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The Einstein Field Equations
part 2

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In part 1, I closely analyzed subsection 4 of Einstein's proof of General Relativity, showing is was a series of pushes and fudges. In this and upcoming parts I will look at the next subsections, starting with subsection 5.

This section begins on page 121 of the Dover edition of *The Principle of Relativity*. In it Einstein starts by discussing contravariant and covariant 4-vectors, which are of course tensors. This is just a further mucking up of variables, as we will see. Remember, Einstein started subsection 4 with "coordinates" in the form X_1, X_2, etc. He then switched to "differentials" in the form x_1, x_2, etc. In subsection 5, he now wants to relabel them again. So he creates an undefined function by which the original variables are translated into new ones, in the form x_ν. To do this, he takes them through an intermediate variable called x_σ. This is just tensor calculus gymnastics, and is otherwise meaningless. It is done only to batter your mind, breaking any tenuous hold it may have had on reality. Again, these multiple variable transferences are done *only* to get you to concentrate on the changing coefficients, so that you forget to ask any mechanical questions or demand any variable assignments. It is prestidigitation of the first order.

It is also done to cover up the dumping of the original infinitesimal ds. Remember that? The first equations were written in terms of that infinitesimal, which was always undefined.

$$ds^2 = -dX_1^2 - dX_2^2 - dX_3^2 + dX_4^2$$

To prevent you from asking what that infinitesimal was, Einstein uses the tensor calculus to get rid of it. I have shown that it either has to equal 0 or 1, but since that would destroy the proof, Einstein needs to bury it as soon as possible. He does that by switching variables. In the way of the tensor calculus, he just creates a new field that is a function of the old field, burying the old field and any problems it may have contained.

But he doesn't quite succeed in covering all the problems. Subsection 5 starts out with this sentence:

The linear element is defined by the four "components" dx_ν, for which the law of transformation is expressed by. . . .

So it would appear the dx_ν's are line elements themselves. Components of a line element must be linear themselves. He even admits it in the very next sentence:

The dx_σ are expressed as linear and homogeneous functions of the dx_ν.

Note the word "linear." But one sentence later, he is stirring our brains again:

Hence we may look on these coordinate differentials as the components of a "tensor" of the particular kind which we call a contravariant four-vector.

Now they are "coordinate differentials." He has called them points, coordinates, differentials, line elements, and now coordinate differentials. And this is *after* he rewrote these sections in 1922 to clarify them!

But let's move on. We have found that a contravariant tensor is just a simple 4-vector, which is a system of coordinates "based on four quantities." Next we begin multiplying these tensors together. The first question that *should* come to mind—but apparently never has in the history of physics—is how you can multiply two coordinate systems together. Remember, to create the matrix, all Einstein did is propose one point-mass moving in the system. Other than that, the system is just a static grid of coordinates. Now say we have two of these systems, each with one mass point moving in each. According to Special Relativity, to bring these two systems together (or to make sense of them physically), we need a transform between them. In Special Relativity, to do this we don't *multiply* S by S', do we? No, we add or subtract them, using the speed of light as the transform. In other words, if we are looking at the x-dimension, and wish to transform an x into an x', we add or subtract some further x. We can see this by returning to the first equation of Special Relativity, which is

$x' = x - vt$

As you see, the simple transform there is in the form vt, and it is subtracted. To create the fuller transform, we just have to get light into that equation, and Einstein does that by using these equations:

$x = ct$
$x' = ct'$

By substituting among those three equations, Einstein derives *gamma*. But at no point does he *multiply* x and x' or S and S'. He doesn't, because it is clearly illogical to do so. You can't multiply coordinate systems together, and you can't multiply distances traveled either. Nor can you multiply "line elements."

And yet we see him multiplying contravariant tensors together in his proof of General Relativity. He does this because the masters of the tensor calculus told him it was OK, and he wasn't clear enough on the manipulations to question them, as we see.

I will be told that tensors are 4-vectors, and once we have motion in the system, each vector is a velocity. If we multiply velocities together, we get accelerations. Gravity is an acceleration, of course.

The problem there is that before you multiply the velocities together, you have to transform them. The transform comes *first*, then the integration. And the transform cannot be achieved by multiplying. The transform is based on a time *differential*, and a time differential is a *difference*, not a *product* or quotient.

You will say that just means we can't multiply a primed 4-vector by a unprimed 4-vector, but it is more than that. Consider equation 5, the first equation of subsection 5:

$dx'_\sigma = \Sigma(\partial x'_\sigma/\partial x_\nu)dx_\nu$

You will say the the transform is written as a sum Σ, which sidesteps my problem. But it is written as a sum of *ratios*. The partial derivative is a ratio. The transform between x and x' isn't a ratio.

You will say, of course it is. See the equation $x = x_0/\gamma$. Since $\gamma = x_0/x$, we have a ratio. But although what we call the transform can be written as a ratio, the above equation, being a field equation, should be written in terms of the field. In the actual field, we get x' from x using subtraction, not a quotient.

You will say, "We can use either one, since subtraction is a variant of a quotient or product. For instance. If x = 1 and x' = 1.2, you are saying the difference is .2, which is not a quotient. But 1 is a fraction of 1.2, so we can just as easily put them in a ratio of partial differentials."

That's true, as long as you are rigorous in your method. But if you are *not* rigorous, these shortcuts are deadly, as we will now see. Since time is now in our 4-vector as an equal partner with x, and since both have been given equivalent coefficients, they should act the same way in these transforms, correct? Our $\partial x'_\sigma$ above is no longer just an x, as in an x-dimension. It can be any one of four vectors, including the t vector. But if we use the tensor calculus' own ratios for *gamma*, we find

$\gamma = x_0/x$
$\gamma = t/t_0$

Those are inverse, as you see. That is simply because v=x/t. When x goes in the numerator, t goes in the denominator. So they have to be inverse, regardless of anything else in Relativity. But that blows the equation

$dx'_\sigma = \Sigma(\partial x'_\sigma/\partial x_\nu)dx_\nu$

Because if we apply the equation to the time vector, the equation needs to be

$dx'_\sigma = \Sigma(\partial x_\nu/\partial x'_\sigma)dx_\nu$

Since the transform is reversed for time t compared to x,y,z, the partial derivative in this equation should be reversed as well. *Gamma* is defined as a ratio of S to S', and so is this partial derivative.

This one problem is enough to destroy the entire derivation of General Relativity.

This is why I warned in my previous paper that writing the 4-vector in such a cavalier manner was deadly. Because Minkowski didn't pay attention to his kinematics or his variable assignments, he wrote the 4-vector in a false form. Even if we accept all the other postulates of Minkowski, the relationship of x and t must be an inverse relationship at all times. It is in the form of x =1/t. And yet in the basic 4-vector equation he and Einstein use, the form is not inverse.

$ds^2 = -dx^2 - dy^2 - dz^2 + c^2dt^2$

Because Minkowski substituted ct for x_4, t and x are in direct proportion. That last term should be in the form 1/t, not t. This means that *gamma* must and does contradict Einstein's first equation.

And this means that if physicists have been claiming to use the field equations to calculate nearly correct answers to various problems, they must have either been lying completely, or further fudging the equations to match the data. There is no possibility of using field equations that are so compromised at the ground level to calculate correct answers.

In part 3, I will continue to clean up this proof of General Relativity, showing how the misdefinitions in the tensor proof doom the final equations.