Cargo Cult Science – The Michelson-Morley Experiment

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Abstract – Richard Feynman introduced the 1974 graduation class of the California Institute of Technology to the concept of cargo cult science. Cargo cult science is a process that gives the appearance of the scientific method. The term ether and its basic definition was known long before it was determined light was a wave. It had been postulated that the ether was responsible for the ability of light to transit a vacuum. The purpose of the Michelson-Morley (1887) experiment was to determine whether the ether existed. The experiment produced a null result, indicating the ether did not exist and space was empty. Acceptance of the experiment result has had a profound impact on scientific thought and allowed theories to be promulgated based upon space being empty. The expanding Universe is taught as a fact and the validity of that conclusion is discussed.

Introduction

It was 130 years ago, 1887 to 2017, when Michelson and Morley (MM) conducted the experiment that they claimed disproved the existence of the ether.[1-2] The concept of the existence of an ether came from Greek writings long before light was found to have the characteristics of a wave. Other than it fills all space, the Greeks didn't provide any information about the ether's characteristics. Scientists in the 1800s developed two theories about the ether, one being it was stationary and all celestial objects moved through it and the other that the ether accumulated near celestial objects and it moved with them. Scientists of that time were aware of gravity and that everything is attracted by it, but the electron had not been identified nor was it yet published that light was an EM wave.

When instruments were developed to examine the characteristics of light, it was shown that light exhibited many of the same characteristics as mechanical waves, such as interference, diffraction, refraction, reflection and the Doppler effect, just as sound waves. Mechanical waves require a medium in which to propagate, whether it was a gas, fluid or solid. It was reasoned that light too must propagate in a medium. Since the Greeks had written that the ether filled all space, it was reasoned that it must be the medium. When it was observed that light had the ability to pass through the vacuum of the glass bell jar, this reinforced the existence of the ether. Much has been written about the ether and these writings are contained in many sources past and present.

The term *luminiferous*, which often precedes ether in writings, meant light bearing. A search on the terms *luminiferous aether* and *timeline of luminiferous aether* will reveal that the MM experiment did not quell the belief in the ether. The scientific authority structure prevailed in keeping space empty.

The basic assumption of the MM experiment was that the ether was static and everything in the universe moves through it. It was reasoned it was possible to determine the ether's presence by comparing a beam of light that was traveling in the direction of the Earth's motion to a beam of light at 90° to the Earth's motion through the ether. This was an attempt to conduct a Doppler experiment using visible light waves. No change was observed, which allowed Michelson and Morley to conclude there was no ether. The experiment did not consider the rotation direction of the earth and the experiments location, the Earth's position relative to the Sun, or the direction of the Sun's travel in the galaxy, nor whether the galaxy itself was moving.

It is apparent that the MM experiment and its adoption by scientific authority has not caused the belief in the ether to go away. That EM waves require no medium in which to propagate, implies that space itself consists of nothing. This nothingness has been carried forward to the present, as the terms *empty space* and *free space* are frequently used in scientific literature. Declaring space to be

empty has had consequences in a broad area of scientific discovery and it is not all positive.

Alternate Ether Theory

The alternate theory on the nature of the ether was that it surrounds and is dragged by celestial bodies. James Clerk Maxwell and other notable scientists held this view. By selecting the static assumption, the MM experiment would produce a negative result. If they had chosen the alternate assumption the experiment result would have produced a positive result. Perhaps there was a reason why the static assumption was chosen.

Underneath all the theorizing about the ether was the nagging question, 'How did the Greeks know about the ether?' The ancient Greeks did not have telescopes, were unaware of EM waves or that light itself was an EM wave. It is almost as though the MM experiment was deliberately established to prove a negative, thus to dispose of the intractable Greek problem.

There are similar questions on how the Greeks knew about the atom. It is doubtful that the Greek's knowledge of the atom can be disposed of so readily as was the ether, because scientists have adopted the term atom and identified some of the parts and characteristics. It is recognized that the physically identifiable parts of an atom take up a small part of the space of its physical size, the remainder being empty space.

Optical Astronomers and Empty Space

Optical astronomers are responsible for the current theories about the nature of the universe and they still treat space as being empty. Since the ether had been discredited, there was just one thing that could alter light from a distant object, the Doppler effect. This was exploited by Edwin Hubble.

The fuzzy patches of light observed by earlier telescopes were thought to be objects within our galaxy, but larger telescopes found them to be other galaxies.[3] The term galaxy comes from the Greek, literally meaning *Milky Way*. A systematic reddening was noticed by the astronomer Vesto Slipher as galaxies at greater and greater distances were identified.

In 1926, Edwin Hubble observed that the reddening increased linearly with distance. The logical conclusion, since space was empty, it was a Doppler shift, the galaxies are moving away from each other. As a consequence of getting rid of the ether and now having empty space between every object that could be seen in space, one need not consider there was anything in space that could result in an increasing reddening with distance. Hubble produced what is known as the cosmological constant, H_O.

Radio Astronomy and Dispersion Measure

Radio astronomy did not get started until after the publication of Grote Reber's “Cosmic Static” and the conclusion of WWII.[4-5] After some 50 years of observation, radio astronomers concluded space in our galaxy is not empty of some material that influences EM waves, which is why they developed the term *dispersion measure* (DM).[6-7] DM was being applied in the early 1990s. The title of ref. (6) is, “A NEW MODEL FOR THE GALACTIC DISTRIBUTION OF FREE ELECTRONS AND ITS FLUCTUATIONS.” The first paragraph of ref. (7) provides a concise explanation of DM. DM is used to account for discrepancies in distances to objects that shouldn't be significantly distant from each other. There had to be material in space that was causing the modification of EM pulses at specific viewing coordinates.

Figure 2 of ref.(6) is a gray scale density plot created to represent the relative electron density in various parts of our galaxy. It is apparent that a viewing coordinate along a galaxy arm or toward the center of the galaxy is going to encounter more density. The DM of radio astronomers is treated as a

linear column of material even though they are aware that there are denser portions in the viewing column. It is a matter of having a usable mathematical model.

The actual components that produce dispersion are charged particles and these in various concentrations are referred to as a plasma. Depending upon the concentration of the plasma, a non-linear medium, it will influence EM waves in a number of ways. The dispersion of strong pulses, as shown in the spectrum display of fig. (7), is the result of interaction between the charged particles, which produce a plasma, and the RF waves. Electronic circuits that produce harmonics and heterodynes use a plasma of electrons or holes, and subsequent circuitry selects frequency components that are produced to achieve a specific purpose. The Swinburne image is showing just heterodynes.

Astronomers are basically physicists and tend to use different terms than those used by electrical engineers. If there are multiple RF waves traversing a plasma they will interact. A single RF frequency will experience harmonic production and multiple frequencies interacting will produce heterodynes. Harmonics of different frequencies interacting can produce heterodynes. The particular Swinburne image is displaying heterodyne action, because harmonics would be multiple integers of the primary frequency. The spectrum display frequency range shown does not extend far enough to show a harmonic. The frequency difference between the two primaries, should be within the frequency range shown in the image, but there is a reason why only one is shown. We are always taught that heterodynes occur between two waves that are perfectly aligned, but that will not be the case outside of electronic circuity that arranges perfect alignment. In space, the intersection of two perfectly aligned waves would be the exception. As a result, the radio astronomy antenna will receive just one of the modified primaries and its associated heterodynes, which results in the unusual spectral display shown in fig. (7).

Light waves have much higher frequencies than those being detected by radio astronomers. Light waves can experience harmonic and heterodyne action in the proper conditions, but the resulting frequencies will not always be detectable in the visible range.

The terms inter-stellar material (ISM) and inter-galactic material (IGM) are used to describe the general location of the material. We are familiar with what dust or smoke does to light when it is between an observer and the Sun, it results in a distinct reddening. The same absorption process occurs with dispersed particles we cannot see, but it takes more of them to accomplish the reddening. IGM need not be as dense as that detected within galaxies because the greater distances will accomplish the reddening. Basically, the Hubble constant can be converted to a Reddening Measure (RM) which can be expressed in parsecs for many of the viewing coordinates that do not go through obscured portions of our galaxy or other galaxies. The RM for coordinates that do go through viewing coordinates that are obscured will have to be determined.

An article titled, “The Expanding Universe: From Slowdown to Speed Up,” exemplifies how the material from a specific celestial object can be interpreted as causing a greater redshift.[8] Considerable material was spread into space by the supernova and that has to be considered to establish a RM value for that particular celestial object. An assumption had to be made about the spectrum of the star that is within the supernova in order to justify the magnitude of the redshift motion claim.

Conclusion

Declaring space to be empty has allowed theories to be developed that would have been difficult to promote if an ether existed.

If and when optical astronomers admit radio astronomers are correct, the Hubble constant will have to be converted to a RM value. Redshift cannot always be interpreted as being caused by motion or as a sole determination of distance.

If the MM experiment had not been done in 1887 and the same experiment was performed today with the same basic assumption, it is doubtful the results would be accepted by the scientific

community. Now, anyone that tries to establish a basic characteristic of space has to deal with ISM, IGM, black holes, dark matter, dark energy and spacetime.

Scientific discovery has paid a heavy price because those that criticize settled science are suppressed.

There is a high probability that conclusions reached a century ago were based upon incomplete information and conclusions reached today will be determined to be deficient a century from now.

References

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