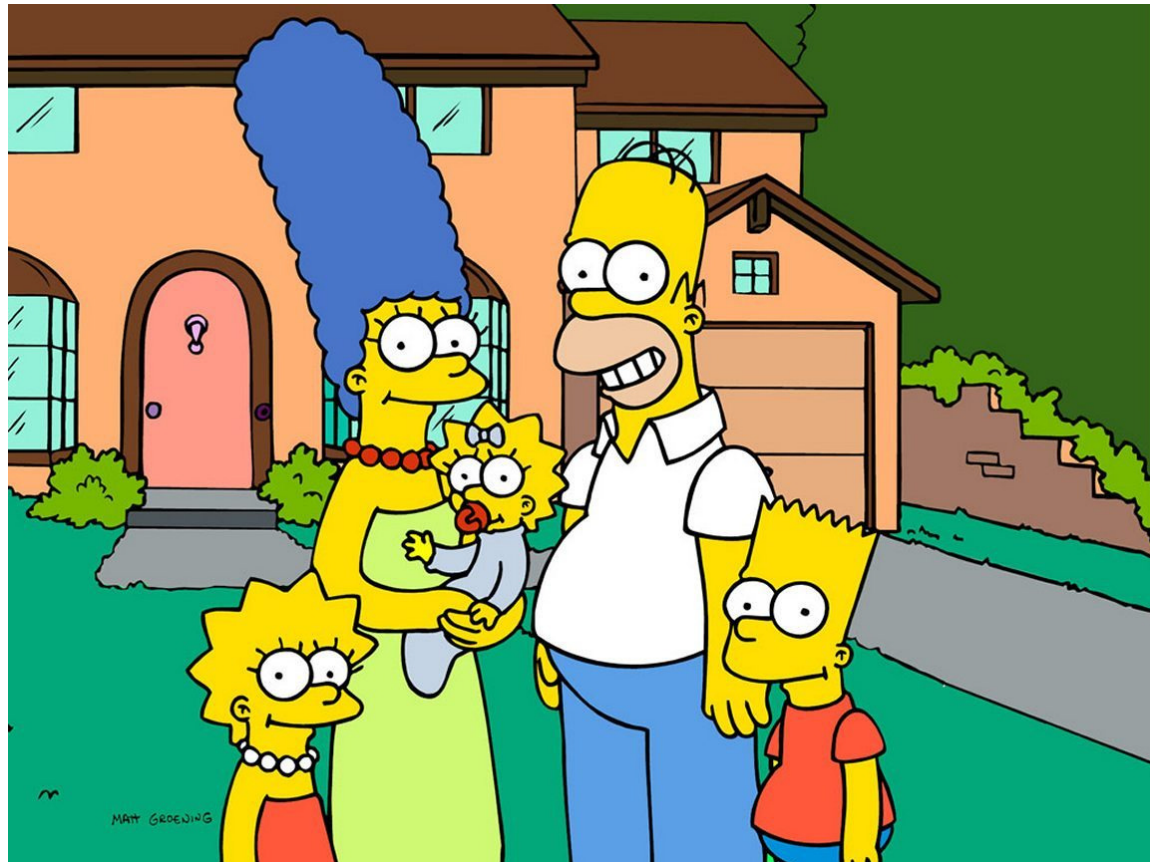


## Section 4.1

*Living things inherit traits in patterns.*



Observe the three children in the picture:



Louis

Crista

Cynthia

Make a list of characteristics that you observe about Louis, Crista and Cynthia.

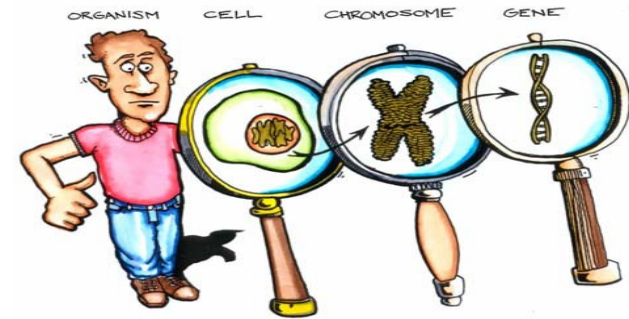
# Traits

- Some are inherited
  - Similar to those that your parents have
    - Hair color
    - Eye color
    - # of legs
    - # arms
- Some are aquired
  - You develop them over your lifetime
    - Language
    - Reading & writing
    - Riding a bike

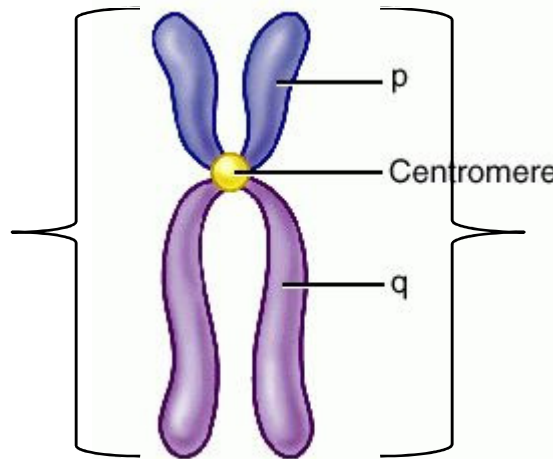


# Traits are controlled by genes

- Genes are located on your chromosomes
- Individuals inherit genes from their parents.
- Your cells contain 23 chromosome pairs (called homologs) –



You received  
half of each  
homolog from  
your mother

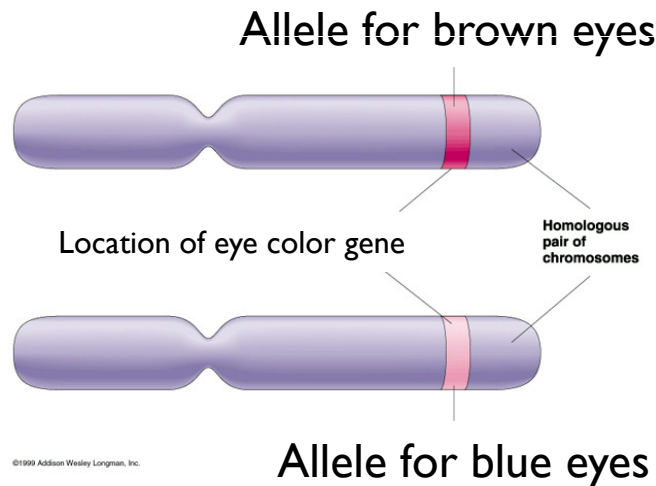


You received  
half of each  
homolog from  
your father

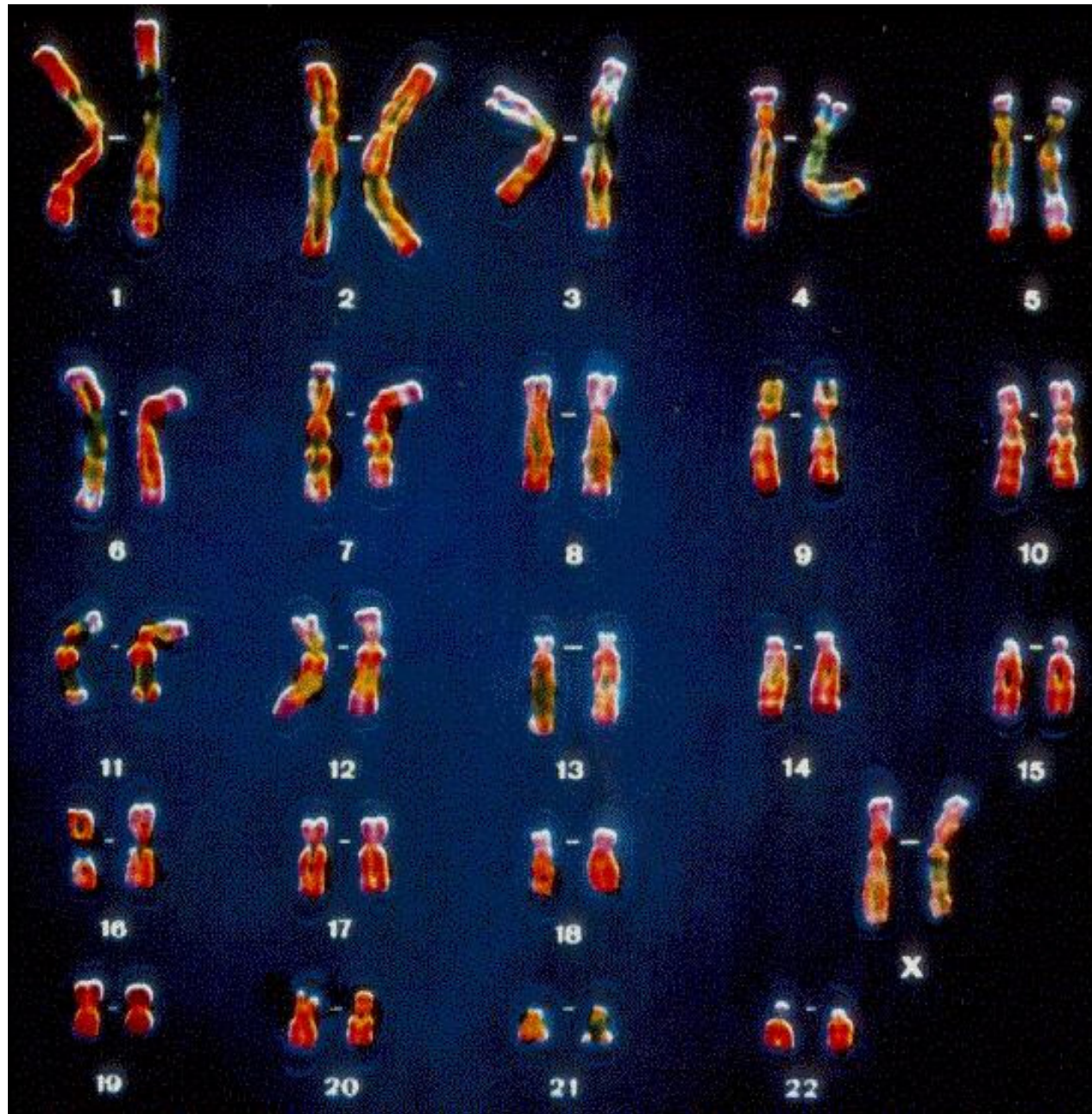
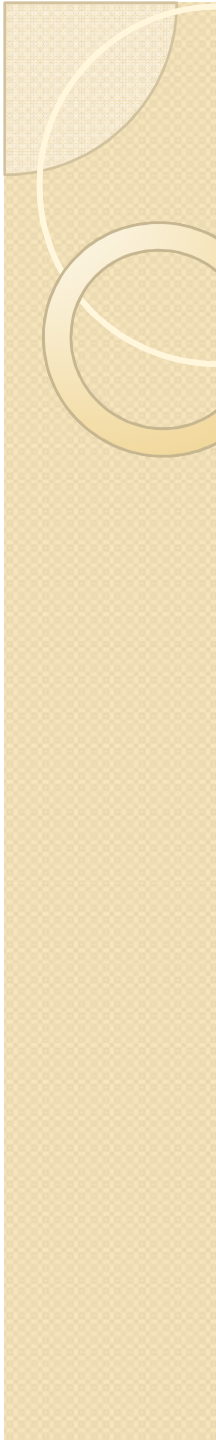
- You are literally half your mother and half your father!

# Traits are controlled by genes

- Each homolog contains sites where genes are located
- Though the gene may be present on both, the form of the gene may be different



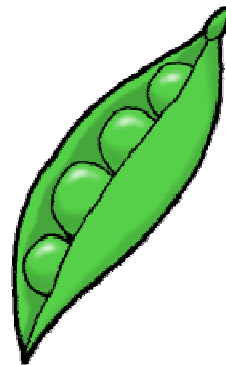
- Different forms of the same gene are called alleles



# The Father of Genetics



- Gregor Mendel performed the first major experiments investigating heredity
  - Austrian monk
  - University trained in Mathematics and Science
  - Experimented between 1856-1863
  - Investigated inheritance among pea plants in his monastery's garden

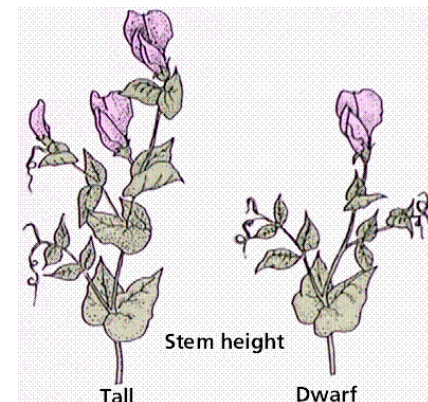


# Mendel's Experiment

- Observed seven different traits of pea plants:
  - Plant height
  - Flower and pod position
  - Seed shape
  - Seed color
  - Pod shape
  - Pod color
  - Flower color
- Using one trait at a time, Mendel crossed two plants who were true breeding for opposite forms of the same trait

## Example

- Trait – plant height
- Opposite forms crossed –



tall plant x dwarf plant



Tall

×



Dwarf

parents

Crossing a true-breeding tall pea plant with a true-breeding dwarf pea plant produces 100% tall plants in the first generation



Tall

×



Tall

F<sub>1</sub> generation  
(all tall)



The dwarf trait disappeared!

Crossing two plants from the first generation resulted in 75% tall plants and 25% dwarf plants



Tall



Tall



Tall

F<sub>2</sub> generation  
(3 tall : 1 dwarf)



Dwarf



The dwarf trait reappeared!

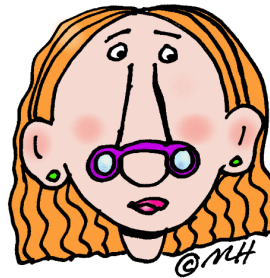


## Mendel's Conclusions

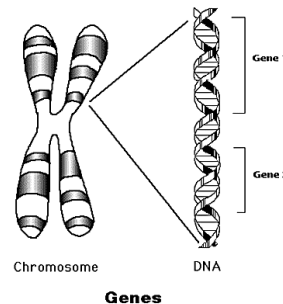
- Each plant must have two “factors” for each possible trait, one factor from each parent
- Some forms of a trait can be masked
- Traits able to be masked can only be seen if both the plant’s factors are for that form of the trait
- Mendel’s “factors” are now known as genes and alleles

# Alleles interact to produce traits

- **Phenotype** describes the physical characteristic that is displayed by your genes; observable (eye color, hair color)



- **Genotype** describes the actual genes that you have on your DNA; not always obvious



# Two forms of every gene

- Mendel found that we have two copies of each allele (one from mom, one from dad)
- Alleles can be



## Dominant

- Physically expressed regardless of what other allele it is paired with
- Always expressed as a capital letter (T)
- Ex: tallness is the dominant trait for pea plant height

OR

## Recessive

- Physically expressed only when paired with another recessive allele
- Always expressed as a lower-case letter (t)
- Ex: dwarfism is the recessive trait for pea plant height