GENETICS

• Genetics
  the scientific study of heredity

• Heredity
  the passing of traits from parents to offspring (kids)

• Trait
  a characteristic (height, eye color, hair type)
GREGOR MENDELS

• The scientist who studied genetics using pea plants in the 1850’s. He came up with all the stuff you will be learning about.
1. Removed stamens from purple flower
2. Transferred pollen from stamens of white flower to carpel of purple flower
3. Pollinated carpel matured into pod
4. Planted seeds from pod
5. Examined offspring: all purple flowers
• **Genes**
  the factors that control traits
  *a segment of DNA that codes for a specific trait
  (such as the gene for rolling the tongue)

• **Chromosome**
  a long chain of genes
• Alleles
different forms of a gene
(Tall stem allele and Short stem allele)

each offspring inherits one allele from each parent.
• **Dominant allele**
  an allele whose trait always shows up in the organism when the allele is present
  – Dominant allele always capitalized

• **Recessive allele**
  an allele that is masked when a dominant allele is present.
  --Recessive allele always lower case
THE TONGUE ROLLING GENE

- **Dominant** allele: tongue rolling = T
- **Recessive** allele: non-tongue rolling = t
- One allele was inherited from _______ *Mom* and the other from _______ *Dad*.
- This gene has 2 alleles:  T and t
- The gene can either be:  TT   Tt   tt
- **TT:** __________ Tongue Roller
- **Tt:** __________ Tongue Roller
- **tt:** __________ Non-Tongue Roller
Human Female Karyotype
Human Male Karyotype
• **Phenotype:** An organism’s physical traits

• **Genotype:** An organism’s genetic combination (alleles)

• **Example:** TT and Tt have the same phenotype (they are both tongue rollers), but different genotypes (one is TT, the other is Tt)

• **Homozygous:** having two identical alleles for a trait (TT or tt)

• **Heterozygous:** having two different alleles for a trait (Tt)
Punnett Square

- A chart that shows all the possible combinations of alleles that the offspring can inherit (get)

- If both parents have one of each allele for tongue rolling, T and t, then their kids could have any of these combinations:

```
  T  t

T | TT | Tt
---|----|----
Tt|   |   
t | Tt | tt
```

1 out of 4 offspring will be non-tongue rollers

\[ \frac{1}{4} = 25\% \text{ will be non-tongue rollers} \]

3 out of 4 offspring will be tongue rollers

\[ \frac{3}{4} = 75\% \text{ will be tongue rollers} \]
If they had four kids, how many would be tongue rollers?

non-tongue rollers?
What if one parent had both dominant alleles, and the other parent had both recessive alleles?

100% of offspring will be tongue rollers.
DNA
Deoxyribonucleic Acid

- **DNA:** the genetic material that carries information about an organism, passed from parents to offspring.

- **Chromosome:**
  Rod-shaped structure made DNA that carries Genetic information.
  Always in pairs (humans have 23 pairs of Chromosomes)
  Genes are located on chromosomes
THE STRUCTURE OF DNA

• Made up of four chemicals called **BASES**
  adenine (A)
  thymine (T)
  guanine (G)
  cytosine (C)

• DNA is like a ladder and each of the rungs is made of a pair of bases

  adenine – thymine
  guanine – cytosine
• A single gene on a chromosome may contain several hundred to a million or more bases.

• The ORDER of the bases along a gene tells what the trait will be.
MITOSIS

• The process by which cells reproduce by asexual reproduction.
  The DNA inside the nucleus makes a copy of itself
  and then the nucleus splits into two daughter cells, which are identical.
MEIOSIS

• The process by which the number of chromosomes is reduced by half to form sex cells – sperm and egg

• Humans have 46 chromosomes
  23 in the egg from mom
  23 in the sperm from dad