



# Battle of the Beaks: Modeling Natural Selection

## INTRODUCTION:

In 1859, Charles Darwin published the book *On the Origin of Species*, where he wrote about his journey to the Galapagos Islands. On these islands, Darwin discovered the theory of natural selection. Natural selection is a mechanism of evolution, in which organisms with favorable traits survive and reproduce overtime. In short, it is “survival of the fittest.”

Darwin discovered natural selection when he found 18 finch species that all differed in beak size and shape. Some species had long, narrow beaks, while others had short, wide beaks. This was interesting because the finches inhabited the same geographic area, yet had evolved to have different characteristics for different food sources. When variations of species rapidly evolve overtime to fill specific ecological niches, it is called adaptive radiation.

From the finches, Darwin theorized that this type of evolution naturally occurs overtime. Certain finches were favored over others because of what they ate, and were thus naturally selected for. As a result, the surviving finches would reproduce with other surviving finches, increasing that specific beak in the gene pool across generations. In this lab, you will simulate the natural selection of Darwin’s finches and their fight for survival on the Galapagos Islands.

## PURPOSE:

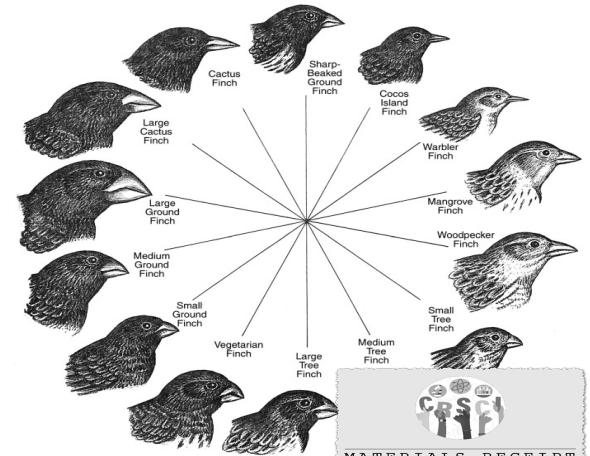
To understand that animals that are better adapted will survive and reproduce more than those less adapted.

## PART ONE: One food source available.

### PROCEDURE:

- Form a group of 4 & everyone grabs a cup. The cup is your “stomach.”
- Each member must select a “beak” (clothespin, fork, tweezer, or binder clip).
- Pour the beans into the plate. The plate is your “feeding area” - keep this equidistant from all members.
- Follow these rules throughout the simulation:
  - Use one hand to hold the beak & the other to hold the stomach.
  - Keep the stomach upright on the table at all times.
  - Food can only be placed in the stomach by the beak.
  - Only ONE piece of food can be placed in the stomach at a time.
- Start countdown to 30 sec & use beak to collect food for your stomach.
- Once time’s up, empty the stomach & count the food collected. Record your group’s data in the table
- Repeat steps 3-6 for macaroni, rubber bands, and toothpicks.
- Answer the conclusion questions for Part One.

### DATA:



MATERIALS RECEIPT	
PRICES ARE APPROXIMATE	
Fork	\$1.00
Tweezer	\$2.00
Binder Clip	\$1.50
Clothespin	\$2.00
Rubber bands	\$1.00
Toothpicks	\$1.50
Macaroni	\$0.80
Beans (Kidney/Pinto)	\$1.50
Plate	N/A
Stopwatch (Phone)	N/A
<b>TOTAL</b>	<b>\$11.30</b>

		BEAK TYPE			
		Clothespin	Fork	Tweezer	Binder Clip
A M O U N T	Beans				
	Macaroni				
	Rubber Bands				
	Toothpick				

## CONCLUSION

#1 Describe your beak and its feeding abilities - aka strengths and weaknesses. Use data as **evidence** to **justify** your answer.

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#2 Which beak(s) will be naturally selected for because they have an advantage for ALL food types? **Explain** using data as **evidence**.

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# Battle of the Beaks: Modeling Natural Selection

#3 Imagine an environmental disaster such as a drought occurs and leaves only toothpicks. Which beak(s) would NOT be naturally selected to survive and reproduce in this drought? Use data as **evidence** to **justify** your answer.

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## PART TWO: Multiple food sources available.

### PROCEDURE:

1. Spread **ALL** of the food types into the feeding area. Mix them up.
2. Start the countdown to 1 minute & use beak to collect food for your stomach.
9. Once time's up, empty the stomach & count the food collected. Record your group's data in the table
3. Copy each member of your group's data for Part II, too.
4. Answer the conclusion questions for Part Two.

### DATA:

		BEAK TYPE			
		Clothespin	Fork	Tweezer	Binder Clip
A M O U N T  F O O D	Beans				
	Macaroni				
	Rubber Bands				
	Toothpick				

### CONCLUSION:

#1 What did you learn about your beak from Part One to help you strategize for this round? These are your adaptations. **Explain** your adaptations.

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#2 Were there any other beak(s) that were competing for the same food source as you? If so, who was it and which beak won - you or them? Use data as **evidence** to justify your answer.

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#3 We can assume the beaks that collected a lot of food will survive and reproduce, and the beaks that collected a little will eventually die off. **Describe** what the next generation of beaks will look like using data as **evidence**.

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