

Introduction to genetics

An overview

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Outline

Why ?

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What ?

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Why ?

Why study genetics ?

- ▶ Pivotal position in biology

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Why study genetics ?

- ▶ Pivotal position in biology
- ▶ Central to human affairs
- ▶ Can we stay ignorant about genetic issues ?
- ▶ What does headlines today read ?

What ?

Reach

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- ▶ Since how long have we been practicing ?
- ▶ The major drive of the green revolution
- ▶ Don't we consume engineered drugs ?



Figure 2: Modern, high-yielding rice plant (left) and traditional rice plant (right)

Figure 1: Norman Borlaug, a leader in the development of new strains of wheat that led to the Green Revolution. Borlaug was awarded the Nobel Peace Prize in 1970.

Definition

Study of heredity

- ▶ Why cats always have kittens and humans always have babies ?
- ▶ Why do children resemble their parents ?
- ▶ Why two people are never same ?

Etymology

- ▶ “gene”
- ▶ At any level of study genes are central
- ▶ Genes have unique nature to perform their biological roles – replication, information bearing/generation of form and mutation

Subdivision

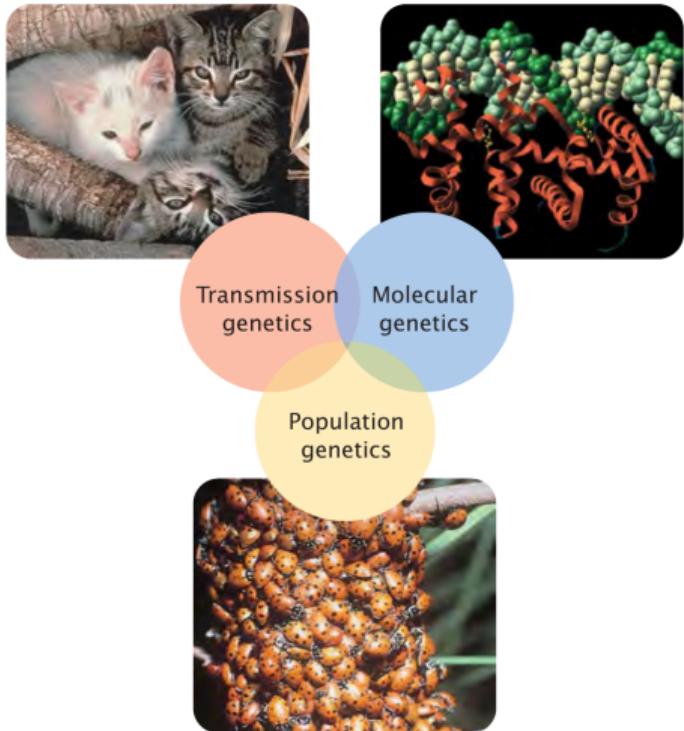


Figure 3: Subdivision of genetics into three interrelated fields

How ?

Gregor Mendel

- ▶ Blending theory of inheritance
- ▶ Mendelian theory of inheritance

Mendel's Experiment

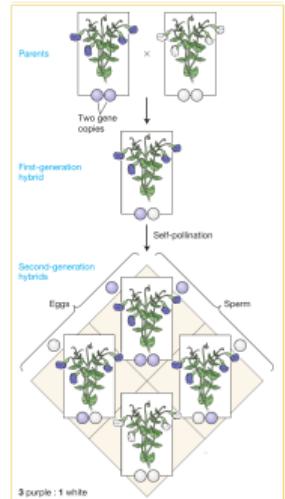


Figure 4: The mating scheme for Mendel's experiment involving the crossing of purple- and white-flowered varieties of pea plants. The purple and white circles signify the gene variants for purple vs. white flower color. Gametes carry one gene copy; the plants each carry two gene copies. The *imes* signifies a cross-pollination between the purple – and white-flowered plants.

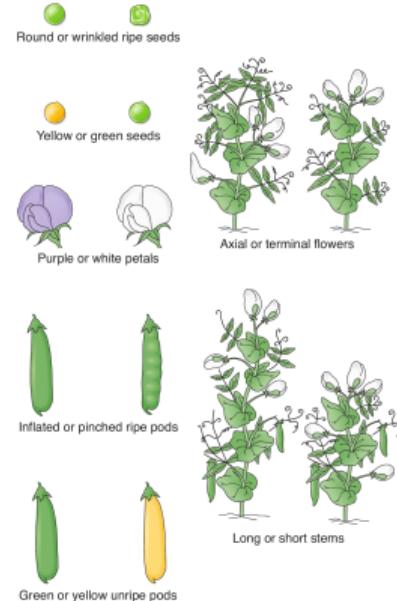


Figure 5: The seven phenotypic pairs studied by Mendel; For each character Mendel studied two contrasting phenotypes

The crossing

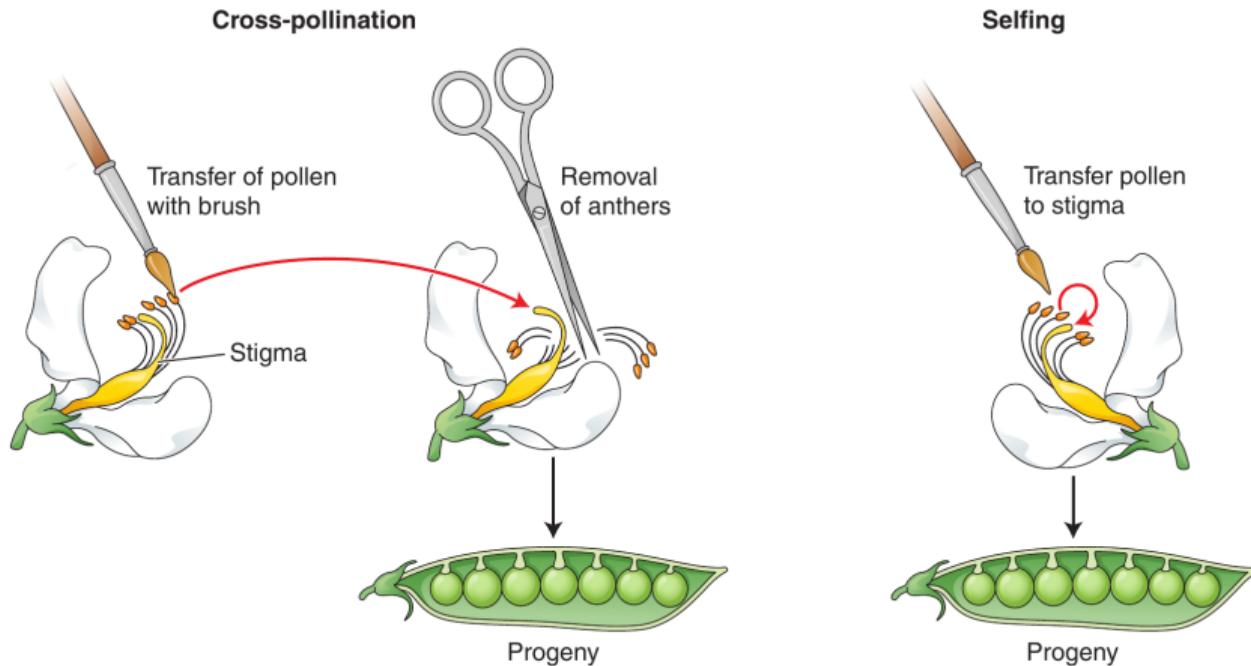


Figure 6: Cross-pollination and selfing are two types of crosses

Model organisms



Figure 7: *Drosophila melanogaster*

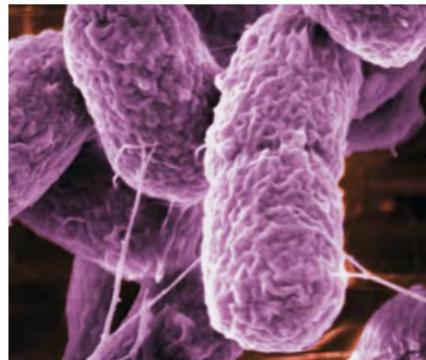


Figure 8: *Escherichia coli*



Figure 9: *Caenorhabditis elegans*



Figure 10: *Arabidopsis thaliana*



Figure 11: *Saccharomyces cerevisiae*



Figure 12: *Mus musculus*

Fundamental concepts of genetics

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Bibliography