

The Universe Is Not Infinite

(George Dlouhy 2020)

The polemic for and against the apparent infinite dimensions of our universe is with us already from the time of ancient Greece, and so far we have no unyielding proof either way.

Even earlier than three centuries BC, there were some philosophers already discussing the infinity of the universe. Philosophers like Aristotle and Plato did not believe in infinite universe. This belief was later challenged by Epicurus, who believed that if the universe is finite, it has to have an edge. Since any edge represents a division between two entities, there must be the universe beyond, i.e., the universe is infinite.

Anecdotal evidence suggests that Epicurus used an experiment, in which a person standing at the end of the universe would stretch its hand beyond the border, and thus prove that there is something beyond the border.

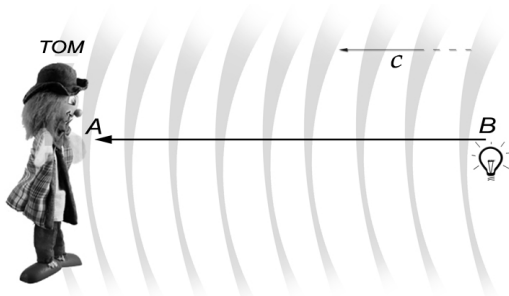
His argument assumes that it is possible to stretch a hand beyond the border of the universe. But what if our universe is a wine barrel, for example? Standing inside at the side of such a container, stretching your hand outside would be impossible. The universe does not have to be a wine barrel, though. The universe could reside inside a tiny transparent plastic bubble, which would stretch with any movement of the person's hand. That makes Epicurus' argument not valid.

The idea expressed by Aristotle and Plato about the universe being not infinite was generally accepted for many centuries, but later it has changed, and most probably only due to religious beliefs and without any tangible proof.

It was Albert Einstein, who expressed his doubts about infinite universe in his famous quote: *"Only two things are infinite, the universe and human stupidity, and I'm not sure about the former."*

Now is generally believed that the universe is infinite, despite the present-day "expanding universe hypothesis". This hypothesis contradicts the motion of the infinite universe, since infinity cannot expand ($\infty + \infty = \infty$).

Should we believe in the infinite universe, then this hypothetical scenario would prove us wrong:



The light emitted by the bulb to reach Tom has to cover the distance **AB**. Considering that the vacuum filling the universe limits the speed of light to its constant value **c**, then **t** is the time needed for the light to cover the distance **AB**.

$$t = \frac{AB}{c}$$

Should the universe be infinite, then **AB** could be also infinite, i.e., **AB = ∞**, and for the light it will take an infinitely large time to cover this infinite distance, i.e., **t = ∞**.

$$c = \frac{AB}{t} = \frac{\infty}{\infty}$$

Then the speed becomes

Yet, the ratio of two infinities is not defined, which is easy to prove.

(Adding two infinities is infinity $\infty + \infty = \infty$, then the speed could be rewritten as:

$$c = \frac{\infty + \infty}{\infty} = \frac{\infty}{\infty} + \frac{\infty}{\infty}$$

If this ratio is defined, then $\frac{\infty}{\infty} = 1$, and $c = 1 + 1 = 2$

We could continue to add infinities, and finish with increasing numbers 3,4,5 ..., which proves that the ratio of infinities is not defined.)

We have therefore just proved that the speed of light in the infinity is not defined, and therefore the light in the infinity cannot exist. Since light exists in our universe, then the universe cannot be infinite.

This is an evident proof by contradiction, i.e., *reductio ad absurdum*.

