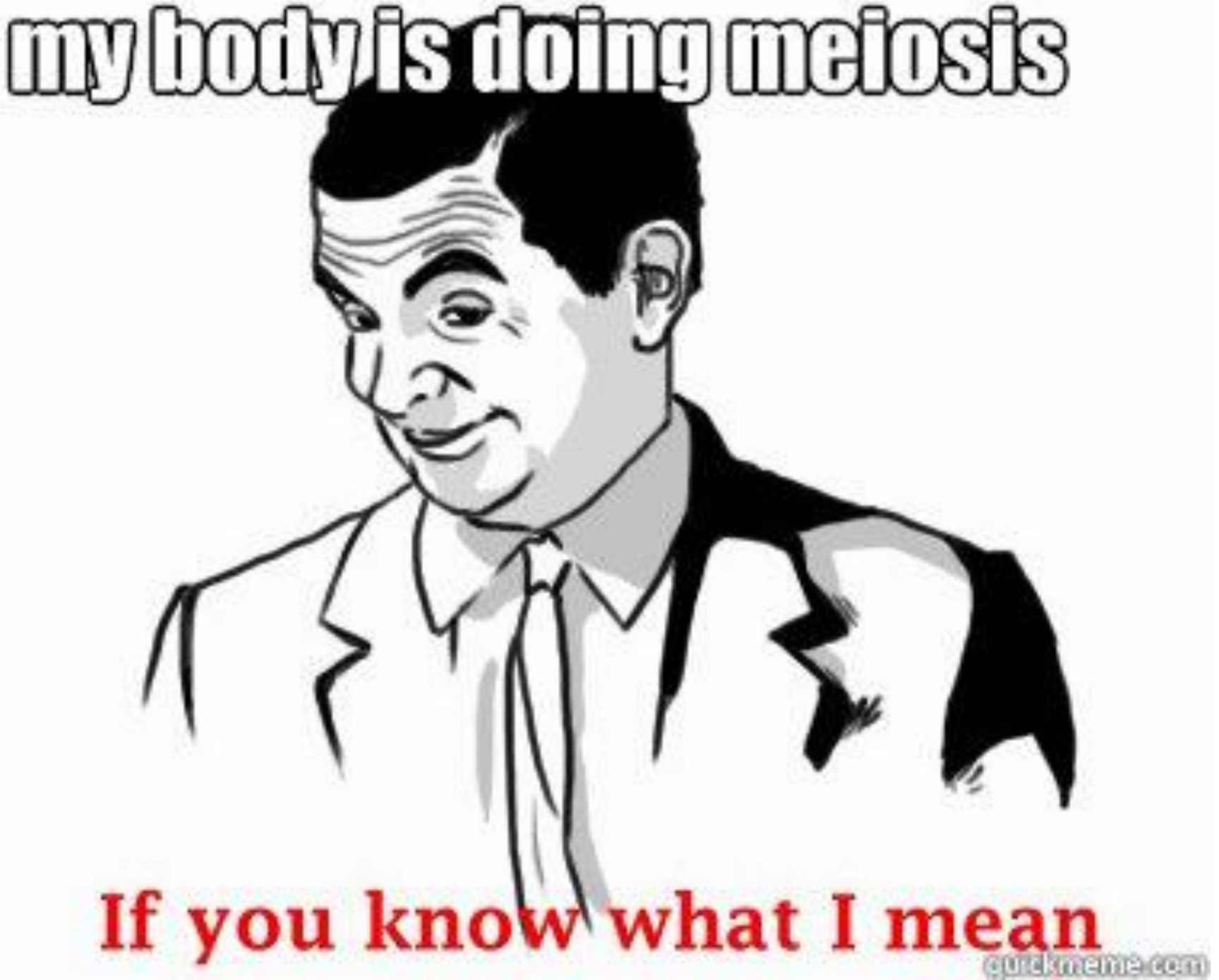
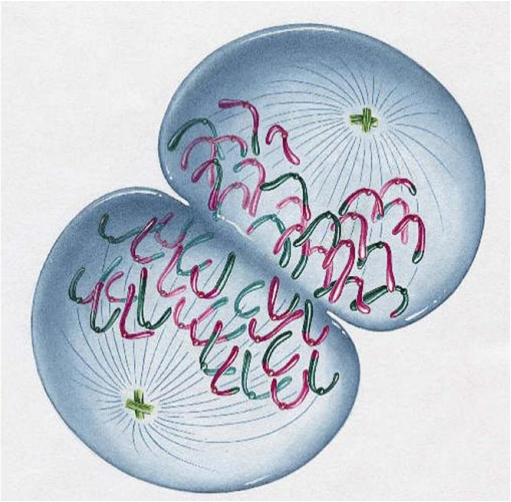

my body is doing meiosis
If you know what I mean
quickmeme.com

Meiosis

The sexy shuffling machine



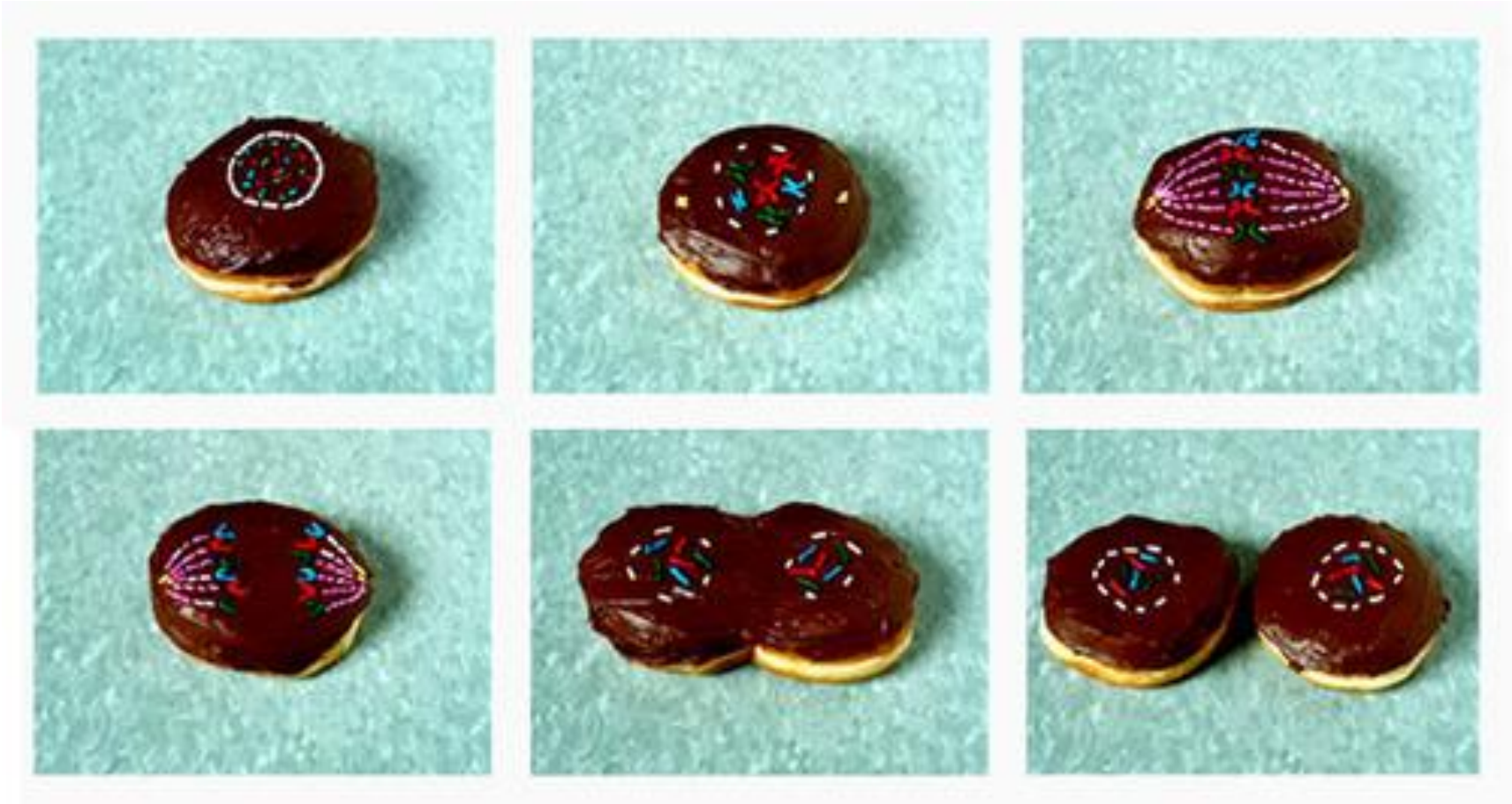
LO:

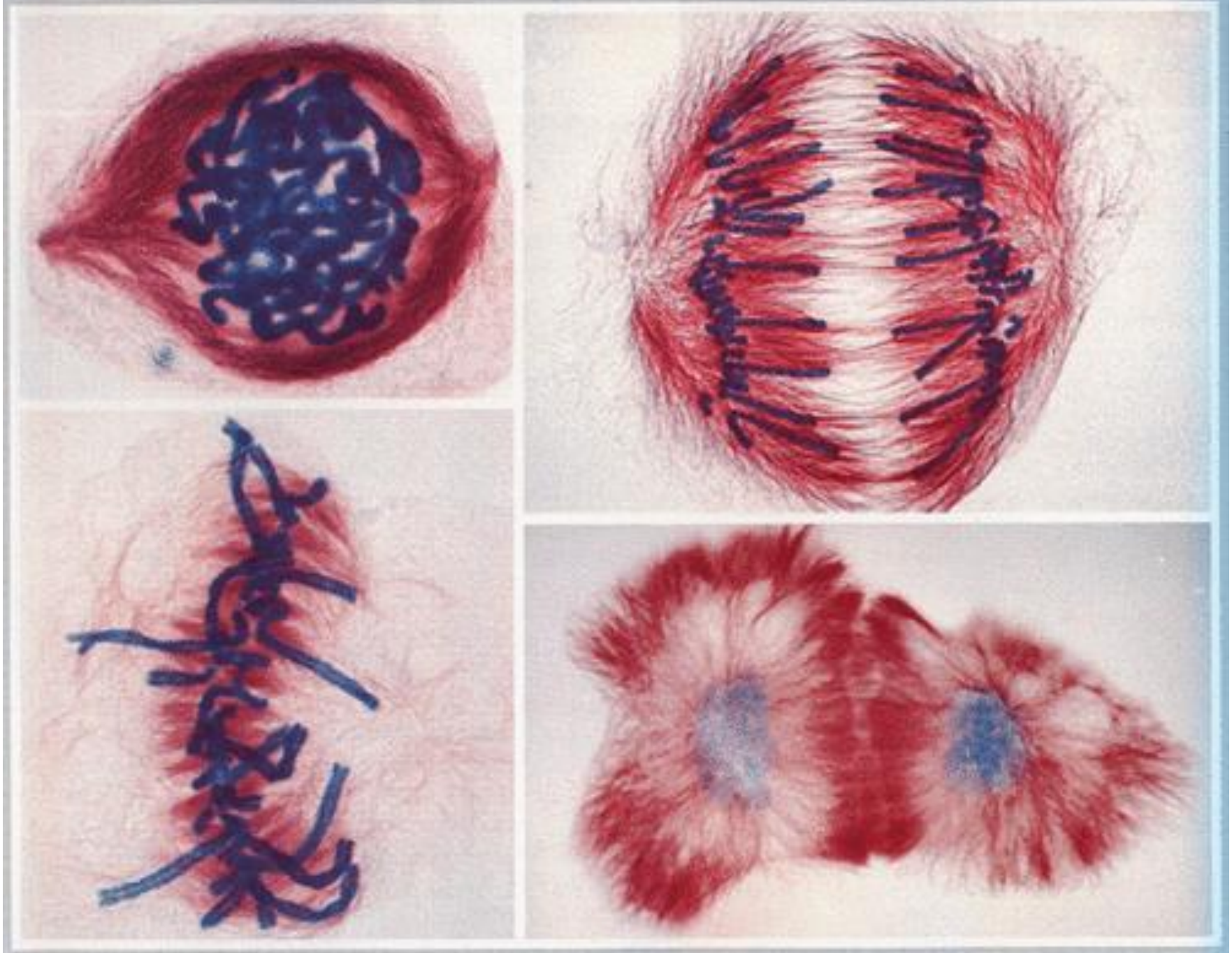
- **Describe** the events of meiosis
- **Explain** how meiosis creates 'uniqueness'
- **Compare & contrast** mitosis & meiosis

http://www.youtube.com/watch?v=kVMb4Js99tA

Mitosis Recap
Discuss

Which phases are depicted in the diagram?
What happens in each?
Which phase of the cell cycle is not shown?





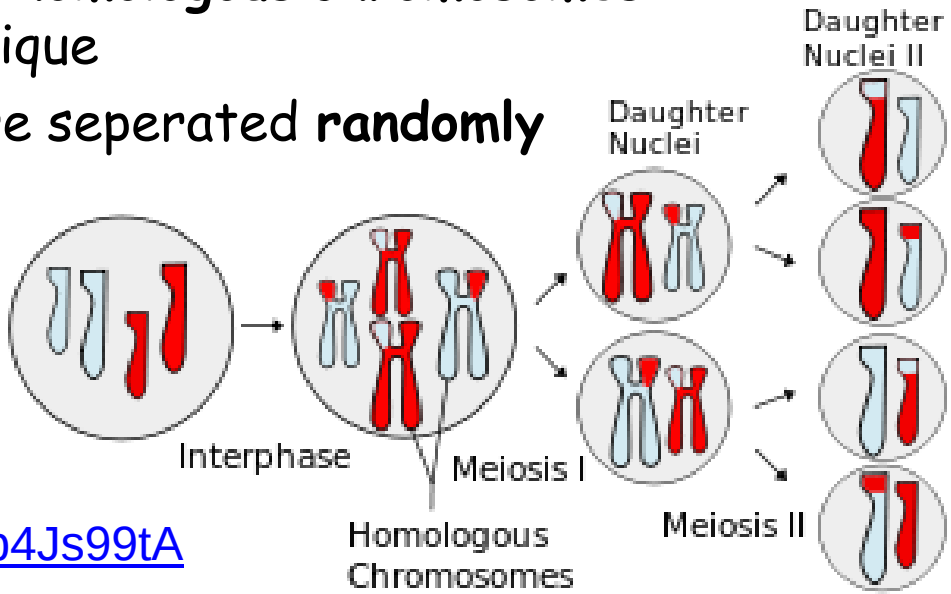
Pint cells in various stages of mitosis: (a) prophase; (b) metaphase; (c) anaphase; (d) telophase (all magnified about 2,700 times).

Meiosis Intro

http://cellsalive.com/meiosis.htm

What does meiosis make?

- DNA replication occurs in **interphase** followed by two cycles of division (**cytokinesis**).
- 1 diploid (di = double DNA) makes 4 haploid daughters (ha = half)
- Daughter cells are sex cells (**gametes)**
- Genes are **shuffled** between **homologous chromosomes** – daughters are genetically unique
- Homologous chromosomes are seperated **randomly**



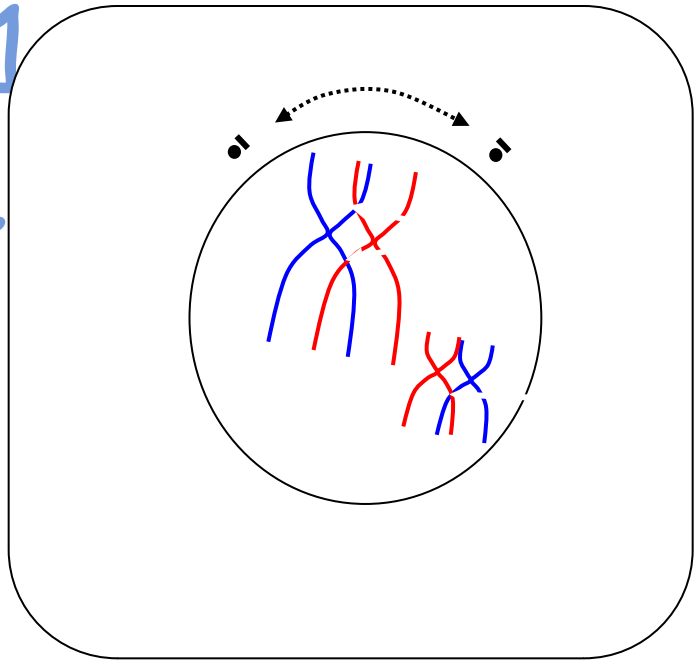
http://www.youtube.com/watch?v=kVMb4Js99tA

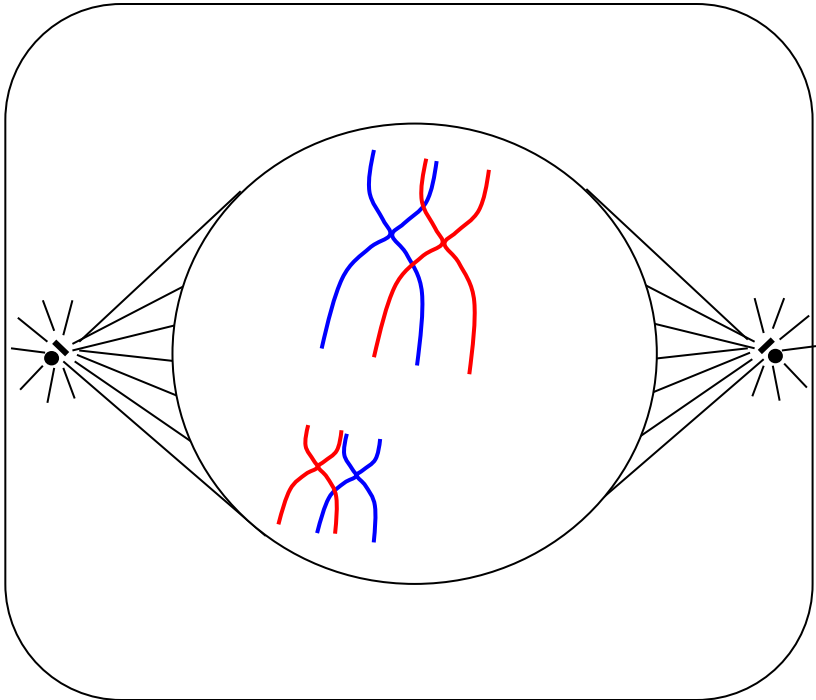
Meiosis - a 2-step process

- **Meiosis 1** is the reduction division (prophase 1, metaphase 1, anaphase 1 and telophase 1)
- **Meiosis 2** resembles mitosis (prophase 2, metaphase 2, anaphase 2 and telophase 2)

Meiosis 1 Prophase

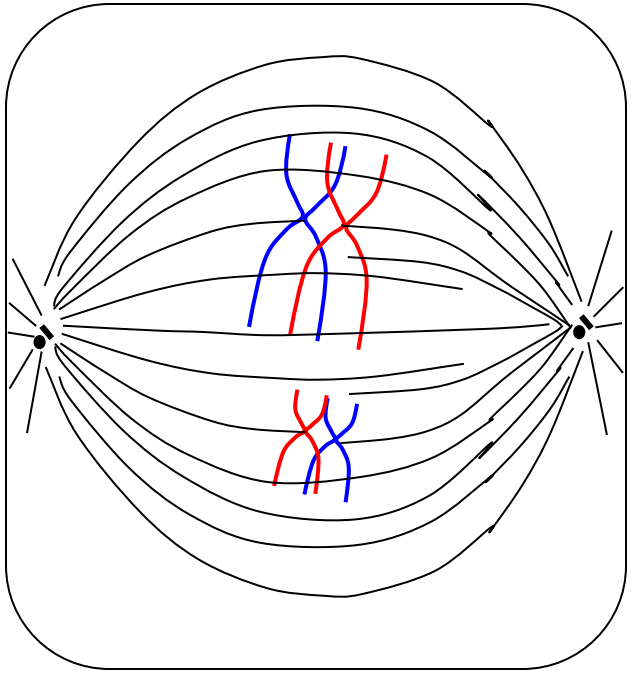
- Chromosomes condense
- **Homologous** chromosomes pair up
- **CROSSING OVER**
- Spindle fibres grow from poles → equator
- Nuclear membrane about to break down

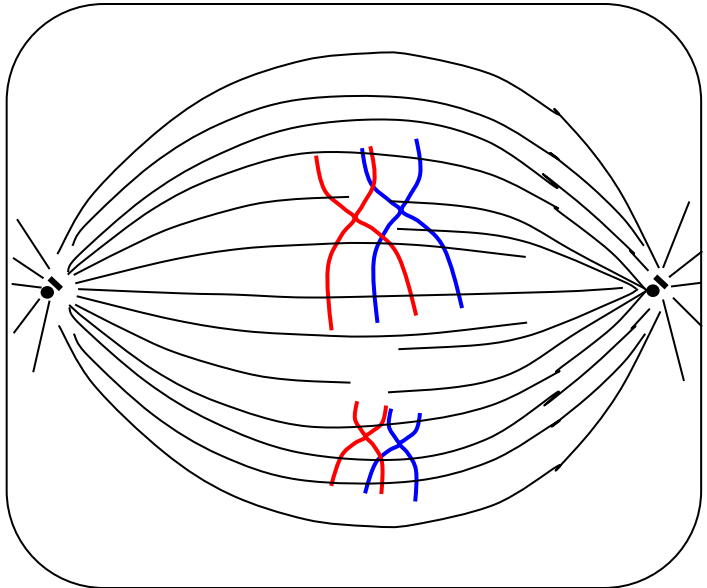




Meiosis 1: Metaphase 1

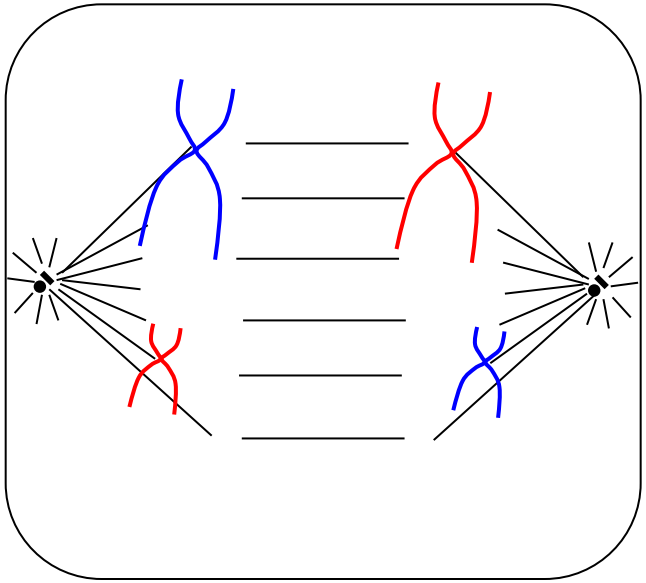
- Pairs of line up on the equator
- Orientation is **random**
- Spindle fibres **attach** to each of a pair of homologous chromosomes

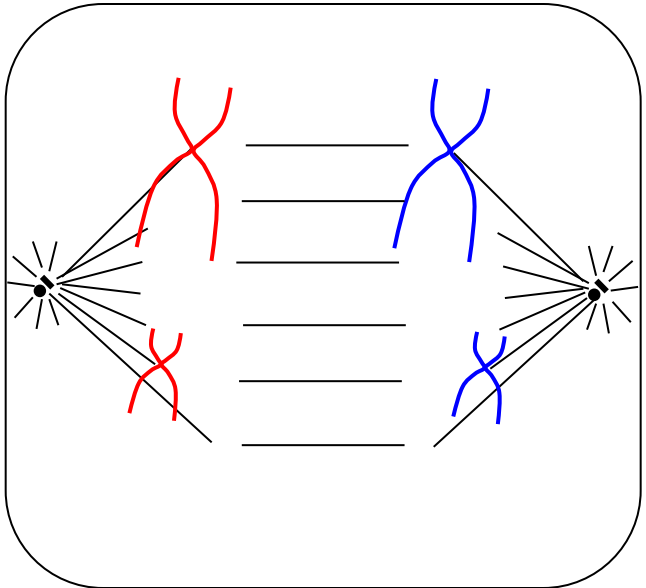




Meiosis 1: Anaphase 1

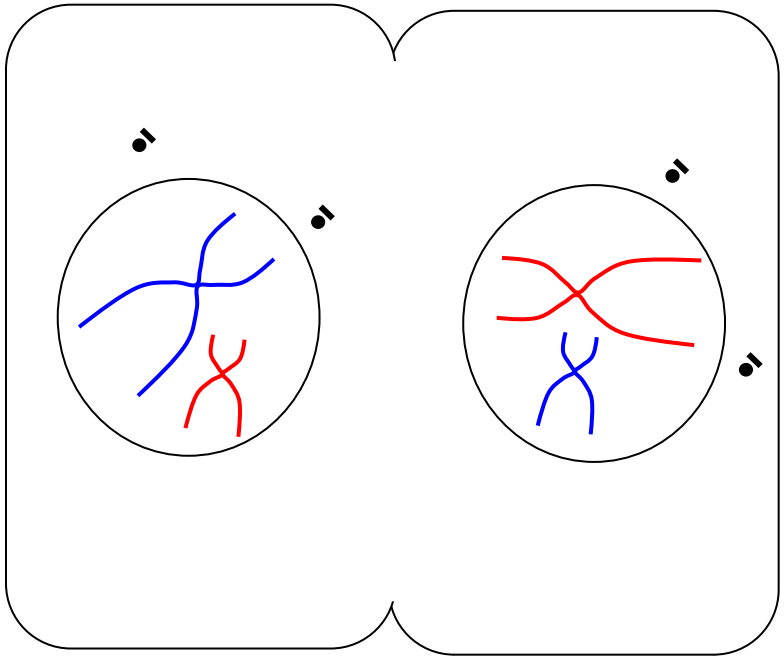
- Homologues are pulled apart, $\frac{1}{2}$ chromosome #
- Move to opposite poles
- Cell membrane soon to be pulled inwards (cytokinesis)
- **RESHUFFLING**
- 2^n combinations
- Humans: 2^{23} = >8 million combinations

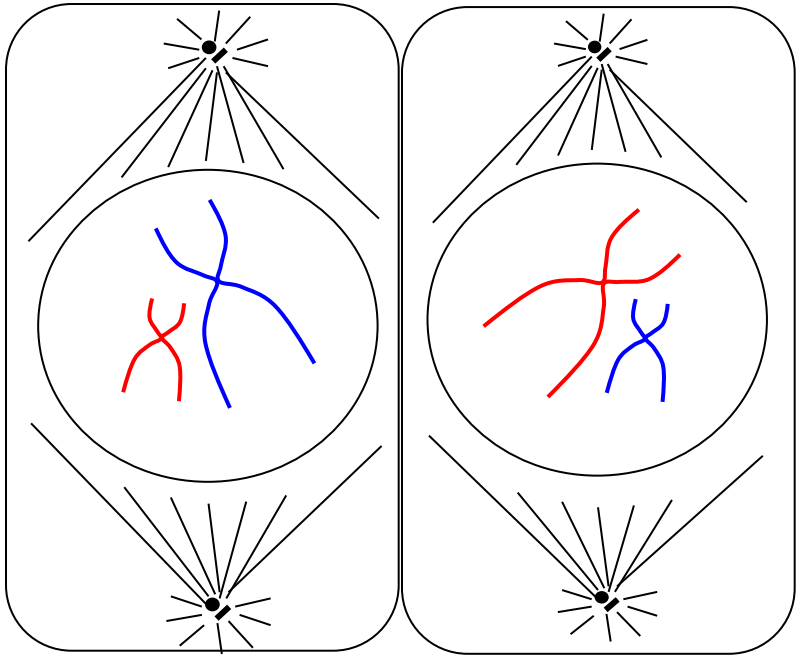




Meiosis 2: Prophase 2

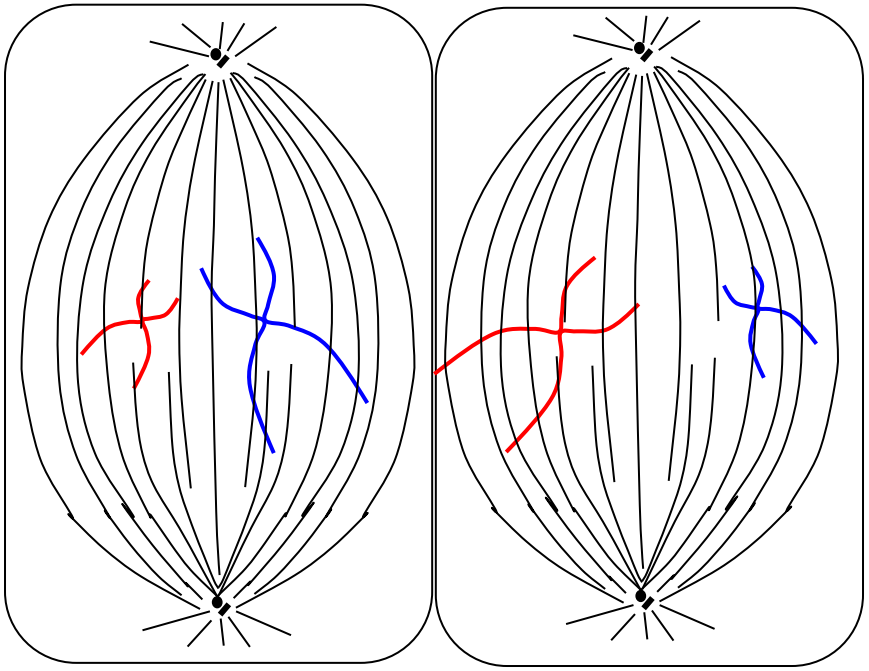
- Cells are haploid
- Chromosomes do not decondense at the end of meiosis 1
- Each chromosome has still two chromatids
- New spindle microtubules form





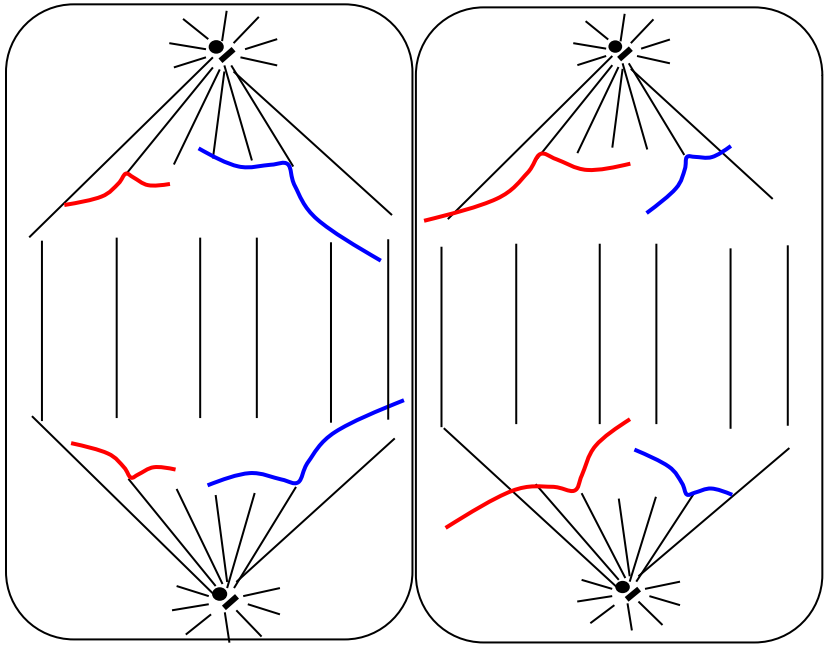
Meiosis 2: Metaphase 2

- The chromosomes line up on the spindle equator independently



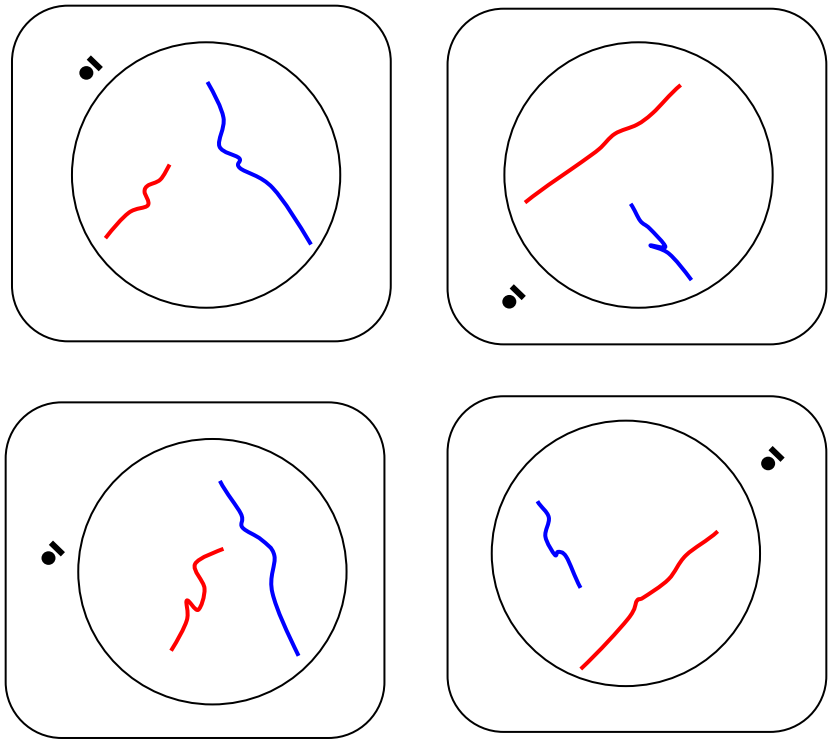
Meiosis 2: Anaphase 2

- The sister chromatids **randomly** separate on the spindle
- Each cell will receive a copy of each chromosome
- The genes on the different chromosomes are recombined (shuffled)



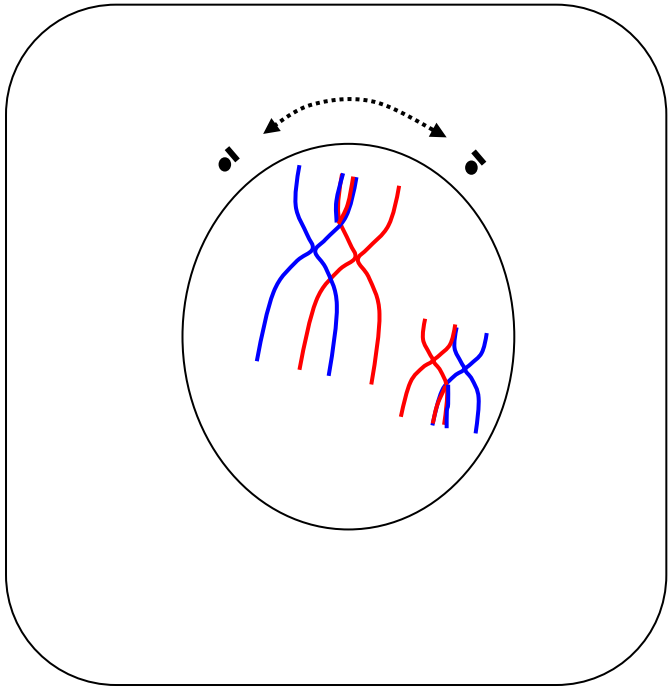
Meiosis 2: Telophase 2

- Four genetically unique haploid sex cells are produced
- New nuclear membranes form



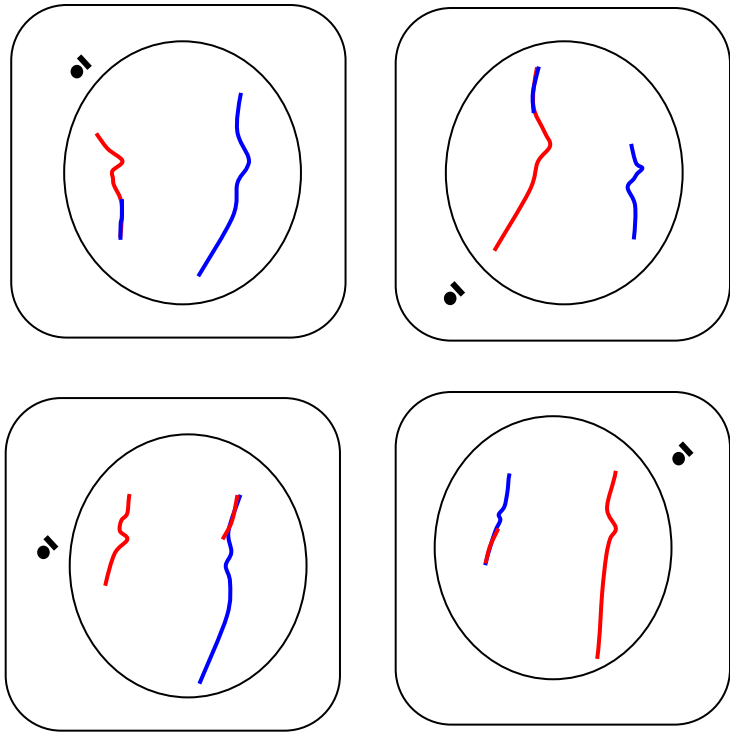
Genetic Variation: **Crossing over**

- **Prophase 1** : homologous pairs link & exchange genetic material
- The genes on each chromosome -not identical ,may be **alleles**
- Alleles = different versions of a gene
- Ear shape gene – 2 alleles: ear lobe allele and no ear lobe allele

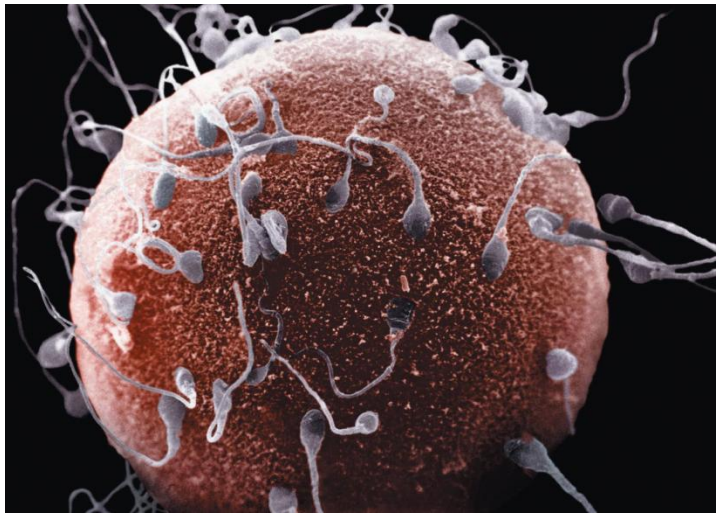


Genetic Variation:
Law of Independent Assortment

- **Metaphase I & II**: Spindle microtubules randomly attach to chromosomes or chromatids on the metaphase plate
- Independent/Random assortment



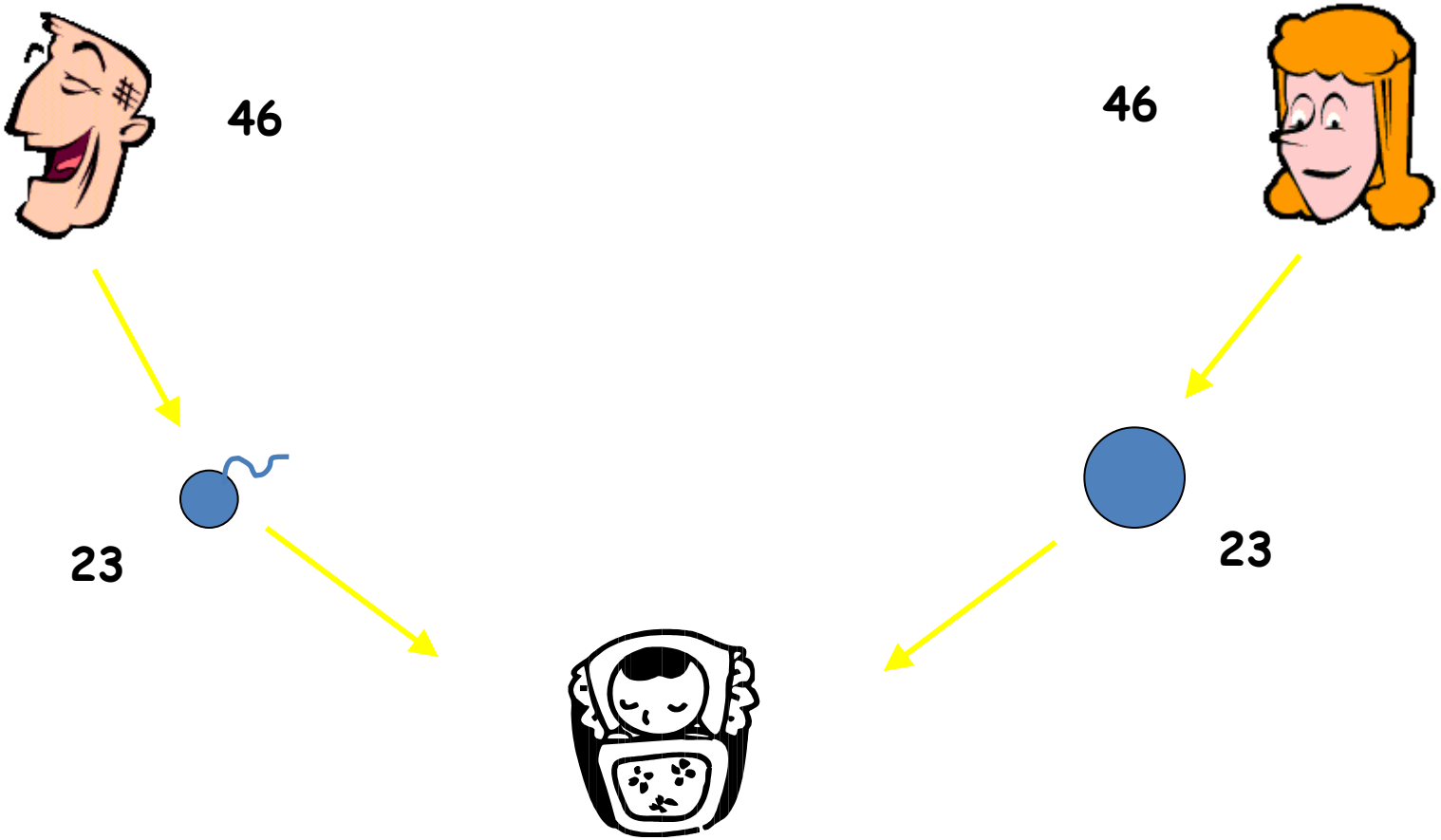
- Combined with random mating , **infinite variety of individuals** is possible.



Why is it important that a cell produced my meiosis has half the DNA of the parent cell?

This means that when they fuse together during fertilisation the **zygote** has the same number of chromosomes as the parents' cells

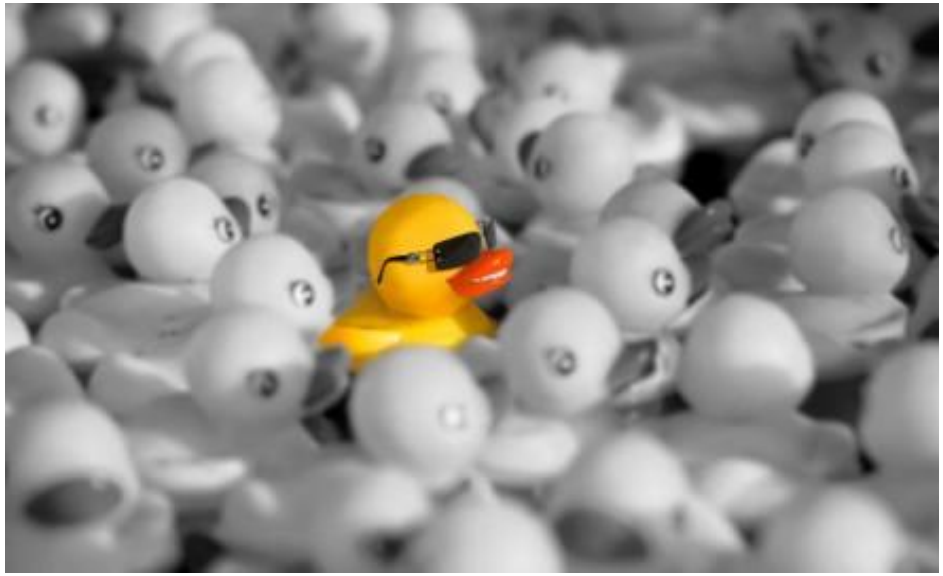
Formation of gametes

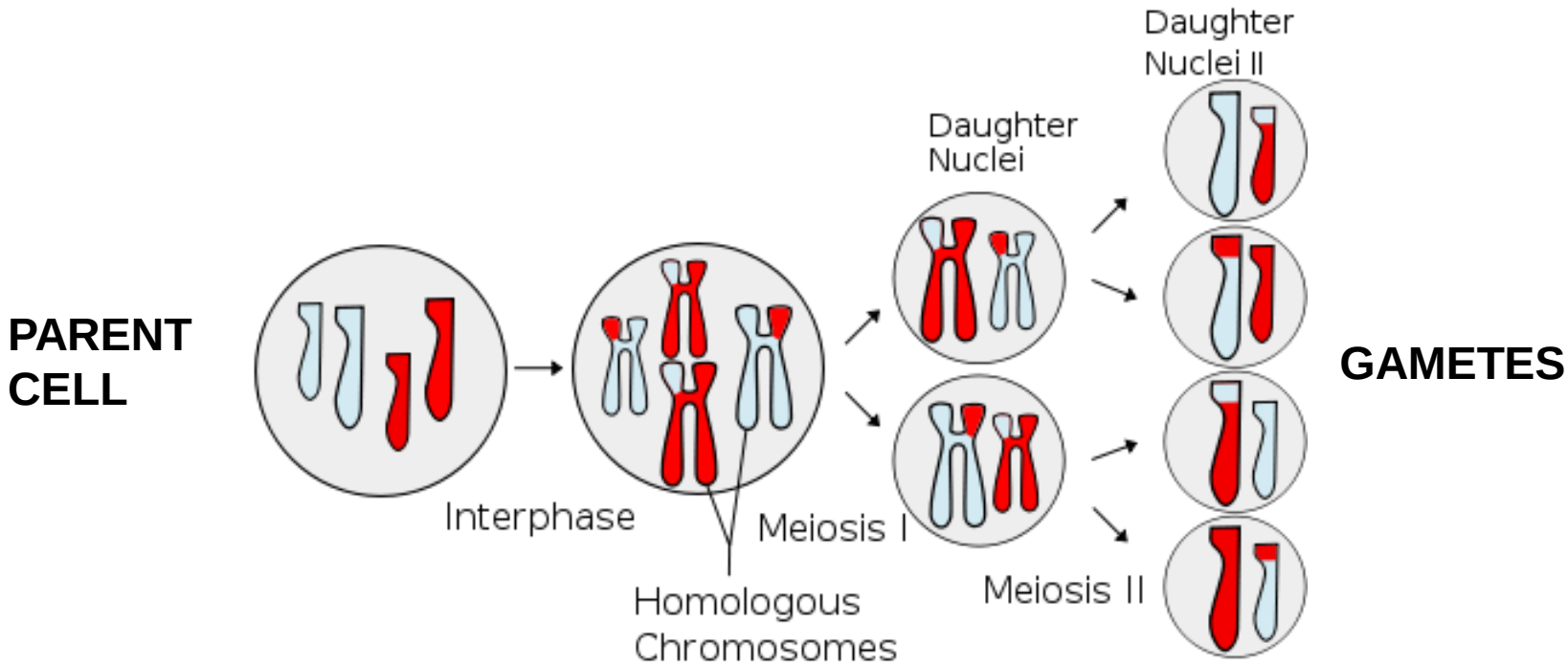


How many chromosomes here?

Creating Uniqueness
(Genetic variation)

- Crossing over of chromosome arms (**prophase** I)– creates new combinations of genes
- Independent assortment of chromosomes (**metaphase** I)
- Orientation of chromosomes along the equator in metaphase 2 is random
- Random mating

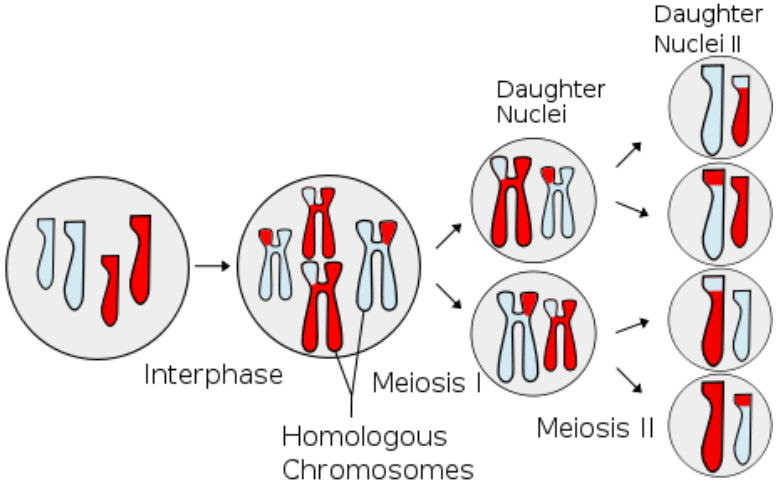


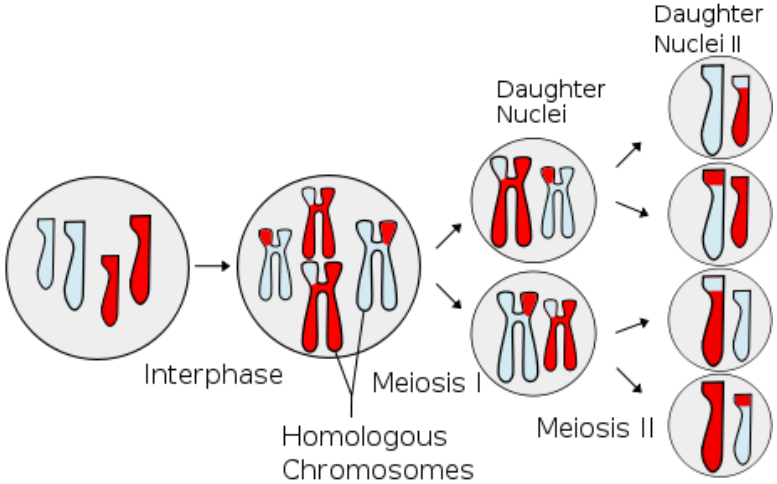


The 'crossing over' of some genes (prophase I)

Means:

1. The gametes produced carry different combinations of genes
2. They do not have the same combination as the parent cell
3. They do not have the same combination as each other


Daughter Nuclei II
Daughter Nuclei
Interphase
Meiosis I
Meiosis II
Homologous Chromosomes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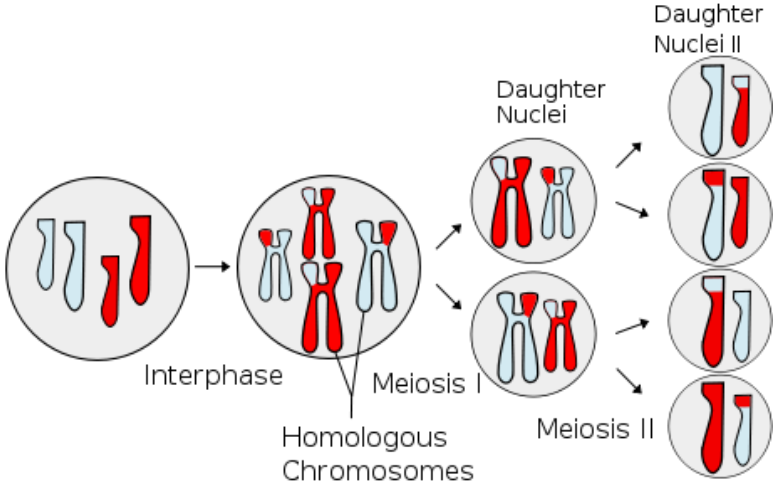
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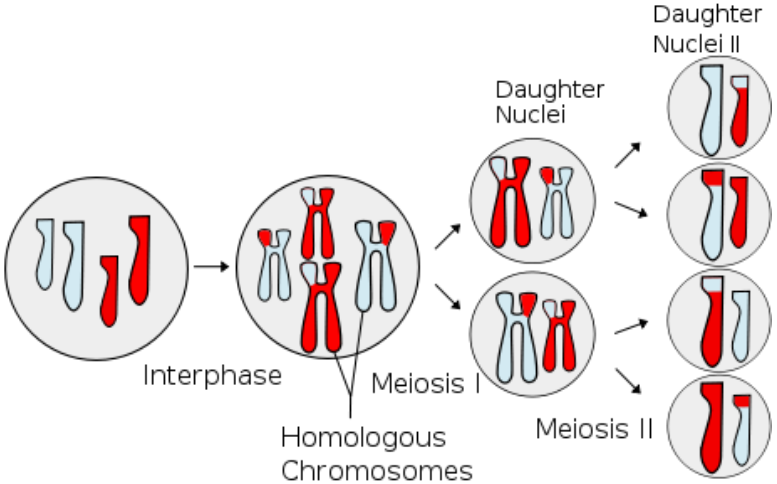
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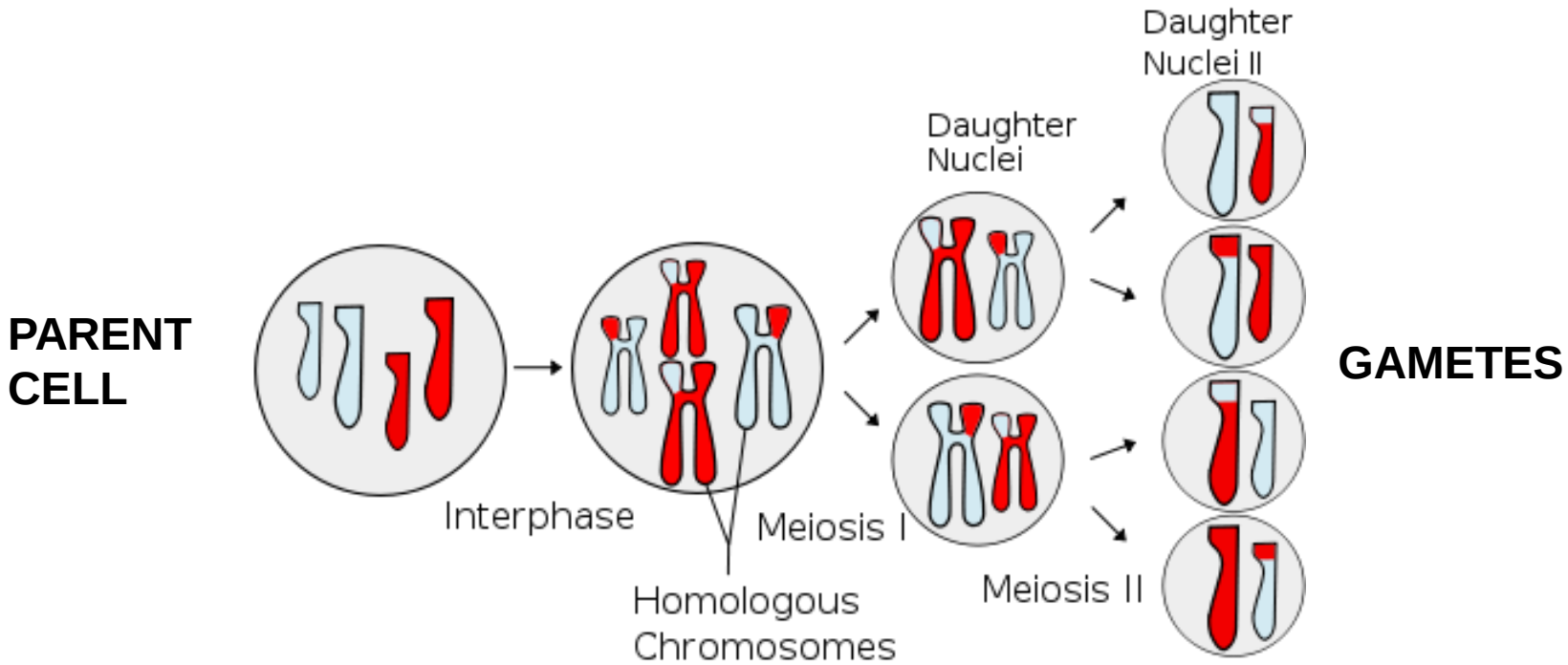


Independent assortment of chromosomes

(Metaphase I & II)

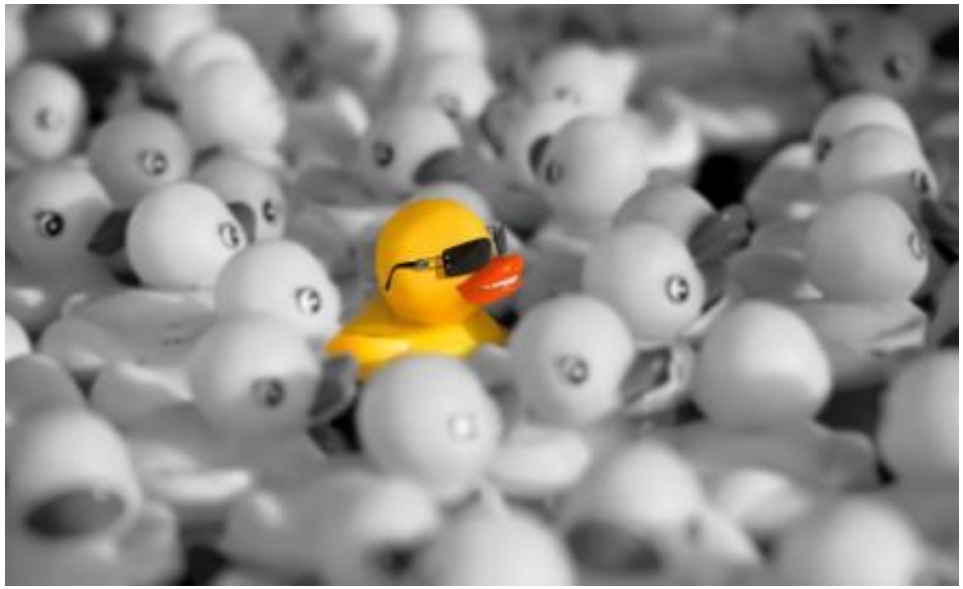
Means:

1. The chromosome received by a gamete from each homologous pair is random.
2. Any combination of chromosomes (as long as one of each is received) is possible in a gamete
3. Meiosis means we are infinitely unique!

Creating Uniqueness
(Genetic variation)

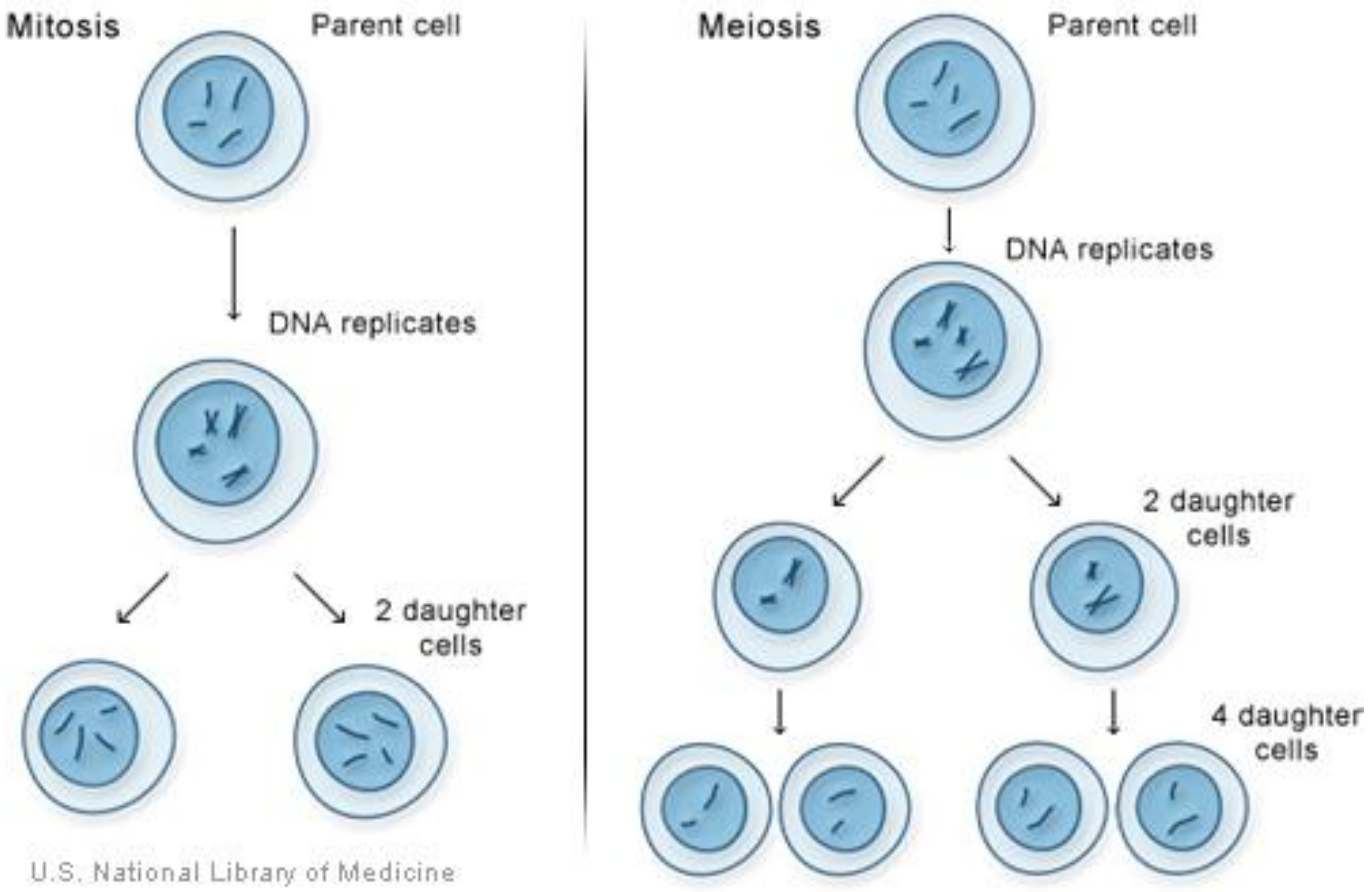
Your so unique!

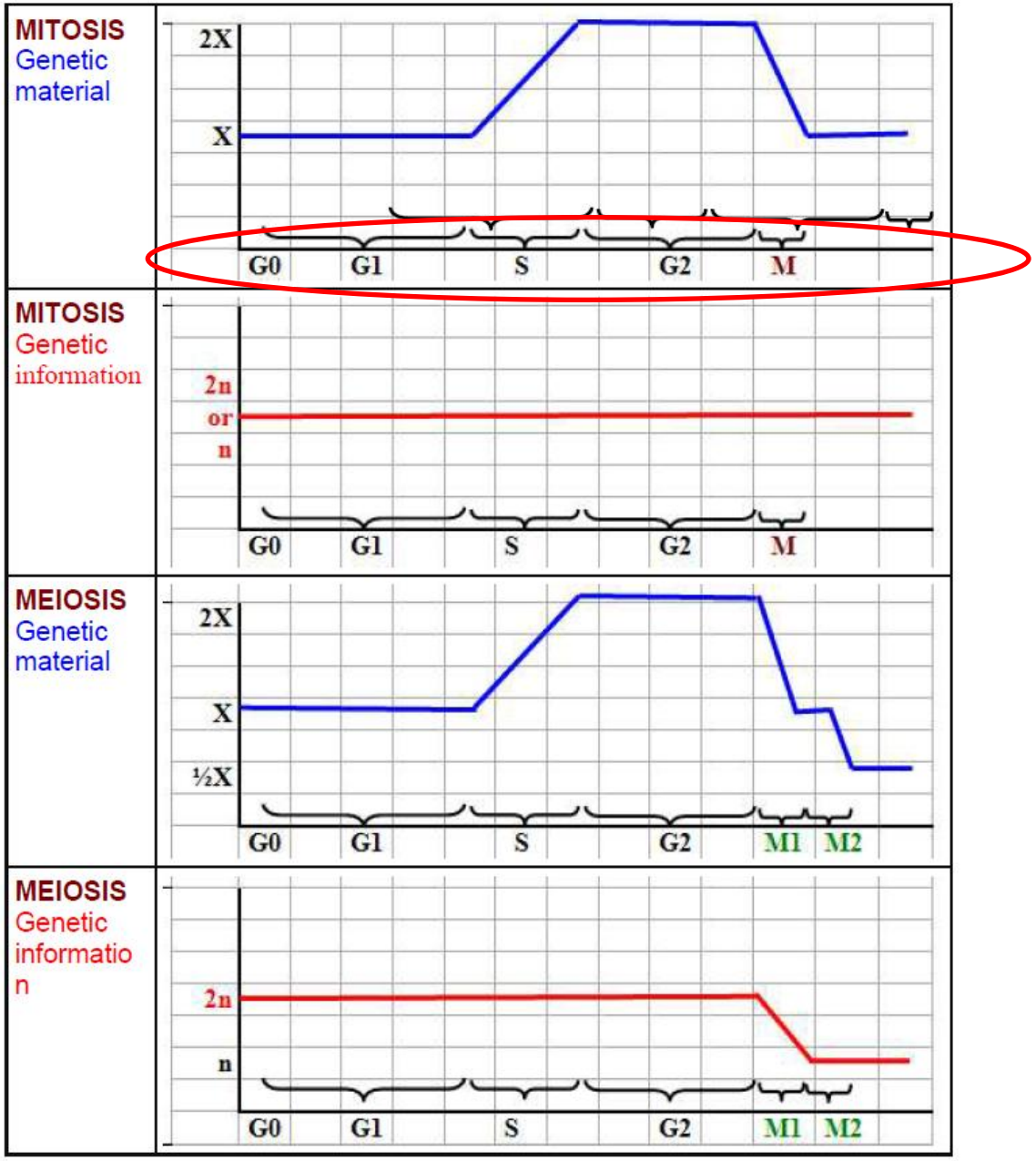
- 23 pairs chromosomes = 2^{23} possible combinations for a single gamete
- Meiosis promotes **genetic variation** within a species **and** maintains the correct chromosome number

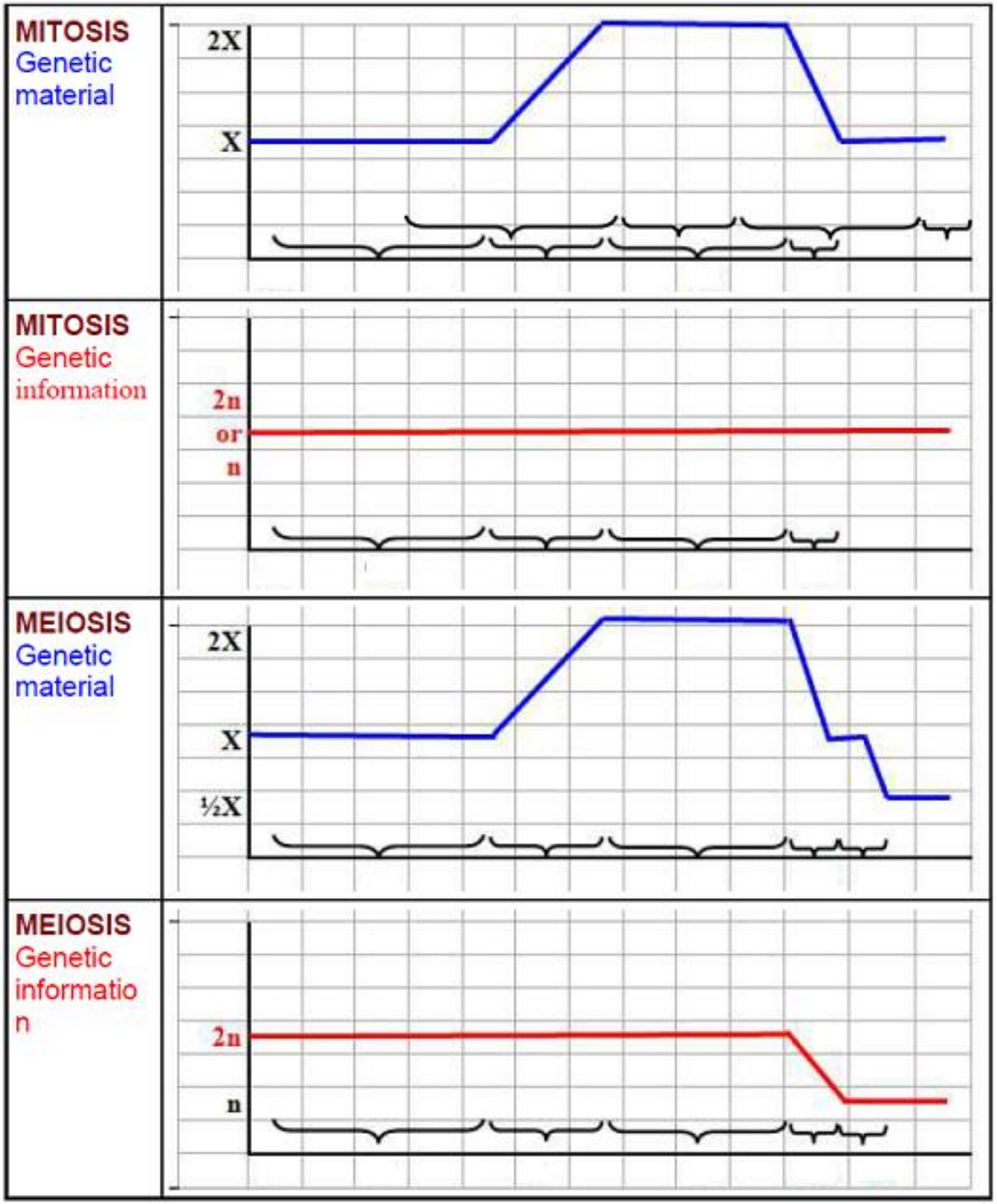


Steps of Meiosis

http://www.cellsalive.com/meiosis.htm




MITOSIS
Genetic material
2X
X
G0
G1
S
G2
M
MITOSIS
Genetic information
2n
or
n
G0
G1
S
G2
M
MEIOSIS
Genetic material
2X
X
½X
G0
G1
S
G2
M1
M2
MEIOSIS
Genetic informatio n
2n
n
G0
G1
S
G2
M1
M2

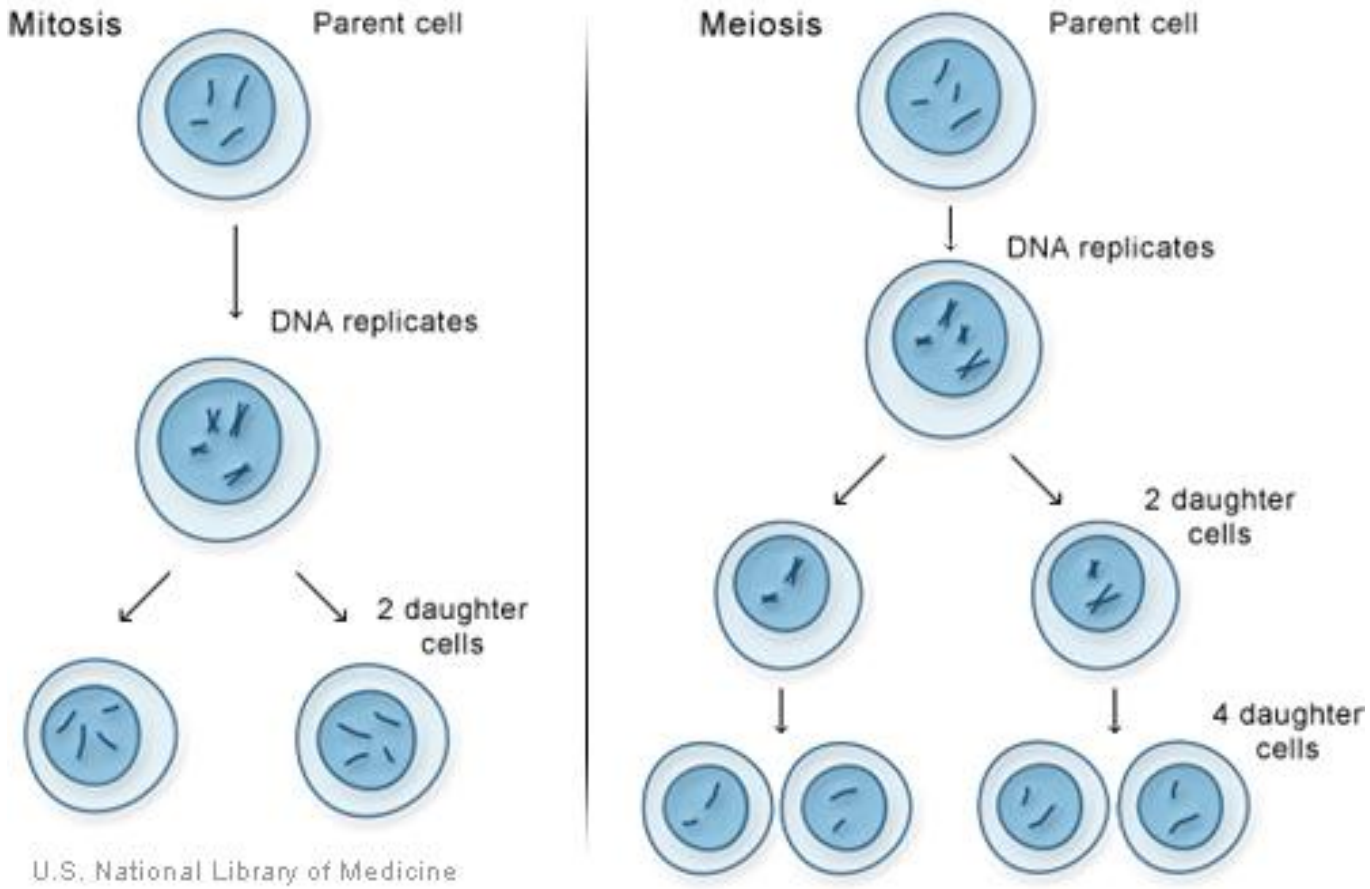


Why does the line go up/down when it does?

Why is it a flat-line all the way through?

Why up once and down twice? What phases are each of these happening in?

Why does genetic info go down?



http://www.youtube.com/watch?v=iCL6d0OwKt8

Feature	Mitosis	Meiosis
Definition		
Occurs in (cell type)		
Number of divisions		
Number of daughter cells produced		
Genetic Composition		
Creates (type of cell)		
Genetically / Type of Reproduction		
Function / Importance in Body		
Human Chromosome number		