Chpt 11: Intro to Genetics

you are a product of genetics and environmt
which is more impt to who you are?
nature refers to ?
nurture refers to ?

geneticists are very interested in this question and conduct studies of identical twins to try to answer it
identical twins have exact same genetics, are they exactly the same in everything?

example of how environment can have effect on heredity: coloring of siamese cats
temperature affects the expression of coat color
where are the cats black, where are they white?
the same genes code for coat color
experiment: if you shave a cat's belly, put on an ice pack and let the hair grow in, the coat grows in with black hair; if you shave the tail and paws, add heat and let hair grow in, it will be white

Historical Perspective: traits are obviously passed down from parents to offspring, but how?
originally thought, blending occurred
an individual's genetic makeup formed when parents' genes mixed at fertilization
but sometimes a child looks like one parent & not the other, where is the mix?

in 1860's-what did we know?
1850's: cell theory
1860's: nucleus of cell contains half protein, half something else

in 1860's we knew nothing about chromosomes, nothing about DNA, nothing about genes
we had seen cell division, but we did not know the process of mitosis, knew nothing about meiosis
and this was when Gregor Mendel began his work on pea plants

Genetics: study of heredity
- began in 1860's w/work of Gregor Mendel
  - Mendel: Father of Genetics
  - Austrian monk, scientist, botanist, mathematician, gardener
  - Mendel tended the garden for monastery & grew peas, because he was scientist he started noticing things about pea plants, so he began experimenting w/ peas
  - because he was a mathematician, he took a mathematical approach to his experiments

Pea plant was great choice to study

1-short reproductive cycle
plants prod new seeds in 90 days
2-seeds easy to obtain: open pods
3-plants were naturally self-fertilizing
pollen can fertilize ovules of same plant
4-pollen-producing parts are closed in flower and open only after pollination, that means you can be sure of male parent
5-also easy to cross-fertilize by hand, you can snip off pollen-producing structures and hand pollinate from another plant

Mendel observed 7 traits that showed only 2 forms,
p.265, Table 14.1

1-seed shape: round vs wrinkled

2-seed color: yell vs green

3-seed coat color: gray vs white

etc

Mendel crossed plants & looked at traits 1 at time

he began w/pure-bred plants: when allowed to self-fertilize, they only produced one trait

terms: P: parental generation, pure-bred trait

F1: first filial generation

F2: crossed F1's w/each other

Mendel's crosses: P tall x short

F1 all tall

then he took F1's and crossed them w/each other

F1 tall x tall

F2 3 tall: 1 short

he repeated exp w/all 7 traits, same results

from these experiments, Mendel made 5 hypotheses

1-each trait is controlled by "factors"

2-the "factors" have only 2 forms and one form is dominant to the other

3-each parent gives 1 "factor" to offspring
thus each organism has 2 "factors" for a trait

4-the "factors" must separate from each other when gametes form, so gametes must only have 1 "factor" for trait

5-the "factors" separate independently of each other

Remember, Mendel knew nothing about mitosis nor meiosis

What are Mendel's "factors"?

from Mendel's hypotheses, we have the Basic Rules of Inheritance or Mendel's Laws

1-Law of Dominance & Recessiveness
when 2 forms of a gene are different, one is expressed (shown) while one is masked (hidden)
the dominant form is the expressed gene
the recessive form is the masked gene

2-Law of Segregation
genes separate from each other when gametes form
we have evidence of this, what is it?

3-Law of Independent Assortment
gene pairs separate randomly & independently of each other

Language of Genetics Crosses
we use letters to represent genes in crosses

T: capital is dominant t: recessive
alleles: the different forms of a gene, T or t
genotype: actual gene combination,TT Tt tt
phenotype: expression of genotype
TT: tall Tt: tall tt: short

homozygous: both alleles for trait are same
heterozygous: alleles for trait are different

TT: homozygous dominant
tt: homozygous recessive
Tt: heterozygous

Genes & Probability

probability is likelihood that something will happen
predicts the chance that certain events will occur

in genetics, we use a Punnet Square to do crosses
a punnet square is a grid for organizing genetic info, it makes it easy to predict results of crosses

in a monohybrid cross: only 1 trait is followed
in a dihybrid cross: 2 traits followed together
in a trihybrid cross: 3 traits followed
each cross gets more complicated