The principle of relativity and the ether

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In the alternative, Lorentzian interpretation of special relativity the ether is a necessity. This has some far-reaching consequences for fundamental research in physics and for the future unification which under this new paradigm shall be much easier.

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1. Introduction

In terms introduced in an earlier paper [1] the principle of relativity has been formulated as follows: "The description $D(G, S_X, F_Y, I_Y, U_Y)$ of any property of any physical object G in the state of inertial motion (SIM) S_X depends only on the description of the velocity $V(G, S_X, F_Y, I_Y, U_Y) = v_{XY}$ of the SIM S_X in the inertial frame of reference (IFR) F_Y, and does not depend on the choice of the SIM S_X or on the choice of the IFR F_Y."

Since this principle is a statement about the descriptions of properties, obtained by adopting in the measurements the conventional elemens F_Y, I_Y, U_Y, and not about the very properties, we called the relativity a formal one. But physics is a science about the properties of objects and therefore we cannot stick at dealing with descriptions of them but must seek reliable conclusions about the corresponding properties of objects. In the subsequent sections we will try to draw from the experimental evidence such conclusions.

2. The character of the conventional elements

Let us look closer at the assumptions which enter the set F_Y, I_Y, U_Y used in the measurements and in making descriptions. It is easy to notice that the assumptions F_Y about the chosen frame of reference and U_Y about the units play just an organizing role. They can be altered without influencing our conclusions about the properties of the investigated objects. We could change the place of the origin of the system of coordinates or the directions of its axes, or the length of the standard length unit and its name without any negative influence on the conclusions about the measured properties of objects. In other words, in F_Y, U_Y we do not assume anything about the physical reality of the objects to be measured.

On the other hand, the character of the assumption I_Y is completely different. It contains a statement about the speed of light relative to the SIM S_Y. This is an element of reality, and our statement may be either correct or wrong, i. e. either true or false. Not in a logical sense but in a sense of accordance with reality. Actually we should be aware that making such kind of assumption is very dangerous and has to be avoided. But we have no escape so we make this assumption but we have to keep extreme caution, being aware that it may turn out to be wrong and thus make incorrect our conclusions about the measured properties of objects.

3. Conclusions about the properties of objects

In earlier considerations, ref. [1], eq. (5)–(10), we obtained the following descriptions of the lengths of the arms parallel to the direction of motion of identical objects P, and R in two different SIMs S_A, and S_B:

$$\begin{array}{l} L_x(P, S_A, F_A, I_A, U_A) = l, \\ L_x(R, S_B, F_A, I_A, U_A) = l/\gamma_{BA}, \\ L_x(R, S_B, F_B, I_B, U_B) = l, \\ L_x(P, S_A, F_B, I_B, U_B) = l/\gamma_{AB}. \end{array} \tag{1}$$

where

$$\gamma_{BA} = 1/\sqrt{1 - v_{BA}^2/c^2}, \tag{2}$$

and similarly for γ_{AB}.

Since $\gamma_{BA} = \gamma_{AB} > 1$, the following inequalities between those descriptions are valid:

$$L_x(P, S_A, F_A, I_A, U_A) > L_x(R, S_B, F_A, I_A, U_A), \tag{3}$$

$$L_x(P, S_A, F_B, I_B, U_B) < L_x(R, S_B, F_B, I_B, U_B). \tag{4}$$

Now from those obtained descriptions we want to draw conclusions about the measured properties. If the assumption I_A is correct, then from eq. (3) we can draw the conclusion that:

$$L_x(P, S_A) > L_x(R, S_B), \tag{5}$$

and if the assumption I_B is correct, then from eq. (4) we can draw the conclusion that:

$$L_x(P, S_A) < L_x(R, S_B). \tag{6}$$

Comparing the inequalities of descriptions in (3) and (4) we can see that they are different. This, however, is not a contradiction since we know that the differences in descriptions are due to the differences in the assumptions, and hence in the conventional elements.

On the other hand, comparing the inequalities of the lengths in (5) and (6) and seing that they differ, we cannot ascribe this difference to the assumptions any more, because the conclusions about the properties of objects are supposed to be free of the influence of assumptions. Therefore these differing inequalities have to be regarded as a contradiction, because the measured arm of the object P in the SIM S_A cannot be at the same time both longer and shorter than the corresponding arm of the object R in the SIM S_B. This indicates that at least one of the two sets of assumptions must have been wrong. Thus we have to examine more closely the consistency of our assumptions.

4. Conclusions about the validity of assumptions

The inequalities (5) and (6) contradict one another. This conflicting result can be explained only by concluding that either I_A or I_B is incorrect. Hence, from those two assumptions about simultaneity at least one is wrong, and thus at most one is corrrect.

This result follows not only from the arbitrarily chosen property of L_x but it could be drawn in an equal way from many other properties, e. g. the times of flight of the light signal along the arms of the objects P and R or from the rate s of their clocks.

Let us notice that the SIMs S_A and S_B were chosen arbitrarily. This means that the above conclusion drawn about the validity of the assumptions I_A and I_B would be the same also for any other pair of two differing SIMs.

5. The existence of a unique SIM

In any set of two SIMs S_A, S_B at most one of the assumptions I_A, I_B is correct. Adding to this set a third SIM S_C with the assumption I_C one can easily prove by a similar consideration carried out for individual pairs of SIMs, that also in this increased set at most one of those three assumptions is correct. It can be also shown that if in a set of n different SIMs at most one of those n assumptions about simultaneity is correct, then also in a set of $n+1$ different SIMs only at most one of those $n+1$ assumptions about simultaneity is correct. Hence, even in an infinite set of different SIMs all the corresponding assumptions about simultaneity except a single one for a particular SIM are incorrect.

By the way, this result is not surprising because it is very intuitive. There exists no one single set of assumptions for carrying out measurements and making descriptions of properties of objects from which it would follow the isotropy of the speed of light relative to more than one SIM.

In this sense we have the right to speak about a unique SIM S_0. The only circumstance in which it is unique is the fact that the assumption I_0 for this SIM is correct while for all other SIMs the corresponding assumptions about the isotropy of the speed of light relative to them are wrong. We are unable to identify this SIM S_0 because of the formal relativity but from the experimental evidence we were able to draw the confirmative conclusion about its existence.

6. Why is it important?

Since we cannot identify the unique SIM and since all the mathematics of SR remains the same, than what sense does it have to insist that such a SIM exists? The adherents of the standard interpretation of SR argue therefore that there is no reason in seeking an alternative to the Einstein's postulates. Below we will try to answer this question and to challenge this argument.

First, the existence of only one SIM S_0 such that the speed of light relative to objects in it is isotropic follows from very elementary considerations on the consistency of measurements and on drawing valid conclusions about reality, while in the standard interpretation of SR the non-existence of such a SIM is a consequence of accepting some very far-reaching postulates which change the epistemology and violate our fundamental concepts of getting from experiments reliable knowledge about reality.

If we ignore those fundamental concepts and accept ad hoc postulates about the properties and behavior of objects, then physics can become a mere numerology without relevance to the existing objective reality.

Second, the character of the experimentally established relativity is very different in those two competing views. Despite of the same experimental evidence and the same mathematical formalism both concepts differ substantially as to what is seeming and what is real.

In the standard interpretation where the relativity is not formal but absolute, the changes of motion of objects are not accompanied by any real changes of the properties of those objects, hence the existence of any kind of medium (the ether) outside of the material objects is redundant and thus any interaction between this medium and the moving objects is not sought for nor considered because it does not exist.

On the other hand, in the competing Lorentzian interpretation the observed relativity is only formal and hence the moving objects undergo real physical changes of their properties which are dependent on the velocity relative to this unique SIM in which the speed of light propagation is isotropic. This indicates that some kind of medium surrounding the objects not only exists but interacts with the moving objects in an enormously significant way, causing such substantial changes of their properties that they fully compensate the anisotropy of the speed of light and adjust the properties of the objects to the changed environment so precisely that formal relativity takes place and hence the changes in the properties of objects become undetectable.

Since the two competing images of reality are completely different, almost entirely opposite, how can choosing one or the other of them be without influence on the direction of research in physics and on the progress of our knowledge about the fundamental structure of matter in our universe?

The standard interpretation would lead the physicist to look at the objects investigated mainly as isolated entities not influenced by their global environment. The Lorentzian interpretation, on the other hand, would cause the physicist to deal in the first place with the structure and properties of this global environment as well as with the mechanism of the close and strong interrelation between this environment and the observed moving objects.

Without doubt the overlooking of the alternative concept of relativity for such a long time did have a harmful effect on the progress of fundamental research in physics. Because of that some extremely important issues have been hidden from the attention of researchers.

7. The character of the Lorentzian ether

The results of measurements of inertially moving objects (eq. (5)–(10) in ref. [1]) indicate that a crucial role in the changes of properties of objects under the influence of their motion relative to the SIM S_0 plays the speed of light as well as the velocity of this motion. The quantity γ_{XO} which determines the magnitude of the changes of the properties of an object in the SIM S_X with respect to the properties of an identical object in the SIM S_0 can be expressed as:

$$\gamma_{XO} = c/\sqrt{c_{min} \cdot c_{max}}, \tag{7}$$

where $c_{min} = c - v_{XO}$, and $c_{max} = c + v_{XO}$ are the minimal and the maximal values of the speed of light relative to the SIM S_X. Thus γ_{XO} represents at the same time the magnitude of the anisotropy of light relative to the SIM S_X. Hence, the anisotropy of the speed of light relative to S_X is the main factor which determines the properties of objects in the SIM S_X moving relative to S_0.

This fact does not seem to indicate that those changes are caused by some objects being in the SIM S_0. It seems quite possible that the unique SIM S_0 does not contain any special objects which would interact with the "ordinary" material objects.

Instead, it seems rather that the ether may consist of objects of photon-like character which reside in the SIMs pertinent to light. In the velocity space these SIMs are represented by the points on the surface of a sphere of radius c the center of which represents the SIM S_0. These ether objects would move in space in all directions penetrating the slowly moving "ordinary" objects and interacting with them.

It might well be that the ether contains a new kind of objects not yet known, the properties of which would differ from those of all known kinds of material objects. Let us call them actons (from the word "action"; this name was first used in ref. [2] where also some of the following thoughts were presented.) Actons are carriers of a certain amount of one or several physical quantities. The interaction of actons with "ordinary" matter (and, maybe, with themselves as well) consists in some exchange of the quantities carried by them.

8. Deliberations over the future unification

The phenomenon of inertia, i. e. the well-known fact that massive objects resist the action aiming at changing their state of motion (i. e. that applying of force is needed in order to get their acceleration) might well be explained as a consequence of the interaction of actons which penetrate the accelerating objects with those objects.

Physical fields (as e. g. the electromagnetic or gravitational) in the surrounding of certain "ordinary" objects might turn out to be composed of flowing actons. If so, then those fields would not be static but continually being restored with the speed of light. If so, then those fields would not be generated by those observed objects but they would be acton fields altered by their interaction with those observed objects.

One cannot even exclude the possibility that "ordinary" objects will at last be found to be somehow "made of" actons, i. e. that they might be mere local anomalies of the density of actons or of the density of quantities carried by them. If so, then also those "ordinary" objects would not be static but continually being restored with the speed of light.

The events of the decays (alpha-, and beta-), gamma-transitions, and fission of unstable nuclei and particles which we call "spontaneous" are most probably not spontaneous but triggered by collisions with actons in specific configurations. If so, then the exponential disintegration law does not reflect the processes inside the decaying particles but the processes in the outer acton field. Moreover, in some of those decays and transitions the actons which participate in them might be absorbed and enter the processes, and may become components of the outgoing particles.

Many phenomena which are supposed to occur in a physical vacuum, like virtual particle creation, virtual exchange of interaction bosons, etc. can be easily explained as caused by fluctuations in the flux of actons and its interactions with "ordinary" particles. Also such phenomena as changes of neutrino flavor or the mixing of K^o and $\tilde{K}^o$ particles into a mixture of K_S and K_L can be understood by similar mechanisms.

It is obvious that in a microscopic scale all processes of this kind will have a random, stochastic, probabilistic and statistical character, and that physical quantities will generally be exchanged in some limited distinct portions. Such behavior of the micro-objects is an excellent foundation for the explanation of phenomena observed and studied in quantum physics. Thus, the ether and its interaction with "ordinary" matter is a very promising framework for the explanation of the wave-corpuscular dualism.

These examples indicate that a number of known phenomena can find a natural and convincing explanation as a result of accepting the alternative Lorentzian interpretation of relativity, i.

e. some kind of an ether and its interaction with "ordinary" matter. Such a possibility seems to be extremely desirable in the present state of our understanding of the fundamental structure of matter in our world. Thus, taking into account the Lorentzian alternative would not lead only to some minor changes. Instead, it would be not less than a change of the paradigm of physics.

9. Conclusion

Experimental evidence, if evaluated thoroughly, supports the existence of a unique SIM and indicates an extremely significant influence of the fast moving "ether" on "ordinary" objects. Those facts, if popularized among physicists, could substantially change the state of arts in physics and cause a positive revolution. Relativity and quantum physics could be satisfactorily reconciled at last.

Will then relativity be of no use? Of course not. Physicists who will work on modelling the ether and the interactions of it with "ordinary" matter will have to be careful to ensure that the mathematical formalism of their models is Poincaré-invariant, in order not to violate the principle of formal relativity which is an experimentally well-established fact.

Let us finish this article with a prediction that if the competing alternative Lorentz interpretation of SR will be published along with its proper justification and if it gains a public attention, at least among physicists, then within five years a real break-through in our knowledge about the fundamental structure of matter in our universe is likely to take place.

It can also be expected that with the changed paradigm there will be a return to the abandoned, old, classical ways of deduction and reasoning. Thus, the revised and improved physical theories will be without doubt more visual, intuitive, convincing, and easy to comprehend [3], [4].

References

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