I. Popular 19th Century Model - 
*The Blending Theory*

- All traits are mixed over time.
- Once the traits are blended, they cannot be separated.

II. Gregor Mendal

*Father of Modern Genetics*

- Raised in a farming community
- Trained in Math/Science
- Monk at St. Thomas’ Monastery
- Conducted research on inheritance using garden peas.
III. Mendel’s Particulate Theory of Inheritance

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•

•

IV. Why did Mendel use Peas?

• Easily cultivated.

• Large number of offspring produced each growing season.

•

NOTE ABOUT TERMS:

•

IV. Why did Mendel use Peas?

• Peas contain ♀ pollen and ♂ egg in same flower and naturally self-fertilize.

•
V. Useful Vocabulary

- Dominant vs. Recessive Traits (or Alleles)
- Genotype
  - Homozygous Dominant (AA)
  - Heterozygous (Aa)
  - Homozygous Recessive (aa)
- Phenotype
- True-Breeding vs. Hybrids

Question 14.1

VI. Mendel’s *Law of Segregation*

1. A sexually producing organism has two determinants (alleles).
2. These alleles separate (segregate) during gamete formation.
3. In hybrid offspring, a dominant allele can *mask* a recessive allele.
VII. Mendel conducted experiments over many generations.
- Parental cross
- F1 self-pollination
- Additional crosses and/or self-pollinations with F2, F3, F4…

VIII. Using Punnett Squares to Explain Mendel’s Work

*Steps for Creating a Punnett Square:*
1.
2.
3.

IX. Test Cross
- PURPOSE:
Question 14.2

Phenotype: Plant with yellow seeds
Genotype: Y?

Phenotype: Plant with green seeds
Genotype: yy

X. Mendel’s Law of Independent Assortment
• (Modern Terms)

<table>
<thead>
<tr>
<th>Character</th>
<th>Trait</th>
<th>Chromosome #</th>
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<tbody>
<tr>
<td>Seed shape</td>
<td>round-wrinkled</td>
<td>7</td>
</tr>
<tr>
<td>Seed color</td>
<td>yellow-green</td>
<td>1</td>
</tr>
<tr>
<td>Pod color</td>
<td>green-yellow</td>
<td>5</td>
</tr>
<tr>
<td>Pod texture</td>
<td>smooth-wrinkled</td>
<td>4</td>
</tr>
<tr>
<td>Flower color</td>
<td>purple-white</td>
<td>1</td>
</tr>
<tr>
<td>Flower location</td>
<td>axial-terminal</td>
<td>4</td>
</tr>
<tr>
<td>Plant height</td>
<td>tall-dwarf</td>
<td>4</td>
</tr>
</tbody>
</table>

(2 slides)

XI. Dihybrid Crosses

• P generation: YYRR x yyrr

• F1 generation?
XI. Dihybrid Crosses

• Plants in the F1 generation allowed to self-pollinate:
  YyRr X YyRr

• F2 generation?

XII. Multiplication Rule

• Used to deduce genotype in dihybrid, trihybrid, and tetrahybrid crosses.
Chapter 14 (Part 2)

class notes

I. Many Human Traits Follow Mendelian Genetics
   A. Recessive Inherited Disorders
      A. Tay-Sachs disease = lowercase t (Jewish-Central European origin)
      B. Cystic Fibrosis = lowercase c (European origin)
      C. Sickle Cell = HbS (African origin)
I. Many Human Traits Follow Mendelian Genetics

A. Dominant Inherited Disorders
   A. Polydactyly = uppercase P (extra fingers and toes)
   B. Achondroplasia = uppercase A (one form of dwarfism)
   C. Huntington’s Disease = uppercase H (degeneration of the nervous system beginning at 35-45 years old)

Questions 14.5

Questions 14.6

Most Lethal dominant alleles are not passed on from one generation to the next. Why not?
II. Inheritance patterns are often more complex

A. Codominance –

B. Incomplete dominance –

C. Multiple Alleles on the same gene -
ABO blood grouping

Question 14.7

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II. Inheritance patterns are often more complex

D. Pleiotropy =

II. Inheritance patterns are often more complex

E. Polygenic inheritance =

III. Environmental Impact of Phenotype

• **Multifactorial traits** =
Question 14.8

- Comparing identical twins (identical genes; similar environment) with fraternal twins (different combo of genes; similar environment) can provide insight into the contribution of genes on disease.

Screening for Genetic Diseases

- Fetal Testing
  
- Newborn Screening