

# **ARGUMENTS ON THE MICKELSON-MORLEY EXPERIMENT**

By: Diosdado F. Fragata

In the light of the findings of other researchers, which seem to indicate that the interpretation of the result of the Mickelson-Morley experiment is erroneous, much less, that the kinematical assumptions of the experiment were simplistic to the point that some important phenomena were not considered, I decided to conduct my own analysis of the experiment.

It would however be helpful to take a look at the background why the experiment was conducted.

It was argued that if light is a wave, then there must be a medium by which the wave travels. Since light can travel from distant stars across interstellar space, which is almost a vacuum, then there must be something in that vacuum that conducts the wave of light.

That the planet, as it orbits around the sun, does not drag along the Aether in its motion, is deduced from the existence of aberration of light coming from the stars which agrees with the kinematical results of compounding the velocity of light in a vacuum with the velocity of the earth in its orbit. This is however viewed as an Aether wind, which blows opposite in direction to that of the motion of the earth. Right here we can see that the notion of an Aether wind is somewhat absurd. Since the Aether is not dragged by the planet, the Aether is stationary and therefore no Aether wind. What is perceived to be an Aether wind is just another means of viewing the motion of the earth relative to the motion of light. This is like what you seem to see when you are inside a moving car and what you see when you are not in the car. When your are not in the car, you can see that the car is moving relative to the stationary state of things on the ground, but when your are in the car, you would see that the stationary objects on the ground appear to be moving at the same speed as your car's speed but in the opposite direction, yet in the actual, the car is the thing that is moving and not the things on the ground. If you stick out your hand outside the window of your car, you would feel that there is a wind blowing in the opposite direction even when there is not a single ripple in the air. Now if someone throws an object to your moving car you would see from inside your car that the object thrown seem to move on a curve so that the object does not hit your car exactly at the point where the object was aimed at. What really is happening then? The phenomenon is the effect of the kinematical interaction of your car's motion and the object thrown devoid of any effect of the apparent wind, which in reality does not exist.

This does not mean that the Aether does not exist. This only means that the Aether may exists but does not necessarily move.

The Mickelson- Morley experiment was designed to determine whether there is an Aether wind or not, but not to prove whether the Aether exist or not. It is unfortunate however that the null result of the experiment was interpreted as the absence of **a luminiferous medium** rather than the absence of **an Aether wind**. This is actually a case where something that proves exactly what is true was looked at in a 180 - degree manner analogous to calling a spade a heart and a heart a spade.

Our intention is not to disprove the common view on the results of the Mickelson- Morley experiment by presenting philosophical arguments to the contrary. Our intention is to present some factors that we believe should be considered in order that the results of the experiment would be viewed in a logical manner.

In interstellar space, the Aether, as perceived originally, is stationary. But in terrestrial environment such as the environment where the Mickelson - Morley experiment was conducted, everything including the source of light used, is moving with the exception of the Aether, which is stationary. The parts of the interferometer are moving along with the rotation of the earth on its axis, thus the Aether would indeed appear to be moving in the opposite direction.

Now, if we look at the interactions of velocities occurring in an equal-legged interferometer such as the ones used by Mickelson and Morley in their initial model we can readily see the following:

1. Any effect of the velocities of the individual parts such as the light source, the mirrors and the eyepiece or recording instrument, will simply cancel out as these surfaces are all moving in pairs and at the same velocity.
2. The net interaction (if there is any interaction at all) would then be only that of the velocity of the Aether (if an Aether wind exist) and the velocity of light.

Therefore the following can be deduced:

1. In the case where there is no Aether wind, the portion of the light that is directly reflected towards the eyepiece would take  $2l/c$  seconds to reach the eyepiece from the time it left the source while the portion that is reflected towards the mirror in the opposite side would take  $6l/c$  seconds to reach the eyepiece from the time it left the source. There is therefore a difference between the times of arrival of the two beams equal to  $4l/c$  seconds.
2. In the case where there is an Aether wind, the portion of the light going towards the mirror on the opposite side of the eyepiece would experience a reduction in velocity since it would be going against the Aether wind, but would get a corresponding boost from the ether wind on the return trip. In effect, the second portion of the light beam, in its journey towards the eyepiece, would get a net assistance from the Aether wind on only one third of the three horizontal legs of the journey. Thus the time it would take for the second portion to reach the eyepiece from the light source

would be  $(5l/c + l/(c+v))$  seconds; where  $v$  is the velocity of the Aether. On the other hand, the portion of the light beam that was reflected directly to the eyepiece would take  $(l/c + l/(c+v))$  seconds. The difference between the times of arrival of the two portions of light beam from the source would be  $4l/c$  seconds; which is the same as the difference in the times of arrival of the two beams when there is no Aether wind.

3. The method of evaluation of the result of the Mickelson – Morley experiment was by comparing the times of arrival of the two portions of the beam. Our kinematical analysis above however shows that the value of  $v$  does not come into the picture. Would it be logical then to expect a positive result from the experiment?

A closer look at the assumptions in the experiment would also lead us to pose the following questions:

1. The experiment was conducted in a place where the surrounding space was filled with air (not in a vacuum). Hence, the space in the room was occupied by physical bodies. Can Aether co - exist separately in the same space as that occupied by a physical body?
2. If the answer to the above question were affirmative, then that would generate another question. Does light prefer to travel through the Aether rather than through the air?
3. If the answer to the question however is negative, then whatever Aether present in the space is assimilated and becomes an integral part of the occupying physical body. Air would then be the medium in the travel of light in the experiment, and since the air was moving at the same velocity as the interferometer, then no interaction of the velocity of the wind and that of the light can be expected.
4. The other question that must be addressed is whether the interaction of the velocity of light and the velocity of the Aether is instantaneous such that the full magnitude of the Aether wind adds up to or deducts to the magnitude of the velocity of light.

The experiment did not actually produce a null result but yielded an apparently insignificant value in comparison to the expected value. But in spite of the fact that this has been consistently showing up in the succeeding experiments, it was simply dismissed as experimental error. The table below shows the values of the fringe shifts obtained from different instances when the experiment was conducted. This might be an indication that a positive result has been disregarded because it did not agree with ones expectation, which in the first place was based on a conjecture that is wanting in logic. An interference fringe shift of as much as 0.002 was noted even on the first experiment that used an equal - arm interferometer of just one meter while the expected fringe shift was in the vicinity of 0.04. Thus a value of .002 is too small

compared to what was expected. But we must consider also the effect of the assumptions. It was assumed that the velocity of the Aether (if indeed there was an Aether wind) would instantly impart a boost or reduction to the velocity of light in its full magnitude. This however is not necessarily the case. Suppose that we have a body with a mass of ten pounds and a cross sectional area of one square inch which is being pushed by a force of 200 pounds (to counteract friction) to maintain a velocity of 200 feet per second, would a wind traveling at 20 feet per second in the same direction as the body increase the speed of the body, instantaneously to 220 feet per second? The answer to this is a big fat **NO!** The force that would be imposed by the wind against the body would only be about 0.0038784 pounds, hence would cause an acceleration of only 0.0003874 feet per second per second, so that the body will attain a speed of 220 feet per second after about 51,627 seconds.

There is no direct correlation between the above example and that of the interaction of the velocities of the Aether and that of light. However it shows that the interaction between the Aether and light is not necessarily a simple case of arithmetic addition or subtraction. Time definitely comes into play, thus with the very small time value involved in the experiment, can a full interaction of light and the Aether wind occur?

The actual values of the fringe shifts obtained in the various experiments may yet be the actual values at the extent of interaction occurring within a very short period of time and not just mere experimental errors.

Name	Year	Arm Length Meters	Expected Fringe shift	Measure Fringe Shift
Mickelson	1881	1.2	0.04	0.002
Mickelson and Morley	1887	11.0	0.40	<0.01
Morley and Miller	1902-1904	32.0	1.13	0.015
Miller	1921	32	1.12	0.08
Miller	1923-1924	32	1.12	0.03
Miller (sunlight)	1924	32	1.12	0.014
Tomascheck (starlight)	1924	8.6	0.30	0.020
Miller	1925-1926	32	1.12	0.088
Kennedy (Mt Wilson)	1926	2.0	0.07	0.002
Ilingworth	1927	2.0	0.07	0.0002
Picard and Stahel	1927	2.8	0.13	0.006
Mickelson et al.	1927	25.9	0.90	0.010
Joos	1930	21.0	0.75	0.002

There are also other factors that were not considered in the mathematical model of the experiment such as the FISEAU effect, which results in a change in the angle of incidence of light when deflected by a moving inclined mirror.

In summary we would like to present the following:

1. The null result of the MICKELSON- MORLEY experiment is not a valid proof that the Aether does not exist. It can be viewed as an indication that the Aether wind does not react with the velocity of light the way it was expected.
2. The Aether does not exist separately from physical bodies in the presence of the latter. (No two things, as separate entities, can occupy the same space at the same time.)

References:

1. The Overlooked Phenomena In The Mickelson-Morley Experiment – Paul Marmet- MAY 30, 2004.
2. BROJON News – Where Dr. Einstein Went Wrong- April 6, 2005.