

EINSTEIN, BATS AND "PAST-POINTING" DARK MATTER**TIMOTHY TAKEMOTO**

Ernst Mach (1897) proposed that the basic stuff of the universe that physics should explain is phenomenon. To explain what he meant by phenomenon, he drew his famous picture of his visual field (below)



Mach (1907, p. 579) wrote "*Nature is composed of sensations as its elements.... Sensations are not signs of things; but, on the contrary, a thing is a thought-symbol for a compound sensation of relative fixedness. Properly speaking the world is not composed of 'things' as its elements, but of colours, tones, pressures, spaces, times, in short what we ordinarily call individual sensations.*"

It is very well documented that Einstein was influenced by Mach's phenomenalist perspective. Why nothing travels faster than the speed of light is because no human-perceived phenomenon can travel faster than the speed of light. But this is not entirely true. If there were things travelling faster than the speed of light then we would be unable to observe them directly, but we may be able to observe their effects, with the very weird time-reversal consequences predicted by relativity.

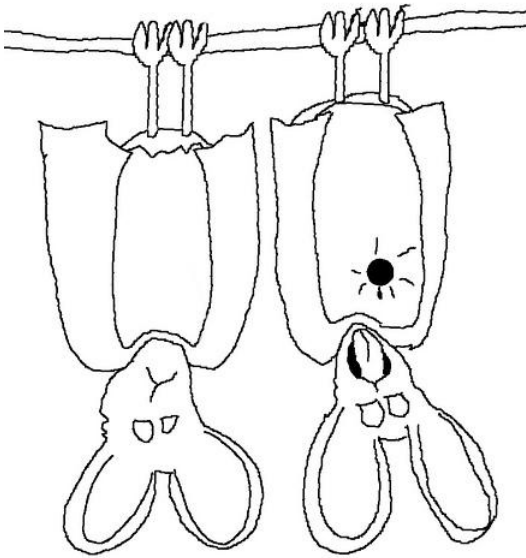
Imagine the cosmology of a bat, assuming that the bat is blind, and that it is using sound waves to judge the distances between itself and the nearest objects in its universe. The bat is of course unable to see light.

Since (let us assume at least) bats are unable to sense anything that moves faster than sound, bullets and other things, that travel faster than sound, must be difficult for bats to comprehend. The bat scientists might postulate that their brethren are liable to spontaneously explode when in the presence of humans with steel sticks.

Or perhaps not? Would they realise that some things travel faster than the speed of sound? That would depend upon how they understood their universe, whether or not they understood it in a 'batty' way.

If two blind bats, with excellent (hypothetically perfect) sonar were hanging in a cave and hunter came in with a gun, which fired super-sonic bullets, and shot one of the bats, then the bat that survived would 'see' his friend fall down, and afterwards 'see' the hunter load up and shoot. In other words, the bats would see cause and effect reversal or *retrocausality*. This type of phenomenalist *retrocausality* would not fall foul of causal consistency since it would not be possible for the bat to prevent the cause of the effect that she had just observed.

As we have seen, super-sonic flight speeds should allow the bat, under the theory of relativity to reverse time and stop that darn hunter. But not so fast! If the bat could fly at supersonic speeds, she would never have experienced the retro-causality in the first place. If the bats were supersonic, then their fastest sense would be that of touch (and bullets would not hit them anyway).



The bat might well set off towards the hunter in the attempt to prevent him from firing his gun, but she would never make it in time. If she flew faster and faster, then again as predicted by relativity, she would feel her own time frame to slow down, as the echoes of the hunter now approaching her faster than the speed of sound, would make the hunter's time frame faster, and the hunter to appear to be super 'fast at the draw'.

As we have seen, super-sonic flight speeds should allow the bat, under the theory of relativity to reverse time and stop that darn hunter. But not so fast! If the bat could fly at supersonic speeds, she would never have experienced the retro-causality in the first place. If the bats were supersonic, then their fastest sense would be that of touch (and bullets would not hit them anyway). In other words, I think that relativity can be understood from a phenomenalist perspective, rather than in terms of a 'cosmic speed limit'.

At the same time however, if it were simply the case that we are bats, and there is a world out there that does not reflect our sonar (light) or moves too fast for us to observe it, then just as the bats should, and do I believe, 'see', strange cause and effect reversals, we should also be seeing similar effects with reversed or at least invisible causes. Since we are not seeing them, perhaps then Einstein did discover the cosmic speed limit? Bearing in mind our evolutionary similarity to goats and our general insignificance in the cosmos, I think it extremely unlikely that we should be able to know and sense at the cosmic speed limit. So where is the retro-causality, where is the "spooky action at a distance" that should be observed if things are moving faster than the speed of light?

Perhaps sound is pretty slow and light pretty fast. But even bearing that in mind, due to our insignificance on the cosmic scheme of things, I would expect a lot of things to be moving faster than we can perceive. What percentage of things should we be unable to experience? Most things I would guess. I think that it would be very bold to suggest that we could even perceive 5% of things, and more than 95% of universe should be quite, or almost, beyond our ken.

Enter dark matter. Since the 1970's, gaining full acceptance in the 1990s, astronomers and physicist have become persuaded that there is not enough visible matter to explain the high speed of rotation of galaxies, and not enough energy to explain the high speed of the expansion of the universe. Galaxies should not be rotating as fast as they do without disintegrating, unless they contain more mass than we can see. Likewise the universe should not be expanding so rapidly given the amount of mass and energy that we can see. The only explanation for these phenomena is that there is dark matter, which, together with dark energy, makes up about 95% of the mass of the universe. We are only seeing 5% of the mass of the universe.

There is the possibility that this dark matter and dark energy is located in dark bodies somewhere out in space, but it seems also quite likely that like bats, we are swimming in stuff that we cannot sense. Bats can't tell when the sun comes up (dark energy for a bat), nor see things that go faster than sound.

Could it be that dark energy is dark for a similar reason?

Another explanation of dark matter provided by J. M. Ripalda (1999, last updated in 2010) from the university of Madrid, proposes that some matter in the universe is not "dark" but "past-pointing", and concludes his paper with the following remark:

"The concepts of 'dark energy' and non-baryonic 'dark matter' are unnecessary. The fact that we experience time as always going forwards is due to the separation of past-pointing matter and future-pointing matter by gravity (a spontaneous local symmetry breaking). On a large scale, there is no 'arrow of time'."

I am not capable of understanding the mathematics used to support Ripalda's assertion, and I find it difficult to conceive of time actually, not phenomenologically, running in reverse anyway. But if the currently observed anomalies can be explained by the presence of 'past-pointing matter,' then we have a similar situation to that found in the bat thought experiments. Bats, if their sonar were good enough, would experience all sort of time reversed events. Bats with good enough sonar would see planes that arrive before they take off, humans becoming people who had already set off towards them, and bullets that killed their neighbours before the bullets were fired. They would detect in their environment, in other words, the effects of "past-pointing matter".

From our point of view, and indeed from the bats point of view if they were able to think about it enough, this does not necessarily

mean that "past-pointing matter" or the reversal of time is the best explanation. It might merely be better to assume that they, and we, are facing a phenomenal wall, due to the speed of the medium of their fastest sense. Hence, I suggest that the "speed limit" found by relativity, and that "dark" or "past-pointing" matter can better be explained in a phenomenalist way.

Strangely, I can't seem to find many other people pointing out this obvious phenomenalist explanation for the 'cosmic speed limit'.

References

Mach, E. (1897). Contributions to the Analysis of the Sensations. (C. M. Williams, Trans.). The Open court publishing company. Retrieved from <http://www.archive.org/details/contributionsto00machgoog>

Mach, E. (1907). The science of mechanics: A critical and historical account of its development. Open court publishing Company.

Thomas Nagel What is it like to be a bat? [From The Philosophical Review LXXXIII, 4 (October 1974): 435-50.]

http://members.aol.com/NeoNoetics/Nagel_Bat.html

Ripalda, J. M. (1999). Time reversal and negative energies in general relativity. arXiv preprint gr-qc/9906012. Retrieved from

<http://arxiv.org/abs/gr-qc/990601>



Timothy Takemoto was born and raised in London, studied electrical and electronic engineering at Bath and philosophy followed by Japanese language at Edinburgh University. He moved to Japan and studied Japanese mythology and the Japanese self from a cultural psychological perspective. He now teaches English conversation, cultural psychology and Japanese culture at Yamaguchi University. He changed his English surname Williams to Takemoto after his marriage to his Japanese wife. <http://nihonbunka.co>

This stone mask from the pre-ceramic neolithic period dates to 7000 BC and is probably the oldest mask in the world. (Musée Bible et Terre Sainte)

