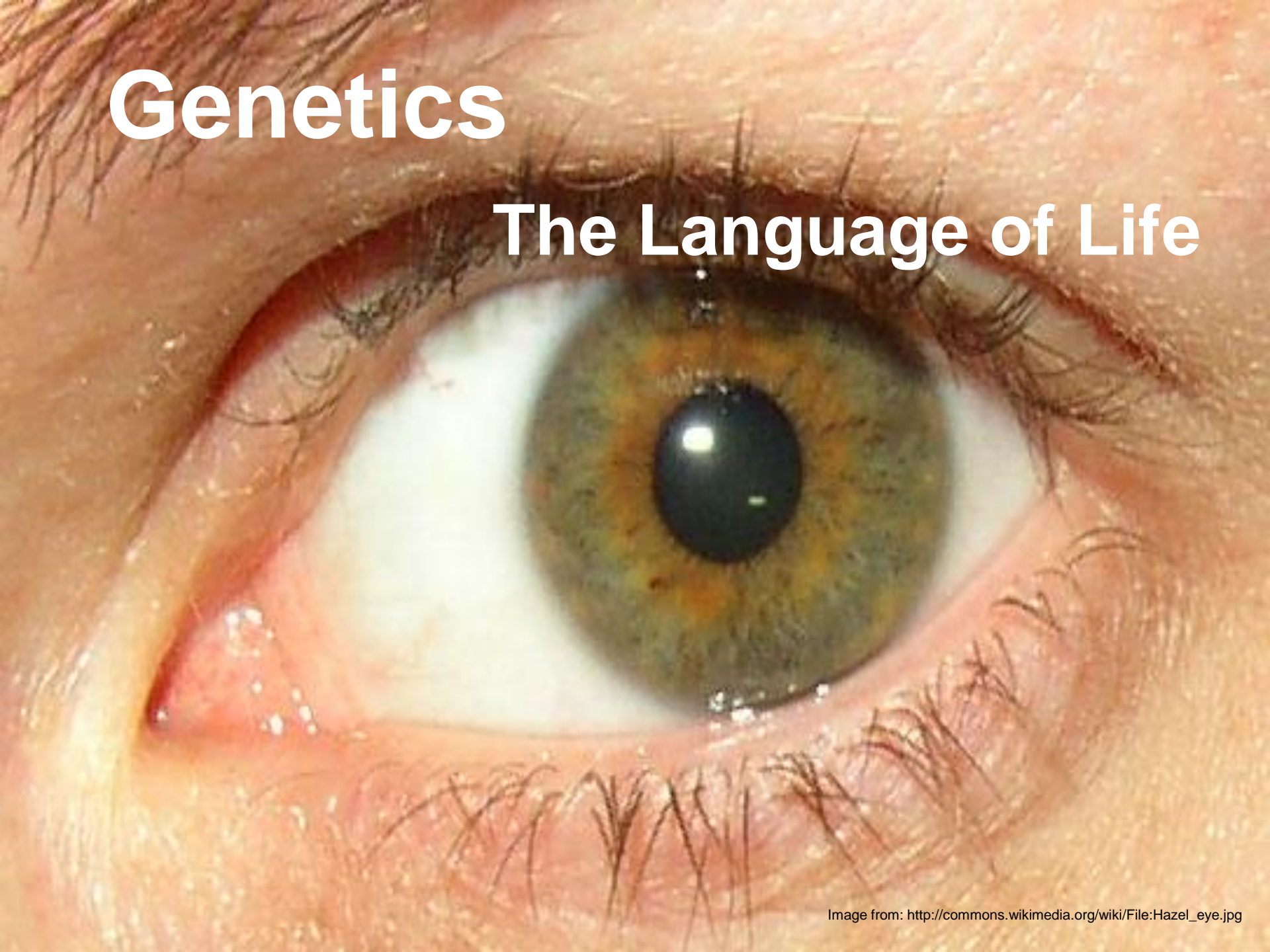


Genetics

The Language of Life



Define Genetics!



Genetics, The Unit

- How these genes are passed from generation to generation. (*inherited*)
- How genes affect the way we look and Function.
- What's the probability of a gene being inherited?
- How we can manipulate genes to get desired outcomes

Genetics, Clarified

How we get the *Genes* we get (Genes?)

Gene: A section of DNA that encodes for a *trait*. (Trait?)

Trait: Information communicated by the DNA. Sometimes obvious (eye color), sometimes hidden (enzymes).

The gene is a sequence of the DNA, the trait is what the DNA encodes for, or “makes”.

Alleles: The different “forms” a gene may have

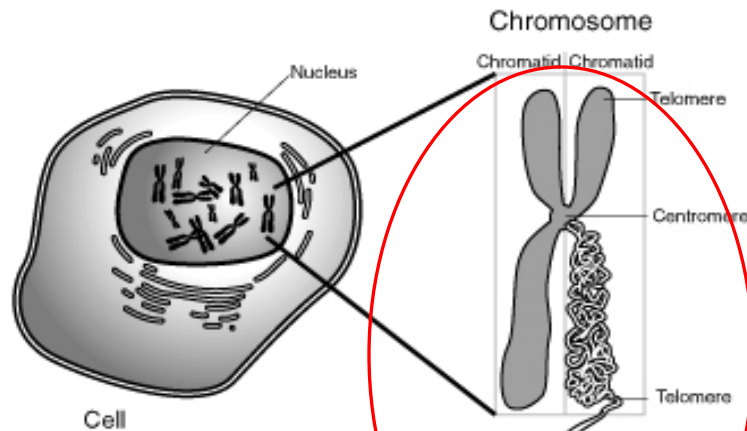
For example: Eye color

Important point: a gene actually encodes for a protein.

“One gene: one protein”



Organization in the Nucleus



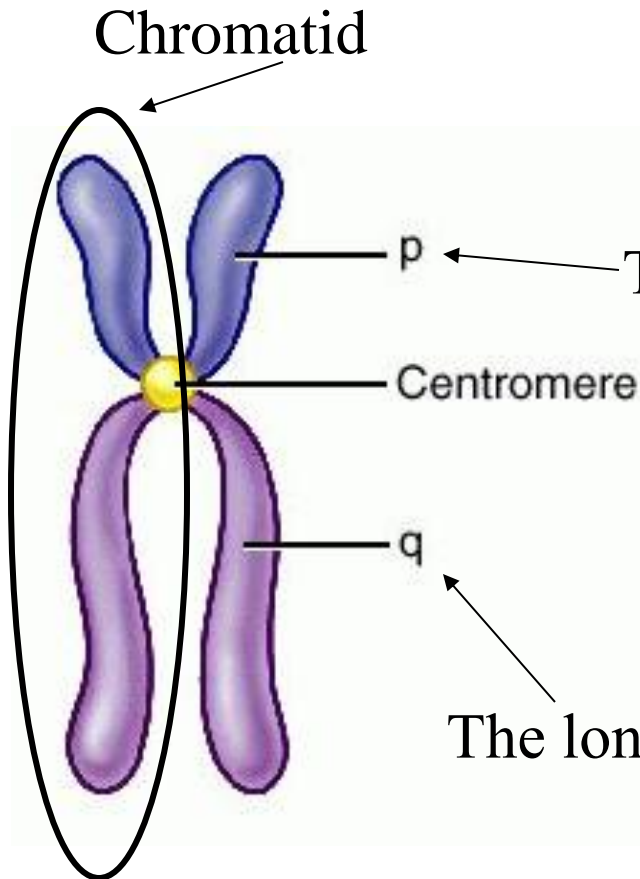
- Long strands of *chromatin* condense into chromosomes.
- The sister *chromatids* are the result of replication.
- Each **chromatid** has the same base sequence
- Histone proteins act as spools



Chromosomes

Chromosomes are generally represented as being shaped like an “X”.

They are actually 2 *chromatids* joined together like conjoined twins. The result of replication of one chromatid

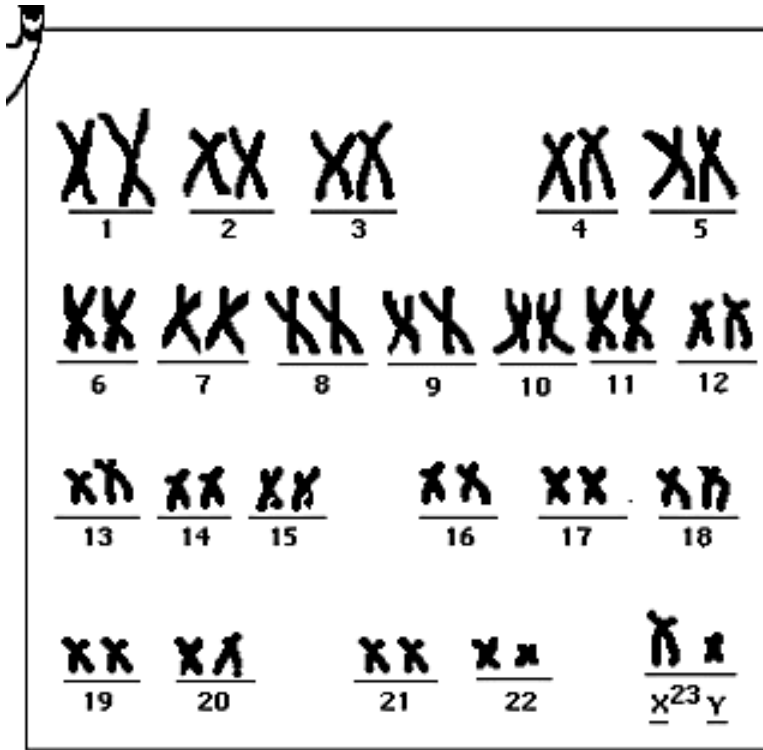


The shorter part of the “X” is the “p” arm

The spot where the 2 chromatids join is called the centromere

The longer part of the “X” is the “q” arm

How many?



c)

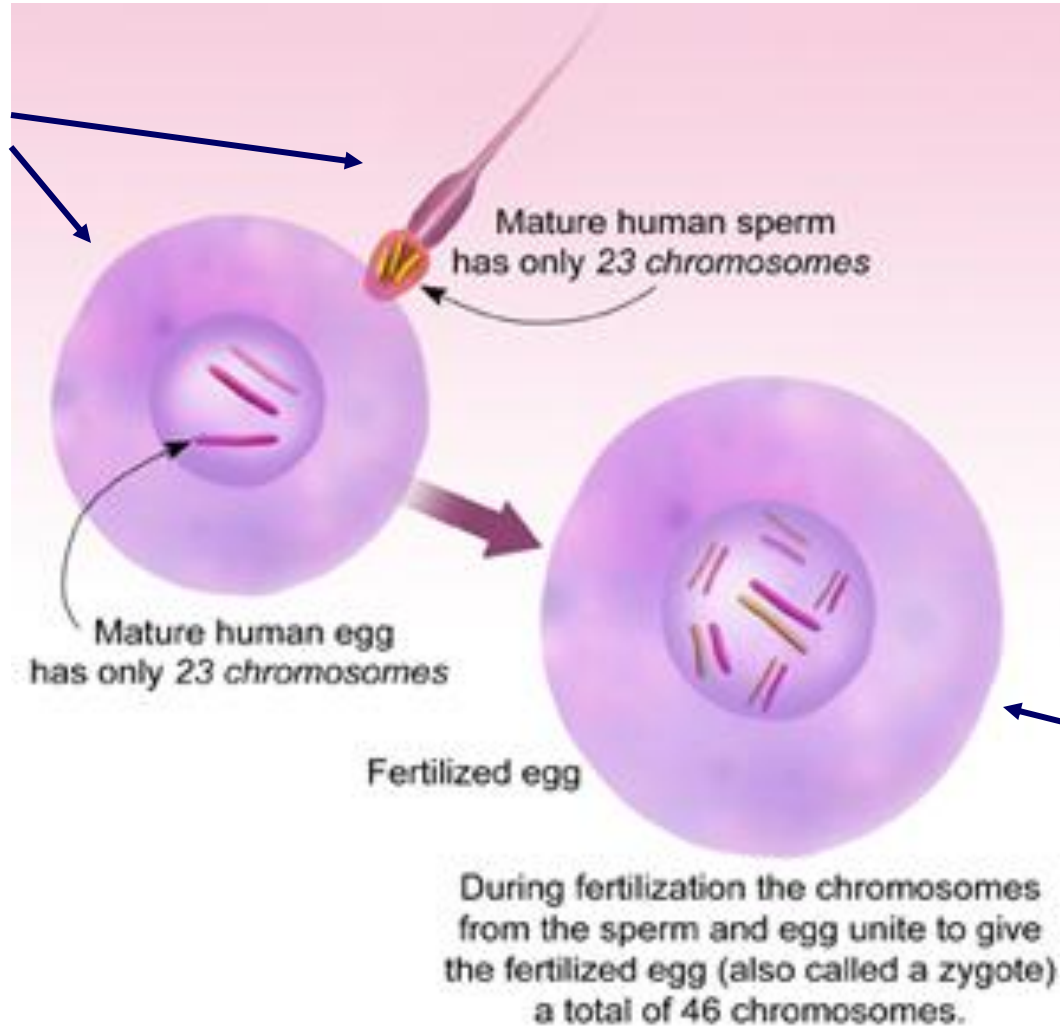
Most of the cells in our body have 46 (23 *pair*) chromosomes.

Exception:

Our Gametes
(egg and sperm) have
23 single chromosomes

How many?

Gametes
(haploid)



Diploid
Zygote
(fertilized
egg)

Some Vocabulary

- Gene → Section of DNA that codes for a trait
(actually, they code for protein strands but more on that later)
- Allele → Different “forms” of a gene
(brown eyes vs. blue eyes)
- Zygote → fertilized egg (alleles in pairs)
- Gamete → sex cells i.e. sperm and eggs
(single alleles)

Mendel

A monk and his peas

- Mid 19th century Austrian
- Developed a basic understanding of inheritance of traits.
- Followed traits in generations of pea plants





http://www.nlm.nih.gov/visibleproofs/media/detailed/vi_a_201.jpg

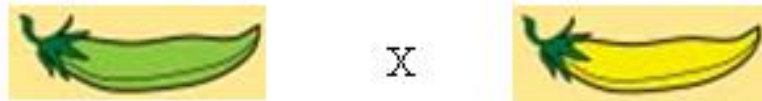


http://upload.wikimedia.org/wikipedia/commons/b/b7/Snow_Pea_on_Plant.JPG

Following the Traits

Form

Grey & Round

White & Wrinkled
1

True-breeding parent generation

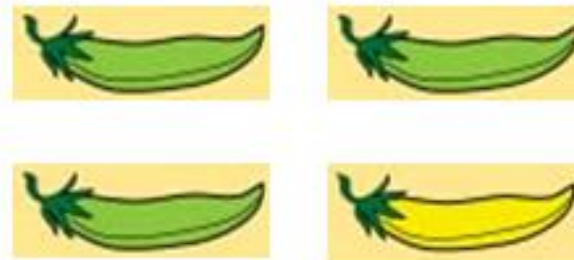


F1 generation



All offspring with green pods

F2 generation



$\frac{3}{4}$ with green pods
 $\frac{1}{4}$ with yellow pods

Size

Long (6-7ft)

Short (1ft)
7

Mendel's "Laws"

- **Genes** for traits come **in pairs** (one from each parent).
- **Law of dominance** – one gene (allele) can prevent the appearance of another gene (allele).
- **Law of segregation** – when gametes form, pairs of genes separate so each gamete gets one of each gene pair.
- **Law of independent assortment** – During gamete formation, genes for different traits separate independently of one another.

More Vocabulary

- Heterozygous → Having different alleles in an allelic pair (Bb) AKA *hybrid*
- Homozygous → Both alleles in the pair are the same (BB, bb) AKA *pure*
- Dominant → The allele that **is** expressed (shown) in a heterozygous pair of alleles
- Recessive → The allele that is **NOT** expressed in the heterozygous pair of alleles

Even More Vocabulary

- Phenotype → The physical traits that are expressed in an individual e.g. brown eyes
- Genotype → The alleles present in an individual e.g. BB or Bb

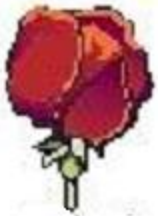
*Phenotype does not always show genotype

Brown eyes = BB or Bb

So how do we figure out our genotype?

More on that...next class

For instance:



Homozygous red

What's the genotype?

RR

The phenotype?

Red



Heterozygous red

What's the genotype?

Rr

The phenotype?

Red



Homozygous white

What's the genotype?

rr

The phenotype?

White