6. *The ballistic principle in the propagation of light and some recent studies by Mr. Rudolf Tomaschek; by M. La Rosa*

A recent paper by Mr. R. Tomaschek [1]) on the aberration feature in connection with the plausible theories about the physics of light ether causes me to again direct the attention of physicists to the value of the basic principle of the conceptions of the ballistic type and on the *extremely conclusive* factual evidence that can be brought into the field.

In the short historically-critical introductory remarks by Mr. Tomaschek in §1 of its work he sketches a decided — however arbitrary — condemnation of these ideas, which I cannot accept, with everything that I have published lately [2]), or give it up.

The arguments, on which Mr. Tomaschek relies with delivery of his verdict, are two:

1. The familiar argument of de Sitter against the ballistic hypothesis, based on double-star observations,

2. The negative Michelson-type experiments, which he himself repeated with extraterrestrial light.

With regard to the first argument, it might be allowed for me to stress emphatically that it cannot be admitted that vigorous and diverse arguments, as they are the ones which I derived for the ballistic hypothesis in recent publications on variable stars and added

---

[1]) R. Tomaschek, *Ann. d. Phys.*, **74**, p. 136, 1924.

[2]) M. La Rosa, *Zeits. f. Phys.*, **21,** n. 6, p. 333; *N. Cimento*, January 1924, p. 1.

to the refutation of de Sitter's argument, you cannot easily with the three words "despite recent objections", in which Mr. Tomaschek is referring to my research in a footnote of the first page, be taken to be pushed aside!

I certainly do not require that Mr. Tomaschek must accept my arguments, but that he, however, examine them, before he rejects them and discuss and indicate for his rejection with clear and certain reasons.

As to the second argument, so I take the liberty to publicly state the opinion that I had Mr. Tomaschek against occasional one I kindly sent special impression his recent Michelson and Morley type attempts with extraterrestrial light [1]) expressed in a confidential manner.

At that time I pointed out to Mr. Tomaschek what I had had written 12 years ago that the experiment of Michelson and Morley could not, with earthly light, provide *crucial proof* between ballistic theory and relativity theory and to supply [2]) that even if my proposal had been *properly considered* it was dropped, because I had convinced myself that this attempt would not have given anything useful, even if it had been possible to implement it well and to overcome the enormous difficulties which lay in the extremely delicate character of the investigation and the smallness of the desired effect and would be significantly exacerbated by the use of extraterrestrial light.

I dropped it because of the well-known difficulties in the interpretation of the classical attempt of Michelson and Morley and under the new circumstances a cause of the uncertainty would have been added, which makes the value of the proof illusory: the inevitable previous (i.e. even before the arrival to the interference

---

[1]) R. Tomaschek, *Ann. d. Phys.*, **73**, p. 105, 1924.

[2]) M. La Rosa, *Phys. Zeits*., **13**, p. 1129, 1913; Further *in extenso, N. Cim.*, Vol. **3**, p. 345, 1912.

apparatus takes place) there is a reflection of the light on a *source of light with respect to the motion in the mirror*.

Are the uncertainties, which prevail still in the theoretical and experimental area over the behavior by such mirror reflected beams? With examination of the relevant literature Mr. Tomaschek would have made sure that we do not have any *crucial* proof, which permitted us to determine, whether it (by the mirror produced) *picture* of the source of light is, behaves as new source of light (Thompson-Stewart) or whether the mirror behaves as such and, in this case, whether the speed of the reflected beam adds itself to that of the mirror (Ritz) or not (Tolman). And Mr. Tomaschek would have needed to read only the first pages of the beautiful monograph of Pauli "About Relativity Theory" [1]), in order to obtain sufficient information on and to know that also proves that he mentions the attempt of Majorana, stated by him, does not prove anything against the Ritz hypothesis (like Michaud clearly demonstrated).

This is the situation which does not permit it, at that time from me suggested and with much delay to grant at that time by me suggested and with so much delay to the experiment implemented by Mr. Tomaschek any value. [2])

Insightful are the observations that the author engages over the serious difficulties which the theory of relativity gets if it tries to give account for the aberration appearance, as we know it.

---

[1]) W. Pauli, Jr., *Encycl. of Math. Sci.*, (Sonderabdruck, Teubner, 1921).

[2]) Even if the result of the Tomaschek experiment was perfect, it would not permit a decision for or against the ballistic opinions, since we do not know anything about the reproduction of the light outside of the earth up to this instant. Thoughts which I already suggested on the recent congress in Naples, which I will explain in more detail in a later paper.

Indeed, it is unquestionable that with the acceptance, the movement of the source of light can lead — like that of the observer — to an aberration effect which would have to make known to us by "double"-stars such namely, as Prof. Lenard has noted, a rather considerable one.

On the other hand, it is likewise unquestionable that to us the astronomical observations never reveal a trace of the source of light dependant movement: shown as an Aberration effect.

It is thus unquestionable that the possibility is maintained of attributing to the stars the movement of the earth as claimed by relativity theory, *in contradiction with the facts*.

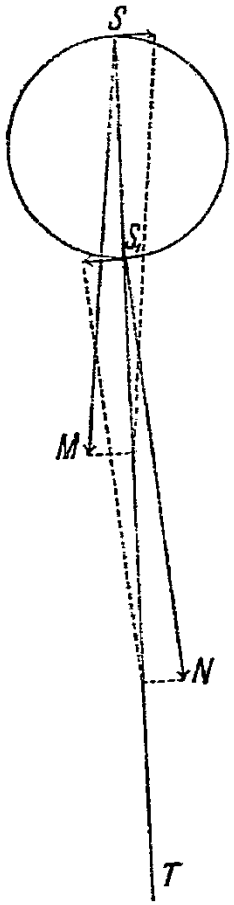

Fig. 1.

What concerns me here is the fact that this asymmetry of the aberration and the ballistic principle are fully compatible.

The difficulty of the asymmetry exists only for relativity theory because the special theory has at its basis put the conception of the perfect equivalence of all reference systems.

With the other kinds of view of the features the questionable asymmetry finds its full explanation, or rather it is accepted and foreseen as something natural and necessary.

It is indeed obvious that, if S and S_1 are the present positions of the two double star components to refer (in the scheme of Professor Lenard), the rays, which are outgoing from the mobile stars, *can arrive at T*, those are which run along the directions ST and S_1T, and only them.

The propagation rate of the rays of light is not affected by the movement of the source of light (classical theory of the absolutely resting ether and their derivatives), so these rays arriving at T are exactly

the *initial* [1]) in the named directions *issued*.

If, however, the propagation rate of the rays of light are in agreement with the composition rule of the classical mechanics were affected by the source of light (concept of the ballistic type), then the following will enter: In *T* initially the rays emitted in the direction *ST* will not arrive, since they are diverted by the movement of the source of light, but other rays will arrive there initially after *SM*, S_1N, that is emitted in after the direction which form the angles demanded by the familiar views of aberration with *ST*. It takes place thus a simple radiation substitution, *which changes the results of the observations, which we will employ on earth, where we will always exactly see the light arriving along the direction ST*.

The absence of an aberration effect dependant on the movement of the source of light is a natural and necessary consequence of the law over the rectilinear propagation of light, which stands with taking any type of explanation in agreement, which recognizes this law and the "physical space" as a Euclidean space.

All in all the discussion of Mr. Tomaschek brings certainly a contribution against the relativity; but neither his attempts nor his arguments meet the ballistic conceptions. Rather the astronomical proofs aforementioned by me cause it to remain intact, since they stand on the firm *basis of the facts* that deserve a serious and impartial examination.

And here it seems no superfluous for me to add few words in order to repair a misunderstanding, which seems to have developed over the "purpose" of my investigations.

I never thought that send those to the credit of having made the Ritz's theory of electromagnetic phenomena onto a pedestal.

---

[1]) It because of brevity that I named "initial" as the direction that the ray would have from a resting star.

Rather, I believe that they proved only that "*the speed of the light adds itself to that of the source of light that emitted it*".

Our proposition is undoubtedly an essential element the Ritz theory. This is, however, just one of the many schemes; the statement about the speed of light can be constructed in accordance with the above. Its fate is quite separate and quite different from that claimed by me about the "ballistic principle". Sooner or later, the Ritz scheme like every different one must finally fall, if it could at all have present vitality. The ballistic principle against it must remain as an "empirical fact", after which the near and distant theoretical must be constructed, if they want to comprise the entire *reality*.

Palermo, Phys. Inst. of the University.

(Received 20th June, 1924.)