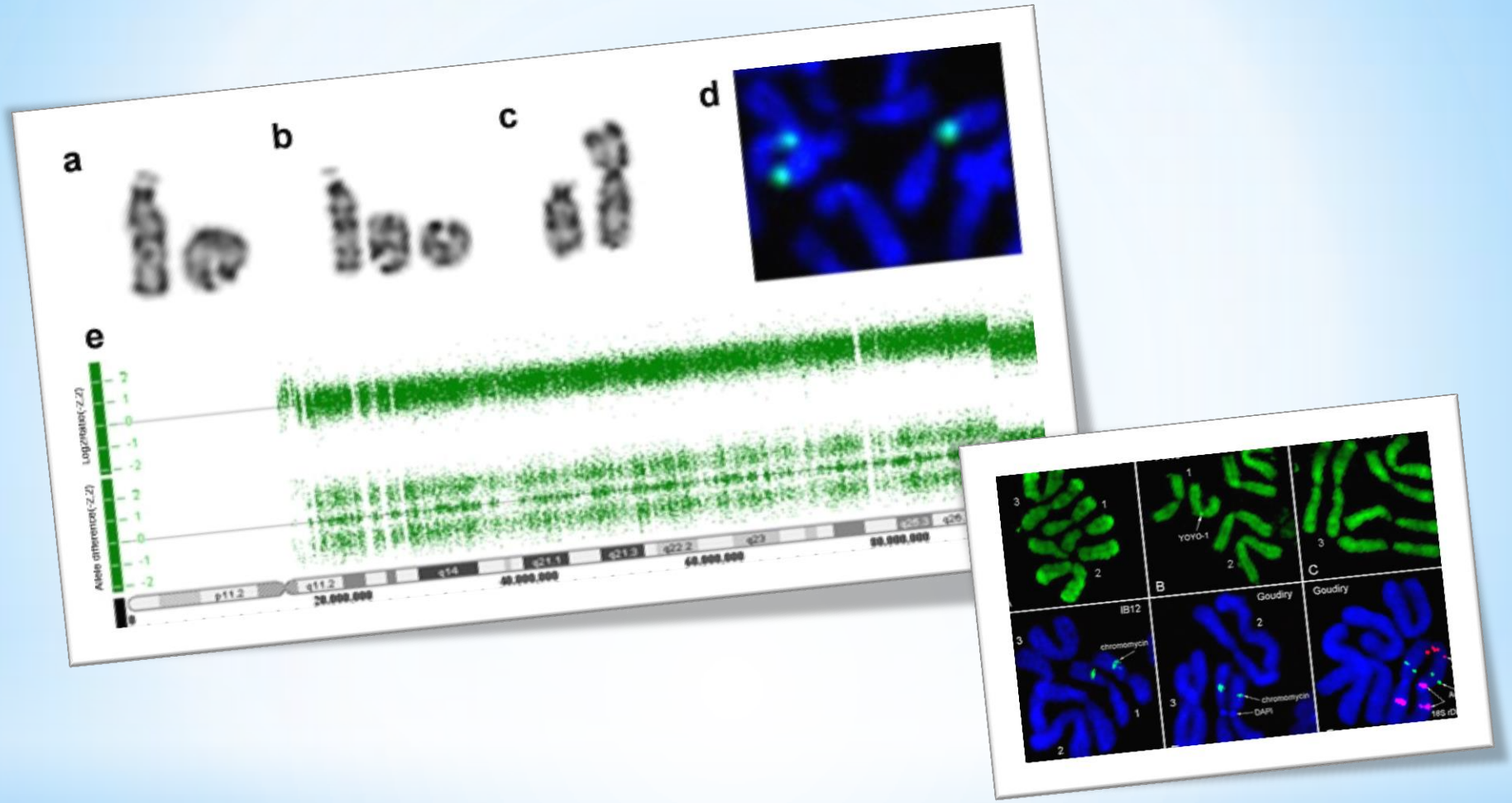
# 251 bot 9lec

Yasmeen Al wasel

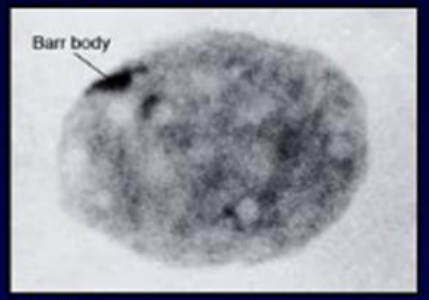
249 office

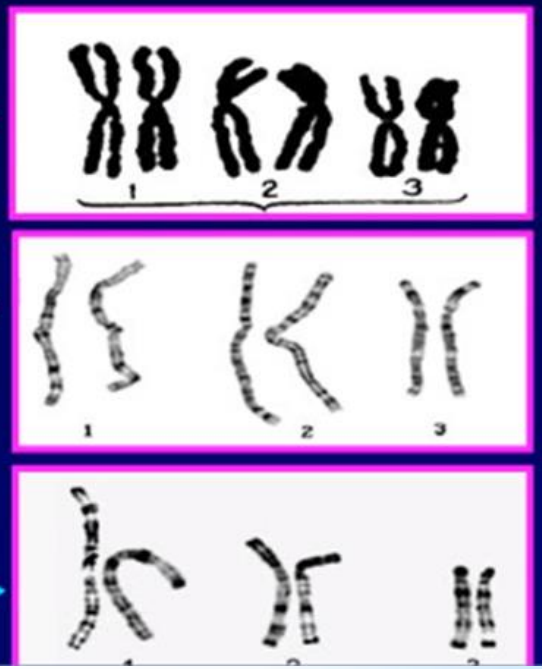



# *Chromosome Banding

# Basic cytogenetic examinations

- **Interphase cells**
  - Barr body (sex chromatin)
- **Metaphase cells** – staining of chromosomes
  - Solid staining
  - G-banding
  - R-banding
  - C-banding
  - Q-banding
  - Ag-NOR



# Classification of chromosomes banding

**Based on**

- GC and AT rich regiones
- Constitutive heterochromatin region

- Dark staining= +ve banding
- Light staining= -ve banding

Dye used for stain

- **Giemsa dye**
- Quinacrine dye

# Number and Size of Bands

- The G-bands are black and the R-bands in white.
- Bands are numbered consecutively away from the centromere on both the short (p) and long (q) arms.
- The total number of bands or ‘resolution’ in the human karyotype depends on how condensed the chromosomes are, and at what stage of mitosis they are in..

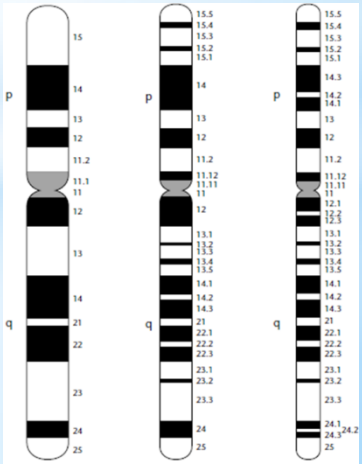
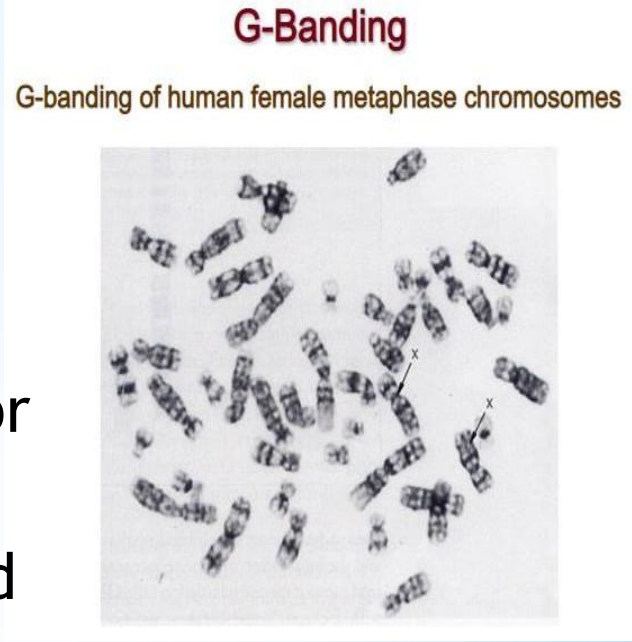


Figure 1 G-band ideograms of human chromosome 11 at (from left to right) 350, 550 and 850 band resolution.

# * Chromosome banding techniques

## G banding

- uses a stain Giemsa .
- For staining metaphase chromosomes.
- Chromosomes are pretreated with salt or proteolytic enzyme.
- Stains region of DNA rich in Adenine and Thymine
- gives light and dark stripes along the length of the chromosome



## G banding not used in Plants. Why?

- Human mitotic metaphase chromosome is 2.3 times shorter.
- Plant mitotic metaphase chromosome is 10 times more shorter  than human chromosome.
- Hence difficult to demonstrate the arrangement of bands at this level with G banding technique

## R banding

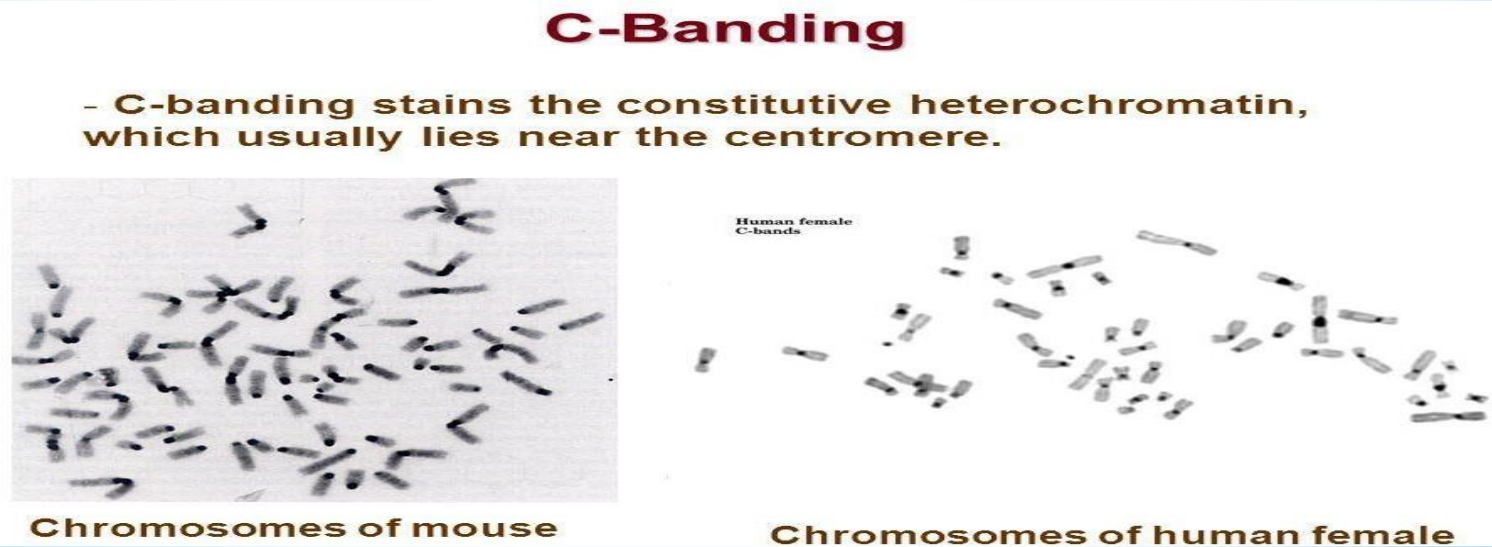
- Reverse pattern of G bands.
- Pretreating cells with hot salt solution causing denaturation of DNA
- rich in Adenine and Thymine. Stained with Giesma stain.
- For analyzing the structure of chromosome ends.

It is the opposite of C-banding.,, R-banding stains non-centromeric regions.

# C banding

- Staining only heterochromatic regions close to the centromeres and rich in satellite DNA stain
- Useful in humans for staining centromeric chromosome regions.
- A technique is presented for C-banding plant chromosomes with a modified Wright stain

- Dark banding = constitutive heterochromatic regions
- Light banding = remaining regions

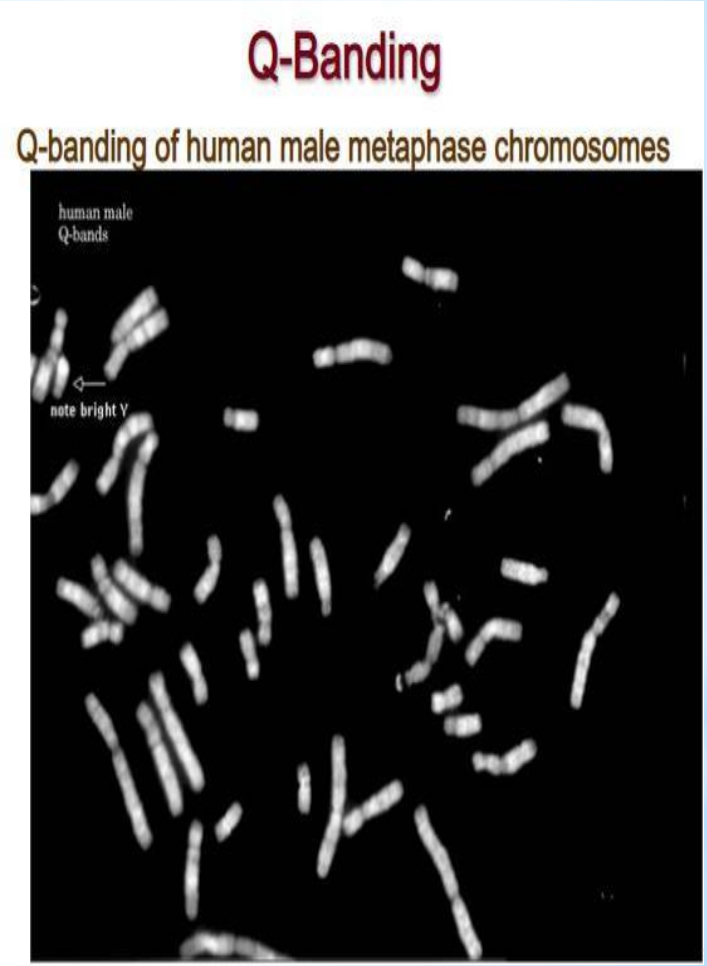


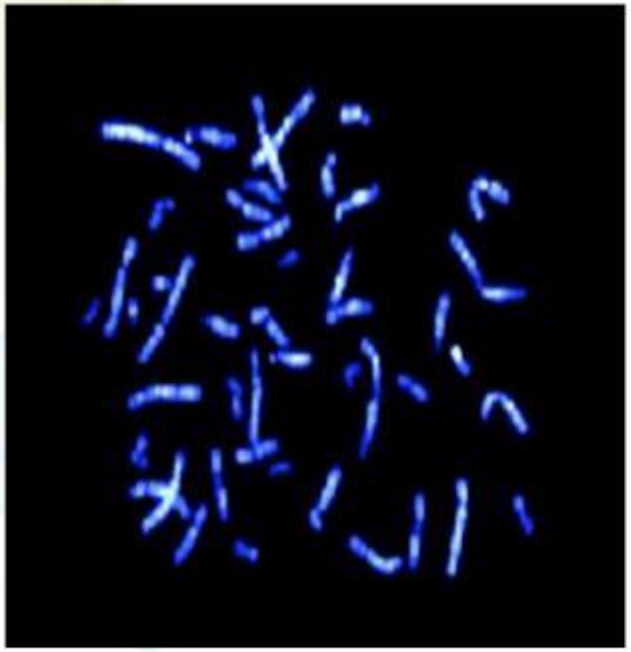
## Q-banding

- uses a stain Quinacrine
- Q-banding yields a fluorescent pattern.

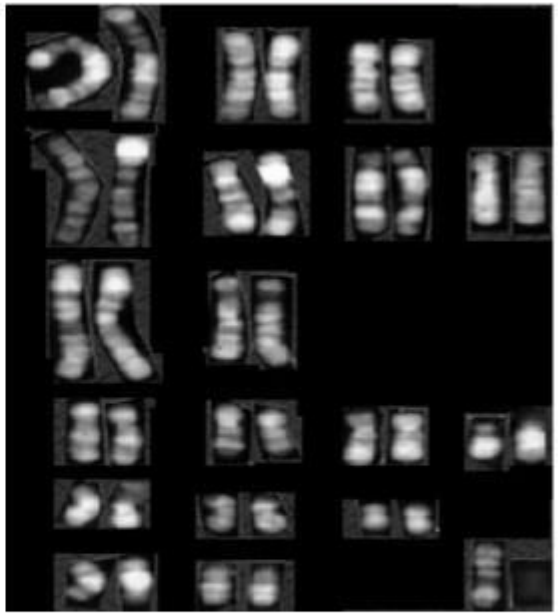
It is similar in pattern to G-banding, but glows yellow.

- Bright bands, regions of DNA rich in Adenine and Thymine.
- Dull bands, regions with Guanine and Cytosine.
- For identifying human chromosome Y and different polymorphisms.

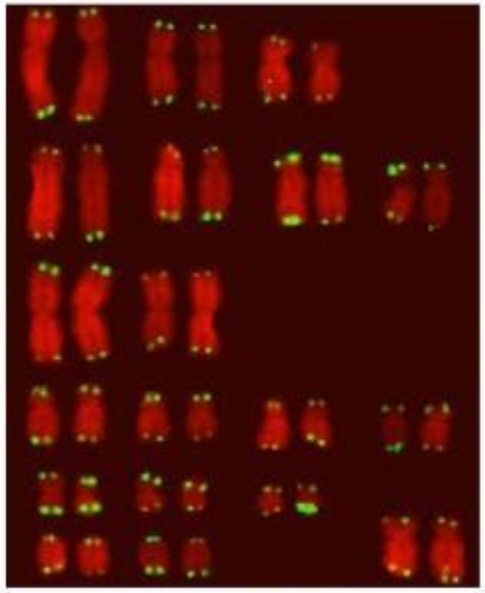




Q banding



Cat Q band



Cat telo

## O bands

- Used in plants. since in plants G, C and Q bandings have relatively limited application
- quick method using trypsin-orcein for banding plant chromosomes
- The technique is directly applicable to meristematic tissues (e.g. root tips)

## T bands

- used to stain the telomeric regions of chromosomes for cytogenetic analysis.
- By Giemsa stain or Acridine orange, after controlled thermal treatment.

## Hy banding

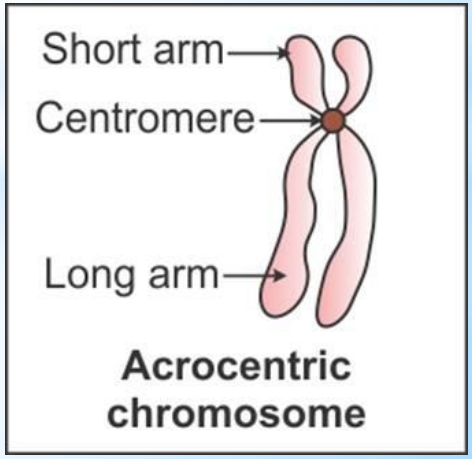
- For plant cells.
- Applied to somatic chromosomes of members of *Liliflorae*

## N or NOR staining

- For nuclear organizing regions.
- Silver nitrate solution binds (secondary constrictions of Acrocentric chromosomes)

## CT bands

Banding of centromeric and telomeric segments



Other techniques

**In situ hybridization- ISH**

(FISH) and **(**GISH**).**

Use probe sequence tagged with radioisotopes or fluorescent compounds..

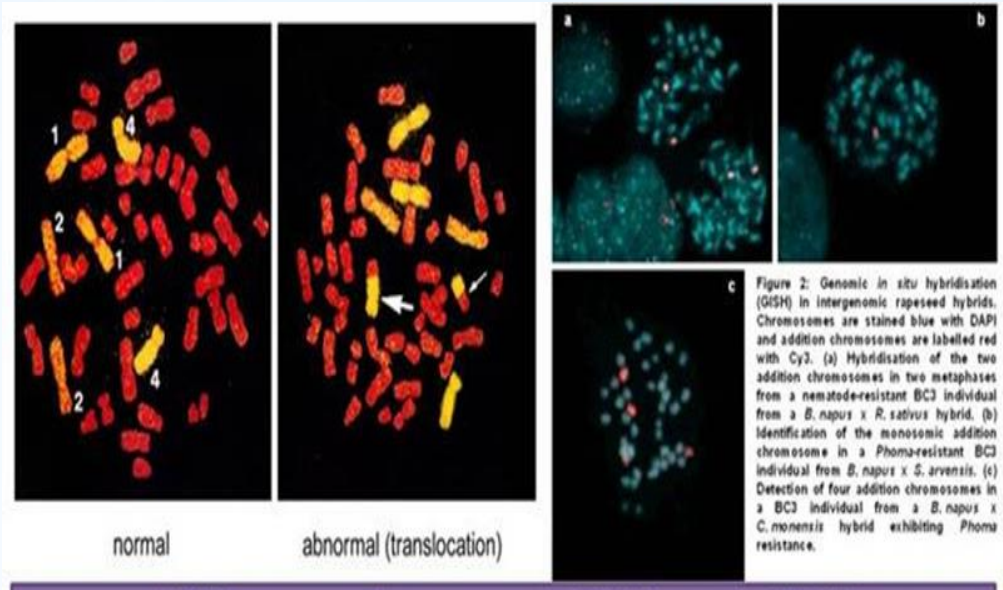
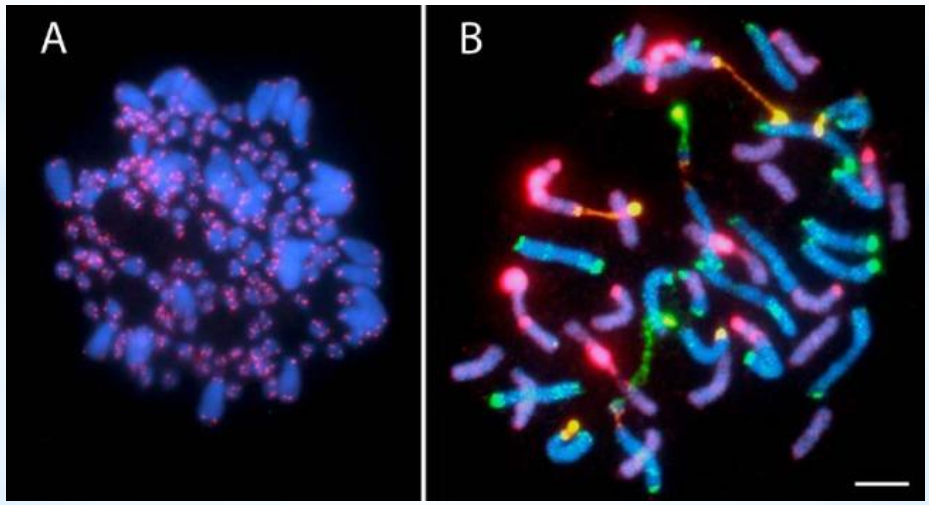



Figure 2: Genomic in situ hybridisation (GISH) in intergenomic rapeseed hybrids. Chromosomes are stained blue with DAPI and addition chromosomes are labelled red with Cy3. (a) Hybridisation of the two addition chromosomes in two metaphases from a nematode-resistant BC3 individual from a *B. napus* x *R. sativus* hybrid. (b) Identification of the monosomic addition chromosome in a *Phoma*-resistant BC3 individual from *B. napus* x *S. arvensis*. (c) Detection of four addition chromosomes in a BC3 individual from a *B. napus* x *C. monensis* hybrid exhibiting *Phoma* resistance.

## Difference between FISH and GISH

FISH GISH



The 9 lecture ended

# Homework

## Write 3 questions for the lecture

## The next lecture