

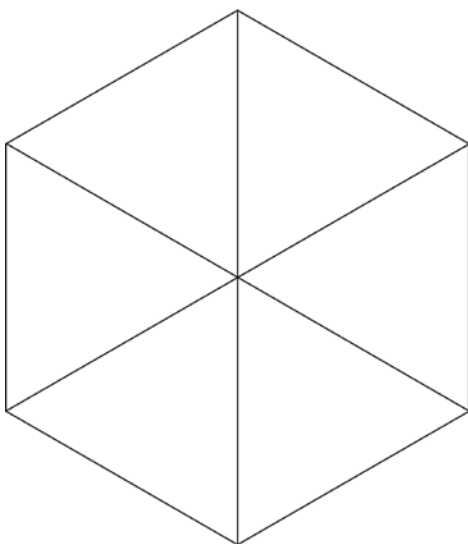
Chapter XIV from a novel „**Problem promatrača**“ (Problem of the observer) by **Antonio Šiber** published by Jesenski i Turk (2008). Uploaded on the author webpage, <http://asiber.ifs.hr> . The author can be contacted at asiber@ifs.hr

XIV. Analysis of sensations and Ernst Mach

An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes.

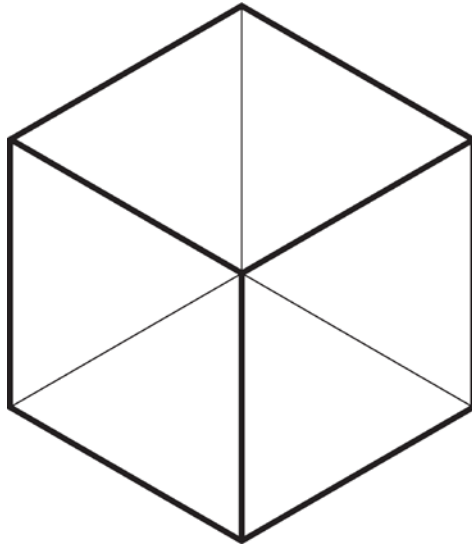
Pierre-Simon Laplace, *Essai philosophique sur les probabilités* (1814)

Ernst Mach already spent a lot of time trying to construct some sort of geometric shape on a blackboard. The audience was already a bit nervous, more so because they didn't know what he wanted to demonstrate and how was it after all related to the lecture title. Mach drew several strokes with a chalk and then he carefully inspected them from all possible angles. After several repetitions of this procedure, he finally created, to the disappointment of most of those present, an unexpectedly simple shape, similar to this one:



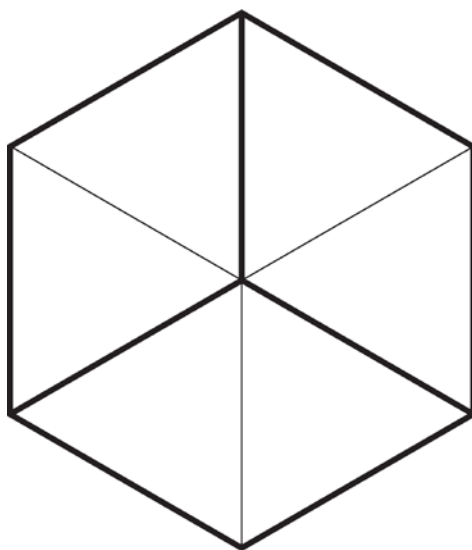
- I made it. What you see is a hexagon with its three main diagonals denoted. Or six equilateral triangles. But, this simple shape can also have a different interpretation.

He returned to the blackboard and thickened some of the previously drawn lines. Thus he got the following shape:



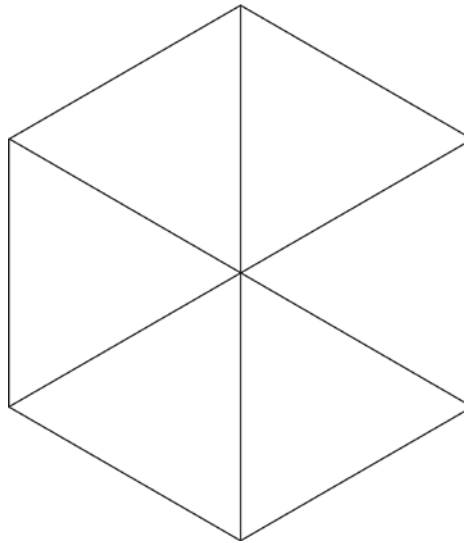
- Here. Now it looks like a cube. Or, to put it better, like a wire frame in the shape of a cube, a cube made of transparent material or something like that. A cube viewed from above. The edges that are closer to the observer have been just a bit thickened. But one can also do it differently.

He carefully swept some of the lines and, much faster this time, drawn the shape he was looking for. It looked like this:



- If we again consider the thicker lines to be the edges of a wire frame that are closer to us, we will again see the cube but this time viewed from below, obviously hanged on some sort of invisible thread or viewed through a transparent support made of glass for example. But, both representations of a cube we can now clearly see also in the first non-accented representation.

He again erased thickened lines and repeatedly drawn the shape that gave him much trouble in the beginning:



- Now we can in the *same* shape clearly see *three* different informations. One about the cube viewed from above, one about the cube viewed from below, and one about the hexagon with main diagonals denoted. We can even easily switch our perception of the shape. We can, depending on the interpretation that we consciously associate with this shape, see two different physical bodies. One and then the other. And then the first one again, and then the second one. According to our wish. So, our cognition of the nature of information and the object depends on the viewpoint taken. But, which of the two viewpoints is correct? Both. And none. No viewpoint has absolute, permanent value. Its value is only as large as it contributes to the reasonable interpretation of sensations. Thank you for your attention.

A short and fragmented applause reflected the fact that most of those present were neither satisfied with the lecture nor they completely understood what Mach wanted to say. Some of them also thought that such pretentious philosophizing does not belong in the Department of experimental physics. Yet, older professors did not openly confront Mach since they knew it was best to avoid discussions with him. His cynical and paradoxical conclusions could not be denied of a certain fatalistic value. That is why the discussion following the

lecture started in a benign tone of acknowledgement of those present. Still, some smooth-faced student from the bottom of the lecture hall braved for more important questions.

- Professor Mach, don't you think that the task of the natural science is exactly to make us free from the constraints of our senses and the tricks they play on us? Don't you think that thought can overcome sensations, give us insights in places that are forbidden for our senses? I have in mind, for example, the fact that with thought we can explain that the Earth revolves around the Sun although our senses tell us otherwise.

- The task of science is to represent the facts and sensations in terms of thoughts either for practical reasons or for removing the intellectual discomfort. Science has no relation to the world as it is by itself, but only to the way we think. Science introduces order in our comprehension of the world but tells us nothing about the world itself. You see, we must be modest. Our consciousness is only a small and a very limited part of the world. It makes no sense to speak about grand matters. Yet, the history of science shows to us that many could not resist this temptation.

The youngster was not prepared to give up so easily.

- But, don't you think that our brain is also a part of this world and that the thought is also influenced by the material - I refer to atoms that our brain is made of. Once we understand the atoms, we will also understand sensations and thought, comprehending thus how reliable reflection of the world by itself the thought is.

Older students knew that this could not finish pleasantly. It was better not to mention atoms to Mach.

- Heh ... Atoms ... Wasn't it also the great Laplace who gloriously stated that we could stuff the whole world into some great mind only if we knew the positions and velocities of all the „atoms“ the world is made of? Such mind would know what was and what will be in any moment in future. And since such an imagined mind would be based on matter, which means „atoms“ again, it would also know where it comes from and what will happen to it from studying the equations of motion. Perhaps I would, I admit, had I been by some accident born fifty years later, fall under the influence of such grand ideas, which are in our time also an ideal of great majority of scientists, because a young mind is ready for grand ideas and idealization of itself and the world. Today I can guarantee you that your dream will never be realized, as well as the properties of light cannot be derived from the law of refraction of light. As well as you cannot

get out of the swamp by pulling your hair. And concerning atoms ... That is a completely lost cause.



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