

## Relativity and the Third Observer

Einstein's theory of relativity is an extremely brilliant construct for reconciling the views of **two** observers in relative motion, particularly when such relative motion approaches the velocity of light. However, it is not generally recognised that when **more than two** observers are in mutually relative motion, the theory as we know it, collapses completely.

To illustrate this point we can consider a thought experiment in which a manned spacecraft (A) is launched to orbit the Earth in a *westerly* direction at a velocity of about 200 000km/sec (about  $\frac{2}{3}$  velocity of light). Another manned spacecraft (B) is launched to orbit the Earth in an *easterly* direction and its velocity is also maintained at 200 000km/sec with respect to its earthly frame of reference in which observer C looks on. Let us assume that both spacecraft use roughly the same orbit and pass each other going in opposite directions. This can all be achieved within the laws of Newtonian physics and does not violate the postulates of the theory of relativity provided that only observer C is considered.

One problem is immediately obvious, that the spacecraft are passing each other at a relative velocity of about 400 000km/sec which is greater than the speed of light. According to relativity principles this is not permitted and should be impossible - but let us approach this problem more gently.

According to relativity theory observer C on Earth will have no problems observing spacecraft A or B, either individually or both together. He will "see" each spacecraft as being contracted in length, gaining in mass and its clocks running slow according to the relativistic formulae<sup>1</sup>. In their simplest form they can be written as:

Time dilation factor (clock slowing)

$$dt = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Length contraction factor (in direction of motion)

$$dl = \sqrt{1 - \frac{v^2}{c^2}}$$

Mass increase factor

$$dm = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

where  $v$  is the relative velocity and  $c$  is the velocity of light (approx 300 000km/sec). When the relative velocity ( $v$ ) approaches the speed of light, the fraction  $v^2/c^2$  approaches unity and these factors become either zero or infinitely large. This is the justification given for velocities greater than the speed of light to be impossible.

But what do observers A and B have to say about each other's impossible speeds ( $1\frac{1}{3}$  times the speed of light) which, according to theory, would result in highly problematic mathematics involving the square root of negative numbers? This is clearly absurd. However, such problems are not limited to space travellers nor is it necessary for relative velocities to exceed the speed of light. **The theory is basically flawed at any speed if a third observer is introduced.**

For example we could apply the theory to three automobiles (with observers A, B and C)

travelling in the same direction along the same straight highway at speeds of 50km/hr, 100km/hr and 150km/hr respectively. Observer A looking at C will calculate values of  $dt$ ,  $dl$ , and  $dm$  based on a relative velocity of 100km/hr. Observer B looking at C will calculate different values of  $dt$ ,  $dl$  and  $dm$  based on a relative velocity of 50km/hr.

The observations of any two drivers with respect to the third will result in differing amounts of time dilation, length contraction and mass increase. How is it possible for an object to simultaneously have two different lengths, two different masses, let alone a clock ticking at two different rates?

**According to relativity theory whenever three or more observers are in mutually relative motion, each observer's domain will simultaneously exhibit at least two different length contractions, at least two different mass increases and at least two different time dilations depending on which relative motion is being considered. In terms of physical reality this is clearly impossible.**

Most scientific theories, when challenged by impossible paradoxes like these, would collapse and be consigned to the forgotten heap of theoretical detritus. I doubt if such a fate awaits relativity. It seems too well established in the psyche of the scientific mind. But maybe it could be relegated to its original intent.

It is my firm belief that when Einstein postulated the general principles of relativity he intended the measurements by each observer to be taken **as if** the observed lengths contracted, masses increased and clocks slowed - **not that these changes actually happen**. Sometime between 1905 and the middle of the 20<sup>th</sup> century, overenthusiastic physicists had taken Einstein's ideas and had run with them, declaring that all the relativistic changes were *actual* and *real*. If we go back to the original intent and apply the theory to the **apparent observations** then relativity could at least be used to reconcile the thorny problem of simultaneity between two observers in relative motion at velocities *less than the speed of light*. We must, however, abandon the concept that velocities greater than the speed of light are impossible. The thought experiment at the beginning of this paper illustrates a perfectly plausible example of how this could be achieved. Furthermore, as a general principle it can be stated that *at whatever velocity a moving object travels, another object can always be projected from it to travel in the same direction at a greater velocity relative to a third observer*. **Hence there can be no theoretical upper limit for relative velocity**. There may be practical impediments which may prevent such velocities ever being realised.

There are yet other problems with the special theory of relativity which cannot be resolved, even by assuming *apparent* observations and calculating *apparent* changes. If we project a light signal in an east-westerly direction along a straight path 300 metres in length, then we would expect it to travel from one end to the other in one microsecond ( $1\mu\text{s}$ ) assuming the velocity of light is 300 000km/sec. This can be accurately measured by synchronised clocks. However, the Earth in its orbit around the sun is travelling at about 30km/sec so that in  $1\mu\text{s}$  the Earth will have moved 30mm. Consequently the light signal (relative to the sun) will have travelled 300.03m in  $1\mu\text{s}$  – slightly faster than the speed of light! This is the very problem that special relativity was designed to overcome. According to the theory, an observer on the sun will see a contraction of the Earth in its direction of motion due to its orbital velocity. Calculations should produce a contraction of 30mm in our 300m test length when orbiting at

30km/sec. Unfortunately the Einstein formula calculates the contraction (real or apparent) to be about 2000 times less than this value. The mathematics cannot be applied to real-life situations such as this.

The fundamental and most important problem with this theory (and several others) is **the lack of a medium** that carries the information, the light signals, between observers. Relativity, in theory, does not require a medium. It assumes that energy and waveforms can be magically transmitted through absolute vacuum. This allows light signals to travel at the same speed relative to any observer whatever their relative motion to each other. At the same time it subtly makes use of the concept of a medium in various ways and with various names. The *electromagnetic fields* and *gravitational fields* are not denied but tend to be subsumed into the all-encompassing *space-time-continuum*. There is also a *frame of reference* attached to each observer. None of these is well defined or has any physical reality but serves only as a mathematical construct. The space-time-continuum ‘out there in space’ appears to be common to all observers but it is not clear whether it is fixed or moves or whether each observer has his own space-time-continuum that moves with him. The existence of a real physical medium can resolve such dilemmas.

One of the main reasons for the widespread acceptance of the theory of relativity and one of its few successful predictions, was its treatment of the effect of gravity on electromagnetic energy. The theory assumed that mass and energy were equivalent and could be converted from one form to another using the famous formula  $E = mc^2$ . Consequently it was predicted that gravity could deflect light rays. This was confirmed by measuring the apparent position of stars during a total eclipse of the sun.

It is conceivable and much more likely that the bending of light rays in close proximity to a massive object, like the sun, can be explained more simply by assuming the existence of an all-pervasive medium. Such a medium is not fixed in space but is free and flexible and can respond to the movement of objects such as stars and planets in the same way as atmospheric air responds to the movement of the Earth.

The case for the existence of a medium (renamed *magna*) has been argued elsewhere<sup>2</sup> and is described briefly in Appendix 1. Such a medium can explain not only the bending of light by gravitational forces but can also explain the fundamental mechanism by which gravitational forces are generated.

Relativity theory explains gravity in terms of a distortion of the space-time-continuum. This is meaningless unless a “space-time-continuum” actually has a physical existence rather than being only a mathematical construct. If we postulate that the medium *magna* replaces the space-time-continuum, then a simple interpretation can be used that is analogous to the ‘distortion of the space-time-continuum’. A brief introduction to the nature of *magna* is given in Appendix 2. Such a medium can explain many other fundamental problems of science which currently elude rational solutions.

One is tempted to muse on the relevance and importance of the theory of relativity. When observations of relative motion occur at velocities approaching the speed of light, any problems arising would normally be of a very short duration. At such speeds, the blink of an

eye could easily miss the whole performance as the objects would be many thousands of kilometres away after only a fraction of a second; too far away to be observed at all.

It has always puzzled me as to why such problems, which seem trivial and of little practical significance, should fire up the imagination of scientists and non-scientists alike for over a hundred years and thereby create such a monumental edifice of poorly understood theory; poorly understood not just by the general populace but also by its proponents, the many highly qualified scientists.

Unfortunately this is not the only theory which has gained credibility by being presented in the language of complex mathematics. It is not the mathematics that is wrong – it is the theory itself.

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Ref<sup>1</sup>: Lorentz, H.A., Einstein, A., Minkowski, H., Weil, H., *The Principle of Relativity*, Dover Publications NY ISBN 0-87975-980-1.

Ref<sup>2</sup>: Goodman, Hans, *The Mindfield: Reinventing Science*, Ibis Books, Australia ISBN 978-0-9577342-6-5

Ref<sup>3</sup>: Newton, Isaac, Sir, *The Principia*, [*The Mathematical Principles of Natural Philosophy* (1687)] Prometheus Books, New York ISBN 0-87975-980-1.

## Appendix 1: The possible existence of a medium

The possibility of the existence of an electromagnetic medium (previously known as the *ether*) has long been rejected by the scientific community due mainly to the good work of Michelson and Morley (and others) who carried out brilliant and painstakingly accurate experiments in efforts to measure *ether-drift*. It was argued that if a medium existed then the movement of the Earth around the sun and its rotation on its axis, must involve some movement *through the ether* on some occasions during its various cycles. If so, then this *ether-drift* should be measurable. It is to the everlasting credit of Michelson and Morley that they did **not** find any *ether-drift*. It is to the everlasting shame of the rest of the scientific community that the failure to detect *ether-drift* was taken as proof that no medium existed. **The fact that no *ether-drift* can be detected does not prove that a medium cannot exist.**

The unwritten assumption was that if a medium existed then it must be *fixed in space* and any objects such as the planet Earth must necessarily be moving through such a medium. There is no rational ground for such an assumption.

Over the last hundred years and more, the belief in the non-existence of a medium has resulted in the very name *ether* acquiring a bad reputation. It is for that reason (and others) that such a possible medium has been renamed *magna* and its individual constituents, *magna particles*.

Any supposed medium that can carry electromagnetic signals must necessarily be an elastic fluid similar to atmospheric air but with an individual particle size much smaller than even the smallest atom. This explains the difficulty in detecting such a medium because it can diffuse through ordinary matter. It also explains its ability to carry signals with wavelengths as small as those of x-rays and gamma rays and beyond.

If such an all-pervasive, elastic fluid medium exists then, with the benefit of hindsight, it must be obvious that large objects such as stars and planets revolving and orbiting within this *magna* will cause disturbances and movements of the medium. Over long periods of time stars like our sun will stir the *magna* into a vortex extending into the far reaches of the solar system. The rotation of planets like the Earth will have a similar effect on the *magna* at its surface. After billions of years the medium *magna* will rotate *with* the surface in much the same way as atmospheric air moves with the surface of the Earth. Detecting the medium cannot be done by measuring its 'drift' relative to the Earth. **There is no drift.** The results of the Michelson and Morley experiments proved that there is no drift. They proved also that any medium must necessarily be moving *with* the surface of the Earth.

There are other ways of establishing the medium of *magna*; for example, by sending spacecraft to orbit the Earth in a direction *opposite* to the rotation of the Earth. This will result in the spacecraft travelling *through* the *magna* rather than *with* it. Interferometry methods can then be used to measure the *magna-drift*. More detail of such methods can be found in Ref<sup>2</sup>.

Apart from the fundamental problem of how *any* waveform can be propagated without a medium, there are many other phenomena that cannot be explained adequately without the

existence of a medium. The existence of the medium *magna* provides solutions to many of the fundamental problems of science including:

- An explanation of the means of transmitting electromagnetic waveforms and energy.
- An explanation of the mechanism by which gravitational forces can be generated.
- An explanation of the means of generating and transmitting magnetic forces and related phenomena.
- An explanation of electric forces and electrons.
- An explanation of inter-atomic forces and chemical reactions.
- An explanation of sub-atomic and nuclear phenomena.
- Some explanations of the strange effects of quantum theory.
- A possible explanation of the ‘missing mass’ and ‘dark energy’ that has yet to be discovered.
- A better explanation of spectral analysis of light including the red-shift which is used as the basis for many fundamental theories including ‘the expansion of the universe’ and its likely cause, the ‘big bang’.

These and other problems can be solved by using the same concept of *magna* for each. Proof of its existence can be obtained as early as the next ‘space mission’.

## Appendix 2: The nature of the medium *magna* and its effects

Ever since the results of the experiments of Michelson and Morley (1887) a general scientific consensus has held the belief that no physical electromagnetic medium (*ether*) exists. Nevertheless the realisation has continued that some sort of medium is absolutely essential. Hence we have the use of the term *electromagnetic field* which is vaguely described as ‘an area of influence which facilitates the transmission of electromagnetic waves and energy’ but has no physical attributes. Similar terms are used to describe the *gravitational field* and its relativistic counterpart, the *space-time-continuum*. These fields are given certain mathematical properties that enable theories to be developed but they have no physical reality.

It is clear and self-evident that the transmission of *any* waveform requires a medium. There must be something that ‘waves’, some elastic substance that when disturbed tends to restore itself to its equilibrium condition. It is equally clear that numerous experiments over the last four hundred years have failed to find a physical medium i.e. a medium consisting of one or more of the known types of elemental atoms.

The Michelson & Morley experiments looked for movement between the Earth and the supposed medium (*ether-drift*) but failed to find any. However, they did not claim to have disproved the existence of a medium. Their experiments were based on an unwritten assumption that the *ether* was fixed in space and unaffected by the movements of stars and planets. Such an assumption is not logical or justifiable.

Any physical medium that can carry electromagnetic waves must necessarily be an elastic fluid, similar to atmospheric air but with a particle size very much smaller than even the smallest atom. Electromagnetic radiations cover a wide spectrum of wavelengths. They range from radio waves ( $10^3\text{m} - 1\text{m}$ ) to TV, microwaves, light ( $\sim 10^{-7}\text{m}$ ), to x-rays and all the way down to gamma rays ( $\sim 10^{-14}\text{m}$ ) and beyond. In order to carry such waves, it is estimated that the particle size of such a medium needs to be of the order of  $10^{-30}\text{m}$  or less. Such a small particle size is also consistent with the transmission of energy at the speed of light ( $\sim 3 \times 10^8\text{m/s}$ ). This physical medium is named *magna* and its individual particles, *magna particles*. The only other necessary property of *magna* particles is to assume some elasticity that enables them to vibrate and pass energy to neighbouring particles.

Such a medium as *magna* will be affected by the movements of stars and planets. We can take the sun as an example. The sun is a very large object with a diameter of more than a million kilometres. It is a hundred times bigger than the Earth and a million times more massive. The sun rotates continuously about its axis making one complete revolution in about 25 days. The sun is so enormously large so that even at such slow rotational speed, the surface of the sun at its equator is moving at more than 7000km/hour or about 2km per second. With the benefit of hindsight, it seems illogical to assume that such a large rotating mass would have no effect on the surrounding *magna*. On the contrary, it seems likely that after five billion years or so, the *magna* will have been stirred into a giant vortex extending into the deepest parts of the solar system.

In a similar way, the rotation of the Earth will cause the *magna* to be dragged around with it (\*). Over time, the surface of the planet and the surrounding *magna* will rotate together.

Consequently no medium-drift (*ether-drift*) would be measurable. The results of the Michelson and Morley experiments confirmed that any medium close to the surface of the Earth must be moving *with* the Earth.

Based on the existence of the medium *magna*, it can be shown that:

- (a) The interaction between a mass of energetic atoms and the surrounding *magna* will produce a vibratory force that increases the mobility of the adjacent *magna* particles and consequently reduces the density of *magna* at the immediate interface. This effect is maximised at the surface of the mass and reduces according to an inverse square law as the distance from the mass increases.
- (b) The *reactive force* due to this interaction between atoms and *magna* particles acts inwards *into* the mass to push the atoms together. The magnitude of this force depends mainly on the number and size of the atoms i.e. on the mass. (There are other secondary factors such as temperature which are not relevant to the present discussion.) *It is this reactive force that constitutes the force of gravity.*
- (c) Taking the two effects (a) and (b) together it can be seen that gravitational force is generated around a mass due to energetic atoms affecting the density of the medium (i.e. 'distorting' it). **It is the change in the density of the medium that causes the bending of light rays (by the simple process of refraction) when passing close to a massive object like the sun.** While this is indirectly associated with gravity, the effect is optical rather than gravitational.
- (d) When two masses are in proximity with each other, each produces an inward gravitational force. This also results in an additional force *between* them. The effect of each atom is coupled with the effects of all the atoms in the other mass so that a multiplying factor results. The magnitude of this force is therefore determined by the product of the masses and decreases with the square of the distance as stated by Newton<sup>3</sup>:

Gravitational force  $F = \frac{Gm_1m_2}{r^2}$

(\*) It can also be argued that the rotation of the Earth on its axis, as well as its orbital motion around the sun is caused by the vortex of *magna* due to the stirring effect of the rotating sun. Otherwise we would have to believe in the concept of perpetual motion.