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Dissident at Oxford Relativity course 5:

Leading up to the Ether

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The lecturer carried on from the history of Euclidean and non-Euclidean to deal with space-time diagrams. (Which I will skip, because dealt with in most relativity textbooks.)

Lecturer told us the following-

Before Einstein, the following were assumed:

- **Space and time were passive, i.e. their nature is unaffected by external influences such as the distribution of matter or energy.**
- **Space and time are independent, i.e. space does not influence time, nor time influence space.**
- **Space is homogeneous, i.e. its properties are the same everywhere.**
- **Space is continuous, i.e. between any two points there is another point.**
- **Space is isotropic, i.e. its properties are the same in all directions.**
- **Space is universal, i.e. all observers agree about the distance separating two simultaneous events.**
- **Space is 3dimensional and complete, i.e. any point may be specified by an ordered triple of real numbers (x_1 , x_2 ,**

x_3), and every such triple corresponds to a point.

- **Time is homogeneous, i.e. its properties are the same always.**
- **Time is continuous, i.e. between any two instants there is another instant.**
- **Time is universal, i.e. all observers agree about the time interval separating two events.**
- **The distance between two simultaneous events separated by Cartesian coordinates dx, dy, dz is $(dl)^2 = (dx)^2 + (dy)^2 + (dz)^2$.**
- **Euclid's fifth postulate is true (the angles of a triangle sum to 180 degrees).**
- **The principle of Galilean relativity holds true.**

Lecturer then told us: Einstein's theories of relativity destroyed our belief in many of these assumptions.

Special relativity was then outlined:

- **1 Introduction: space and time become space-time.**
- **2 Light, ether, and the Michelson Morley experiment.**
- **3 Some kinetic concepts – events, frames ans observers.**
- **4 Coordinate transformations.**
- **5 Galilean transformation and its consequences.**
- **6 Einstein's postulates of special relativity.**
- **7 The Lorentz transformation and its consequences.**
- **8 Minkowski space.**
- **9 Light cones and causality.**
- **10 Relativistic physics.**

Ideally, I should have challenged "Einstein's theories of relativity destroyed our belief in many of these assumptions." This is because from my point-of-view based on mathematical modelling it is possible to create valid mathematical models from different assumptions. So, even if Einstein's assumptions work then the pre-Einstein assumptions should also work; then the issue becomes why switch from one set of assumptions to another. But the course was about Einstein's theories and not dissecting the assumptions that Einstein changed from; so it would have been too big a diversion, and I let it pass.

So the lecturer now went on to expand his outline-

Lecturer: Introduction: Special relativity was introduced by Albert Einstein in 1905.

My comment on this would have been that actually Einstein was working from earlier sources that he did not cite in his 1905 paper on special relativity. But I let it pass. The lecturer was building on the theory as starting with 1905 and ignoring earlier sources as is the common way this is taught.

Lecturer: Like other theories of relativity, it concerns the relationship between measurements made by OBSERVERS in a state of RELATIVE MOTION. The theory is called 'special' because it is restricted to situations in which the observers are in a special state of relative motion- UNIFORM RELATIVE MOTION.

My comment on this would be that is the usual way special relativity is treated and how Einstein dealt with it, but there are variations in the literature which do things like differentiate velocity with respect to time and get acceleration in a special relativity context, ending up with different versions of theories. But again I let it pass, it was not worth going into too much detail; only to note the lecturer was not giving enough details and so could be deceiving students in this area who took too literally what was said.

Lecturer: It is based on ideas about SPACE and TIME. A pre-Einsteinian view: All observers agree about the distinction between (3 dimensional) space and (one dimensional) time. A post-Einsteinian view: Different observers in uniform motion disagree about how (4 dimensional) space-time should be split into space-time.

From my point of view it is possible to form a mathematical model from the pre-Einsteinan view and the post-Einsteinian view. But again I made no interruption. What we really have up to now is – no reason why we should mathematically model the post-Einsteinian way as opposed to the pre-Einsteinian way. My point-of-view – the pre-Einsteinian mathematical

model still works, and the post-Einsteinian model in the way its usually presented is full of mistakes; but ideally could be made to work. So ideally there is a type of relativity between pre-Einsteinian model and post-Einsteinian model and either can be used to describe physical reality. Where Einstein fans go wrong is to believe that description of physical reality can only be done their way. So once again it is an issue of relativity being misrepresented by them.

Lecturer: 2 Light and the Ether: In 1865, James Clerk Maxwell recognized that light was an electromagnetic wave – a fluctuating pattern of electric and magnetic fields that travel through space at the speed c = 300 000 000 metres per second.

Of course by that speed value he was giving an approximation, not the precise value.

Lecturer: Maxwell assumed the waves travelled through a medium – the ETHER. He supposed c was their speed relative to the ether.

Picking up on this word "supposed". The claim is – Maxwell "supposed" c was their speed relative to the ether. In other words the lecturer is claiming that Maxwell did not derive from the mathematics of his electromagnetism theory that c was their speed relative to the ether; instead he (Maxwell) made the guess that c was their speed relative to the ether independent of the mathematics in his theory. I think that highly relevant, ideally claims like this should be backed up with mathematics, but that is not being done. Lecturer is not going deep into the mathematics, he is making claims such as these without backing them up by mathematics. Ideally, a more mathematical based introduction to relativity should cover these issues; but from my experience they don't. So, we have both types of lectures misrepresenting relativity; i.e. bad teaching.

Lecturer quoted Maxwell from 9th edition of Encyclopedia Britannica: "Whatever difficulties we may have in framing a consistent idea of the constitution of the aether, there can be

no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest and probably the most uniform body of which we have any knowledge."

The lecturer then made comment of the Michelson-Morley experiment's famous null result. I made comment on the block on experiments claiming otherwise. (See such papers at NPA, Sagnac award by NPA etc.) However, lecturer of course did not want to be drawn into that controversy, and one just has to put aside the issue of experimental dispute, and proceed with the interpretation that is required for Einstein, because after all the lecture was about Einstein's theories not other persons' theories.

So assuming the null observation is correct, the lecturer pointed out there were attempts to explain the null observation.

Lecturer: Lorentz explanation- Lorentz developed an 'atomistic' theory of electricity and matter. According to Lorentz, motion relative to the ether caused bodies to CONTRACT along the direction of the ether movement. This shrinkage made it impossible to detect the relative motion, even though it was happening.

I am OK with this, from what I have read of Lorentz, his point-of-view was the ether exists but it was not possible to detect it (from relative motion with respect to it, etc.). Far as I am concerned – Lorentz sets up his mathematical model in the way he wants, but there are other mathematical models equally possible. Again I did not interrupt the lecturer with my point-of-view, instead I waited for the next comment.

Lecturer: Einstein's explanation – The ether is irrelevant and maybe discarded. The measured speed of light is not influenced by the motion of the Earth because many of our intuitive assumptions about space, time, speed etc. (the subject of KINEMATICS) are wrong. We need a new kinematics, based on different assumptions.

I protested, and said the word “old” had to be added to him saying “The ether is irrelevant and maybe discarded.” A few words in exchange and the lecturer recanted, and agreed.

In the context of Einstein's relativity – the ether does not get discarded, instead the “old” version of ether is replaced by another version. Einstein does not help on this issue because he keeps changing his mind; in 1905 he was discarding it and in 1920s was bringing it back. And these lecturers teaching Einstein's relativity are faced with how to interpret this changing mind of Einstein. The general way that Einstein's relativity is taught is as per this lecturer initially in saying that the ether is discarded. But when pressed, I was surprised at how easily he collapsed in defending discarding the ether, and switched to accepting the ether's existence. What I suspect though is that in subsequent lectures to other classes he will go back to saying the ether is discarded, and it is only for the sake of this course he recanted. For other courses he will go back to making a false claim about ether. i.e. back to bad teaching. But for this course, he has accepted the existence of ether and in effect is saying a lot of what he was talking about is wrong and what he subsequently talks about is wrong. I claim therefore victory.

c.RJAnderton31-07-2011