

Class 4 8/30/17 Mendelian Genetics

- Announcements
 - Class administration
-
- Office hours HH668C:
 - Mon 2 – 4pm

1

i>clicker



or



- ☐ Did you bring your clicker remote today? GREAT!!
- ☐ Please check iLearn for your clicker score in gradebook (ignore any letter grades in gradebook)
- ☐ If your clicker score is missing, please e-mail me your clicker remote ID.

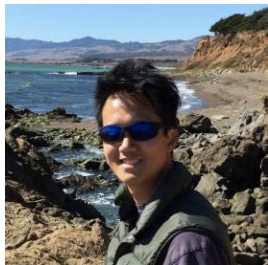
2



Romberg Tiburon Center Seminar Series

<http://rtc.sfsu.edu/seminar/index.htm>

Wednesday, 8/30/17
Bay Conference Center, 3:30PM



Andrew Chang
**Smithsonian Environmental
Research Center**
*Extreme ways: Great Floods, Big
Blobs, and the assembly of
marine communities*

<https://serc.si.edu/users/andrew-chang>

3



Thursdays, 8/31/17
SCI 210, 2:10 pm



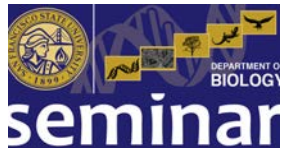
Michael McManus
UC San Francisco
*Deconstructing the genome
using CRISPR technologies*

<http://mcmanuslab.ucsf.edu>

4

Biol 871 Colloquium in Microbiology, Cell & Molecular Biology

<http://biology.sfsu.edu/content/MCMB>



Tuesday, 9/5/17
HH 543, 2:10pm

Biol 572/872 Ecology, Evolution, & Conservation Biology Colloquium

<http://biology.sfsu.edu/content/EEC>



Justen Whittall
Santa Clara University
*Intercontinental flower color
enigma - evolution & ecology of
the scarlet (& blue) pimpernel in
California, Spain and Chile*

<https://www.scu.edu/cas/biology/faculty/whittall/>

5

Cilantro Clicker Question

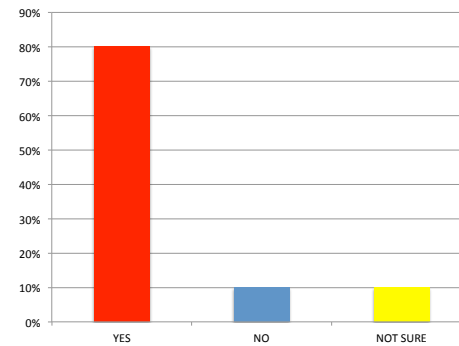
Do you like the taste of cilantro?

- A. YES
- B. NO
- C. NOT SURE

Cilantro



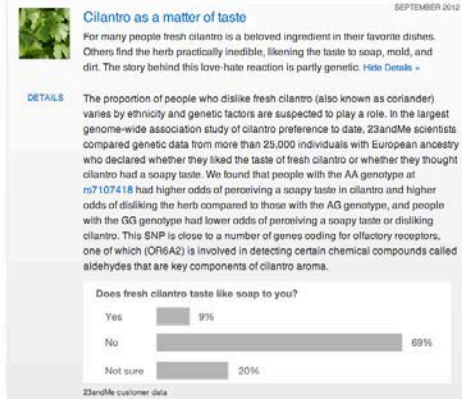
Do you like the taste of cilantro? (n=100)



6

The "lighter side" of DNA analysis

23andMe Research Findings



Cilantro taste in 23andMe customers Cilantro soapy-taste by ancestry

Ashkenazi Jewish	14.1%
Southern European	13.4%
Northern European	12.8%
African-American	9.2%
Latino	8.7%
East Asian	8.4%
South Asian	3.9%

Sex differences in cilantro taste perception

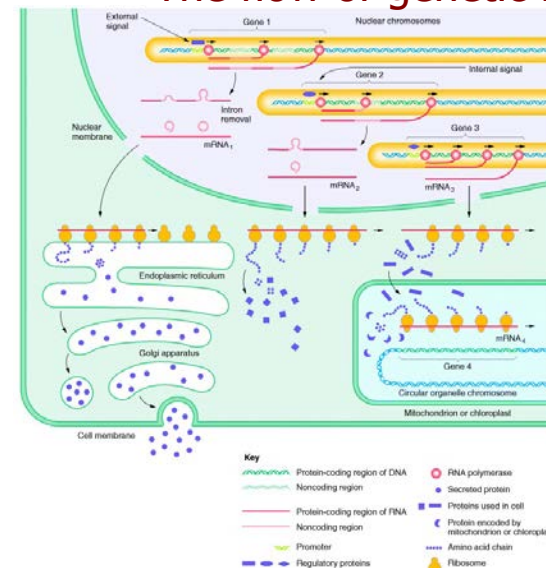
	Female vs. Male
Tastes soapy	57% vs. 43%
Doesn't taste soapy	49% vs. 51%

Does fresh cilantro taste like soap to you?

<https://blog.23andme.com/23andme-research/cilantro-love-hate-genetic-trait/>

7

The flow of genetic information

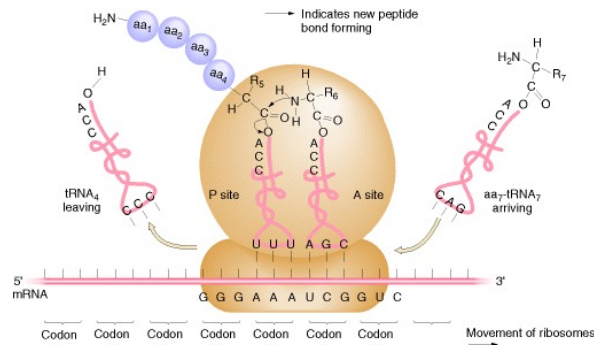


- Diagram of 4 types of genes
- 1. Responds to external signals, protein exported
- 2. Internal signals, cytoplasmic protein
- 3. Protein targeted to organelle
- 4. Organelle gene for organelle function

8

Figure 1-10

Translation: protein synthesized based on information in RNA



- mRNA is read by the ribosome
- Ribosome catalyzes the linking together of amino acids to generate a polypeptide/protein

9

Figure 1-10

Gregor Mendel and Genetics



Mendel



Augustinian Monastery of St. Thomas, Brno, Czech Republic

- Gregor Mendel
 - 1866 published Experiments in Plant Hybridization
 - Work was rediscovered in 1900 (16 years after his death) by de Vries, Correns, von Tschermak

http://history.nih.gov/exhibits/nirenberg/images/photos/01_mendel_pu.jpg

http://www.mun.ca/biology/scarr/Chap02_Mendels_garden.gif

10

Mendel's model organism: *Pisum sativum*, the garden pea

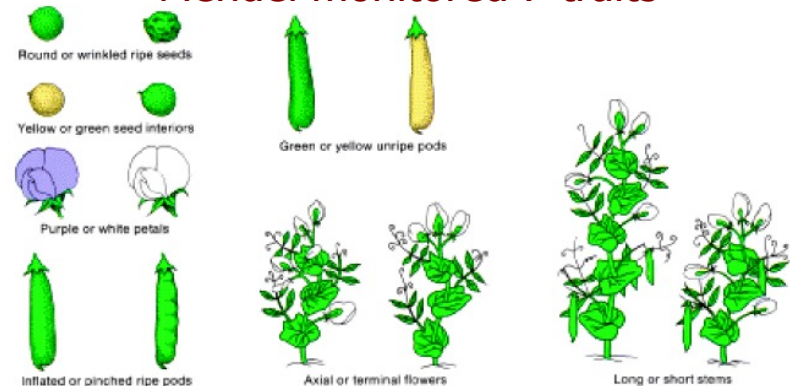


Pisum sativum, the garden pea

- Mendel chose the garden pea as his model system because
 - easily obtainable and came in many shapes and colors
 - can be crossbred artificially or allowed to self-fertilize
 - it is easy to grow
 - grows to maturity in one season
 - Have many offspring

http://z.about.com/d/gardening/1/0/N/Q/V_Pea_SnowSweet.jpg

Mendel monitored 7 traits



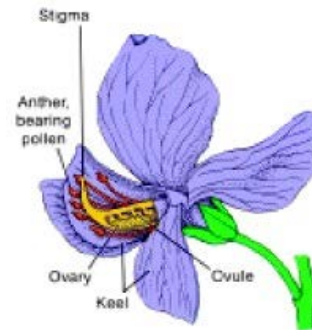
- Seven pairs of contrasting traits that were **true-breeding**
- Mendel
 - determined that discrete units of inheritance exist and
 - predicted their behavior during the formation of gametes

12

Figure 2-3

Mendel could cross plants

- Reproductive parts
 - Stigma on pistil
 - Ovary & Ovule
 - Anther on stamen (pollen on anther)

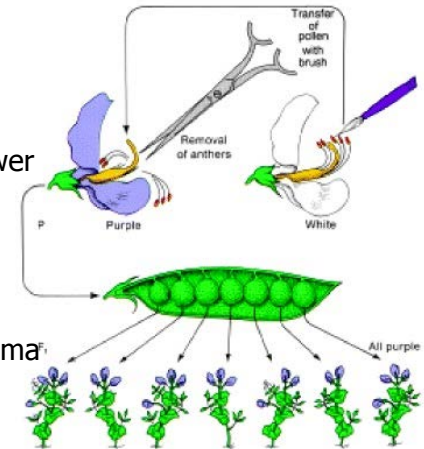


13
Figure 2-1

Mendel could cross-fertilize plants

Example:

- Trait or Characteristic: flower color
- Violet flower plant x white flower plant
- Removed anthers from violet flower plant
- Brushed pollen (male gamete) from white flower plant to stigma of violet flower plant
- Pollen enters stigma, moves down pistil to the ovary to fertilize eggs (female gamete)



14
Figure 2-4

Monohybrid crosses involve a single pair of contrasting traits

Table 2-1 Results of All Mendel's Crosses in Which Parents Differed in One Character

Parental phenotype	F ₁	F ₂	F ₂ ratio
1. Round×wrinkled seeds	All round	5474 round; 1850 wrinkled	2.96:1
2. Yellow×green seeds	All yellow	6022 yellow; 2001 green	3.01:1
3. Purple×white petals	All purple	705 purple; 224 white	3.15:1
4. Inflated×pinched pods	All inflated	882 inflated; 299 pinched	2.95:1
5. Green×yellow pods	All green	428 green; 152 yellow	2.82:1
6. Axial×terminal flowers	All axial	651 axial; 207 terminal	3.14:1
7. Long×short stems	All long	787 long; 277 short	2.84:1

- The original parents are the **P1 generation**, and their offspring are the **F1 generation**.
- Offspring arising from "selfing" (self-fertilizing) the F1 generation are the **F2 generation**.
- In the F1 generation of a monohybrid cross, *all of the plants have just one of the two contrasting traits*.
- In the **F2 generation**
 - 3/4 of the plants exhibit the same trait as the F1 generation
 - 1/4 exhibit the contrasting trait that disappeared in the F1 generation

15
Figure 3.1

Inheritance of seven contrasting traits

Table 2-1 Results of All Mendel's Crosses in Which Parents Differed in One Character

Parental phenotype	F ₁	F ₂	F ₂ ratio
1. Round×wrinkled seeds	All round	5474 round; 1850 wrinkled	2.96:1
2. Yellow×green seeds	All yellow	6022 yellow; 2001 green	3.01:1
3. Purple×white petals	All purple	705 purple; 224 white	3.15:1
4. Inflated×pinched pods	All inflated	882 inflated; 299 pinched	2.95:1
5. Green×yellow pods	All green	428 green; 152 yellow	2.82:1
6. Axial×terminal flowers	All axial	651 axial; 207 terminal	3.14:1
7. Long×short stems	All long	787 long; 277 short	2.84:1

- For each trait, which allele is dominant and which is recessive?
- Which phenotype was observed in the F1 progeny?
- What is the F2 phenotypic ratio?

16
Table 2-1

Mendel's monohybrid crosses were not sex dependent

- CROSS: a tall male plant pollinated a dwarf female plant, or a dwarf male plant pollinated a tall female plant (these are called **reciprocal crosses**)
 - results were the same either way
 - Same F1 phenotype observed
 - Same F2 phenotypic ratio observed

strongly agree
A

agree
B

Four Corners activity

strongly disagree
D

disagree
C
18

17

strongly agree
A

agree
B

strongly agree
A

agree
B

People should get counseling from a doctor or genetic counselor when they get genetic testing because they will not be able to handle the information otherwise.

strongly disagree
D

disagree
C
19

Four Corners Clicker Question 1

People should have the right to learn whatever they want about their DNA because it is their own body.

strongly disagree
D

disagree
C
20

Four Corners Clicker Question 2