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Herbert Dingle Was Correct! Part XIII

The Mathematical Mistake In The Special Theory Of Relativity

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1.0 Introduction

The purpose of this paper is to make clear, using a primarily nonmathematical narrative, the mathematical error in the special theory of relativity, which is the reason for the fatal flaws discovered by Herbert Dingle and confirmed by other critics of relativity. The fatal flaw results in contradictions, which have been dismissed by orthodox relativists as valid consequences of that theory. However, Dingle's contradictions have not been as easily dealt with as the older traditional paradoxes. Dingle's contradictions, he calls them an inconsistency, have been dismissed as errors in Dingle's mathematical analysis. In this series of papers, it was shown that Dingle's fatal flaws are inherent to the mathematics of special relativity and that the theory is falsified by Dingle's proofs.

The mathematical error in special relativity can be traced to Henri Poincare who introduced the notion that the mathematical structure of the special theory of relativity was a rotation group in space time. The rotation group structure implies an additive group structure. In an additive group, the inverse transformation is mathematically a subtraction operation. Thus the inverse of a Lorentz transformation in space time is a rotation in the opposite direction. However, there is another type of group structure, the multiplication group. In this group structure, the inverse transformation is a kind of division, where the inverse operation is multiplication by the inverse of the group element. This is usually the reciprocal number. For example the inverse or reciprocal of 2 is ½. The mistake arises because in special relativity the inverse operation is taken to be an element of the additive rotation group, when the correct mathematical operation should use an element of the multiplicative group. Hence, when familiar algebraic operations are used in special relativity, an error occurs which results in paradoxes and contradictions. This can only be corrected by introducing the correct inverse Lorentz transformation based on the multiplicative group property.

2.0 Background

It is firmly believed by the physics establishment that the rotation group concept, introduced by Poincare, then adopted by Minkowski, and finally embraced by Einstein, is the correct mathematical structure for special relativity. This belief is so firmly entrenched that despite years of controversy, beginning long before Dingle took up the problem, belief in this conception has remained unquestioned.

The rotation group property is so vital to the established theory of special relativity that

the theory can not survive without this concept. Hence, the denial of any fatal flaw in the theory, despite the contradictions that will not go away. Curiously, this idea was not a key concept in Einstein's version, but arose from Poincare's theory of relativity. The concept of a rotation in space time is vital if the idea that all reference frames are to be considered equivalent is to be maintained. This idea is built upon the additional assumption that the standards of measure are identical in all of the equivalent reference frames. Hence, a unit of time or space measure is the same in all of them. But this the leads to contradictions when the Lorentz transformations show that the measures of space and time are different in relatively moving reference frames.

The contradictions and inconsistencies arise when the mathematics of an algebra is applied to solve problems in the special theory of relativity. Strictly speaking, the rotation group conception introduced by Poincare is a very simple mathematical structure compared to the structure of the field of real numbers, which is assumed in physics. This however, is not the actual structure used in physics. The mathematical structure commonly used is a linear algebra. The point of this paper is to show that the structure of the Lorentz rotation group is incompatible with the structure of a linear algebra as is normally used in physics.

As is typical when dealing with the special theory of relativity, the rotation group concept has led to confusion and misinterpretation. There are two distinct physical interpretations of the mathematical structure of relativity. This has led to endless controversy as the proponents and critics of relativity battle. Critics who take Einstein literally, demonstrate that his idea that time actually slows down in the moving frame leads to a contradiction in the form of the twins paradox. This criticism is met by proponents of relativity who claim that this literal interpretation is false.

The result of this confusion is the following. It is indeed possible to interpret the Lorentz transformations of the special theory in terms of a rotation group, but this interpretation restricts the physical interpretation to imply that the observed changes in the standards of space and time are only apparent as viewed from a relatively moving reference frame. But this contradicts Einstein's insistence that the dilation of time and the contraction of space are real physical phenomena in the moving reference frame. The result of this is the following. If the rotation group interpretation is maintained to be true, then the result must be a physical interpretation which interprets all observations of physical changes as merely apparent, and without physical significance within the moving reference frame. They are real only for a relatively moving observer. However, it must be emphasized that this is not the interpretation advanced by Einstein that made him famous. That interpretation leads to contradictions and inconsistencies as demonstrated conclusively by Dingle. The essence of the problem is this. In order for the Einstein interpretation to be valid, the rotation group mathematics must be invalid.

The last point is the essence of what Dingle demonstrated in his proofs that relativity was false. He showed that when using the rotation group mathematics and assuming that the changes in time were real in the moving frame, then it was a mathematically unavoidable

conclusion that each of the two clocks in the relatively moving reference frames ran slower than the other. A result which is a physical impossibility, because if clock A runs slower than clock B, then it must be true that B is faster than A. But relativity concludes, based on the rotation group interpretation, that if clock A runs slower than clock B, it is also true that clock B runs slower than clock A. This result is a logical contradiction, as conclusively shown by Dingle.

In papers written by the author, it has been demonstrated that by using a linear algebra in which the Lorentz transformations do not conform to the rotation group hypothesis, it is possible to establish a contradiction free interpretation in which if clock A runs slow relative to clock B, then B is fast relative to clock A. It is claimed that this is the correct mathematics of the Lorentz transformations. In the following sections this contradiction free mathematical interpretation of the mathematics of special relativity will be explained.

3.0 Mathematical Analysis

The fundamental claim of this paper is that the mathematics of the Lorentz transformations used in the special theory of relativity is false and the application of the correct mathematics to the theory of Lorentz transformations leads to a contradiction free theory of relativity. Specifically, it is asserted that the Lorentz rotation group mathematical system used in the traditional theory of special relativity is the reason for the paradoxes, contradictions, and inconsistencies in the theory. This claim is made specific in the following way. It is asserted that the use of the Lorentz rotation group leads to the incorrect inverse Lorentz transform equation. The use of an incorrect inverse Lorentz transformation is the cause of the mathematical difficulties, and when the correct inverse Lorentz transformation is used, there are no contradictions or inconsistencies.

The above can be summarized in the following way. Because relativity assumes the mathematical structure of an additive rotation group, there is no mathematical operation of division in relativity. Since there is no “division” in relativity, it is impossible to correctly implement Lorentz transformations in physics, which requires a division operation, because physics uses the mathematics of linear algebra in the field of real numbers.

3.1 Dingle’s Unrecognized Accomplishment

The primary aim of the series of papers, Herbert Dingle Was Correct!, has been to demonstrate that Dingle’s primary claim is correct. This claim was that the special theory of relativity must be false because it leads to the conclusion that each of two clocks in relative motion must run slower than the other.

There have been two tactics used by Dingle’s critics to discredit this conclusion. The first claim is that Dingle’s mathematics is mistaken. This series of papers has shown that this claim is false, because Dingle has made no mistake in his mathematics. The second tactic is to claim that Dingle’s claim is false because the special theory of relativity does not

actually claim that clocks run slow, but that this effect is only valid for an observer in relative motion. This is the primary tactic used by I.J. Good in his criticism of Dingle's conclusions.

This second tactic is definitely refuted by experimental evidence, in the form of the elementary particle decay experiments and the Haefle-Keating experiment. These experiments definitely show that the clocks in moving reference frames run slow, and not appear slow to a relatively moving observer, because the measurements are obtained in the same reference frame and not relatively moving ones as specified by relativity. Unfortunately, these results have been hailed as validation of the correctness of Einstein's fundamental prediction that time slows down. Here we accept these experimental proofs. But, this entails an unpleasant consequence. The results imply that Dingle's argument is valid. The mathematical structure of relativity based on the rotation group property must be discarded as false, because this implies that clocks in relative motion each run slower than the other. Since this effect has not been observed in the experiments cited, and it is impossible that it could be so, as pointed out by Dingle many times, then it is obvious that the mathematical structure of the Lorentz transformations based on the rotation group property must be invalid.

3.2 The Order Property Of Real Numbers

This section presents the argument that the mathematical property of the rotation group in special relativity violates the order property of the real numbers, and that this is the logical basis for Dingle's conclusions.

The thesis is that physics is fundamentally based on the order property of the real numbers in the following way. Physics is concerned with measurement, and measurement is concerned to determine whether a physical property is same or different from a standard definition of that property. Once this operation of comparison is performed, the results can be stated in terms of a real number. The stated result is in terms of real numbers that correspond to the number of standard units of the property that correspond to the unknown measurement. Once the result is stated in terms of numbers, the order property of numbers can be used to compare two different measurements. Hence, if two clocks A and B measure times of 10 seconds and 15 seconds for the same time interval, the order property of numbers allows a comparison to be made, which gives the result that clock A runs slow relative to B, and that B runs fast relative to A. Dingle showed that the mathematics of special relativity violates this order property of numbers, since according to relativity the above result should be that if B is slow relative to A then A is also slow relative to B. But this conclusion definitely is in violation of the physical idea, which is at the heart of the use of the real numbers as the basis of physical measurement in order to form as comparison judgment.

It is important to clearly understand that the order property of the real numbers is an essential concept of physics. The translation of the magnitudes of physical properties into numbers is what makes physics possible, its essential tool. When we explore the basis of

the real numbers, we discover that there is a complex mathematical structure involved, known as a field. Hence in mathematics we refer to the field of real numbers.

There is a second, sometimes ignored, factor. This involves the introduction of a linear algebra using a basis. For each measurement we have two components, the measurement in terms of numbers and the standard unit upon which the numbers are defined. Hence a measurement of time is 10 seconds. The first being the number and the second the units of the measurement. We have to know both, because a measure of 10, could be seconds, minutes, hours, or days unless it is clearly stated. In the case of a linear algebra with a basis, we specify the basis as the standard units of measure.

Now when we compare two physical properties, say time, we compare them using real numbers in terms of the same units of measure, called seconds. We don't compare seconds with minutes, because then we would compare 30 seconds with 0.75 minutes and incorrectly conclude that thirty seconds is greater than 0.75 minutes since the number thirty is bigger than the number 0.75. This is false because we divided 45 seconds by 60 seconds per minute to obtain the number 0.75, and forty five is greater than 30. It is clear that the operations of multiplication and division are essential in order to formulate the measurement correctly in terms of the number of measure. Now the point is that there is no division in relativity, so there is a problem in making the comparison of measurements. Actually it is not really necessary to make this argument at all, because it should be obvious that without division, we can't do any kind of physics, since physics is based on measurement, and measurement is based on mathematics which requires division.

The point now is to show that in relativity, it is impossible to make the required comparison of number magnitudes corresponding to physical quantities because there is no division. This is not as obvious as it would seem to be. We all know that 45 is greater than 30 because 45 follows 30 in the order of real numbers. So there is an inherent property of numbers that comes to be used. If asked to prove this, I would have to use division as follows. I would divide 45 by 30 and discover that the result is greater than unity, so I would say that 45 is greater than 30. But if I can't do division then what? Effectively, because you can't do division in relativity, because it is an additive rotation group and not a multiplication group, you can only get the results A>B and B>A, because you can't do division. In other words you can never arrive at the results A>B and B<A, because you can't do division, and you can never find any result in which B<A or A<B.

Now if you have the result, which we always get in relativity, that A>B and B>A, what can you conclude? You can't say anything at all in terms of which is greater or lesser than the other. But relativity does this, and obviously, this must be false since you can't claim that A>B unless you also can say that B<A. Hence relativity can not make any valid claim about the magnitude of physical quantities in relation to each other. So the claim that moving clocks run slow, or that moving distances are contracted is simply an impossibility mathematically. This is what Dingle said.

To summarize this section. Physics relies upon the operation of comparison by measurement in order to arrive at its conclusions. Comparison relies upon he ability to assign a magnitude number to a measurement, and this assignment relies upon the field of real numbers, which includes the mathematical operation of division. The special theory of relativity assumes the existence of space-time, which is a fancy way of saying it assumes a particular type of mathematics, called a pseudo-Euclidean space, which is based upon a rotation group structure and not a multiplicative group structure. Hence it does not have a division operation that allows a comparison of physical magnitudes to be made. Therefore it is impossible to make a statement that a physical quantity, such as time, is dilated by a comparison based upon a measurement.

4.0 The Mistaken Inverse Lorentz Transformation

Relativity falsely assumes the additive rotation group structure, instead of the correct multiplicative group structure. This means that the inverse Lorentz transformation is false. This is the basic cause of the paradoxes and the failure to have the operation of division. Using the Lorentz transformation it is possible to transform from the rest frame into the moving frame, but it is not possible to correctly transform from the moving frame into the rest frame without error, because the inverse transformation is mathematically incorrect. It is incorrect because in relativity there is no division operation. In the physics textbooks the problems which attempt to do this are called paradoxes. They give the wrong mathematical result because there is no division in relativity.

To clarify, there is division of numbers in relativity, because physics uses the field of real numbers, and there is division defined in them. The problem is in the Lorentz transformations. There is no operation of division defined in them. Technically what this means is that there is no property of a multiplicative inverse, which is division, defined within the Lorentz transformations as conceived by the theory of relativity. This is because relativity defines Lorentz transformations as an additive rotation group, from the basically false notion that this is the mathematical structure of space-time. Now when physicists perform calculations using this mathematics that doesn't have a division, they get contradictory, confusing, and basically false results known as paradoxes. They arise because in doing the mathematics, the results come out wrong, because there is no division in relativity.

Now the question arises, if the inverse Lorentz transformation is incorrectly defined in relativity, what is the correct definition of this transformation? The answer is that it is the adjoint or dual transformation in a linear algebra, which does have a mathematical operation of division defined in it.

The next question is this. Is there an inverse Lorentz transformation that does define an operation of division? The answer is yes there is, but it is not the one used in relativity. To see how to obtain it is relatively simple. We simply take the Lorentz transformation equation of standard relativity and find its mathematical inverse using division and standard algebra.

Finally we ask, is there an inverse transformation for the dual Lorentz transformation? Yes there is. It is obtained simply by the operation of division on the dual transformation by the same method used to obtain the inverse of the Lorentz transformation. We now have four transformations, and want to know what they mean physically. This is discussed in the following section.

The summary of this section is simple. The inverse Lorentz transformation used in relativity is false, it does not define a division operation and using it produces incorrect results, which are called paradoxes, because they contradict common sense. There is a mathematically correct inverse Lorentz transform that can be derived by assuming a linear algebra with a multiplicative group structure in which a mathematical division operation is defined, and in this mathematical structure the traditional inverse Lorentz transformation is known as the adjoint or dual Lorentz transformation. This dual transformation also has an inverse transformation. The bad news is that this mathematical system, that does posses a division operation, is not anything at all like space-time. The good news is that there are no paradoxes, since there is an operation of division defined in them.

5.0 The Linear Algebra Of Relativity

This section gives a very brief discussion of the mathematics of the correct theory of relativity based on a linear algebra interpretation of space and time. The previous analysis showed that the special theory of relativity resulted in a theory of space-time which does not have a mathematical operation of division defined in the Lorentz transformations. Consequently, that mathematical system produces absurd results of calculations, which have been dubbed paradoxes in order to make them seem acceptable results, instead of mathematical mistakes, which result from the fact that there is no operation of division in relativity.

The alternative mathematical system starts by assuming that a division does exist, and the result was a different inverse Lorentz transformation. Now there is a need to give a physical interpretation of this new approach. The way to do this is to go back to the idea of measurement. A measurement consists of a standard unit (basis) and a number measure (coordinate) of measure relative to the standard unit. Note that division is needed here to do this correctly. Now suppose we have different standard units in different frames of reference. The Lorentz transforms describe mathematically how this standard unit is transformed between reference frames in relative motion. So it naturally follows that a clock calibrated to a standard unit of seconds at rest, runs at a different rate when in motion, because according to the Lorentz transformations the standard unit is different for the two frames. In fact the units of both space and time are larger in the moving frame.

The adjoint or dual Lorentz transform transforms the number measure for a physical measurement between frames. So it is a coordinate transformation dual to the basis transformation. Hence we now have a linear algebra equipped with dual spaces of basis

and coordinate transformations. Since the Lorentz transforms make the basis of the units larger, the dual transformation of coordinates transforms the measured numbers so that they are smaller in the moving frame than in the rest frame. This is mistaken for the Lorentz contraction in relativity. When going from the moving frame to the rest frame the measured units become larger, since the basis transformation is opposite to this.

There is an important result of this. That is that while the calibration of measure changes, so that clocks calibrated in one frame run at a different rate in the other frame, there is actually no change in the intrinsic time or space measures. What changes are only the way these are expressed in terms of number measurements, and the calibrations of the measurement scales. Time and space in and of themselves are invariant.

6.0 Summary and Conclusions

This paper has discussed the primary mistake in the theory of relativity that has been the source of the paradoxes and inconsistencies pointed out by Herbert Dingle. It was shown that the mistake lies in the fact that there is no operation of division in the mathematics of relativity, because it assumes the existence of space-time and that assumes an additive rotation group that type of group does not possess an operation of division. It was shown that a theory based on a linear algebra, can be constructed that does not have the paradoxes of relativity, because that system of mathematics does have an operation of division. This system was briefly described.

It is clear that the mathematics of relativity is false because there is no division in it. This leads to severe mathematical difficulties and means that physicists can not always do correct calculations using it. The failed calculations are called paradoxes. These are so common in relativity that enumerating them is not necessary, they can be found by doing a simple internet search.

It is also a result of this that, because there is no division contained in it, the concept of space-time as invented by Herman Minkowski and implemented as the basic mathematical structure of relativity is false.

In conclusion, it has been proved that the problems pointed out by Herbert Dingle were real mathematical flaws in relativity, and as a result, that theory is falsified, because its mathematical structure is inconsistent and therefore false. Hence relativity is faulty, just as Dingle claimed. So, Herbert Dingle was correct!