DNA

- What is DNA?

    - What is its shape? Why is the shape important?

- Where is it found?

- What does it do?

1

DNA

- What bases make up DNA?

- How do they pair?

- What does the sequence of bases do?

2

Proteins

- What is a protein?

- What are amino acids?

- How do they make proteins?

- How does DNA make proteins?

3

Protein Synthesis

- What are transcription and translation?

- How does RNA differ from DNA

- What is the difference between mRNA and tRNA?

- How does the ribosome help?

- How is the protein made?

4

This is how a protein is created -- But this is only the start

We don't just have one copy of a gene, we have two, and we have to know

- How do these two copies combine to create a phenotype?
- How do we get our two copies?
- How is variation produced?

5

3 Part question

- How does the genetic code create a characteristic?

- How come we resemble our parents? That is, how is our heritable information passed from generation to generation?

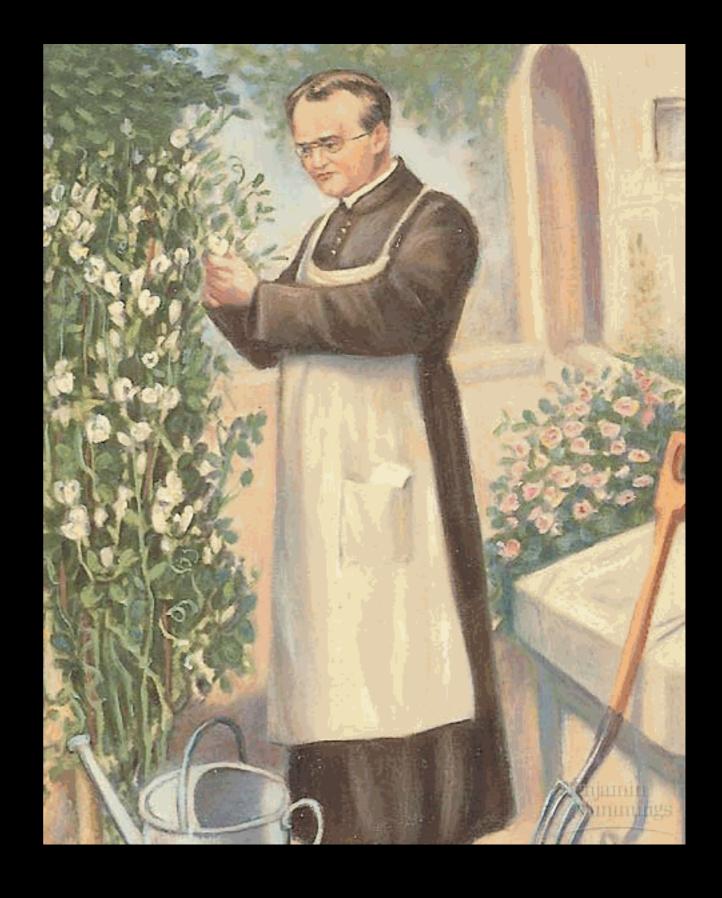- Where does variation in the code come from?

6

Example: Sickle Cell

Example: Blood Type

- ABO

- A creates an antigen on the blood, which will result in antibodies against B

- B creates an antigen on the blood, which will create antibodies against A

- O creates no antigens - but will create antibodies against both

- AB creates both antigens, and therefore no antibodies

8

Example: Eye Color

- actually created by pigment genes at at least 3 locales

- Blue eyes are due to the lack of other pigmentation

- One allele makes nothing, others make pigmentation.

9

Mendel

1822-1884
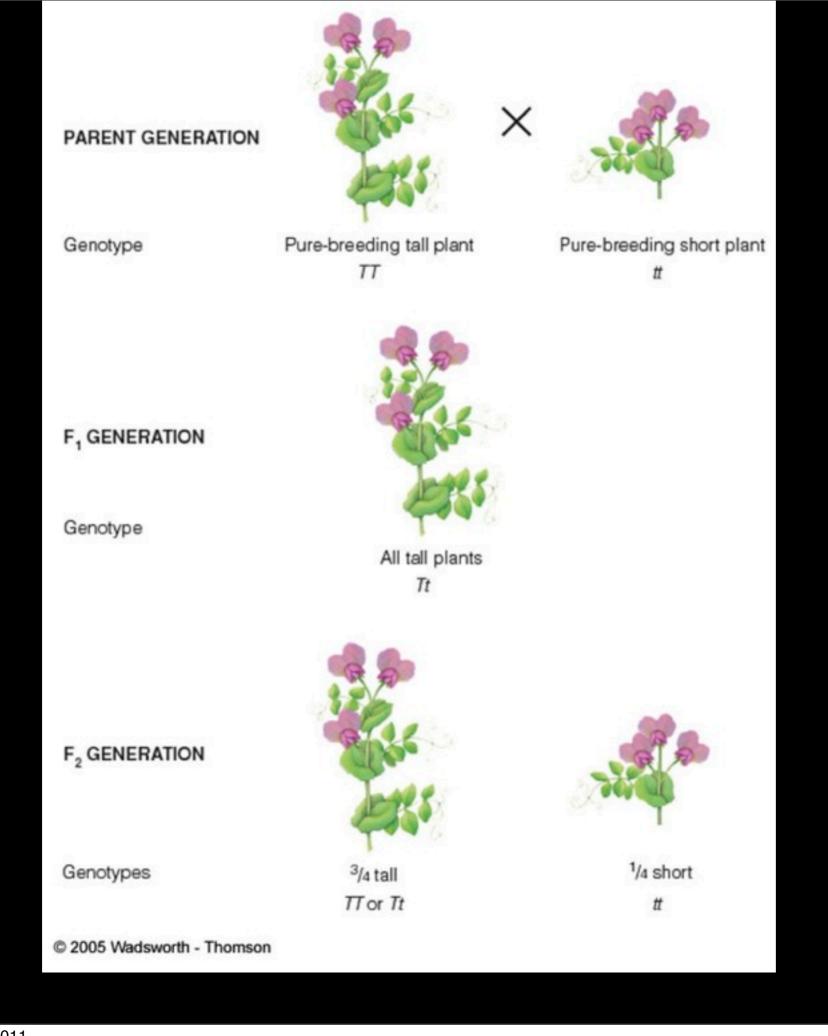
Mendel

- Inferred mechanism of heredity from patterns

- Inferred GENES (or particles of inheritance) from phenotypic rations

- Gave the idea of DOMINANCE and RECESSIVENESS

BUT HOW?

Trait Studied	Dominant Form	Recessive Form
Seed Shape	round	wrinkled
Seed Color	yellow	green
Pod Shape	inflated	wrinkled
Pod Color	green	yellow
Flower Color	purple	white
Flower Position	along stem	at tip
Stem Length	tall	short

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PARENT GENERATION

Genotype

Pure-breeding tall plant
TT

×

Pure-breeding short plant
tt

F₁ GENERATION

Genotype

All tall plants
Tt

F₂ GENERATION

Genotypes

¾ tall
TT or *Tt*

¼ short
tt

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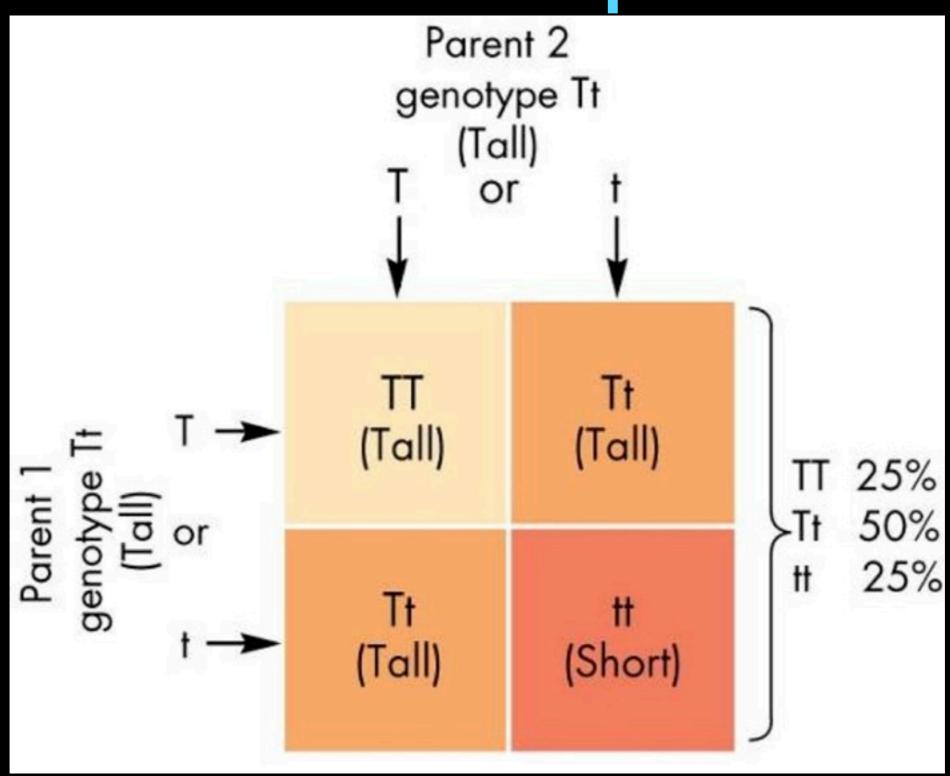
Conclusions

- Traits can be hidden in an individual

    - The character that is hidden is called recessive

    - Character shown is called dominant

- Those tall plants of the F1 generation must be hiding the "short" - not the same as the tall of the parental generation.
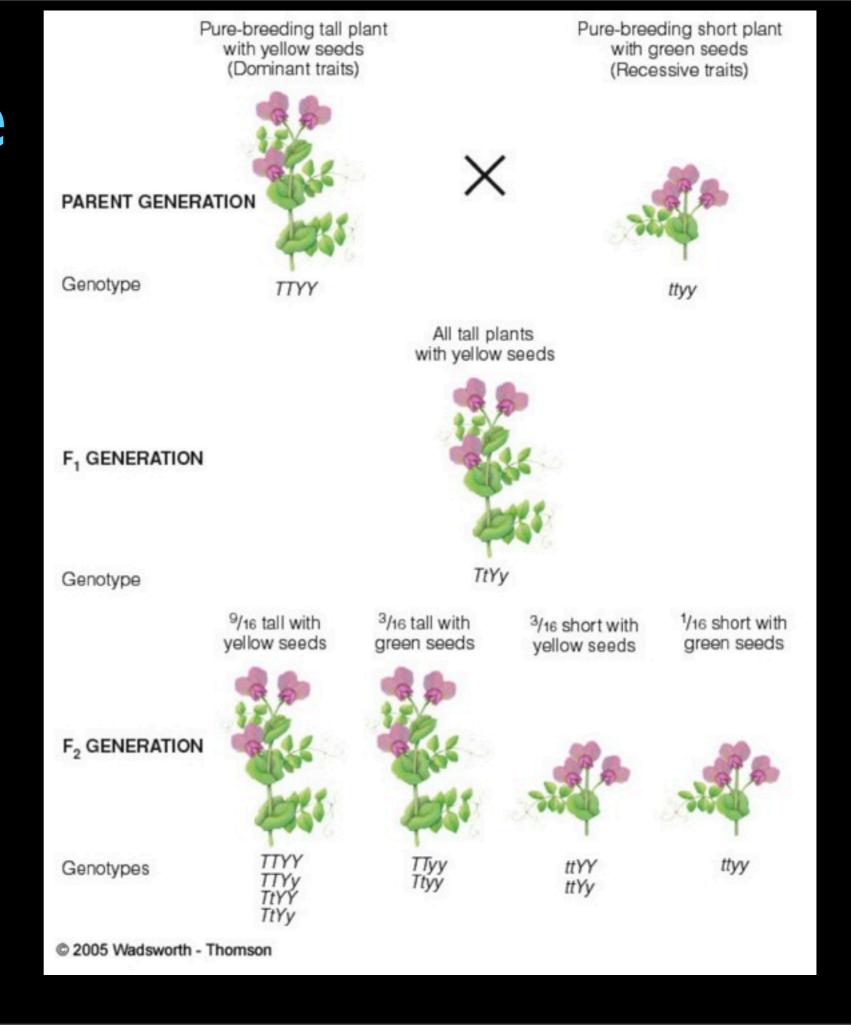
Law of Segregation

- Each person carries two particles of inheritance for each trait

- These separate (segregate) during reproduction, one copy being passed on to the next generation

Punnett Square

Multiple Traits?

Pure-breeding tall plant with yellow seeds (Dominant traits)

Pure-breeding short plant with green seeds (Recessive traits)

PARENT GENERATION

Genotype — $TTYY$ × $ttyy$

All tall plants with yellow seeds

F₁ GENERATION

Genotype — $TtYy$

$9/16$ tall with yellow seeds

$3/16$ tall with green seeds

$3/16$ short with yellow seeds

$1/16$ short with green seeds

F₂ GENERATION

Genotypes — $TTYY$ $TTYy$ $TtYY$ $TtYy$ — $TTyy$ $Ttyy$ — $ttYY$ $ttYy$ — $ttyy$

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Two Traits

	Y	y
Y	YY	Yy
y	Yy	yy

X

	T	t
T	TT	Tt
t	Tt	tt

2 trait punnett square

	TY	Ty	tY	ty
TY	TTYY	TTYy	TtYY	TtYy
Ty	TTYy	TTyy	TtYy	Ttyy
tY	TtYY	TtYy	ttYY	ttYy
ty	TtYy	Ttyy	ttYy	ttyy

Phenotypes: 9 TY, 3 Ty, 3 tY, 1 ty

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Law of Independent Assortment

- the units which govern one trait assort independently of the units that govern other traits

- true of chromosomes - mostly true on loci, due to crossing over

Human Mendelian Inheritance?

- most human traits more complicated than all that

- but a few are inherited this way

- Online Mendelian Inheritance in Man (OMIM)

SNP density

Example: Sickle Cell Anemia

- result of recessive allele at 11p15.5

Sickle cell

	HbA	HbS
HbA	AA	AS
HbS	AS	SS

HbA = Dominant, HbS = Recessive

Mendelian Traits

- Sickle cell (R)

- Cystic Fibrosis (R)

- Tay-Sachs disease (R)

- Phenylketonuria (R)

- Huntington disease (D)

- Achondroplasia (D)

- Hemophilia (R)

Mendelian Traits

- Hitchhiker's thumb (recessive)

- Earlobe attachment (recessive)

Other Simple Mendelian Traits

- Tongue rolling (dominant)

- Darwin's Tubercle (dominant)

Other Simple Mendelian Traits

- Mid-digital hair (dominant)

- Hand clasping (left over dominant)

Heritability -
a 3 Part question

- How come we resemble our parents? That is, **how is our heritable information passed from generation to generation?**

- How does the genetic code create a characteristic?

- Where does variation in the code come from?

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