DSC 180A: Clustering the Human Genome

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INTRODUCTIONS

For your name tag, please:

1. Fold paper into thirds
2. write your name large enough (this should be what you want me to call you)

On the back, include:

1. Your PID
2. Something you're interested in (work/fun)
3. The most boring fact about you/your life

Genetics: Section Details

- Attendance required (1 absence free; after that, we should chat)
- Each week there will be readings and discussion questions.
  - Readings:
    - posted on GH: https://github.com/ShanEllis/Genetic-Variation
    - More helpful if I share PDFs as well?
  - Discussion Question responses:
    - must be submitted by Sunday night (11:59 PM) ; gives me time to read over them and form discussion plan
    - Will be submitted using Google Forms
  - 'Friday' Lab Hours (weekly check-in):
    - Planning to hold on a different day
    - Date/Time up for discussion
      - First proposal: W 4-6 PM
  - Slack or Piazza?

Idea here:

- You’re working as a data scientist at a genetics company
- You need to be able to “speak” data science, genetics, *and* general audience
- You need to understand the biology/genetics *enough* to work with, understand, and interpret the company’s data (goal of Wednesdays)
- The replication portion == something geneticists working with genotyping data do at the beginning of pretty much every project

Quick Assessment

18 questions; 12 minutes; Multiple Choice

How you do does not matter

Only answer questions you have some idea about

Gives me an idea about what you all already know

HOW TO READ A SCIENTIFIC PAPER...

1. READ THE TITLE
2. READ THE ABSTRACT (AND *MAYBE* THE INTRODUCTION)
3. LOOK AT THE FIGURES. UNDERSTAND THE FIGURES.
4. ...then: READ THE PAPER
    a. Look stuff up as needed
    b. This takes time, y'all

If I were in this class, I would:

- Skim reading once
- Actually read the whole thing (while looking up a bunch of stuff)
- Look over the reading questions
- Read the whole thing again

Readings for Week 2:
https://github.com/ShanEllis/Genetic-Variation/tree/master/02_background

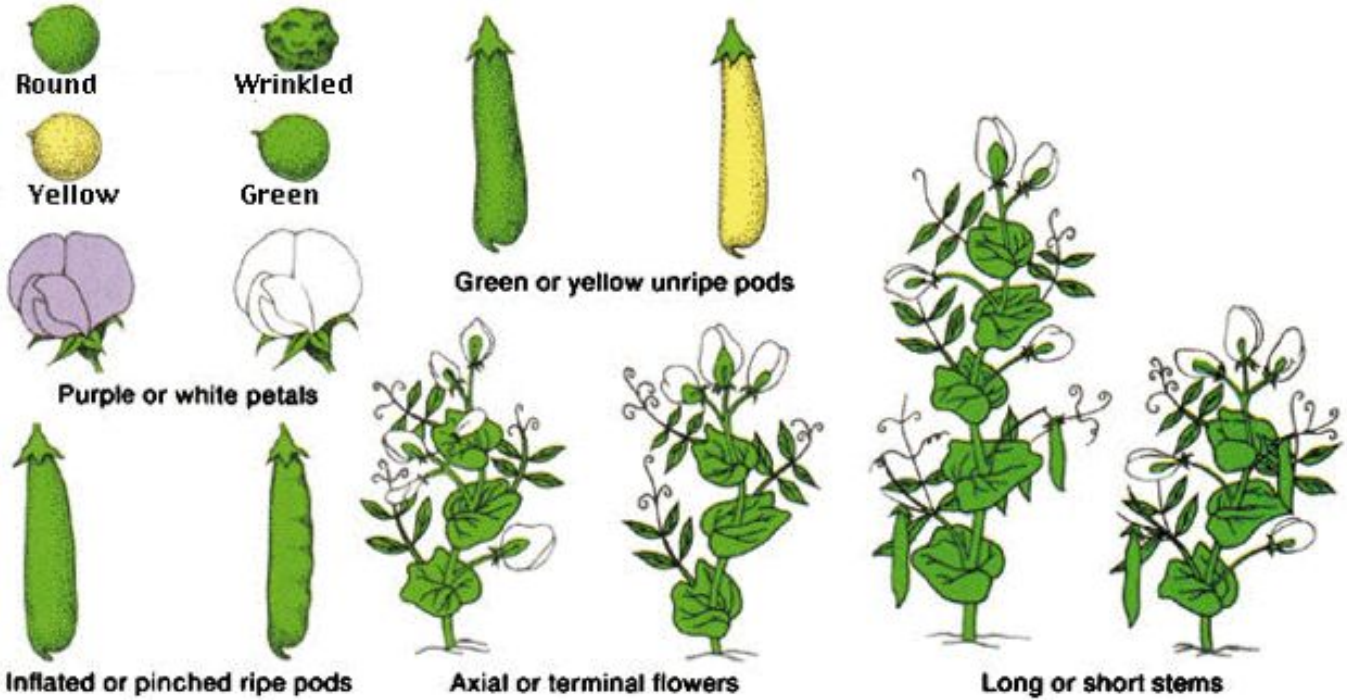
Genetics: a branch of biology that deals with heredity and variation of organisms

Discussion Questions:

1. What is heredity?
2. What is DNA?
3. What is a gene?
4. What is variation?

- What is heredity?
  - Process of getting characteristics from your parents
- What is DNA?
  - Stuff that holds your genetic material
  - 4 nucleotides (A,T,C,G) (-> codes for proteins; combine to determine amino acids)
  - Genetic code -> proteins == carry out biological processes
- What is a gene?
  - Genes = Section of DNA that codes for something (makes proteins)
- What is variation?
  - Different ‘expressions’ of genes in your DNA
  - Mutations can be benign, deleterious (harmful), silent

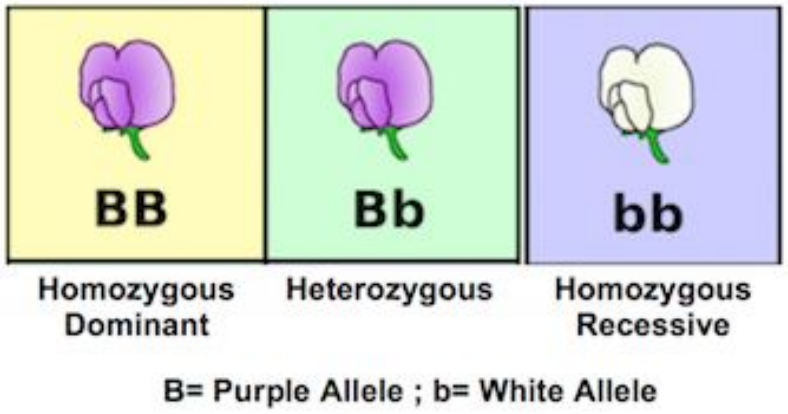
Genetics: Mendel's definition (1866)



Alleles can be dominant or recessive

Dominant – an allele that gets expressed regardless of what the other allele is (the trait appears in the heterozygous condition)

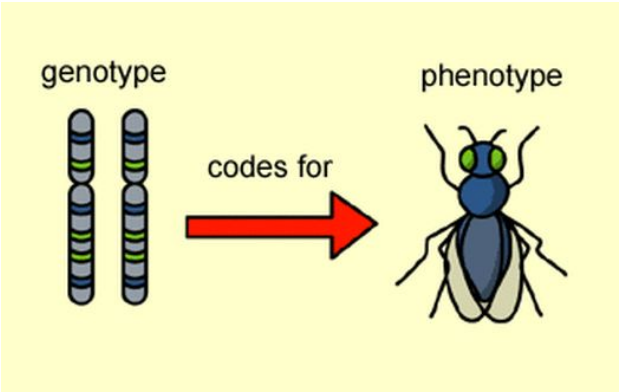
Recessive – an allele that is masked by a dominant allele; requires homozygous state to be expressed



Your genotype contributes to your phenotype

Genotype - the genetic makeup of an organism
- What are the alleles?

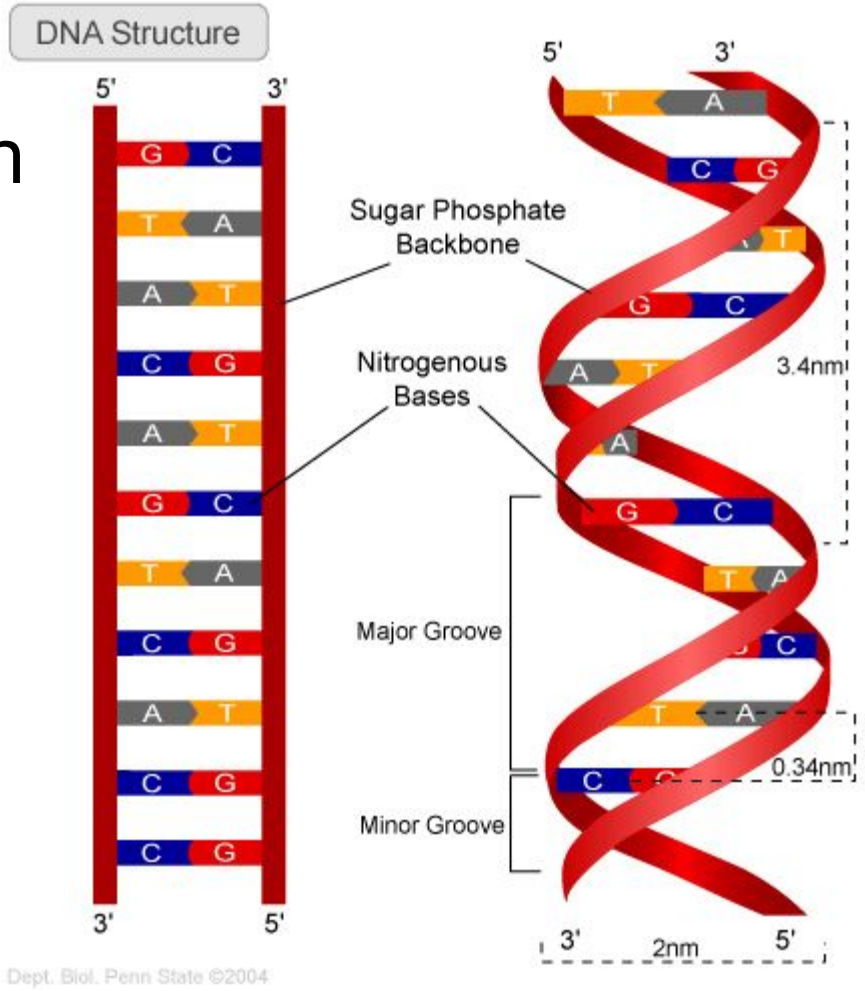
Phenotype - the physical appearance of an organism?
- What does the organism look like?



Genetics:
The Molecular Definition

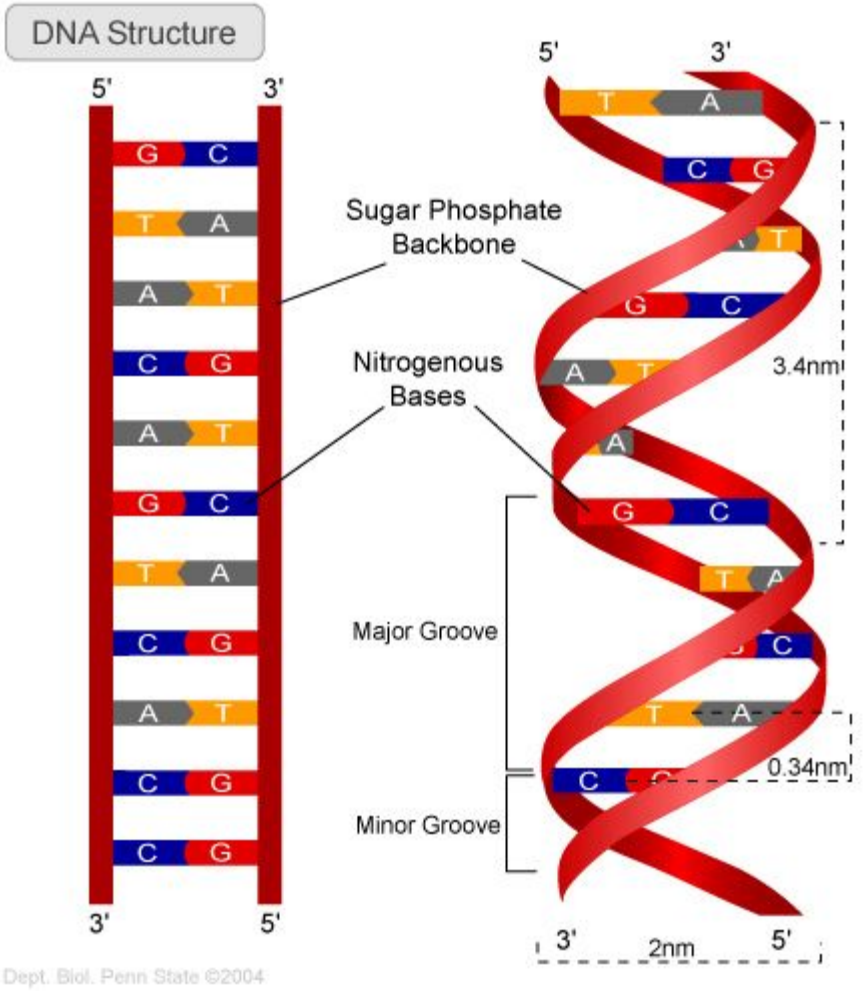
Double helix w/ nucleotides:

- G, T, C, A
- Stored on chromosomes
- Inherited from one generation to the next
- Comprised of:
  - genes
  - Lots of other stuff (rRNA, tRNA, microRNA, lincRNA, repetitive elements, etc.)



The structure of DNA

- Double helix
- Deoxyribose sugar + nitrogenous base + phosphate backbone
- Right-handed
- Phosphate on outside; bases on inside of helix
- A - T ; G - C base pairing



The Nobel Prize in Physiology or Medicine (1962) :

Watson, Crick, and Wilkins

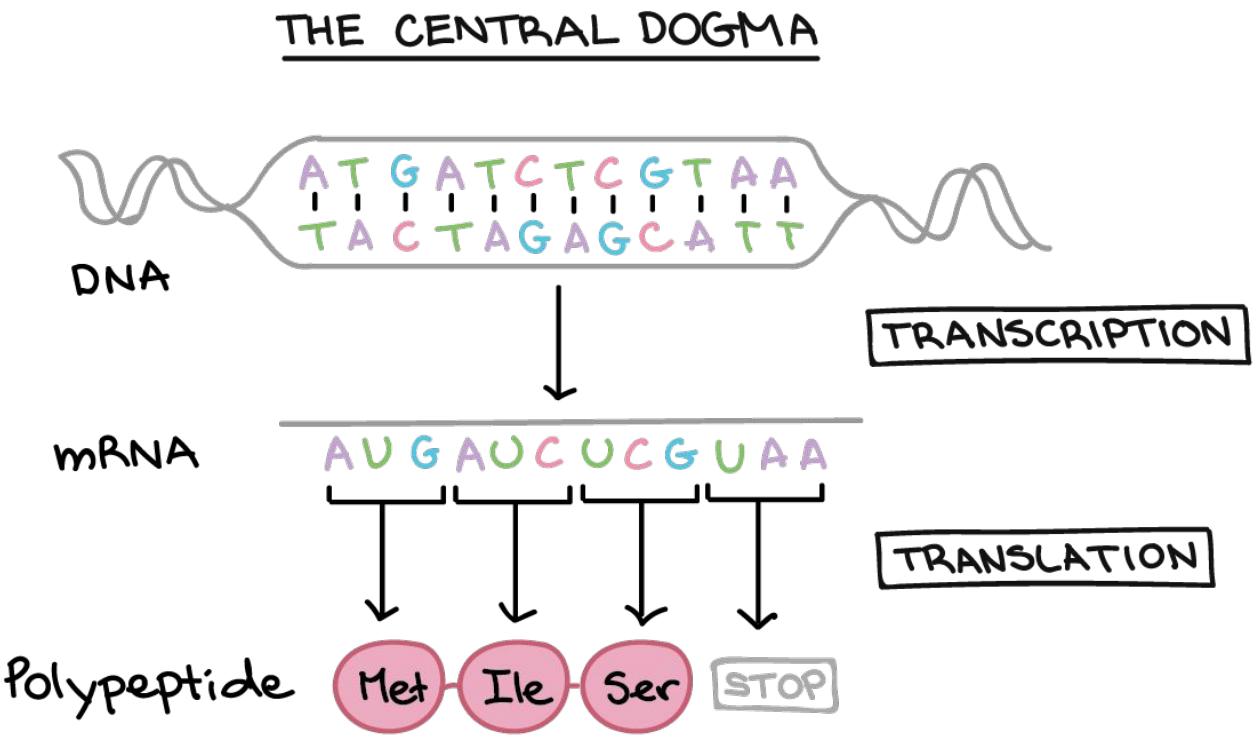
(Rosalind Franklin got the shaft.)

Francis Harry Compton Crick (1916-2004)

James Dewey Watson (1928 -)

Maurice Hugh Frederick Wilkins (1916-2004)

The Central Dogma of Genetics



Source: Khan Academy

After Class Update

Domain-specific check-in:

- Not happening on Fridays
- Instead:
  - W 4-5 PM
  - Th 10:30-11:30AM
- Where: CSB 243
- What: Show up at some point with questions/updates/etc.
- Begins: week 2 (meaning, you don’t need to check in week 1)

Piazza for genetics domain: piazza.com/ucsd/winter2020/dsc180agenetics