

## **Wheel In or Wheel Out?**

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### **Introduction:**

'Timaeus' is one of the many acclaimed works of renowned Greek philosopher Plato. In it he describes in great detail what all could possibly have led to the formation of the universe. He goes on to say, the whole universe is a living form with soul and intelligence. It is a unique creature. It is in the most perfect shape that of a sphere and has rotary motion, which happens to be the most uniform motion.

The importance of rotary motion to man has manifested in the form of revolutionary (pun intended) advancements in transportation, trading and life-style. The natural question to ponder, therefore, is why don't life forms have some sort of biological wheels. Creative minds around the world might have long contemplated this subject and fantasized about it, for there are several references to wheeled animals in popular literature bordering science fiction (a.k.a an escapist's paradise!).

So one would now begin to wonder if this is even a genuine question to muse about. The answer of course is yes. Many evolutionary scientists and biologists have dedicated years of research on this and come up with reasons as to why it is impossible for an animal to have evolved a wheel. Let us understand these explanations from a simplistic viewpoint.

### **Animals should have wheels, but they just couldn't evolve one:**

This is the first school of thought. Wheels provide the most efficient form of transportation and so they are in fact highly desirable in animals. The reasons as to why they weren't developed are manifold. But let us first comprehend what evolution means in Darwinian terms.

Evolution is by "Natural Selection", a principle by which each slight variation of a trait, if it is useful, is preserved in the individual animal. Usefulness of a mutation is its contribution in helping the animal to survive in its environment and breed more. Thereby having a higher representation of the offspring in the subsequent generation at which time we can say the population has evolved.

For a complex trait to develop, there is a sequence of adaptations that occur over a long period of time. This subscribes to the hypothesis of Gradualism according to which development is slow and consistent. A complex structure or system will not evolve if its unfinished form provides no benefit to the organism. That is each stage in its development should offer some advantage, for it to be considered for natural selection. The development of body parts occurs only in stages and we realize that a wheel, until fully developed, will not rotate and hence will not be beneficial to the animal.

Another reason is the anatomical constraint on the development of a wheel like structure. All living cells are connected to the heart and brain by way of blood vessels and nerves respectively. A wheel-axle assembly requires a rotating joint, which would twist the vascular and neural ducts on the very first revolution! This deprives any way of supplying nutrients to the rotating organ.

Some may argue that animals could have evolved wheels made of dead tissue with no requirement for arteries and veins just like hair and nails. But what they forget is that such a dead wheel could in no way generate or transform

human power to locomotive force, which causes the wheel to move. Another line of thought talks about a “symbiotic relationship” between a wheel-like animal and a driver-like animal. What it implies is a parasitic relationship where the parasite (driver) could have control over its host (wheel) as a means of transport. But doesn't this sound more like a social evolution rather than a biological evolution?

Speaking of which, any discussion on wheels in nature stands incomplete if we did not talk about the theories of the famous evolutionary biologist, Richard Dawkins. According to Dawkins, the evolution of wheels is directly dependent on a prior invention—that of roads. He says that had there been roads, that could have fuelled the possibility of the evolution of wheels in animals. But this did not happen because building roads is not a selfish gesture. It serves not only the animal that built it, but also loads of other animals including rival species of the road-builder (that is species with contrasting dominant traits). In such a harmonious environment there is no place for selection and evolution of surviving traits.

Okay, so does this mean rotary motion in animals is unheard of? Absolutely not! Rotary motion in animals is of two types: rolling on a whole and having wheels. The first are a class of plants and animals that use their whole bodies as wheels like tumbleweeds, rolling spiders and pangolins. The second is known to have been found in unicellular prokaryotes, which use Flagellum or thread like tail by which the bacterium moves. The bacterial flagellum is attached to a shaft, which is powered by a molecular engine.

### **Animals need not have wheels; they are much better off without them:**

This is the second school of thought. Why should we mull over something, whose utility is highly constrained? Wheel is not a panacea for all locomotive ills because of the following reasons:

Efficiency of wheels is restricted to the terrain in which it operates. Animals live in a rough terrain marked with ups and downs that do not elicit the desired performance from wheels. This is mainly due to increased rolling resistance. To explain this, whenever a wheel exerts force on a surface, the surface in turn exerts a reactive force. In case of a soft terrain, this reactive force is less and hence the surface gets deformed by the action of the wheel, and in this process the wheel loses energy. There is also the inability of the wheel to climb over vertical hurdles higher than half the wheel radius, in case of a rigidly framed structure. But it becomes equally difficult even for a wheeled structure with a non-rigid framework that is one which is capable of shifting their center of gravity. If it couldn't climb over why not manoeuvre around? Well this again depends on the terrain. Moving around hurdles is done easier in an open terrain than in a closed and littered one, especially if the wheel's turn radius is long.

With all the above (and much more) complications, one might come to the conclusion that perhaps animals are in a better place without wheels. But the problem doesn't quite end there. What does the future hold in store?

### **Is it possible to evolve wheels in the future? :**

Touching upon Richard Dawkins's theory once again, if the absence of roads was the reason for animals not developing wheels, well, that is no longer an impediment. The new environment, covered with concrete roads, provides

untaken segments to the animals that should now evolve and adapt to them. This theory is similar in spirit to what Moore's law means, well, again in spirit! But this can become possible according to an evolutionary theory called the theory of punctuated equilibrium. This was proposed by Stephen Jay Gould and Niles Eldredge, as opposed to the theory of Gradualism which we saw earlier. This theory states that: when new niches become available new species quickly evolve to occupy them, then persist unchanged for long times. That is species remain stable with little or no changes for millions of years and then their 'equilibrium' is 'punctuated' by a sudden burst of change that results in new species. If this were true, in the near (or distant) future, we may live in a world replete with wheeled species of all kind, homosapiens included. Until then, we can only wait for a Marvel mutant, with wheels-for-legs as their superpower!

### **Sources and Inspirations:**

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