CHROMOSOMES

Dr. Mahesha H B
Professor and Head
Department of Sericulture
Yuvaraja's College,
University of Mysore, Mysore, India

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The chromosomes are nuclear components of special organization, individuality and function. They are capable of self reproduction and play a vital role in heredity, mutation and evolution.

- Chromosomes were first described by Strausberger in 1875.
- The term "Chromosome", however was first used by Waldeyer in 1888.
- They were given the name chromosome (Chromo = colour; Soma = body) due to their marked affinity for basic dyes.
- Their number can be counted easily only during mitotic metaphase.

Number of chromosomes

- Normally, all the individuals of a **species have the same number** of chromosomes.
- Closely related species usually have similar chromosome numbers.
- Gametes normally contain only one set of chromosome – this number is called

Haploid : n

- Somatic cells usually contain two sets of chromosome -

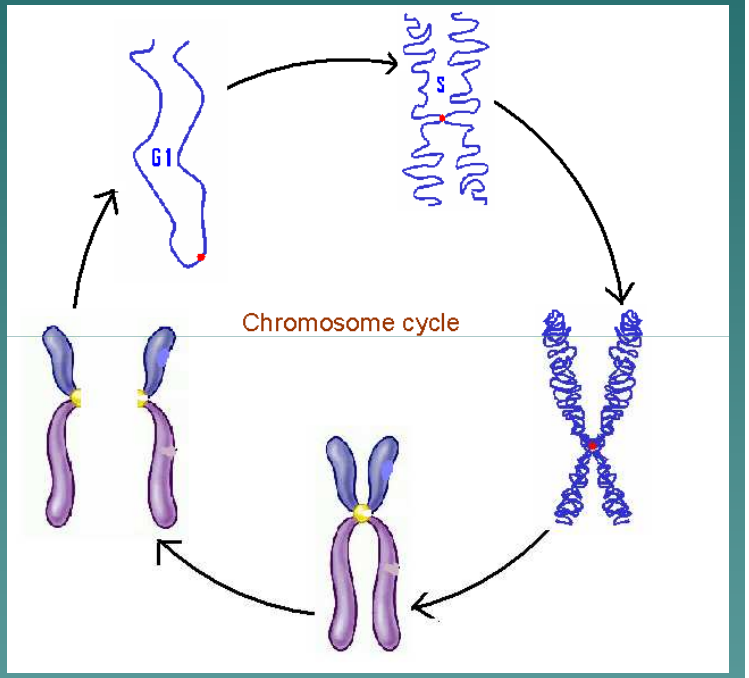
2n : Diploid

Chromosomes in different species

Table 1: Examples of chromosome numbers (diploid).			
Species	No. of chromosomes	Species	No. of chromosomes
Fruit fly	8	Human	46
Pig	40	Ape	48
Guinea Pig	16	Sheep	54
Wheat	42	Horse	64
Edible snail	24	Silkworm	56
Earthworm	36	Fern	~1200
Butterflies	~380	Onion	16

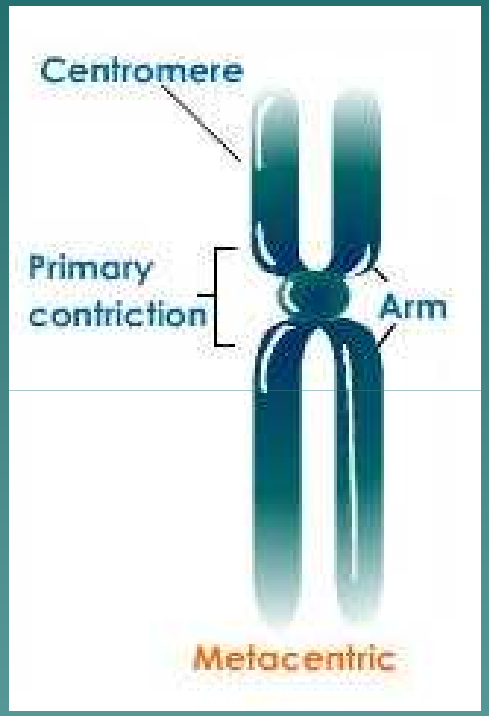
Size of the Chromosomes

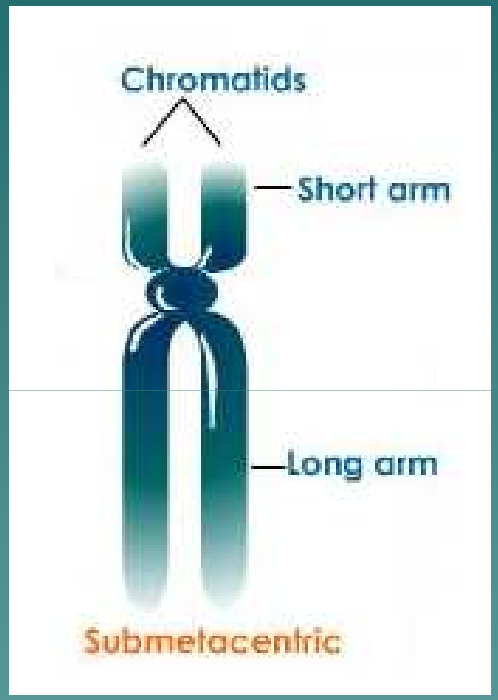
- In contrast to other cell organelles, the size of chromosomes shows a remarkable variation depending upon the stages of cell division. *i.e.,* **Interphase, Prophase, Anaphase & Metaphase**.

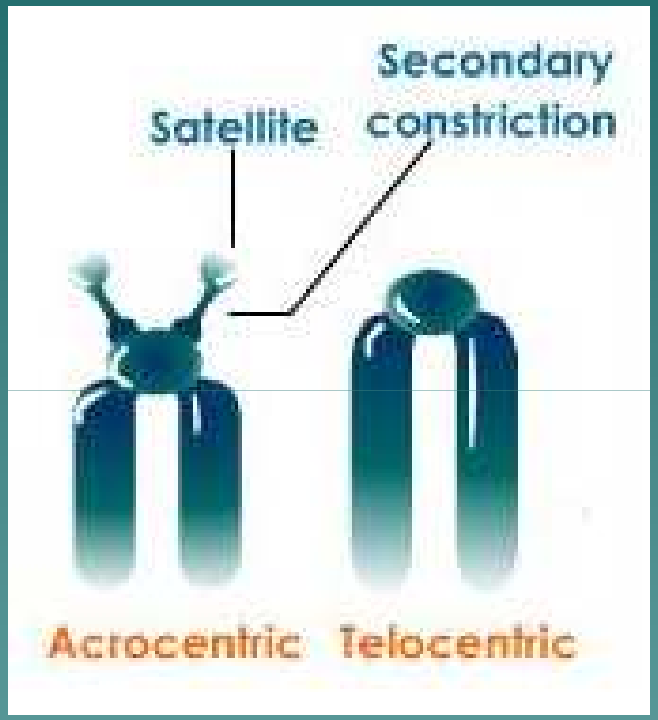


- **Therefore, chromosomes measurements are generally taken during mitotic metaphase.**
- **Length 1µ – 30 µ**
- **Dia 0.2 µ – 20 µ**

Types of Chromosomes

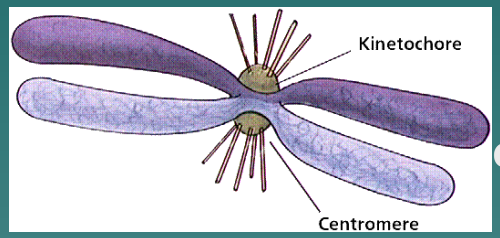




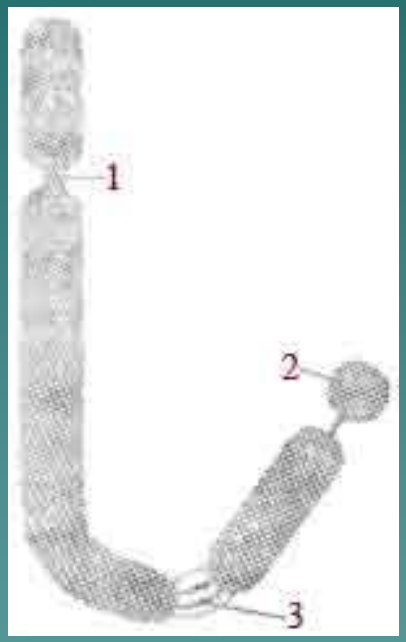


Structure of Eukaryotic Chromosomes

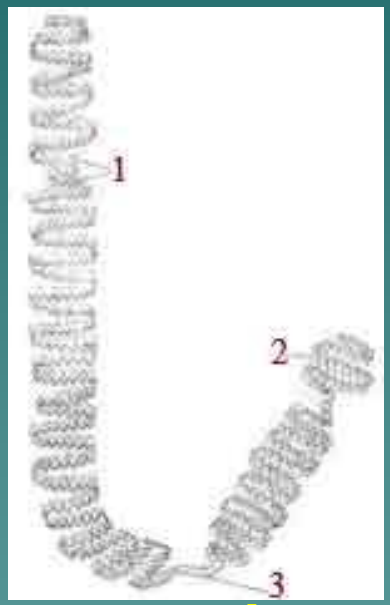
Structure of a metaphase chromosome



CHROMATIDS > CHROMONEMATA

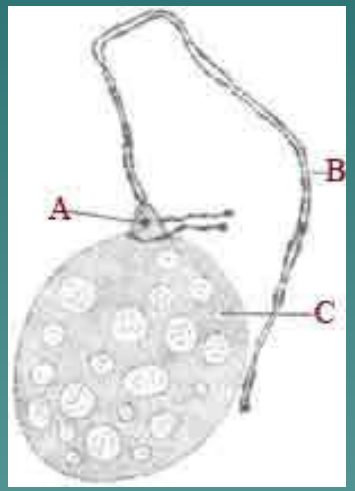


A-External Structure
1.Secondary constrriction
2.Satellite
3.Primary constriction or centromere



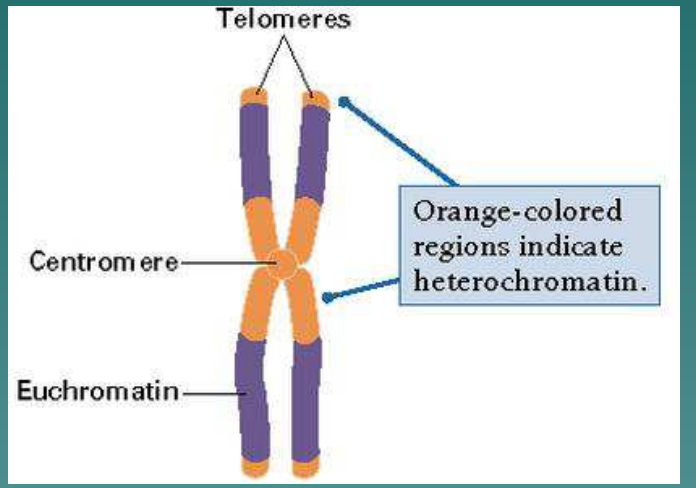
B-Internal Structure

1.Two chromonemata
2.Satellite
3.Centromere



A. Nucleolus organizer
B. Chromosome
C. Nucleolus

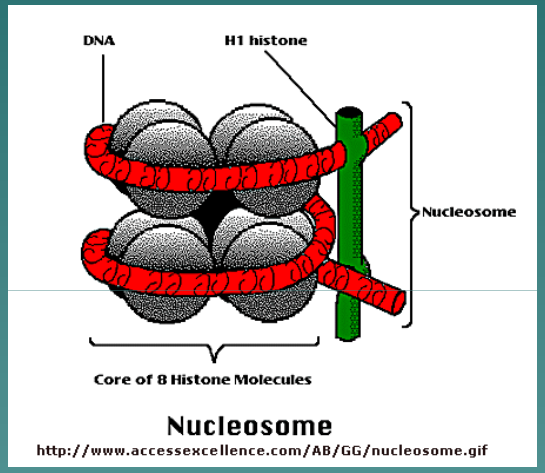
- Euchromatin- large amount of DNA, Small amount of RNA and certain Basic proteins & Takes deep stain by basic stains
- HeteroChromatin - large amount of RNA, Small amount of DNA and certain Acidic proteins & Takes light stain by basic stains

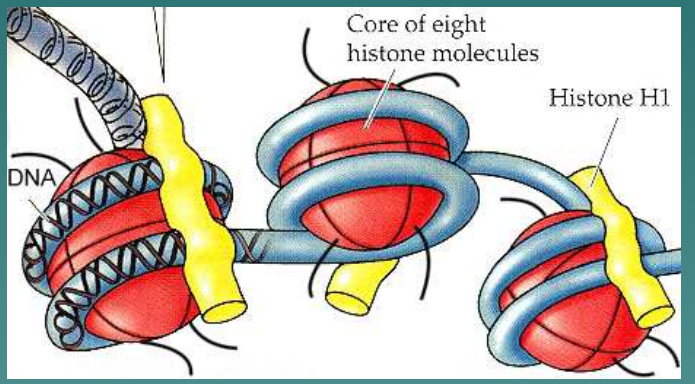


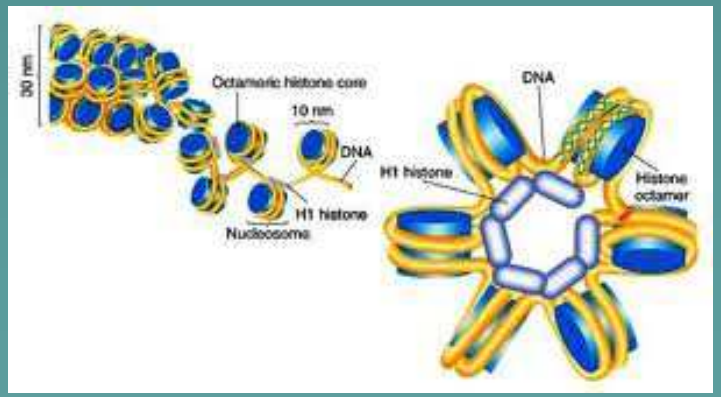
Chromatin Structure

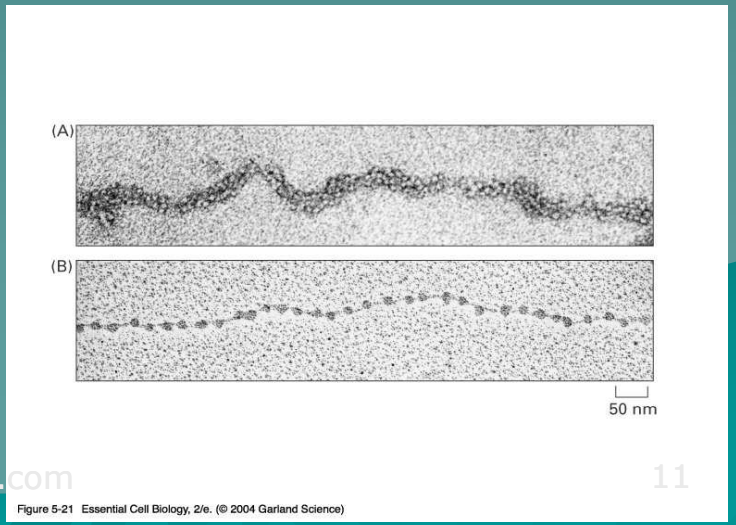
Chromatin =DNA+Protein complex

In Humans 2.2 meters of DNA distributed in 46 ch'somes
Each ch'somes contain 4.8 cm condensed to 6 Microns
***i.e.*, packing ration 8000:1**

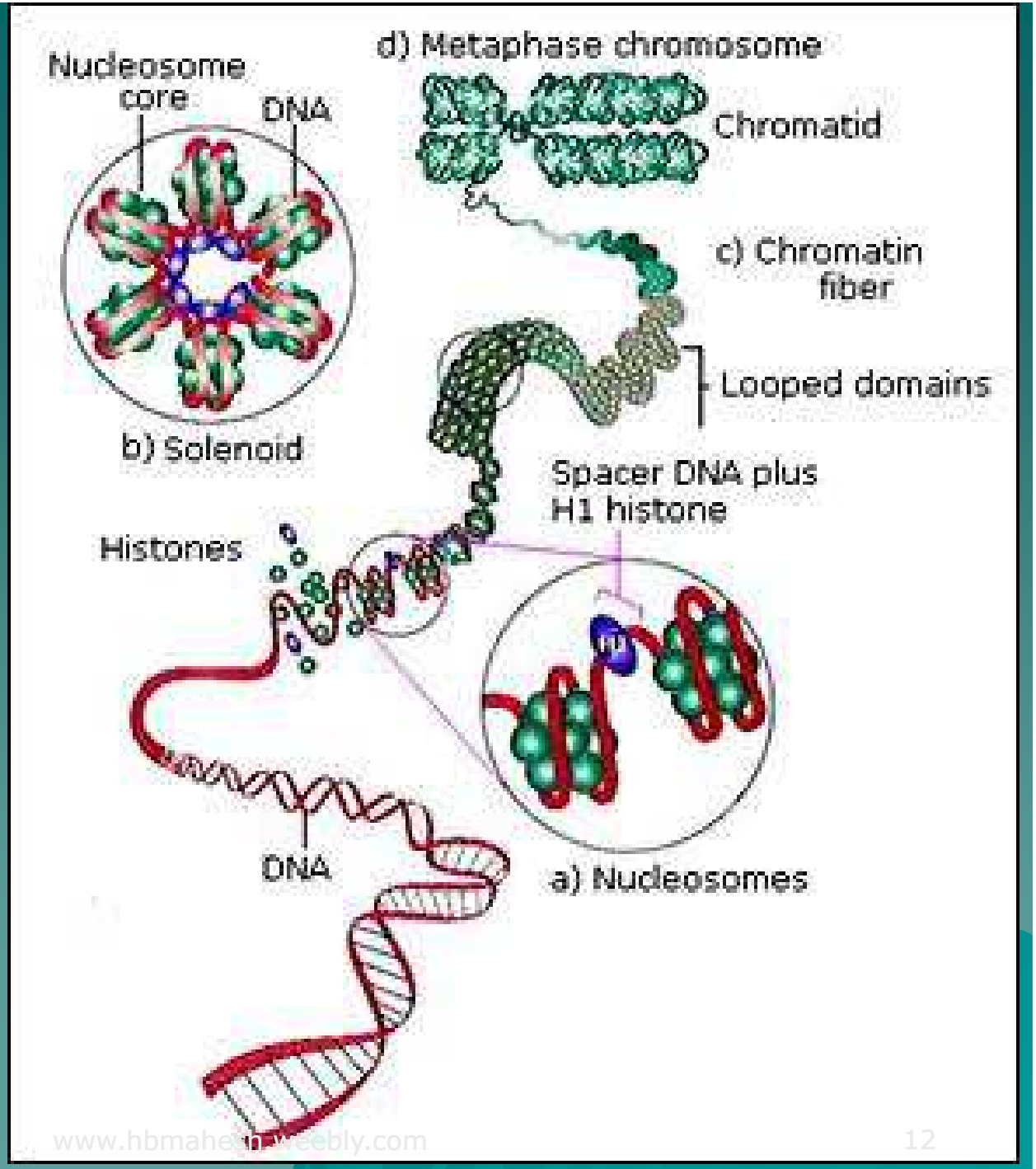








Chromatin Structure :



Special chromosomes

Polytene Chromosomes: **occurs in certain tissues salivary glands, trachea, fatbody cells and malphighian tubules of Dipterians.**

Eg., Drosophila

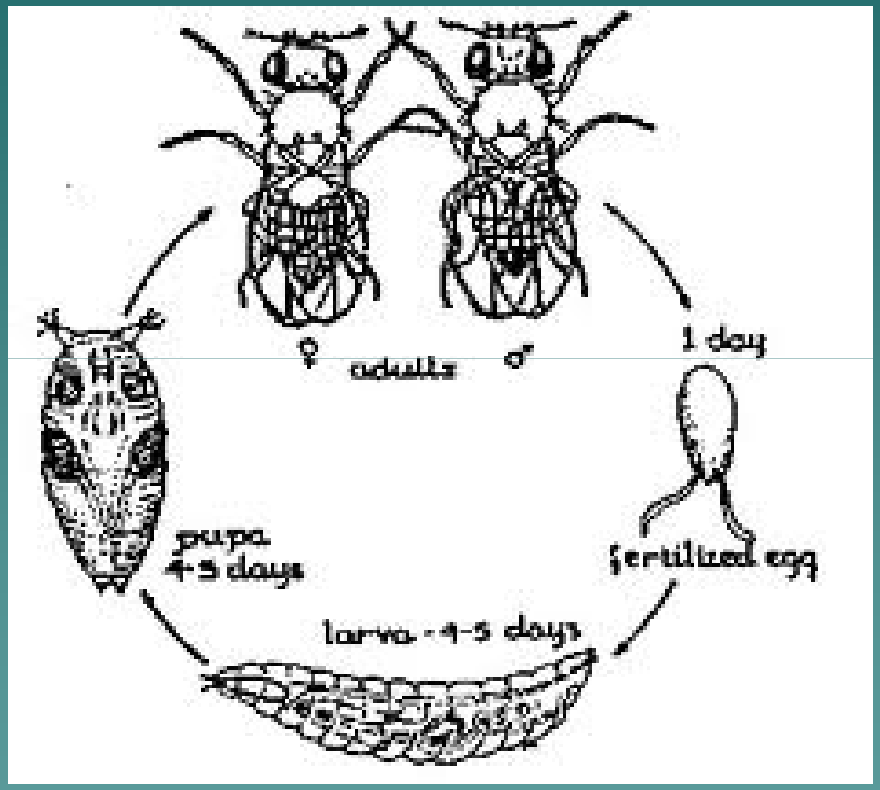
First observed by Balbiani - 1881

The name was suggested by Kollar

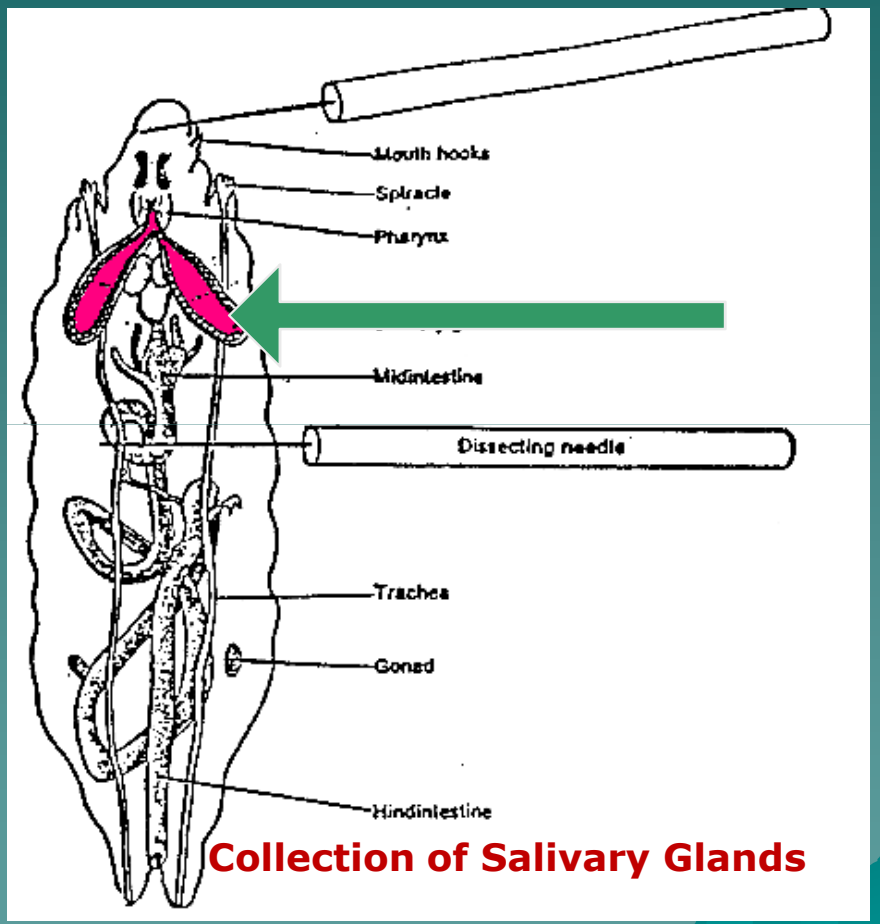
Measures 200 micron against 7.5

DNA 1000 times more due to endomitosis

Polytene Chromosomes

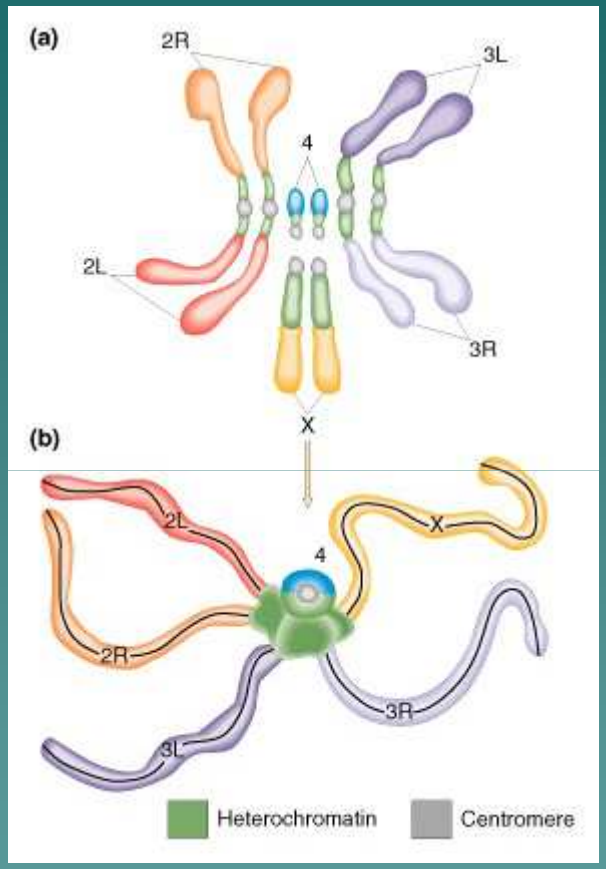


Life Cycle of Drosophila

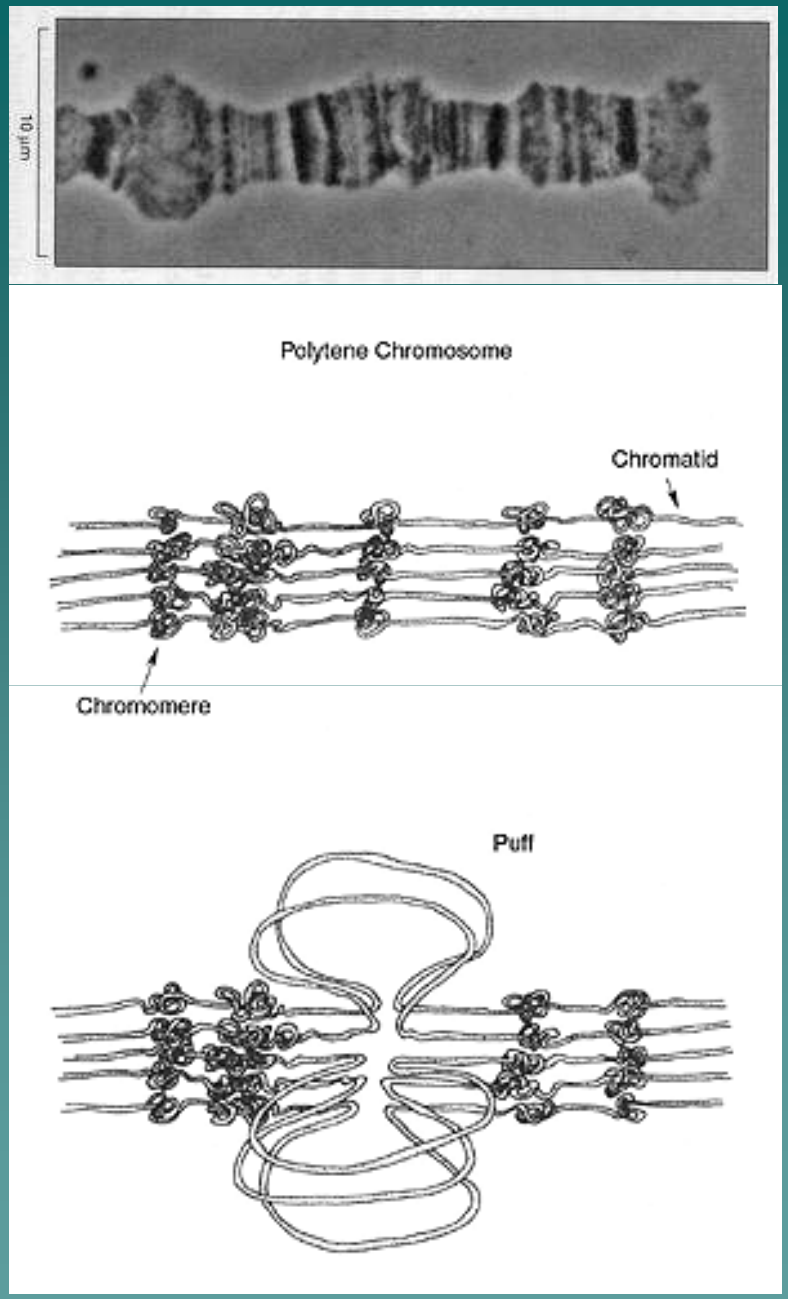


Collection of Salivary Glands

Polytene Chromosomes



Dark bands are euchromatin
Light bands are heterochromatin



- Schematic drawing shows the organization of the chromosome (chromatids, chromomeres, chromosome bands).
- The lower figure exhibits the change in chromosome structure upon puff formation at one locus. These puffs are active genes and represents site of RNA synthesis

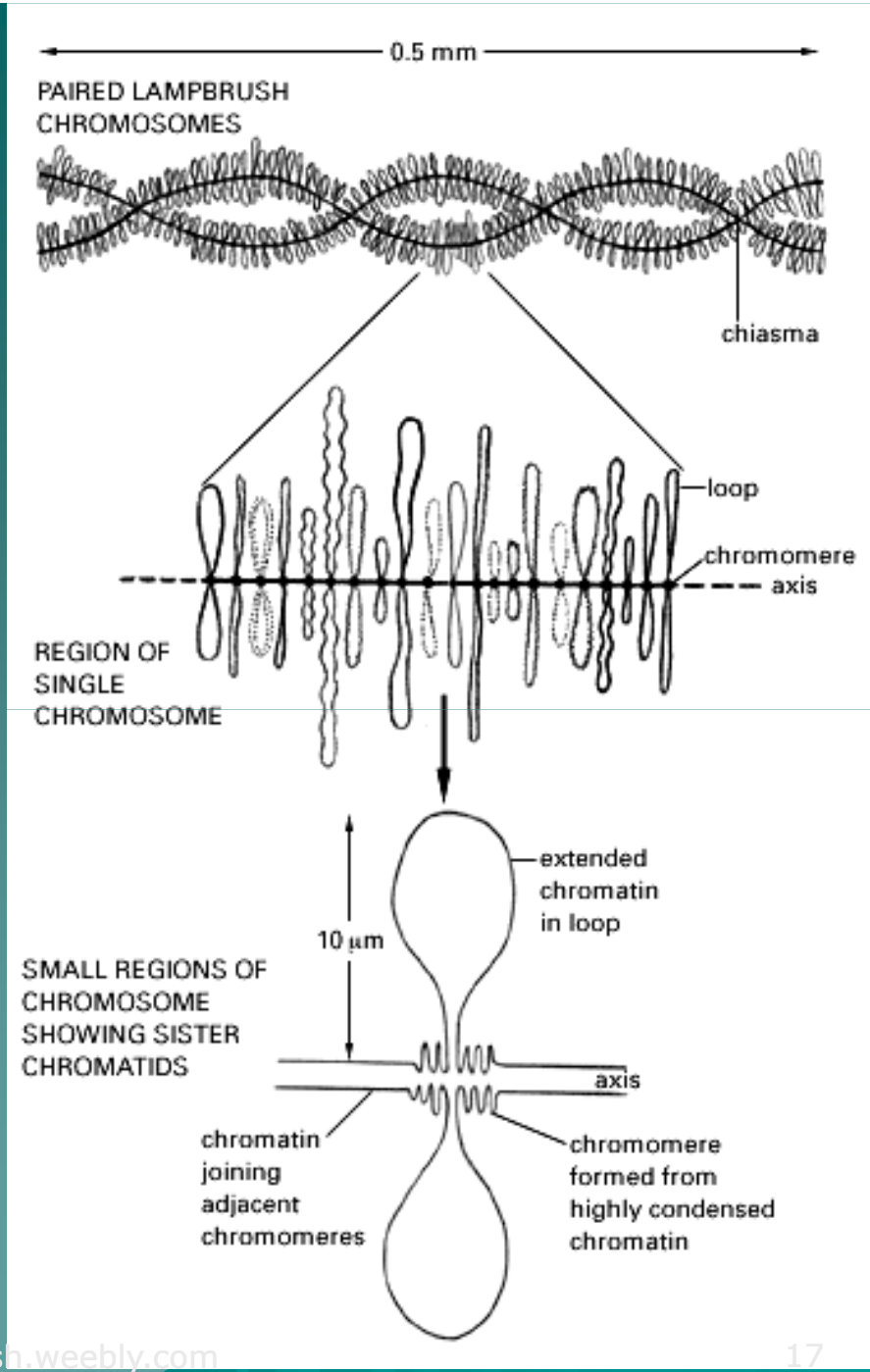
Lamp brush Chromosome:

Found in animal Oocytes *eg.*, fishes, birds, reptiles and birds

Length & Breadth is 1000 & 20 microns respectively

Ch'somes composed of Main axis & Loops.

Loops are rich in RNA and Protein synthesis



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FOR PICTURES