Philosophical dogmatism inhibiting the anti-Copernican interpretation of the Michelson Morley experiment

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Goal of the paper

The goal of this paper is to investigate scientific assumptions and dogmas related to the mainstream interpretation of the Michelson Morley experiment. The current interpretation denies the possibility of a motionless Earth or the existence of ether, in the context of relativity that cannot accept the abovementioned notions without collapsing. Yet, even though in the most recent years mainstream science postulates that there is no absolute time or motion, the debate is far than settled. One would be surprised to find out that the main assumptions that support the relativistic view are not science-related but have deep philosophical roots related to specific dogmatic beliefs prevailing in the scientific world from the time of Copernicus. At the end, the need for some people to deny the existence of absolute rest and time is nothing more than a need to deny the importance of human existence in the vast space of the cosmos. This need, deeply rooted in our science via cosmology's principles, seems to drive all scientific efforts to investigate observed phenomena, from the nature of light's speed in relation to the way Earth moves, only because we are afraid to ask the most obvious of questions: Does it?

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Overview

From the beginning of time, humans believed they were the center of the universe. Such important beings could be nowhere else than at the very epicenter of existence, with all the other things revolving around them. Was this an arrogant position? Only time will tell. What is certain is that as some people were so certain of their significance, aeons later some other people became too confident in their unimportance. In such a context, the Earth quickly lost its privileged position at the center of the universe and along with this, the ideas of absolute motion and time became unbearable for the modern intellect, which saw nothing but relativeness in everything. After years of accepting the ideas of relativity at face value without doubting them, scientists are now mature enough to start questioning everything as any true scientist would do, including their own basic assumptions. And one would be surprised to see that the basic assumptions of today's science in physics (and cosmology alike) are based on philosophically dogmatic beliefs that humans are nothing more than insignificant specks of dust. These specks cannot be in any privileged position in the cosmos, nor can their frames of reference. These specks cannot be living on a planet that is not moving while everything else is. There can be no hint of our importance whatsoever. Hence, the Copernican principle that has poisoned scientific thinking for aeons now. When one analyzes the evidence provided by science to support the idea of relativity though, he would see that the same evidence can more easily and simply fit into a model where the Earth stands still. Yet, scientists preferred to revamp all physics by introducing the totally unintuitive ides of relativity – including the absolute limit of the speed of light – than even admitting the possibility of humans having any notion of central position in the cosmos. True scientists though should examine all possible explanations, including those that do not fit their beliefs. To the dismay of so many modern scientists who blindly believe the validity of the theory of relativity at face value, the movement towards a true and honest post-modern science where all assumptions are questioned, necessarily passes through a place where the Earth we live in stands still. Non-relativistic explanations of the Michelson Morley experiment, related to a motionless Earth or to ether, are viable alternatives that deserve their place in modern scientific thought.

Method of research

The problem of trying to understand the philosophical assumptions behind the relativistic and non-relativistic interpretations of the Michelson Morley experiment will be analyzed with the help of three tools: Science, science history and philosophy. Science history will first provide the context of the theories and will give an explanation on how theories related to ether were discarded vis-à-vis the theory of relativity. The reasons for which specific assumptions were used instead of others will be analyzed and explained with the help of philosophy. Last but not least, science itself will help to explain – in simple terms – why and how the data many people see as proof for the theory of relativity can also be portrayed as evidence for theories which are supported by the exact opposite assumptions that theory uses.

1. The Michelson-Morley problem

The details of the nature of ether were for years a matter of research. Scientists tried to understand the properties ether must have to allow the propagation of waves or the effect ether had on objects travelling in it.

A very famous experiment took place in 1887 to investigate the speed of light in ether – the Michelson-Morley experiment (referred to as the "M-M experiment" from here on). The results of that experiment are widely known. Essentially the researchers tried to detect variations in the speed of light depending on the way Earth was moving towards or away from the Sun.

And they failed to do so.

The results were amazing and hard to manage. Based on the science of the time, these results indicated that the Earth was motionless, since no variation was detected in the speed of light. But this option could not be easily accepted, as we will see later on.

But before we can speak of this, a short description of the context is needed.

1.1 On the nature of Ether

One of the main questions of science is about the nature of space and time. Long before Einstein, great philosophers and scientists alike tried to answer this question with little or more success.

Despite the different opinions posed, what all scientists and philosophers agree on is that there must be 'something' that penetrates all existence. From Descartes to Kant and from Maxwell and Newton to Lorentz and Einstein, all people debating the subject inherently accept that space cannot be empty as in 'nothing is there'.

Regardless of differences between theories, its role is important in numerous ways. If not filled with particles coming in and out of existence (quantum fluctuations) or with a field impacting everything inside it (gravity), space is filled with the potential of a field (e.g. curvature of spacetime) or it serves as the context of things we measure, providing the substrate of our observations.

Only to remind us what Parmenides said from the beginning…

Nothing cannot exist!

Nothing does not make sense.

Accepting the existence of 'nothing' in space led to a series of paradoxes that science could not accept. Thus, scientists of the time accepted what seemed logical: that things travel into a medium. That included matter as well as waves. That was the basic premise of science long before Einstein. And to answer this, scientists thought of the most obvious answer: a medium (tautology was always the best way to progress in science).

They named this medium "ether" (or aether, derived from the Greek word αιθέρας). And for years that followed, they accepted its existence as a fact. Everything that was travelling, from the planets to the light of the stars, was travelling inside ether.

But if ether is there and everything moves inside it, what is its nature?

There are many potential answers, everyone different than the other.

One of the attempts to dwell on the intricate details of ether was the event that initiated an avalanche of changes in modern physics.

1.2 Michelson & Morley measure the speed of light

At some point in time, Michelson and Morley tried to measure the speed of light in ether in the infamous homonymous Michelson-Morley experiment. Since scientists believed that the light traveled in ether and since Earth was moving in relation to ether, everyone believed that a measurable variance of light's speed would be detected as our planet moved towards or away from the Sun.

Yes, the experiment did not detect any variance whatsoever. Michelson and Morley failed to measure any difference in that speed depending on how Earth is moving in space in relation to the Sun.

Because of that, Relativity was born to explain things: The speed of light is constant! And many paradoxes where created by that. And many more paradoxes where introduced to support and explain those paradoxes. And science, as Wittgenstein once said, took people to sleep…

But one day they will wake up they will see that a much simpler explanation is possible, as illustrated from the purposefully simplistic depiction of the problem above.

As I was already mentioned…

"Michelson and Morley failed to measure any difference in that speed depending on how Earth is moving in space in relation to the Sun"

Can you detect the problem?

If you read Aristotle, you would.

You see Aristotle was very intuitive in saying that the answers we seek are sometimes hidden in the questions we ask. Because depending on our beliefs, we formulate these questions by already accepting things that are not proved, things that we then take for granted without even noticing. Look carefully at the sentence above. Surely the experiment failed to measure any variation of the speed of light in relation to the moving Earth.

But…

Who said that the Earth is indeed "moving" in the first place?

Remember, a true scientist is never afraid to ask stupid and obvious questions. It is in these simple questions that the most obscure monsters of the intellect are hiding in plain sight...

Let us explore the monster while it is still breathing.

1.3 Possible interpretations

The Michelson Morley experiment results posed a serious problem to physicists of the day. The way the problem was solved however reflected specific philosophical beliefs and not based on purely scientific criteria. These beliefs we ought to acknowledge, since only by knowing the underlying assumptions of a theory can you truly judge it properly.

But else can we explain the negative result of the experiment?

Let us list the main three solutions here:

1. **Motionless Earth solution**: There was no variance detected in the speed of light while Earth was moving, because the Earth is not moving.

2. **Dragging ether solution**: The Earth is moving in ether and dragging it as it moves. That is why no variance in the speed of light in relation to ether was not detected.
3. **The relativity solution**: The Earth moves but there is no ether. The speed of light is absolute!

Out of these three options, all equally valid (at least based on the evidence available – we will see later on how this does not play a major role in the argument made by this paper), Einstein and mainstream science chose the third one.

1.4 Criteria to select the best solution

Is the option selected by Einstein (and later on by mainstream science) a correct solution?

Well, in science that question does not make much sense.

Every theory that adheres to the available data must be accepted at least as scientifically valid. And if all these three options are capable of generating theories which do that, then as far as science is concerned, they are all acceptable.

Yet, there are additional criteria that can help us analyze whether the option we have opted for is the optimal one. A list of such criteria includes:

- **The simplicity criterion**: Is the option selected the most simple one? Does it require the less assumptions possible than the alternatives?
- **The practicality criterion**: How much rework of all existing theories does the new theory require? Do we need to rewrite everything or small adjustments will just do the trick?
- **The philosophical dogma criterion**: Does the theory adhere to my philosophical dogmas? If all are equivalent, why not select the one that

The first criterion is related to the common intuition we all have that the simplest of the solutions must be the one closest to the truth. Leaving aside the fact that philosophy does not even agree whether 'truth' per se exists, it is a type of common sense criterion. Not purely scientific in nature, but yet again, perhaps because of that the most scientific of them all.

The other two criteria are not scientific.

Guess which criteria were used to select the three option.

2. Earth standing still as a solution

The motionless Earth solution/ interpretation of the M-M experiment results is by far the most elegant one. After all, when you fail to detect any effect of the motion of something, the first thing that should come to the rational mind is to question the initial assumption that this something is indeed moving. The **simplicity criterion** is surely favoring this option.

Regarding the other two criteria mentioned in Chapter 1.4, we must note that by accepting that solution, we would nevertheless have to discard the Copernican Principle. On the other hand, it is equally (or even more) important to note that all our physics regarding movement, electromagnetism and waves would remain intact. Transformations with regards to coordinate systems which move in relation to each other would still work in the intuitive way they were working. Philosophically speaking, the option is the most philosophically-neutral one: There are no hidden philosophical dogmas guiding our selection.

As Lincoln Barnett said: The Michelson-Morley experiment confronted scientists with an embarrassing alternative. On the **one hand they could scrap the ether theory which had explained so many things** about electricity, magnetism, and light. **Or if they insisted on retaining the ether they had to abandon the still more venerable Copernican theory that the earth is in motion**. To many physicists it seemed almost easier to believe that the earth stood still than that waves – light waves, electromagnetic waves – could exist without a medium to sustain them. It was a serious dilemma and one that split scientific thought for a quarter century [1, p. 3]. In a book endorsed by Einstein, theoretical physicist James Coleman admitted: **"The easiest explanation was that the earth was fixed in the ether and that everything else in the universe moved with respect to the earth and the ether….Such an idea was not considered seriously, since it would mean in effect that our earth occupied the omnipotent position in the universe, with all the other heavenly bodies paying homage by moving around it" [1, p. 3]**

Do all the above ring a bell? They certainly do. Hubble was following the same line of thinking when selecting his cosmological model. Again, the infamous Copernican Principle came forward and forced science to choose one path instead of the other.

As explained already in the relative paper I published for Hubble and the Copernican Principle [2], the fact that Earth rotates around the Sun is not a fact at all. It is now known that a physicist can easily choose any point as the center of the system he examines, without that having any effect on the validity of the physical description of that system. The selection of the heliocentric over the geocentric system was made upon the philosophical dogma that we are insignificant; that is the main premise of the Copernican Principle. Not something 'proved' (anyway such a thing does not exist in the context of science), but a purely dogmatic stance dictated by religious (or rather, anti-religious) beliefs. Even though the available data showed that the Earth is at the center of the universe (literally) [3], Hubble chose to ignore them and opt for another option to explain the phenomena observed. Based on the Copernican Principle which holds that we cannot have a privileged position in the universe (Why? Just because! No, there is no justification for this principle that we use as an axiom), Hubble chose one cosmological model over the other.

In the same way and on the same grounds, the first solution to the M-M problem was discarded. The same line of thinking was followed by Einstein as well, when selecting the solution to the problem posed by the M-M experiment. The easiest potential solution was discarded from the beginning, simply because the Copernican Principle said so. Regarding physics, scientists made their selection loud and clear once more based on the principle that there can be no privileged position, that there can be no possibility of Earth standing still. Or for anything else actually, like ether (for that we will talk later on). All motion must be relative, there can be nothing at absolute rest.

As Ronald W. Clark describes it, the renouncing of the whole Copernican theory was "unthinkable". [1]. In the same way Hubble thought it was unthinkable to accept the Earth at the center of the cosmos, Einstein thought it was unacceptable to speak about an immobile Earth. The common denominator for both being one: The Copernican Principle. We can have an in-depth analysis of why that principle is so pervasive and persuasive. Yet, this is not the scope of this paper. The goal of this paper is to show that the mainstream way of thinking is based on legs of clay. And that if we select different assumptions (simply by… choosing them), then we result in a whole different cosmos.

Of course, by rejecting the motionless Earth solution, a price had to be paid. And that was the total revamp of physics that resulted after the acceptance of the theory of relativity on the premise of the absolute light speed. (Remember, we always speak about the acceptance of the initial unproven premises here, not about the inherent internal consistency of the theory, which is taken for granted) And yet, scientists were accepting this cost in order to keep their precious unprivileged position in the cosmos.

The rest, as they say, is history.

What is our duty though, is to acknowledge that history.

And to be ready to change it.

To recognize the abovementioned process and to always remember that there are more than one ways to interpret the same evidence. That is and that has been the process followed by the scientific method. Theories formulated based on data and then new theories formulated to explain the same data[1] in a different way. In a cynical turn of events, the moment we accepted that everything is moving, was the moment science stopped in its tracks.

Note that the actual solution to the problem is not important here. What is important is to understand that the Earth standing still is one viable solution to the problem at hand. And that the alternative solutions to the M-M experiment were not only discarded without providing justification whatsoever, but they were deliberately buried under the veil of the history of science as irrelevant.

We must always keep in mind that it is very dangerous though to believe in facts. True scientists need to keep an open find for all possibilities.

[1] Surely this usually – but not always – happens with the advent of new data. However, the new theories do interpret the 'old' (existing) data as well. In that sense, the initial data are then seen in a completely different context of the new theory.

3. Ether-based potential solutions

As already mentioned, the immobile Earth is not the only way to interpret the M-M experiment. There exist also other two alternatives:

- The Earth moves and drags the ether along as it moves through space. That is why we cannot detect any change in the speed of light in ether as Earth moves.
- The Earth moved but there is no ether. The speed of light is an absolute number not related to the movement of the frames of reference.

For the last solution we will not speak much in this paper. It was anyway the solution finally selected and it is easy to find many books regarding the subject [4] that analyze it in great extent. More on that in the next chapter.

Regarding the ether-based solution, it was (and still is) an equally acceptable solution like any of the other two. This option was discarded based on philosophical grounds similar to the ones that led to the discarding of the motionless Earth option.

In a cosmos where motion is relative, ether could not stay as-is. Accepting its existence would imply the possibility of absolute rest. Even though ether dragged along Earth was moving, the ether per se would refer to something standing still in absolute terms. And the existence of absolute rest was incompatible with the (special) theory of relativity.

Einstein explained by means of his famous K and K' models what led him, initially, to dispense with ether: *"... if K be a system of coordinates relative to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations without any change of meaning also hold in relation to any new system of coordinates K' which is moving in uniform translation relative to K. Now comes the anxious question:* ***Why must I in the theory distinguish the K system above all K' systems****, which are physically equivalent to it in all respects, by assuming that the ether is at rest relative to the K system? For the theoretician such an asymmetry in the theoretical structure, with no corresponding asymmetry in the system of experience, is* ***intolerable****. If we assume the ether to be at rest relative to K, but in motion relative to K', the physical equivalence of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless unacceptable."* [1, p. 635 - 648]

Again, the grand old debate of whether a 'privileged' position exists. Again the same grandiose expressions of 'intolerable' positions, erringly similar to the expressions used afterwards by Hubble. The aeons old debate of whether we are important or not, coming back at a different form, yet all the same whatsoever. Surely, the privileged position of the Earth is not at stake here, yet the existence of any privileged position is. You see the Copernican principle is nothing else than a special case of more general principles, namely the Cosmological and the Mediocrity principles.

The mediocrity principle is the philosophical notion that "if an item is drawn at random from one of several sets or categories, it's likelier to come from the most numerous categories, than from any one of the less numerous ones". The principle has been taken to suggest that there is nothing very unusual about the evolution of the Solar System, Earth's history, the evolution of biological complexity, human evolution, or any one nation. It is a philosophical statement about the place of humanity. The idea is to assume mediocrity, rather than starting with the assumption that a phenomenon is special, privileged, exceptional, or even superior than others [16]. The Cosmological Principle on the other hand supports the idea that "on a large scale the universe is pretty much the same everywhere" [17]. Both of these principles essentially say the same thing as the Copernican principle but on a different level. Overall, all three state that there can be nothing 'special' about anything in the cosmos. There can be no God, sorry I mean there can be no ether standing still, no Earth standing still, no nothing in a more superior position than anything else [18].

If we are to judge the selection of the dragged-ether solution by our criteria laid down in Chapter 1.4, we would say that it seems like a viable yet not optimal option. Surely it is not as simple as the motionless Earth option, since it introduces the ether dragging phenomenon as well. Regarding the practicality aspect, the same as in the previous solution apply: we would keep the physics we have and we would have to revamp the cosmology. Last but not least, regarding the philosophical criterion, there are not many hidden assumptions here, except obviously from the fact the ether's existence is assumed.

4. The relativity solution

As mentioned above, the detailed analysis of the relativity option is not in scope for this paper. The goal is to show that alternative solutions to the M-M results exist.

A short description of how the relativity solution would stand up to the **criteria we mentioned in Chapter 1.4** is crucial though into our analysis.

Regarding the **simplicity criterion**, the relativity fails big time. In order to explain the results of Michelson and Morley, it introduces an unintuitive absolute limit in the speed of light and then, based on that and other premises it creates a chaotic complex of paradoxes that still baffle physicists around the world[2]. Paradoxes that are still confused as 'reality' in the context of the general tendency of people to forget that science deals with theories and not with what is real [5]. Length contraction, time dilation, curvature of space-time are some of the components that are now necessary to explain the cosmos around us. Things which would be completely useless have we opted for the simplest of the solutions. But it seems we are too unimportant for that option.

Regarding the **practicality criterion**, again this option seems not to have a very high score. Choosing to accept the relativity premises, science needs to revamp all the physics related to light and movement. Of course, cosmology would stay unaffected on the other hand. Accepting that two twins on a relative motion to each other age differently (check the "Against

[2] For an analysis of how the Theory of Relativity should not be interpreted literally, check the related article "Against the realistic interpretation of the Theory of Relativity" by Spyridon Kakos at https://harmoniaphilosophica.com/2019/07/20/against-the-realistic-interpretation-of-the-theory-of-relativity-and-any-other-theory/.

the realistic interpretation of the Theory of Relativity" paper [5] on an explanation on how the twins paradox is misinterpreted as 'real') at least makes us keep the most precious position of being nothing in the cosmos.

Last and most importantly, the relativity solution fails the **philosophical criterion** in an astounding scale. In order to accept that option we adhere to specific philosophical dogmas relating to our importance in the world. Such opinions are widely known to be related to anti-religious materialistic philosophies that have been in fashion for the last centuries. Humans who take a stand against religion tend to adhere to such philosophies with zeal. And although we cannot say anything regarding the actual connection of these philosophies with the people who made this specific choice and still support it, we cannot but admire the almost obvious connection of the Copernican Principle and all Copernican Principle-compatible premises with such ways of thinking. The selection of the relativity option is not a casual selection of one option over the other. Opting for that solution is full of philosophical dogmas charged with aeons of tension; hence the unusually and unscientifically super-charged language ('intolerable') used by scientists supporting this option over the others.

How astonishing beings humans are.

Capable for the most astounding of feats.

And for the most amazing of mistakes.

Einstein could not accept what would kill his theory.

And thus, as simple as that, ether died.

And thus, 'space-time' was born.

Along with complexities, paradoxes and unintuitive science based on contracting lengths, slowing clocks and twins who seem to age differently based on relative motions that we cannot define properly. All because we could not accept the much simpler solution of an immobile Earth.

But was this really the end of ether?

A more detailed look implies no.

4.1 Ether with a new name

Even though many people today believe that Einstein discarded ether altogether, Einstein actually replaced ether with something else that essentially had similar properties: "something" that penetrates all the cosmos, being the context for all the phenomena we observe. It must be evident by now that the change was not much of a change to speak of.

Essentially, Hermann Minkowski's idea of four-dimensional spacetime is the conceptual substitute for the ether. [6] The metric tensor of Einstein [7] is essentially replaced ether that penetrates all space and provides the background substrate for gravity to manifest itself. Like ether provided the substrate for science back in the days of Lorenz.

Philipp Lenard, one of Einstein's most vocal opponents at the time, in a 1917 speech titled "Relativity Principle, Ether, Gravitation" remarked that **Einstein merely renamed ether as "space,"** and concluded that General Relativity theory could not exist without ether. As Einstein himself describes it: *"No space and no portion of space [can be conceived of] without gravitational potentials; for these give it its metrical properties without which it is not thinkable at all….**According to the general theory of relativity, space without ether is unthinkable;** for in such space, not only would there be no propagation of light, but also no possibility of existence for standards of space and time (measuring rods and clocks), nor therefore any space-time intervals in the physical sense."* [1, p. 635 - 648]

And now we do not have ether. But the metrical tensor field and space-time. An ether nonetheless, but without its most important characteristic: absolute rest. [1, p. 635 - 648]

4.2 Einstein on Ether

The best place to begin in discovering what constitutes that ether for relativity (or 'space' as we now know it) is to investigate the way Albert Einstein himself is theorizing on the subject.

In 1916, Einstein wrote: "*in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, i.e., no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity… Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together. **It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the ether, for I can see that with the word ether we say nothing else than that space has to be viewed as a carrier of physical qualities"*** [1, p. 635 - 648].

What Einstein says here is the essence of his stance towards ether. Initially, the ether could not exist because if it did, it would imply that absolute rest is possible, thus nullifying the validity of the theory of relativity per se. But at the advent of the general theory of relativity, ether was needed to provide the substrate that would essentially explain the existence of gravity and action at a distance: the curvature of 'something' (now known as 'space-time') was required to explain the movement of planets on the sky.

In simple words, Einstein did not renounce ether. He renounced ether with physical properties as accepted by others at the time with the only goal not to leave an opening for the possibility of absolute rest. He did however use the notion of ether (albeit with a new name to avoid any misunderstandings or unwanted connotations) with specific physical qualities to support his action-at-a-distance explanation.

The ether of General Relativity only had to incorporate gravity, thus Einstein had to develop another type of ether in order to unify gravity with electromagnetism, which led to embellishing Riemann's geometry with what was known as "tele-parallelism" and six more tensor fields in addition to the ten already being used by General Relativity. [1, p. 635 - 648].

4.3 Evidence for Ether

Even though the null result of the Michelson Morley interferometer experiment in 1887 has been widely regarded as proof that the ether does not exist, there are still evidence proposed by science that ether might actually do.

Poincaré continued to insist upon the existence of ether for three main reasons: (1) stellar aberration (check related studies of the Arago and Airy experiments); (2) "action-at-a-distance" whereby gravity and electromagnetism could be transmitted over vast distances; (3) rotational motions (of which we saw an example in Sagnac's 1913 experiment). Although Einstein felt that he had answered the phenomenon of stellar aberration (but in reality he had not), he did not have a quick answer for rotation and action-at-a-distance. [1, p. 635 - 648].

To-day, ether keeps on coming back with various shapes and forms. Many scientists call for the need of 'something' that would act as an absolute frame of reference for our view of the cosmos [8] [9]. This was something already tackled in my previous papers [5]. When the theory of relativity speaks for 'speed' what speed does it refer to anyway? The hypothesis provided by ether gives a solution to that simple yet complex problem. There must be something relative to which we measure things, otherwise there is no meaning whatsoever in talking about speeds in the first place.

A number of experiments have detected anisotropy in the speed of light by exploiting the effect known as Fresnel Dragging to reveal the different travel times by light in each direction between two points [10].

Astrophysicist Toivo Jaakkola claims that *"The ether hypothesis was thought to be buried by the Michelson-Morley experiment, but today it is more alive than ever, in the form of the CBR [Cosmic Background Radiation]"* [1, p. 635 - 648].

That evidence call for a need to re-evaluate the premises we have placed our faith upon. And perhaps be ready to choose a different path than the current one.

4.4 Ether-based theories equivalence

One very important thing to understand when discussing alternative solutions to the M-M problem, is the equivalence of the possible solutions. There is no privileged solution based on the data available. The ether-based theories trying to explain the M-M experiment (e.g. the one postulated by Lorentz[3]), are essentially identical with the theory of relativity proposed by Einstein. There is no way to distinguish one from the other based on the evidence available, which all fit both.

Some believe that the difference between the two theories is mainly related to the way they formulate their assumptions. Both try to explain the cosmos and they are simply doing so in a different way.

$$\begin{bmatrix} \text{classical} \\ \text{space-time} \\ \mathbb{E}^3 \times \mathbb{E}^1 \end{bmatrix} + \begin{bmatrix} \text{physical} \\ \text{content of} \\ \text{Lorentz} \\ \text{theory} \end{bmatrix} = \begin{bmatrix} \text{empirical} \\ \text{facts} \end{bmatrix}$$

$$\begin{bmatrix} \text{relativistic} \\ \text{space-time} \\ \mathbb{M}^4 \end{bmatrix} + \begin{bmatrix} \text{special} \\ \text{relativistic} \\ \text{physics} \end{bmatrix} = \begin{bmatrix} \text{empirical} \\ \text{facts} \end{bmatrix}$$

Equivalence of Lorenz and Einstein's theories [11]

Differences between the different theories obviously do exist. Choosing one over the other is at the end a matter of choice, if such a choice is valid when one of the them (the Lorentzian one) uses clearly less assumptions than the other (refer to the analysis made above based on the Chapter 1.4 criteria). Despite those differences though, they are both at the end empirically equivalent [11].

Special relativity and Lorentz's theory are completely identical in both sense as physical theories and as theories of physical space-time. All statements of special relativity about those features of reality that correspond to the traditional meaning of terms 'space' and 'time' are identical with the statements of Lorentz's theory. On the other hand, all statements of Lorentz's theory about those features of reality that are called 'space' and 'time' by special relativity are identical with the statements of special relativity. The only difference between the two theories is terminological [12].

Of course there are points where there are differences. The theories themselves are too broad to even be possible for someone to claim complete equivalence in every single aspect. For example, there are scientists who claim that the Lorentz theory can explain more phenomena than the theory of relativity. For example, Lorentz invariant cosmology holds promise of being able to account for the ratio of gravitational mass of galaxies to their baryonic masses (though this requires a tedious computation yet to be accomplished); i.e., it conceivably could account for the existence of so-called "dark matter". General relativity does not [13]. On the other hand, other writers explain the the Lorentz theory needs more assumptions that Einstein's [14].

Again, the details of this debate are mute.

[3] Note that in the theory that Lorentz postulated, the M-M experiment was explained by the length contraction also affecting the measuring devices, thus leading to a null result.

What is important is the possibility of alternative explanations [15].

And that they are all largely compatible with the data.

True science is not about selecting a path.

It is about acknowledging the existence of other paths as well.

Conclusion

What is obvious is most of the times the hardest thing to grasp. For aeons now, humans thought of themselves as the center of everything. Did they hold that belief because they made an in-depth analysis of all possible explanations of the cosmos and after careful consideration they came up to this justified example? No. They did so because – out of their instinct – this sounded logical and true. It felt true. And perhaps especially for those reasons, this view was more scientific than it could ever be. Now we look at the Sun revolving around Earth at the sky. And we admire how Earth rotates around the Sun instead. We see evidence for us not moving. And yet we formulate theories on the premise that we do. We are so much convinced of our insignificance that any other solution is simply “intolerable”. Instead of scientists we have become cowards. Look at our selves again we must. And honestly ask: Why can’t we catch that light?

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