

# Einstein's work on Poincare's theory: conventionalism

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Einstein accepts the conventionalism of Poincare – that light speed constancy in vacuum is only due to measurements adjusted to keep it constant. This means that many believers in Einstein's special relativity have their understanding of that theory as wrong.

The main idea of light speed (in vacuum) is a constant of special relativity has been referred to by many names such as principle, postulate, stipulation and so forth, there are differences as to what these things can mean, but treating it as an assumption it can mean two things:

Assumption of light-speed in vacuum constancy can mean:

- (I) it was measured to be constant independent of any adjustment to measuring instruments, or
- (II) adjust experiments to conform to keeping it constant.

it is not (I) as many believe but instead (II)

Those under the mistaken belief that it is (I) think along the lines that Einstein assumed the light speed constancy (in vacuum) and experiments validated his assumption.

But it is quite the reverse – Einstein wants the measuring instruments adjusted to conform to the assumption, and this can be traced back to what Poincare was talking about regarding Conventionalism. Einstein was working on Poincare's theory and adopted that theory's conventionalism. The speed of light constancy (in vacuum) is a convention. (Poincare's theory has been dealt with in a previous article.)

Now I am going to show this from Einstein's writings. The source I am going to use is “the Meaning of Relativity” By Einstein first published 1922 updated by him in 1954 for the fifth edition. [1]

One of the problems we have with Einstein is that he kept changing his mind, but what the heck a source like this is best we are probably going to get, and it shows he is thinking along Poincare's lines.

Einstein says [2]:

“The only justification for our concepts and system of concepts is that they serve to represent the complex of our experiences; beyond this they have no legitimacy. I am convinced that the philosophers have had a harmful effect upon the progress of scientific thinking in removing certain fundamental concepts from the domain of empiricism, where they are under our control, to the intangible heights of the a priori. For even if it should appear that the universe of ideas cannot be deduced from experience by logical means, but is, in a sense, a creation of the human mind, without which no science is possible, nevertheless this universe of ideas is just as little independent of the nature of our experiences as clothes are of the form of the human body. This is particularly true of our concepts of time and space, which physicists have been obliged by the facts to bring down from the Olympus of the a priori in order to adjust them and put them in a serviceable condition.”

This is all very colourful language referring to Olympus – the realm of the Greek gods. He blames the philosophers for messing up science. Now in the Western tradition – our science comes from the Ancient Greek philosophers, so up until Einstein that is what science is based upon. Einstein decides to go against that tradition, hence why he blames them for getting it wrong, and hence why he is perceived as making a radical change in science – what is Einstein's revolution in science/physics in the popular representation with his miracle year of 1905 and the radical overturning of Newtonian physics when his theories were supposedly confirmed by Eddington in 1919.

I have dealt with it in previous articles – Einstein had not revolutionized physics in 1919 and he had not overturned Newton. But unfortunately, the news media and popular science literature is misrepresenting that he has.

However, picking up on his criticism of existing philosophy behind the existing science, he has brought in his strange ideas in a weird philosophy that has confused many people. And that is what the quote in its colourful way is highlighting, he's going to change everything as to how things have been done up to then.

Now my position is that we should go back to the old way of doing things before Einstein. But the problem with that is – most people are convinced of the genius of Einstein because that is what they are told to believe from Einstein propaganda, they then try to understand what Einstein is talking about if they are interested. Trying to understand Einstein takes a great deal of effort and many years. So, after all that effort, it is a big disappointment to be presented with the suggestion that we should go back to how it was before Einstein. It means a great deal of wasted effort has been made in trying to understand Einstein and he has sent many people off on the wrong track.

So, what he has done is jettisoned the old way and convinced people to follow his way that is full of mistakes about Philosophy and everything else.

Now next he says:

“We now come to our concepts and judgements of space. It is essential here also to pay strict attention to the relation of experience to our concepts. It seems to me that Poincare clearly recognized the truth in the account he gave in his book, "La Science et l'Hypothese." Among all the changes which we can perceive in a rigid body those which can be cancelled by a voluntary motion of our body are marked by their simplicity; Poincare calls these, changes in position. By means of simple changes in position we can bring two bodies into contact. The theorems of congruence, fundamental in geometry, have to do with the laws that govern such changes in position.”

Einstein mentions Poincare. He is working from Poincare's ideas. Poincare developed them into his theory. There is a great deal of controversy over whether Einstein should be credited with special relativity or Poincare, over whether special relativity should be understood by Poincare's theory with its conventionalism or not.

Now we have it clearly stated that Einstein was working from Poincare's theory!

Of course, in the book by Poincare which Einstein is referring to, Poincare's theory is not as fully formed as it later becomes. But Einstein's theory is still based on it, whether it is fully formed or not, and particularly its based-on conventionalism.

That is, its case proved.

Now all that remains is to highlight some of the details to make things clearer. From earlier he says: “This is particularly true of our concepts of time and space, which physicists have been obliged by the facts to bring down from the Olympus of the a priori in order to adjust them and put them in a serviceable condition.”

What he is talking about is – he is going to change the concepts of “time” and “space” from how they were previously being used as per the Western tradition. And what he is going to do is define the new versions as that they have to keep light speed in vacuum as a constant. That is

(II) adjust experiments to conform to keeping it constant.

Einstein decides to review what is meant by time and velocity because he is going to change them to a different meaning. Einstein says [3]:

“Before we draw any conclusions from these two principles [of relativity and lightspeed in vacuum constancy] we must first review the physical significance of the concepts "time" and "velocity." It follows from what has gone before, that coordinates with respect to an inertial system are physically defined by means of measurements and constructions with the aid of rigid bodies. In order to measure time, we have supposed a clock,  $U$ , present somewhere, at rest relatively to  $K$ . But we cannot fix the time, by means of this clock, of an event whose distance from the clock is not negligible; for there are no "instantaneous signals" that we can use in order to compare the time of the event with that of the clock.”

So, he is presenting the problem as he sees it – in the existing definition of time – the clocks need to be synchronized by sending a signal between them that is instantaneous. Now sending an instantaneous signal he must deem impossible and he thinks the signal has to be a finite speed. He then offers his solution:

“In order to complete the definition of time we may employ the principle of the constancy of the velocity of light in a vacuum.”

Now he means that he is redefining time where in its new context – clocks are synchronized by light signals that he believes are finite and not instantaneous.

That is one of the big changes that he makes, and he goes on to make more changes with respect to what is meant by space etc.

He now works by

(II) adjust experiments to conform to keeping it constant.

Where the clocks have to be adjusted so as keep light speed in vacuum as a constant.

Einstein does not understand these things properly and says [3]:

“The principle of the constancy of the velocity of light then states that this adjustment of the clocks will not lead to contradictions.”

He admits that he wants the clocks adjusted to fit the convention of light speed in vacuum as a constant. But he thinks it leads to no contradictions. Well it does lead to contradictions if things are messed up.

Anyway, he continues [3]:

“With clocks so adjusted, we can assign the time to events which take place near any one of them. It is essential to note that this definition of time relates only to the inertial system  $K$ , since we have used a system of clocks at rest relatively to  $K$ . The assumption which was made in the pre-relativity physics of the absolute character of time (i.e. the independence of time of the choice of the inertial system) does not follow at all from this definition.”

By that he means he has changed the definition of time to something other than what it was in what he calls pre-relativity physics. i.e. pre- special relativity.

Einstein says [4]:

“The theory of relativity [i.e. special relativity] is often criticized for giving, without justification, a central theoretical role to the propagation of light, in that it founds the concept of time upon the law of propagation of light.”

I think criticized rightly so, it's a change in how things are being done in the old way to some other way.

Einstein [4]: “The situation, however, is somewhat as follows. In order to give physical significance to the concept of time, processes of some kind are required which enable relations to be established between different places. It is immaterial what kind of processes one chooses for such a definition of time.”

I think he is being a bit bad here, it is not immaterial what kind of processes, the process he has chosen for his version of time definition is to keep light speed in vacuum as a constant.

Anyway, he continues and says that the process he uses is the light speed in vacuum constancy [4]:

“It is advantageous, however, for the theory, to choose only those processes concerning which we know something certain. This holds for the propagation of light *in vacuo* in a higher degree than for any other process which could be considered, thanks to the investigations of Maxwell and H. A. Lorentz.”

So now he admits to working from Maxwell and Lorentz. But in this regard, it is still via Poincare's theorising.

Einstein says [3]:

“The consequence of the Maxwell-Lorentz equations that in a vacuum light is propagated with the velocity  $c$ , at least with respect to a definite inertial system  $K$ , must therefore be regarded as proved. According to the principle of special relativity, we must also assume the truth of this principle for every other inertial system.”

Once again Einstein is saying things badly. He says “regarded as proved” - that is bad – what he has is a convention to keep light speed in vacuum as constant, it is bad to talk of that as proven, it’s only a convention to adjust experiments. Once again going by what Einstein says can throw a person off into the wrong direction as to what he has done.

If the assumption was (I) then experiment would test the claim. But it’s not (I), it’s (II), it’s not something that can be tested. So, talk of “proven” is just misleading.

As to the principle of special relativity – what he is meaning by this is that the measuring instruments are now to be set to obey (II) in all inertial frames. It’s a different relativity to what Galileo had. So, he has modified relativity from how it was.

Putting aside the issue of if he has the maths correct, for the moment. – I have dealt in previous articles pointing out Einstein was bad at maths.

Consider the following:

If an observer in frame  $K$  observe  $c$  for light emitted in  $K$  frame, what does such an observer make of observing a frame  $K'$  moving at non-zero velocity  $v$  with respect to him?

By Newtonian physics he would say  $c+v$ , and we would call this a new velocity of light greater than  $c$ . Let us call it  $c_{\text{new}} = c+v$

This scenario is dealing with the one-way speed of light in vacuum. Einstein is not dealing with this scenario.

But if he was dealing with this scenario, he might do it as follows:

Einstein sets things so that instead of this have clocks synchronized to have light speed in vacuum as constant, as result  $t$  and  $t'$  are not the same.

$t$  is time interval in  $K$  and  $t'$  is time interval in  $K'$

There is a bit of confusion in relativity texts on this issue, and  $t$  is more likely what person in frame  $K$  claims for clock in frame  $K$ , and  $t'$  is what person in frame  $K'$  claims of clock in frame  $K'$ .

Now, Einstein does not deal with the one-way light speed scenario. Instead he deals with the two-way light speed scenario, where in the Newtonian physics context observer in  $K$  frame observes light in frame  $K'$  as first moving at  $c+v$  and then  $c-v$ . This then forms  $(c+v)(c-v)$  which is multiplied by  $t'$  squared and equated to  $(ct)$  squared, from which the time dilation equation is formed by taking  $t$  as not equal to  $t'$ . Einstein deals with it in that way. Whereas Newtonian physics would be having light speed varying from  $c_{\text{new1}} = (c+v)$  to  $c_{\text{new2}} = (c-v)$ .

It is unfortunate that Einstein could not have explained himself properly regarding what he was doing.

So now I want to bring attention to what Raju says in his acceptance speech for pointing out one of the mistakes that Einstein made, he deals with Einstein copying Poincaré's theory [5]:

“Cases where one student copies from another, but denies it, are commonplace for a teacher. The simple way to resolve such cases is to test the understanding of the students verbally. The one who does not understand has copied. One cannot thus interrogate the past, but mistakes are proof of lack of understanding. If a person claiming independent rediscovery shows lack of understanding through a mistake, that is proof of copying according to my epistemic test. That is exactly what happened in this case: Einstein failed to understand what Poincaré, the mathematician, understood: namely, that relativity changes also the character of the equations of physics. They can no longer be the ordinary differential equations of Newtonian physics, but must be functional differential equations (which, Poincaré took for granted, must be retarded). Einstein never understood this aspect of relativity till his death. That settles the matter: Einstein published later, his claims of independent rediscovery are seriously suspect, and he never fully understood the implications of relativity. Possibly as a patent clerk he realized that he could copy ideas from frontline thinkers, for there is no legal patent on ideas. For almost a century now, it would seem, people have worshipped a false god of science. “

There are several things of interest to note in this, but the relevant thing I want to bring your attention to in this article is – Einstein was working from Poincare's theory but not properly understanding Poincare's theory.

So, on top of all the other problems that Einstein has presented to mainstream physics, he was talking from a theory that he did not properly understand.

And the propaganda campaign portraying Einstein as a genius diverts most everyone to look at Einstein's misunderstandings of Poincare's theory rather than look at Poincare's theory directly without the hindrance of Einstein's mistakes.

## **References**

[1] The Stafford little lectures of Princeton University, May 1921, The Meaning of Relativity by Albert Einstein, Institute of advanced study, Princeton University Press, Princeton, New Jersey first published 1922 updated 1954 for fifth edition. *ibid* p 1

[2] *ibid* p 15

[3] *ibid* p 16

[4] <http://ckraju.net/News/ckr-TGA-acceptance-speech.pdf>

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Typo corrections: 10 Oct 2018