Last Time

- What was Lamarck right about? What was Lamarck wrong about?
- What was Malthus's contribution to Darwinian thought?
- What were Lyell's and Hutton's contribution?

1

Darwin

- When did Darwin go on the Beagle?
- When was *The Origin of Species* published?
- Why did it take so long?
- Who was Alfred Russell Wallace?

2

Darwin, cont.

- Why is it called Natural Selection?
- What are the necessary conditions for evolution by natural selection?

  (book has 3, I gave 4)
- Can anything evolve by natural selection?
- Is "Survival of the Fittest" an accurate description of the theory? Why or why not?

3

Elephant's Child?

4

Can *anything* evolve by Natural Selection?

5

Can intelligence evolve?

- Is intelligence at least IN PART determined by genetics?

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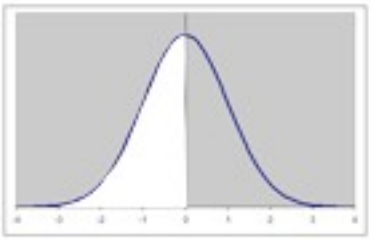

Let's say, people in the top 50% have 4 kids each and the people in the bottom have 2 kids each

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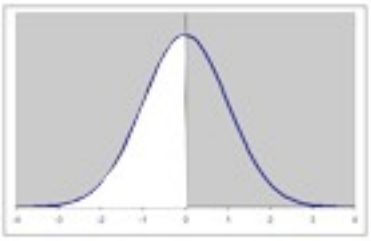

Let's say, 60% of the people in the top 50% are there because their genes code for greater intelligence

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	Gen1		Gen 2
Higher Int. 60%x100x4 40%x100x4	= 240 =160	Higher Int. 60%x320x4 40%x280x4	= 768 = 448
Lower Int. 40%x100x2 60%x100x2	= 80 =120	Lower Int. 40%x320x2 60%x280x2	= 256 = 336
	= 320 (53%) = 280 (47%)		= 1024 (57%) = 784 (43%)

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Heredity

- This was the missing piece
- Darwin had the idea of competition, variation, differential reproduction, and heritability, but didn't know how traits were inherited

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3 Part question

- How does the genetic code create a characteristic?
- Where does variation in the code come from?
- How come we resemble our parents? That is, how is our heritable information passed from generation to generation?

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Phenotype

- the observable characteristics of an organism
- can be anatomical, biochemical, or behavioral
- natural selection works on phenotypes

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Phenotype = genotype + environment

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Genotype

- the genetic makeup of an individual
- the genes we carry

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BUT HOW?

How does a genotype create a phenotype?

15

Earlier ideas

- Homunculus

A tiny version of a fully formed individual is passed from generation to generation

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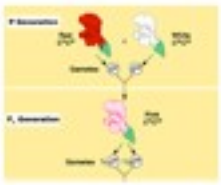
Blending Inheritance

Each parent contributes equally to the offspring, and these contributions are halved in each successive generation



Offspring are intermediates of their parents

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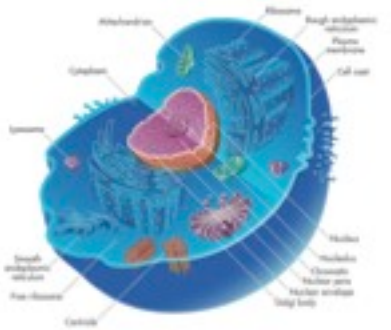
Mendel

1822-1884

What is a particle of inheritance?

- a "gene"
- an "allele"
- a "locus"
- a segment of DNA



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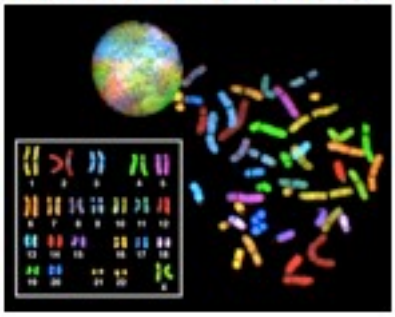
Human DNA in Chromosomes



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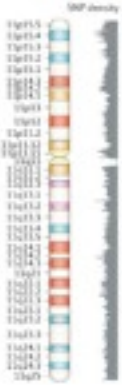
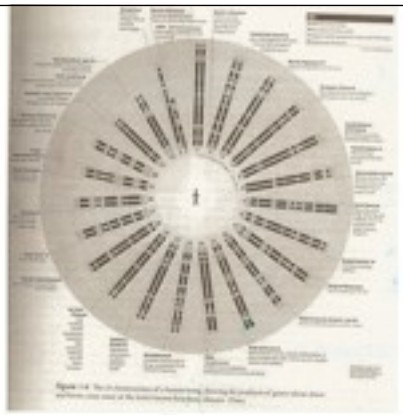


Example: Sickle Cell Anemia

- result of recessive allele at 11p15.5



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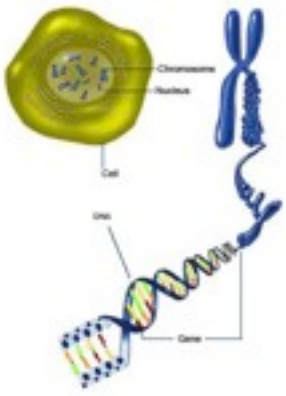
Chromosomes are DNA



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DNA

- A SEGMENT OF DNA is a particle of inheritance
- All scrunched up in nucleus – supercoiled into tiny packs
- Forms the Chromosomes
- Really long! Haploid genome of one gamete = about 1 meter
- Double helix

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1953: The structure of the DNA molecule is first described.

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DNA made of 4 bases

- Adenine
- Guanine
- Cytosine
- Thymine

A--T
G--C

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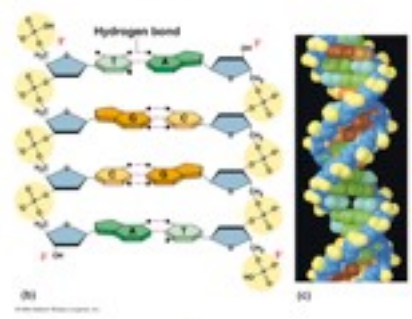
DNA structure



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Particle of Inheritance?

- A segment of a chromosome
- A segment of DNA
- A series of bases
- A gene
- An allele
- A segment of DNA with a particular job

DNA's Job

- DNA carries the code for making proteins
- Proteins are the building blocks of the body
- What proteins you make or don't make determines your phenotype
- Different sequences can create different proteins and therefore different phenotypes