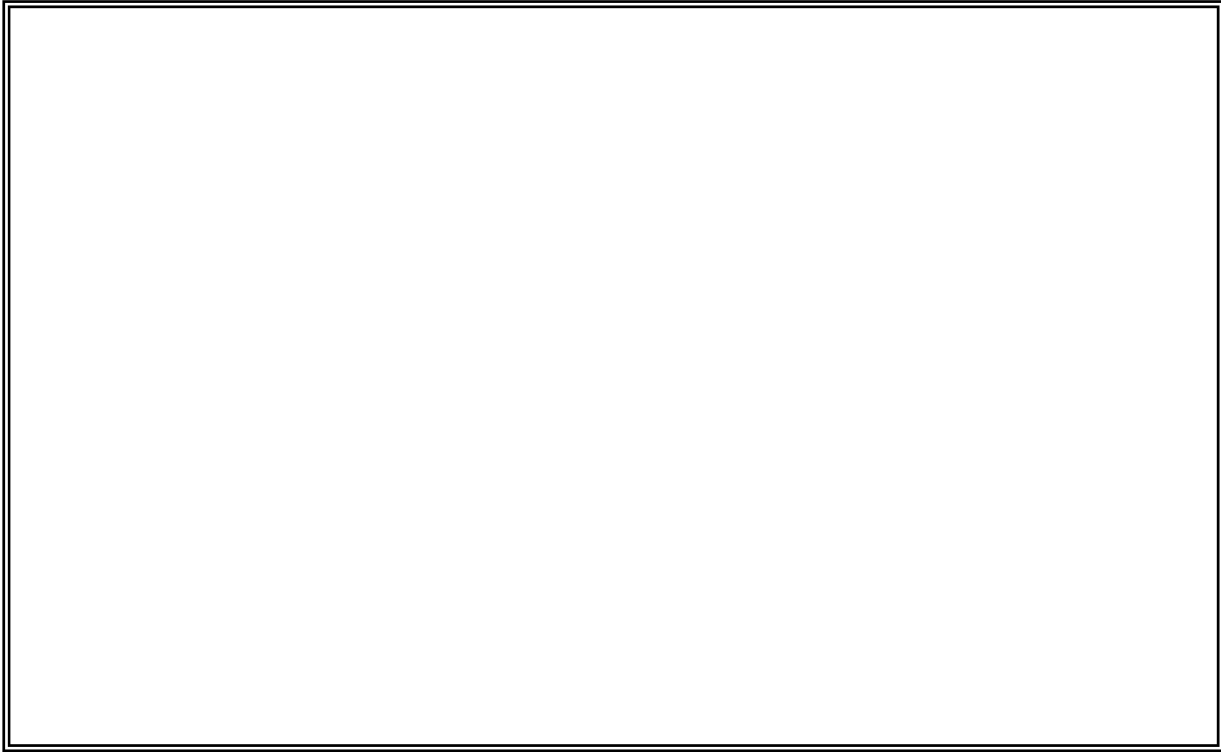Name_____   Period_____

Artificial Selection Lab – "Born to Run"   *In the box below, draw a hypothetical organism that is an excellent runner. Remember that this is independent work. You will get a chance to compare your drawings later!*

Now compare your drawing with those by other members of your team.
List the common features on the lines below.

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Write a paragraph to explain how natural selection might act on a population of organisms that varied in the traits you listed.

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Name_____   Period_____

Artificial Selection Lab – Automated Measurements

A. How might legs *change* in a way that would improve the ability for wheel running? In other words, what leg adaptations might evolve? Discuss with your lab partner and then circle the one you will choose to study.

_____   _____

_____   _____

_____   _____

B. You will have available digital photographs femurs of mice to take measurements. Write the question you have chosen to investigate regarding femur dimensions:

Are the femurs of mice selectively bred for wheel running _____?

C. What will you *measure* on a femur bone to find the answer for your question?

_____

Hypothesis: Write your hypothesis and be sure to use the **if... then...** format and include an explanation.

_____

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C. Method: With your lab partner, decide how you will measure the femurs of the control and selected lines of mice. Draw a line on the photograph that shows where you will measure. Be sure to be consistent with each photograph you measure.

The mice, from generation 11 of the selection experiment, have been studied previously, as reported in this paper:
Garland, T., Jr., and P. A. Freeman. 2005. Selective breeding for
        high endurance running increases hindlimb symmetry.
        Evolution 59:1851-1854.
You will be measuring the same bones they used.

Using Image J to measure bone (femur) lengths: Student Directions

1) *File – open*: Select image
2) Select line tool on the tool bar
3) Draw line on the ruler that is 15 mm long (1.5 cm)
4) *Analyze – set scale*
5) Enter 15 in "Known scale" and mm in "Unit of length". You can choose to display in mm also and set the number of decimals of accuracy.
6) Click "Global" This will apply the scale measurement to each picture that you measure thereafter.
7) Draw a line at the dimension which will be measured. The scale bar will display the measurement as well as the angle of the line. This will disappear when you click the end point of the line.
8) *Analyze-measure*: A data table will appear with the first measurement
9) *File – open next* : The next image to be measured appears
10) Draw a new line on the new femur picture.
11) *Analyze – measure*: The next length will be displayed on the data table
12) When your measurements are complete, select *Analyze – summarize*.
13) Record the average from the displayed information. You will be graphing these data later.
14) Repeat steps 1-13 for the control animals.

16 Folders are on the Flash Drive:

> G12_Control_L1_Female_Femora
> G12_Control_L2_Female_Femora
> G12_Control_L4_Female_Femora
> G12_Control_L5_Female_Femora
>
> G12_Control_L1_Male_Femora
> G12_Control_L2_Male_Femora
> G12_Control_L4_Male_Femora
> G12_Control_L5_Male_Femora
>
> G12_Selected_L3_Female_Femora
> G12_Selected_L6_Female_Femora
> G12_Selected_L7_Female_Femora
> G12_Selected_L8_Female_Femora
>
> G12_Selected_L3_Male_Femora
> G12_Selected_L6_Male_Femora
> G12_Selected_L7_Male_Femora
> G12_Selected_L8_Male_Femora

Each folder contains photos of left and right femurs of several individual mice (although in a few cases one or the other is missing).

The above folders are also available by clicking here:
http://www.biology.ucr.edu/people/faculty/Garland/G12_Split_for_STEM/

Name_____   Period_____

Results

Sample number	Selected Measurement (cm)	Sample number	Control Measurement (cm)
Averages			

	Average Measurement (mm)	Total number of femurs measured
Selected		
Controls		

Conclusion

Write a concluding paragraph. Use additional paper if necessary.
- **What effect did selecting for the trait of wheel running have on the <u>femurs</u> of the selected and control mice?**
- **Explain how the average <u>femur</u> measurements for selected and control mice support your inference. Be sure to restate the averages you obtained.**
- **Was your hypothesis supported or not?**
- **What parts of your method might have resulted in inaccuracies?**
- **Suggest further questions to address.**

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