

#### SEXUAL CELL REPRODUCTION

### Meiosis

- In most sexually reproducing organisms, the doubling of the gametic chromosome number is compensated for by a halving of the resulting zygotic chromosome number at some other point during the life cycle.
- These changes are brought about by a single chromosomal duplication followed by two successive nuclear divisions. The entire process is called meiosis, and it occurs during animal gametogenesis or sporogenesis in plants.

## Stages of meiosis

- A. Meiosis I
- Interphase I:genetic materials are duplicated due to active DNA replication.



• **Prophase I**:Prophase-I is a very long phase, it is divided into five-sub-phases.

leptonema, zygonema, pachynema, diplonema, and diakinesis.

• Leptonema:- (leptos = thin; taenia = band / stripe)

The chromosomes are very thin and so can be hardly seen. Chromosomes duplicated and the two chromatids of each chromosome are twined round each other and appear to have small nodules known as "**Chromomeres**."



Zygonema:- (zygon = touching another) In this phase the homologous chromosomes come adjacent to each other to form pairs Synapses. The paired chromosomes are known as "bivalents".



- Pachynema:- (pachus = dik) The chromosomes become thick and dense on the completion of pairing in this phase. As they are paired, there appear to be four chromatids in all"tetravalent".
- **Crossing over** is now exhibited by the inner chromatid of each homologous pair of chromosome.



• **Diplonema**:- (diplous = in twofold )It is a longer sub-phase. The chromosomes in each pair now stay moving away from each other. The inner chromatids are in a state of crossing over and remain attached at some loci. These loci are referred to as **chiasmata**.



Diakinesis:- (dia = apart; kinein = to move) In subphase Diakinesis there is an increase in the opposite pulling between the homologous chromosomes. Because of this the chromatids break at the chiasmata and exchange their parts. The opposite pulling of the homologous chromosomes here does not take them away from each other but they remain nearby.



#### Leptonema

- Chromosomes are already duplicated.
- Synaptinemal complex begins to appear.

#### Zygonema

- Pairing is initiated.
- Synaptinemal complex develops more fully.

#### Pachynema

- Pairing is completed.
- Chromosomes thicken.
- Crossing over occurs.
- Chromosome bouquet forms.

#### Diplonema

- Repulsion between homologs begins.
- Chiasmata are clearly visible.
- Chromosomes are held together at chiasmata and centromere.

#### Diakinesis

- Maximum chromosome thickening occurs.
- Chiasmata disappear.
- Chromosomes move to equatorial plane.











Copyright @ 1997, by John Wiley & Sons, Inc. All rights reserved.





Convight @ 2000 Reason Education Inc.



### Metaphase-I

 At this moment the nuclear membrane starts disappearing. *The spindle fibers developing from the centrosome and* get attached to the two chromosomes of each homologous pair opposite ends. As a result the chromosomes appear to be arranged in two lines on equatorial plane of the nuclear spindle.



### Anaphase-I

 In the sub-phase Anaphase-I the chromosomes of each homologous pair are pulled towards the opposite ends because of the contraction and ultimate shortening of spindle fibers.



### **Telophase-I**

 The nuclear spindle disappears on completion of the contraction of the spindle fibers. A new nuclear membrane is formed and two daughter nuclei come into existence. Each daughter nuclei has half the number of Chromosomes.



### MeiosisII

• The same like mitosis except in the end we have 4 tetrads not identical













COMPARISON OF METAPHASE & ANAPHASE LINEUP OF CHROMOSOMES



# Differences between nuclear divisions of MEIOSIS & MITOSIS























