The Missing Third Question

Prof. As. Dr. Aleksandër Kocani

Faculty of Sociale Sciences, Tirana University, Albania
Email: alkocani@gmail.com

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Abstract

This is about a question that could have been put logically by Einstein or anyone that has followed his way of reasoning, following two other guided or heuristic questions. In the literature that analyses Einstein's scientific work, it is said that in his analysis of so-called mechanical principle of relativity, he was trying to understand if there was something in the laws of nature that was justifying it. Logically, a question comes up: Did something exist in laws of nature that conditioned discrimination in identification possibilities of the difference between mechanical experiments from one side and optical, magnetic etc. ones on the other? Why in principle was impossible for mechanical experiments to identify this difference, but it was not for, say, optical experiments? Einstein by his principle of restricted relativity gives an answer to this question. He did the same for "Why"-s of principal impossibility to differentiate the rest from the straight-lined uniformed motion by any physical experiment carried within a system of reference. Now is the time to ask the third "Why" which logically follows the two mentioned and to propose an answer. That is the "Why"-s of principal impossibility to differentiate the immobility (or the rest) from the any mechanical motion by any physical experiment carried within a system of reference.

Keywords: missing question, motion, rest.

This is about a question that could have been put logically by Einstein or anyone that has followed his way of reasoning, following two other guided or heuristic questions. In the literature that analyses Einstein's scientific work, or that sets forth, in a popular style, ideas and importance of a special as well as general theories of relativity (2), (3), (4), (5), (6) it is said (perhaps metaphorically as well) that in his (philosophical) analysis of so-called mechanical principle of relativity (or that of Galileo), he was trying to understand if there was something in the laws of nature that was justifying it. In short, the essence of the problem posed by Einstein, logically, lays the ground for the question to be asked if there was something in nature that conditioned the fact that the state of a uniform straight-line motion could not be differentiated from that of a immobility (or rest) with mechanical experiments being done within the system of reference where they have been analysed. This principal impossibility to differentiate the mentioned two opposed state constituted the substance of the Galileo's principle of relativity. Therefore, it was quite reasonable to ask why this difference was not possible through mechanical experiments, as it was with other physical experiments, e.g. optical experiments. It was this conviction that, on the eve of the 20th century, led towards the so-called experimentations of Michelson – Morley. Whose aim was to measure, through optical methods, the speed of light in relation to what was called 'æther of space' (2), a kind of hypothetical environment conceptualised as something with unusual features in classical physics (e.g. being in itself absolutely at rest) (2), (3). Since, according to traditional (classical) physics, this æther was thought as an environment in total immobility (as opposed to any other system of referral consisting of physical objects!!??), to measure the speed of light toward this aether would have meant to differentiate the rest from the straight-lined motion of the earth and the light opposed to it. Logically, a question comes up: why would exist, if one takes for granted this principle, this kind of asymmetry or preference in nature? Did something exist in laws of nature that conditioned this discrimination in identification possibilities of the difference between mechanical experiments from one side and optical, magnetic etc. ones on the other? Why in principle was impossible for mechanical experiments to identify this difference, but it was not for, say, optical experiments? It is too likely to suppose that Einstein thought that this kind of consideration that "discriminated" the mechanics against other branches of classical physics was simply a model of thought that could not stand against strict physical-philosophical critical analysis. This being so because there was nothing in the laws and phenomena of physics to justify it. As a result, a physical model was postulated in classical physics (the principle of relativity of classical mechanics) that could not pass the logical tests – the "filter" of physical-philosophical reasoning. Therefore, the above-mentioned discrimination would fail if one would give up this unjustified model. This would require replacing this model with a better one that would, initially, resist to physical-philosophical critical analysis. This is exactly

what Einstein did; a replacement of a model with a more general one that would be able to avoid this discrimination. More specifically, using the postulate: no physical experiment (not only mechanical) carried within a system can distinguish the state of motionlessness from that of a uniform straight lined motion ["…it is not only in mechanics that not a single feature of phenomena corresponds with the notion of absolute motion but in electrodynamics as well" (1)]. With this, "the democracy", denied arbitrarily between different physical (as well as mechanical) phenomena, "was replaced". This is named as "the special principle of relativity"1 and, as it is known, its author is Albert Einstein (2). So, the answer to the "why" question results fruitful: a very important physical principle can been formulated: a principle of special relativity. The genius of Einstein was that he was not satisfied with this conclusion, instead, he went further. That is, he probably was searching for "Why"-s of principal impossibility to differentiate the immobility (or the rest) from the straight-lined uniformed motion by any physical experiment carried within a system of reference. Why was in meantime, according to the traditional well-established opinion in physics, possible to distinguish the rest from the accelerated motion through even mechanical experiments, based on what is known as "inertial" phenomena (e.g. the moving forward when the bus brakes suddenly). Using the same logic, we may possibly think that Einstein was looking for an answer to the question if there was something in nature or in its laws that was conditioning this discrimination (6). Then, based on the analysis of famous virtual experiments in a laboratory-styled lift [the lift being in a free motion towards an earthly gravitational field is equal to the lift being stationary but with an added anti-gravitational field. In this case, principally, neither of these two states (the rest or the motion) can be chosen as the real cause of the consequences observed] and the equality of inertial mass with the gravitational one, he came to the same conclusion as with the first case. I.e. there was nothing in the laws of nature that would make possible the distinction between a accelerated motion and the state of rest with experiments carried within one system of reference. If we were to believe Blanche, he cites Einstein as saying that in physics, everything that can not be measured or observed it has no physical reality (5), (6). So, the difference discussed above has no physical reality. That would mean, we could consider that we could not differentiate the state of rest from that of motion in general through any kind of physical experiment carried within a system of reference. And this acknowledgement forms the so-called "principle of generalised relativity" and represents his first formulation conceived on a kinematic approach according to so so-called "Euclidean space". So, the answer to the second 'Why' question led logically towards generalisation of the principle of special relativity in its first formulation by Einstein. In the second one Einstein has considered the gravitational field, in which "there are no such things as rigid bodies with Euclidean properties;…The motion of clocks is also influenced by gravitational fields…"2. By doing this, Einstein, "mathematically speaking", substituted the Galileian reference-body with the Gaussian four-dimensional co-ordinate system. So He not only generalised its special principle of relativity, but also, in a mathematical-physical point of view, "upgraded" it. This work made in a mathematical-physical field, refer more, let say, to a "Quantitative approach", which is very necessary for dying measurement in physics3, formulating laws as hypothesis and testing its. But, by our opinion, if we refer to a "Qualitative approach", which needs no for measurement, in essence, we have not to do with any kind of reference-body (i.e. "rigid", "Galileian", "mollusc" etc.) (6). Quoting Einstein, "If it is simply a question of detecting or describing the motion involved, it is in principle immaterial to what reference-body we refer the motion. As already mentioned, this is self-evident, but it must not be confused with the much more comprehensive statement called "the principle of relativity", which we have taken as the basis of our investigation."4Here Einstein underlined not only the relativity of choosing one of two reference-bodies for detecting the motion, but also the equivalence of anyone of two reference-bodies for physical description of natural processes. As mentioned, our intention is not related to such a mathematical – physical description, but to a philosophical-physical one. I.e., for us very important is the possibility to detect the motion or the rest of bodies despite of considering them as Galileian or Gaussian co-ordinate systems. In this framework, it was, and it still is, logically possible to accomplish on with the series of logical questions (the "why"-s) that are looking for the answer as to why there is a difference between the state of rest and that of any kind of motion with physical experiments carried within a system. So, it is possible to search for the answer to the third "Why" or to set a problem that in essence incorporates it and that has not been done before. In other words, why not a single experiment carried within a system cannot show us the difference between the state of rest and that of any kind of motion. What is in the laws or phenomena of nature that conditions this principal uniqueness? To put it differently, does this kind of principal difference really exist? Or, is there something outside us that forms it? Does this difference make a physical reality or, the same as two other models mentioned above, is simply a product of our limited modelling abilities and can be avoided without infringing on the study of physical phenomena? So, is it being imposed to us from the outside or is something that we want to impose to physical

[1] *Merleau-Ponty named it as "principle of restricted relativity" (in French, principe de relativité restreinte) (6), p.161-164.*
[2] *(2), p.98.*
[3] *Merleau-Ponty underlined this especially for classical physics theories (6), p.169-171.*
[4] *(2), p.61-62.*

phenomena's performance as their appropriate model? So far, we've seen that the first two "Why"-s were related to two relatively not appropriate models of the performance of physical phenomena and, being so, getting rid of them would not damage the process of understanding and the performance of physical phenomena, on the contrary, it would further improve it.

Since formally it is possible to follow with the logic of their formulation through another question, we can expect this line of argument to continue further with the third "Why". That means, the answer that would replace the less-appropriate model with a more appropriate one as well as deepen our understanding of physical phenomena, the same as with other two previous "why"-s. If we go back at Einstein's line of argument, according to R. Blanche (5), something that cannot be observed or measured to physics has no physical reality. That means, in our example, that a difference between the rest and the motion or, in other words, the identification of a motion or a rest of a system that in principle cannot be observed, has no physical being or is physically inexistent. It simply constitutes a model or relatively inappropriate physical performance in an analogous way with Galileo's principles of relativity and the principle of special relativity. Therefore, it needs to give way to another, more advanced, model that would demonstrate relatively in a better way physical phenomena. Essentially, this model would prove that any mechanical motion couldn't have been distinguished from rest with any kind of physical experiment carried out within a system because the rest as well as any kind of motion, do not constitute genuine features of this system. They feature not a system or an object in itself, but only the relationship that they have with something akin to them (be it a system or an object). Therefore, they can not be certified to either of the system (or objects) in particular, but only to the relationship between them. This is the reason we find it difficult to identify them in any of them: they simply do not exist within a given system (or object) as its individual feature. While the considerations for the motion of particular objects that operate in physics are necessary models that are required to measure mechanical motion. In order to measure this, we must replace the symmetrical model that demonstrates the relationship between two physical systems in motion as well as in rest with two asymmetrical models that polarise in opposing ways the "motion" and the "rest" in any of the mentioned systems. So, we need to consider one of the systems in "rest" and, in connection with it, to measure the mechanical "motion" that we have "ascribed" to the other system Otherwise, it is impossible for us to accomplish these measurements. But, the need that we have to carry empirical procedures of quantitative analysis of the motion does not have to be imposed to us when we do our analysis in a qualitative way. We do not need simplified quantitative models in order to carry a qualitative examination of the mechanical motion; instead, we can go back to symmetrical model ("synthetic model") that considers the motion and the rest the features of the relationship between the systems and not of either of them in particular (6).

In conclusion, it is worth noting that it's not difficult to recognise that physical implications that can logically be deducted from this kind of generalisation would, without doubt, require skills beyond capacity and real possibilities for a modest researcher, as is the case with the author of this article, and as such, it would not have been right for anyone to require so.

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