

Cytogenetics

2nd Lecture

Prof.Dr. Abdul Hussein M. AlFaisal

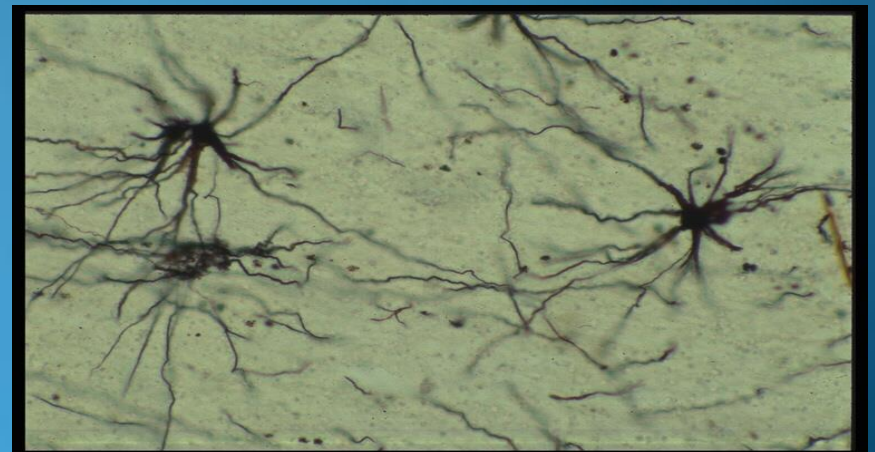
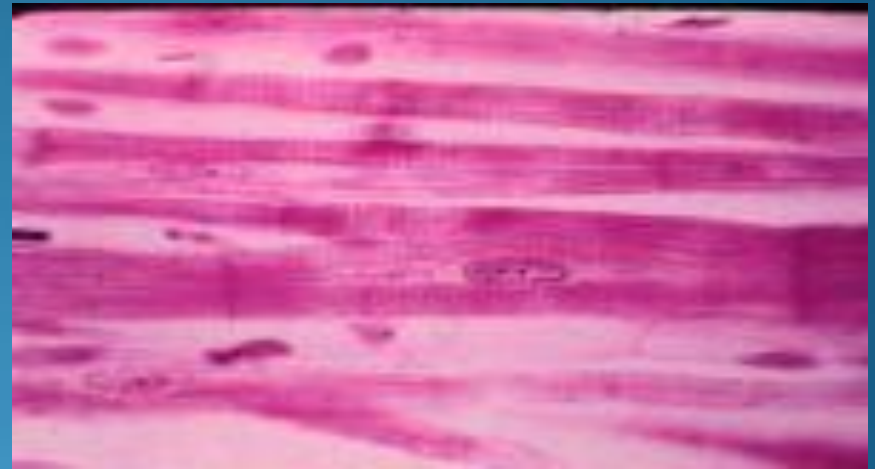
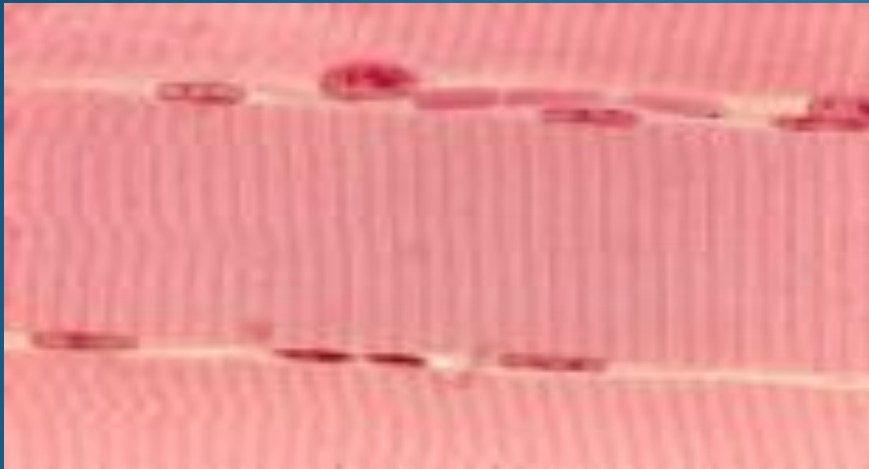
Ph.D. in Cancer Molecular Genetics

Wales University- UK

Cell divisions and Chromosomes

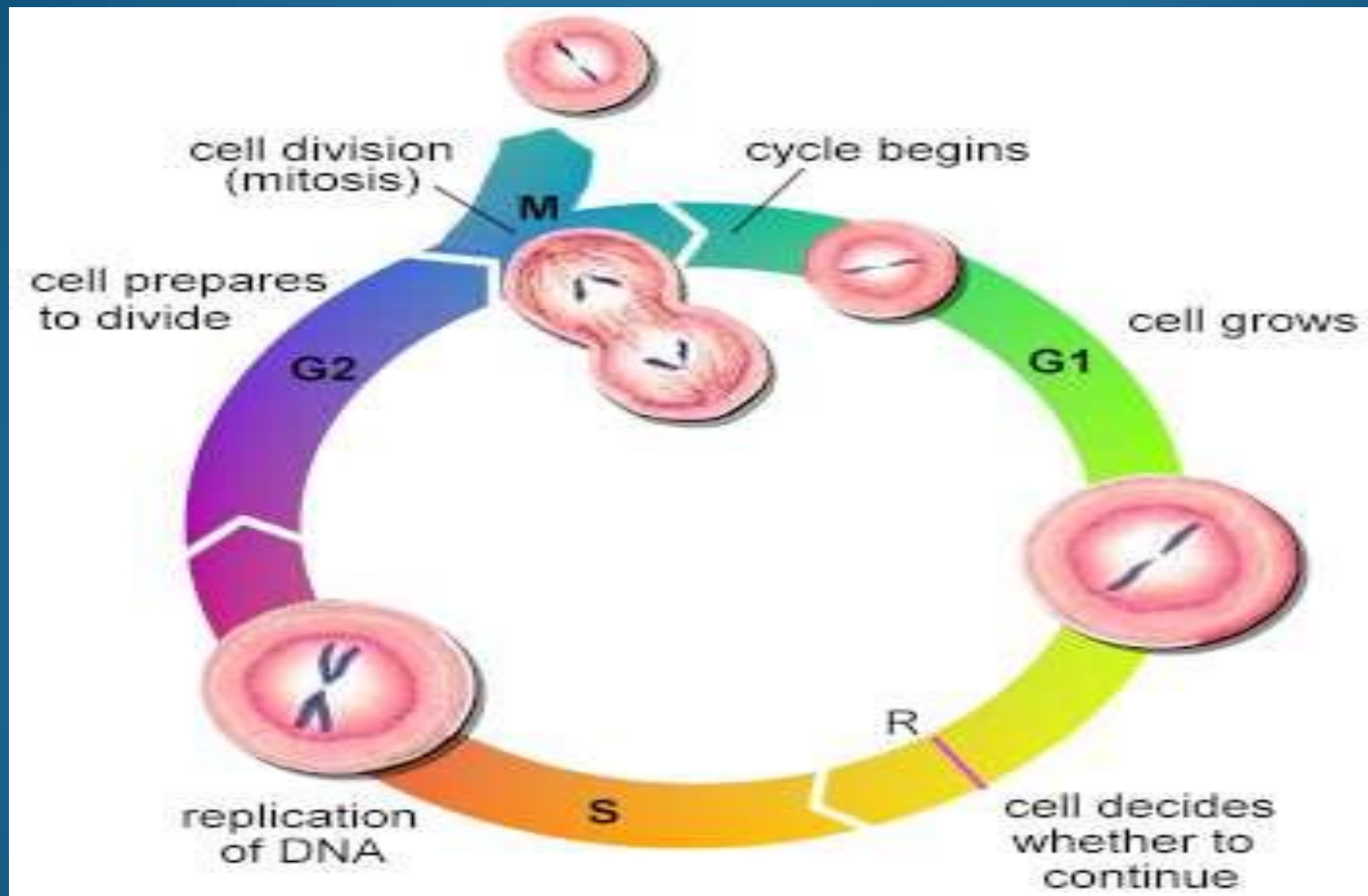
What type of cell can enter cell division?

Differentiated and stem cells



Cell divisions and Chromosomes

Cell Cycle

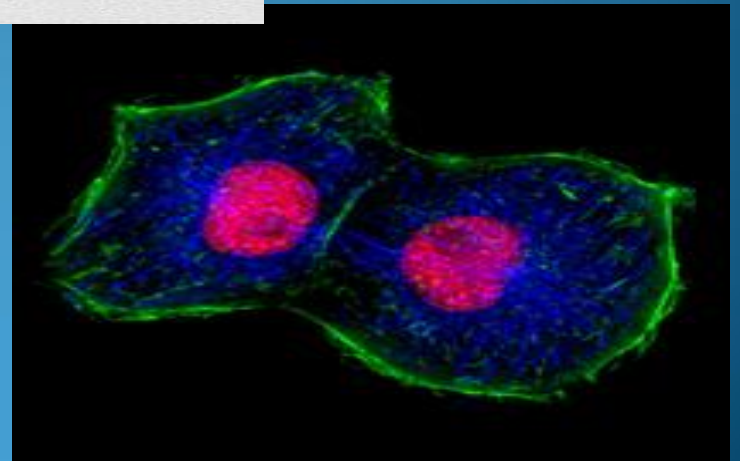
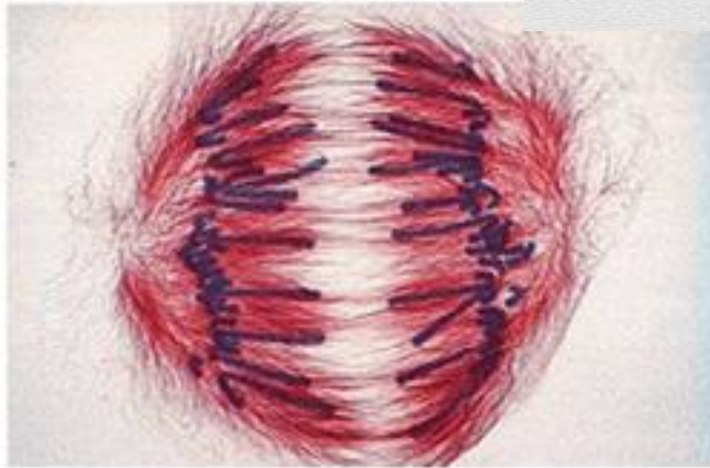
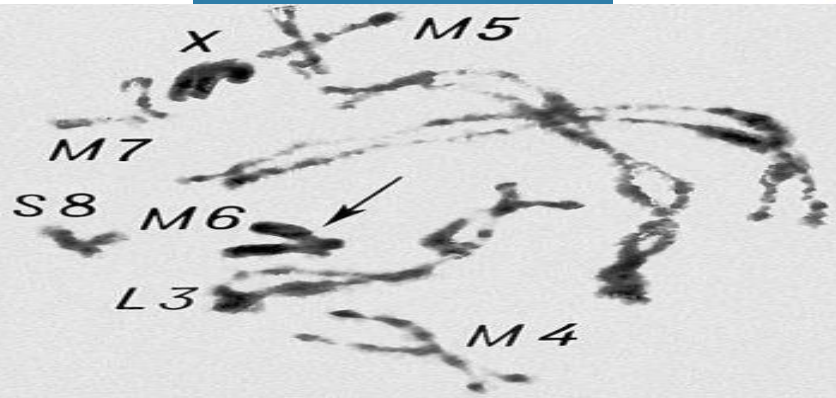
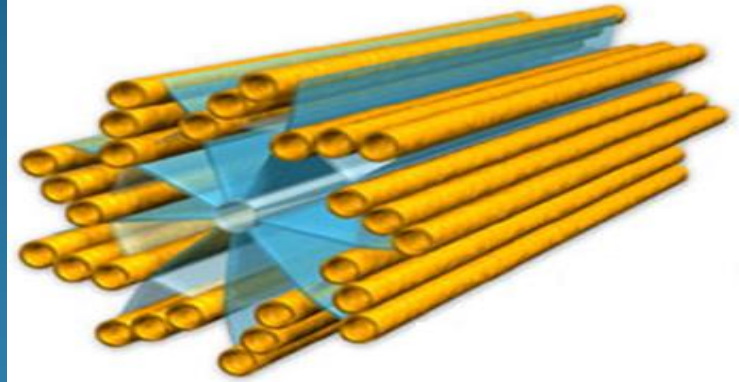
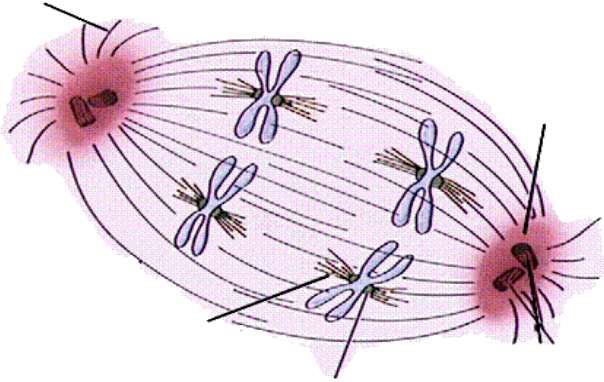


Cell divisions and Chromosomes

Molecular events associated with cell division:

1. Nuclear membrane disappearing
2. Chromosomes appearing
3. Centrosomes appearing
4. Spindle rays appearing
5. Synaptonemal Complex
6. Cytokinesis

Cell divisions and Chromosomes



Cell divisions and Chromosomes

Mitosis .. Somatic cells division

. Interphase

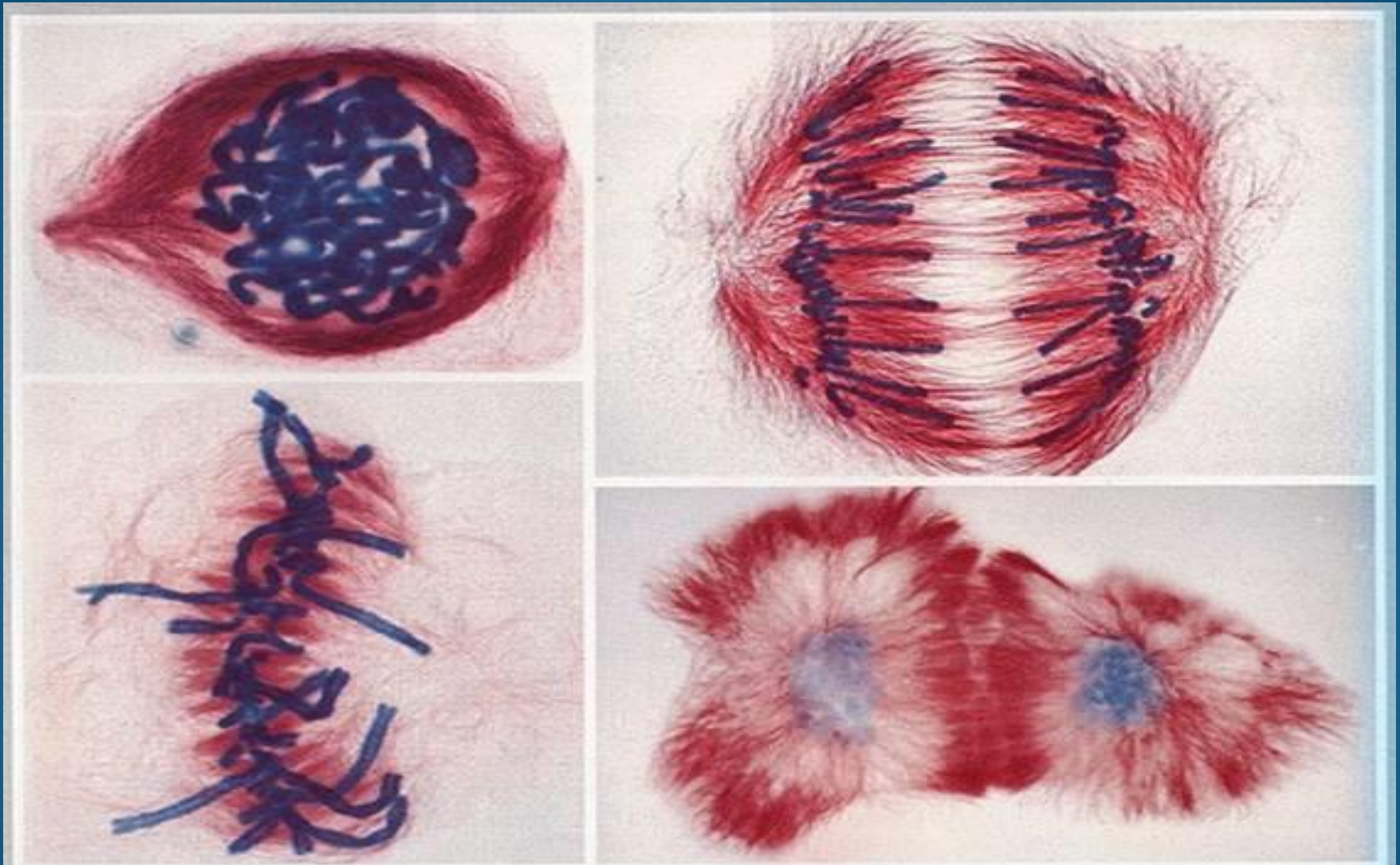
1. Prophase

2. Metaphase

3. Telophase

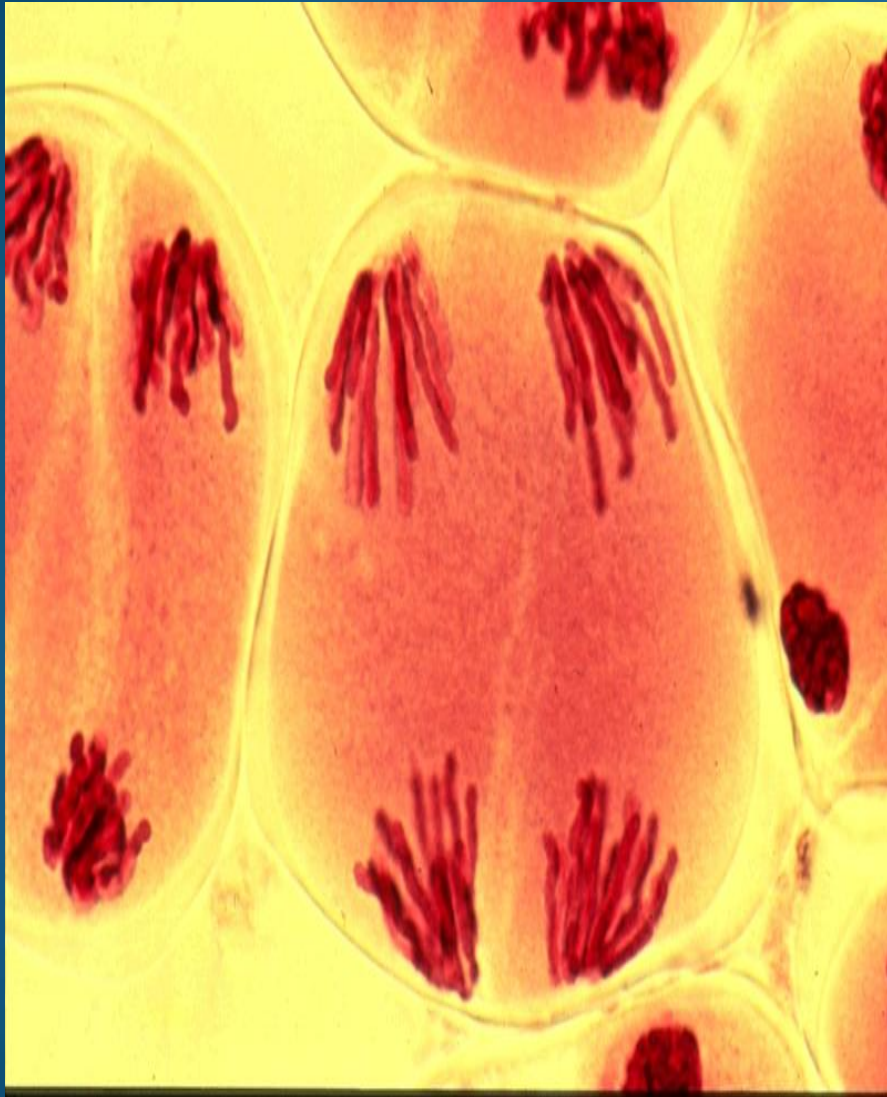
4. Anaphase

Cell divisions and Chromosomes

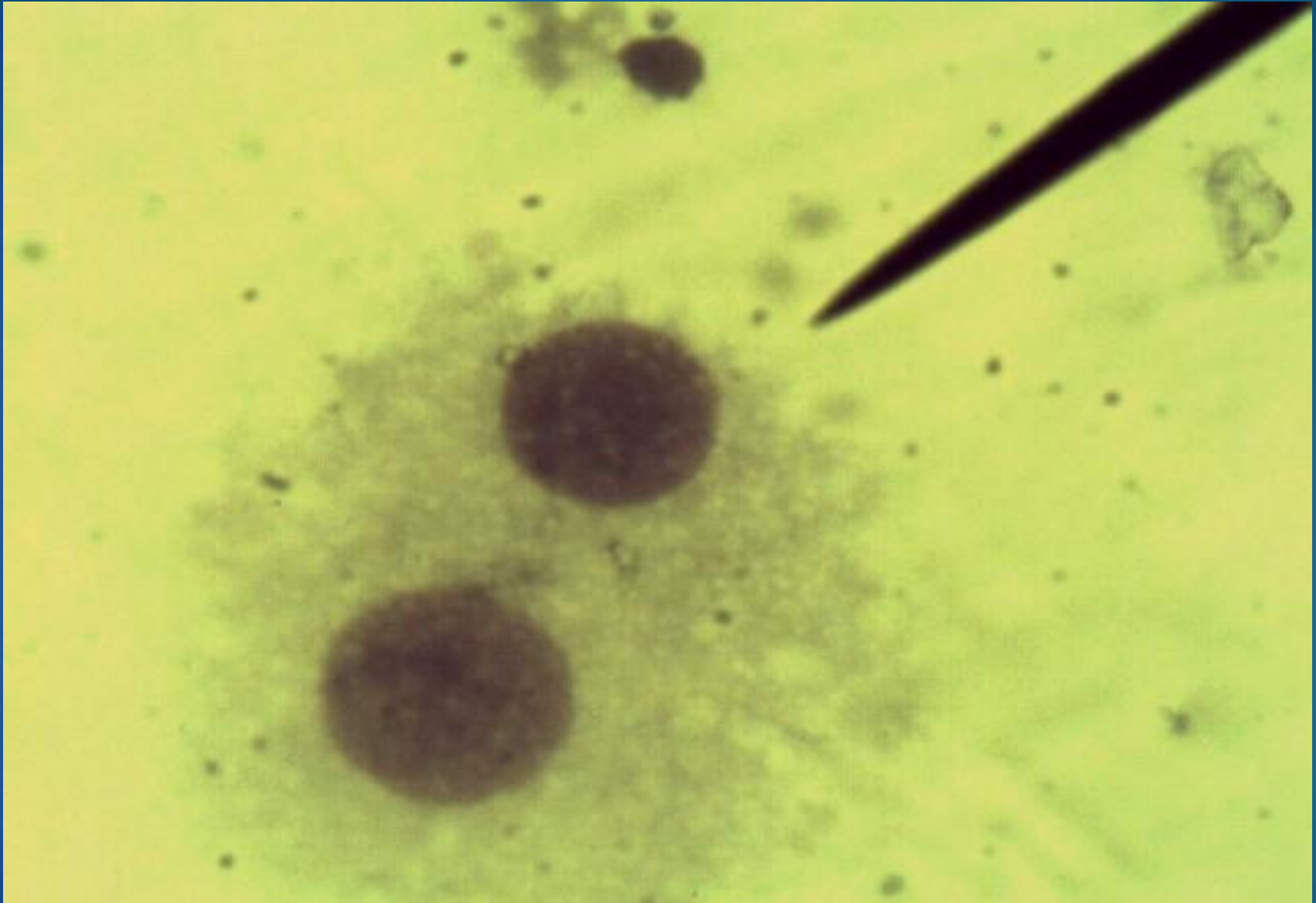


Plant cells in various stages of mitosis: (a) prophase; (b) metaphase; (c) anaphase; (d) telophase (all magnified about 2,700 times)

Cell divisions and Chromosomes



Cell divisions and Chromosomes



Cell divisions and Chromosomes

Meiosis ... Sex or Germ Cells division

Meiosis I.....Meiosis II

Meiosis I Sister chromosomes separation

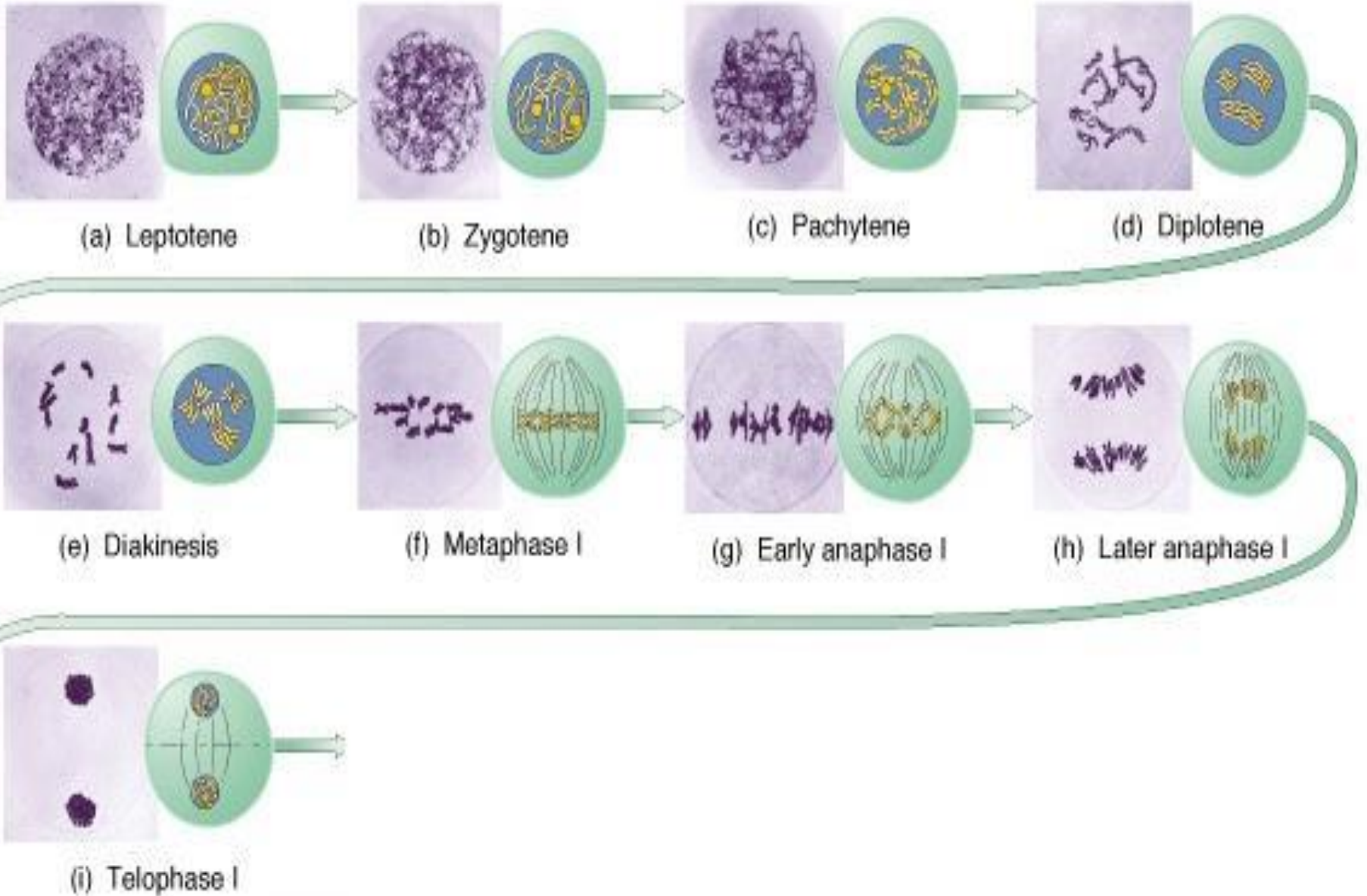
1. Prophase I

2. Metaphase I

3. Anaphase I

4. Telophase I

Cell divisions and Chromosomes



Cell divisions and Chromosomes

Meiosis II..... Sister chromatides separation

1. Interphase
2. Prophase
3. Metaphase
4. Anaphase
5. Telophase

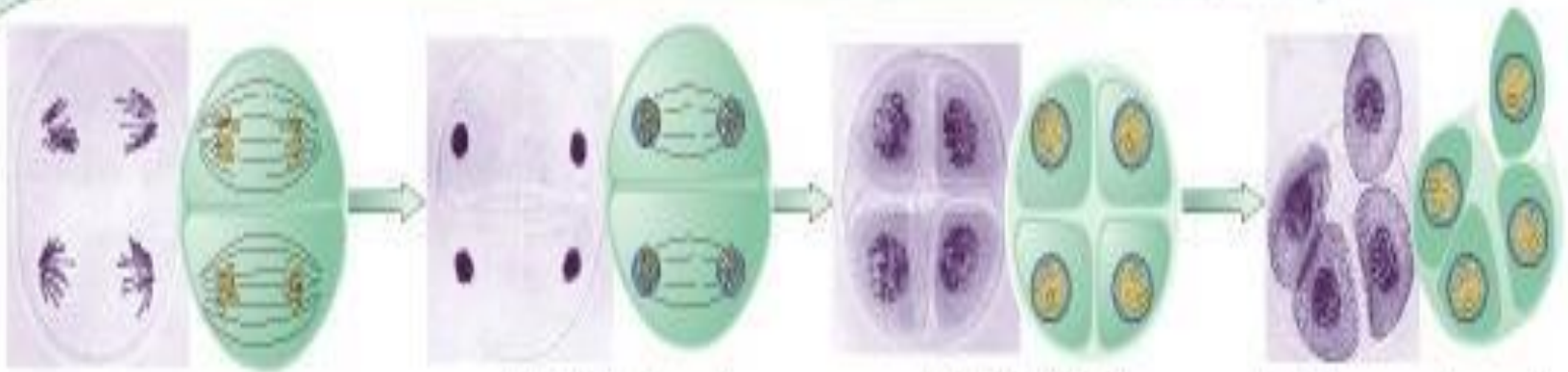
Cell divisions and Chromosomes



(j) Interphase

(k) Prophase II

(l) Metaphase II



(m) Anaphase II

(n) Telophase II

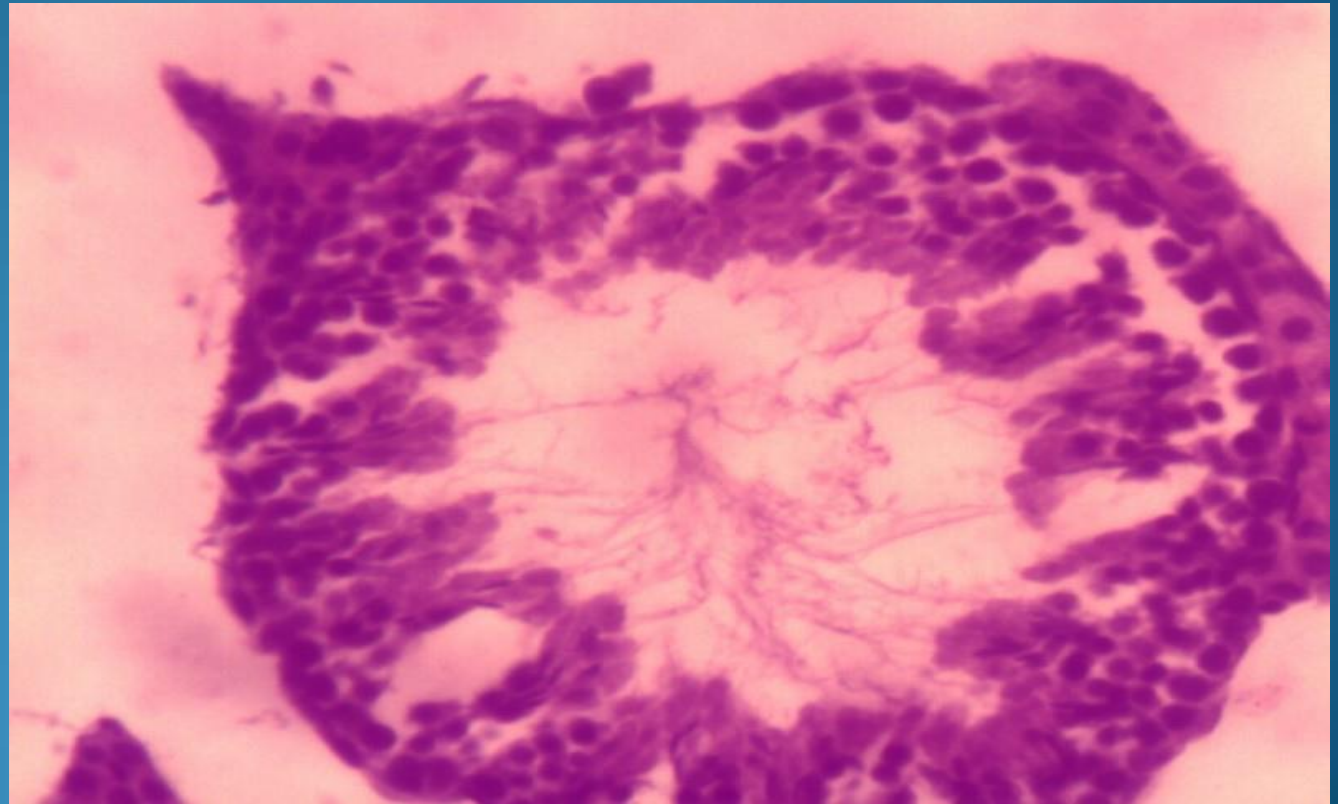
(o) The tetrad

(p) Young pollen grains

Cell divisions and Chromosomes

Spermatogenesis and Oogenesis:

Division happened in germ tissue e.g. testis and ovary

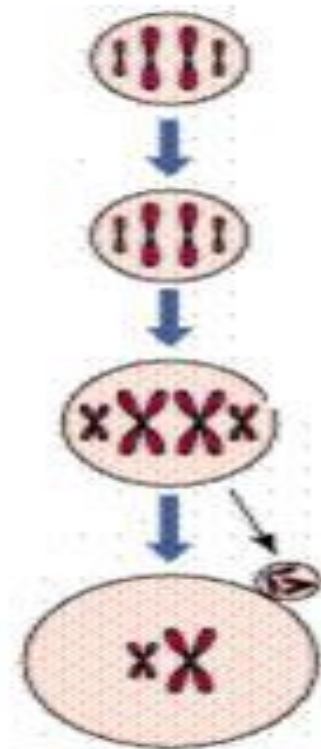
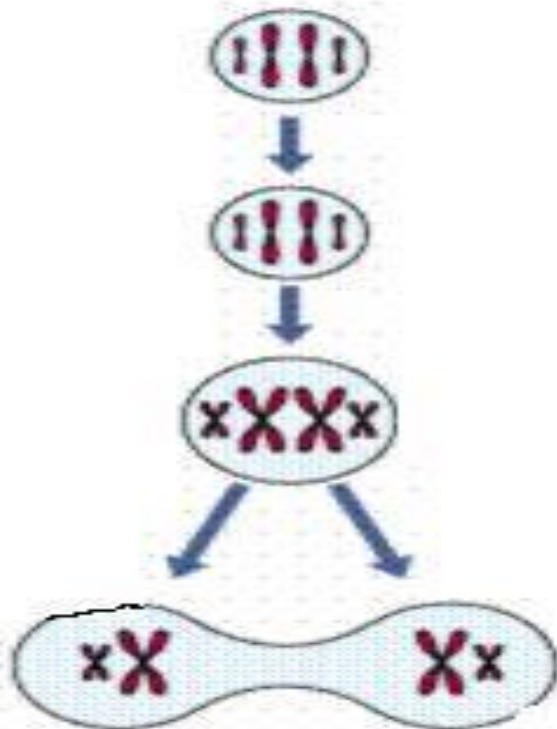


Cell divisions and Chromosomes

Meiosis I

Spermatogenesis

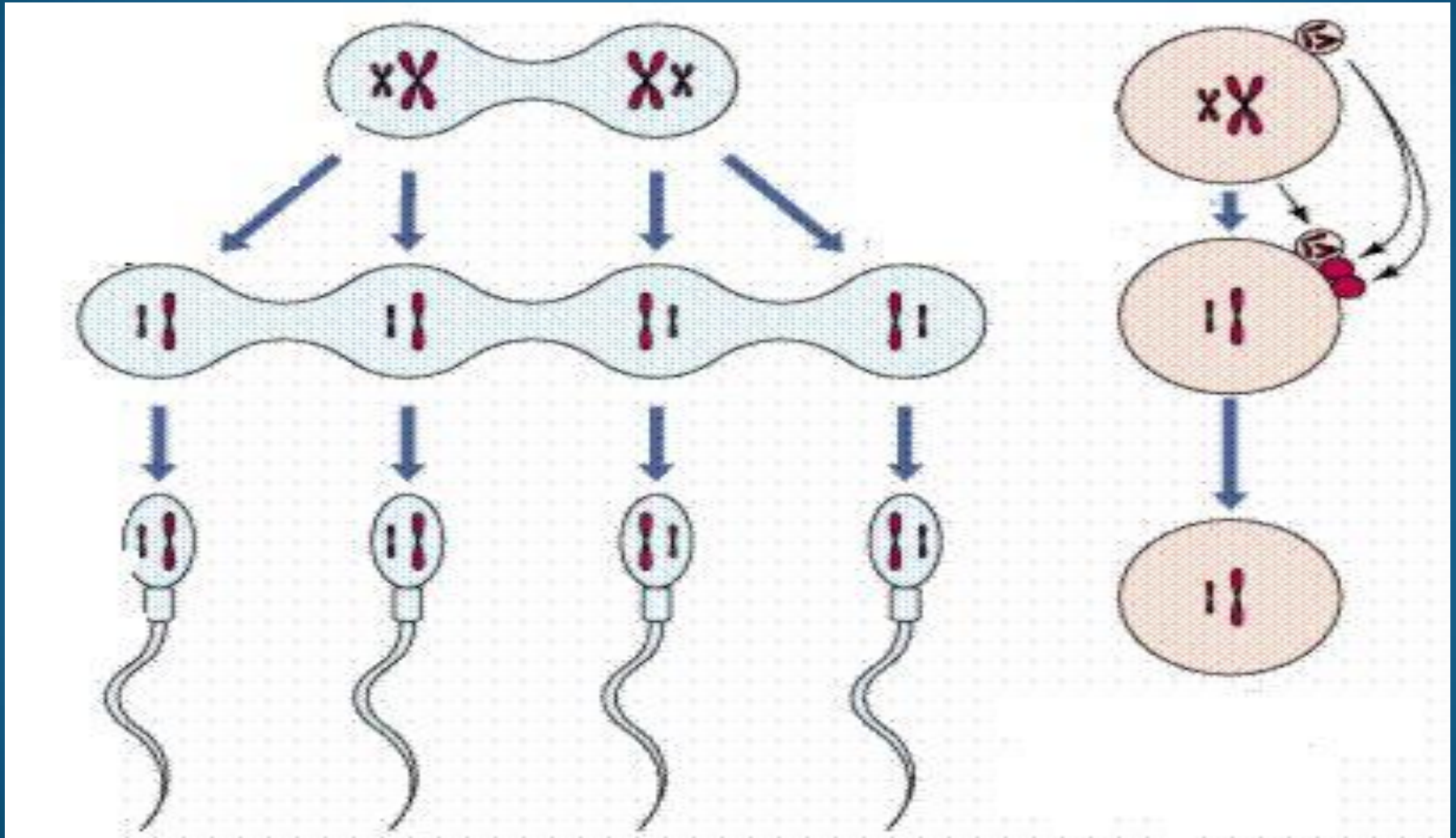
Oogenesis



Cell divisions and Chromosomes

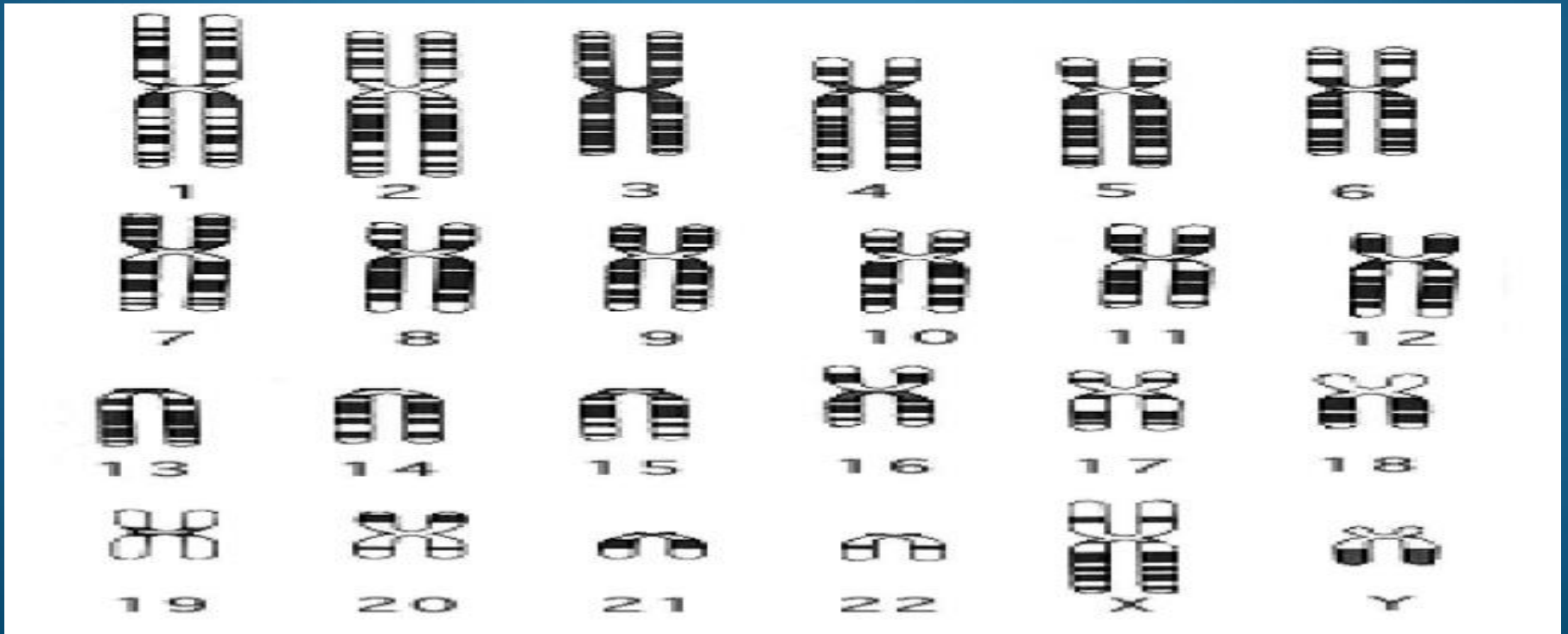
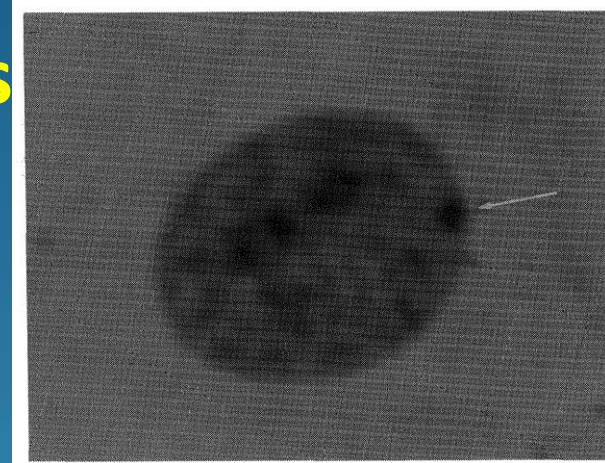
Spermatogenesis

Oogenesis



Human Chromosomes

- Female and Male chromosomes
- Autosomes and Gonosomes
- Sex determination

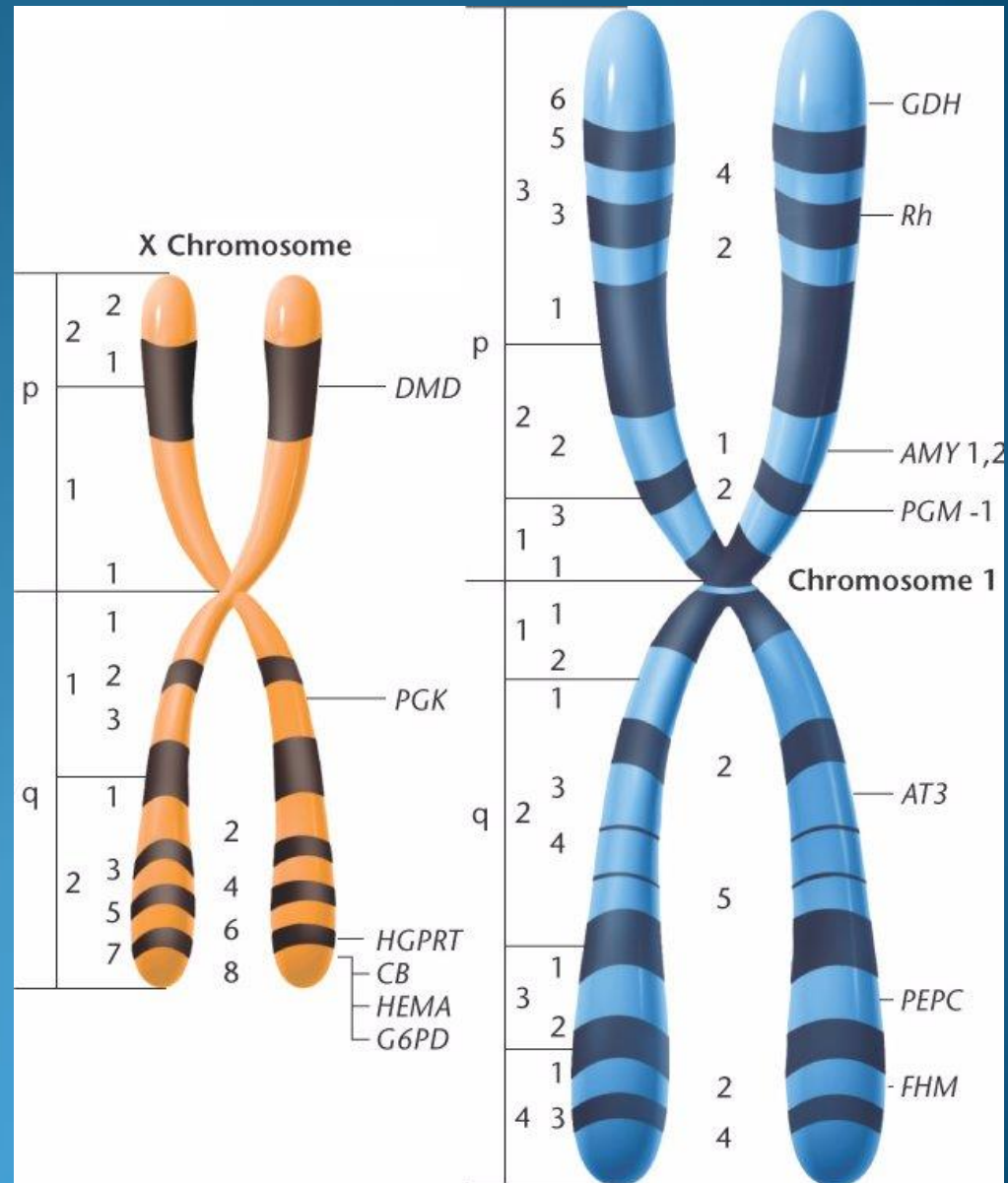
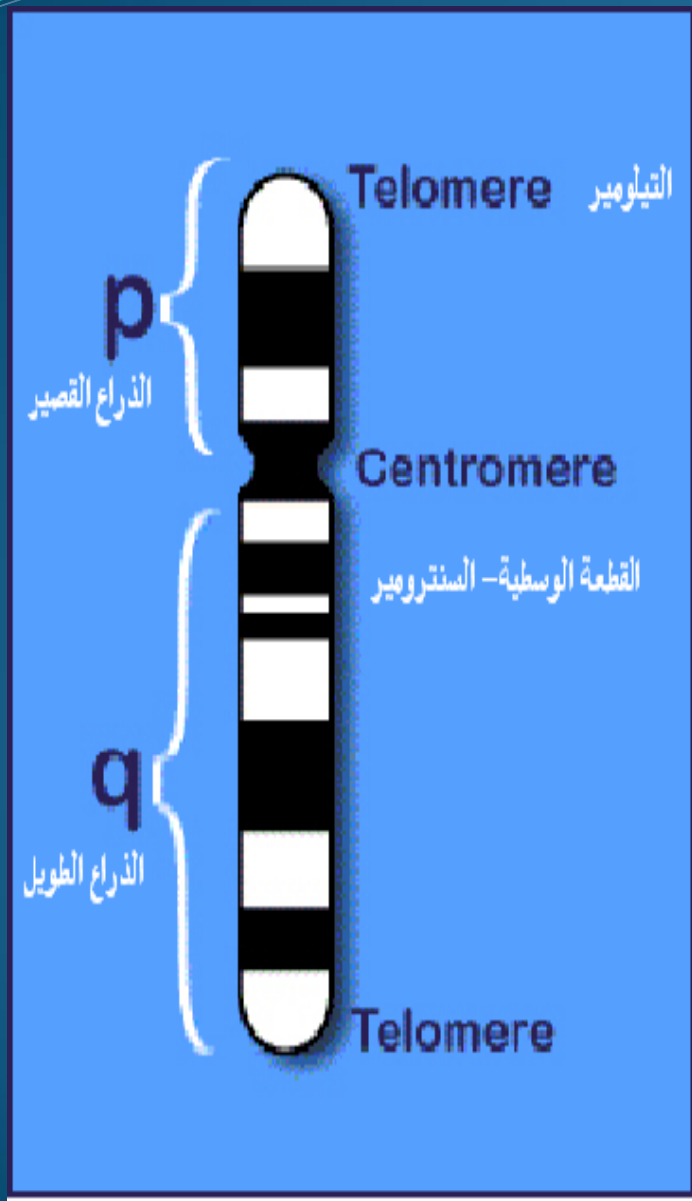


Human Chromosomes

Chromosomes Landmarks:

- Centromere ... location of Kinetochore the Micro-tubule Organizing centre (MTOC).
- Telomers... qter... pter.. TTAGGG
- Nucleous organizer region- NOR –rRNA genes
- Arms...P the short arm... petit, q the long arm... queue.. a line of people
- Variations between chromosomes

Human Chromosomes

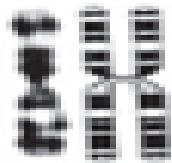


Human Chromosomes

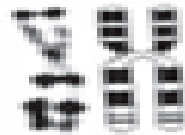
Centromer:

- Metacentric
- Sub Metacentric
- Telocentric or Acrocentric
- Sub Telocentric or Sub Acrocentric

Human Chromosomes



metacentric



submetacentric



acrocentric

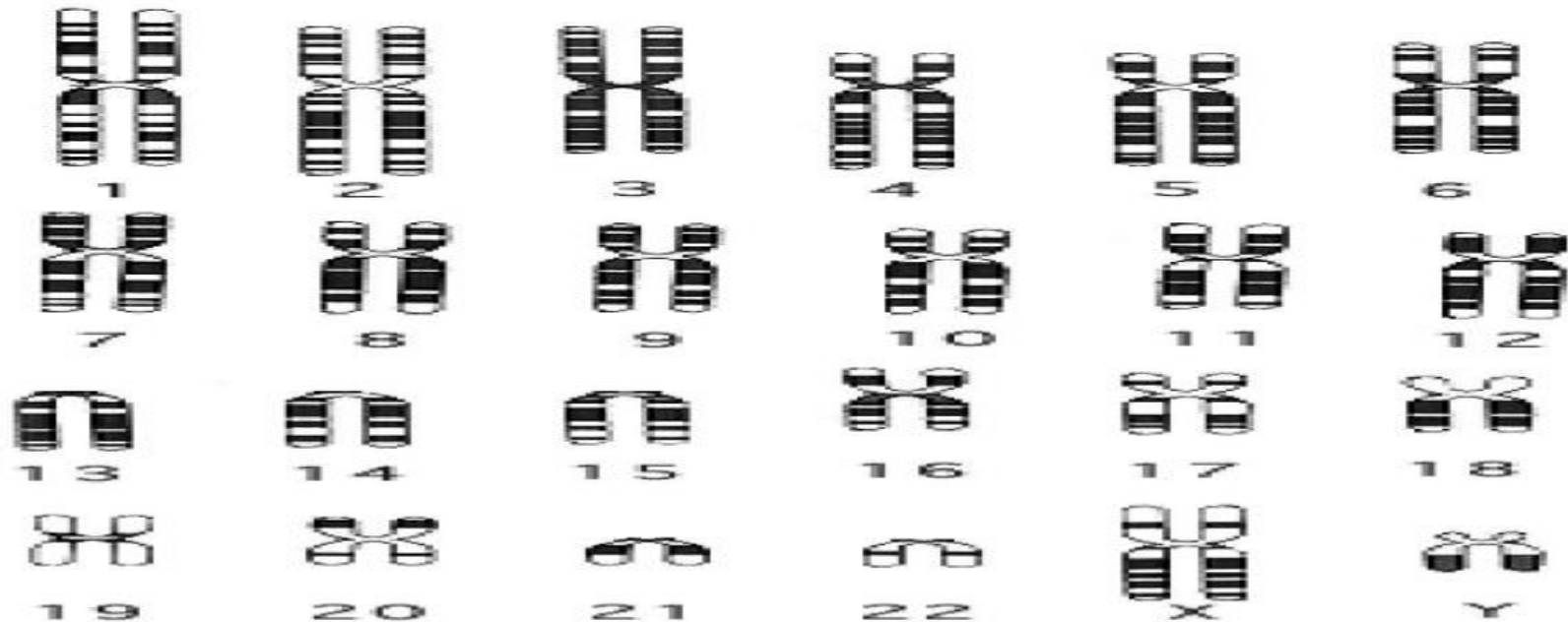
سنترومير مركزي

سنترومير

سنترومير نهائي

تحت

مركزي



Human Chromosomes

International System for Human Cytogenetic Nomenclature (ISCN)

Denver Conference 1960

London Conference 1963

Chicago Conference 1966

Paris Conference 1971

Paris Conference (Supplement) 1975

Stockholm—1977 ISCN 1978

Paris—1980 ISCN 1981

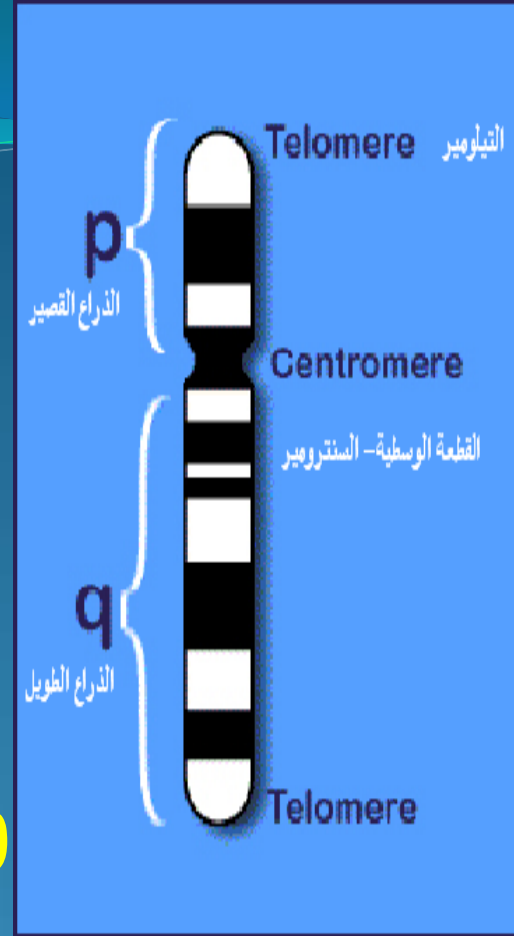
ISCN 1985

Cancer Supplement ISCN 1991

Memphis—1994 ISCN 1995

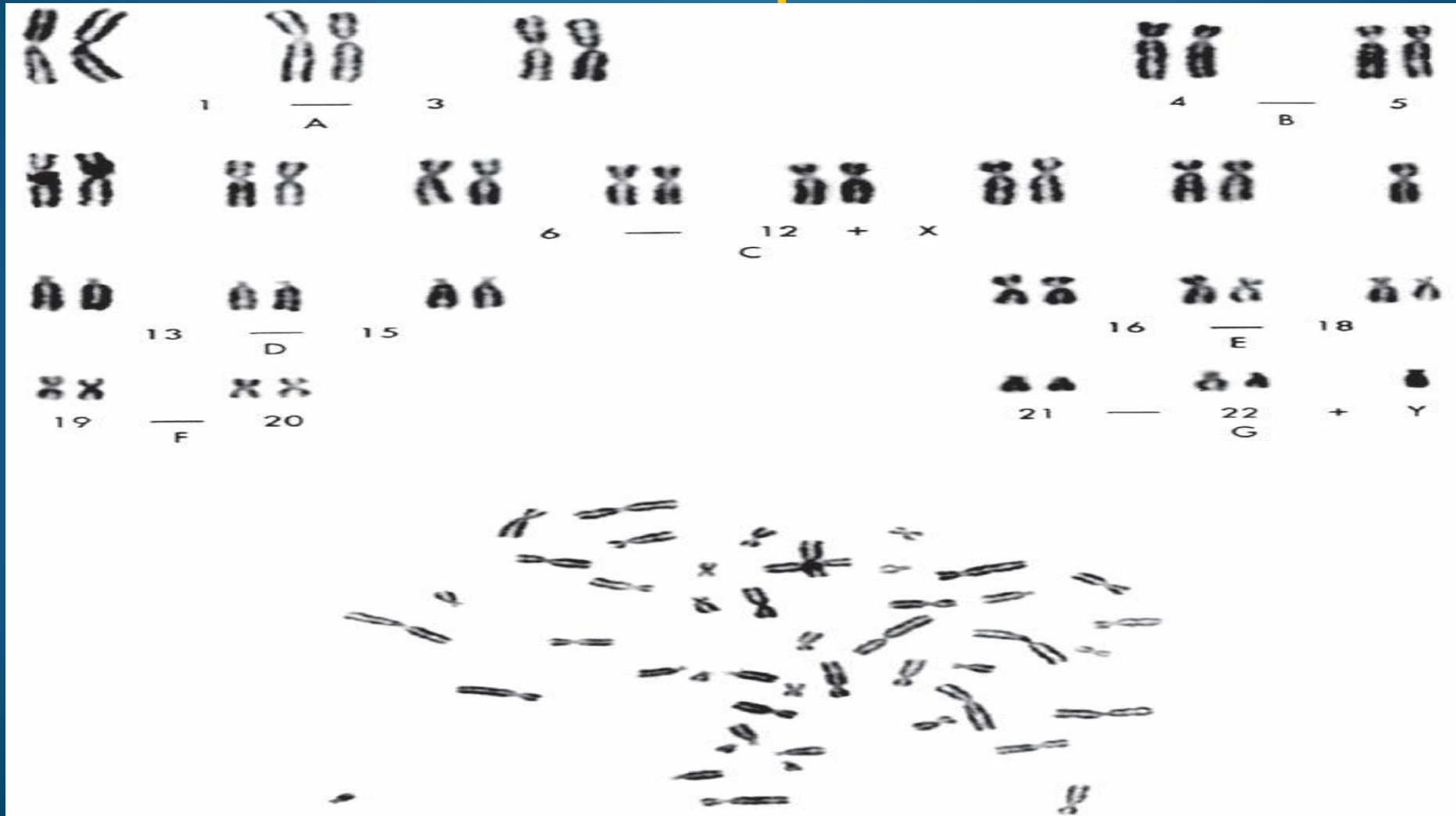
Human Chromosomes

- 1971 Paris –France
- Arms
- Up and Down
- Regions and Bands P12.1
- Number of bands ... 400 - 850
- Writing and Reading of Karyotyping
- Abbreviations and Symbols System



Human Chromosomes

Based on decreasing relative size and centromere position



Human Chromosomes

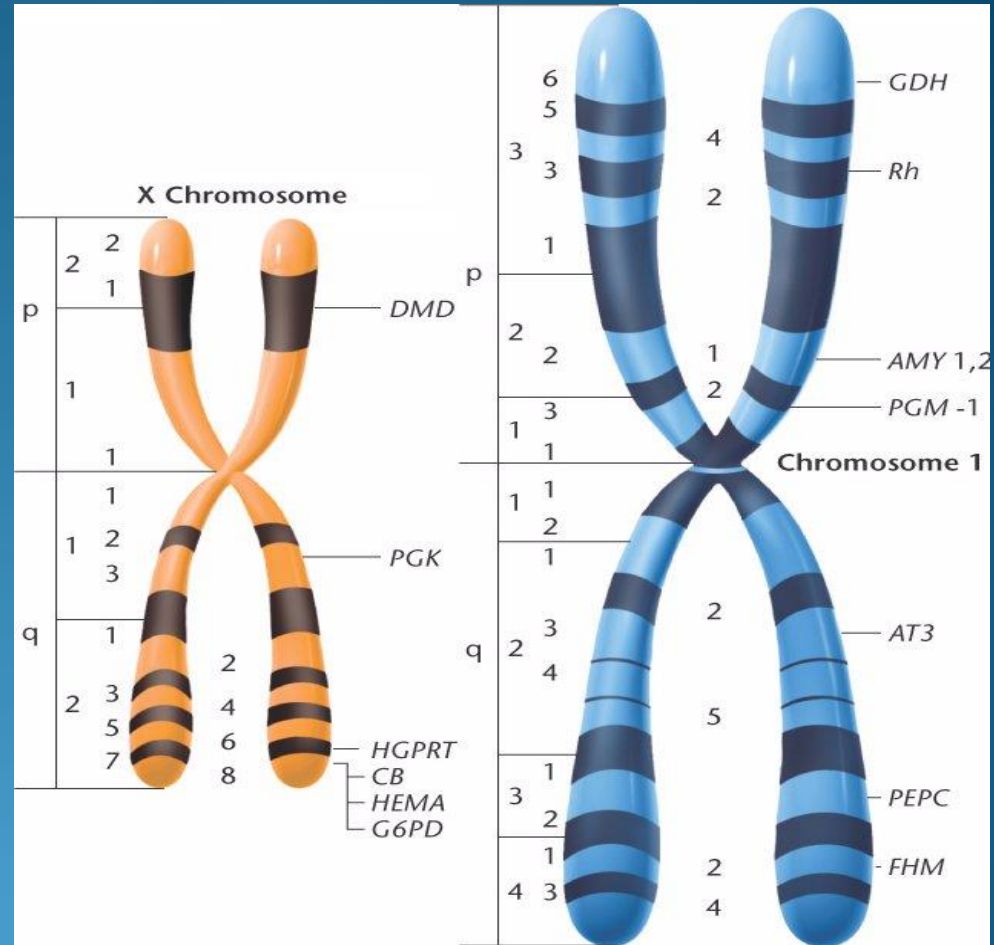
P10: The portion of the centromere lying between its middle and the 1st band on the short arm.

q10: The portion of the centromere lying between its middle and the 1st band on the long arm.

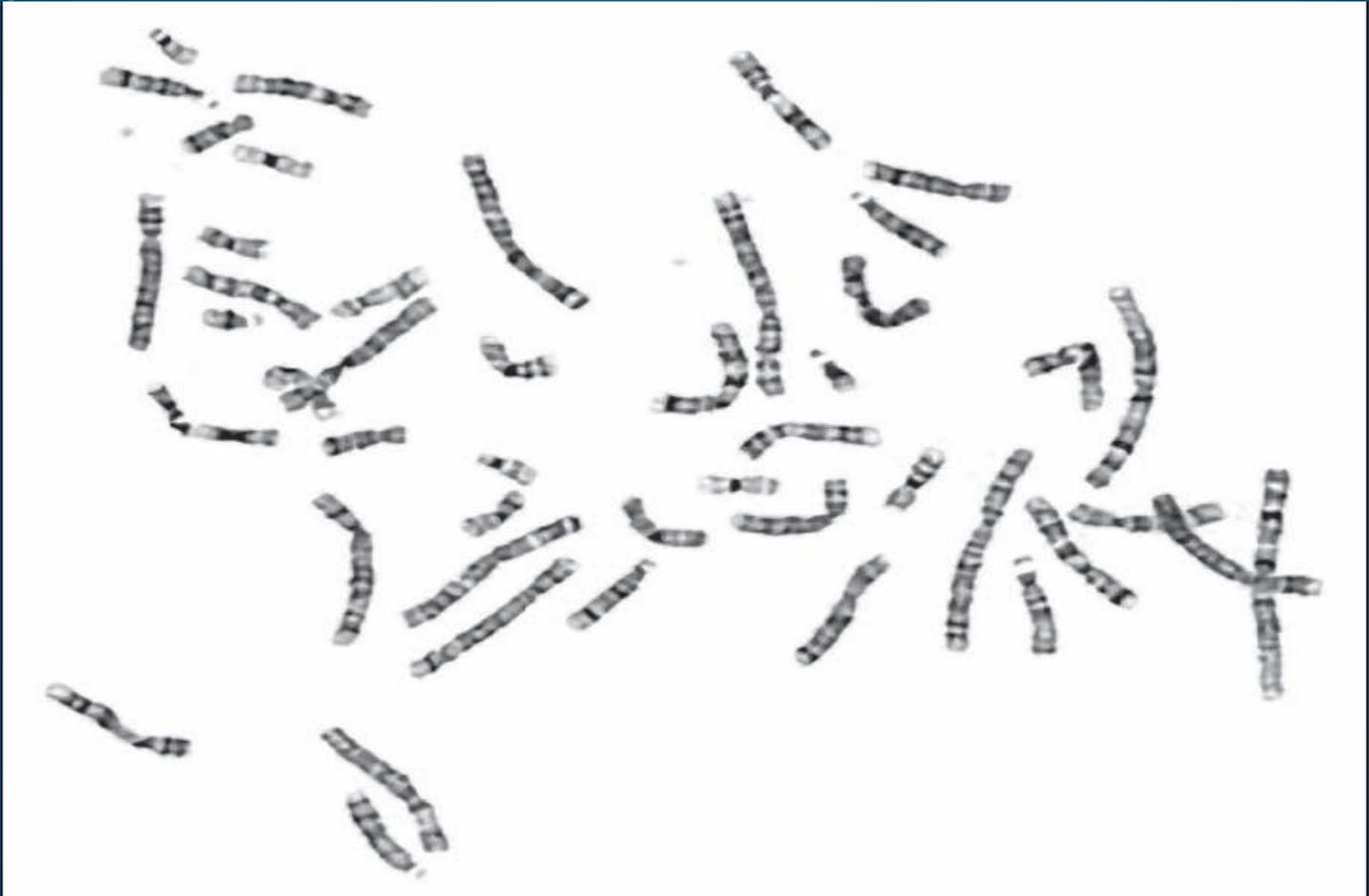
Region is an area that lies between two landmarks

The two regions immediately adjacent to the centromere are designed as 1(P1&q1).

A band is that part of chromosome that is distinctly different from adjacent area.



Human Chromosomes



Human Chromosomes

- add Additional material, origin unknown
- [] square brackets Number of cells in each clone
- cenCentromerechi..... Chimer
- comma (,) Separates chromosome number, sex chromosomes, and abnormalities
- Del Deletion
- der Derivative chromosome
- dic Dicentric
- dmin Double minute(s).....
- dup Duplication.....
- .fis Fission.....
- fra Fragile site
- H Heterochromatin.....
- i Isochromosome.....
- Inv Inversion..... ins..... Insertion
- mar Marker chromosome.....mat Maternal

Human Chromosomes

1. You have a test-Exam- in

Sunday 6-4-2013 lecture 1&2 .

1. You have a 2nd test-Exam- in

Sunday 4-5-2013 lecture 3 & 4

Thank you

