

Chicken or the Egg Proof: CS 2102

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1. The question we will be analyzing in this proof is whether a modern chicken existed before a modern chicken egg, or vice versa.
2. We will define a chicken as follows: A feathered, flightless organism that can only be hatched from a chicken egg and only produces chicken eggs.
3. We will define an egg as follows: An object from which an organism hatches.
4. We will define a chicken egg as follows: A specific type of egg from which only chickens hatch.
5. Based on these definitions, we can assume that chicken eggs produce chickens, which can be logically portrayed as follows:

Chicken Egg \rightarrow Chickens

6. Therefore, if we assume this statement to be true, then the contrapositive must also be true, which can logically be portrayed as follows:

\neg Chickens \rightarrow \neg Chicken Eggs

7. In plain English, this means that when there were no chickens, there must not have been any chicken eggs.
8. As can be seen on the Wikipedia page for chickens, the earliest pictorial or written history of modern day fowl dates to just over 2,000 years ago. Therefore, before this date, neither chickens nor chicken eggs could have existed.

9. This brings up the question: regardless of which came first (the chicken or the chicken egg), how did they come to exist?
10. The most logical answer to this question relates to the theory of evolution, which is accepted to be true by the vast majority of Scientists.
11. We will define evolution as follows: the process by which organisms come to exist over time, through natural and/or artificial selection. For the case of the chicken, we will assume only natural selection.
12. We will define natural selection as follows: the process by which certain varieties of an organism become better suited for survival due to mutations. This often leads to evolution in the long term.
13. Therefore, based on these definitions and the fact that modern day chickens didn't exist some 2,000 years ago, we can assume that some organism must have slowly evolved into a chicken over time. This can be logically represented as follows:
- $$\text{Organism X} \xrightarrow{\text{time}} \text{Chicken}$$
14. However, in order to know for sure that an organism evolved into a chicken, we need a more formal definition for evolutionary relation.
15. Because of the fact that the evolution between Organism X and a chicken was such a slow process, we can conclude that the state of being a chicken lies on a continuous

spectrum.

16. We will define the unit Chick (ch) as follows: represents the "chickeness" of an organism, where a higher value indicates a closer evolutionary connection to the modern day chicken.
17. The unit Darwin (source: Blackwell Publishing Biology Textbook) is defined as follows: the unit of the rate of evolution, expressed in levels of characteristic/year. The formula is:

$$r = \frac{x_1 - x_2}{t}$$

where x_1 = measure of characteristic of organism 1.
 x_2 = measure of characteristic of organism 2.
 t = time in years between the existence of organism 1 and organism 2.

18. We will formulaically define the unit Chick as follows:

$$c = \frac{1 \frac{\text{characteristic}^2}{\text{year}}}{r} = \frac{t}{x_1 - x_2}$$

where the unit is the level of chickeness.

19. We will also make the following assumption: Any organism whose chickeness exceeds 100,000 Chicks, or .1 Mega-Chick, is evolutionarily related to the modern chicken.
20. After doing some research, I have concluded that the earliest known direct predecessor of the chicken is the archaeopteryx, a feathered dinosaur that existed about

150 million years ago, in the mid-Jurassic period
(source: Wikipedia).

21. We will determine the chickeness of the archaeopteryx, in order to prove that some organism did indeed evolve into a chicken.
22. It is assumed that the number of chicken-like characteristics for a modern day chicken is 100%. Based on similarity in feathering, skeletal structure and size, we will assume that an archaeopteryx has 20% of a modern day chicken's characteristics.
23. We will now calculate the chickeness of an archaeopteryx:

$x_1 = 100$ units of chicken-like characteristics

$x_2 = 20$ units of chicken-like characteristics

$t = 150,000,000$ years

$$C = \frac{t}{x_1 - x_2} = \frac{150,000,000}{100 - 20} = 1,875,000 \text{ Chicks}$$

$$= 1.875 \text{ Mega Chicks}$$

24. Since the chickeness of an archaeopteryx exceeds the pre-defined chickeness threshold (1.875 Mega Chicks is greater than 0.1 Mega Chicks), we can conclude that an archaeopteryx is indeed evolutionarily related to a modern day chicken.
25. Based on how we defined a chicken though, it is implied that a chicken can only be hatched from a chicken egg. This leads us to believe that a predecessor of the chicken must have,

at some point, given birth to a chicken egg. This can be logically represented as follows:

Chicken Ancestor \rightarrow Chicken Egg.

26. We will use a proof by contradiction to show that this statement is true.
27. We will assume that this implication is false, so a chicken ancestor never produced a chicken egg:

Chicken Ancestor $\rightarrow \neg$ Chicken Egg

28. However, this creates a logical contradiction. If a chicken ancestor didn't produce a chicken egg at some point, then a chicken would have never evolved from one of its predecessors. Because of the fact that we see chickens nowadays, and because in Step 24 we proved that chickens evolved from archaeopteryx, we know that this must be untrue.
29. Therefore, we can conclude that at some point in time, a chicken ancestor must have produced a chicken egg, which in turn produced the first chicken.
30. But wait, there's more! We will have to do some analysis in order to logically determine when exactly this first egg came to exist, if possible.
31. The wild fowl, the closest ancestor of the modern domesticated chicken, has a chickenness level of approximately 20,000,000, or 20 Mega Chicks. It also shares 99.999% of chicken-like characteristics.

32. By plugging into the Chick formula, we can see:

$x_1 = 100$ units of chicken-like characteristics

$x_2 = 99.999$ units of chicken-like characteristics

$t = ?$

$$C = \frac{t}{x_1 - x_2} = \frac{t}{100 - 99.999} = 20,000,000$$

$$t = 2,000.$$

33. The age ^{difference} between the wild fowl and the modern chicken is about 2,000 years, which is exactly when the first records of the modern chicken date. Therefore, at some point in time, a wild fowl gave birth to a chicken egg, through mutation.

34. However, we defined a chicken egg as a type of egg from which only chickens hatch. This raises the question: At the time of conception, how do we know that a wild fowl egg is really a chicken egg?

35. We will only truly know the variety of an egg when we can see its offspring, so up to the point of hatching, an egg's type is unknown. Only when it hatches and a chicken emerges can we deem it a chicken egg.

36. In conclusion, the chicken and the chicken egg came to exist at the exact same time, since we can only know that an egg is a chicken egg once the chicken comes out.