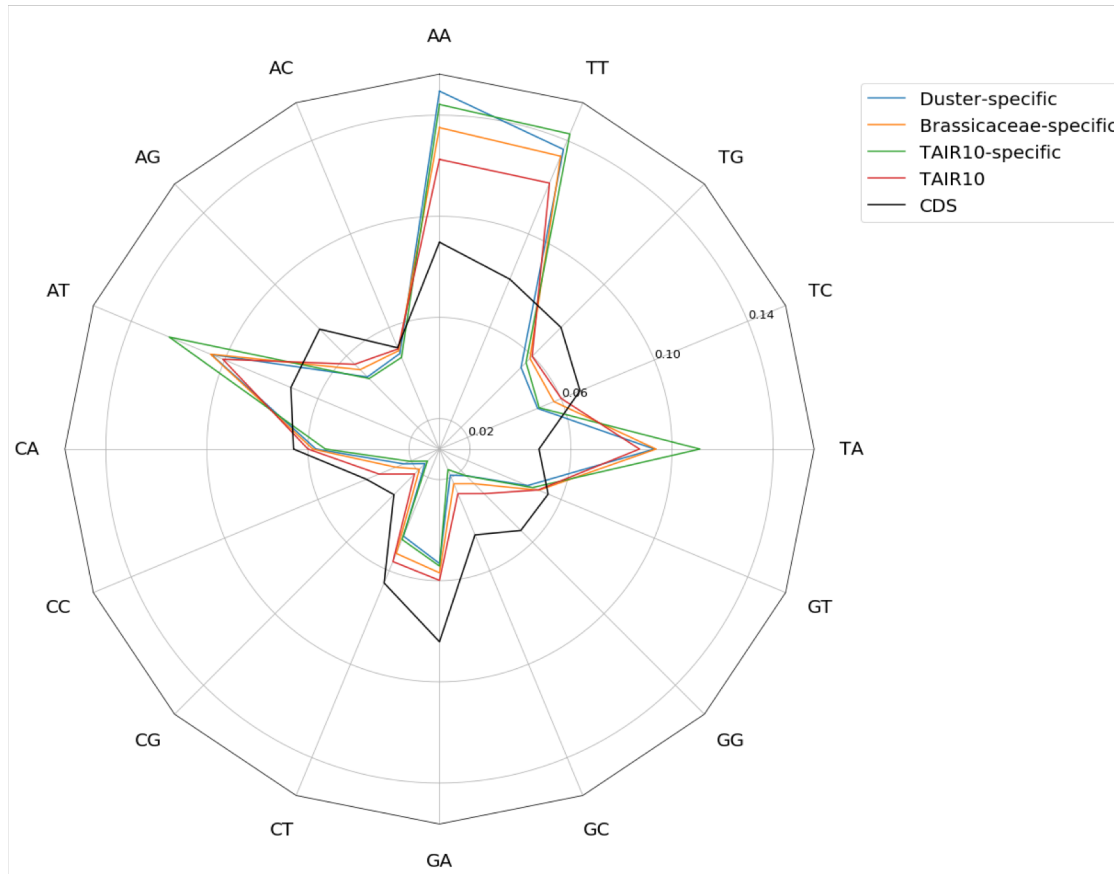
Combining annotations



Location to closest gene

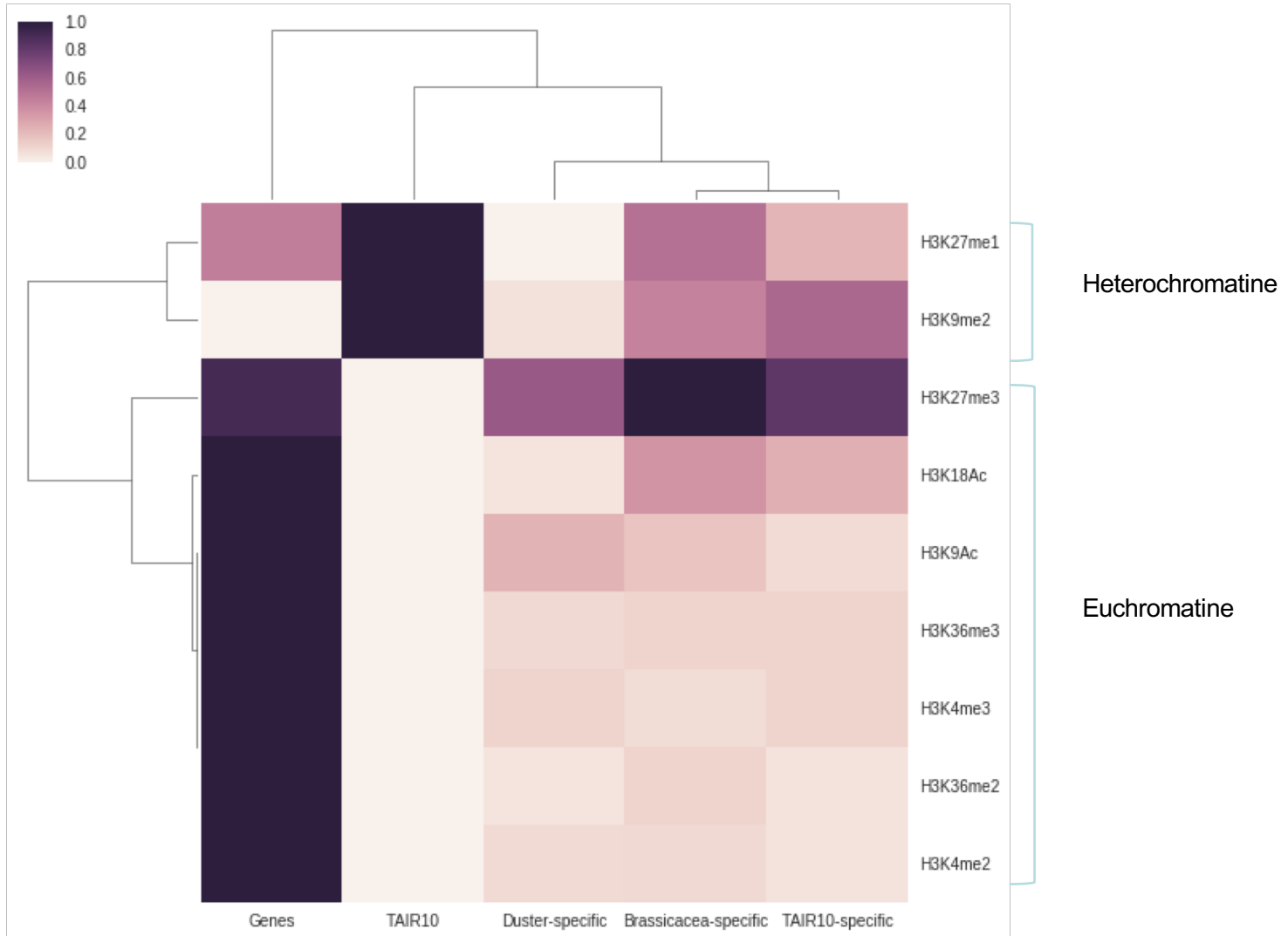


Base composition

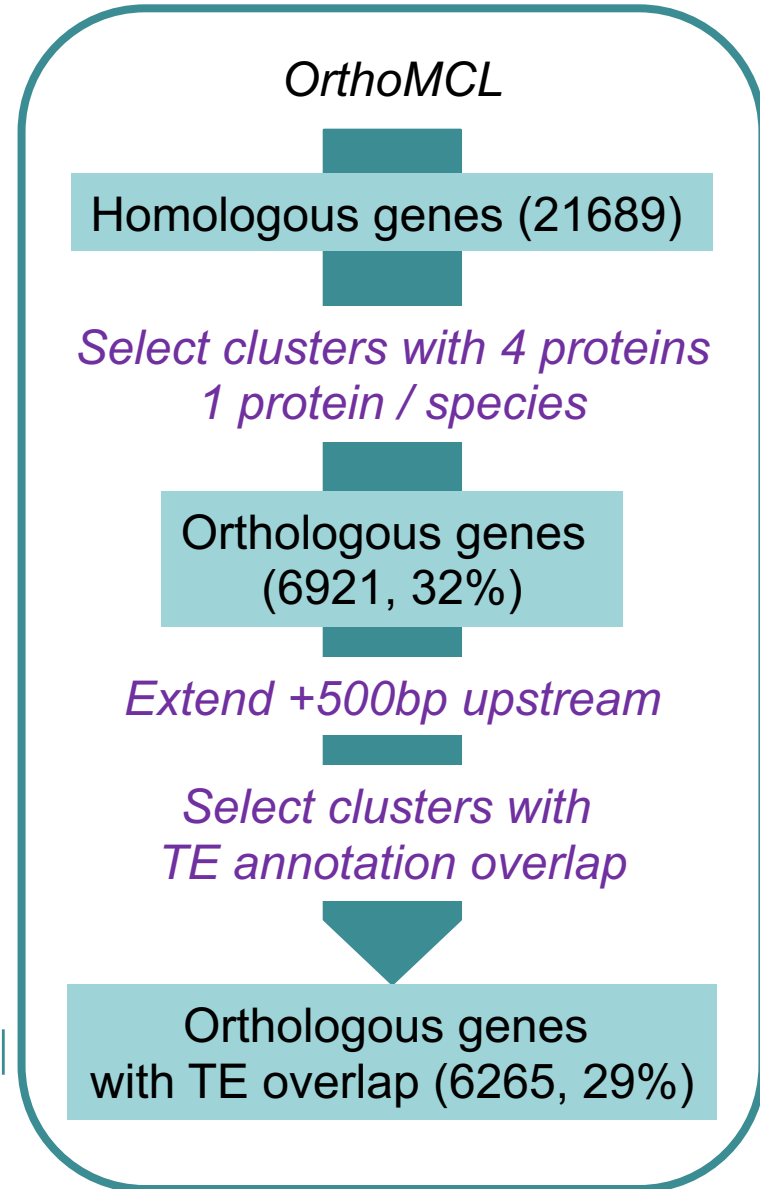
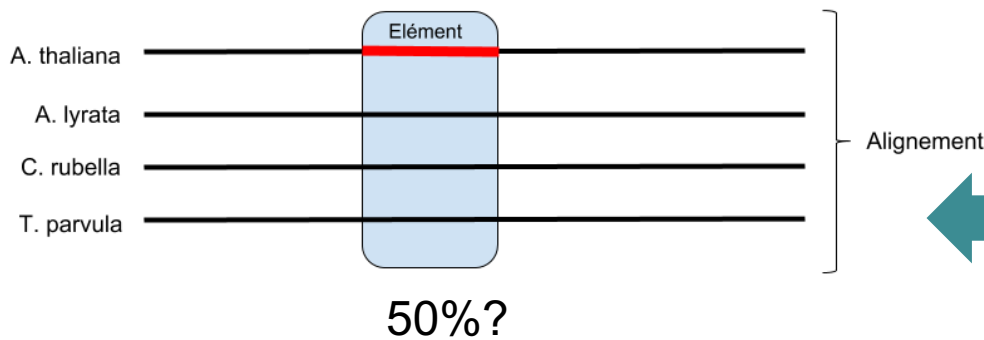
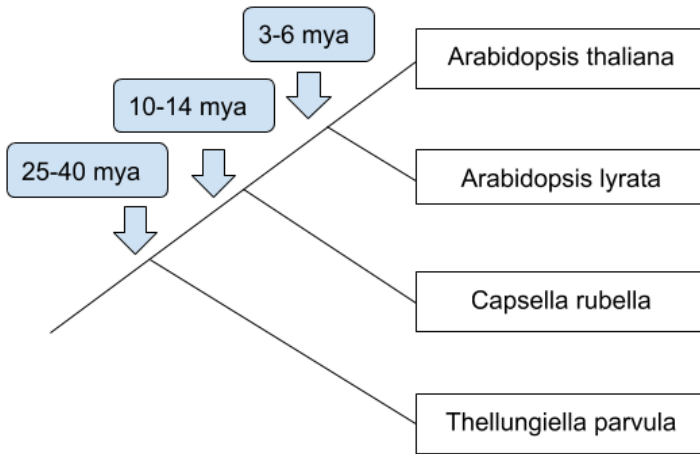


Epigenetic status

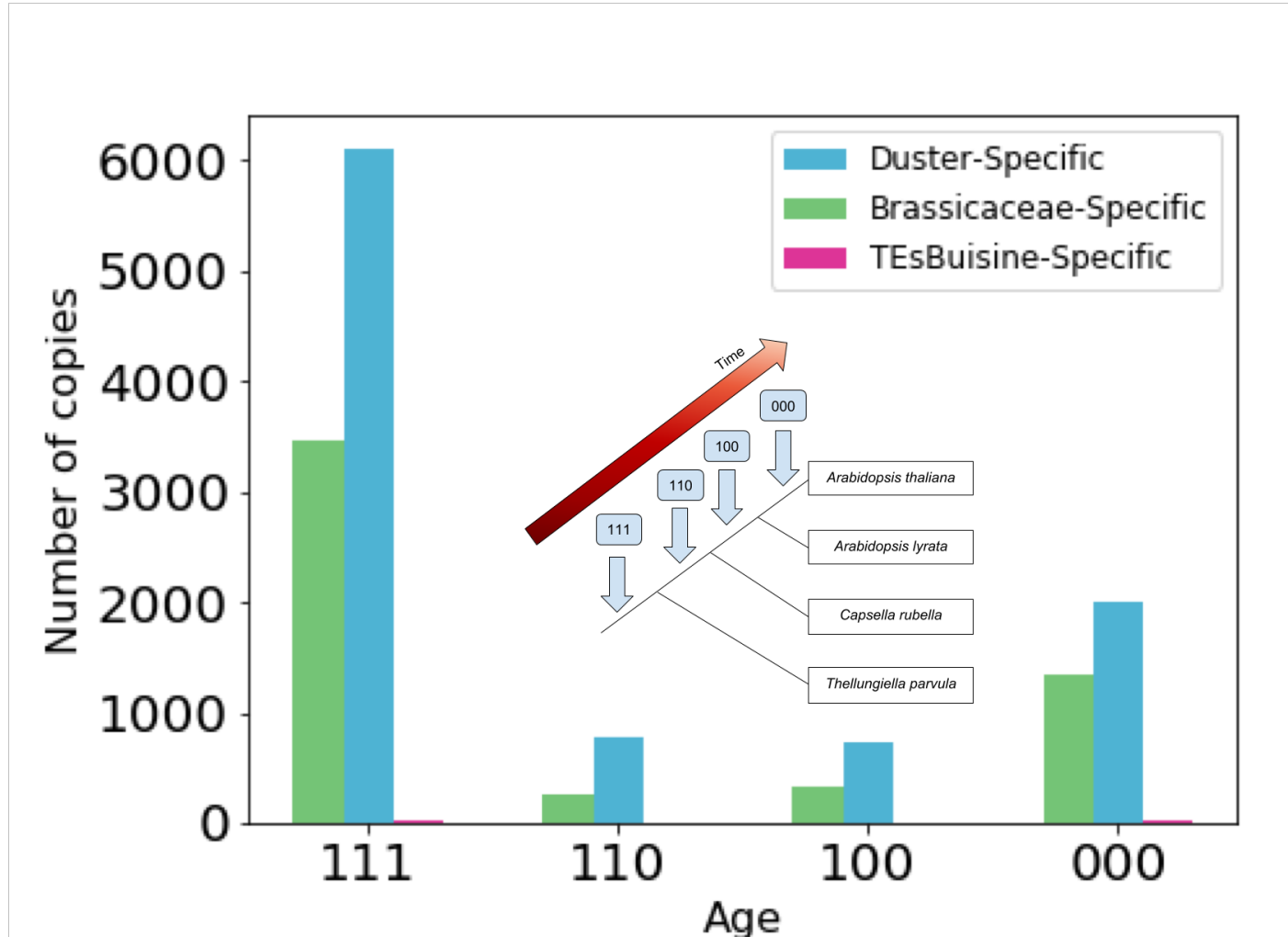
Luo *et al.*, 2009. Defining the Functional Network of Epigenetic Regulators in *Arabidopsis thaliana*. *Molecular Plant* 2, 661-674.



Conservation → Orthologs



Age of insertion



Conclusions

- ***Duster* more sensitive and faster than *BLAST* and *MegaBLAST* (not shown in this presentation)**
- **Up to ~50% of *A. thaliana* genome derives from TEs.**
 - ◆ Official annotation ~20%
- **Found old and degenerated TE fragments**
- **Upstream of genes**

Thanks

The « Genome Analysis » team



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