

Chpt 6: Patterns of Inheritance

a **genetic trait** is any inherited characteristic of an organism that can be observed or detected in some way

these include physical traits, ex?
biochemical traits, ex?
and behavioral traits, ex?

you are a product of **genetics and environment**
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

