INCOMPATIBILITY BETWEEN THE LORENTZ TRANSFORMATION EQUATIONS AND GENERAL RELATIVITY

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THE LORENTZ transformation equations exhibit serious problems when we try to reconcile them with General Relativity.

According to Einstein's own words in his 1920 book *Relativity — The Special and General Theory:*

> "All Gaussian co-ordinate systems are essentially equivalent for the formulation of the general laws of nature."

And the term "Gaussian co-ordinate systems" is defined by him as follows:

> To every point of a continuum are assigned as many numbers (Gaussian co-ordinates) as the continuum has dimensions. This is done in such a way, that only one meaning can be attached to the assignment, and that numbers (Gaussian co-ordinates) which differ by an indefinitely small amount are assigned to adjacent points.

Given that Einstein assumes, according to his "Equivalence Principle" — see Chapter 20 of his above-mentioned book — that acceleration due to gravity and acceleration due to inertia are equivalent, what he has written essentially means that all frames, whether inertial or accelerated with respect to each other, must be equivalent for the formulation of the laws of nature. (For the sake of easy reference, Einstein's entire book can be found on-line at <http://www.bartleby.com/173/>.)

But this conclusion flatly contradicts the predictions of the Lorentz Transformation equations, as we shall see by the following simple thought-experiment:

Imagine a spaceship carrying a cubical container with a gas in it — say, hydrogen, or argon, or xenon (though it doesn't really matter what kind of gas.) Imagine the container to be rigid, and of fixed dimensions (when its dimensions are measured by an observer at rest relative to it.)

Imagine that the spaceship has a nuclear-powered rocket, which ejects very hot plasma at a very high velocity from its thrusters. Imagine that the acceleration imparted to the spaceship thereby is exactly of 9.80665 m/s^2. This being exactly equal to the acceleration due to the earth's gravity, which is to say 1*g,* persons in the spaceship would not be inconvenienced by the negative effects of micro-gravity. Indeed if the spaceship had no windows and no communication with anyone outside it, to the people in it, it should seem as if they were motionless on earth.

Imagine also that in the spaceship there is enough nuclear fuel, and enough material (such as water) from which to generate plasma, to enable the above-mentioned acceleration of 1*g* to be maintained for months on end. This is certainly not beyond the capacity of nuclear-powered rockets.

Now using the simple formula $v=at$, we find that within a few months — 176.9 days to be more exact, which is to say in less than six months — the spaceship will have reached a speed of half that of light (compared, that is, to what its own speed was when it *began* accelerating, which we shall take as zero.) Therefore within a year the spaceship will have reached pretty much the maximum speed it will ever achieve, namely that of light — that is, if the Lorentz transformation equations are correct.

And as it approaches the speed of light, everything in it, including the container of gas and the gas in the container, should increase in mass according to the Lorentz transformation equations.

Of course to the people in the spaceship, who remain stationary with respect to the gas container, the dimensions of the container will not have changed one bit. It will still appear to be exactly the size it was when they started out. To observers stationary with respect to the spaceship's *original* frame of reference, however, the container and the spaceship will have decreased in the direction of acceleration, according to the Lorentz length contraction formula. But since the people in the spaceship are at rest relative to the container, this contraction should not be apparent to *them*.

But — and this is the B-I-G "but" — to the people in the spaceship as well as to those who stayed behind at wherever it was the spaceship started accelerating, each of the gas molecules in the container should have increased in *mass* according to the Lorentz transformation formula for *mass* increase! And as a result, the *momentum* of each of those molecules should have increased in exact proportion.

So each gas molecule should hit the walls of the container with an increased momentum. But provided the temperature of the container were held steady — and this should not be difficult to do — the number of molecules hitting the walls of the container in any given period of time should not change. So the combination of these two facts should result in the gas pressure in the container rising!

In other words, if a pressure gauge were fitted to the container, the pressure gauge should show a perceptible increase in the pressure of the gas inside the container, this becoming quite noticeable about eight or nine months after the spaceship started its acceleration. And as time passed thereafter, the pressure should increase at an *increasing rate* as well … and all this, for no apparent reason!

Indeed, eventually the container — unless it were extremely strong — should explode from the gas pressure in it.

Now as we noted above, General Relativity claims that the laws of nature should be the same for all observers regardless of their reference frame, and regardless of the frame's acceleration. But wherever did we hear of a "law of nature" which says that within a year or so, a container of gas, *with nothing done to it save for maintaining its temperature steady,* should exhibit an increasing gas pressure inside it with the passage of time, and eventually might even explode?

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