

# CASE

*Curriculum for Agricultural  
Science Education*

**Principles of Agricultural Science – Animal**

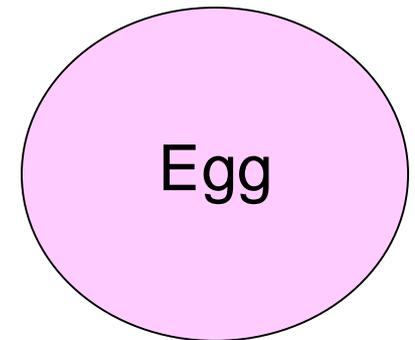
# In the Beginning

Unit 7 – Lesson 7.1 A New Pair of Genes

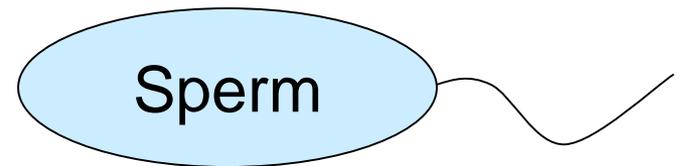
# Before the calf....



Was the



and the



# What is Inheritance?

- The transfer of genetic material (genes) from one generation to the next.
- Half of an individual's genes come from the sire via sperm.
- Half of an individual's genes come from the dam via the egg.
- Offspring contain genes from both parents.

# Fertilization

**Fertilization** is the union of sperm with the ovum to produce a fertilized egg called a zygote.

## When sperm reaches the ovum:

1. One sperm cell unites with one ovum.
2. The resulting cell contains all genetic material and undergoes rapid cell division (i.e., mitosis) as the embryo develops.

# Point to Ponder



Why does fertilization not increase the number of chromosomes in each generation of offspring?

# Meiosis

# A Microscopic View – Formation of Sperm and Egg Cells

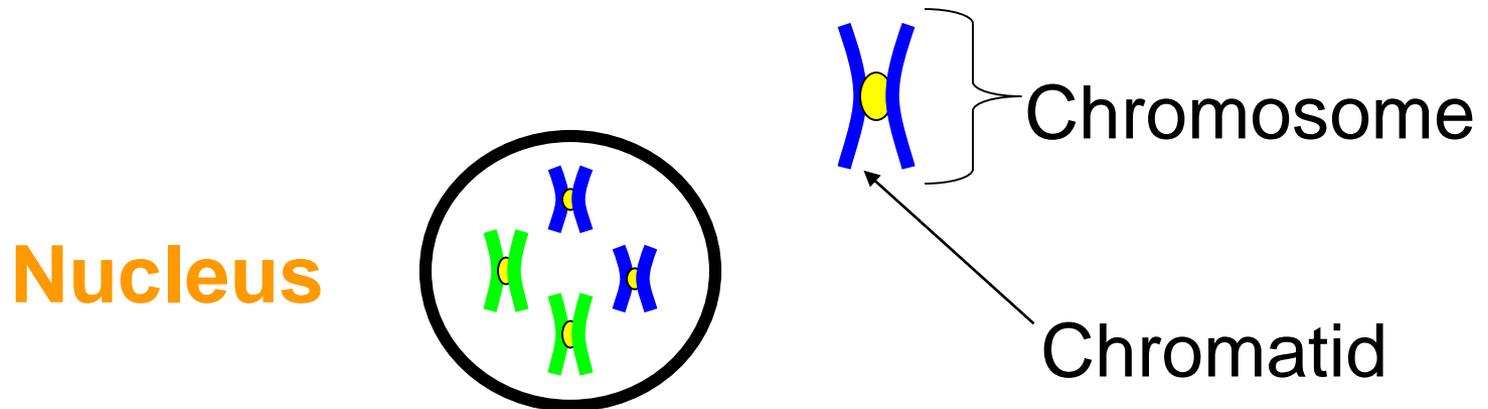


Sperm and egg cells must undergo the process of **meiosis** to become haploid.

**Meiosis** is a type of cell division that reduces the number of chromosomes in new cells by half.

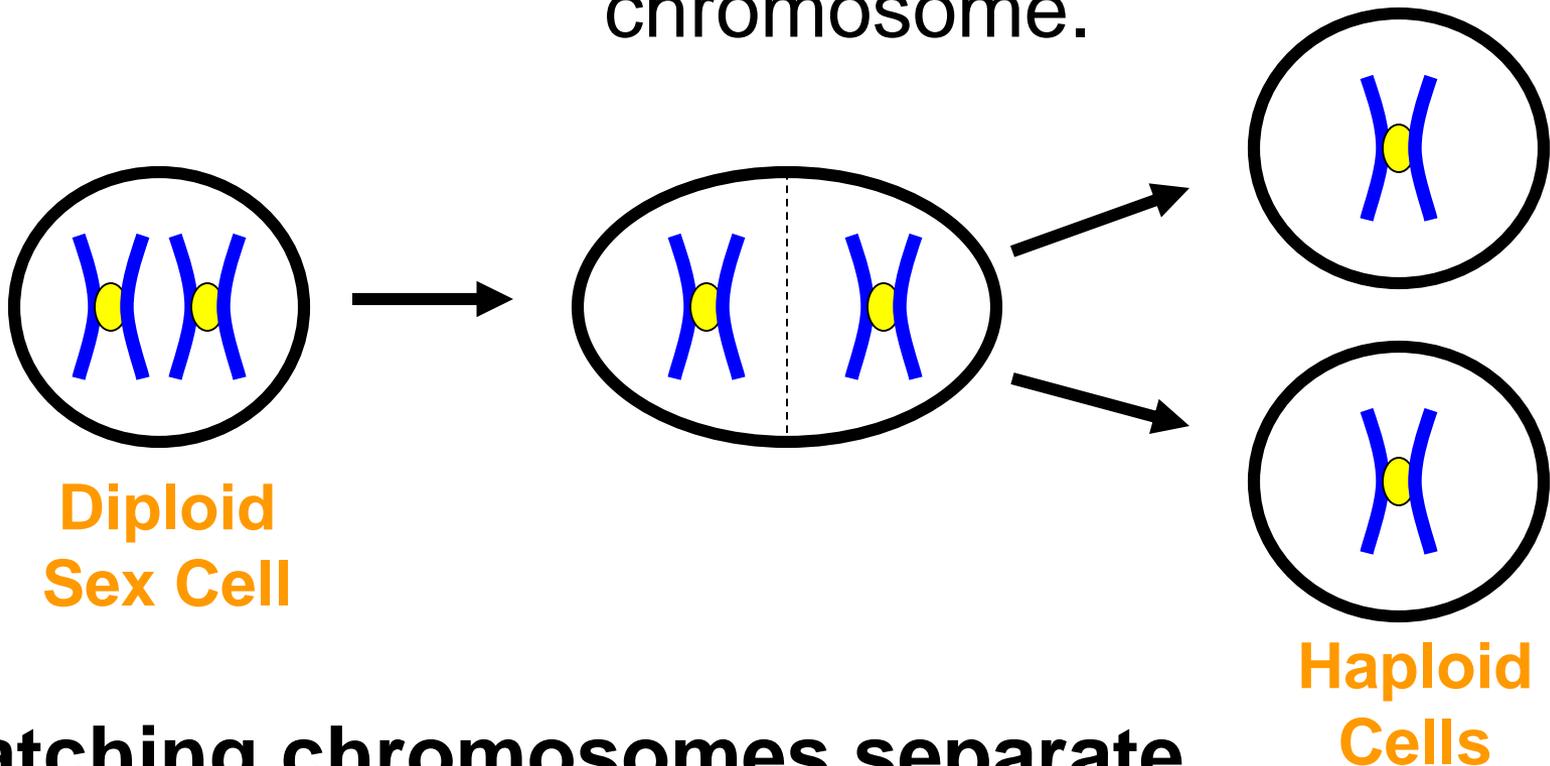
# Start With a Sex Cell

- Male and female reproductive organs produce sex cells.
- The nucleus of cells contains chromosomes, which carry genes.



# Meiosis I

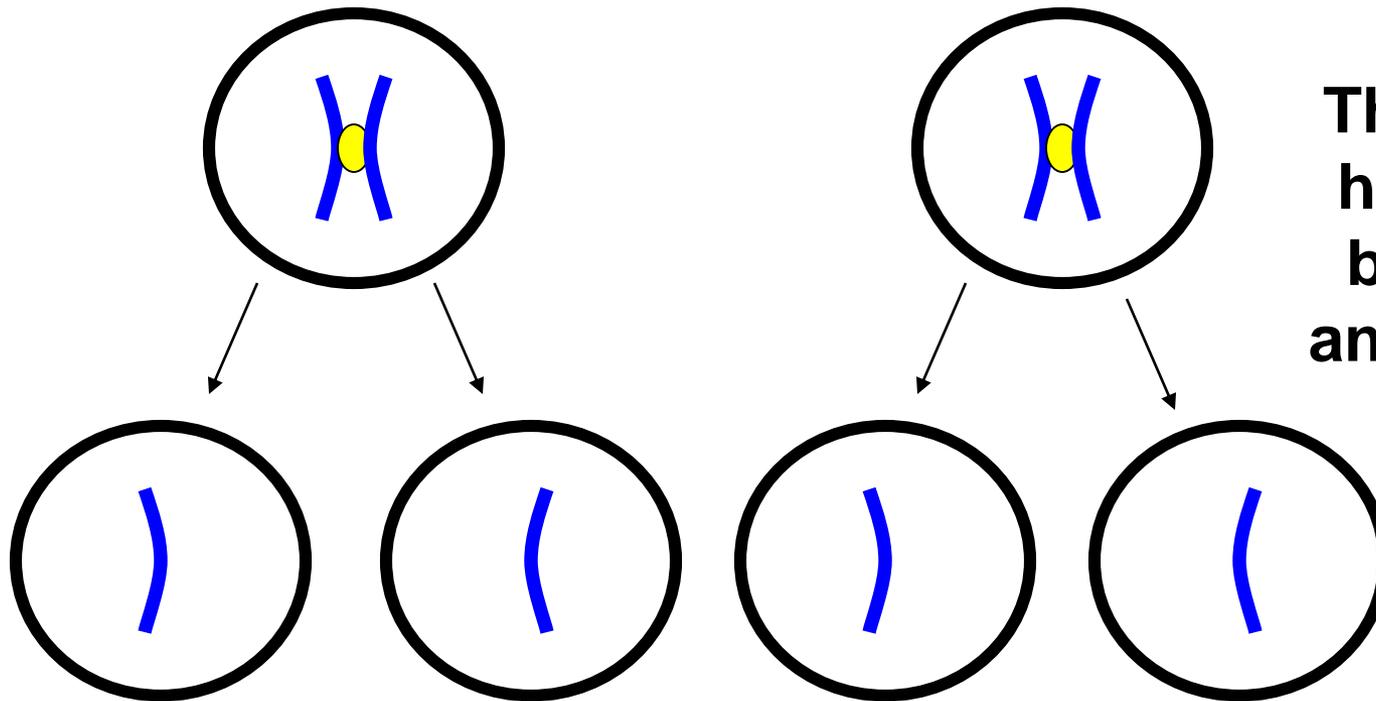
**Diploid** cells are cells with two sets of each chromosome.



**Matching chromosomes separate**

# Meiosis II

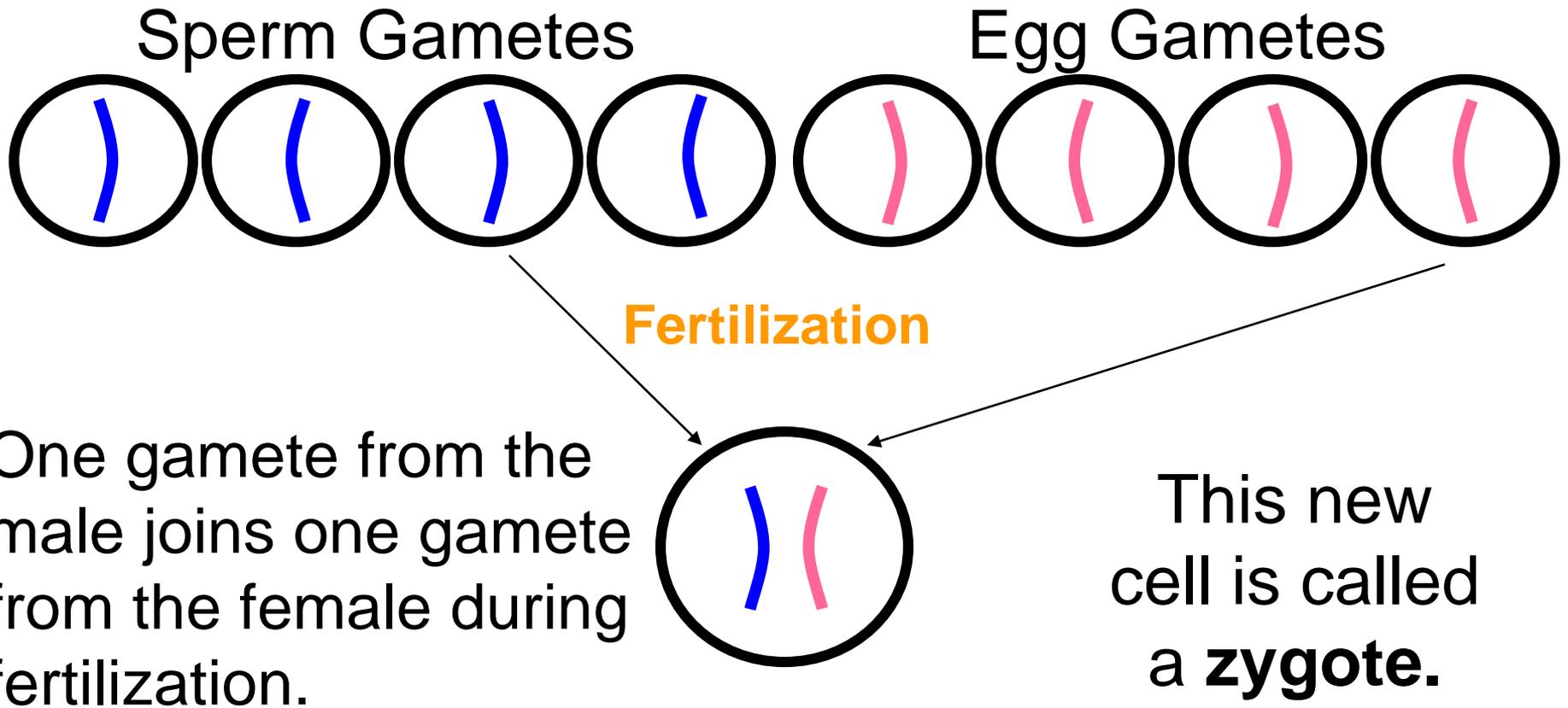
Cells divide again to produce **haploid** gametes.



This process happens for both sperm and egg cells.

**Four gametes are produced**

# From Haploid Gametes Back to a Diploid



One gamete from the male joins one gamete from the female during fertilization.

This new cell is called a **zygote**.

# The Next Step

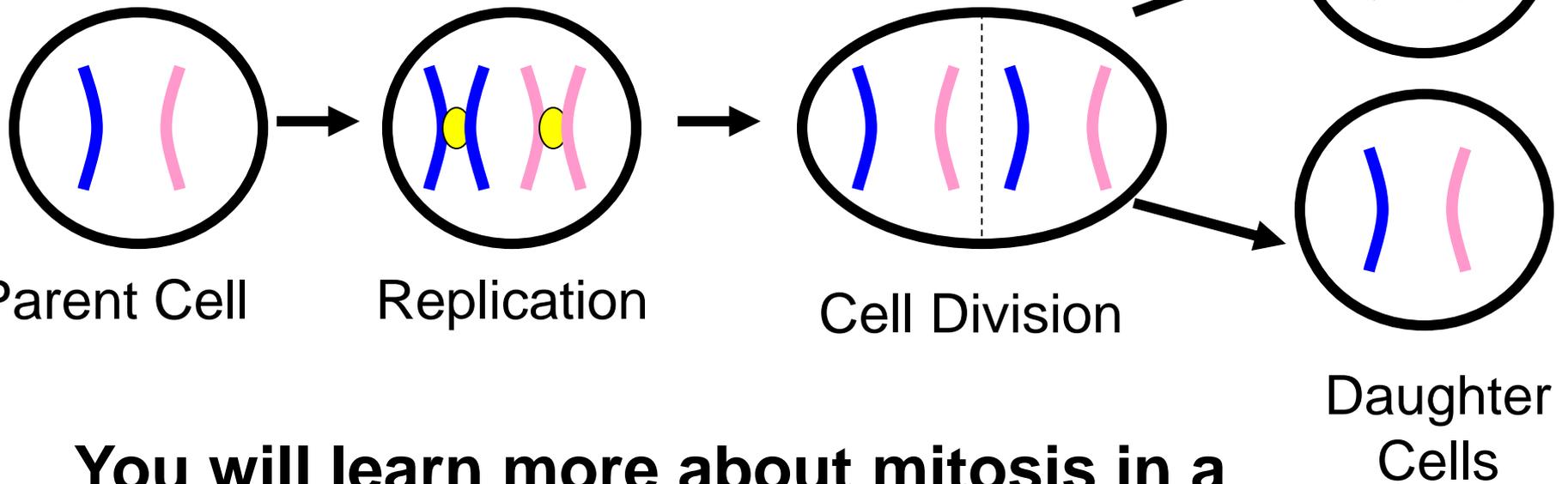


Following fertilization, division of the zygote will continue the cell replication process.

This process is called **mitosis**.

# The Development of a Zygote

Cells undergo rapid **mitosis** as the zygote grows.

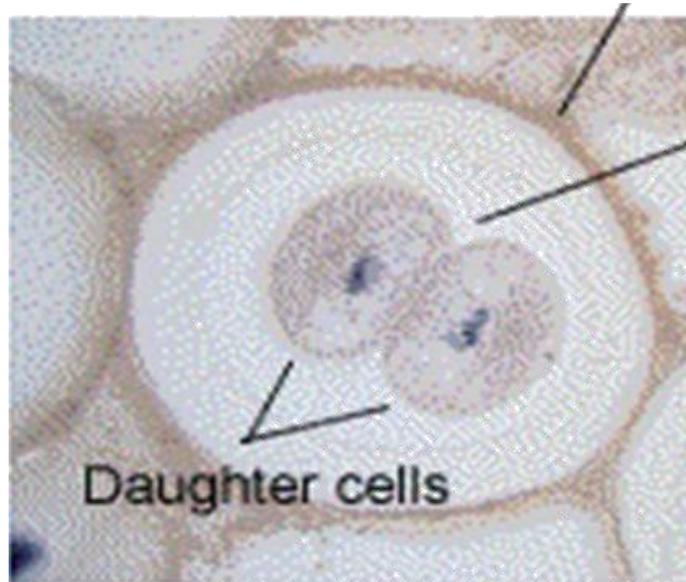


**You will learn more about mitosis in a later activity.**

# Mitosis

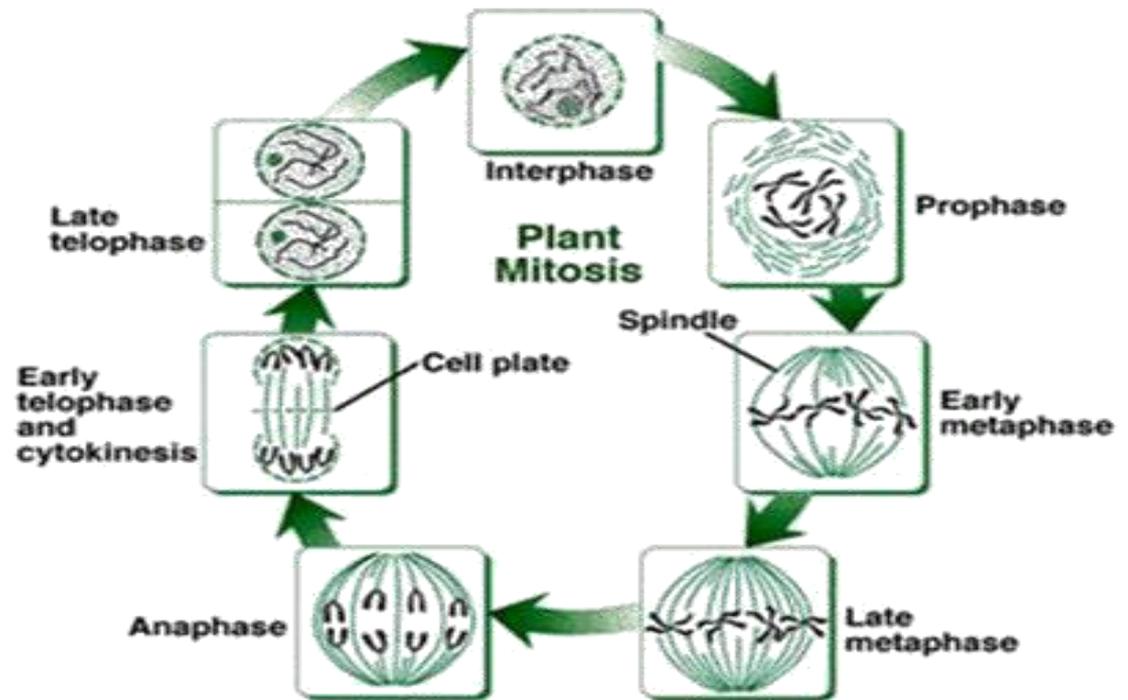
**Mitosis** is the division of cells to produce daughter cells that contain a full set of chromosomes.

Parent cell



# Phases to Mitosis

- Interphase
- Prophase
- Metaphase
- Anaphase
- Telophase



Mitosis phases will be explored further in **Activity 7.1.1 Focus in on Mitosis.**

# References

- Feldkamp, S. (Ed.). (2002). *Modern biology*. Austin, TX: Holt, Rinehart, and Winston.
- Gillespie, J.R., & Flanders, F.B. (2015). *Modern livestock and poultry production (9th ed.)*. Clifton Park, NY: Delmar.
- Herren, R. V. (2004). *The science of agriculture: A biological approach (2nd ed.)*. Albany, NY: Delmar.
- Herren, R. V., & Donahue, R. L. (2000). *Delmar's agriscience dictionary with searchable CD-ROM*. Albany, NY: Delmar.