Evolution of the Origami Bird

Background

The world is a diverse and open place, with species spanning from extreme bacteria(archaea) at the size of a nano-meter, to mammals with a length of up to 18 meters (Wild about Whales,2016). For the longest time, although we have seen and documented the world, we never truly understood the madness behind the diversity; evolution.

Once an unfathomable idea, evolution can now be broken down into four distinct components:

1. Variation
2. Inheritance
3. Selection
4. Time

Each of these can be controlled either by natural or human forces to mold organisms to adapt better to their environment over the lifespan of the population. And so what we can truly take away from this is that, humanity like any organism is shaped by the world, until we began to shape the world, which turned evolution on its head.

Purpose

The purpose of this lab is to breed the Avis Papyrus according to its ‘natural’ conditions and monitor the environmental selection, variation and inheritance.

Hypothesis

If the Avis Papyrus is bred based on the selection variables of the environment, then the birds will adapt appropriately to the environment. Because as it can be seen throughout evolution, when an organism is faced with environmental challenges, given variation, inheritance, selection and time, they will come out inherently different but better suited to their environment.

Materials

Refer to Attached sheet.

Procedure

**Data**

**Fig. 1 – Part One variation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Generation | Front Dimensions Survivor | Tail Dimensions Survivor | Front Dimensions 2 | Tail Dimensions 2 | Front Dimensions 3 | Tail Dimensions 3 |
| 1 | 3x20x3 | 3x20x3 | 3x20x3 | 2x20x3 | 3x20x3 | 3x18x3 |
| 2 | 3x20x3 | 3x20x3 | 3x20x4 | 3x20x3 | 3x22x3 | 3x20x3 |
| 3 | 3x20x3 | 3x20x3 | 4x20x3 | 2x20x3 | 3x20x2 | 3x20x3 |
| 4 | 3x20x2 | 3x20x3 | 3x20x2 | 2x20x3 | 3x20x2 | 3x20x4s |
| 5 | 3x20x2 | 3x20x3 | 3x18x2 | 3x20x3 | 3x20x2 | 3x22x3 |

**Fig.2 – Part Two variations**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Flightless Generation | Front Dimensions 1 | Tail Dimensions 1 | Front Dimensions 2 | Tail Dimensions 2 | Front Dimensions 3 | Tail Dimensions 3 |
| 1 | 3x18x2 | 3x20x3 | 3x18x2 | 3x20x4 | 3x16x2 | 3x20x3 |
| 2 | 3x16x2 | 3x20x3 | 3x16x2 | 3x20x4 | 3x16x1 | 3x20x3 |
| 3 | 3x16x2 | 3x20x4 | 3x16x2 | 3x20x4 | 3x16x2 | 3x20x4 |
| 4 | 3x16x2 | 3x20x4 | 3x16x2 | 3x20x5 | 3x16x2 | 3x18x4 |

Discussion

1.

Yes, the experiment resulted in birds more adept to their environment, due to their variation and artificial selection.

2.

a)

Our experiment produced continual variation between generations because of the methodology used when conducting the experiment. During the procedure it is required that the variation is dictated by two forms of randomness:

A coin flip giving an equal .5 chance to either the head or tail end of the bird,

And a dice roll, with which, 6 possible variations with an equal 0.16 chance are possible.

Both a coin flip and dice roll is done for each unique offspring and as such increases variance greatly.

b)

Our experiment produced continual selection between generations because of the methodology used when conducting the experiment. During the procedure it is required that based on the ‘environmental’ needs, only the Avis Papyrus of the greatest distance can survive.

Due to these requirements, only the bird who flew the greatest average distance continued to produce viable offspring.

3.

a)

Although I do not have access to another group at the time of writing, I assume that there is likely to be a slight difference in variation between the two youngest birds.

b)

Because each bird can only variate in one aspect in one generation, a majority of both the bird’s attributes will most definitely remain the same.

c)

Due to the variation of each unique bird, although they both have a selection process they must arrive to, they may arrive there in a great manner of ways.

Similarly; although humans evolved in different parts of the world with a wide array of natural selection requirements, such as in Asia, Africa and North America, we all slowly began working towards culture, a human attribute often marveled upon as the best human survival mechanism, which all humans evolved towards in a great number of ways.

4.

***\*Note,***

*“c. … the bird whose color blends with its environment survive”*

Color was not a possible variation during the experiment.

And so the assumption shall be made that the context for question 4. c) is outside the scope of the experiment.

a)

If the selection was based on the same initial requirements, I believe that our youngest bird’s descendants will most likely have a greater body size. The bird will most probably have increased wingspan and length. In in this manner, the future bird generations will have a large wing surface area, which in turn, will greatly increase the lift of the bird.

And so if the future offspring proportions were to be estimated, they would be:

Front | 5x26x1 Tail | 4x26x4

b)

If the artificial selection was to be made to benefit only bird with little to no flying ability, based on the inverse of the above reasoning, the estimated future offspring proportions would be:

Front | 1x16x4 Tail | 1x16x1

c)

If the artificial selection was to be altered to favor birds with colors similar to their environment, the future offspring population would have a greater population of birds with colors that blend with their environment.

d)

For scenario a) A species of birds is required to migrate to survive the winter

For scenario b) A species of birds are living on a now secluded island, similar to the Galapagos.

For scenario c) A species of birds are forced to migrate to a northern part of North America, allowing those who are lighter in color to blend with the snow and survive.

5.

When compared to a group with the same Part B scenario (flightless birds), we found that although our birds were similar in dimensions, both our birds had a few variations. One defining variation would be the distance between the front and wing, for which we had a difference of 2cm.

6.

Although we could not find another group who have chosen the second scenario, it is likely that the group with this scenario would have a bird considerably different variations. It is likely that this group would have a bird whose front and tail circumferences would have a 4+cm difference. Which would differ greatly from our current youngest bird from the first scenario.

Update:

After discussing with a group with the second scenario, the above reasoning proved to be true and the difference of the front and tail circumference was 4cm (18cm & 22cm)

7.

This lab, helps to explain the observations Darwin made of the finches in the Galapagos because it proves that a population of species will adapt accordingly to their artificial or natural selection until only those who are superior in their environment remain. All the while, it also shows how similar end goals can be achieved in different manners due to variation.

Sources of Error

This experiment has a great number of sources of error, many of which could have been mitigated with greater resources and time. This can be seen in the manner with which the birds were built, w­­­­­here the paper often creased and the tape was replaced due to resource management. As well, the obstructions in the testing space such as the tables, desks and lab stations, which often obstructed flight. All of these caused errors in the ranking of offspring and the potential results of the experiment.

Conclusion

The experiment examined the effects of variation and artificial selection on a five generations of offspring. The results, as can be seen in both figure 1 & 2, display that based on the selection variables, the Avis Papyrus is able to adapt to its environment. The findings can be used to further the proof related to Darwin’s theory of evolution.

Bibliography

Wild about whales. “Southern right whales” Wild about whales, Sydney south. 2016. Accessed Oct, 16th, 2016.