

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?

Darwin

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

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?

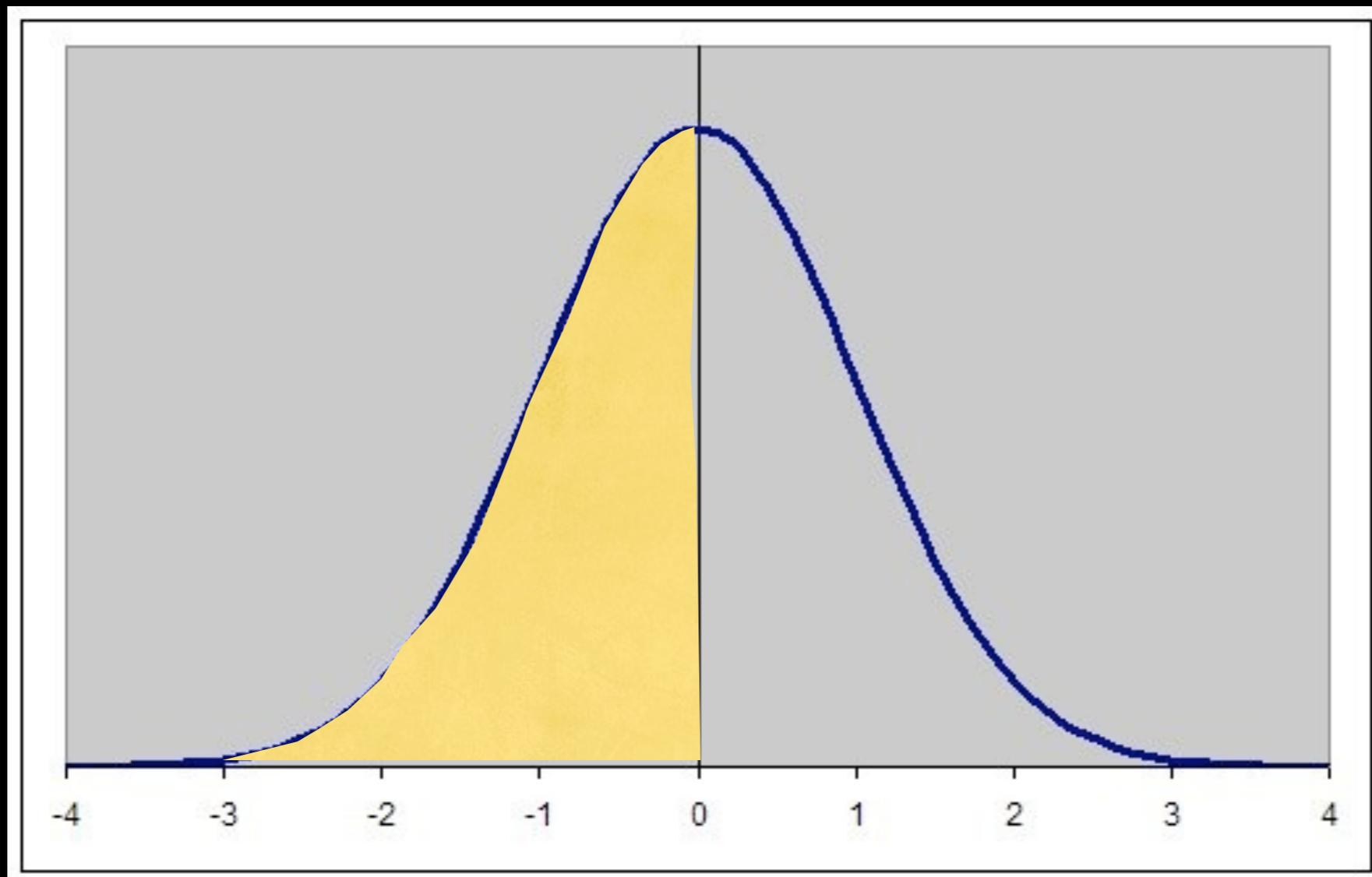
Elephant's Child?



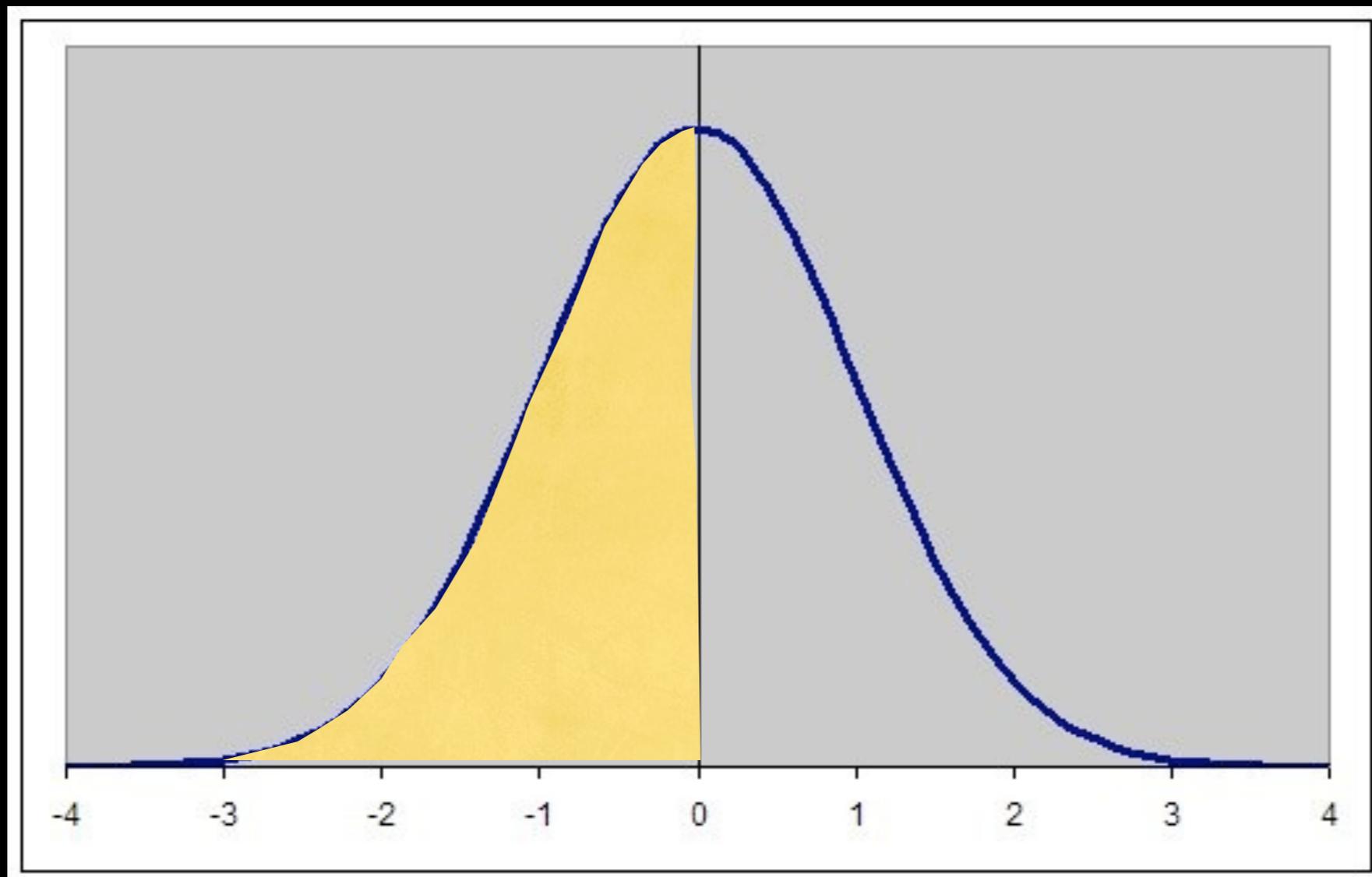
Can *anything* evolve by Natural Selection?

Can intelligence evolve?

- Is intelligence at least IN PART determined by genetics?



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



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

	Gen I		Gen 2
Higher Int. 60% x 100 x 4 40% x 100 x 4	= 240 = 160	Higher Int. 60% x 320 x 4 40% x 280 x 4	= 768 = 448
Lower Int 40% x 100 x 2 60% x 100 x 2	= 80 = 120	Lower Int. 40% x 320 x 2 60% x 280 x 2	= 256 = 336

= 320 (53%)
= 280 (47%)

= 1024 (57%)
= 784 (43%)

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

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?

Phenotype

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

Phenotype = genotype + environment

Genotype

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

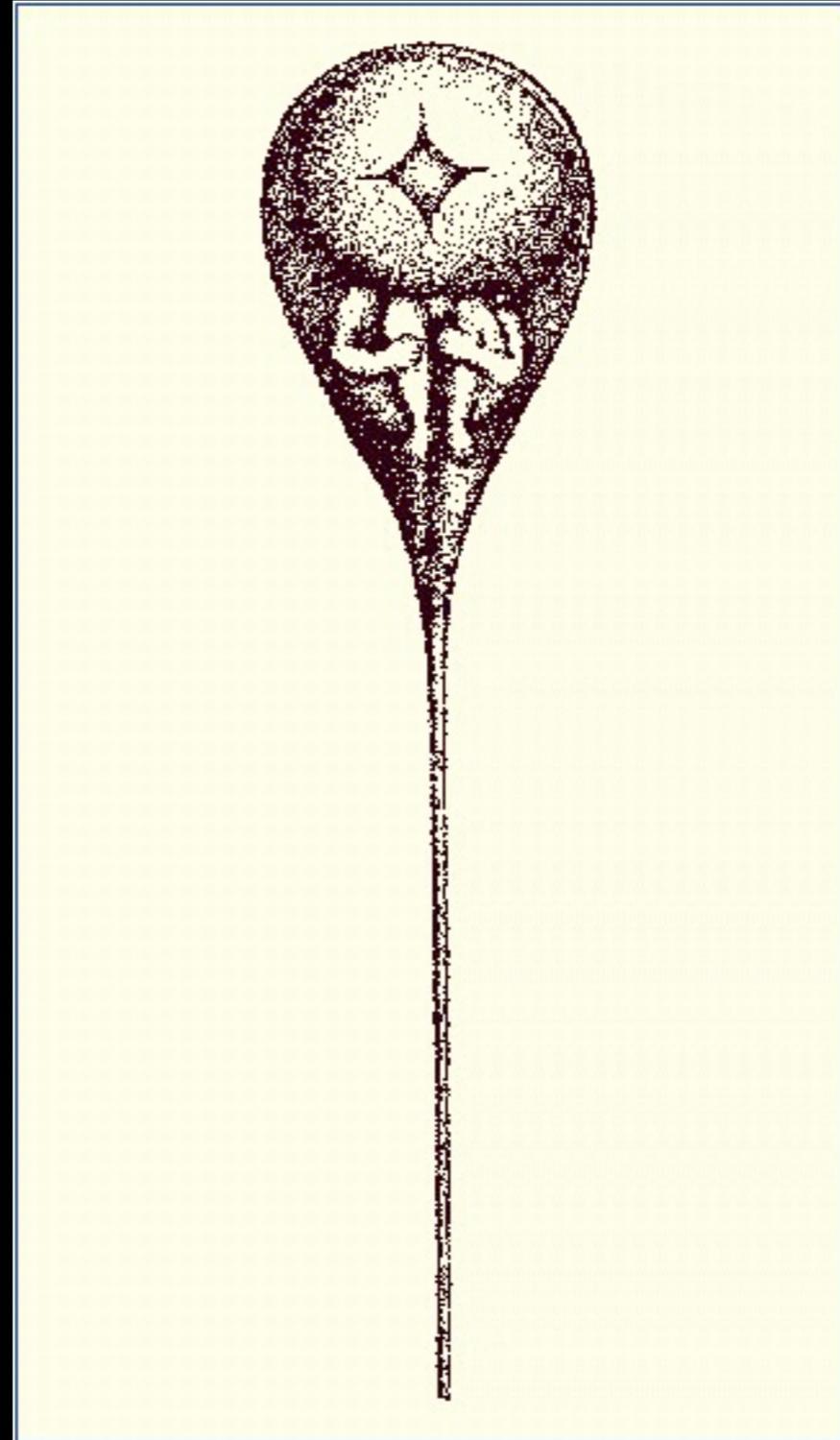
BUT HOW?

How does a genotype create a phenotype?

Earlier ideas

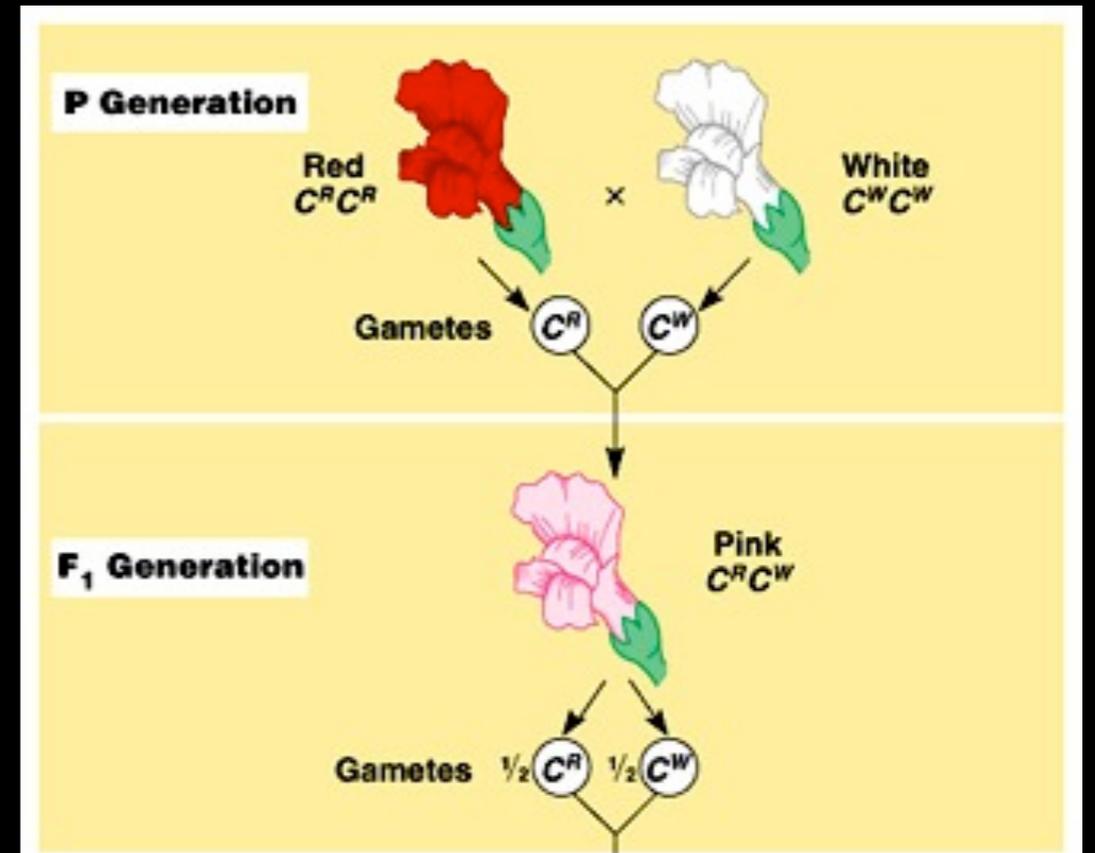
- Homunculus

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



Blending Inheritance

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



Offspring are intermediates of their parents

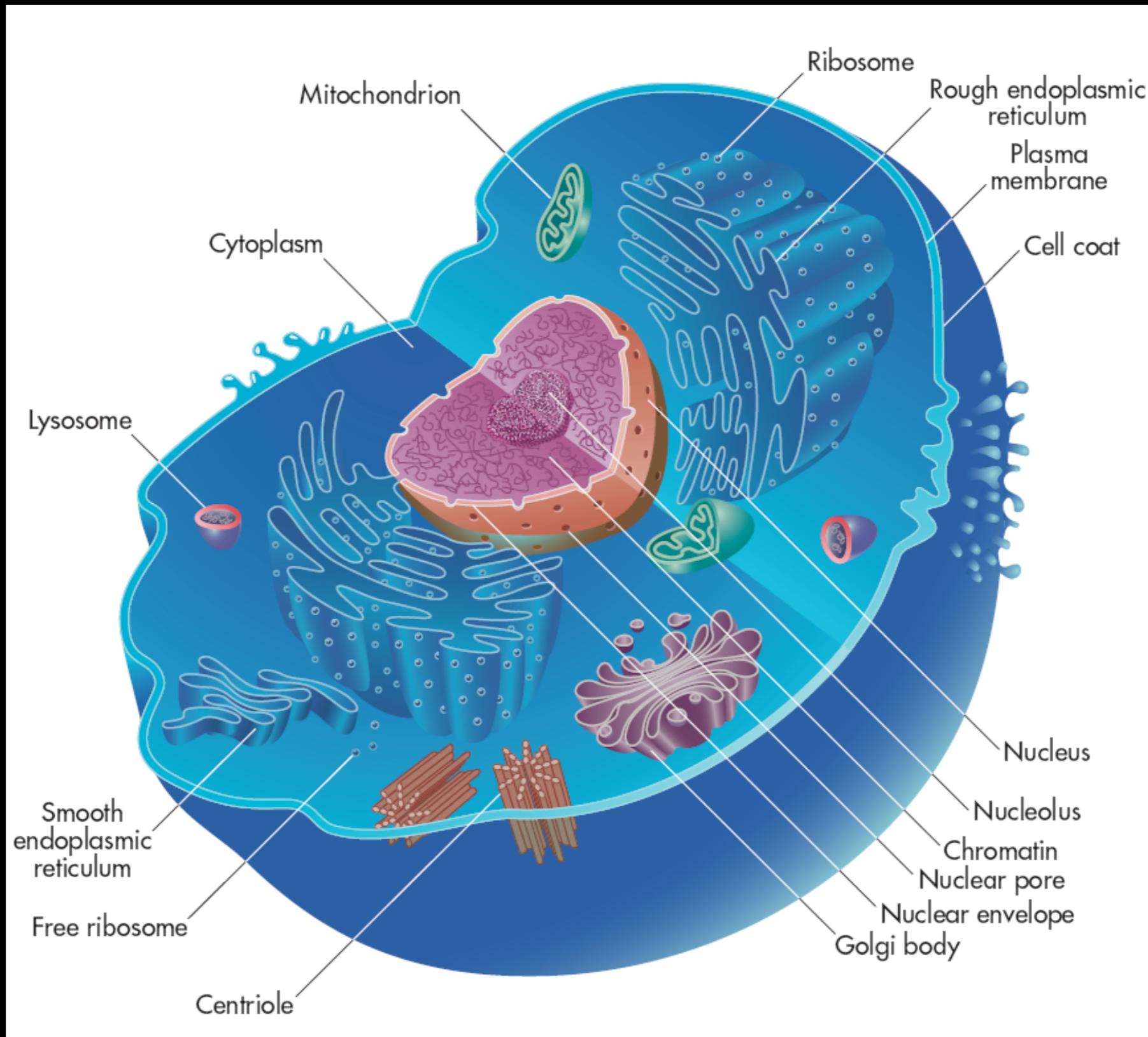
Mendel

1822-1884

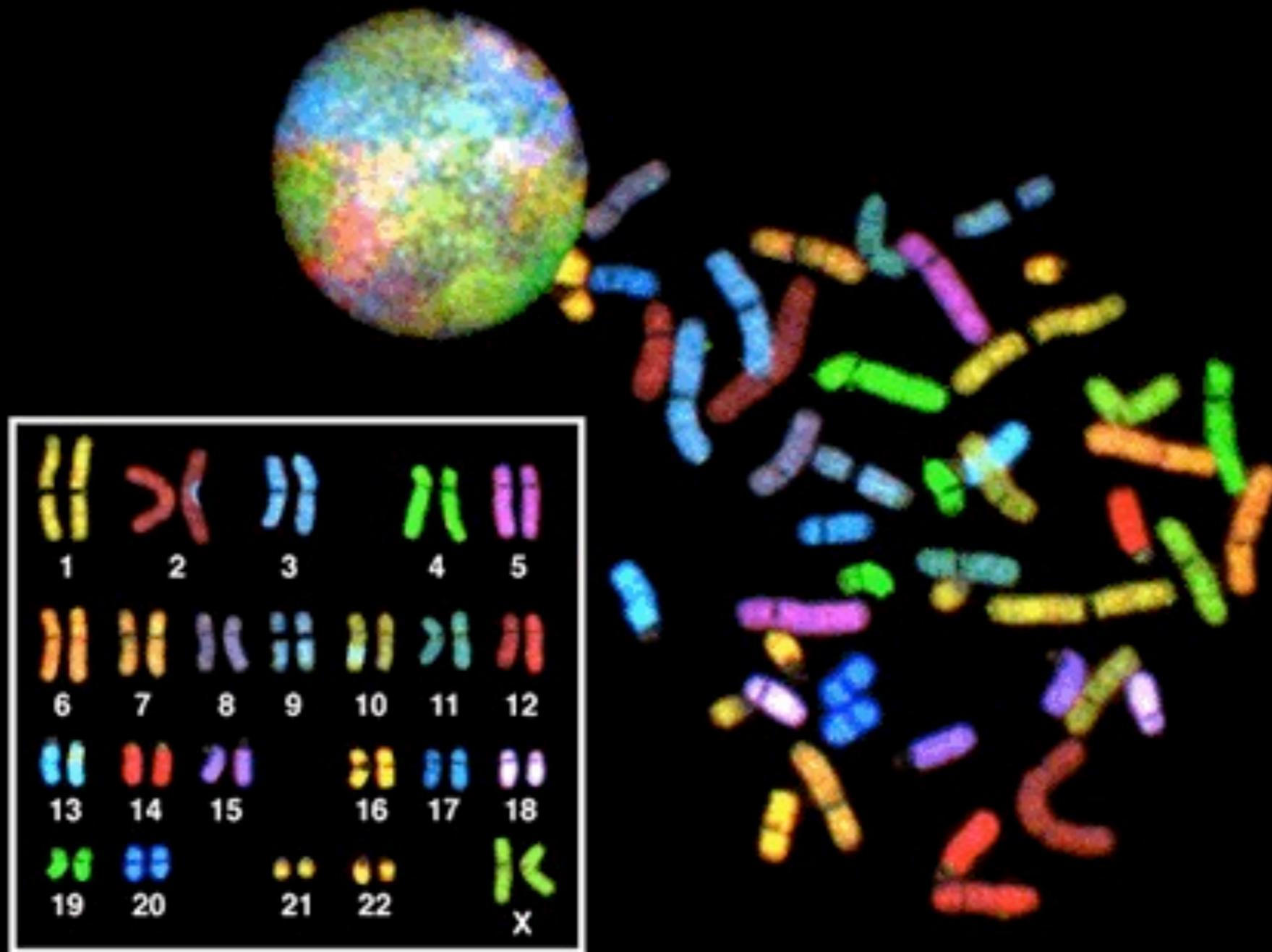


What is a particle of inheritance?

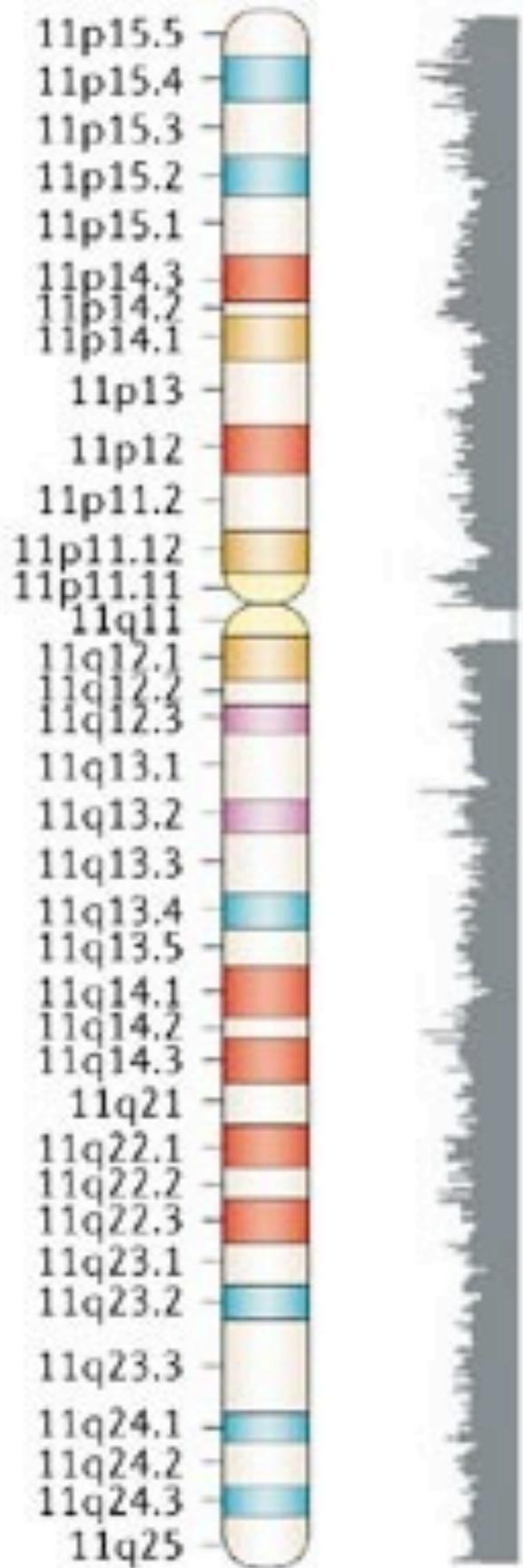
- a “gene”
- an “allele”
- a “locus”
- a segment of DNA



Human DNA in Chromosomes



SNP density



Example: Sickle Cell Anemia



- result of recessive allele at 11p15.5

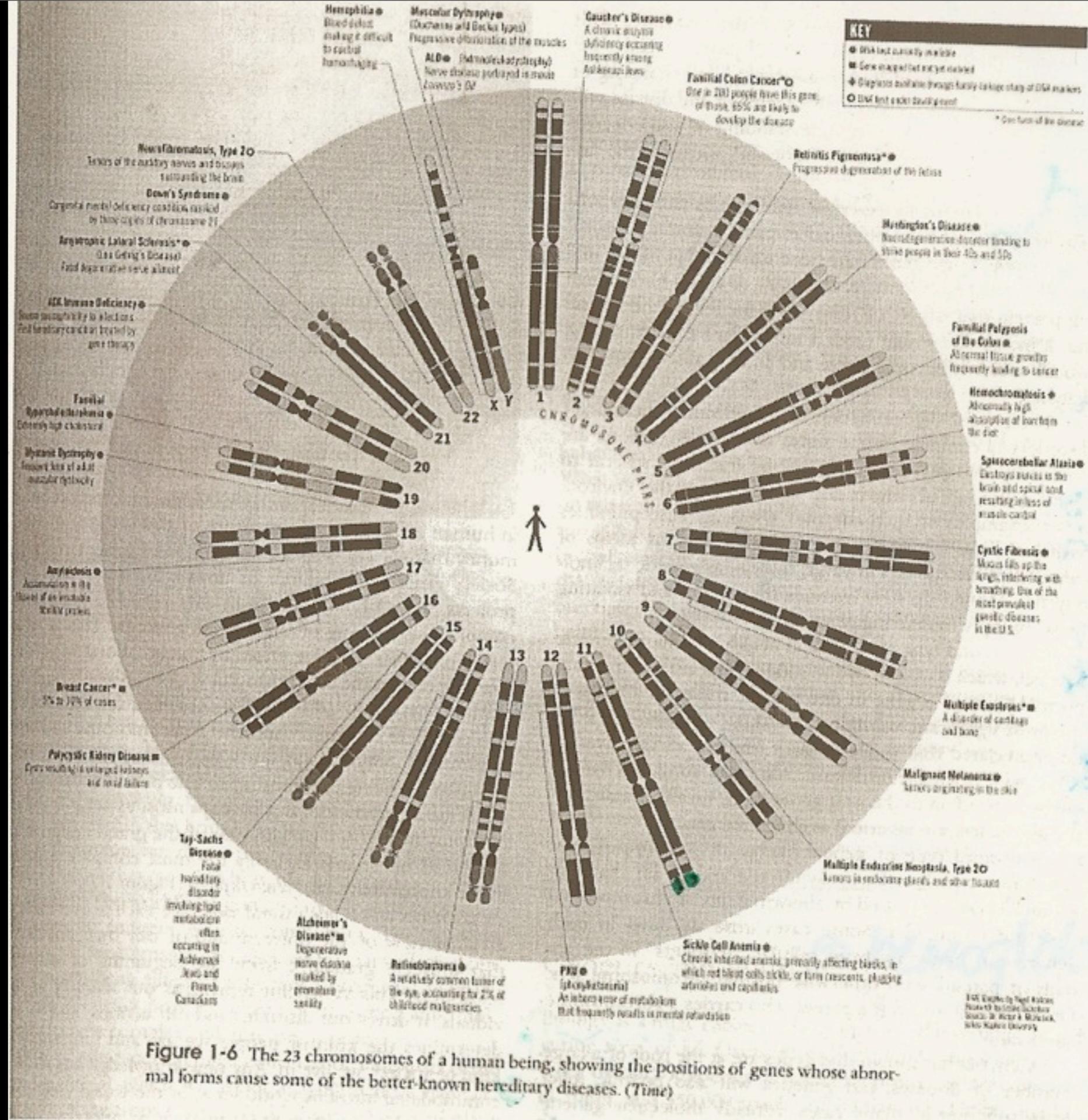
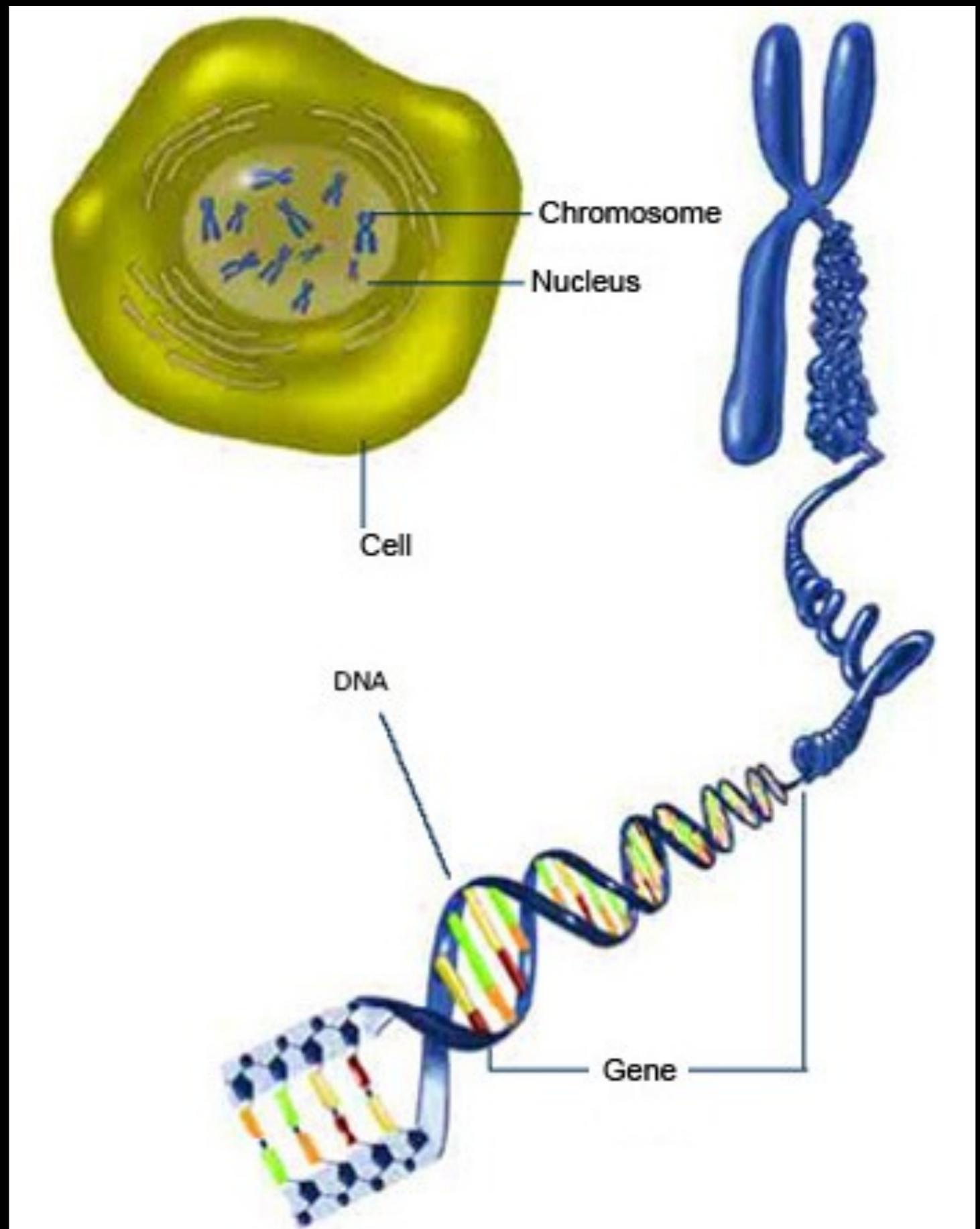


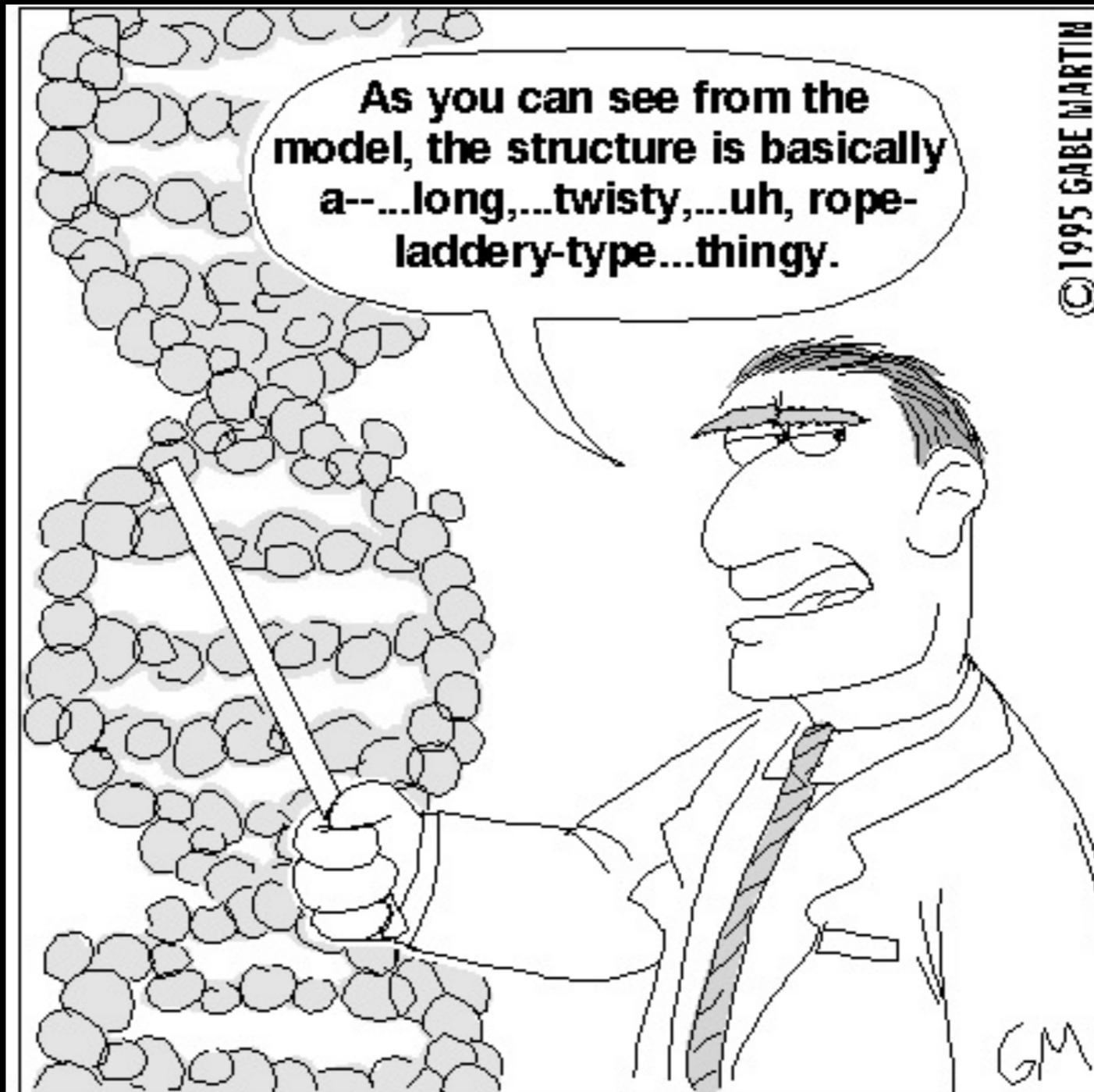
Figure 1-6 The 23 chromosomes of a human being, showing the positions of genes whose abnormal forms cause some of the better-known hereditary diseases. (Time)

Chromosomes are DNA



DNA

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

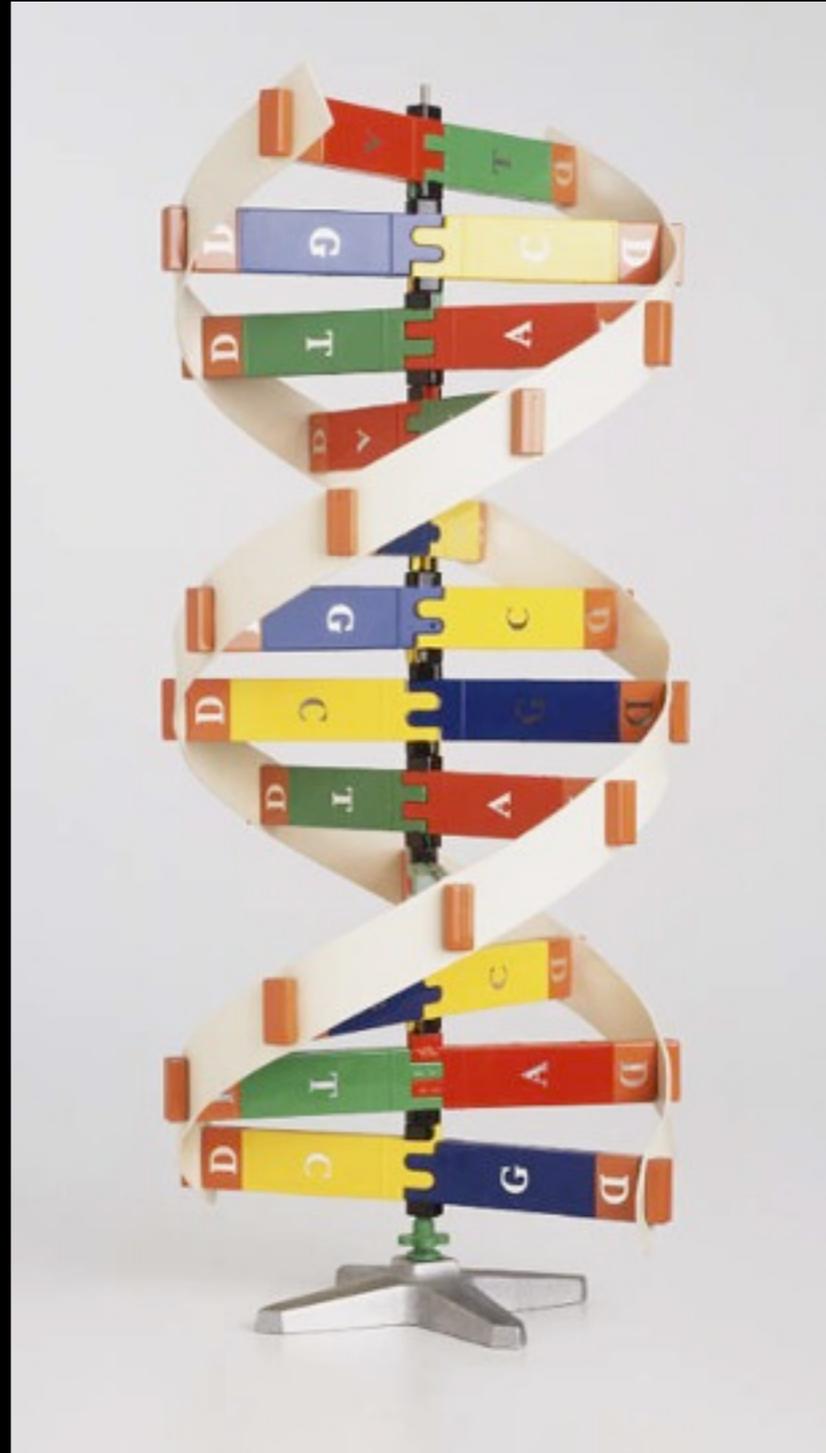


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1953: The structure of the DNA molecule is first described.

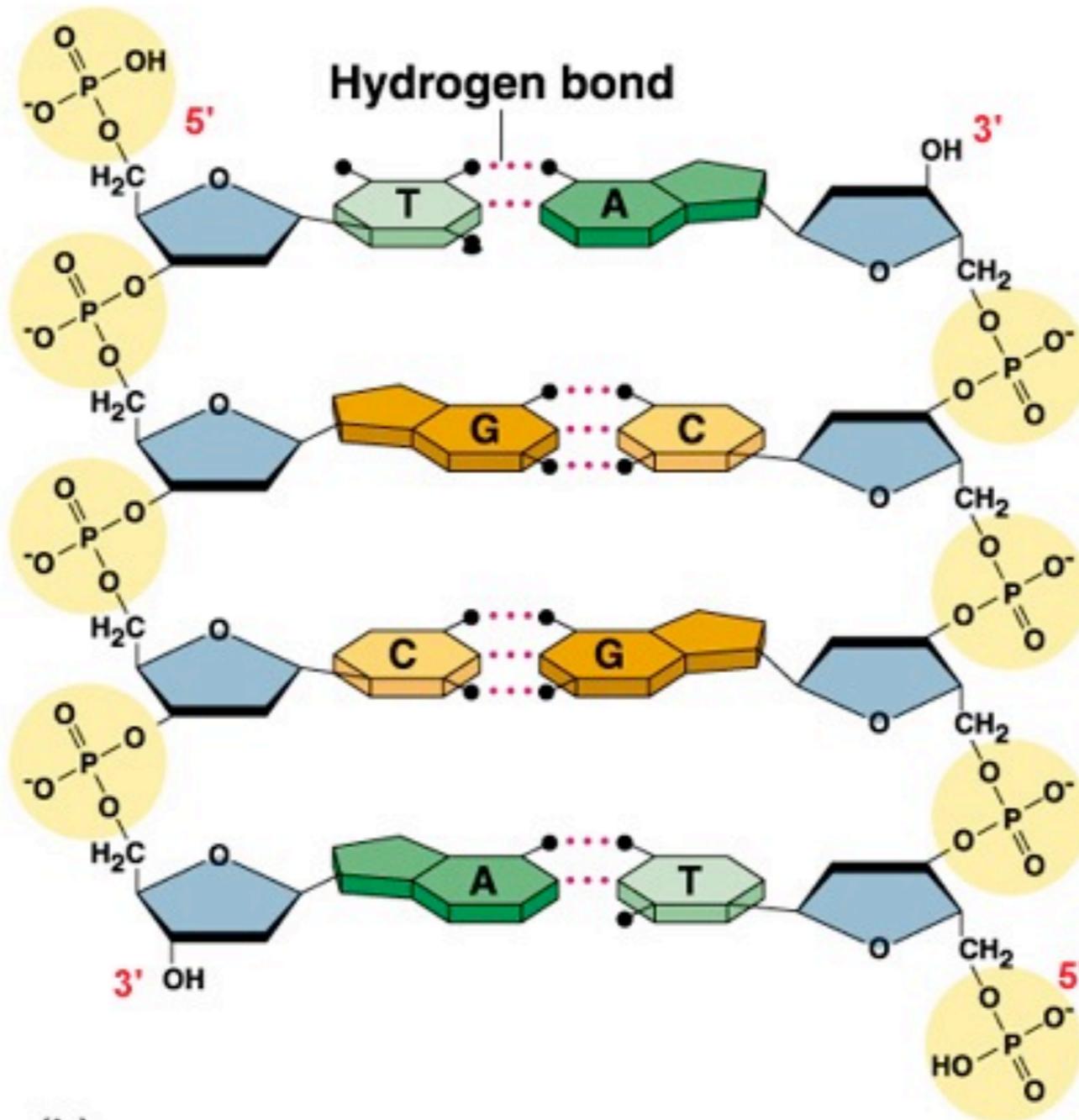
DNA made of 4 bases

- Adenine
- Guanine
- Cytosine
- Thymine



A--T
G--C

DNA structure



(b)

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(c)

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