

ESSAY 59: THE NEW GENERAL RELATIVITY.

The old general relativity has completely disintegrated scientifically, but still generates Nobel prizes. So much for Nobel prizes, or any prizes - they are very human and very transient. It has never been my intention to destroy anything in physics, or natural philosophy, so I have started the search for a better theory. Common sense will always get you into an awful lot of trouble. In recent papers some ideas for a completely new general relativity have been tried out, which is what science ought to be all about. Physics, or natural philosophy, is the philosophy of the natural world, it is not a political campaign for careers and prizes, just a modest search for new thought. It is really arrogant to pretend that human nature could describe nature, but we go on trying.

What can be agreed upon in the tremendously divisive world of physics is that general relativity is an attempt to make special relativity more general. That sounds like a truism, or tautology. Special relativity began in discussions about the result of the Michelson Morley experiment in the eighteen eighties. In the world of physics these results are still being argued about 120 years later. Leaving that aside and accepting the data, this experiment shows in effect that the speed of light is a constant no matter how fast one moves. That is the opposite of common sense, but that is also special relativity. There are many arguments about special relativity, these repetitive arguments tend to be about concepts that are very abstract, but I accept its claims to have been tested with great precision by measurements of time in a moving object, such as an aircraft or spacecraft. However, there are several ways of interpreting the equations of special relativity, one of them has been given by Horst Eckardt of AIAS recently.

Special relativity seems to have begun with letters between Oliver Heaviside and George Francis Fitzgerald and crystallized out in the work of Henrik Anton Lorentz, Henri Poincare and others. Albert Einstein contributed a little more to these ideas, notably the definition of relativistic momentum, a notion by which the Lorentz transformation is made compatible with the law of conservation of momentum. I don't think that Albert Einstein can be credited with the idea of a constant speed of light, that is due to the much earlier work of James Clark Maxwell, work that was made useable by one of my Civil List predecessors, the same Oliver Heaviside. Lorentz, Poincare and others had already proven very elegantly that classical electrodynamics is a theory of special relativity intrinsically. It may be claimed that Einstein extended special relativity to classical dynamics, and that claim is more or less true. However, the ideas of Einstein were not verified experimentally until the thirties, in the work of Cockroft and Walton, whom I met in the Senior Common Room of Trinity College Dublin. Over the fireplace was a statue of the same George Francis Fitzgerald.

The mathematical structure of special relativity is due to Herman Minkowski of ETH Zurich. It is based on a metric, a four by four diagonal matrix denoted $\text{diag}(1, -1, -1, -1)$. It seems to me that general relativity must also be based on this metric. That is rank heresy, and therefore always very interesting. An orbit for example means that the Minkowski metric is constrained, its freedom is lost because of the existence of the orbit itself. An orbit is a relation for example between the two cylindrical polar coordinates of a plane. These are r and θ . So by differentiation, the infinitesimal dr is related to $d\theta$, producing a constraint, we are no longer free to choose dr and $d\theta$ independently. The infinitesimal line element of Minkowski in this set of coordinates is made up of the square of the time infinitesimal, dt , and the squares of dr and of $d\theta$. In special relativity there is no orbit, because a particle moves in a straight line with constant velocity. This means that there is no relation between dr and $d\theta$. If the orbit is put in to the Minkowski metric, special relativity becomes general relativity automatically.

This result can be seen clearly because the procedure produces torsion and curvature elements. In UFT205 they are worked out by Horst Eckardt and myself using computer algebra from the basic theorem of Riemann geometry, metric compatibility. A self consistent procedure for cosmology emerges very simply using common sense, no need for all those Nobel prizes. In UFT205 a very pleasing self consistency also emerged, in that all the mathematical procedures of the ECE were proven to be correct and beautifully consistent. This should not surprise anyone, Cartan knew what he was doing. These self consistencies are described in the next essay.