TOPIC 4: WEARING YOUR GENES

I Can…

- Identify examples of both discrete and continuous variation
- Investigate how characteristics are passed down from parents to offspring
- Distinguish between characteristics that are heritable and those that are not; identify characteristics for which heredity and environment both play a role

Genetics

The variations we see are the result of gene expression. *Genes* are the sections of chromosomes, or strands of DNA, that code for different traits…

Eye colour, hair colour, and the ability to roll your tongue are all the result of different genes. Because genes are passed down from parents to offspring, we call these variations

Heritable Variations

1. DISCRETE VARIATIONS

- ➢ Variations that have a limited amount of possibilities (“either/or” variations)
- ➢ E.g. ear lobes are either attached or unattached
- ➢ Often the result of a single gene

2. CONTINUOUS VARIATIONS

- ➢ Variations that have a range of possibilities (along a spectrum)

Which characteristics are discrete? Which are continuous?

Blood Type

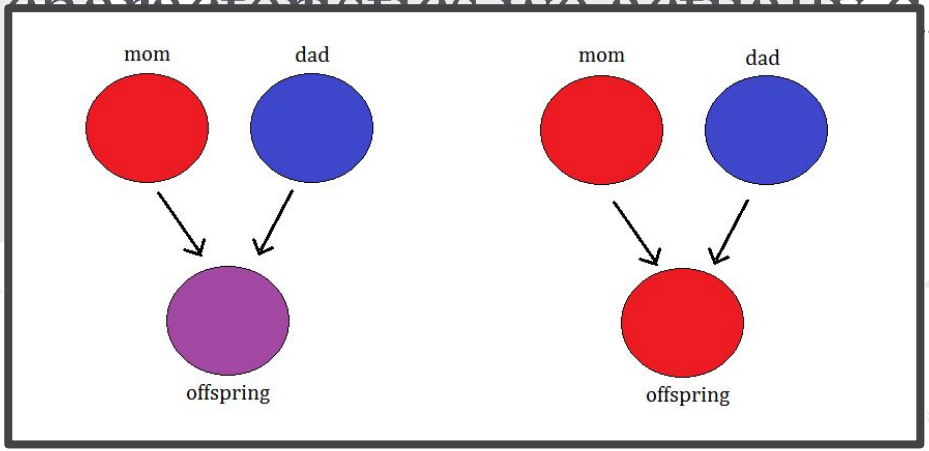
Hairline

Hitchhiker's Thumb

Foot Size

Skin Colour

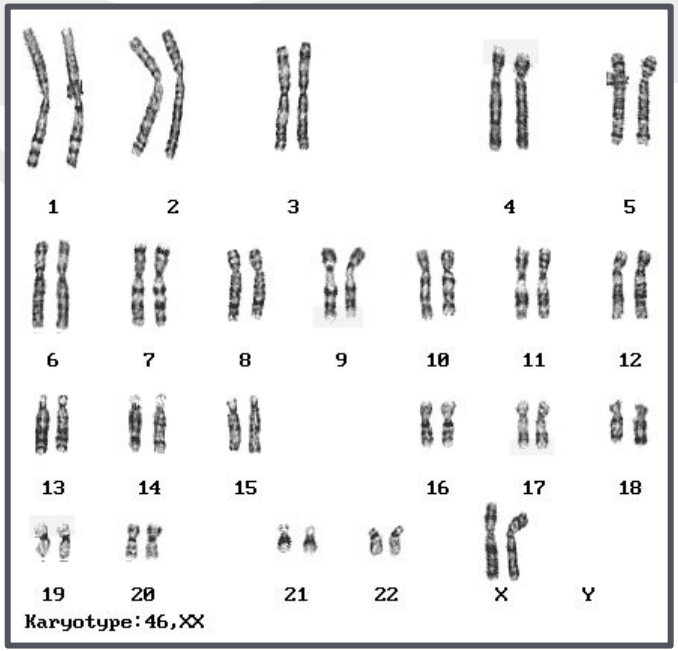
If heritable variations are the result of genes passed down from parents to offspring, what determines which characteristics we actually display???



Does a blending of traits occur? Or do you display one variation or the other?

Gene Expression

Humans have 46 chromosomes (or 23 pairs):



You inherit one of each chromosome from each of your parents, meaning that 50% of your DNA comes from your mom, and 50% comes from your dad.

Each gene has two alternative forms, or *alleles*. One allele is *dominant*, while the other is *recessive*.

Because the dominant allele “overrides” the recessive one, you require two recessive alleles to express a recessive trait.

cessive allele and one dominant allele, ways express the dominant trait.

- E.g. the gene that encodes eye colour has two alleles: one that results in a blue pigment (recessive), and one that results in a brown pigment (dominant)

If we know the *genotypes* of both parents, the probability of offspring displaying a particular variation can be determined through the use of a *Punnett Square*:

- A capital letter is used to represent the dominant allele (e.g. brown eyes = B)
- A lowercase letter is used to represent the recessive allele (e.g. blue eyes = b)

If the dad has one "brown eye" (B) allele and one "blue eye" (b) allele, we say his genotype is "Bb"

If the mom has two "blue eye" (b) alleles, we say her genotype is "bb"

	B	**b**
b	Bb	bb
b	Bb	bb

1/2 of offspring will be Bb (brown eyes)

1/2 of offspring will be bb (blue eyes)

Some misconceptions about inheritance:

"Traits that are recessive are rare"

- Just because a trait is dominant does not mean it is more common; different variations are more common in different populations across the globe depending on the frequency of those alleles.
- For example, blue eyes tend to be more common in European countries despite being a recessive trait, while brown eyes are more common in Asia.

"Heritable disorders are usually recessive"

- Many common disorders are dominant; Huntington's disease,

“Nature vs Nurture”

- Some traits, such as eye colour, are determined solely by genetics (nature)
- Other traits, such as scars, are determined solely by environment (nurture)

Most heritable traits, however, are influenced by BOTH genetics and environmental factors. Height, for example, is determined by your genes (nature) and nutrition/lifestyle (nurture).

The study of how environmental factors

Epigenetics

Mutations: Changing our DNA

The genetic information encoded by our DNA can be altered by both environmental factors and random errors; this is known as *mutation*.

- Mutations can cause noticeable changes in the structures of organisms, or they can have no significant impact at all
- *Mutagens* such as x-rays, ultraviolet light, and some chemical sub[illegible]he mutation of DNA

Over-exposure to UV rays from the sun or tanning beds can alter the DNA in skin cells, causing cells to divide uncontrollably (skin cancer!)