Traditional Ether-hypothetic miscalculations in the Michelson-Morley Experiment

© Dr. Gyula Korom
E-mail: korom.mem@axelero.hu

Key words: phasor theory, path difference, optical path difference, phase difference, phase shift, phase constant, optical distance, optical distance difference, Michelson interferometer, Michelson-Morley experiment, Special Relativity Theory, Ether hypothesis.

Summary: It is shown based on a gedanken-experiment in the Ether hypothesis, that the difference of the two wave-propagations and the “optical” path difference (OPD), or more simply the optical distance (OD) is the same only in systems resting in the conductive medium. In case of moving sources and moving observers, the OD is equal with the actual distance of the source and the observer from each other in the phase-space, and is not necessarily equal with the length of the wave propagation across the medium. It has turned out that the phase difference of the amplitude-splitted, and later reunited electromagnetic vibrations in the Michelson-Morley experiment will not change while the speed difference of the Ether-wind is changing, and/or the Michelson Interferometer is rotating. Only phase shifts with equal magnitude will occur at the observers, but the interferometer is insensitive to these shifts, and the observed frequency remains constant because of a double Doppler effect. Consequently, the circular interference fringes observed on the screen will not be dislocated. These results urge the revision of the significance of the Theories operating with relativity of Time and absolute constant light speed, refusing the existence of the Ether. Besides the widely used, derived terminology of “Optical Path Difference”, author suggests to use – as for the future – the equivalent, directly measurable “Optical Distance”, and finally, also the “Optical Distance Difference” because it describes much better the real physical events going on in the Michelson-Morley experiment.

I. Light route, Optical Path Difference, Optical Distance

Consider the four stages of a gedanken-experiment on Figure 1. Let us stand on the platform of the Ether Hypothesis. Note that standing wave chains generated in the Ether by resting \( F_0 \) and moving \( F \) are practically equivalent. Phase constants, phases and frequencies generated in the direction of \( x \) axis by moving phasor \( F \) synchronized with the resting phasor \( F_0 \) [1] are the same respectively within the intervals shown on Figure 1. Consequently, constructive interference will emerge when the two vibrations superposed, the vibrations of the medium support each other in all phases. It is important to realize that phase constant of the moving source is continuously changing, but this phenomenon has no influence on the phase constant and on the phase of the vibrations generated by itself in the Ether!

1. Let us suppose that the light beam is propagating in a hypothetical medium called Ether with constant speed \( c \) (top of Figure 1). Light source \( F_0 \) is in the origo \( O \) of the \( K_0 \) Cartesian coordinate system resting in the Ether, which is disturbed by at frequency \( f_0 \).

At points \( A \) and \( B \) on the \( x \) axis two transparent thin film sheets \( M_1 \) and \( M_2 \) are at rest. Now the length of the light-route from \( F_0 \) to \( M_1 \) is \( I \), while that to \( M_2 \) is \( L \).

In this first case, the spatial distance of \( A \) and \( B \) within the standing waves of the medium will define the phase difference of these two points. This distance is called as Optical Path Difference (OPD) in the literature of Science of Physics. In our case, OPD (on Figure 1 \( \Delta \)) and difference of the light routes between the source and the points \( (ds) \) is equal: \( \Delta = ds = L - I \). Nevertheless, we will see later that this is always true only in resting systems. In systems moving in the Ether OPD is not always equal to \( ds \). This is the reason why author will use a more clear term from now on, namely the Optical Distance (OD), in order to avoid some misunderstandings.

In this case the rate of the light-routes will be \( \frac{l}{L} = \frac{l}{l + \Delta} \). We will see that in systems moving in the Ether these rates can be subject to changes.

Note when in our case the distance between \( M_1 \) and \( M_2 \) is constant, and both start moving towards the same direction along the \( x \) axis in the phase-space, their motion will not influence the OD, the phase difference, and the light route difference (\( ds \)) as well. However, the frequency observed by the
moving observers evidently will not be \( f_0 \) (Doppler effect), the rate of the distances the light beams have taken in the Ether will also change.

We have to emphasize that in case \( M_1 \) and \( M_2 \) are also secondary wave sources, their phase constants will of course change depending on their optical distances \( (OT) \) from the primary source. Nevertheless, this phenomenon has no impact on the phase difference between them, because their relative optical distance \( (OT) \) is constant.

2. This is a gedanken-experiment. Consequently can tune the \( f \) frequency of source \( F \) (moving along the \( x \) axis towards \( O \), then \( A \) and \( B \) at a speed \( v \)) so, that the Doppler effect affected frequency of the standing wave disturbances generated in the Ether will be \( f_0 \) in the direction along the \( x \) axis of \( K_0 \) (2\textsuperscript{nd} part of Figure 1).

When \( F \) is also at the \( O \) origo of \( K_0 \), let start two light beams (one from \( F_0 \) and one from \( F \)) exactly in the same phase. In this case the two disturbances generated by \( F_0 \) at rest and moving \( F \) in the Ether along the \( x \) axis will have the same \( f_0 \) frequencies and when the two beams will arrive at \( A \) and \( B \) in the same phase, and will have run along the same distances \( (I \) and \( L) \). One can see that the OD (on Figure 1 \( \Delta \)) between \( A \) and \( B \) is the same for both beams coming from the moving and resting sources, and the light route difference of both light beams are also equal: \( OD = \Delta = L - I = ds \).

It is clear, that both the route difference and the OD are the same for a resting and/or for a moving source, the phase difference between \( A \) and \( B \) will be the same as well in both cases.

The rate of the light paths in the Ether for this example is \( \frac{I}{L} = \frac{l}{l + \Delta} \) as well.

Let \( M_1 \) and \( M_2 \) approaching \( A \) and \( B \) along the \( x \) axis also at a speed \( v \) so, that at the very moment when the light beam coming from \( O \) arrives at \( M_2 \) after route \( L = ct_2 \), then \( M_1 \) and \( M_2 \) will be exactly at \( A \) and \( B \) respectively. In this case, the light beam will arrive at \( M_1 \) a bit earlier, running along a distance \((I - vt_2)\), while the calculated actual optical length of the light route till \( M_2 \) will be \( L - vt_2 \). As a result, the OPD, and its simpler equivalent OD between \( M_1 \) and \( M_2 \) remains

\[
\text{Calculated OPD} = (L - vt_2) - (l - vt_2) = L - I = \Delta = OD.
\]

In the other very moment, when \( M_2 \) is in \( B \), \( M_1 \) is at \( A \) yet, – according to the phasor theory [1] – their OPD is: \( \text{Measurable OPD} = L - I = \Delta = OD \).

However, the light route difference \( (ds) \) between the very moment when the beam passes \( M_1 \) and the other very moment when it arrives at \( M_2 \) is \( |ds| = L - (l - vt_2) \neq \Delta \). One can see that while calculating the phase differences in moving systems, using the Path Difference instead of the Optical Path Distance (OPD), or instead of Optical Distance (OD) should be avoid, because this method can produce very serious complications, as the History of XX\textsuperscript{th} Century Physics has proved it!

Consider moving observers \( M_1 \) and \( M_2 \) also as moving secondary sources, surfing across the crests and troughs of waves in the vibrating phase-space from moment till moment. As if they were sitting
on a roller coaster in Disneyland. This means that the phase constants both of them are continuously changing. Nevertheless, this permanent change has no influence on the phase constant of standing waves generated by the moving sources in the Ether, because the phase constants of the moving sources are:

- in direct proportion to their actual distance from the primary source,
- shifting with the same rate, as their velocities in the phase-space are equal.

As a whole, the resting and the moving source will generate vibrations in the medium at the same phase, if the basic frequencies of two sources are equal, because the phase constant of the moving source is changing at the same rate as its phase is changing.

3. Regarding the rates of the light routes, let us see the third example on Figure 1. Now the primary source F (moving at speed v along the x axis, generating disturbances in the Ether at the same frequency f₀) firstly is not at the O origo, and secondly is much closer to both A and to moving M₁ and M₂ (No 3. on Figure 1). Sources F and F₀ are vibrating the medium in the same phase (with the same phase constant) as before, so the standing wave “surface” (the vibrations) of the phase-space is equivalent with examples No 1 and No 2. Now let we F leave a beam at a later moment. This beam will arrive at A running along route a, and will arrive at B running along route b, with the same OD (phase difference remains as it was in examples No 1 and 2).

The light route difference (ds) and OD between A and B are: $|ds = b - a = \Delta = OD|$, and clear that the phase difference between A and B will be the same as well.

But the rate of the light routes between A and B is $\frac{a}{b} = \frac{a}{a + \Delta}$. It is clear that $\frac{l}{l + \Delta} \neq \frac{a}{a + \Delta}$

In this case it is also true that the light path difference calculated in the Ether and the Optical Distance (or Optical Path Difference) are not equal: $|ds = b - (a-vt_2)| \neq \Delta$.

4. Extraordinary attention has to be paid for the example at the bottom on Figure 1, as it is the case in the Michelson interferometers [2]. Should be source F – being phase and frequency synchronized to F₀ and with the same phase constant – in the position of observer M₁ at a distance $\Delta$ from M₂. Let leave F a beam so, that the light beam will reach M₂ at that very moment, when F and M₂ are at A and B subsequently. (This is the case in the arm of the Michelson Interferometer, along which the light beam is propagating from the amplitude splitter to the transferable mirror against the Ether-wind.) Laser F will disturb the Ether within the same phase with the same frequency as does F₀ resting at point O, as the change is only that F has moved towards A and B along the x axis. We have also discussed that the phase constant of the source is continuously changing during the course of the motion, but this change is not conveyed onto the vibrations of the medium, which keeps its original phase constant, because the actual phase of the moving source is changing at the same rate as its phase constant is changing.

Now OD ($\Delta$) calculated at the very moment when F and M₂ are at A and B respectively is the same: $OD = d - c = \Delta$, consequently the phase difference between the F source and M₂, or between A and B will not change either. But now the rate of the light routes in the Ether will: $\frac{c}{d} = \frac{c}{c + \Delta}$

Furthermore: $\frac{l}{l + \Delta} \neq \frac{a}{a + \Delta} \neq \frac{c}{c + \Delta}$

It is clear from the four examples shown on Figure 1 that – both in a simple phase-space, or in a complex, interference phase-space generated by two or more standing and/or moving sources – the phase difference between two observers staying at two different points in the phase-space will be defined by:

- their spatial distance (OD),
- the phase constant of the primary source,
- the frequency of the primary source.

The velocity of light, the length of the light-path, and the time necessary for the light running along its path have no influence on the phase difference.

The phase difference of the two observers (M₁ and M₂) moving at the same v velocity in the Ether remains constant, even if the speed of the waves is not c. Having the interference phase-space been built, only standing waves disturb the vibrating motion of the medium, and spatial distance of two wave fronts of these
standing waves will give us the Optical Distance (OD) and the phase difference of the two wave fronts. The Optical Distance is always equal with the spatial distance of the two observers.

One can see from the above-mentioned examples, that in moving systems the rate of the light paths may change, meanwhile the phase difference remains the same.

It has to be emphasized that when \( M_1 \) and \( M_2 \) are not only observers, but they are also secondary sources, their phase constants will change depending on their spatial distances (or OD-s) from the primary source. Nevertheless, as their spatial distance (or OD) is constant, their motion neither will change the phase constants of the vibrations in the Ether, nor the phase difference between them.

In the very specific case when both \( M_1 \) and \( M_2 \) are observers and secondary sources, and they are moving at the same distance from each other with the same velocity across the standing waves generated by \( F_0 \) primary source resting in the Ether; the distances between the observers and the primary source \( F_0 \) are changing as well:

- On the one hand the followings will change:
  - The rate of the light routes.
  - The difference of the light routes (\( ds \)).
  - The phase constants of the secondary sources.

- On the other hand the followings remain constant:
  - The frequency observed by the moving observers.
  - The Optical Path Difference (OPD)
  - The Optical Distance (OD) in our examples \( \Delta \), and
  - The phase difference between the observers (and the secondary sources).

II. The equivalence of moving sources, and phasors resting in far distant.

In all the 2nd, 3rd and 4th examples on Figure 1, and also in general is true that the wave source \( F \) with basic frequency \( f \), moving with velocity \( v \), generates standing waves with frequency \( f_0 \) in the Ether. This source can be substituted by a source resting very distant in the Ether somewhere near the negative endless of the \( x \) axis (see the 1st example on Figure 1). This substitution means that the phase constants and the frequencies of the vibrations in the Ether generated by the original (substituted) moving sources, and those of the resting substitutes are equal respectively. Let we apply these rules onto the secondary sources along the translating \( x \) axis of the Michelson interferometer [2].

Let us first substitute the amplitude splitter of the Michelson interferometer (it is moving \( F \) generating vibrations in front of itself in the Ether with frequency \( f \) in the 4th example on Figure 1). The substitute of the moving primary source \( F \) will be an \( F_1 \) source (with the same phase constant as \( F \) and vibrating at frequency \( f_1 \)), resting in the far distance somewhere near the negative endless of the \( x \) axis (see on Figure 2, signed by Nr 5a.). It is clear that the two observers (\( M_1 \) and \( M_2 \)) moving along \( x \) axis towards the positive endless at a speed \( v \), will observe exactly an \( f_0 \) virtual frequency of the standing waves (with real frequency \( f \)) in the Ether, coming from \( F_1 \). The phase difference between the moving observers...
remains constant during their motion, while their phase constants as of moving secondary sources will be shifted, according to their actual distance from the primary source.

Furthermore, should be the substitute of secondary source \( M_2 \) with another resting source \( (F_2) \) near the positive endless of the \( x \) axis. The frequency \( f_1 \), generated by \( F_2 \) in the Ether will be much lower than \( f \), exactly so as the two moving observers \( (M_1 \text{ and } M_2) \) will observe a virtual frequency \( f_0 \) (Figure 2., Nr. 5b).

In this configuration, it is trivial that the two standing sources \( F_1 \) and \( F_2 \) will produce two interfering standing waves in the Ether with different frequencies. These two frequencies are related to each other that the observers moving from \( F_1 \) towards \( F_2 \) will observe the same \( f_0 \) virtual frequency for both vibrations. It is also trivial that these vibrations can be built up not only by two waves propagating at a speed \( c \). Two waves propagating at any different speeds are able to build up the same interfering standing wave formation in the medium. Furthermore, any two distant sources moving at any speeds can build up such interference-spaces. Only the building time will be different, depending on the velocity of the waves and on the distances from the resting sources. Neither the velocities of the waves, nor the distances from the sources play role in constructing the surface of the standing waves in the Ether. Only the two interfering frequencies are important, neglecting the intensity of the waves.

When the two observers are “surfing” on the two different interfering standing wave chains with frequencies \( f \) and \( f_1 \) in the middle of Figure 2 (imagine that 5a and 5b are at the same place), the optical distance (OD) remain constant regarding both waves, and as a result, it is absolutely impossible to observe for \( M_1 \) and \( M_2 \) phase difference in this phase-space, keeping constant their spatial distance and their velocities. The two surfing observers will observe the same constant \( f_0 \) frequency, as the frequency of the resting \( F_2 \) was tuned to be equal with the frequency of the beam coming from \( F_1 \) and reflected from \( M_2 \) affected by a Doppler Effect. As the couple of observers is getting farther from \( F_1 \) and getting closer to \( F_2 \), their distances from both the resting sources are changing, the result is a continuous phase-shift at a constant phase difference.

In my best knowledge, our up to date experimental tools are not able in one-way experiments to register directly the phase changes, phase shifts of the electromagnetic waves propagating in the vacuum, or that of the moving sources and observers, it is necessary to apply indirect methods. The Michelson interferometer using a two-way method looked useful for these purposes. Let us analyze, whether this tool is able to measure the Ether wind.

### III. Optical Distance Difference, Frequency and phase differences in the Michelson-Morley experiment

We have just shown the substitution of the moving sources (laser and \( M_2 \)) on the \( x \) axis of the Michelson interferometer with resting sources at a large distance, in order to make easier the calculations of the Optical Path Differences of the moving observers (amplitude splitter and \( M_2 \)). It has turned out that OPD, Optical Distance (OD), and the phase difference do not change, meanwhile a continuous shift with the same size — proportional with the changes in their distances from the resting \( F_1 \) and \( F_2 \) virtual sources — occur in their phases.

We could substitute in a similar way the other two sources (splitter and \( M_3 \) reflexive mirror) along the arm of the interferometer parallel to the \( y \) axis, with phasors \( F_3 \) and \( F_4 \) moving along \( x \) axis at speed \( v \). But this is unnecessary, because the distances (light route, OPD, OD and phases) of the splitter and \( M_3 \) as secondary sources are constant from the observers \( (M_1 \text{ and } M_3) \). It is also true that actual phases of the secondary sources of splitter and \( M_3 \), and that of the observers \( M_1 \) and \( M_3 \) along the \( y \) axis are shifting at the same rate as are shifted the phases of \( M_1 \) and \( M_2 \) along the \( x \) axis.

As for the frequencies, a vibration with \( f_0 \) frequency is propagating in the Ether along the \( y \) axis in every moment of the experiment. Along the \( x \) axis the vibrations of the distant resting virtual \( F_1 \) will propagate towards observer \( M_2 \) with frequency \( f \). As the distance between the sources and the observers do not change along axis \( y \), there is no Doppler effect. On the other hand, observer \( M_2 \) is moving away from \( F_1 \) at speed \( v \) along the \( x \) axis, consequently Doppler effect occur, \( M_2 \) will observe the same \( f_0 \) frequency.

As a whole, all optical elements of the Michelson interferometer observe the unchanged primary frequency of the laser, but all optical elements suffer the same phase shift with the same size. The magnitude of the phase shift depends on the \( v \) speed of the instrument, and their actual distance from virtual sources \( F_1 \) and \( F_2 \).

It can also be stated that OPD and OD of two moving observers are not equal with the difference in the length of the light routes in the Ether. The OD can only be changed by moving the translating mirror in the Michelson interferometer.
The frequencies transferred to the Ether by sources \( F_1 \) and \( F_2 \) are subject to proportional change by changing the Ether wind, but the observed frequencies remain \( f_0 \) due to the occurring double Doppler effect. While the speed of the instrument is changing, a proportionate phase shift will be occurred at all optical elements of the interferometer, and as a result, the phase difference remains constant. Due to the same phase shifts, the phase difference will only be defined by the OD. During the course of the translating motion the whole optical system is working as if Ether and Ether wind were not exist, because the system is insensitive for the changes in the speed of light.

In vase we substitute the laser (or rather the splitter) and \( M_2 \) with real light sources instead of virtual sources \( F_1 \) and \( F_2 \), a rotation would produce changes in the OD-s of observers \( M_1 \) and \( M_2 \). Preventing this complication, let us put our sources back into their original positions (to \( M_1 \) and \( M_2 \)). Turning now the interferometer around, the OD and the phase difference remain constant. Only the frequency of the disturbances generated to that direction in the medium according to the Doppler Effect – and of course the parameters of the respective virtual substitute source – will change. Nevertheless the observers moving at a constant distance with the same velocity cannot observe these frequency changes, because the observed frequency will be constantly \( f_0 \), due to a second Doppler Effect (double Doppler Effect). This double Doppler Effect makes possible for the secondary wave sources to vibrate on the same frequencies, and for the two amplitude-splitted beams to reunite the returning beams in coherence, forming interference fringes on the screen.

On the basis of the gedanken experiment we discussed it is proved that phase differences between the optical elements of the Michelson interferometer are defined by only the spatial distance of the elements. Phase difference between the optical elements remains constant while the instrument is turned, or the speed of the Ether wind is changing. As a result it is not surprising that ODD measured by the instrument is constant while the interferometer is turned or the speed of the Ether wind is changing in the background..

One can see from the above mentioned facts that – in spite of the generally accepted opinions – this tool does not measure the Optical Path Difference of two observers, rather measures the Optical Path Difference-Difference – or rather the Optical Distance Difference – between two observer couples.

Consequences:

a.) On the basis of the above-mentioned facts, one can state that evaluating the measurement data in the experimental series in 1887 [2], Mr. Michelson made the following serious principal mistakes:

- The calculations of the Optical Distances (OD) were erroneous. Instead of calculating the OD-s in all individual stages of the light routes to and back between the beam splitter and the reflective mirrors, Mr. Michelson took into account only the total sum of the to and back light routes. After that – based on the well-known form between the phase difference and path difference [1] – Mr. Michelson erroneously calculated the total phase difference between the two amplitude splitted beams reunited on the beam splitter. This calculating procedure means as if only the routes \( L, b \) and \( d \) would be summed in our gedanken-experiment while calculating the effective total OD-s, fully neglecting the effect of the routes \( a \) and \( c \). In his next step Mr. Michelson – incorrectly, because the light paths was used instead of the Optical Path Differences – derived the false phase difference with the well known equation between the optical path difference and the phase difference from phasor theory [1]. The correct calculation procedure would have been if the real OD-s were calculated step by step in each individual stages of the two light propagations taking into account the analogues of the distances \( l, a \) and \( c \) in our gedanken-experiment. In the latter case Mr. Michelson would have noted that the OD-s and the phase differences are not subject to change in his experiments, as the distances between the source and the observers is constant while the velocity of the instrument is changing, and while the interferometer is rotating as well. As a result, the total phase difference in his measurements in principle must not change.

- Mr. Michelson missed the relevant coordinate system. He derived perfectly the OD of \( M_1 \) from source \( F \) in the Ether at the very moment, when the light beam passes \( M_1 \). But the OD of \( M_2 \) at that very moment was not calculated. At this point he changed the coordinate systems, traveled for a while with the instrument in \( K_1 \). At a superficial glance he stayed on \( K_1 \) logically till \( M_2 \) arrived at \( B \), and now he changed the coordinate systems again, turning back to \( K_2 \), and calculated the length of light route from \( M_1 \) before \( A \) till \( M_2 \) at \( B \). But now he missed to calculate the optical path difference of \( M_1 \). The phase difference can be calculated by the phasor theory was calculated by Mr. Michelson between \( M_1 \), resting at \( A - v_2 \), and \( M_2 \) resting at \( B \). This procedure is absolutely irrelevant if one is going to use the phasor theory to calculate the phase differences. This calculation is an erroneous mixture of two coordinate systems, and is a prohibited time-shift in the phasor theory. Due to his errors, Mr. Michelson falsely expected phase shifts in case of the Ether wind. From this fallacy grew up – among others – the theorem...
of relativity of coincidence and the theorem of absolute constancy of the light speed developed by Mr. Albert Einstein. These unproven ideas are unnecessary if we use the well-defined OD-s respectively in our calculations.

- Calculating the effects while rotating the instrument, Mr. Michelson took again the total net light route differences before and after rotating, and hence the rates of these two differences are evidently not the same during the course of rotation, he automatically derived the false consequence that also changes in the phase differences should necessarily be emerge while rotating. One can see from the above mentioned gedanken-experiment that the changes in the rate of light route differences not necessarily means that OD and phase difference changes will unavoidably emerge in the Michelson interferometer. In optical systems moving in the Ether, the OD is not necessarily the same as the calculated total net light route in the medium.

- Mr. Michelson missed the basic points of the phasor theory, where the disturbances generated by a phasor in a medium are independent of time and speed. In general (and not only in optics) is evident that – whether the source is moving in the medium or not – in a medium continuously disturbed by the phasor representing the wave source will be emerged standing waves. This is true in case of two interfering phasors as well. Consequently, only the spatial distances between two points of the medium have roles in the net phase differences observed by the observers. Phase difference is independent from the speeds of the interfering waves (group-speed, phase speed, sign-speed, speed of energy propagation), and is also independent from the length of the routes of the light beams having arrived at those points of the medium, and of course independent from the time that is necessary to run for a wave along its path. The medium is vibrating at that points, and that is all. In other words, the phases of the vibrations produced by a phasor are time- and consequently speed independent, only the spatial distance between two points in the medium has role in the phase difference.

b.) The Michelson interferometer is sensitive for the phase differences between the source and two observers, and it is sensitive only for phase differences. As the phase difference between the laser and the observers (the amplitude-splitter and the reflexive mirrors) depends only on their spatial distances (and only on these distances), never will occur shifts on the screen and/or in the photo-detector until we do not move the transferable mirror into another position, or do not change the frequency of the source. This experimental tool is very useful in measuring indirectly the frequency of light sources, spatial distances and the refractive indexes of two different light propagating media (rate of speeds, but absolutely insensitive in measuring speeds of waves in the same medium (e.g. speed-differences in vacuum, alias Ether). In the Michelson interferometer the spatial distances between the laser, the amplitude splitter and the reflexive mirrors will define the OD-s of the individual light-route stages and the OD-s of the whole system. As a result, during the changes of the Ether-wind, or during the course of the instrumental rotation, the spatial distances between the three virtual images generated behind the mirrors in the linear optic equivalent of the Michelson interferometer will not change. These virtual images will surf with the whole instrument at the same velocity, regardless the velocity of the Ether wind.

c) Several experiments support the wave theory of light (interference, Doppler Effect, Michelson-Gale experiment, Sagnac experiment and so forth.) and the existence of the Ether. On the other hand, the only known measurement that previously seemed to disclose the possibility of Ether wind is principally insensitive to register the changes of the Ether wind (namely the Michelson-Morley experiment). As a result, it seems to be necessary to reintroduce the Ether-hypothesis. Widely known that – at those times it was only an expected perspective – Einstein agreed this. General Relativity Theory unavoidably needs a propagating substance for the action at a distance [3]. These consequences will affect only the philosophy of the relativity theories. There are quite different physical reasons of the surprisingly good practical, experimental and unquestionably heuristic forces of the mathematical apparatus of the Special Relativity Theory; author will publish these results in another paper.

d.) One of the most important causes leading to the errors made by Mr. Michelson might be that he was using clumsy terms. In order to avoid similar errors in the future, author suggests using near the term of Optical Path Difference (OPD), the term of Optical Distance (OD) and Optical Distance Difference (ODD) as well. Beside the less misleading nature of this latter two terms is that they are directly measurable, comparing with the OPD that is only calculated.

References: