

# Introduction to genetics and scientific inquiry

## A brief history of modern genetics

### Before 1860

- Development of microscopy
- Elucidation of cell theory
- Publication of “The origin of species” by Charles Darwin in 1859

## Before 1860

~**1600** Janssen & Janssen, father & son lay claim to the invention of the compound microscope



Soon after cellular structure of plants and animals were recognized



Significant improvements in glass quality & lens manufacturing lead to

Recognition of separate organelles within cells



## Before 1860



**Cell theory:** Cells and their nuclei were the basic units of structure and function in living organisms



**Lineage theory:** Cells are derived from pre-existing cells (i.e. all cells trace back to one original cell)

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### 1860 - 1940

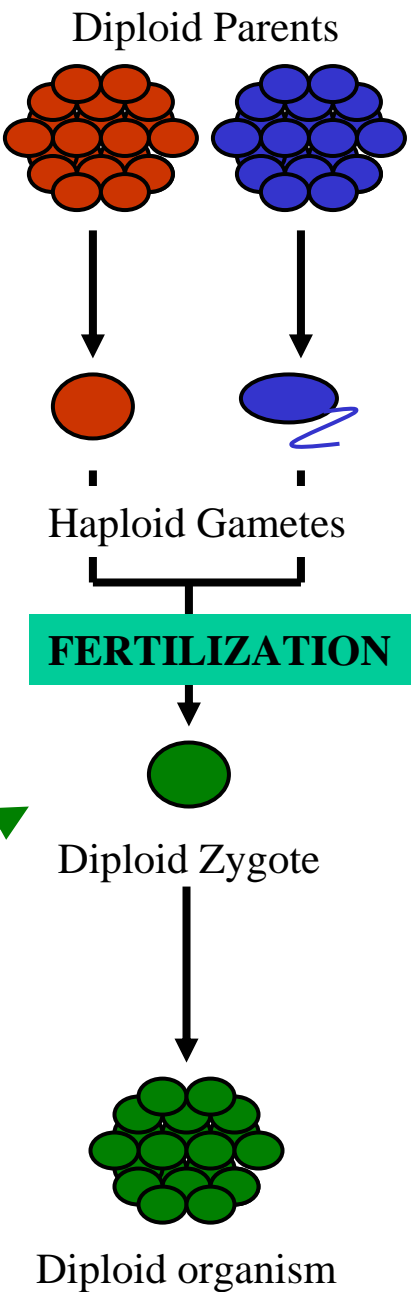
- Publication of Mendel’s work in 1866
- Discovery of chromosomes and their behavior and rediscovery of Mendel’s work in 1900

1860 - 1940

## **Mendel's Laws of Genetics**

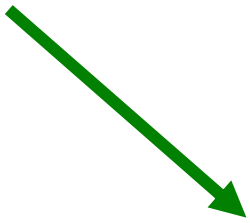
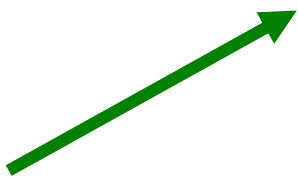
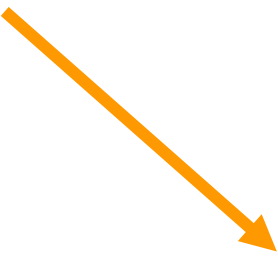
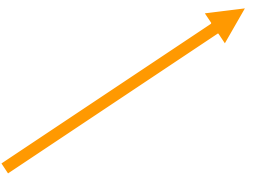
1. Alleles are different forms of the same gene that segregate during gamete formation (Law of Segregation)
2. Alleles of different genes segregate independently (Law of independent assortment)

don't worry about these it will make sense in a few lectures



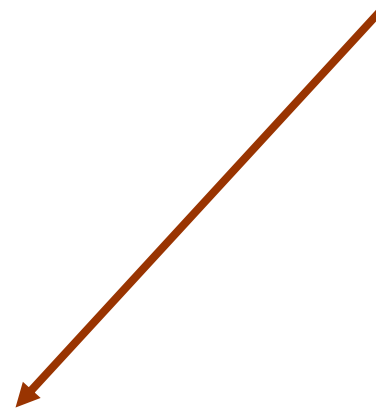
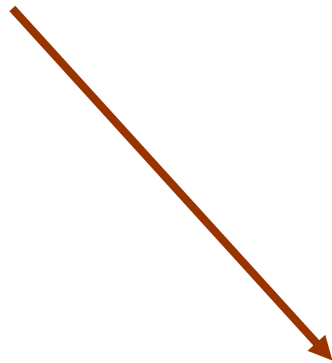
The Gametic Cell Cycle

The Somatic Cell Cycle



Mendel's Laws of Genetics

Chromosomes



Chromosomes are the linear arrays of genes

1860 - 1940

## **Chromosome theory of heredity**

Heredity characters are carried & passed on to generations in discrete units (Correlation between Mendelian inheritance and chromosome behavior)

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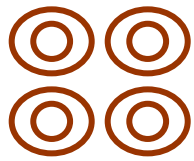
- **Development of microscopy**
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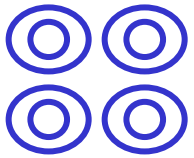
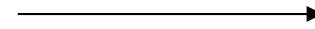
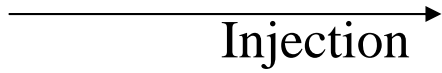
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### 1940 - Present

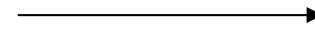
- **Discovery that deoxyribonucleic acid (DNA) is the basic genetic material**
- **DNA structure was elucidated**
- **Era of molecular genetics (recombinant DNA technology)**



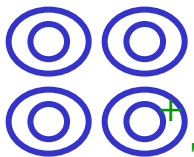
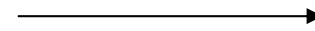
Type S



Type R



heat-killed  
Type S



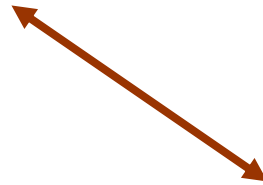
Type R

+ heat-killed  
Type S

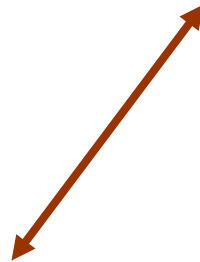


# Scientific Inquiry

Genetics is an empirical science



Information comes from observations of natural world



Scientific method is a tool for understanding these observations

Observation



Hypothesis



Prediction



Experiment



New hypothesis

A guess as how things are working based on the observations



This is performed to test the hypothesis.

