



The Roles of Fluorescence *in situ* Hybridization (FISH) To Pachytene Chromosomes in Sequencing the Genome of Tomato

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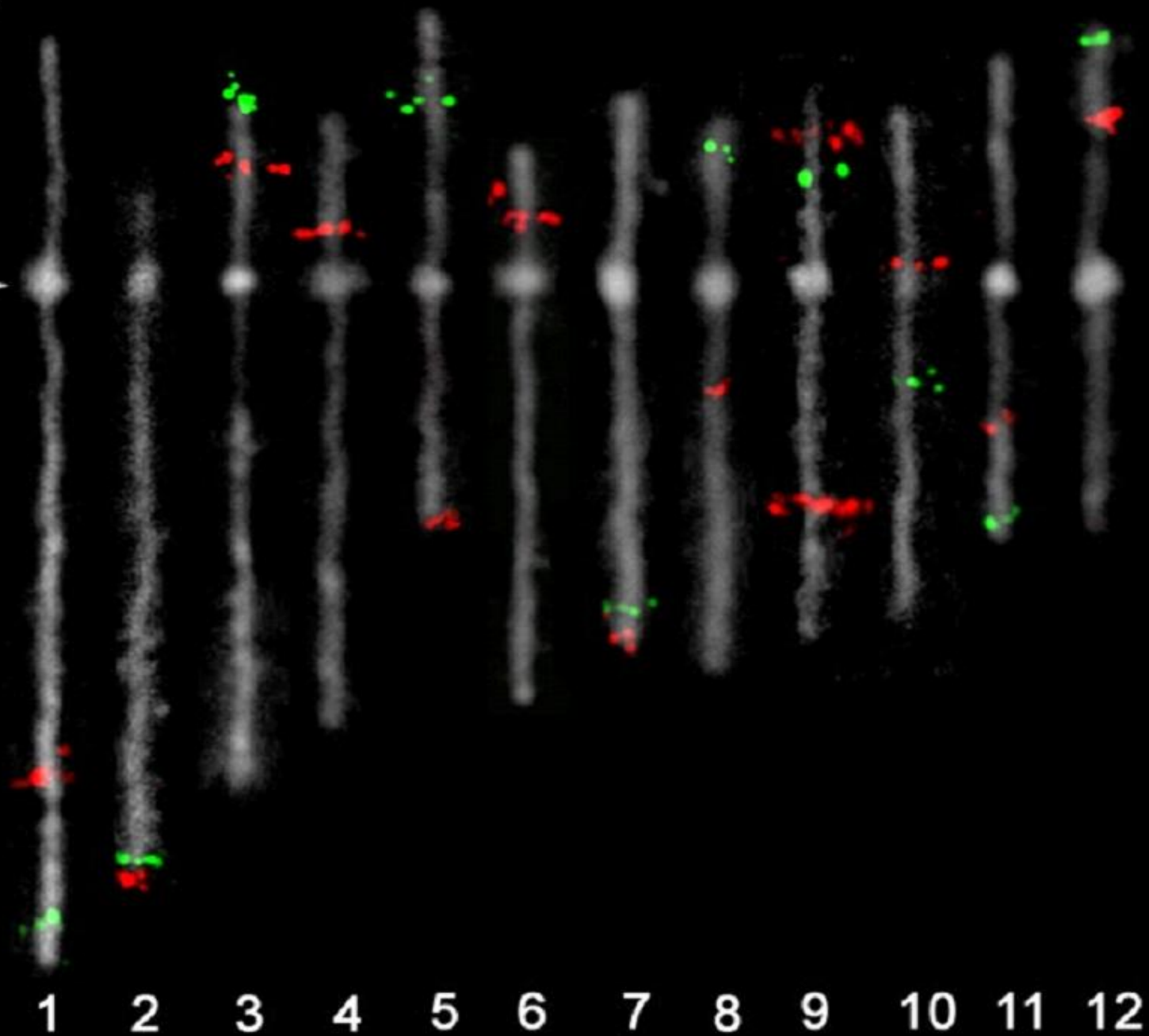
Tomato

(Solanum lycopersicum)

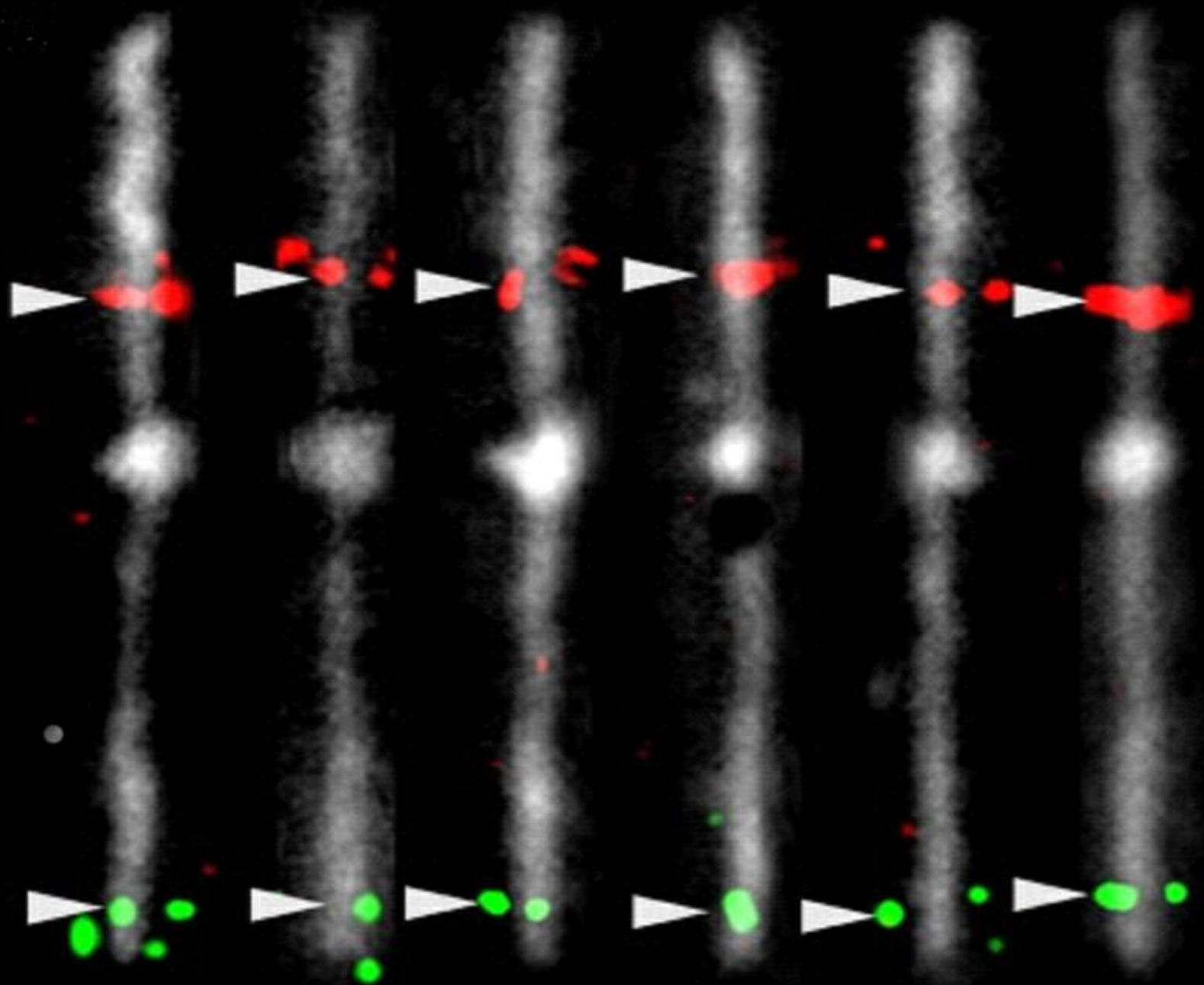
$1C = 0.95 \text{ pg} = \sim 917 \text{ Mb}$

$2n = 2x = 24 \text{ chromosomes}$

A



B





New Sequencing Technologies

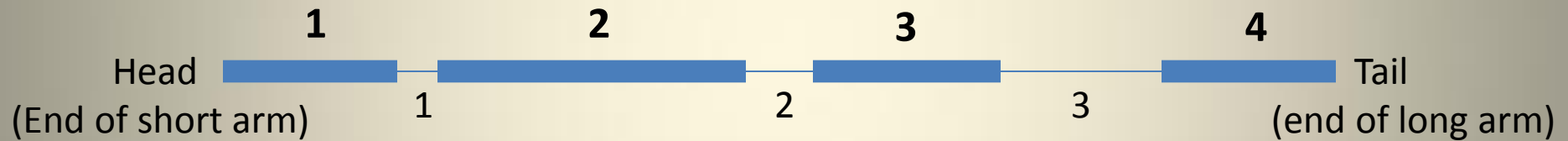
454

Illumina

SOLiD

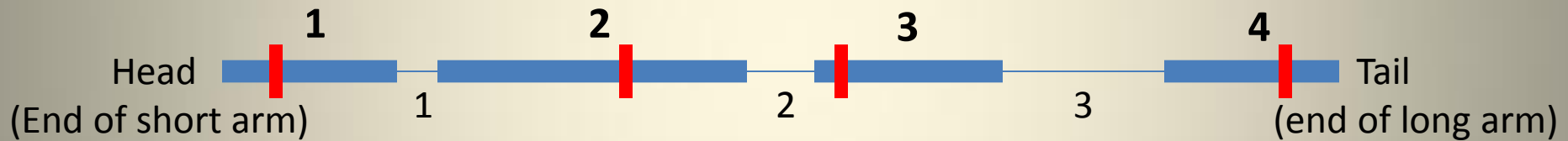
Pseudomolecule

Scaffolds 1-4



Gaps 1-3

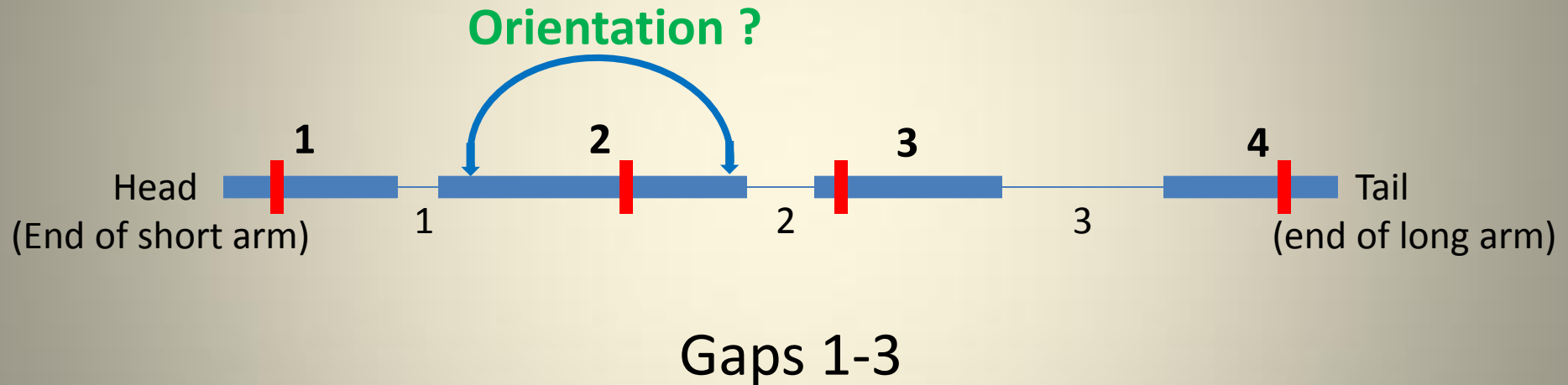
One mapped molecular marker
or
one BAC on a Scaffold located by FISH Permits
assignment of the scaffold to a
linkage group/chromosome
and indicates order of scaffolds.



Gaps 1-3

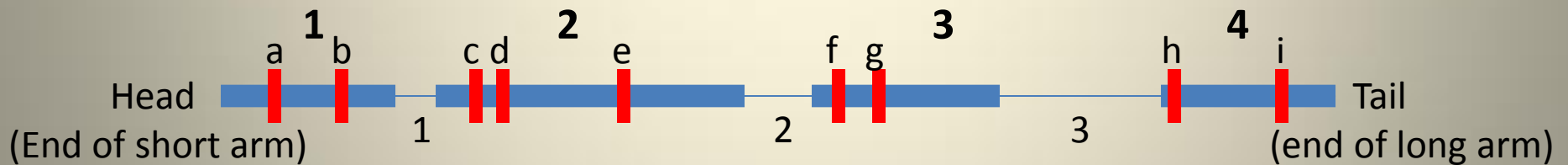
Pseudomolecule

**One molecular marker
or
one BAC located by FISH
on a scaffold does not permit orientation of the scaffold
in regard to the head and tail of the pseudomolecule.**



Two or More Molecular Markers or Two or More BACs Located by FISH Determine

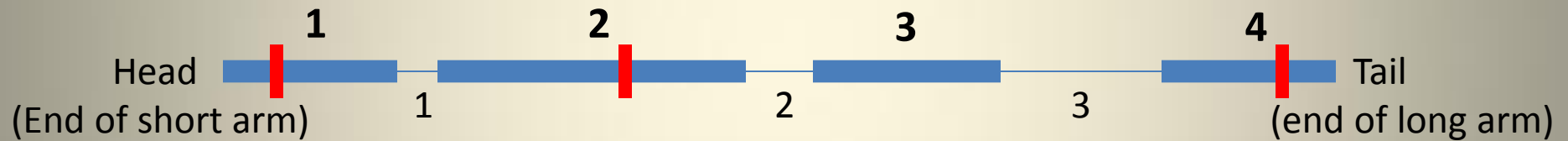
Scaffold Orientation



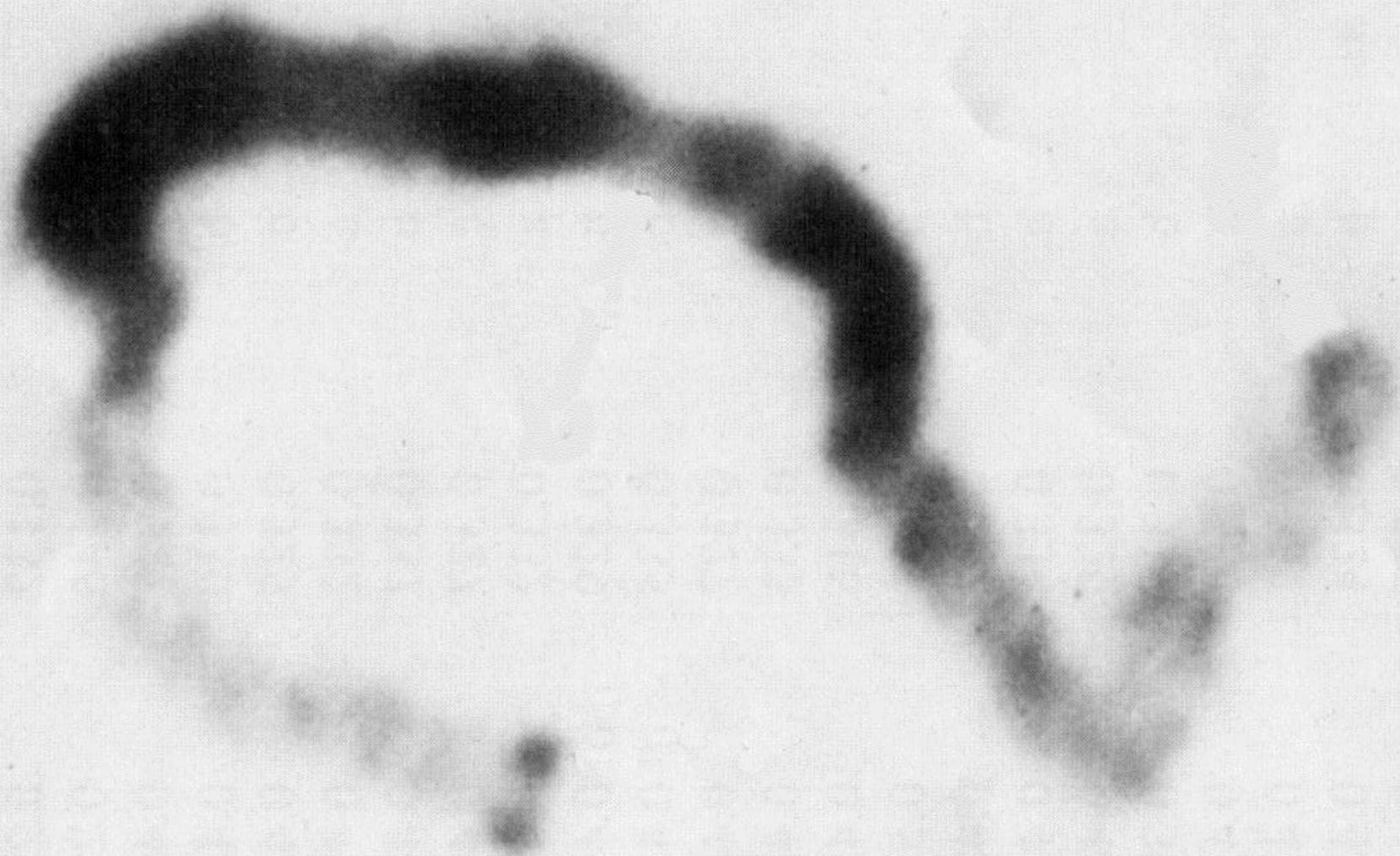
Gaps 1-3

One Molecular Marker per Scaffold?

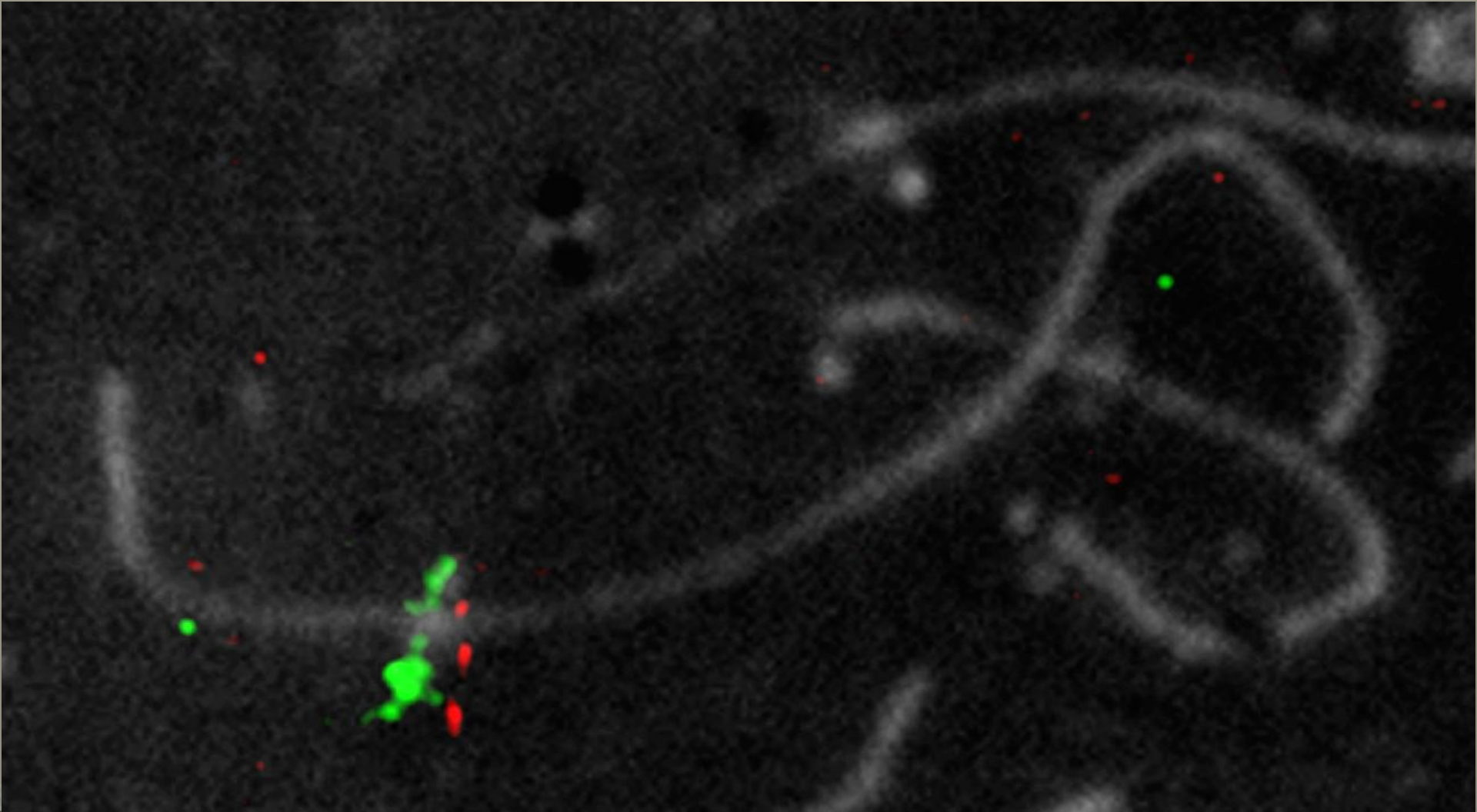
Scaffold 1-4 order



Gaps 1-3

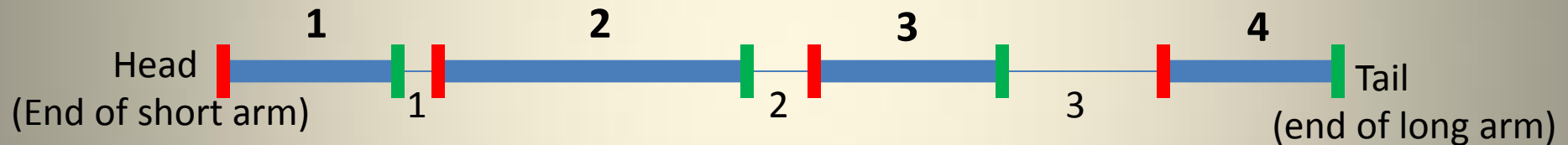


BAC FISH probes can locate scaffolds accurately on chromosome structure regardless of crossover patterns.



Two terminal BAC **FISH** Markers per scaffold permit estimates of gap sizes.

Scaffold 1-4 order



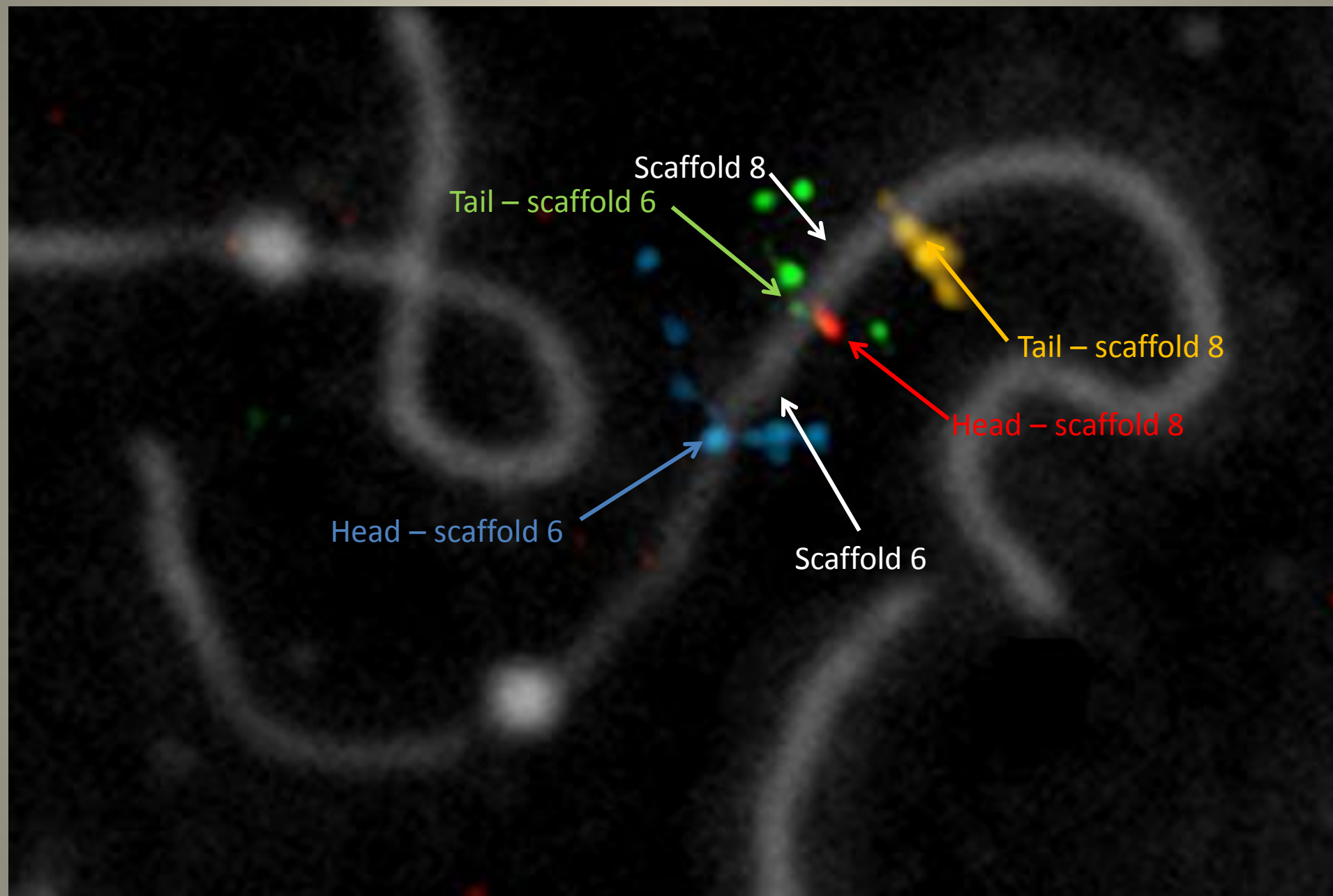
Gaps 1-3

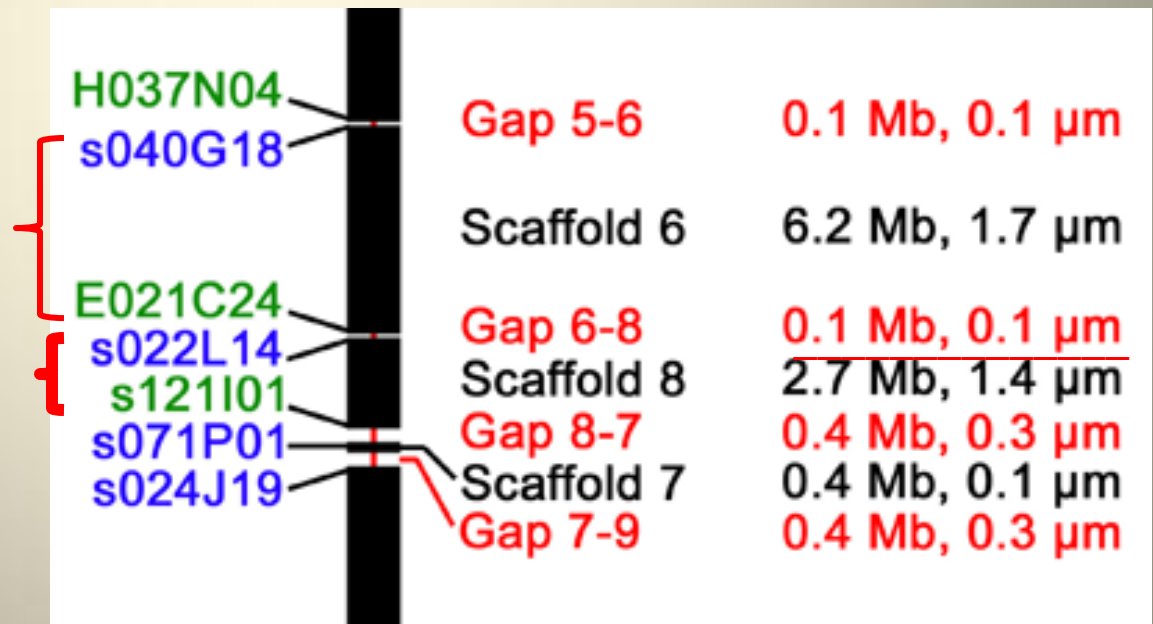
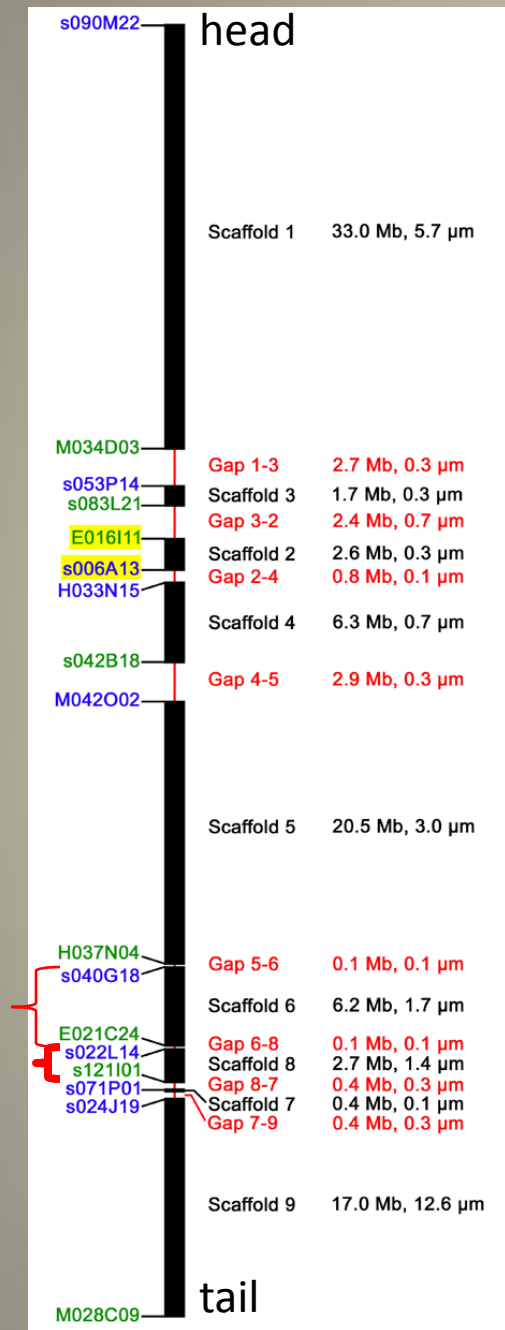
Pseudomolecule

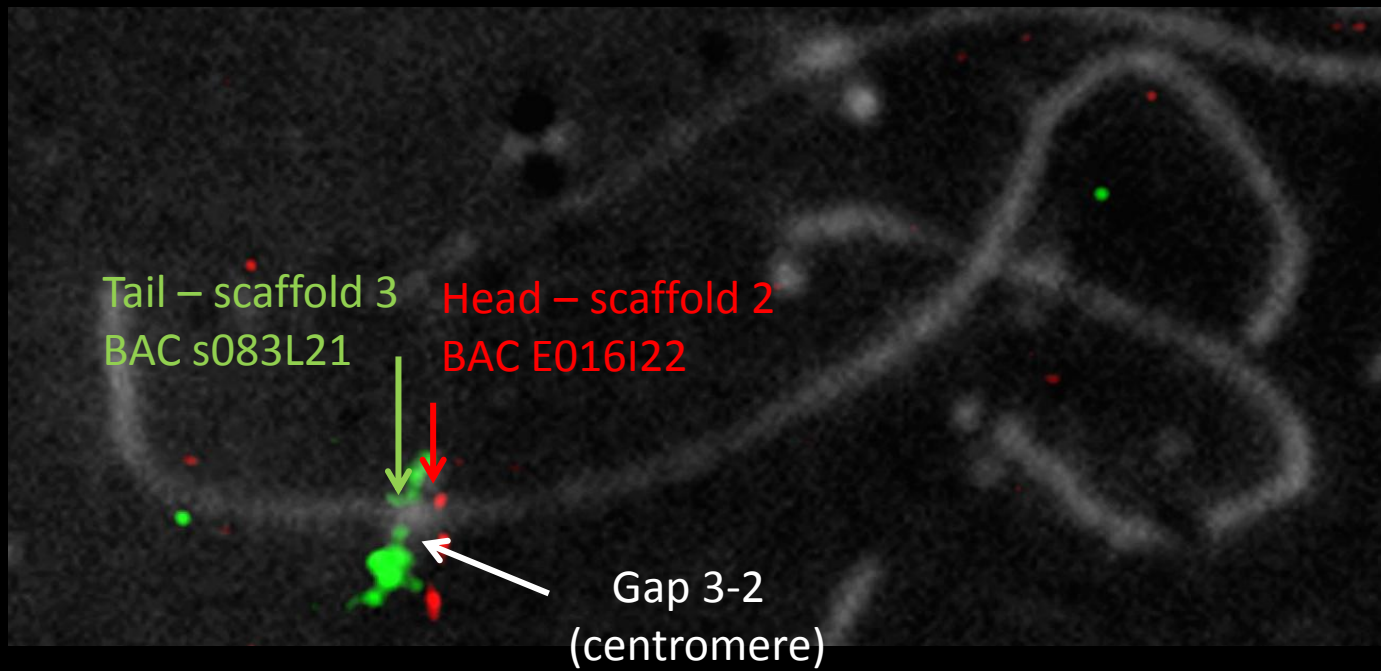
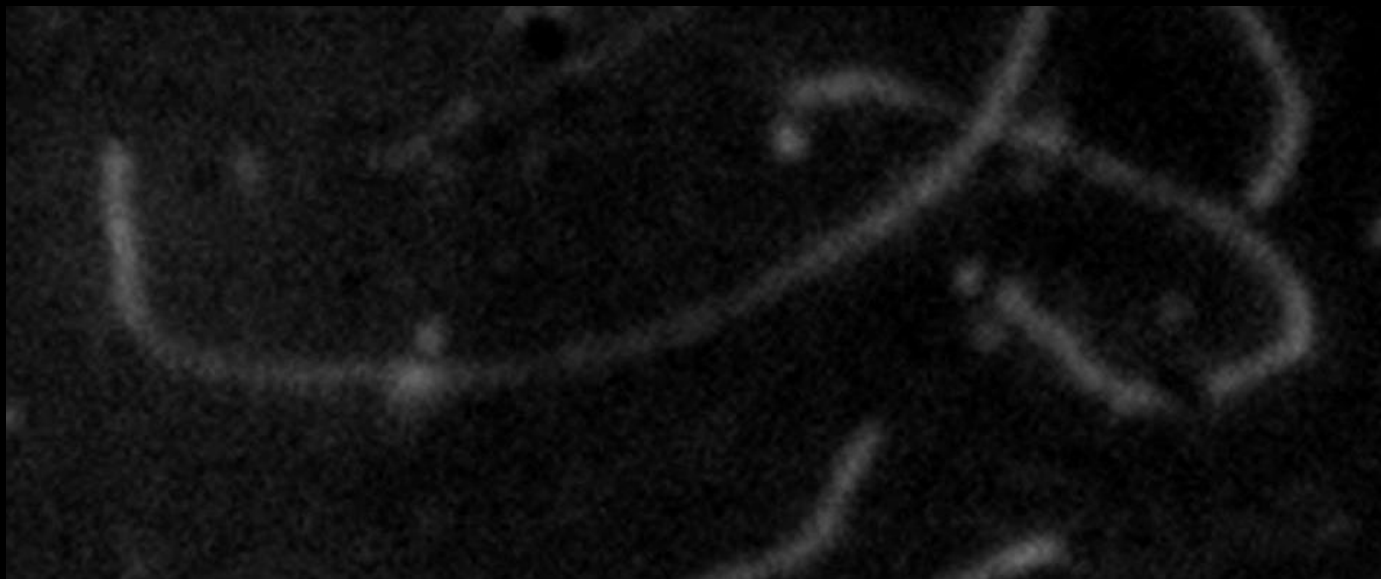
1.5 Mb/ μ m of SC in euchromatin

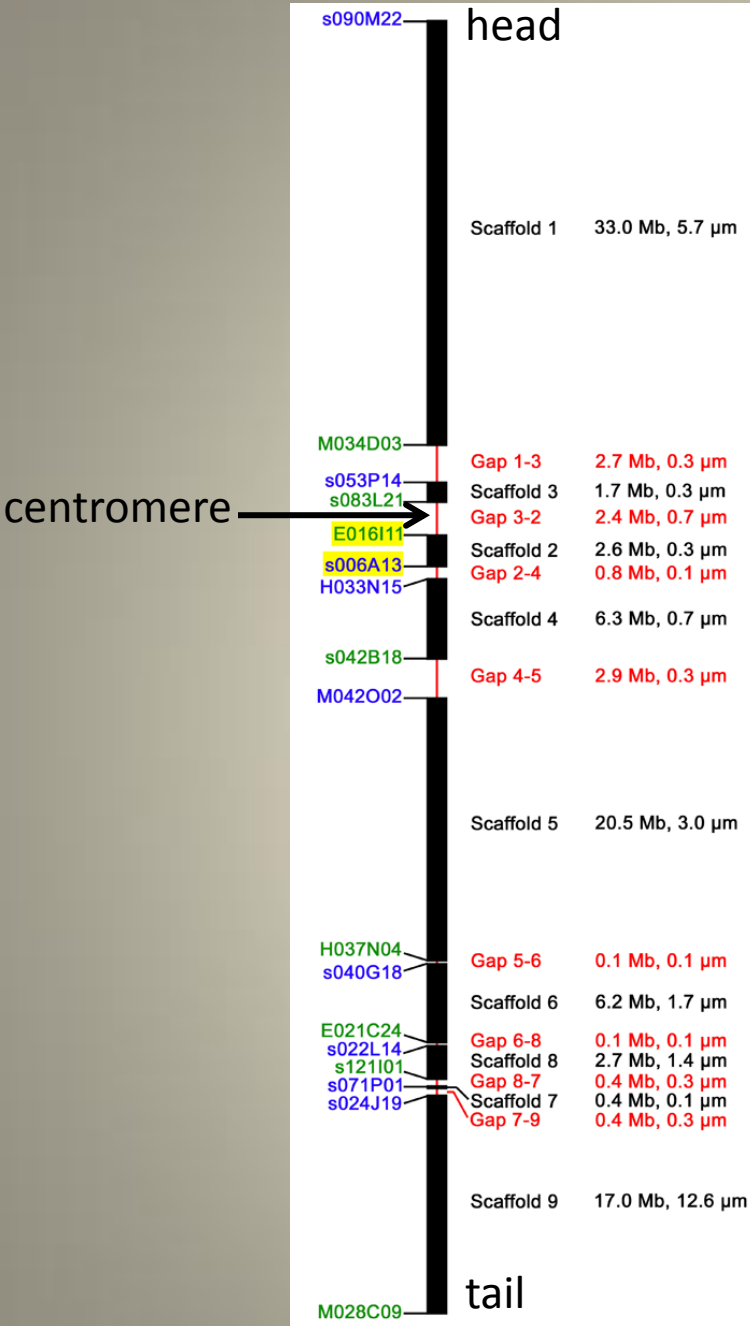
8.5 Mb/ μ m of SC in heterochromatin

3.5 Mb/ μ m of SC in centromeres









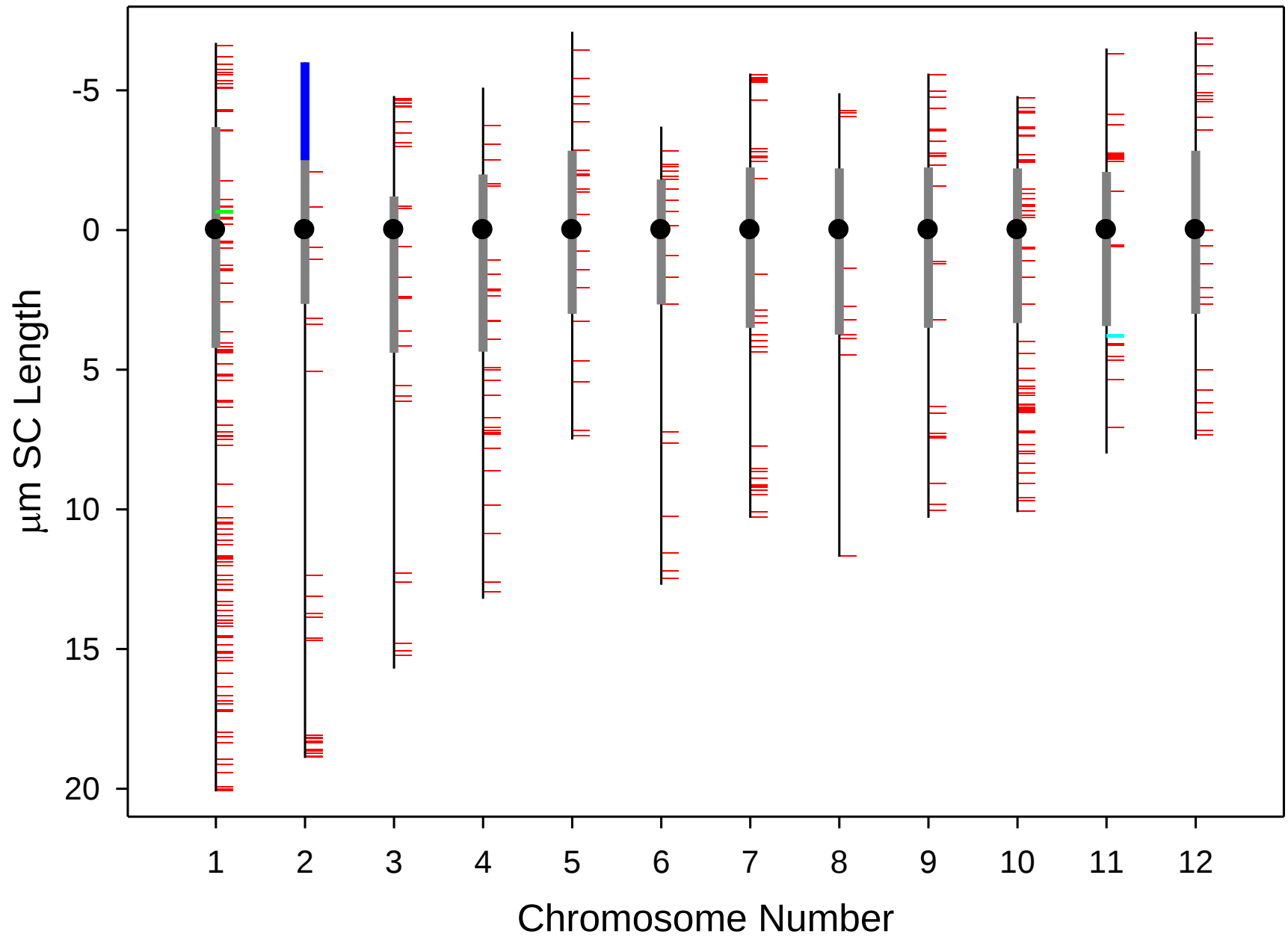
Chromosome 1 = 100.2 Mb

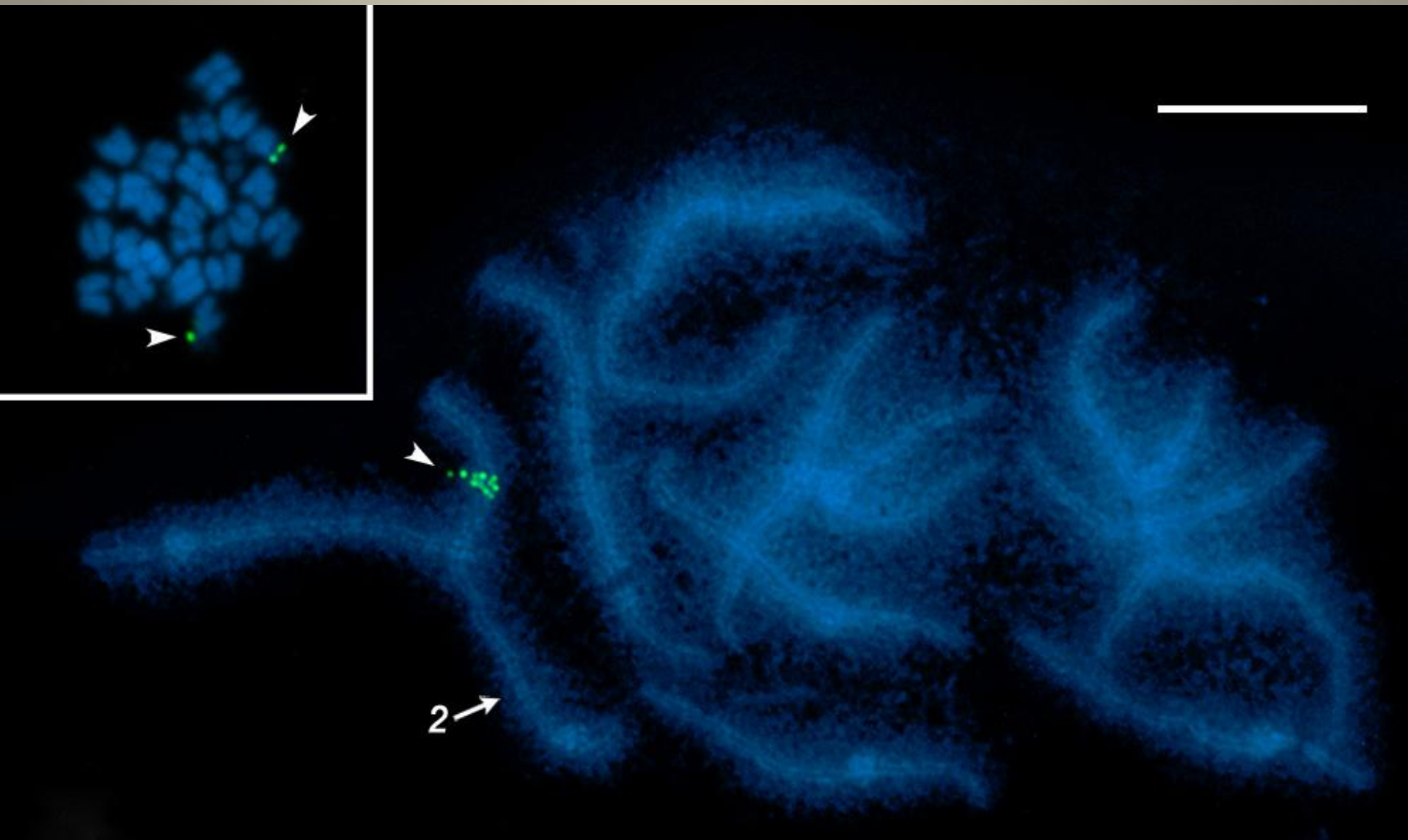
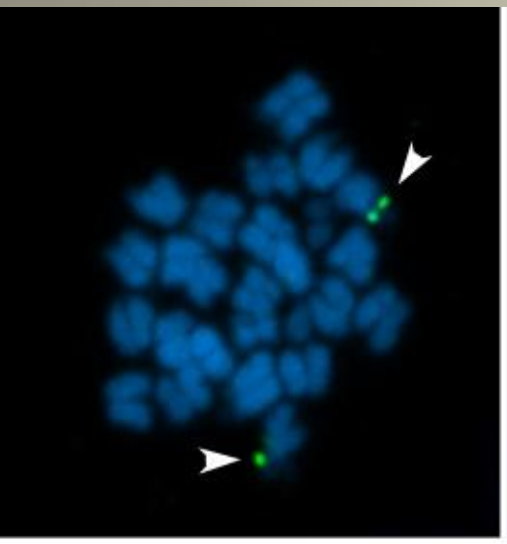


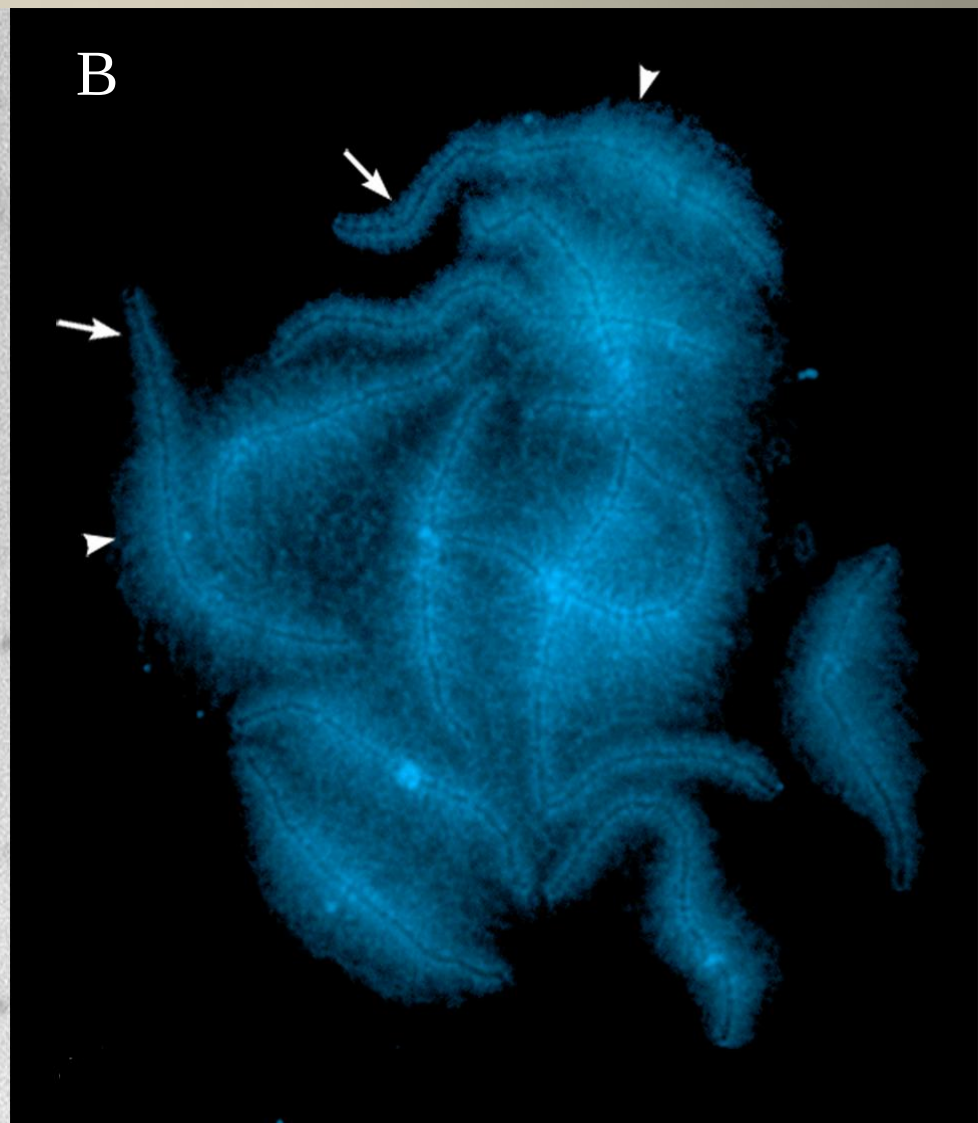
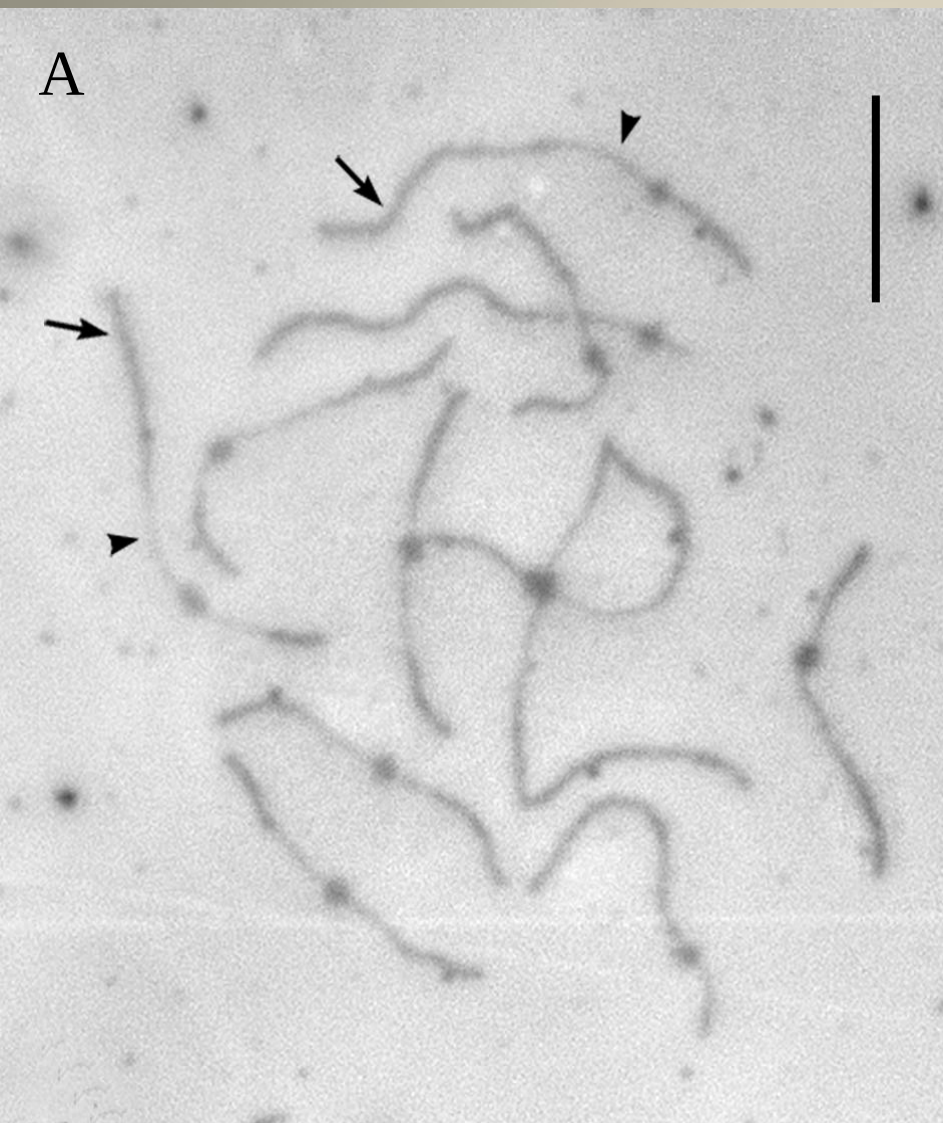
$$3.5 \text{ Mb}/\mu\text{m} \times 0.7 \mu\text{m} = 2.4 \text{ Mb}$$

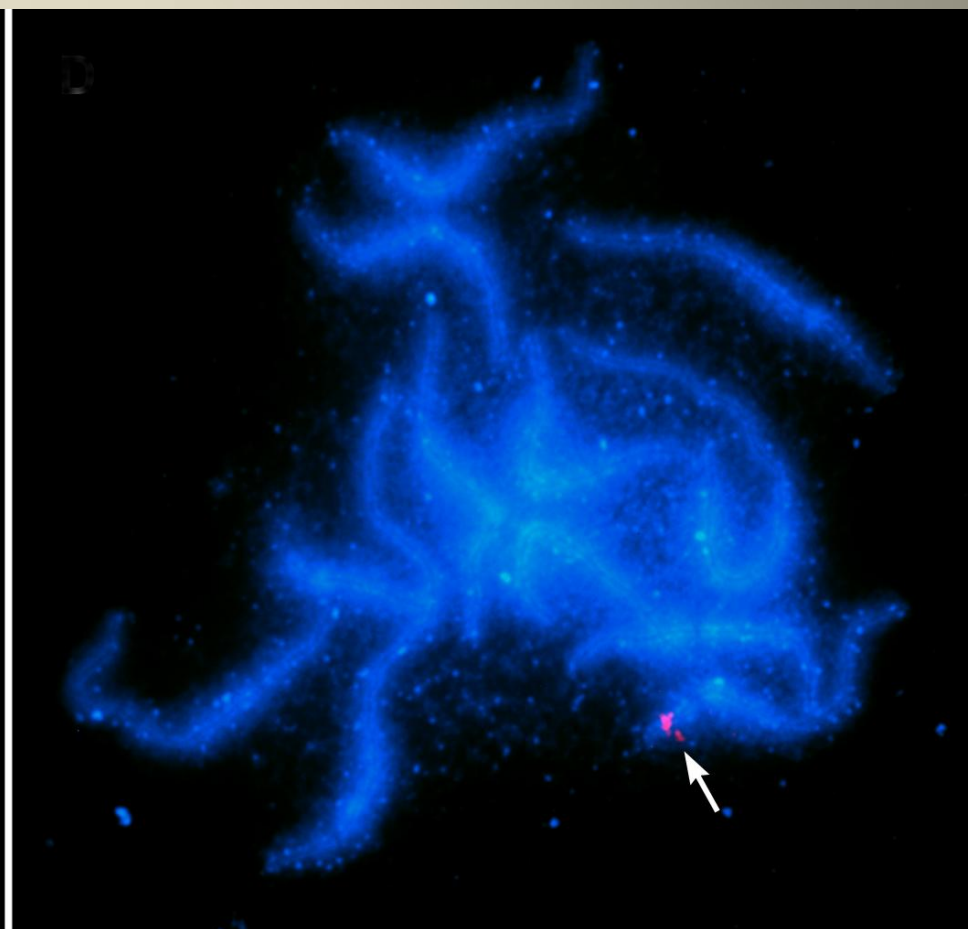
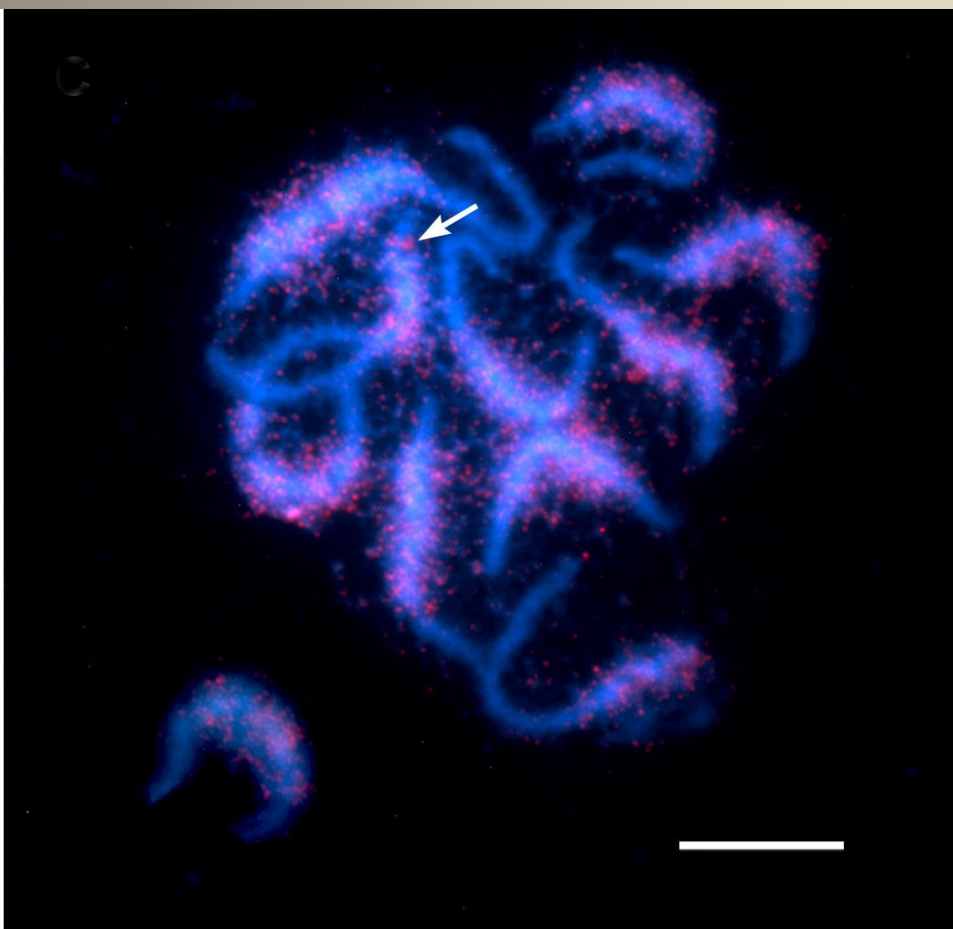
Gaps and Zero BACs

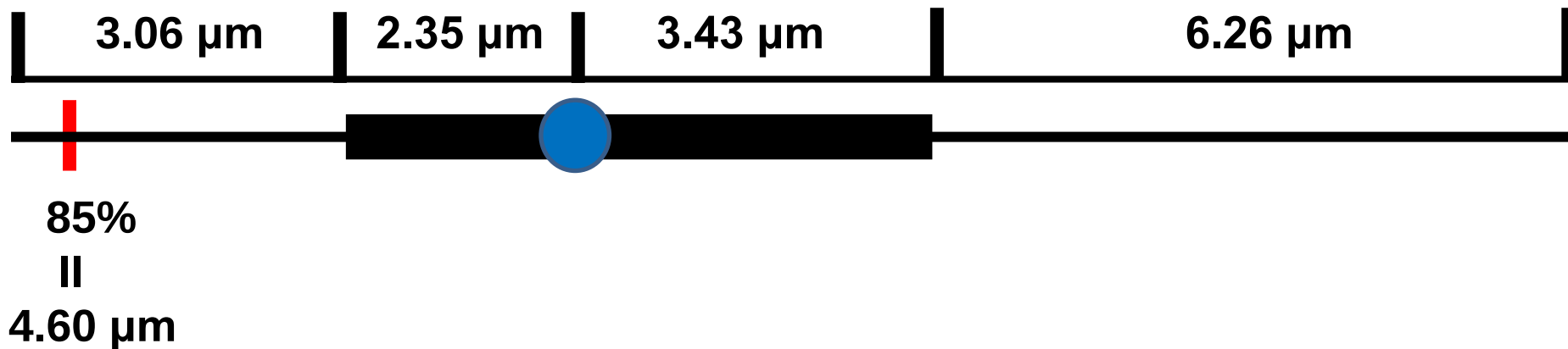
Tomato FISH Idiogram







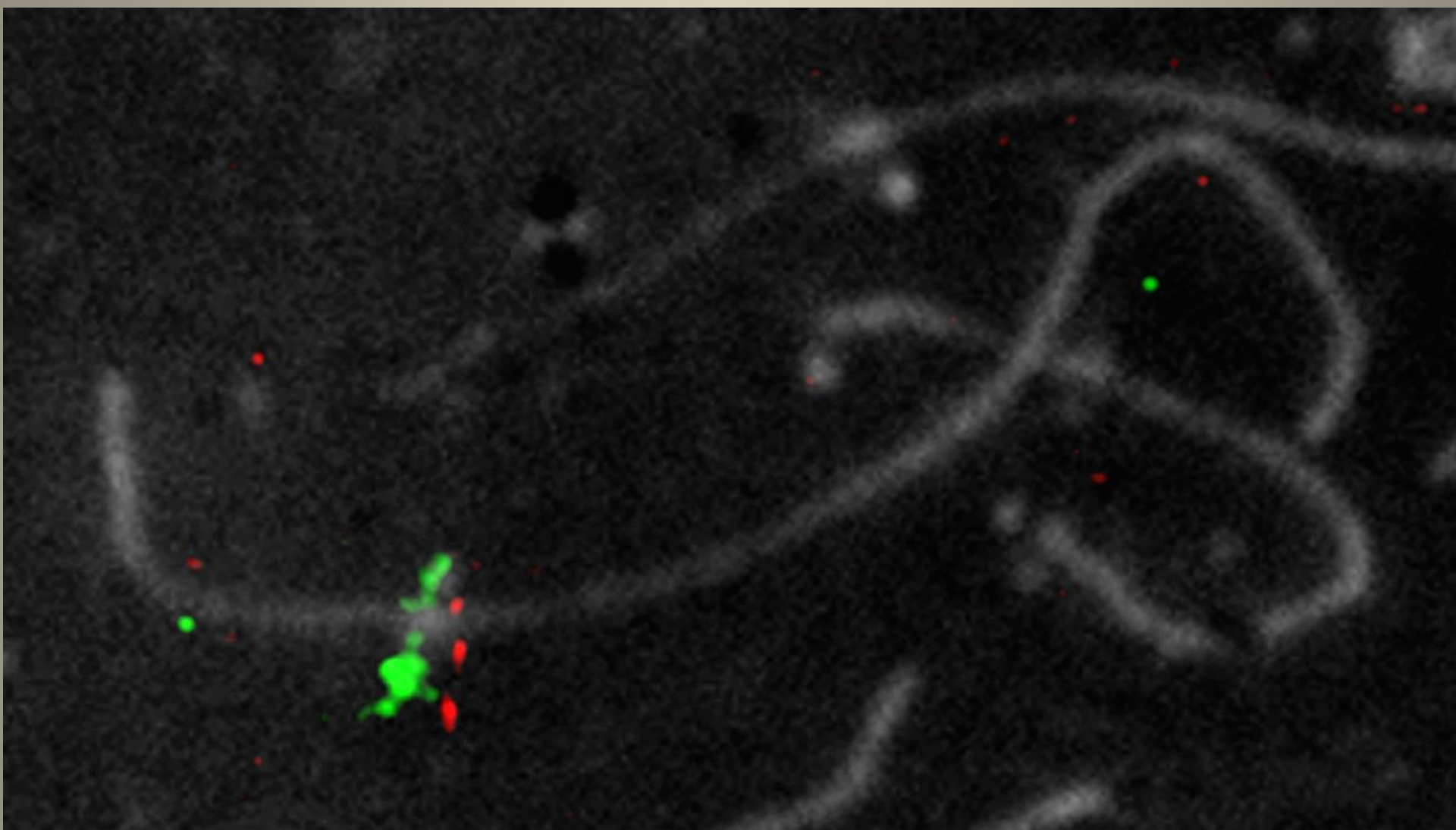


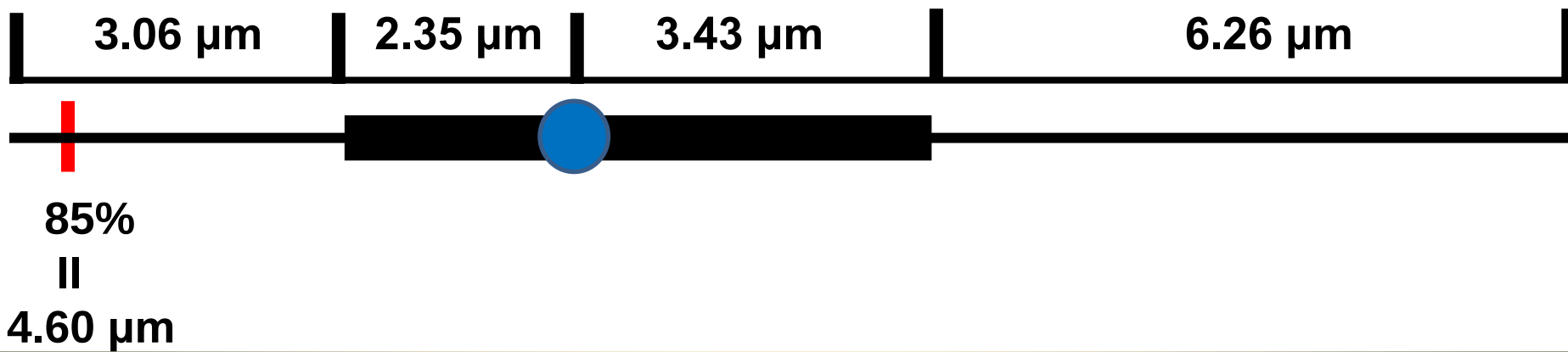


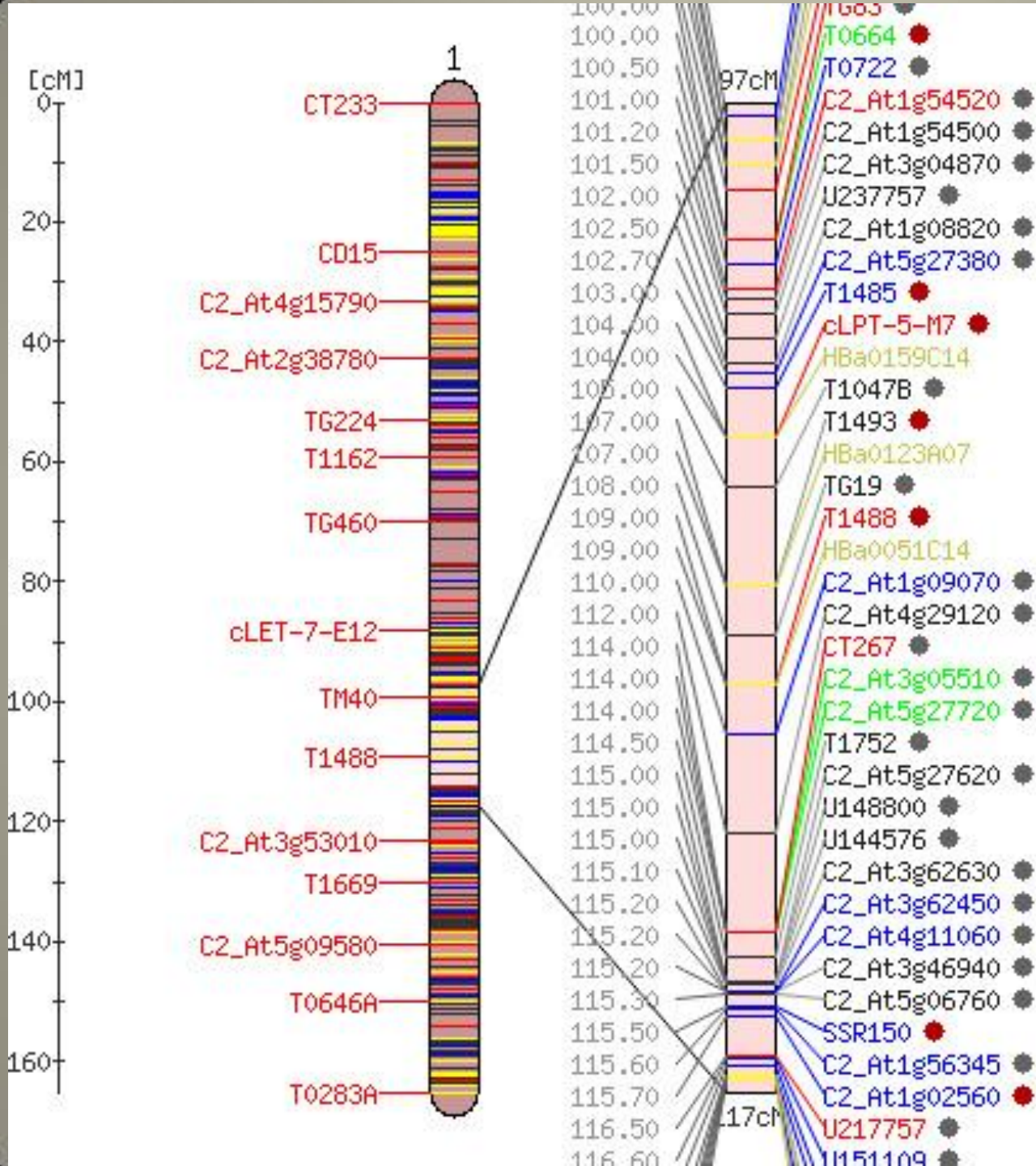
Dan Peterson *et al.* (1996)

1.54 Mb per micrometer in euchromatin

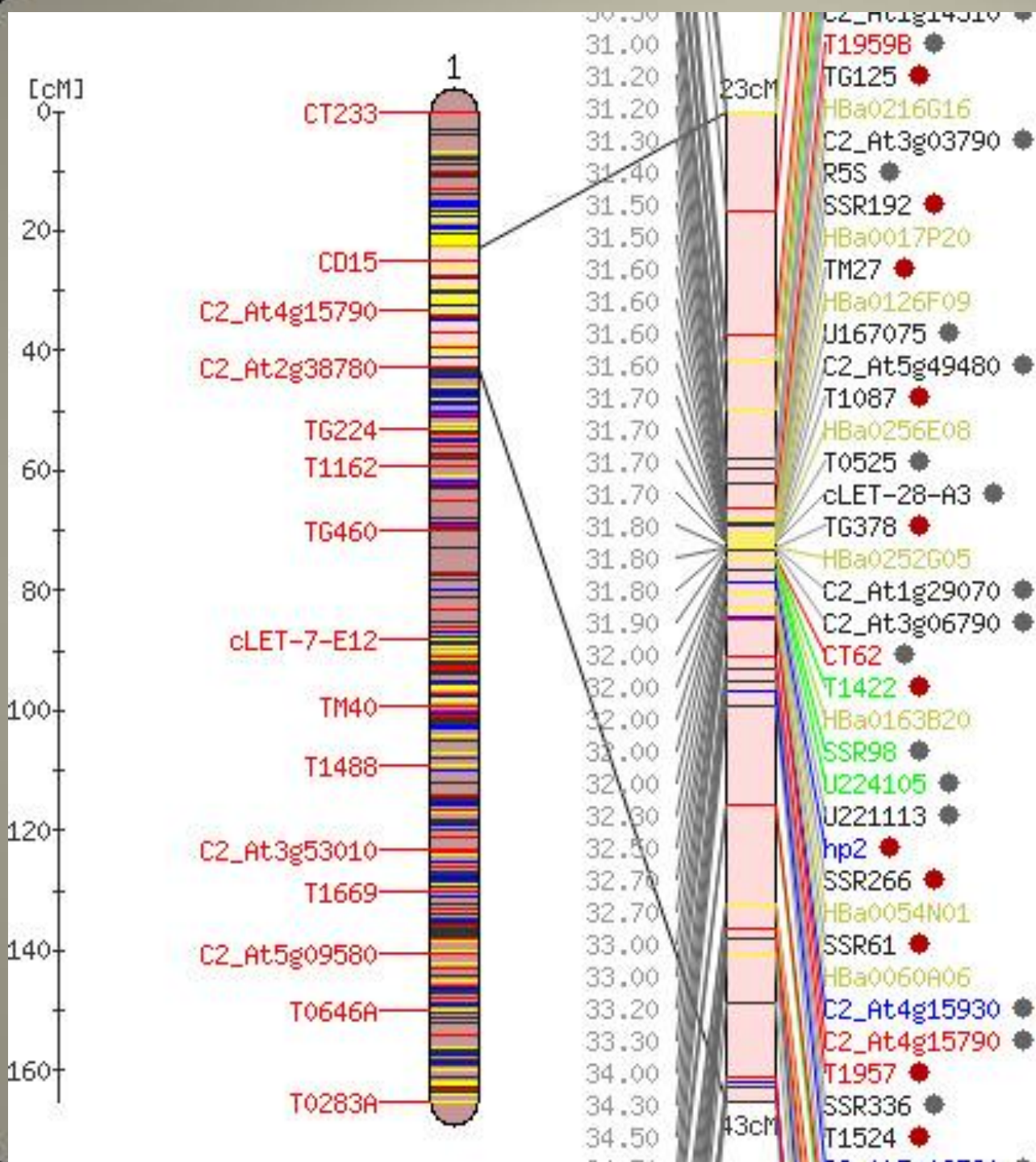
9.22 Mb per micrometer in heterochromatin



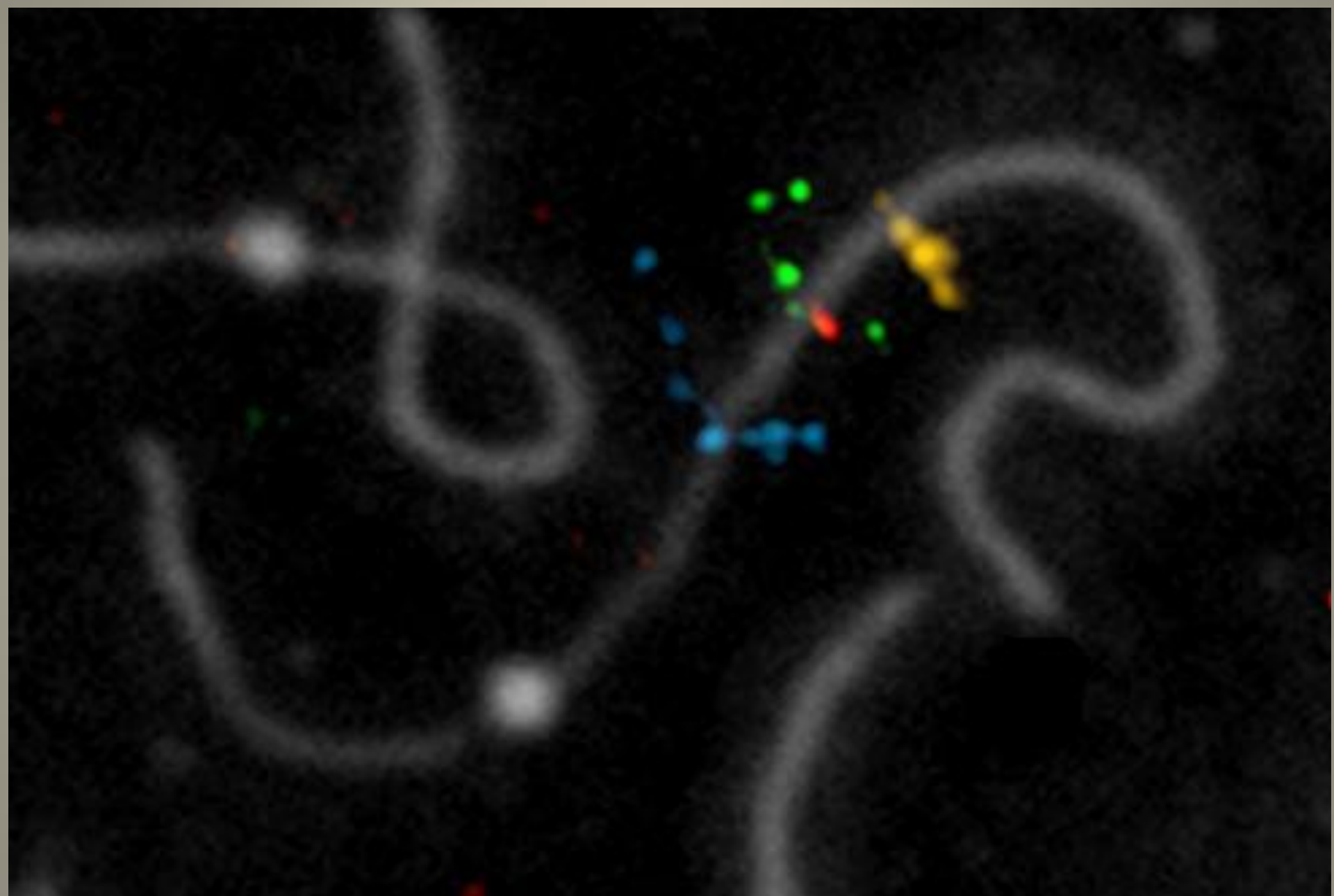




Tomato EXPEN 2000
Chromosome 1
Linkage Map



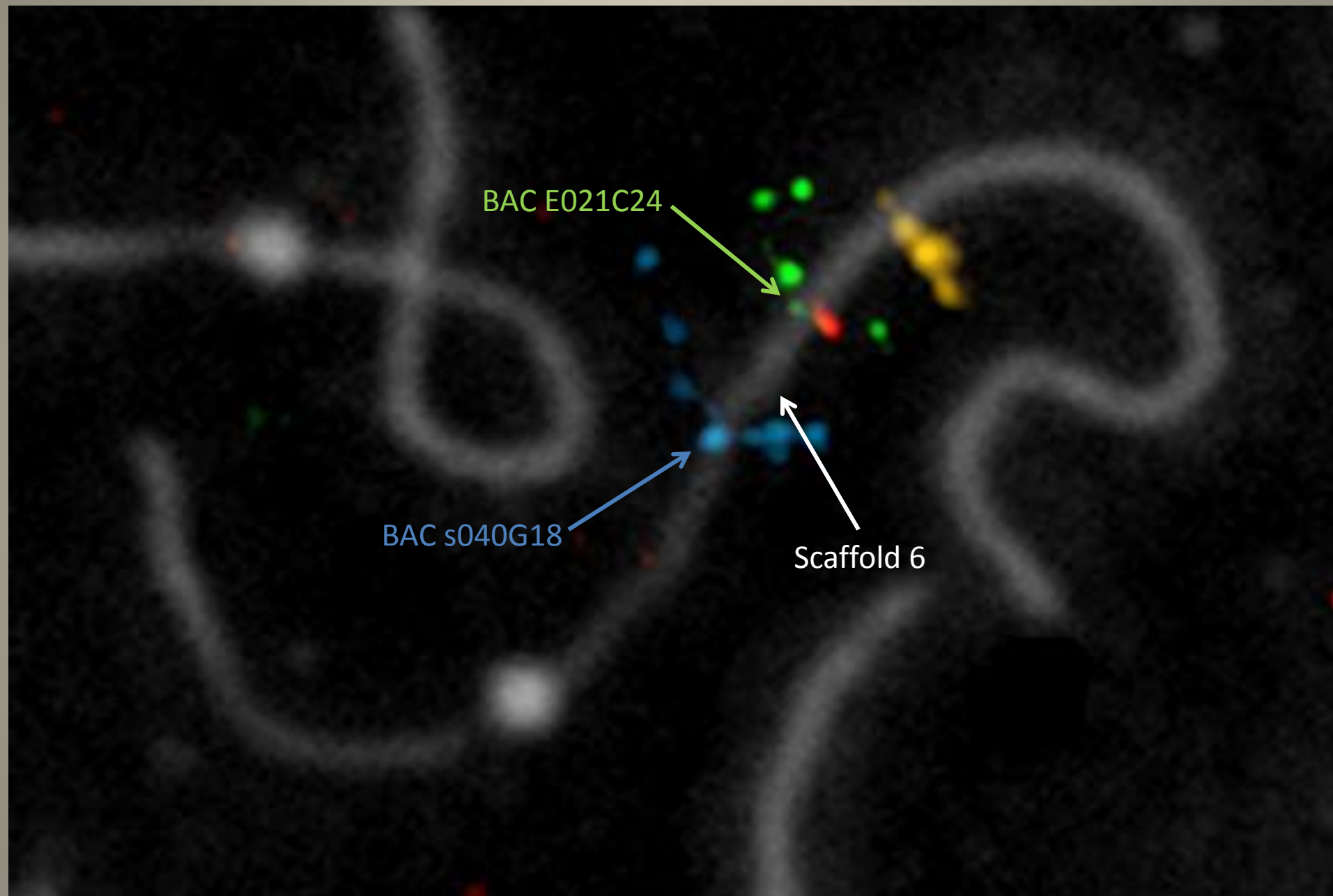
Tomato EXPEN 2000
Chromosome 1
Linkage Map

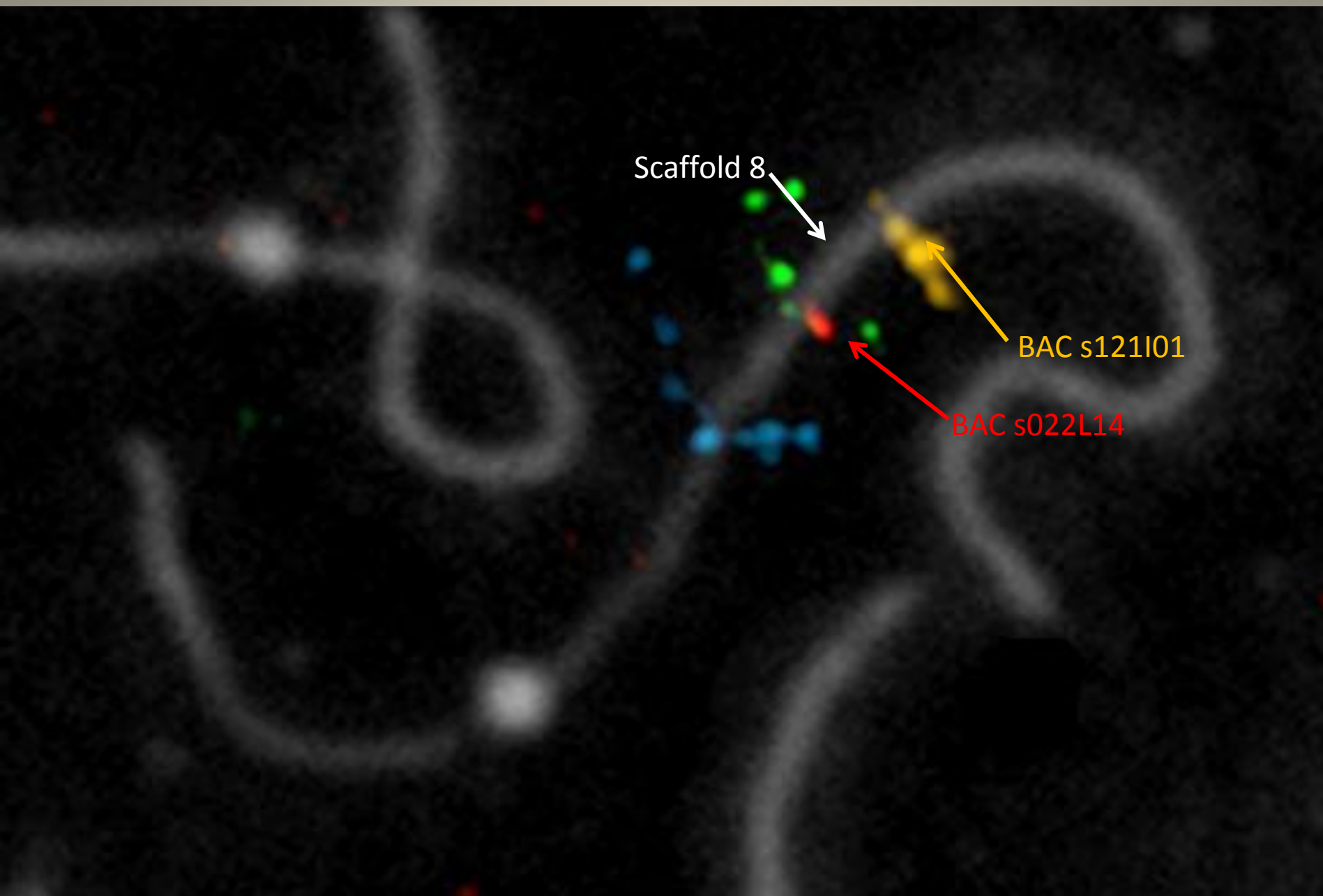


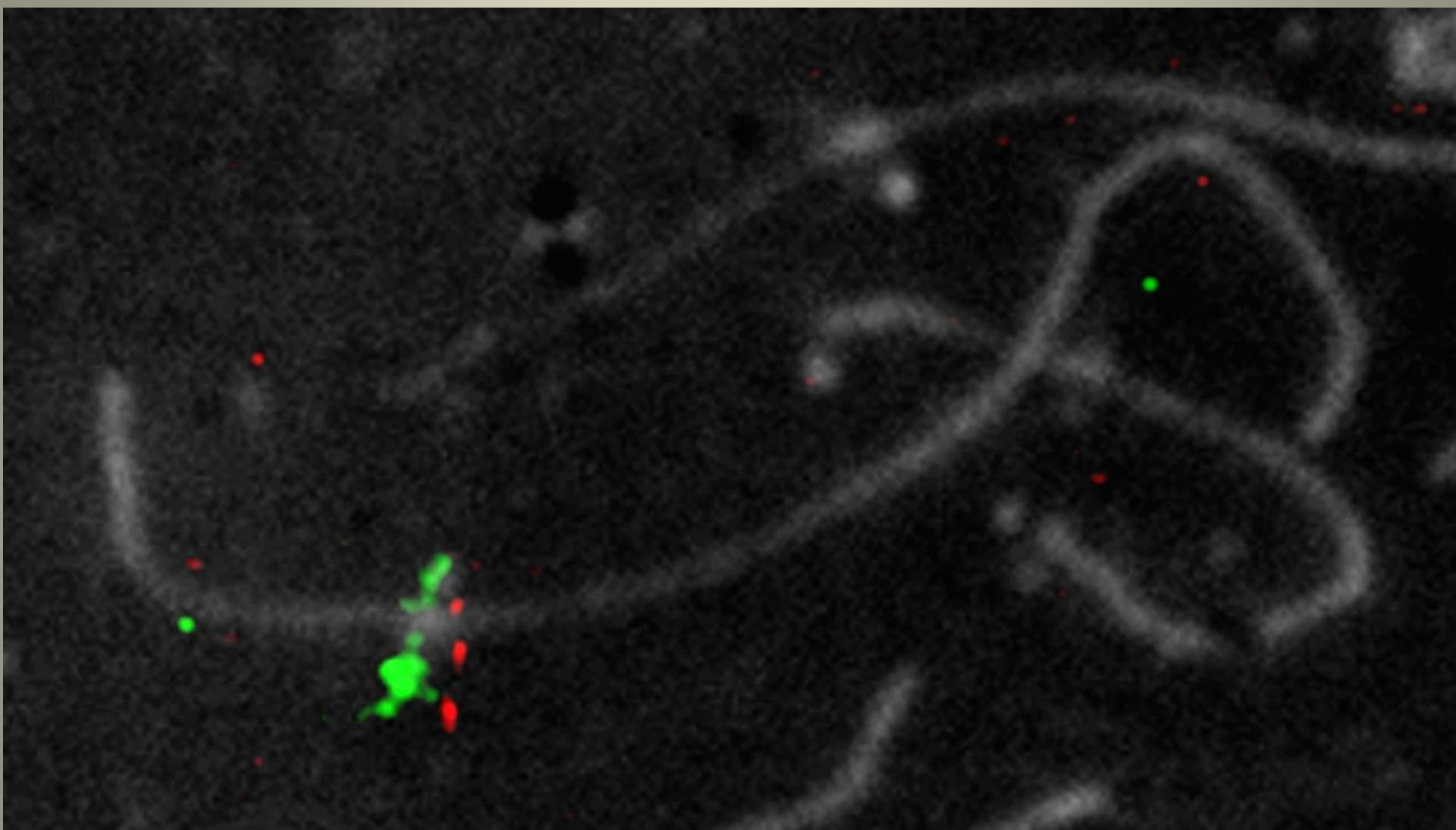
BAC E021C24

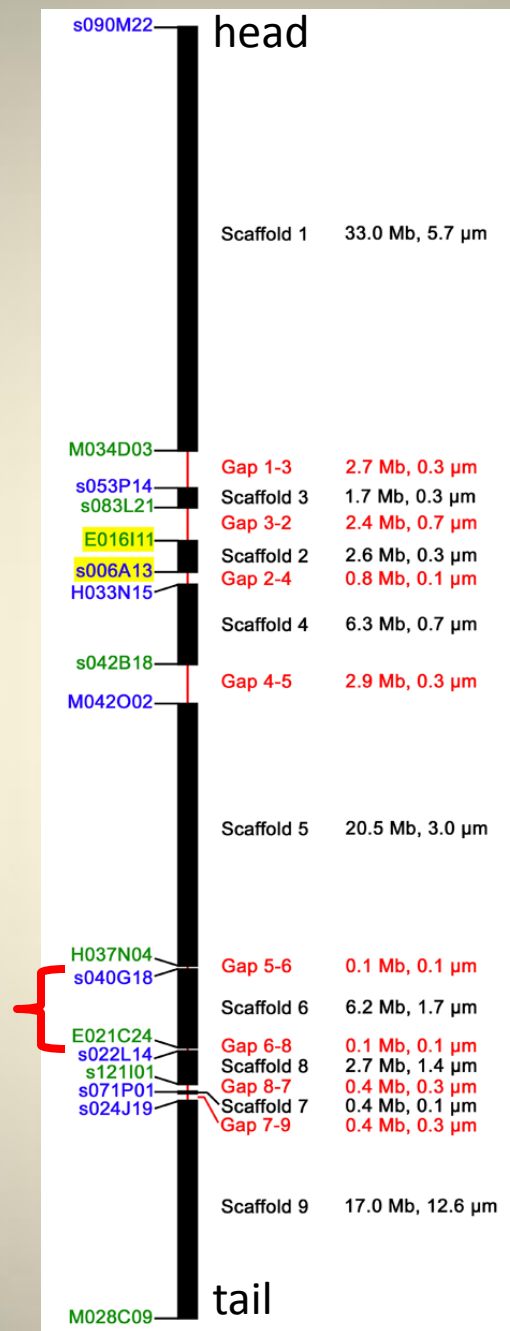
BAC s040G18

Scaffold 6









centromere

