



# Inheritance



# Basics of genetic inheritance

- Familial resemblance is obvious...



# Don't see as much familial resemblance in adoptees

- Don't necessarily look similar
- Little or no correlation in traits like IQ



## Darwin attributed family resemblance to “gemmules”

- “If I ask myself how you derive, and where you place the innumerable *gemmules* contained within the spermatozoa formed by a male animal during its whole life, I cannot answer myself.” -letter to Galton
- Famous Mendel pea experiments had been done, but Darwin did not know about them.



# Genetics is fundamentally important for evolution, too!

- What would happen if traits were inherited such that offspring always intermediate to parents?
  - e.g., Offspring of tall x short = medium
  - How would this affect the population over time?
- Example on next slide, then discuss how get around this problem





# “Blending inheritance”

Gen 1  
Gen 2

4 9  
6.5

5 8  
7.5

2 6  
4

1 3  
2

7 0  
3.5

Range 0-9  
Range 2-7.5



# “Blending inheritance”

<u>Gen 1</u>	4	9	5	8	2	6	1	3	7	0	Range 0-9
<u>Gen 2</u>	6.5		7.5		4		2		3.5		Range 2-7.5
<u>Gen 2</u>	6.5	7.5	7.5	4	4	2	2	3.5	3.5	6.5	
<u>Gen 3</u>	7		5.75		3		2.75		5		Range 2.75-7
<u>Gen 3</u>	7	5.75	5.75	3	3	2.75	2.75	5	5	7	
<u>Gen 4</u>	6.375		4.375		2.875		3.875		6		Range 2.875-6.375



# Variation must be “created” or “renewed”



## Inheritance of acquired characters



- *All the acquisitions or losses wrought by nature on individuals, through the influence of the environment in which their race has long been placed, and hence through the influence of the predominant use or permanent disuse of any organ; **all these are preserved by reproduction to the new individuals which arise...***
- Darwin adopted this idea for “gemmules”
- Anecdotal evidence: giraffes, blacksmith



## One of Mohamed' s high-school screwups

- In 10<sup>th</sup> grade Biology, Mr. Bennett asked:
  - “If you were to cut someone’ s left arm off, and they have kids, would the kid have one or two arms?”
    -
  - “If you were to cut someone’ s left arm off, and cut their kid’ s left arm off, repeating for 20 generations, would the 21<sup>st</sup> generation kid have one or two arms?”
    -

## One of Mohamed' s high-school screwups

- In 10<sup>th</sup> grade Biology, Mr. Bennett asked:
  - “If you were to cut someone’ s left arm off, and they have kids, would the kid have one or two arms?”
    - Mohamed wrote “two” 
  - “If you were to cut someone’ s left arm off, and cut their kid’ s left arm off, repeating for 20 generations, would the 21<sup>st</sup> generation kid have one or two arms?”
    - Mohamed wrote “one” 

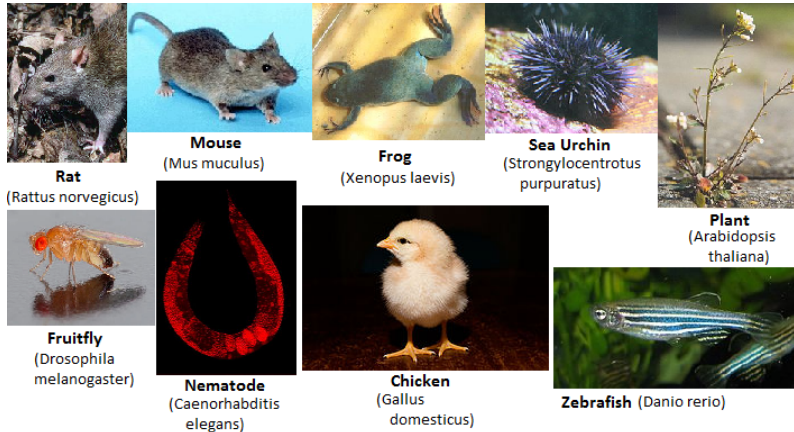
# THE REASON

- We have **particulate inheritance**
  - Not simple copy of parents
  - Not necessarily “midpoint” of parents
  - Can have blue-eyed offspring from brown-eyed parents: traits can be “masked”
  - Genetic diseases can crop up
  - All this was discovered **long** before we knew that DNA carried the code...



# Inheritance is similar across most animals, and many plants & fungi

- Many species are “diploid”
  - having one gene copy from each of two parents
- Many of the same proteins & structures involved in inheritance
- Because of these similarities, we can use “model organisms” to understand inheritance





# Foreshadowing...

- How do offspring get genes from two parents?
  - How do single copies of these genes “come together”?
- Are any traits controlled by “one gene” alone?
- How do we “find” genes for traits?

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