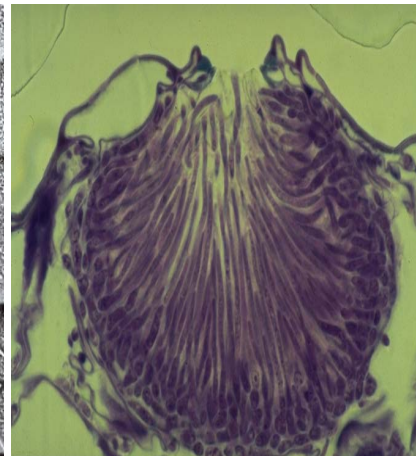
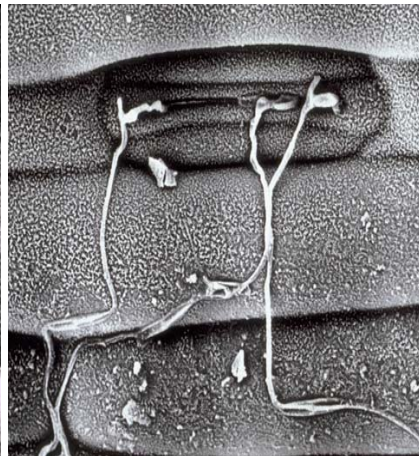
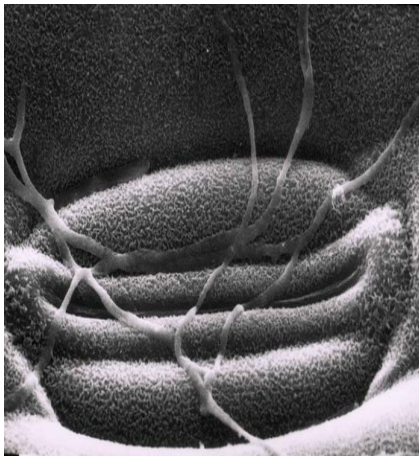




# Comparative Genome Hybridization in *Mycosphaerella graminicola* demonstrates the extraordinary genome plasticity

Ascona, August 19<sup>th</sup> 2008

Sarrah Ben M'Barek



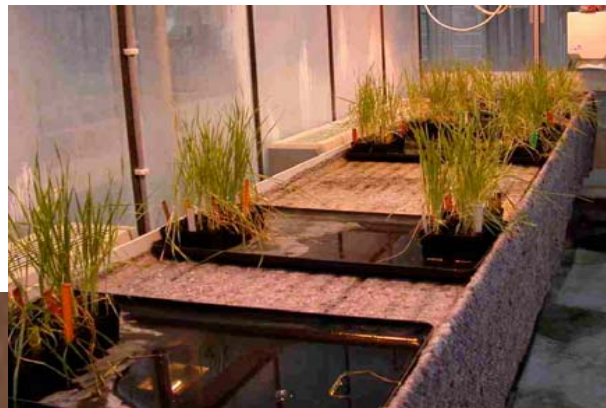
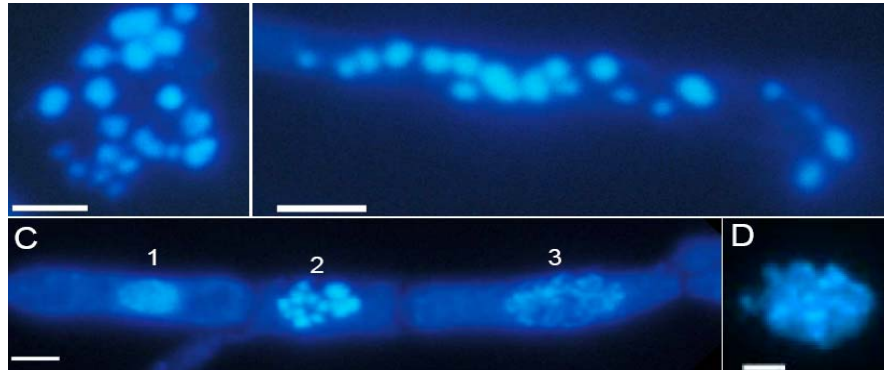




Ancient Greek vase depicting Olympic runners, c. 525 bc

# GENOME PLASTICITY

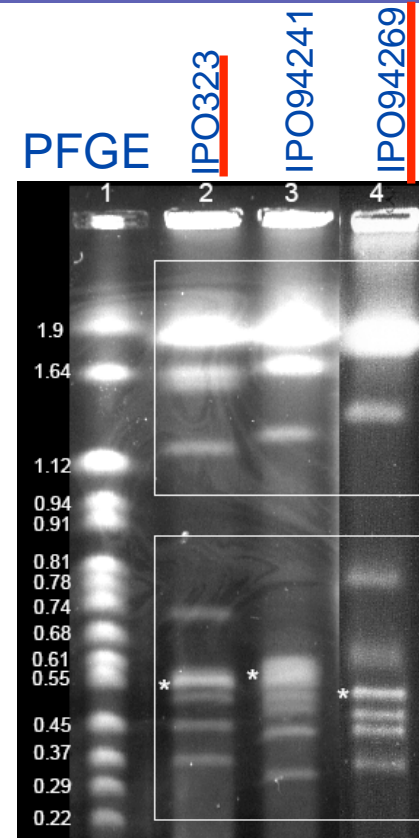
## Germ burst method



## Crossing procedure



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Mehrabi et al. 2007

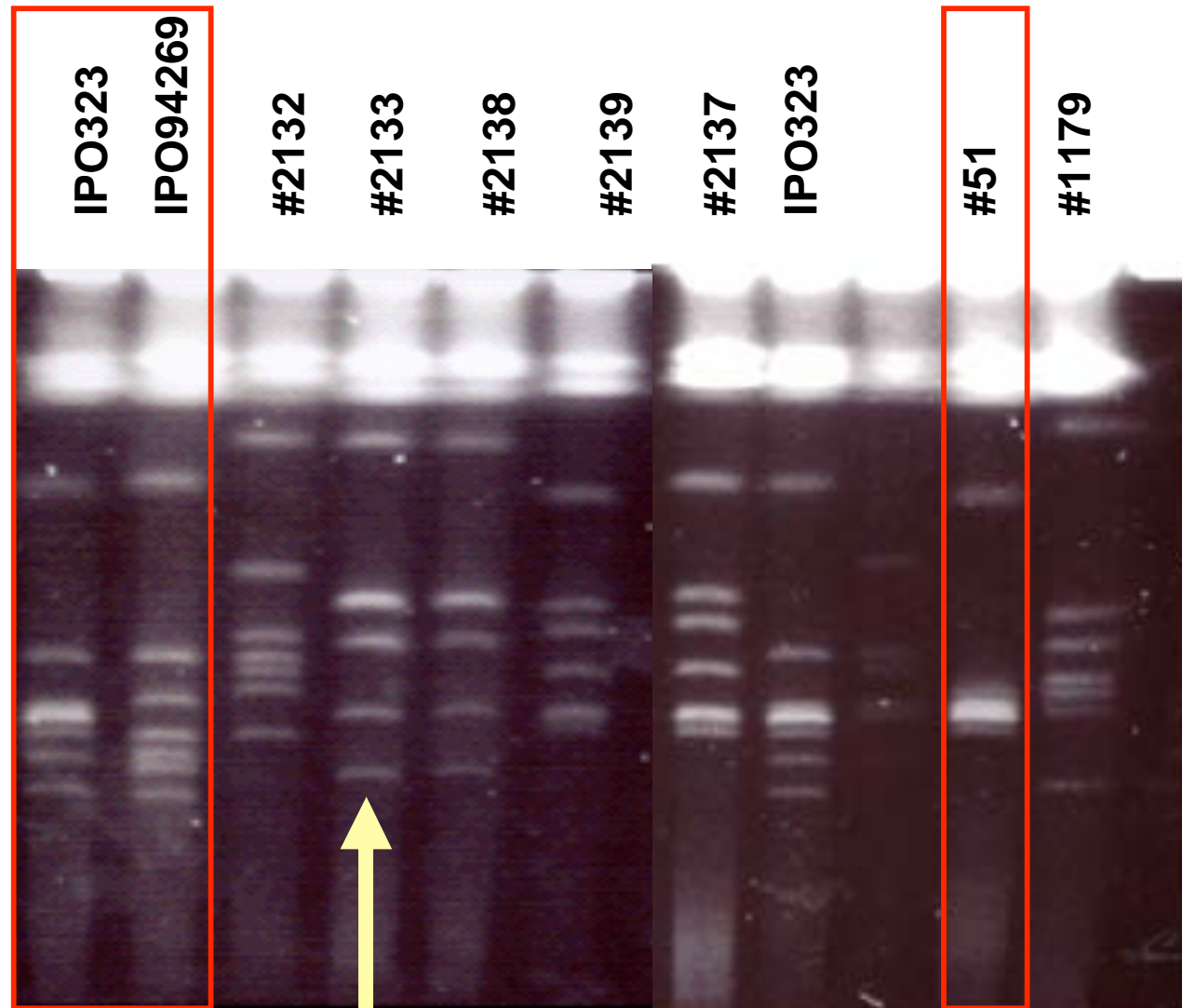


Chromosome length  
polymorphism (CLP)

Chromosome number  
polymorphism (CNP)



## PFGE: Chromosome length & chromosome number polymorphisms

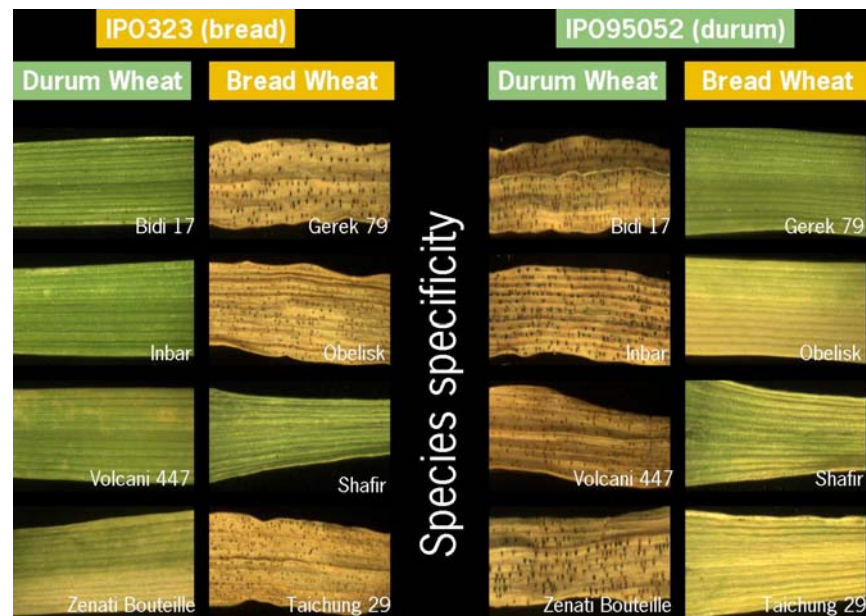


2133 progeny misses 3 chr. !

CLPs  
CNP

# Recent Genetic studies

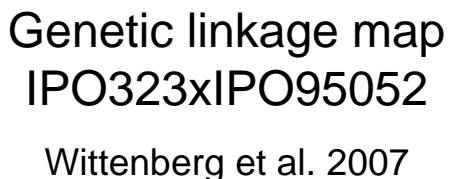
- Two high-density genetic linkage maps with over 1793 Diversity Arrays Technology (DART), 258 AFLP and 25 SSR markers from two Mapping populations:



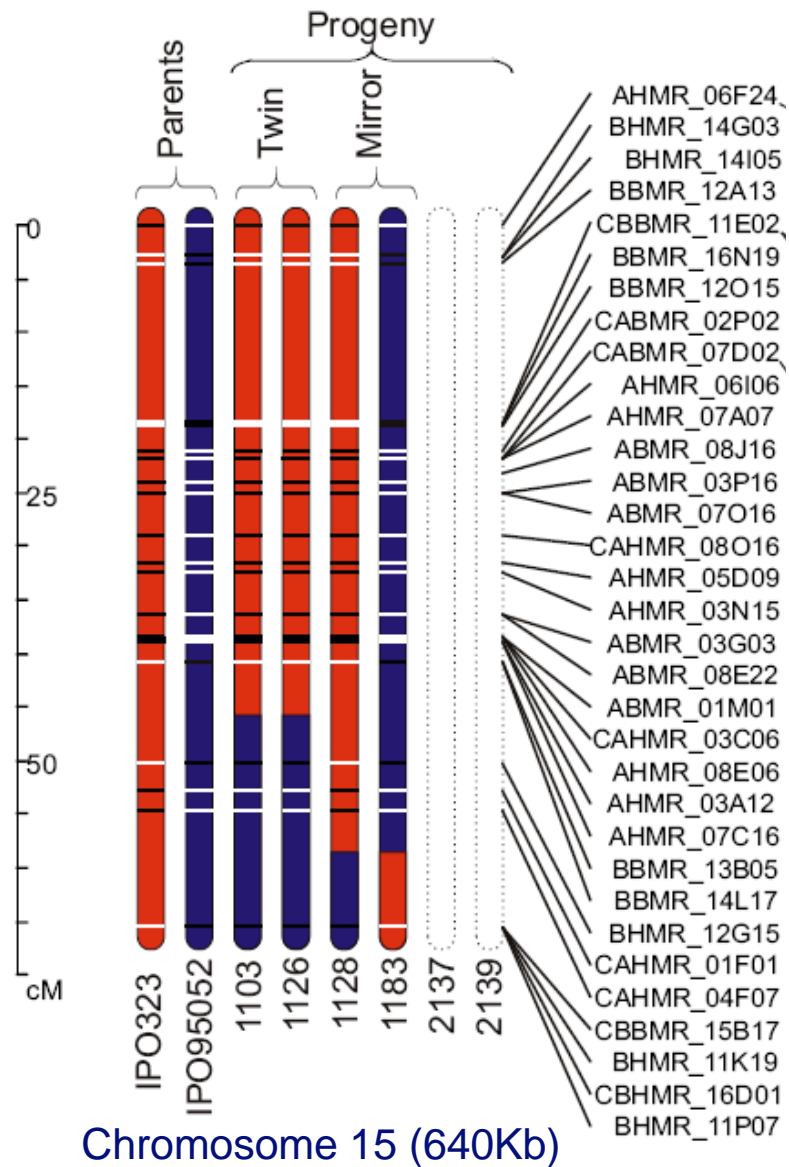
IPO323 (BW) x IPO94269 (BW)

IPO323 (BW) x IPO95052 (DW)



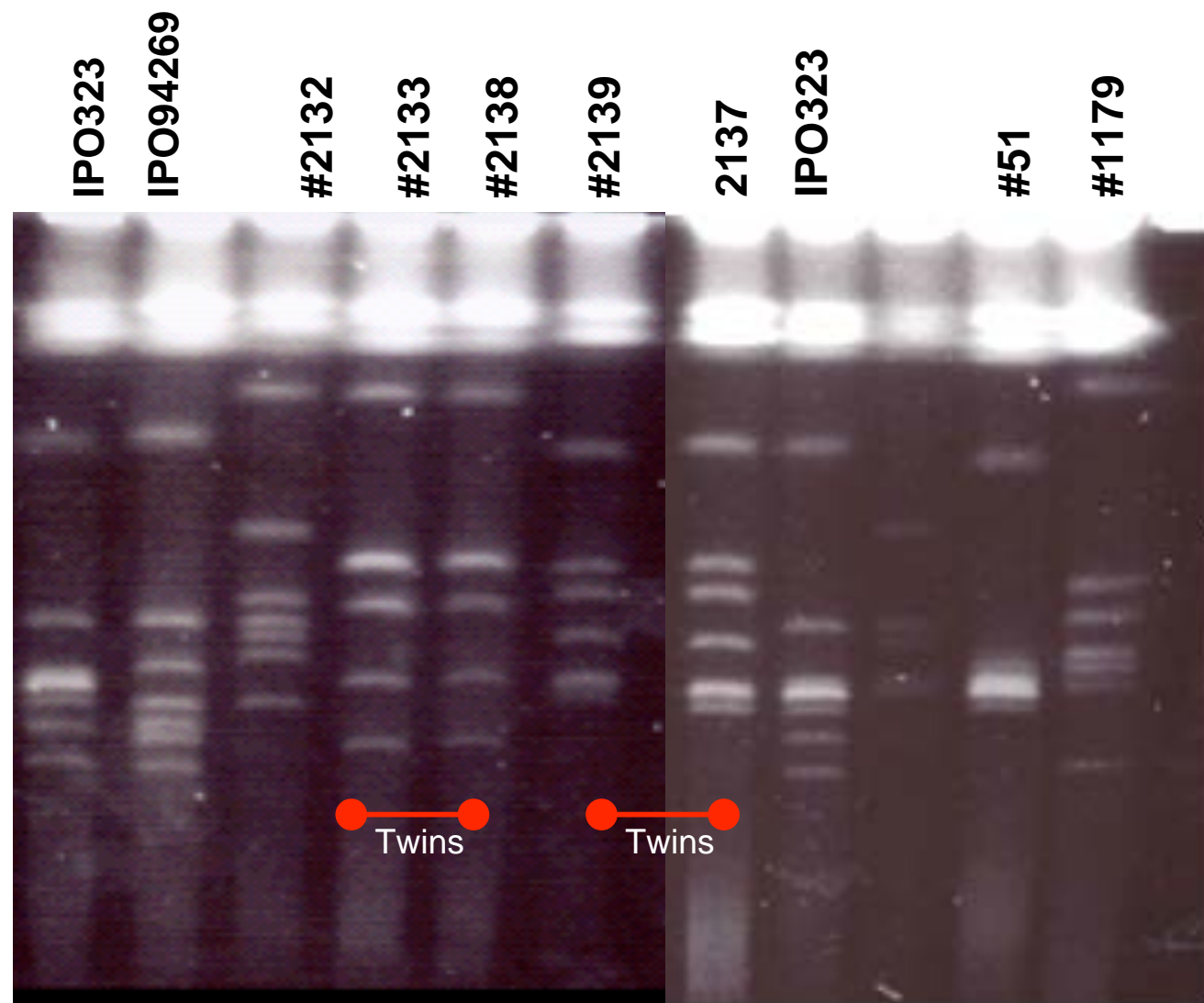


# Graphical genotyping: PROGENY TWINS & MIRRORS



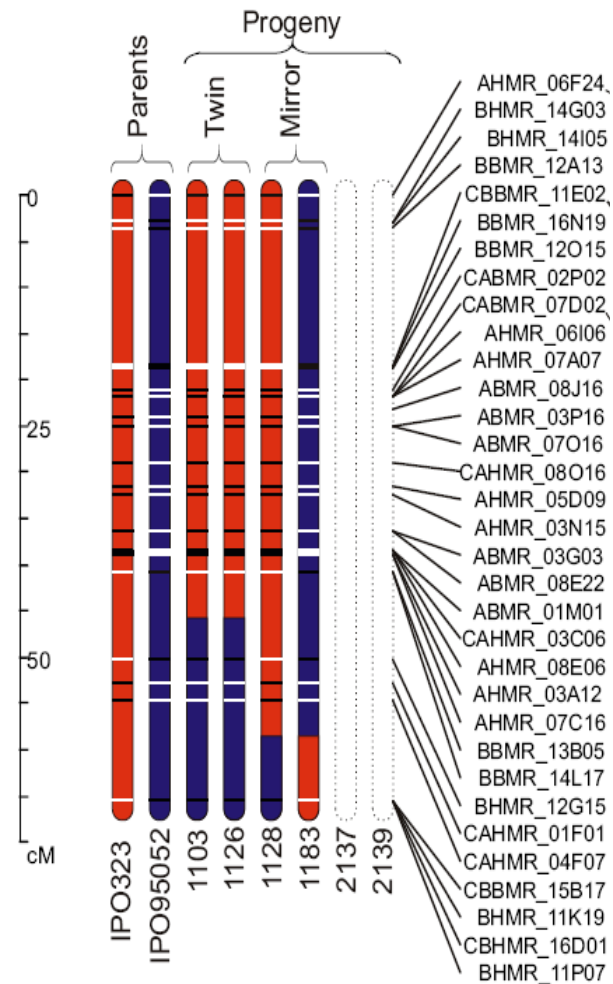


# PFGE: TWINS





# High-density linkage maps reveal frequent meiotically generated Chromosome Number Polymorphisms

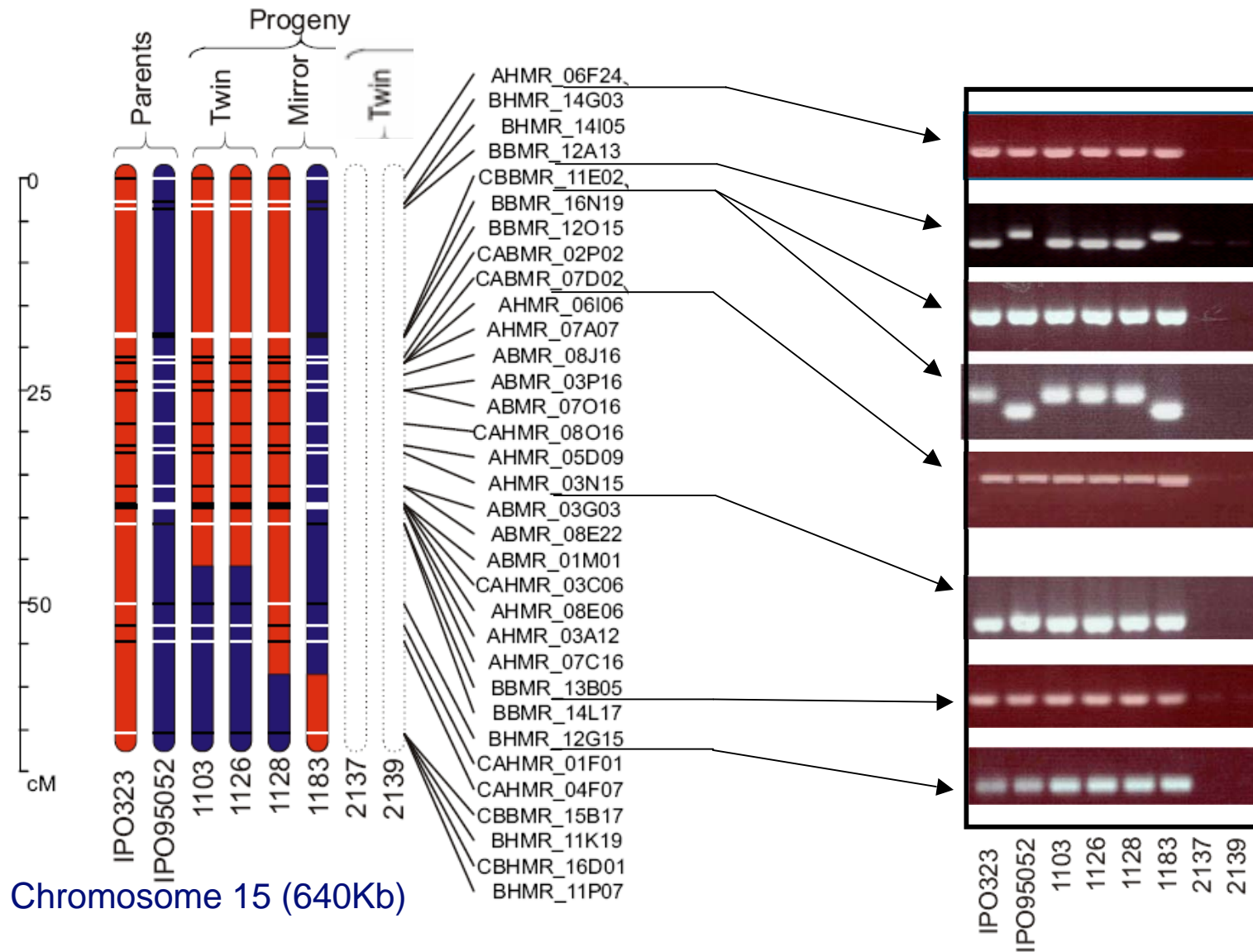


Chromosome 15 (640Kb)

Lack of one or more chromosomes in some of the progeny that were present in both parental isolates



# CNPs in *M. graminicola* isolates



# Non-Disjunction during Meiosis

Non-disjunction during meiosis I



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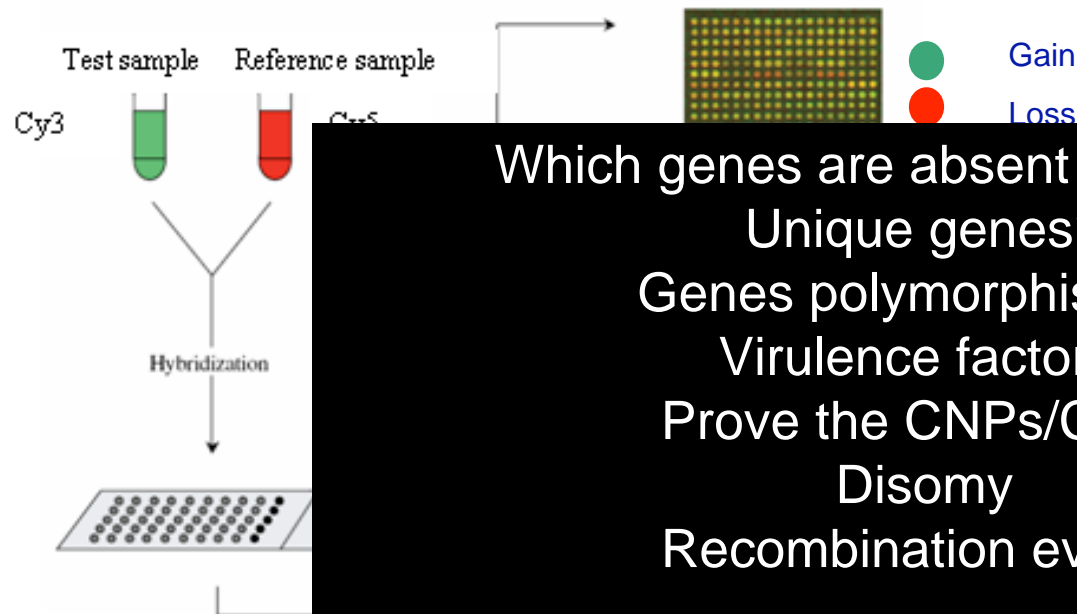
# NimbleGen Oligonucleotide array

Paul Klee, 1925  
*Ancient Sound*



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# Genome profiling on a oligonucleotide array



Which genes are absent or present?  
Unique genes?  
Genes polymorphisms ?  
Virulence factors?  
Prove the CNPs/CLPs  
Disomy  
Recombination events

Spotted once  
covering the  
(10Mb)

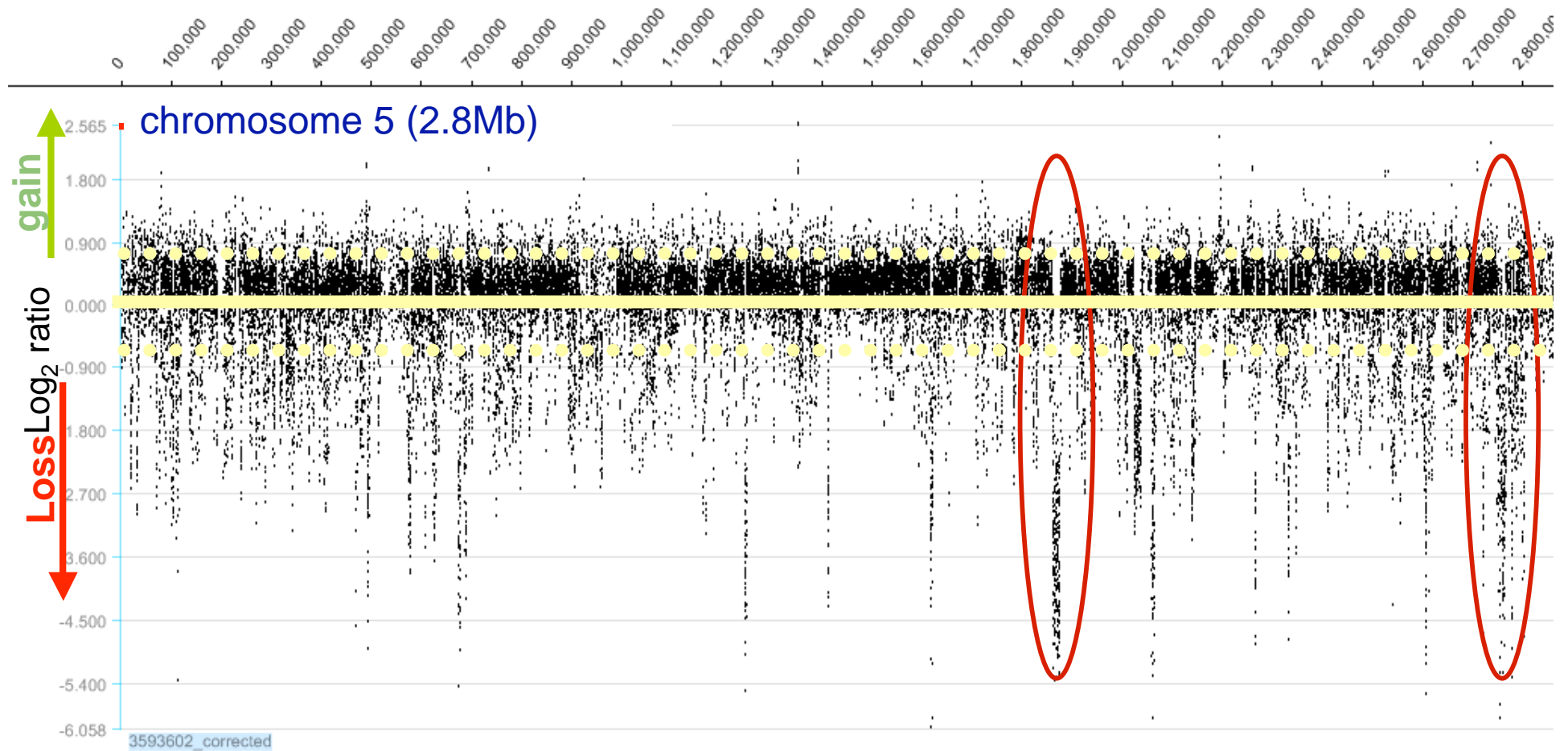
Wheat genome v 2.5  
9  
IPO94269

-Wheat genes  
= 334000 probes + additional control  
probes



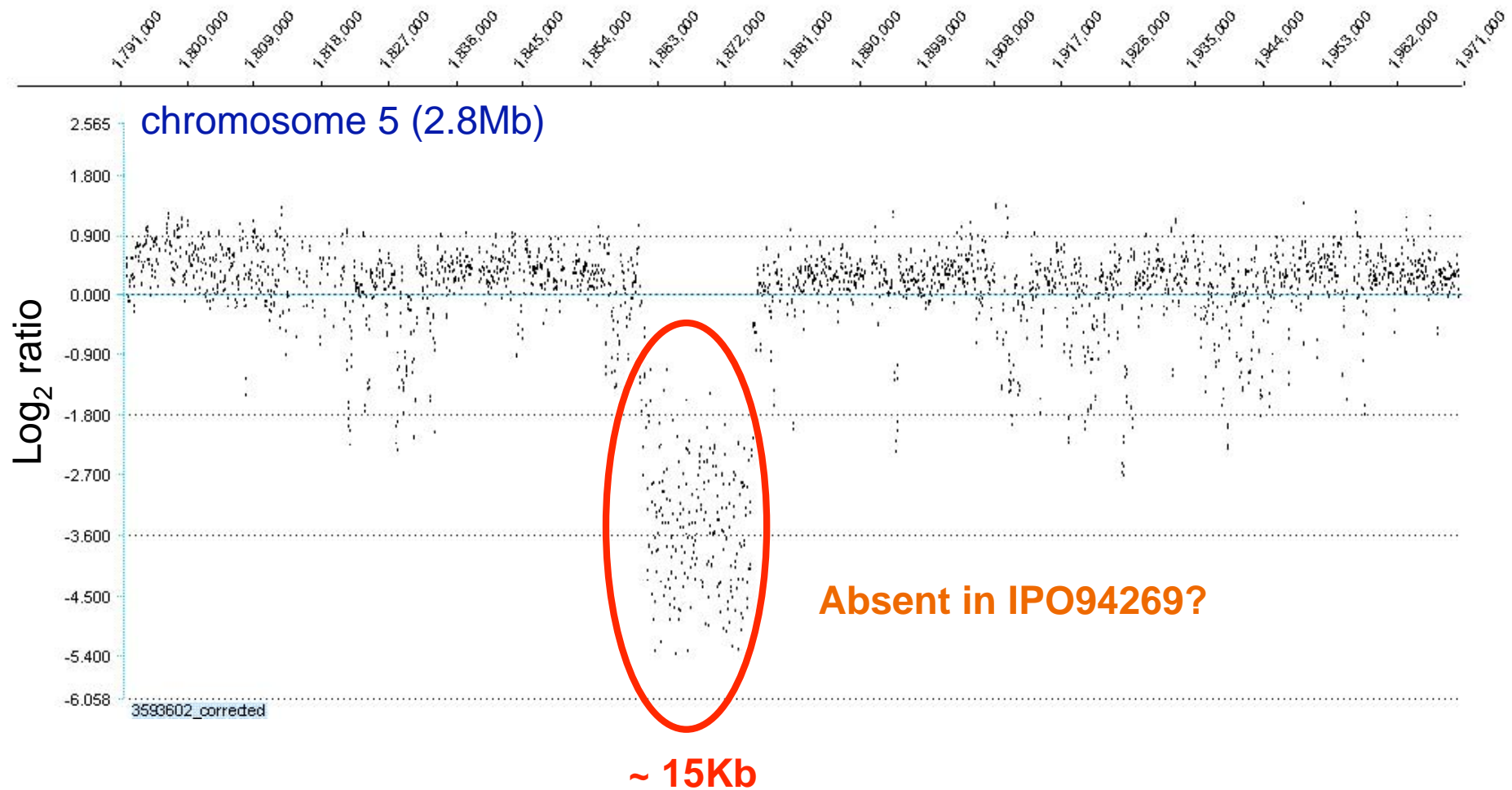


# Results: IPO323 BW/IPO94269 BW # chromosome\_5

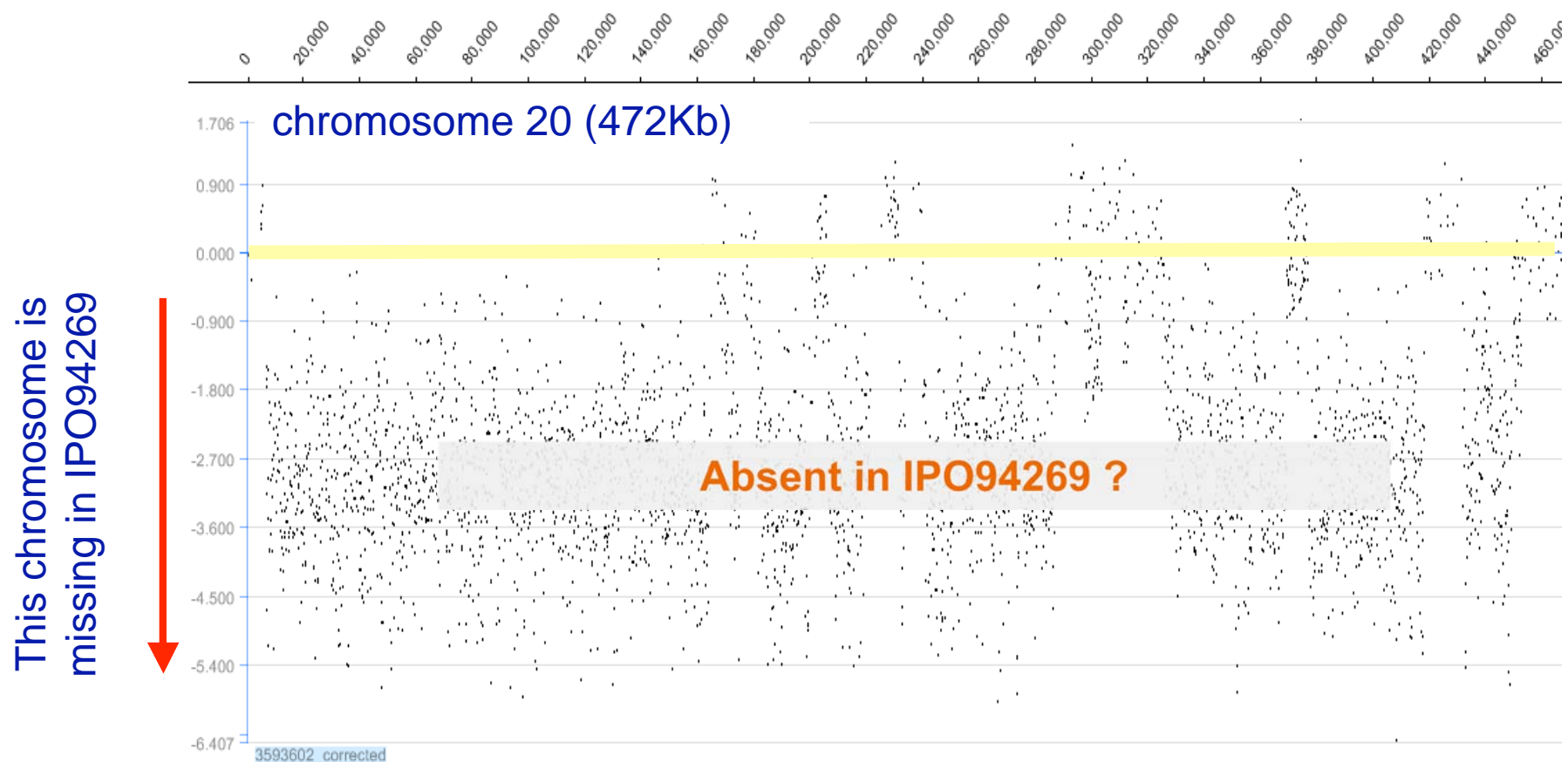




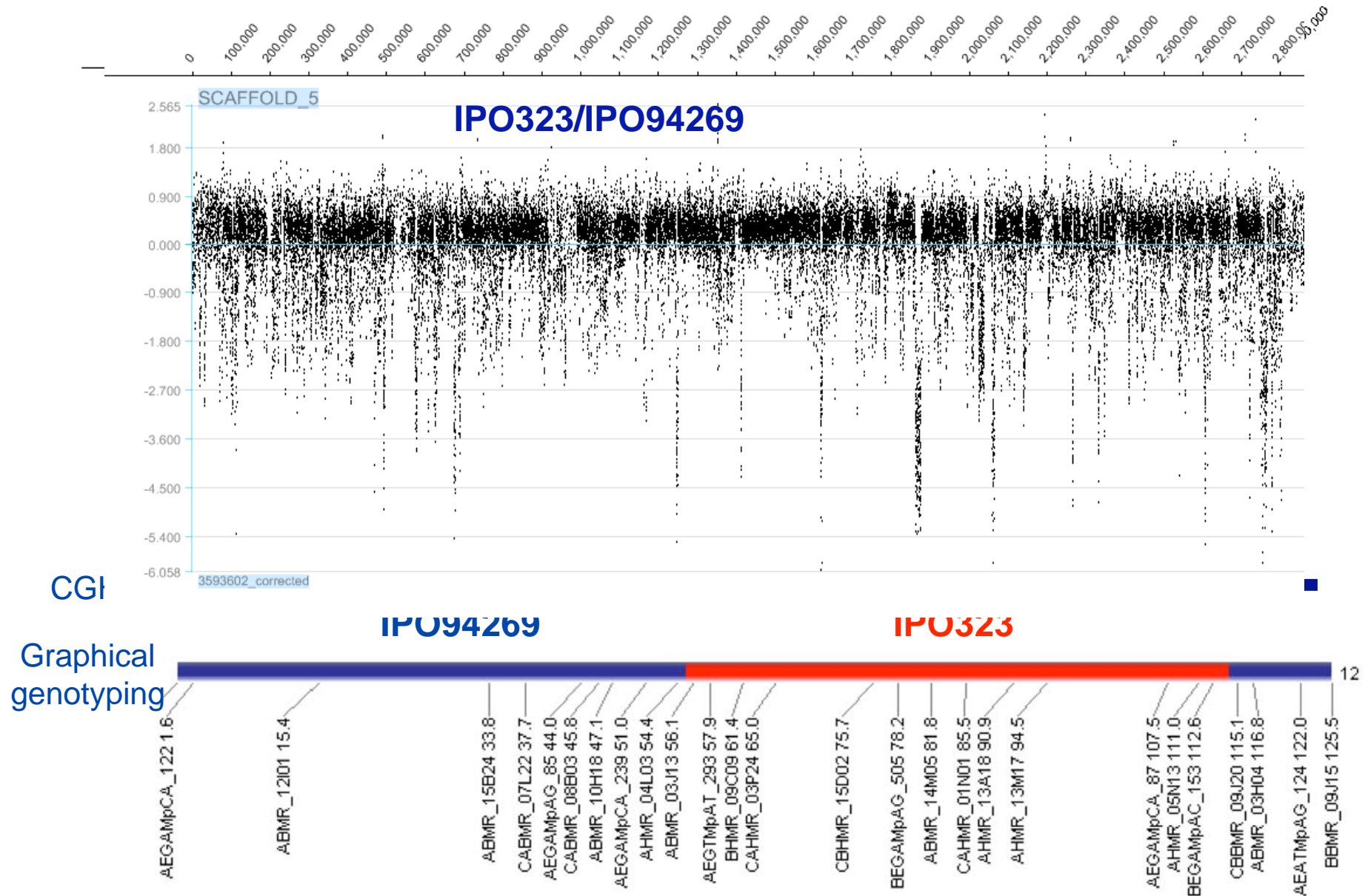
# VARIABILITY: e.g IPO323 / IPO94269



# Copy Number polymorphism: e.g IPO323 / IPO94269



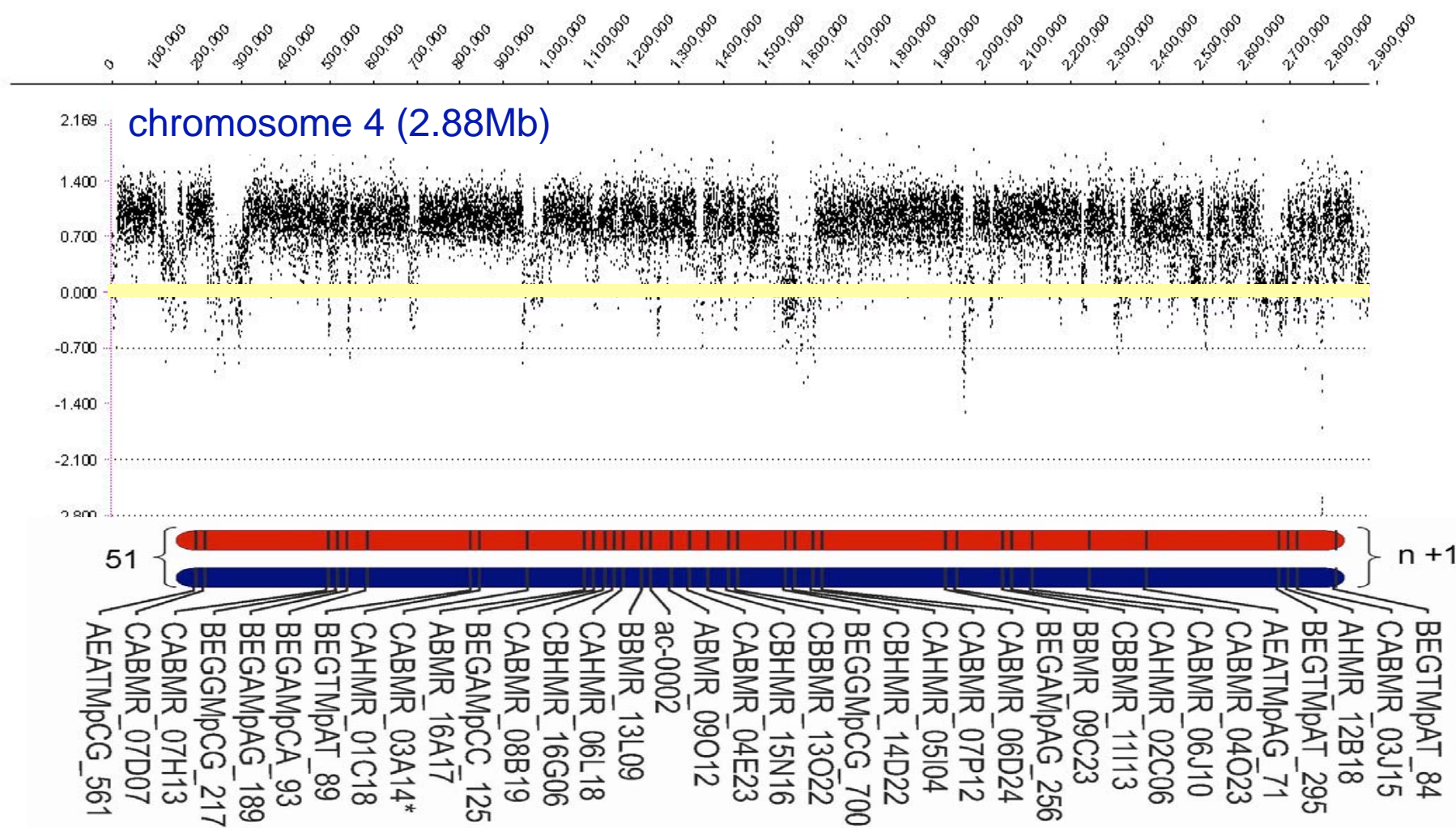
# Recombination break-points: e.g IPO323 / #51

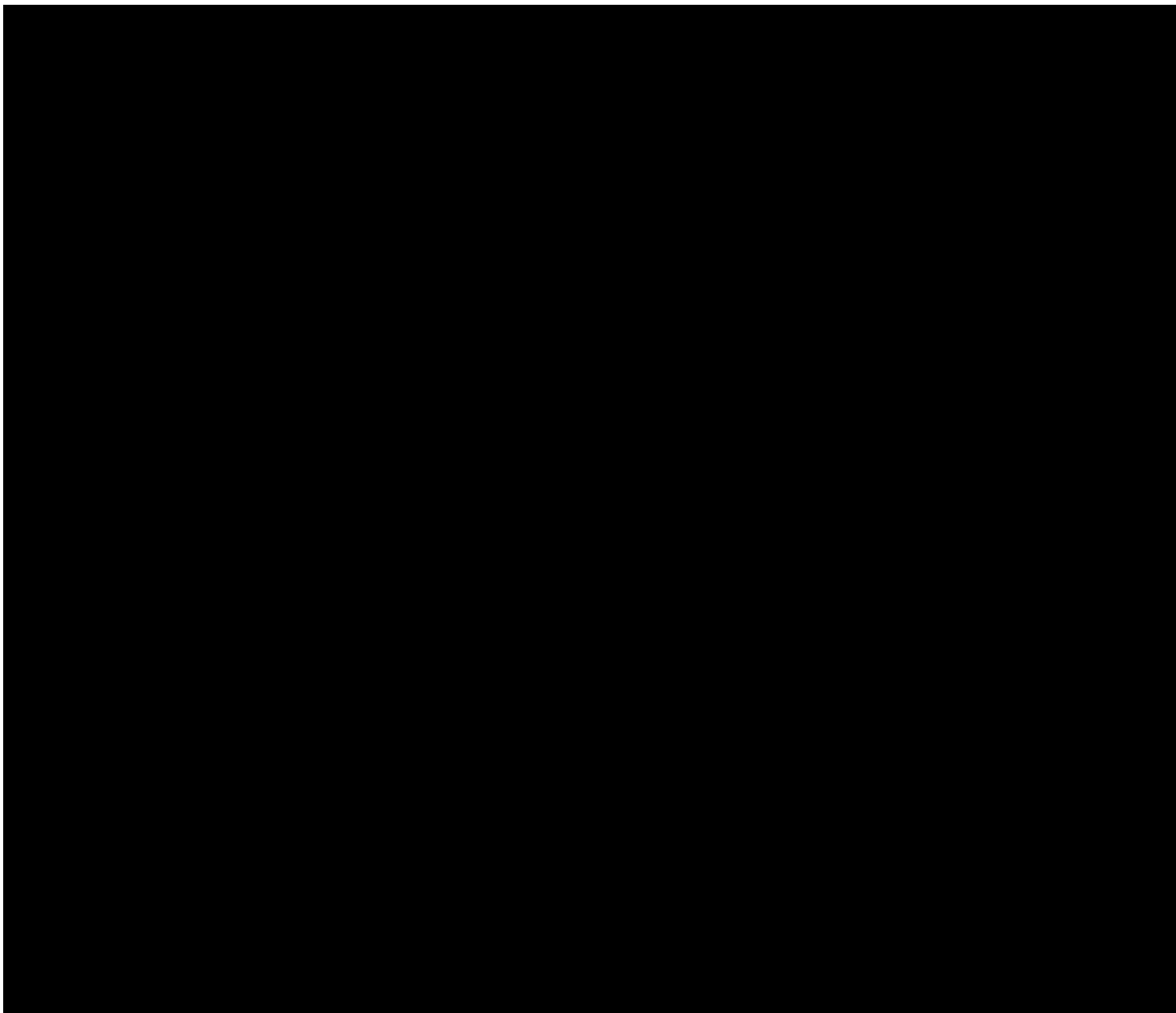




# Disomy: e.g IPO323 / #51

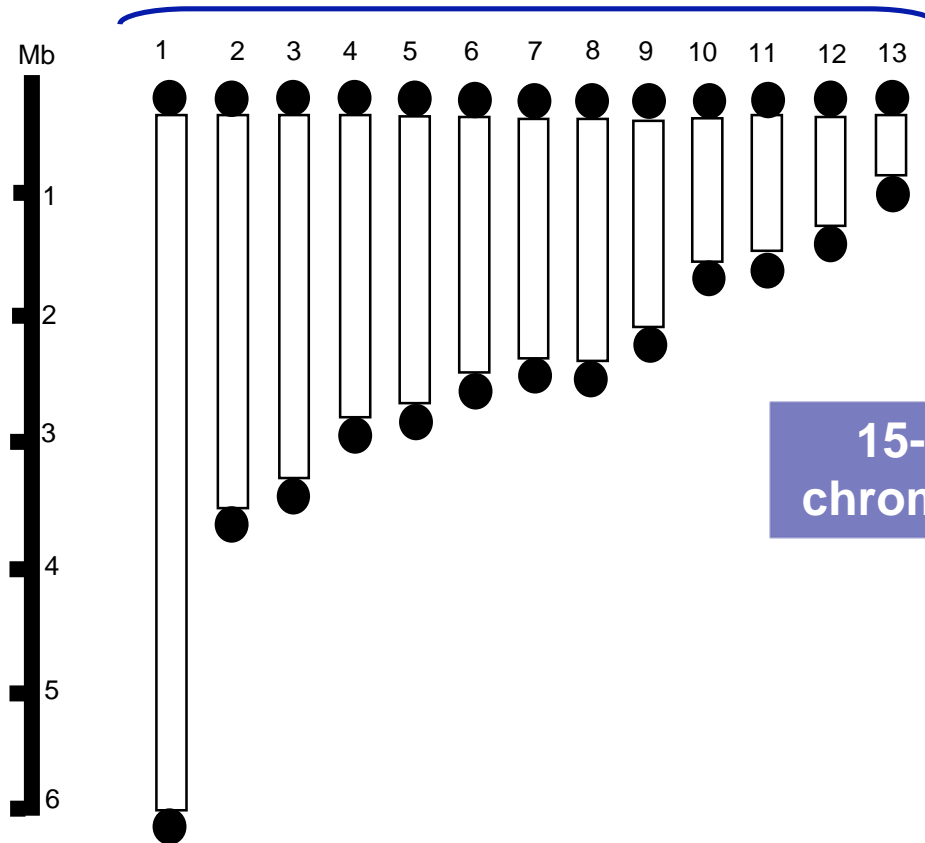
#51 is diploid for chromosome 4



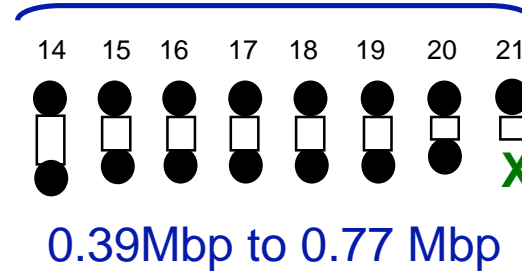


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## Core set of chromosomes



## Supernumerary, dispensable chromosomes



15-20% progeny lack one or more chromosomes present in both parents

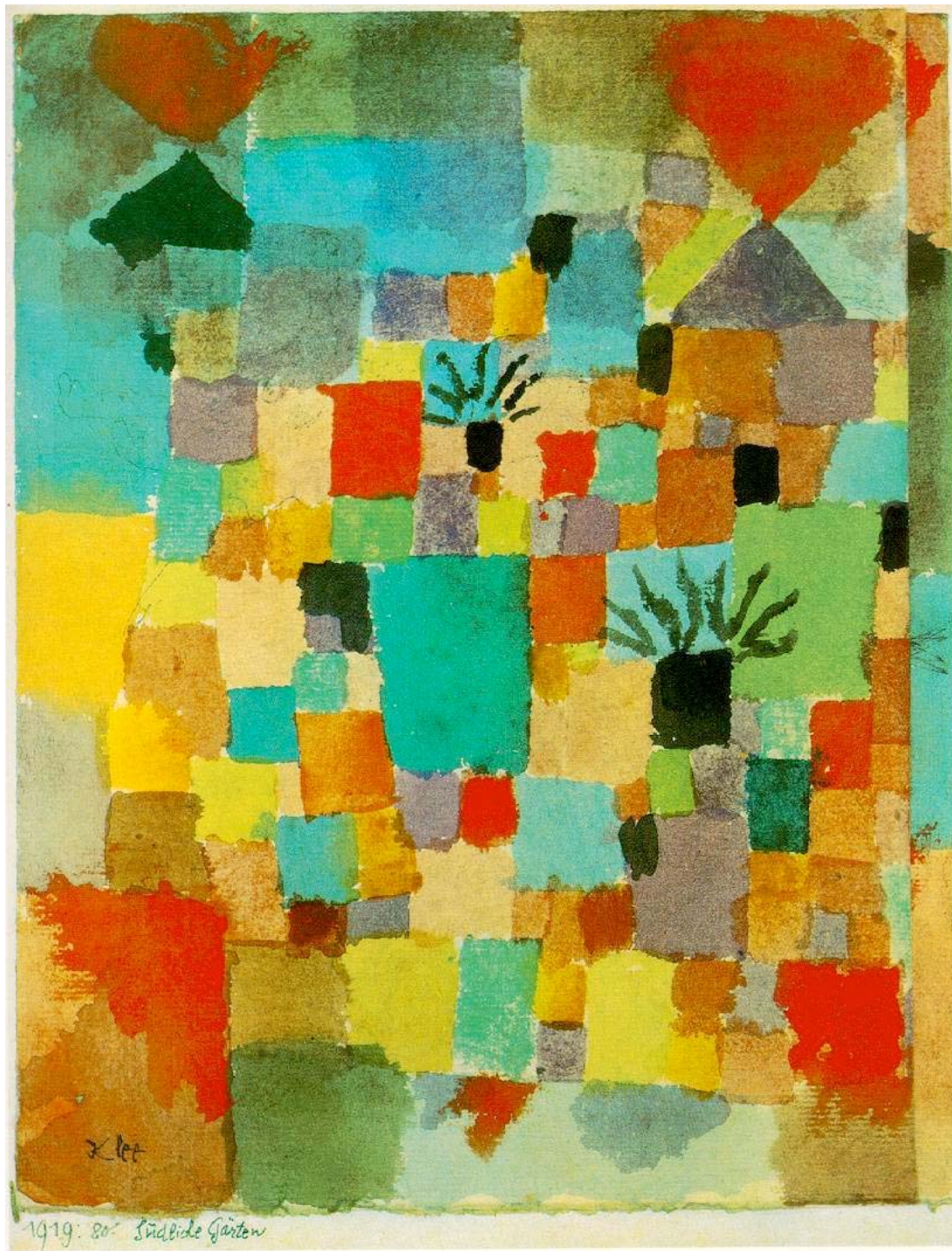




# CONCLUSION : Genome diversity & plasticity

- Large “INDELS” are an important source of genetic variability between isolates as shown with CGH
- Graphical genotyping/ PCR/CGH: demonstrated chromosomal number polymorphisms between the parental isolates and progeny and confirmed the absence of three complete chromosomes in isolate #2133, and two complete chromosomes in isolate IPO94269 corroborating our previous genetic linkage analysis and karyotyping
- CGH is a powerful tool to detect variability, disomy, CNPs and recombination breakpoints
- CGH will enable us to understand the genomic dynamics of this pathogen and its impact on pathogenicity and fungicide resistance





Paul Klee, 1919  
*Southern Tunisian Gardens*



# Acknowledgements

## Plant Research International

Gert Kema  
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Charles Crane

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Moncef El Harrabi

# THANK YOU

Paul Klee, 1919

*Southern Tunisian Gardens*



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