The *Logical* Origin of Relativity

The theory of relativity is generally taken to be complicated and difficult to comprehend. But this view is based on a misunderstanding of the underlying physics.

In fact, relativity is not complicated. It is only that Einstein managed to make it complicated. How come? Einstein started his work with a basic misunderstanding in view of the speed of light.

The situation has a certain analogy to the history of astronomy. Ptolemais followed the apparent view that the earth is the centre of the universe and the sun and the planets are orbiting the earth. This view caused the necessity of the complicated epicycle theory to determine the motion of the planets relative to the earth. When Copernicus corrected this view by putting the sun into the centre of the planetary system, this caused a dramatic simplification of the mathematical formalism.

In analogy Einstein followed the apparent result of the Michelson Morley experiment that the speed of light c is constant relative to any frame. This assumption caused the necessity of the known four-dimensional space-time based on Minkowski metrics and Riemannian geometry. In contrast Lorentz explained the Michelson Morley result as a measuring phenomenon caused by the relativistic behaviour of clocks and rulers. The application of this approach facilitates the mathematical formalism considerably by returning to the traditional application of Euclidean geometry.

Einstein's fundamental error:

Einstein: "The speed of light is constant with respect to every inertial system."

Einstein's position is based on the following aspects about the speed of light:

- The one-way measurement of c:

  Here clocks are needed at both ends of a measured distance, which have to be synchronized.
  Einstein prescribed a means of synchronization by *assuming* the constancy of c in any system. This leads inevitably to the result he wanted: the nominal value of c. But it does not prove the result is true, because the reasoning is circular.

- The two-way measurement of c (an example is the Michelson-Morley experiment):

  The measuring apparatus contracts when it is in motion. This was and is a well-known fact, independently of relativity. This contraction provides a full explanation of the null result

- Furthermore, Einstein's space-time system with a constant c in any frame is incompatible with rotational motion.

This problem was known to Einstein and conceded by him as such, but he drew no consequences. The conflict has never been resolved.

History of the development of the theory of relativity:

When the Michelson-Morley experiment yielded the unexpected null result in the 1880s, several physicists looked for an explanation of it.

Some of them (Heaviside, Fitzgerald, Lorentz) explained the null result of the Michelson-Morley experiment in terms of the contraction of matter in motion. This was – in contrast to Einstein's impression at that time – not an ad-hoc assumption, but followed from the contraction of fields in motion.

Einstein on the other hand explained the null result of the experiment by assuming that the speed of light has ontologically the same constant value in any inertial system.

This approach by Einstein had considerable consequences. Einstein had to solve the problem of the summation of velocities. In the Galilean transformation, which is based on Euclidean geometry, velocities are transformed by the linear addition of the components. This is, however, incompatible with the assumption that the speed of light is retained in any transformation.

Einstein solved this problem in a formal way. He came up with a geometry in which he combined space and time to produce a four-dimensional coordinate system which changes its shape during a transformation. This means that its coordinates vary in size depending on the velocity.

Minkowski formalized Einstein's approach as a complex formal 4-dimensional space-time system. The combination of Einstein's idea and the geometry of Minkowski is today known as the "Einsteinian interpretation of relativity".

From the present point of view, Minkowski's formalism is on the one hand elegant, but on the other hand it is physically unnecessarily complicated and leads to logical conflicts. And it contradicts the physical imagination.

In Lorentz's approach, the relativistic behavior of matter and objects follows from the behavior of fields, in his days electrical fields as described by Maxwell's equations. The temporal behavior follows from a particle model corresponding to the particle approach later presented by Louis de Broglie

This particle model is presented here. It is compatible with the actual experimental state of particle physics.

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1. The Concept of the Basic Model of Matter

The concept is:

1. Elementary particles are composed of pairs of "basic particles". These basic particles are bound to each other at a specific distance by a field shape.
2. These basic particles have no mass and orbit each other at the speed of light c.

3. The orbital frequency, i.e. the rate at which the particles rotate, is the de Broglie frequency.

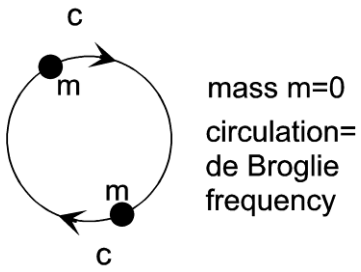

Figure 1.1

If all matter is assumed to be made up of such particles, the well-known relativistic effects are a necessary consequence; as are a number of observations which are otherwise explained with the help of quantum mechanics.

This model explains relativistic dilation and contraction and it explains the inertial mass of elementary particles, as well as the relativistic increase of mass in motion.

For details we refer to the following sites:

- Relativity without Einstein
- The Origin of Mass
- Relativistic Dilation
- Relativistic Contraction
- The Origin of Gravity.

2. Bibliographic References

[1] Prokhovnik, S. I., The Physical Interpretation of Special Relativity - a Vindication of Hendrik Lorentz. Z. Naturforschung 48a, 925 (1993).
[2] F. Selleri et al., Die Einsteinsche und lorentzianische Interpretation der speziellen und allgemeinen Relativitätstheorie. Karlsbad:VRI 1998.
[3] Louis de Broglie, RADIATIONS - Ondes et Quanta, Comptes rendus, Vol. 177, 1923, pp. 507-510.

NOTE:
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