

Chapter 10

FALSE ASSUMPTIONS WHICH CAUSED THE M & M PARADOX

The false assumption of a stationary ether as an absolute reference frame in space resulted in the further false assumptions of one specific and absolute solar orbital motion for the Earth through space, of an absolute and specific displacement of Michelson's mirrors from the stationary ether, and of an ether wind effect that would change the velocity of a propagating light ray. It was then falsely inferred and assumed that these arbitrary and ad hoc concepts would result in a greater distance and/or time interval for a light pencil to propagate to and fro between Michelson's displacing mirrors in the direction of such solar orbital motion. It was also falsely assumed that this theoretically greater distance and/or time interval would be detectable by Michelson's interference of light method. Finally, Michelson's null results, in conjunction with these false assumptions, created a baffling absolute paradox and a crisis for late 19th century physics.

Just like everyone else, the author was initially mystified by the absolute paradox that was perceived and inferred from Michelson's null results. Only after years of painstaking analysis, and many dead ends, did he finally realize and understand the real reasons and answers for this monumental mystery.

The M & M paradox was created *inter alia* by such empirical null results, the stationary ether theory, numerous false inferences and assumptions, and by many *ad hoc* theories and mathematical calculations. For example, since Maxwell's transmission velocity of light is a constant c (300,000 km/s) in both to and fro directions in Michelson's apparatus, it was assumed by theory and by mathematical calculation that the longitudinal light pencil in the M & M experiment (which propagated to and fro in the direction of the Earth's absolute velocity of 30 km/s around the Sun) must have to propagate a greater absolute distance away from the stationary ether than the transverse light pencil which propagated to and fro in the direction perpendicular to such solar orbital velocity. (see Figures 9.1B, 9.2 and 9.3A) This false 1887 geometrical

computation for such absolute difference in distance/time intervals of light propagation is illustrated on Figure 10.1.

However, M & M never detected an interference of light wave phase fringe shift, which theoretically would indicate a greater or different time interval of propagation in any direction. Thus, the question was asked: How could a light pencil propagate a greater distance/time interval in one absolute direction, yet the difference in time intervals of propagation in such different perpendicular directions could not be detected?

There was only one fundamental *ad hoc* reason why the scientific community staunchly believed that Michelson should be able to detect a relative change in the wave phases of two different perpendicular light pencils (in other words, an interference fringe shift) in the direction of the Earth's solar orbital motion through space. That reason was their false belief in a material substance called 'stationary ether' which existed in all of space (like a fixed stake in space) from which all positions, distances, time intervals, motions and directions could be measured. All other false assumptions, misanalysis, false mindsets and unrealistic expectations followed from this one fundamental false premise. They include the following:

1. The false assumption that the absolute direction and absolute motion of the Earth with respect to such stationary ether (a fixed stake in space) produced one (and only one) absolute and specific velocity of 30 km/s for the Earth: its solar orbital velocity.
2. The false assumption that such absolute motion of the Earth relative to the stationary ether should cause the mirrors in Michelson's apparatus to displace from each light pencil so that such light pencil would have a greater distance/time

interval to propagate in such absolute direction. (Maxwell, 1880, Nature, Vol. XX1, p. 315; Michelson, 1881, p. 121; Lorentz, 1895 [Dover, 1952, p. 3]; see Figure 10.1)

3. The false assumption that Michelson's mirrors could physically displace from the light ray in his apparatus (Figure 10.1).
4. The impossible angular path of the transverse light ray (see Figures 9.5 and 10.1).
5. The false assumption and mindset that such one specific absolute velocity in turn results in a greater absolute distance/time interval which a light ray must propagate in Michelson's experiments (Figures 9.1B, 9.2B, 9.2C and 10.1B), as compared to the theoretical distance/time interval which a light ray must propagate if the Earth was at rest in the stationary ether (Figures 9.1A, 9.2A, 10.1A and 10.2).
6. The false assumption that such motion of the Earth through the stationary ether would result in an ether wind effect which would decrease or change the velocity of the light pencils in the direction of such motion. (see Gamow, 1948, pp. 92 – 96; see Figure 9.3B)

To add to the confusion, these theoretical misassumptions were often commingled and intertwined with each other.

All of these false assumptions created an unshakeable and impossible expectation within the scientific community that such difference in absolute specific time intervals should have been detected and measured by Michelson's interference of light method. This completely unrealistic expectation, and the bewildering paradox which it and such

other false assumptions produced, required an explanation, any explanation; finally even a contrived ‘contraction’ explanation of desperation. (see Miller, p. 28 and Chapter 15)

The general explanation for Michelson’s absolute paradox is really quite simple. Such absolute paradox was really not a paradox at all, because it was based upon a series of impossible false assumptions that logically and empirically could never physically occur. For example, we now know that there is no stationary ether in space from which to measure the absolute velocity v of the Earth in any absolute direction. It was purely a myth. Similarly false was Maxwell’s assumption that the round trip time interval for a terrestrial light ray to propagate to and fro in Michelson’s apparatus depends “on the speed of the earth through the ether.” (French, p. 50) Michelson’s and Lorentz’s assumption that the mirrors in Michelson’s apparatus could displace a greater absolute distance from their respective light pencils (than if such light propagation was taking place on the Earth at rest in stationary ether) so as to cause a greater distance/time interval of propagation by such light pencils...was obviously false. The concept of an ether wind that could decrease or change the velocity of light (and thus the time interval of light propagation) in the direction of the Earth’s motion was also patently false. Finally, the longer angular path of the perpendicular transverse light pencil in Michelson’s 1887 experiment could not exist, because a perpendicular light pencil does not have lateral inertia. There were also other impossible false assumptions that could not rationally be believed. (see Chapter 9) Michelson’s apparatus could never detect an imaginary greater distance and/or a time interval that could not and did not exist, nor a difference between impossible absolute distance/time intervals that could not and did not exist. It was a mission impossible.

In this chapter we shall further analyze and discuss the above false absolute assumptions, false mindsets, unrealistic expectations and the perceived absolute paradox which they created, and we shall continue to explain why they were all theoretically incorrect and impossible to achieve. Once the absurdity of such false assumptions are fully explained, understood and accepted, and the real reasons for Michelson's paradoxical null results are disclosed, discussed and explained in Chapters 11 and 12, the above false assumptions and their resulting unrealistic expectations should completely disappear for the reader, and so should the absolute paradox that they created.

A. The concept of stationary ether caused an absolute mindset of scientists (including Einstein), which resulted in many other false assumptions, unrealistic expectations, and ultimately in the M & M absolute paradox. All of the above are myths, including Einstein's proposed contraction solution.

First, let us retrace these false assumptions and impossible expectations from their beginning. In the early 19th century, Fresnel and others invented the concept of stationary ether in Newton's absolute space in an attempt explain the propagation of light and other phenomena. For various reasons, Maxwell believed in the concept of stationary ether as an absolute reference frame in space for the purpose of physical measurement. (Chapter 6) In his March 1879 letter, Maxwell described a 'possible' method to detect the absolute velocity of the Earth with respect to the stationary ether, based upon his false and *ad hoc* assumption that the round trip time interval for any terrestrial light ray to propagate to and fro between relatively stationary mirrors "does in principle depend upon the speed of the earth through the ether." (French, p. 50) Maxwell conjectured:

“[I]n the terrestrial methods of determining the velocity of light, the light comes back along the same path again, so that the velocity of the earth with respect to the ether would alter the time [interval] of the double passage...” (Maxwell, 1880, Nature, Vol. XXI, p. 315)

This *ad hoc* conjecture was a totally false assumption. What was the magnitude of the time interval for the double passage of light on the Earth altering or varying from?

Maxwell, like everyone else of his era, falsely assumed that if the Earth was absolutely at rest in the stationary ether, then a light ray transmitting at c from one stationary mirror to another and back again on the surface of the Earth would propagate over the same distance during the same time interval in any direction. (Figures 9.1A and 10.1A) This, of course, was a false assumption, because there is no stationary ether in which the Earth could be absolutely at rest. Maxwell then assumed that the Earth was not absolutely at rest, but rather it was moving relative to the stationary ether at an absolute velocity of v ...its solar orbital motion. This was another false assumption.¹

Because of this theoretical absolute velocity of the Earth, Maxwell then falsely hypothesized that a light ray, propagating to and fro from one relatively stationary mirror to another and back again on the surface of the Earth, would have to propagate a greater absolute distance and a greater absolute time interval in the direction of the Earth's absolute velocity with respect to the ether...greater (that is) than if the Earth was absolutely at rest in the stationary ether. (see Figures 9.1, 9.2 and 10.1) However, this impossible comparison of two different absolute distances and two different absolute time intervals was another impossible false assumption, because the absolute distance/time interval of light propagating on the Earth at rest in the ether does not exist. All of these *ad hoc* concepts are myths. A greater distance than a distance which does not exist cannot be detected. Likewise, a greater time interval than a time interval that

¹ As we now know, all of these absolute assumptions were completely wrong. There is no stationary ether and there is no state of absolute rest from which an absolute velocity v could be measured or compared. Also there is no specific and absolute velocity of the Earth. The Earth has an infinite number of relative velocities.

does not exist cannot be detected or measured.

In 1895, Lorentz interpreted Maxwell's hypothesis to mean that "the time [interval] required for a ray of light to travel from a point A to a point B and back to A [on the Earth's surface] must vary when the two points [mirrors] together undergo a displacement..." with respect to the stationary ether. (Lorentz, 1895 [Dover, 1952, p. 3]; Figures 9.1B, 9.2B, 9.2C and 10.1) Lorentz's interpretations and assumptions immediately beg the question: If there is no ether, then what are such two points (Michelson's relatively stationary mirrors) displacing in tandem from...empty space?²

In 1880, Michelson adopted Maxwell's false logic. Like Maxwell, he also assumed that the stationary ether was an absolute reference frame, like a stake in space; a definite place and a specific material body of reference from which he could measure positions, distance intervals and time intervals in a certain direction, and with respect to which he assumed his mirrors would displace in tandem. Based on all of the above false assumptions, Michelson further assumed in 1881 that "the actual distance that light travels in the [direction of the Earth's solar orbital motion] is greater than in the [direction perpendicular to such motion]."³ (Michelson, 1881, p. 121) In 1881, Michelson further assumed that light which propagated from Earth perpendicularly to the direction of the Earth's absolute solar orbital motion "would be entirely unaffected" by such motion.⁴ (*Id.*) In Michelson's words:

"Assuming then that the ether is at rest, the earth moving through it, the time

² The word 'displacement' means: "a specified distance in a specified direction." (Oxford Dictionary of Physics, p. 121) A 'distance' must be measured from something tangible. (Einstein, *Relativity*, pp. 6 – 7) Neither a 'distance' nor a 'direction' can be 'specified' with respect to the endless nothingness of empty space.

³ We shall discuss this false premise in great detail in Chapters 10B, 11D and 12A.

⁴ By 1887, Michelson had changed his mind and assumed that the perpendicular light pencil actually would be affected. (see Figure 9.5) But this angular path of the transverse light pencil was yet another false assumption. (Figure 9.6)

required for light to pass from one point to another on the earth's surface, would depend on the direction in which it [light] travels.”⁵ (*Id.*)

Apparently, Michelson also hypothesized that the absolute motion of the Earth through the stationary ether would cause an ‘ether wind’ effect which would reduce the light ray's transmission velocity in the direction of the Earth's absolute solar orbital motion and thus “alter the time” interval of the double passage in the direction of such motion. (Gamow, 1948, pp. 92 – 96) Based on this alternate ‘ether wind’ hypothesis, Michelson then would have assumed that the time interval for light to propagate in an absolute direction perpendicular to the Earth's solar orbital motion would be different than in the direction of the Earth's solar orbital motion. As previously mentioned in Chapter 9, the basis for these alternate assumptions was an analogy to the fact that a boat on Earth will empirically take longer to travel to and fro against and with the flow of a river than it will take to travel the same distance across the flow of the river.⁶ (Gamow, 1948, pp. 92 – 96; Figure 9.3B)

One way or another, Michelson falsely assumed that there would be a time interval difference for light to propagate in different perpendicular directions within his apparatus. He also believed that this time interval difference would be manifested by an observable interference of light fringe shift when the arms of his apparatus and their light rays were rotated through 90° relative to the absolute direction of the Earth's solar orbital velocity (30 km/s) through the stationary ether. But no fringe shift (and thus no difference in absolute time intervals) was ever detected by Michelson, either in 1881, or in 1887, or thereafter.

These null results created an unexplained theoretical absolute paradox and a crisis

⁵ This, of course, was yet another false assumption by Michelson.

⁶ Again, the author can find no evidence that Michelson actually considered this ‘ether wind’ concept.

in physics after 1887. How could Maxwell's seemingly reasonable expectations not have been demonstrated and verified by Michelson's seemingly foolproof experiments? How could the 'ether wind' not have produced a difference in the time interval for such propagation? How could light at c propagate an assumed greater distance in the direction of the Earth's solar orbital motion, but the corresponding greater time interval was not detected? M & M's null result and these paradoxes also cast doubt on the validity of Maxwell's equations and his concept of the constant transmission velocity of light at c .⁷ With false assumptions and false expectations like those described above, no wonder that the scientific community (including Einstein) was baffled with Michelson's null results.

In his 1916 book, *Relativity*, Einstein described and agreed with Maxwell's 1879 false absolute assumptions. He also summarized and confirmed Michelson's false absolute hypotheses and experiments, and described the resulting paradox, as follows:

“Imagine two mirrors so arranged on a rigid body that the reflecting surfaces face each other. A ray of light requires a perfectly definite time T to pass from one mirror to the other and back again, if the whole system be at rest with respect to the aether. It is found by calculation, however, that a slightly different time T' is required for this process, if the body, together with the mirrors, be moving relatively to the aether. And yet another point: it is shown by calculation that for a given velocity v with reference to the aether, this time T' is different when the body is moving perpendicularly to the planes of the mirrors from that resulting when the motion is parallel to these planes.⁸ Although the estimated difference between these two times is exceedingly small, Michelson and Morley performed an experiment involving interference in which this difference should have been clearly detectable. But the experiment gave a negative result – a fact very perplexing to physicists.⁹ (Einstein, *Relativity*, pp. 58 – 59)

This paragraph demonstrates that (even in 1916) Einstein was operating and

⁷ Maxwell's equations implied that the transmission velocity of light was a constant c in all directions, but (as claimed by many scientists) this velocity was only relative to stationary ether. *A priori*, many scientists (including Einstein) claimed that the transmission velocity of light at c should mathematically change to $c + v$ or $c - v$ with respect to bodies moving linearly relative to the light ray or the stationary ether, and that this change in transmission velocity should have been detected by Michelson. (see Einstein, *Relativity*, pp. 22 – 23, 58 – 60)

⁸ See Figure 10.1 for these calculations mentioned by Einstein.

⁹ We will continue to discuss these false absolute assumptions of Einstein in Chapter 15 and beyond.

agreeing with some of the same false absolute mindsets as the rest of the scientific community.¹⁰ The first theoretical “definite” time interval described by Einstein assumes that the Earth and Michelson’s apparatus could be absolutely at rest in the stationary ether. It is from this absolutely stationary reference frame that Einstein asserts: “a ray of light requires a perfectly definite time T to pass from one mirror to the other and back again.” (Einstein, *Relativity*, pp. 58-59) The second theoretical time interval is also described by Einstein with reference to the absolutely stationary frame of ether:

“a slightly different time T' is required for this process, if the body, together with the mirrors, be moving relatively to the aether.”¹¹ (*Id.*, p.59)

On the other hand, if the theoretical stationary reference frame of ether does not exist, then none of the above theoretical absolute distance/time intervals could exist, and the theoretical absolute ‘difference’ in such theoretical time intervals could not exist either. If this theoretical absolute ‘difference’ in time intervals was only a myth, resulting from a false mindset in the minds of theoreticians, then Michelson could not detect or measure by any method something that did not exist.¹² And he never did.

After the null results of his 1881 experiment, Michelson was probably the first scientist to conclude that the stationary ether hypothesis was an invalid myth. He stated:

“the hypothesis of a stationary ether...is erroneous...[T]his conclusion [Michelson’s null results] directly contradicts [the hypothesis]...that the earth

¹⁰ For his Special Theory, Einstein needed the concept of stationary ether in order to describe the assumptions of everyone, the expectations of the scientific community, and the bewildering absolute paradox which desperately needed an explanation...even though he postulated on the same page of *Relativity* (p. 59) that absolute rest and stationary ether could not exist. The reason for Einstein’s need was that his Special Theory provided a false mathematical solution of ‘contraction’ for Michelson’s paradox, which Einstein would later claim was an experimental confirmation for his Special Theory. More about this later.

¹¹ Einstein also agreed with Michelson that a slightly different time interval would result because of the absolute velocity v of the Earth. In other words, the light ray would take a greater distance/time interval to propagate in the direction of such absolute solar orbital velocity than in the direction perpendicular to it. (Einstein, *Relativity*, p. 59)

¹² Einstein was absolutely wrong in all of his above assumptions and conclusions. (see Chapters 10B, 11, 12A, and 15)

moves through the ether, the latter remaining at rest.” (Michelson, 1881, p. 128)

In 1905, and later in his book, *Relativity*, Einstein first implied and then agreed with Michelson’s conclusion concerning the myths of absolute rest and stationary ether:

“[T]he unsuccessful attempts to discover any motion of the earth relatively to the light medium [ether], suggest that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest.” (Einstein, 1905d [Dover, 1952, p.37])

“[T]here is no such thing as a ‘specially favored’ (unique) coordinate system to occasion the introduction of the aether-idea, and hence there can be no aether-drift [ether drag], nor any experiment with which to demonstrate it.” (Einstein, 1916, *Relativity*, p.59)

This, of course, is the reason why Michelson could not detect an ‘ether wind’ in his experiments, if in fact he actually attempted such detection. Ether does not exist.

Today, the concept of a substance called ether at rest in space as an absolute reference frame from which to measure the absolute motions, speeds, distances, time intervals, and directions of material objects and light through space has been totally repudiated. For this reason, all of the aforementioned assumptions of Maxwell and Michelson concerning the existence of stationary ether and ether wind were meaningless myths. For the same reasons, the assumptions of Maxwell, Michelson, Lorentz and Einstein concerning the theoretical difference of absolute time intervals between absolute rest and the Earth’s absolute motion relative thereto, were also meaningless concepts and erroneous myths.

Likewise, Michelson’s and Einstein’s assumptions that there could be a calculated time interval difference for light to propagate in the absolute direction of the Earth’s absolute solar orbital velocity with reference to the ether, and in the direction perpendicular thereto, was a meaningless myth. It was also a myth that such different

absolute time intervals could be compared. In essence, it was a mission impossible for Michelson to attempt to detect and measure such absolute theoretical time interval differences that theoretically could not and empirically did not exist.¹³

After Einstein described Michelson's paradoxical null result, he went on to conjecture that:

“Lorentz and Fitzgerald rescued the [ether] theory from this difficulty [Michelson's paradoxical null results] by assuming that the motion of the body relative to the aether produces a contraction being just sufficient to compensate for the difference in time... [T]his solution of the difficulty was the right one.”¹⁴ (Einstein, *Relativity*, p. 59)

Einstein then described his own somewhat different relativistic ‘contraction solution’ for Michelson's paradoxical null results, which was just as *ad hoc* and absurd as those of Fitzgerald and Lorentz. Einstein claimed that “the prime factor involved in [his] contraction [solution was] not the motion in itself...but [rather] the motion with respect to the body of reference chosen in the particular case in point.” (Einstein, *Relativity*, pp. 59 – 60) In other words, Einstein's theoretical contraction of the longitudinal arm of Michelson's apparatus was caused by and depended upon the relative motion of such apparatus with respect to whatever moving reference body someone might chose. In Chapter 15, we will discuss all three of the above contraction hypotheses in detail and explain why each so-called solution is artificial, invalid and totally meaningless.

Let us now summarize the above state of affairs. If there had never been a stationary ether theory and false assumptions based thereon, then there never would have been any theoretical absolute time interval difference, nor any paradox of a missing time

¹³ We will discuss this ‘mission impossible’ in greater detail in Section B of in this chapter.

¹⁴ Lorentz and Fitzgerald were attempting to save the ether theory with their contraction concepts, whereas Einstein was attempting to save ‘Maxwell's theory of the constant velocity of c with his somewhat different contraction concept. However, Maxwell's theory of the velocity of light did not need saving by Einstein's ‘contraction of matter theory’ contained in his Special Theory, as we shall learn in Part II of this treatise).

interval, nor the need for Einstein's relativistic contraction theory in order to attempt to explain why such imaginary and mythical time interval difference was not detected by Michelson. Thus, the paradox of Michelson's null results and Einstein's artificial solution for such paradox (his perceived contraction explanation), in reality, result from and are solely dependent upon the existence of stationary ether at rest in space...which Einstein asserted (in the previous sentence on p. 59) is invalid, impossible and does not exist. (see Einstein, *Relativity*, pp. 59 – 60) How convincing is Einstein's inconsistency and self-contradiction for the reader?

For all of the above reasons (and those that follow in the next section), there is no way that the myths of stationary ether, of an ether wind, of the absolute displacement of Michelson's mirrors from a propagating light ray, or of a greater distance of propagation in the direction of the Earth's solar orbital motion, could ever have caused such a time interval difference or the shift of an interference fringe to detect it. The false assumptions and expectations (by everyone, including Einstein) that they could were an impossibility. If the stationary ether does not exist and could not possibly have caused a time interval difference or a fringe shift, and Einstein's relativistic contraction theory was invented in part to explain the non-detectability of such time interval difference and of a fringe shift caused by stationary ether, then where does this leave Michelson's absolute paradox and Einstein's attempted contraction solution for it? ¹⁵ The answer is obvious: nowhere.

B. There is no absolute motion, no absolute direction of motion, nor an absolute magnitude of velocity of the Earth through empty space that could produce a specific displacement of Michelson's mirrors relative to a light ray.

The concepts of 'distance,' 'motion,' and 'direction' only apply between and

¹⁵ In reality, as we shall further explain in Chapter 15, Einstein's contrived relativistic contraction hypothesis was just a mythical *ad hoc* solution in search of a real problem.

relative to material bodies of reference, not between a material body and relative to the empty space in which it is floating. By way of analogy, if the Earth was floating by itself in empty space there would be no assumption or illusion of its motion or velocity over a distance in any direction. (see Figure 10.2)

What exactly was the “velocity v of the Earth” which Maxwell, Michelson, Lorentz and Einstein assumed would “alter the time” interval of a light ray’s propagation to and fro between two relatively stationary mirrors? What specific magnitude and in which specific direction of the absolute velocity “ v ” were Maxwell, Michelson, Lorentz and Einstein assuming and attempting to measure? In other words, what was the assumed absolute “velocity of the earth with respect to the ether”? (Maxwell, Nature, 1880, Vol. XXI, p.315) The answer is: the most obvious relative velocity of the Earth...its solar orbital ‘motion’ of 30 km/s relative to the Sun.¹⁶ (Michelson, 1881, p. 120) Over the centuries, this most obvious relative motion (a change of relative position) of the Earth was assumed to be the only ‘motion’ of the Earth through space.¹⁷ By the end of the 19th century, this belief had become an absolute mindset for almost everyone.

Since we now know that stationary ether does not exist, all we are left with in its place is empty space, nothing. Still, it is not reasonable to assume that empty space is an absolute reference frame or body from which to measure a change of position, motion, velocity or direction. As Gamow stated:

“If there is no world ether filling the entire space of the universe, there cannot be any absolute motion, since one cannot move with respect to nothing. Thus...one can speak only about the relative motion of one material body with respect to

¹⁶ Michelson assumed and calculated that this theoretical absolute velocity would result in a specific observed fringe shift in his apparatus of 0.10 of a wavelength in 1881 and of 0.04 of a wavelength in 1887.

¹⁷ Because the word ‘motion’ can have misleading connotations, we will sometimes refer to the ‘continuous (relative) change of position of a body’ instead, because that is a more correct definition of ‘motion’ and ‘relative motion.’

another...” (Gamow, 1961, p. 173)

The same is true with respect to relative velocity and relative direction.

So we must ask this question: Which material body should take the place of the stationary ether in Maxwell’s, Michelson’s, Lorentz’s and Einstein’s assumptions? Is it the Moon, the Sun, Jupiter, another planet, a nearby star, the core of the MW Galaxy, a star on the opposite side of the MW Galaxy, or a distant galaxy? (Figure 10.4) Each of these possible reference bodies will result in a different relative motion of the Earth, a different relative magnitude of velocity for the Earth and a different relative direction of the Earth’s motion. Which one of these infinite numbers of possibilities should we choose?

Only if we arbitrarily choose the Sun, will the Earth’s magnitude of relative velocity be 30 km/s. Only if we arbitrarily choose the Sun will the Earth’s relative direction of motion be its solar orbital trajectory. Only if we arbitrarily chose the Sun as our reference body, will the theoretical contraction of Michelson’s longitudinal arm be “just sufficient to compensate for the difference in time,” as Einstein asserted.

On the other hand, if we arbitrarily chose the core of the MW Galaxy as our reference body, then the correct relative velocity of the Earth would be 225 km/s, the correct relative direction of the Earth would be its galactic orbital motion, and the correct contraction of Michelson’s longitudinal arm would be about 8 times as great in order to produce a null result. No matter which different reference body we might choose, the motion, the magnitude of the Earth’s velocity, and the direction of its motion (its change of position) relative to such different body of reference would be different.

How could the longitudinal arm on Michelson’s apparatus know which reference

body we have chosen? If it doesn't know, then how could it determine the correct specific relative velocity in the correct specific relative direction of motion in order to physically contract to the correct shortened length so as to produce a null result? How could Einstein's theoretical contraction "with respect to the body of reference chosen in the particular case" have any validity with respect to the M & M paradox or its possible solution?

The conclusions are clear. All of the above assumptions, especially those based on stationary ether, were completely arbitrary, *ad hoc*, meaningless, and totally without empirical justification. They were all totally invalid on their face. How could such mythical magnitudes which were imagined in the minds of the theoreticians be physically detected or measured by Michelson's apparatus, or by any other method? They couldn't.

Again, if there was no ether 'at rest' in space, then there could never be an absolute time interval from something that does not exist. There could be no absolute velocity (direction and speed) of the Earth measured from something that does not exist. There could be no specific displacement of Michelson's mirrors from something that does not exist. There could be no greater specific distance interval or greater specific time interval for light to propagate over the finite distance between two mirrors, from something that does not exist. In short, there could be no physical measurements from something that does not exist or the attempted detection of them by any method.¹⁸

Let us now further discuss the absurdity of such absolute assumptions, absolute mindsets, unrealistic expectations, and proposed contraction solutions, based on our current knowledge. Large telescopes, such as the 100-inch on Mount Wilson, only began

¹⁸ The above absolute assumptions and measurements only made some semblance of theoretical sense so long as one believed in stationary ether and absolute rest. When these concepts were demonstrated to be false, such assumptions and measurements no longer make any sense nor had any theoretical validity.

to be operational after 1917. We now know, starting with Hubble's discoveries in 1925,¹⁹ that the magnitude and direction of the Earth's solar orbital velocity is but one of an infinite number of relative velocities, magnitudes, and directions of the Earth's motion (its change of relative position) through space. The Earth has a different position and velocity relative to every star, planet, moon, asteroid, comet, and other particle of matter in the Solar System and in the Cosmos. The Earth moves with the Solar System at approximately 225 km/s relative to the core of the Milky Way Galaxy (MW), and at billions of other different velocities relative to all of the stars and other celestial bodies in the MW Galaxy.²⁰ (Figure 10.3) Together, the Earth and the MW Galaxy move at an infinite number of different magnitudes of velocity and directions of motion relative to all of the other countless galaxies, stars, and celestial bodies in the Universe.²¹ (Figure 10.4 and Chart 10.5)

What is the specific magnitude of the Earth's absolute velocity 'v' through space at any specific instant of time? Is it 0 km/s, 30 km/s, 195 km/s, 225 km/s, 255 km/s, 280 km/s, 310 km/s, 340 km/s, 440 km/s, 500 km/s, or a myriad of other magnitudes and directions of motion? (Figure 10.3 and Chart 10.5) In which specific direction is the Earth absolutely moving: forward, backwards, upwards, downwards, obliquely, some other direction; at what specific speed, and relative to what? (Figure 10.6) No one will

¹⁹ In 1925, Hubble discovered that Andromeda was a separate galaxy of stars from the Milky Way Galaxy, not merely a cloud of particles within the MW Galaxy as was previously imagined. Four years later he also discovered that Andromeda, the Milky Way Galaxy, and many other galaxies were all moving in different relative directions and at different assumed velocities. (Hubble, 1929, pp. 168 – 173)

²⁰ For example, at one point during its annual solar orbit the Earth is moving at 255 km/s relative to the MW galactic core, and at an opposite point in such annual solar orbit it is moving at 195 km/s relative to the MW galactic core. Also, relative to stars orbiting the galactic core on the opposite side of the MW galaxy, the Earth is moving at about 440 km/s or 500 km/s depending upon its position during its annual solar orbital motion. (Figure 10.3)

²¹ For example, relative to its nearest giant neighboring galaxy, Andromeda, the MW Galaxy and Andromeda are closing their relative distance apart (approaching each other) at about 310 km/s. (see the Astronomical Almanac)

ever know the answers to these questions, because there is no absolute answer. If these questions cannot even be answered with specific motions and directions, how could M & M be expected to detect and measure them? (Figure 10.7) Similarly, how could all of the relative velocities of the Earth be detected and measured as one specific absolute velocity 'v' in one specific direction? They could not.

We must also ask the question: Why did Michelson's apparatus neither detect nor measure any of these other relative velocities of the Earth by means of a fringe shift? Not only did Michelson's apparatus fail to detect the Earth's perceived orbital motion of 30 km/s relative to the Sun, it also failed to detect any and all of the Earth's other relative motions as well. All of these other relative motions (or changes of the Earth's relative position over time) are equally as real as the Earth's solar orbital 'motion.'

If the mirrors in Michelson's apparatus were *a priori* displacing at the specific magnitude and in the specific direction of their solar orbit, then they must also be displacing in the specific direction of all of the Earth's countless other relative motions, and at an infinite number of different specific magnitudes of velocity, all at the same time. This, of course, is an impossibility. If Michelson's mirrors *a priori* could not displace in an infinite number of different specific magnitudes and different specific directions of relative motion at the same time, why should we assume that they are selectively displacing from a light ray at only one specific magnitude (30 km/s) and in only one specific direction of relative motion (the Earth's solar orbital motion)? How could anyone expect Michelson's apparatus to select and detect just one of such relative velocities (vis., the Earth's solar orbital motion at 30 km/s), to the exclusion of all of the

others?²² Why should we assume that this impossible selective displacement could be detected? In retrospect, the attempts by Michelson to detect and measure only the Earth's solar orbital velocity at 30 km/s by the interference method was logically doomed to failure from the start. Again, it was truly a mission impossible.

How could the Earth's motion (its change of position) in space, relative to just one of this infinite number of possible reference bodies (i.e. the Sun), create a specific physical change in the finite distance between two relatively stationary mirrors on Michelson's apparatus which would result in a greater time interval of light propagation? Could the specific magnitude and direction of velocity of the Earth relative to the most distant observed galaxy in the cosmos (over 12 billion light years away) cause the assumed specific physical displacement (or any displacement) of such terrestrial mirrors relative to the propagation of the light pencils on Earth? The answer is obviously, no. The same answer follows for each of the infinite number of other possible reference bodies that are co-moving in all directions of the cosmos. Why should our Sun as reference body be specially favored? What is the mechanism for how a physical displacement of mirrors on the Earth can be created at a distance?

From the above discussion, another important conclusion becomes quite obvious. The infinite relative motions (changes of relative position) of all other celestial bodies in the Solar System and in the Universe (including the Sun) are totally irrelevant to the finite time interval which a light ray must propagate over the finite distance between two relatively stationary mirrors on the surface of the Earth, or anywhere else. (Figure 10.8)

²² Just as we could not detect and measure all of such comparative celestial velocities and directions of velocity at one time in Michelson's interferometer, we could not arbitrarily select only one of such relative velocities to compare and measure (vis. the solar orbital velocity of the Earth), to the exclusion of all others.

There is a tremendous difference between the enormous systems of the Solar System, the MW Galaxy and the Cosmos on one hand, and the small finite system of M & M's apparatus on the other hand. In the enormous and infinite systems, we do not and cannot know any absolute velocities or directions of velocities of the Earth or any other body. Everything is relative. There is no absolute body of reference from which to make such absolute judgments.

But in the very small system of M & M's apparatus, we know the exact distance between the light source and the mirrors, and the relative direction of the light rays between them. We do not observe the mirrors to physically displace from the light source nor from the tip of the propagating light ray in any direction of the Earth's motion through space. Rather we observe such mirrors and such light source to be stationary with respect to the Earth, and stationary with respect to each other. Therefore, we must assume that there is no greater distance or time interval that a light ray must propagate to and fro in any direction within this small finite system, regardless of any assumed velocities (relative changes of position) of the Earth, any assumed magnitudes or directions of such velocities, or any assumed changes of relative position of bodies in the enormous systems.

This was the empirical result of the M & M experiments. In the absence of any convincing empirical proof to the contrary, the M & M empirical null results must be believed.²³ The primary reason that anyone believed otherwise was because of the myth of stationary ether and the invalid computations that were made based on that false belief. Because we now know that there is no ether, such false beliefs and invalid computations

²³ It was only because of the Earth's change of position relative to other celestial bodies in empty space that such increase in distance/time interval of propagation was imagined or inferred to exist.

must also be abandoned. It follows that Fitzgerald's, Lorentz's and Einstein's contraction concepts of desperation, invented to explain such false assumptions and computations, must also be abandoned.

In retrospect, it also becomes obvious that Maxwell's, Michelson's, Lorentz's and Einstein's above theoretical assumptions, mathematical computations, and contraction concepts were not only absurd; they were also totally meaningless with regard to the M & M experiments. If they were meaningless, then we must disregard them and turn to more tangible and empirical criteria in order to fully understand the real reasons for the M & M null results. We will further discuss these real reasons in detail in Chapters 11 and 12.

Aside from our discussion of the M & M paradox and its possible solutions, what is the primary lesson to be learned from this chapter? Such important lesson is: always trust observation and empirical results over theoretical prophesies and mathematical computations.

Figure 10.1 Michelson's 1887 Theoretical Difference In Time intervals For A Ray Of Light To Propagate Along The Longitudinal Arm In The Direction Of Motion, And Obliquely To The Transverse Arm In Such Direction Of Motion

A. When the apparatus is theoretically at rest in the stationary ether, the transverse and longitudinal light rays theoretically propagate 24 squares, from the absolutely stationary beam splitter (BS) to the absolutely stationary reflecting mirrors TM and LM, and then back to BS.

B. However, if the apparatus is theoretically moving relative to the stationary ether at velocity v , *a priori* the transverse light ray propagates obliquely (29 squares) from BS to TM to BS, and the longitudinal light ray propagates (32 squares) from BS to LM and back to BS; a theoretical distance/time interval difference of 3 squares. During this period of propagation, Michelson's apparatus and his eye theoretically move 16 squares to the right. Einstein asserted that because of this computation, the distance/time interval "difference should have been clearly detectable." (Einstein, *Relativity*, p. 59)

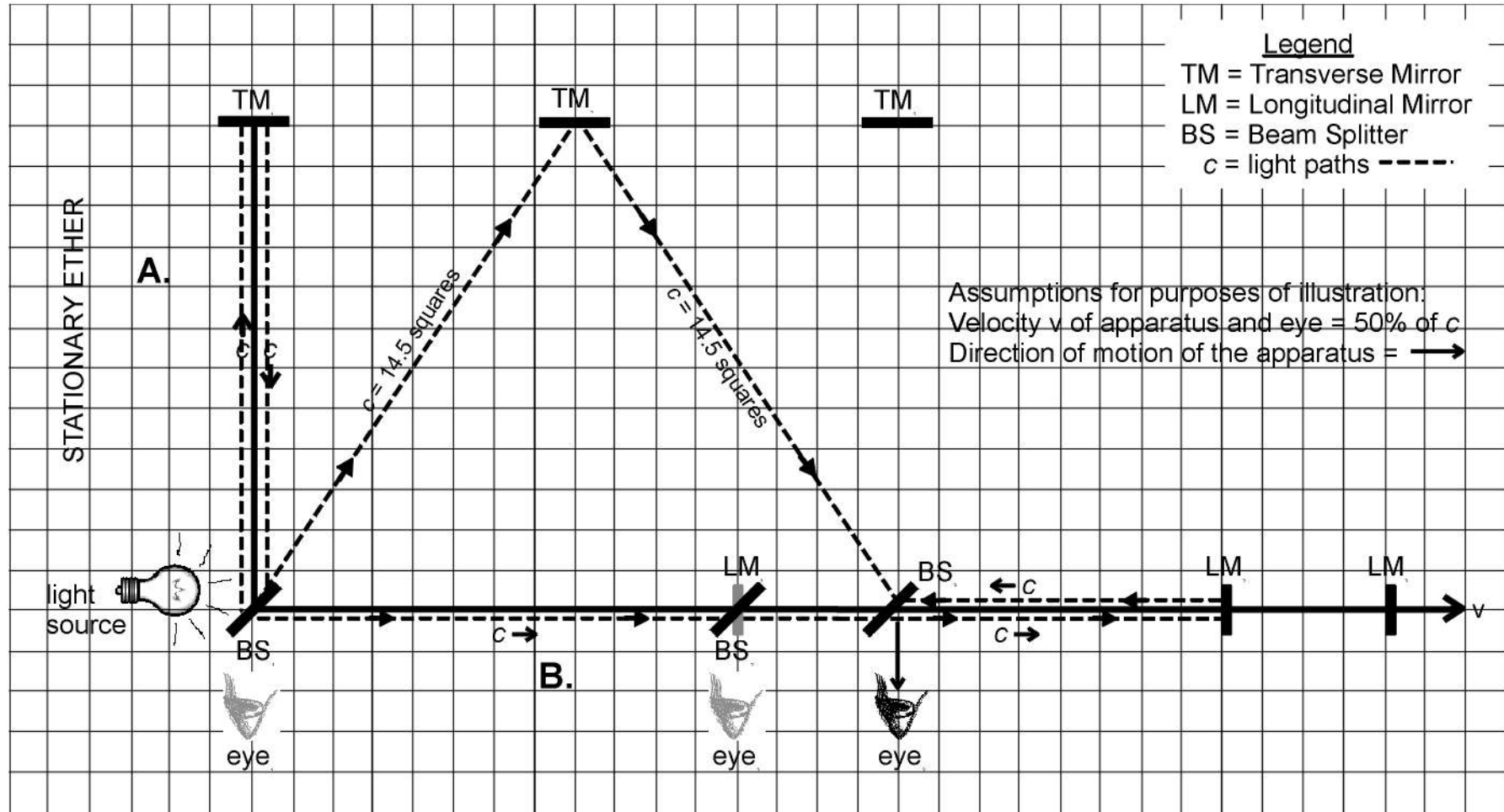
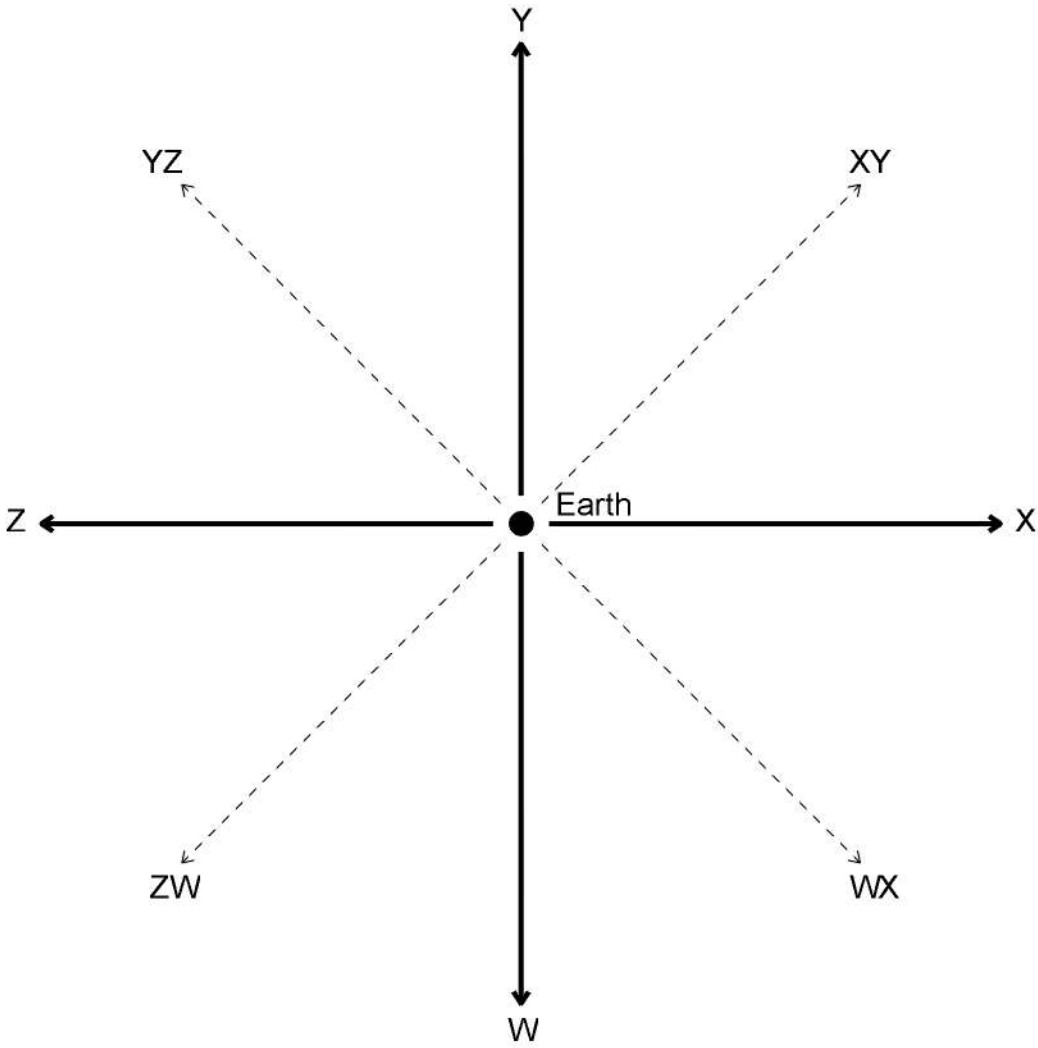


Figure 10.2 If The Earth Was Alone In Empty Space, Light Emitted From Earth Would Propagate Over The Same Distance During The Same Time Interval In Any Direction



Maxwell and others theorized that if the Earth was absolutely at rest in the stationary ether, then light transmitting at c on the surface of the Earth would propagate over the same distance during the same time interval in any direction.

The null result of Michelson's experiments also implied that the distance and time interval for light to propagate in any direction from the Earth was the same, regardless of the Earth's solar orbital change of its relative position to other bodies in the Cosmos. Thus, such null results also implied that the transmission velocity of light propagating in every direction from Earth was the same constant velocity c , regardless of any change of relative position of the source of the light (Earth). But the late 19th century scientists could not accept these implications.

Why? Because everyone assumed that the Earth was absolutely moving relative to stationary ether with a solar orbital motion of 30 km/s, and that this absolute motion would increase the distance and the time interval for light propagating in such absolute direction of motion. This was similar to the absolute mindset shown in Figure 2.2B. Ether was assumed to be like a post absolutely at rest in space; a place from which to measure the absolute velocity of the Earth in any absolute direction.

But in the universe filled with relatively co-moving bodies, as we now know it, we ask the impossible question: In which specific direction, at what specific velocity, and relative to what is the Earth absolutely moving? The answer is the same as if the Earth was alone in endless empty space. There is no absolute answer.

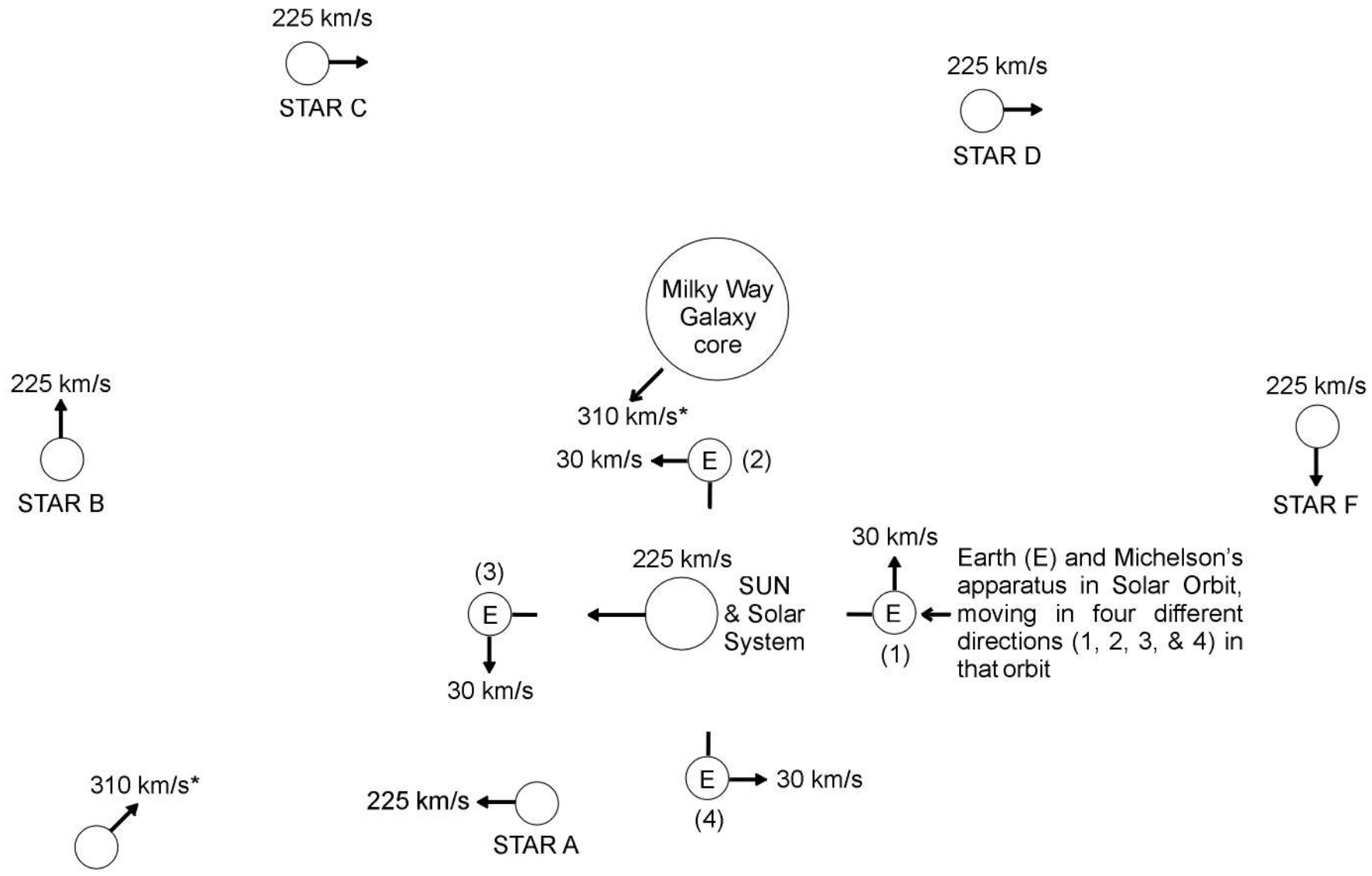


Figure 10.3 Motions (Continuous Changes Of Position) Of The Earth Relative To Other Bodies In The Nearby Space Of The Cosmos

*relative velocity of closure
 ** l/y = light year

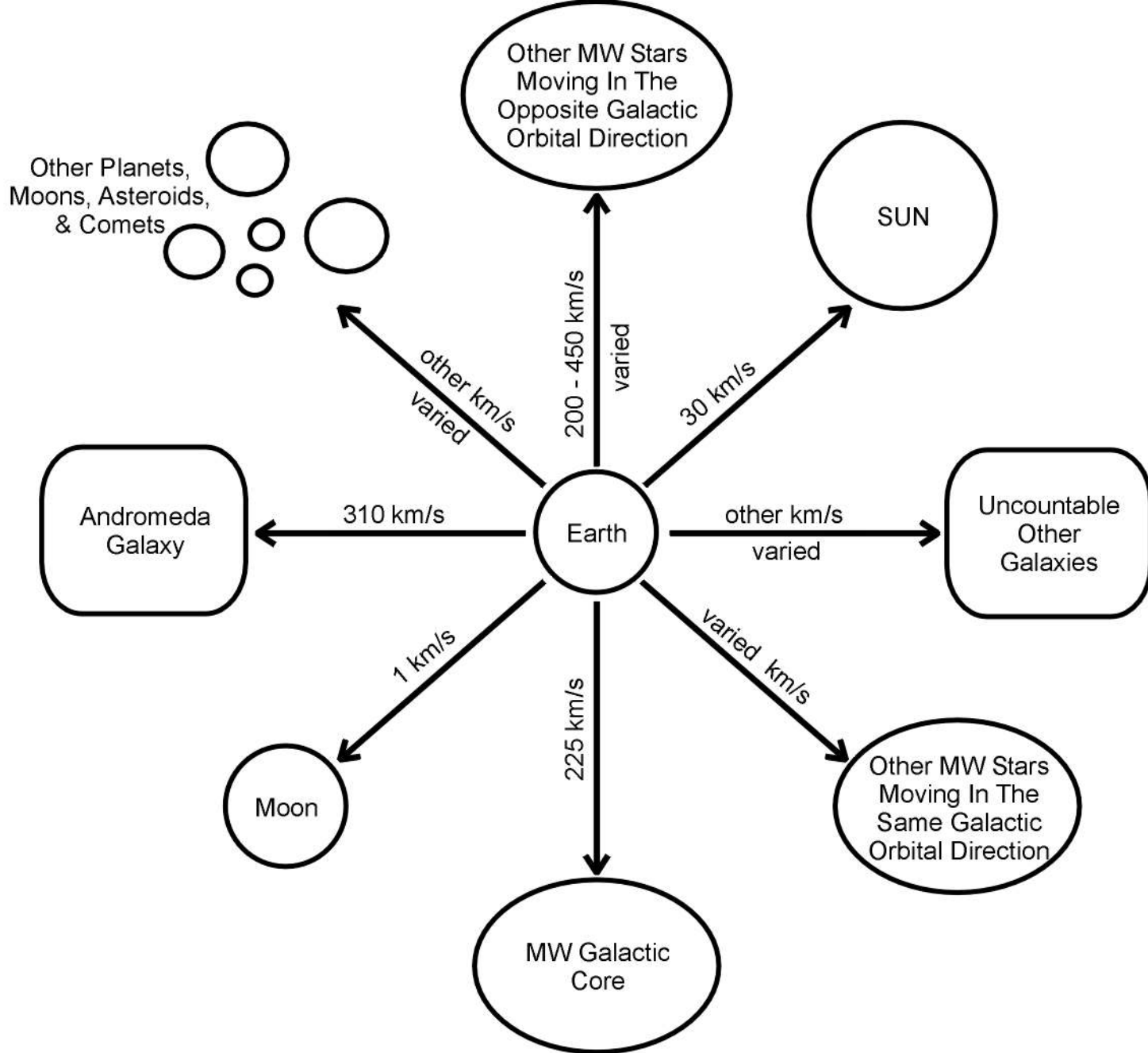


Figure 10.4 In Which Direction And At What Velocity Is The Earth Moving Through Space? Which Was Michelson Attempting To Detect And Measure?

Chart 10.5
Motions, Velocities And Changes Of Position Of Earth
Relative To Other Celestial Bodies
(all velocities approximate)

Earth's Motion or Velocity Relative to:	Type of Motion	Relative Velocities in km/s	Number of Relative Velocities	Description of Motions & Velocities
Planet Earth	R	+ .45		Earth rotating on its axis
Earth's Moon	O	M	1	Earth's orbit relative to Moon
	O	+1.4*	1	Moon orbiting Earth
Planet Jupiter	C & S	+15*	1	Earth's orbit rel. to Jupiter's
Other solar planets and their moons	C & S	V	8+	Earth's orbit relative to orbits of other planets and moons
Solar Asteroids & Comets	C & S	V	thousands	Earth's orbital vel. relative to velocity of asteroids & comets
Sun	C & S	M	1	Earth's elliptical motion rel. to Sun
	O	+30	1	Earth's solar orbital velocity
Other nearby stars	C & S	V	millions	Earth's velocity relative to velocity of nearby stars
Core of MW Galaxy	C & S	M	1	Earth's elliptical motion rel. to MW core
	O	+300*	1	Earth's orbital velocity rel. to MW core
Stars on opposite side of MW Galaxy	C & S	±600	billions	Stars orbiting MW core in opposite directions to Solar System
Andromeda Galaxy	C	-310**	1	MW Galaxy approaching Andromeda
Galaxy NGC 4697	S	+1236**	1	MW Galaxy separating from Galaxy NGC 4697
Other galaxies & stars in Universe	C & S	V**	infinite	Motion of Earth relative to motions of all other stars & galaxies

Key to Types of Motion/Velocities

R = Rotational
O = Orbital
C = Closure
S = Separation
V = Varied
M = Minimal Radial

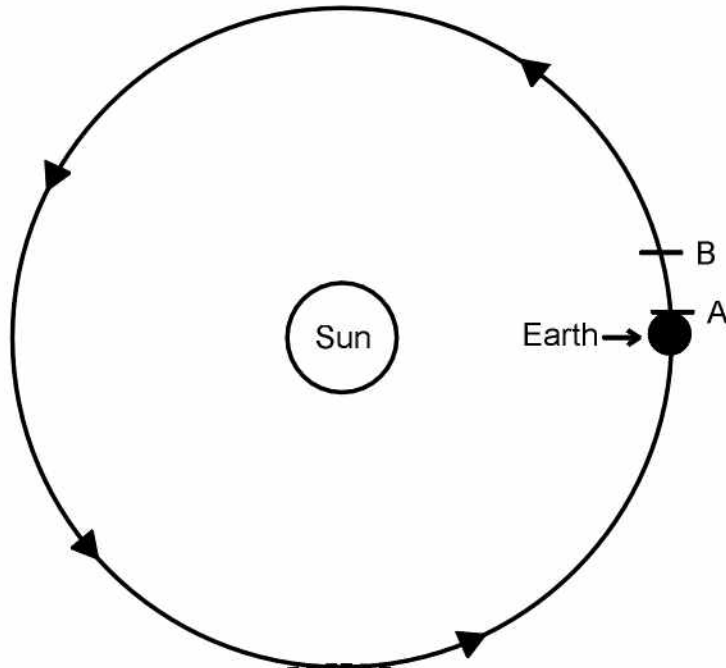
Partial Sources: *Zeilek, pp. A4 – A7

**Astronomical Almanac, pp. H44 -H48

Figure 10.6 What Is The Direction And Velocity Of The Earth Relative To

Figure 10.6A

It was assumed by the 19th century scientists that the Earth would absolutely move through stationary ether from point A to point B at 30 km/s in (t) time.

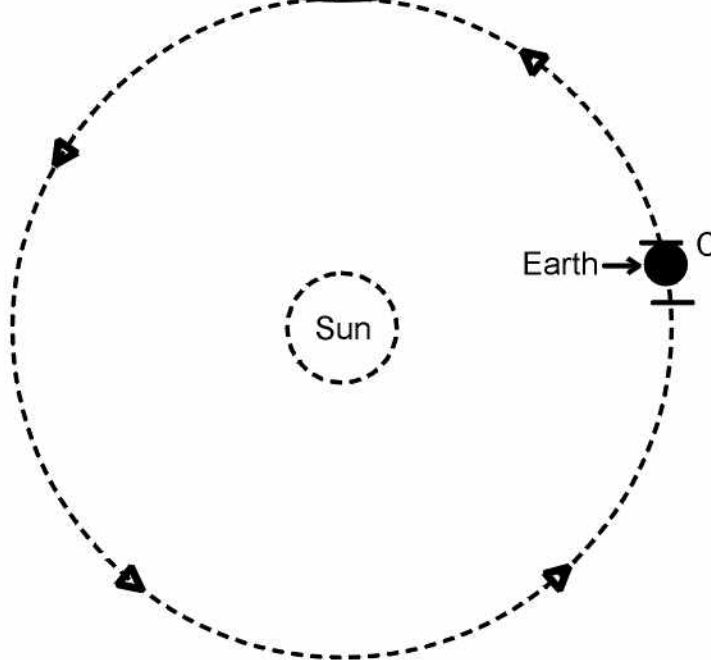


Earth's orbital velocity relative to the Sun at 30 km/s.



Figure 10.6B

But if the Solar System is also orbiting the MW Galaxy in the opposite direction at 225 km/s, then the Earth will actually move from point A (in Fig. 10.6A) to point C (in Fig. 10.6B) at 195 km/s during the same time interval relative to the core of the MW galaxy... a very different velocity in a very different direction than was assumed.

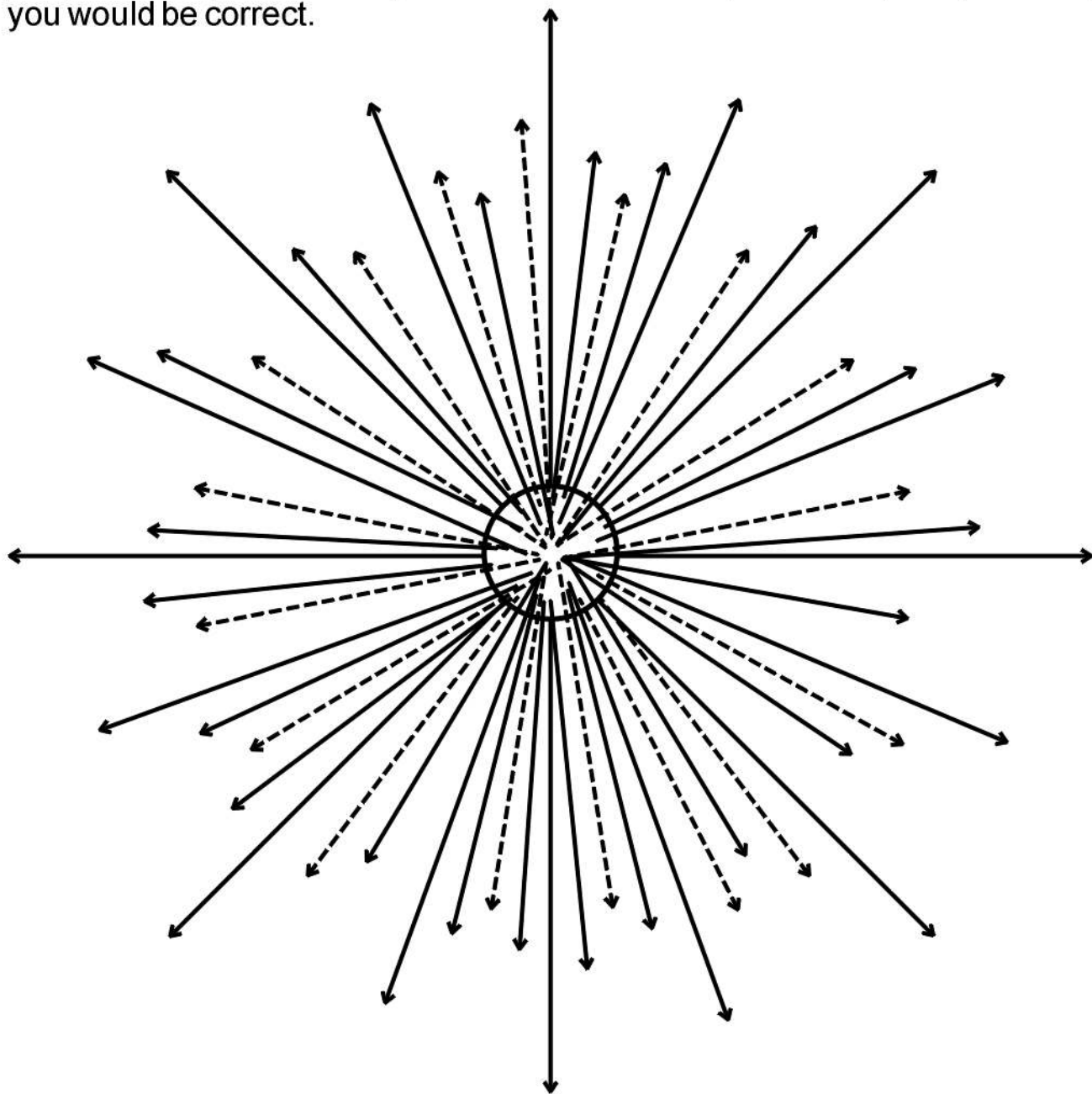


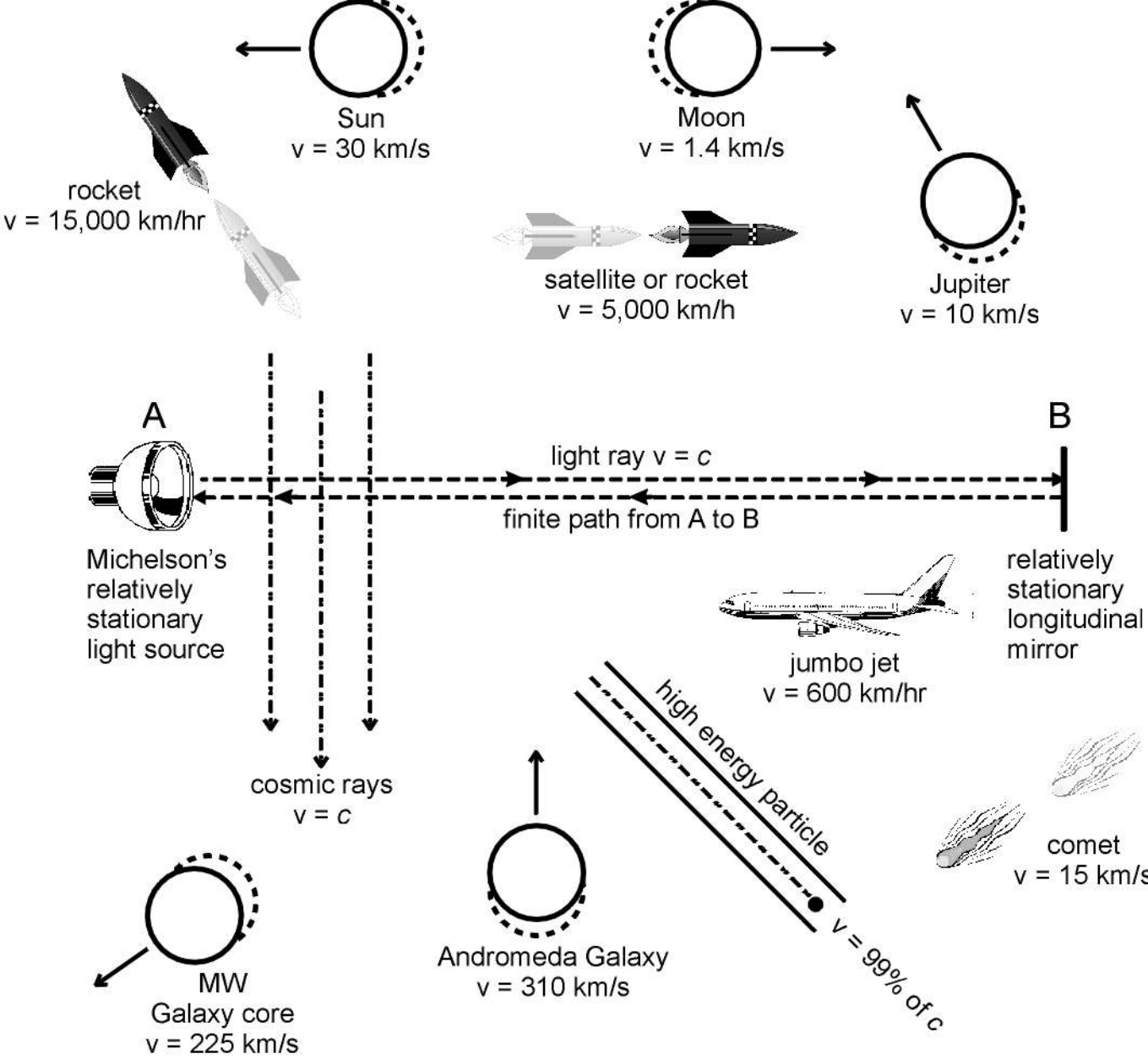
Motion of the Solar System relative to the core of the MW Galaxy at the galactic orbital velocity of 225 km/s.

This greater galactic orbital velocity of the Earth should *a priori* result in a six to eight fold greater displacement of the mirrors on the Earth,...but M & M did not detect any velocity of the Earth, either relative to the Sun or relative to the MW core.

Figure 10.7 Assume that you are a reflecting mirror in Michelson's apparatus which is located on the surface of the Earth. There are an infinite number of relative directions and an infinite number of relative velocities of bodies in the universe. In which relative direction of motion and at which relative velocity are you going to choose to displace from the light ray in Michelson's apparatus? All of them? One of them? None of them?

If you choose all of such directions and velocities, this is the same as saying that the Earth has no specific direction or velocity...which could cause a displacement of Michelson's mirrors from the light ray. If you chose only one, how did you arbitrarily make this choice? If you chose none of them, you would be correct.





Light source A and mirror B are relatively stationary on two mountain tops 1,000 kilometers apart on the surface of the Earth. A light ray propagates over the finite distance from A to B and back to A. During this period of propagation, the positions of 10 different bodies, particles and rays change relative to A, B, the light ray and the Earth, at different relative velocities. Will any of these changes of position in any way cause mirrors A and B to displace from the light ray, or affect the distance which the light ray must propagate? If so, why, in which direction, and at what velocity?

Why is any such relative change of position more important to A, B, the Earth, and the distance the light ray must propagate from A to B, than any other?

Figure 10.8 Can The Relative Motions (Changes Of Position Of Observed) Bodies Affect The Distance A Light Ray Must Propagate Over A Finite Path? Answer: NO.