

Problems thrown up by the history of relativity

Roger J. Anderton
R.J.Anderton@btinternet.com

Poincare dealt with relativity before Einstein. The Einstein believers tend to prefer to believe the theory with the mistakes in it as created by Einstein 1905 rather than accept the better theory of Poincare. Some of the mistakes and confusions made by the Einstein believers will be dealt with in this paper. Einstein believers try to construct a version of history that conforms as much as possible to their false beliefs.

Alberto A. Martínez in essay reviewing Galison's book *Einstein's Clocks, Poincaré's Maps: Empires of Time*, points out the problem with historical roots of Einstein's relativity [1]:

“Over the decades, students of physics as well as laypersons have wondered: how did Einstein's theory of relativity originate? Where did it come from? Accordingly, historians, philosophers, and psychologists have pursued various lines of inquiry and uncovered many significant roots. Nonetheless, fascination and puzzlement on the question has persisted, and thus many writers have advanced conjectures and plausible scenarios trying to reconstruct details of Einstein's creativity.”

This problem is due to Einstein not giving references as to what he was working from in his famous 1905 papers.

There were precursors to Einstein working on the same sort of theoretical ideas, most notably Poincare. And it is my contention that Poincare had the better theory with less of the mistakes that Einstein made. But the mainstream has been diverted onto the publicity campaign around Einstein as celebrity, and become fixated on Einstein to the exclusion of Poincare theory being better.

The article I will be giving a critical look at is - “Who Invented Relativity?” [2] Some of the mistakes made by Einstein believers are insidious; for instance sometimes they notice that there is a clear difference between Poincare's theory and Einstein's theory. But when Einstein changes his mind and decides to agree with Poincare's theory, this

leaves the Einstein believers in a state of confusion as to what Einstein's theory "is"; which of course they refuse to acknowledge. They then have the choice of going by the original Einstein or the Einstein with his change of mind; and they find themselves unable to cope with that. One moment representing Einstein in his original version and then on other times flip-flopping to the other version.

The article points out the history of relativity:

"There have been many theories of relativity throughout history, from the astronomical speculations of Heraclides to the geometry of Euclid to the classical theory of space, time, and dynamics developed by Galileo, Newton and others. Each of these was based on one or more principle of relativity."

So, if Einstein's relativity is wrong or needs correcting then it does not mean all the other versions of relativity theories are wrong. Some people after their experience with Einstein are prejudiced against all relativity theories – I am not.

"However, when we refer to the "theory of relativity" today, we usually mean one particular theory of relativity, namely, the body of ideas developed near the beginning of the 20th century and closely identified with the work of Albert Einstein."

That's what makes it difficult criticising Einstein's relativity because it is often simply referred to as "relativity" when there is more relativity than just Einstein's.

"One of the interesting historical aspects of the modern relativity theory is that, although often regarded as the highly original and even revolutionary contribution of a single individual, almost every idea and formula of the theory had been anticipated by others."

The single individual being Einstein, but my contention is that he made lots of mistakes which are not necessarily in the works on relativity before him.

"For example, Lorentz covariance and the inertia of energy were both (arguably) implicit in Maxwell's equations."

Note the word "arguably" - because it is an interpretation issue of whether Maxwell's equations are to be interpreted that way, or whether they should be amended to better conform with Newtonian physics. Einstein went for not conforming it with Newtonian physics or rather not conforming properly with Newtonian physics. So therefore he was making mistakes.

"Also, Voigt formally derived the Lorentz transformations in 1887 based on general considerations of the wave equation. In the context of electro-dynamics, Fitzgerald, Larmor, and Lorentz had all, by the 1890s, arrived at the Lorentz transformations, including all the peculiar "time dilation" and "length contraction" effects (with respect to the transformed coordinates) associated with Einstein's special relativity."

Yes so a lot of the maths that Einstein used for special relativity came from others. Since he was bad at maths it is my contention that he did not deal with this maths properly and made lots of mistakes.

“By 1905, Poincare had clearly articulated the principle of relativity and many of its consequences, had pointed out the lack of empirical basis for absolute simultaneity, had challenged the ontological significance of the ether, and had even demonstrated that the Lorentz transformations constitute a group in the same sense as do Galilean transformations.”

This was all before Einstein, so some people credit Poincare as the original creator of special relativity. BUT-

“In addition, the crucial formal synthesis of space and time into space-time was arguably the contribution of Minkowski in 1907, and the dynamics of special relativity were first given in modern form by Lewis and Tolman in 1909. Likewise, the Riemann curvature and Ricci tensors for n-dimensional manifolds, the tensor formalism itself, and even the crucial Bianchi identities, were all known prior to Einstein’s development of general relativity in 1915. In view of this, is it correct to regard Einstein as the sole originator of modern relativity?”

“The question is complicated by the fact that relativity is traditionally split into two separate theories, the special and general theories, corresponding to the two phases of Einstein’s historical development, and the interplay between the ideas of Einstein and those of his predecessors and contemporaries are different in the two cases.”

Yes, so it all becomes complicated by this, giving lots of room for lots of mistakes to occur.

“In addition, the title of Einstein’s 1905 paper (“On the Electrodynamics of Moving Bodies”) encouraged the idea that it was just an *interpretation* of Lorentz’s theory of electrodynamics.”

Yes. So, now we have a semantics problem. We have Poincare and Lorentz creating a “theory” with Einstein just giving a different interpretation of the “theory”.

The Poincare-Lorentz theory is that to be called special relativity or NOT?

Einstein gave a different interpretation of the Poincare-Lorentz theory, and we call that special relativity.

“Indeed, Wilhelm Wein proposed that the Nobel prize of 1912 be awarded jointly to Lorentz and Einstein,..”

That would be Wein ignoring Poincare’s contribution, and such a theory would be called Lorentz-Einstein theory.

According to Wein: “The principle of relativity has eliminated the difficulties which existed in electrodynamics and has made it possible to predict for a moving system all electrodynamic phenomena which are known for a system at rest... From a purely logical point of view the relativity principle must be considered as one of the most significant accomplishments ever achieved in theoretical physics... While Lorentz must be considered as the first to have found the mathematical content of relativity,

Einstein succeeded in reducing it to a simple principle. One should therefore assess the merits of both investigators as being comparable.”

But issues of whose “theory” it was may have stopped it getting a Nobel prize at that time.

And what we have is no-one ever gets a Nobel prize for relativity:

“neither Einstein, Lorentz, nor anyone else was ever awarded a Nobel prize for either the special or general theories of relativity. This is sometimes considered to have been an injustice to Einstein, although in retrospect it's conceivable that a joint prize for Lorentz and Einstein in 1912, as Wein proposed, assessing "the merits of both investigators as being comparable", might actually have diminished Einstein's subsequent popular image as the sole originator of both special and general relativity.”

However:

“On the other hand, despite the somewhat misleading title of Einstein’s paper, the second part of the paper (“The Electrodynamical Part”) was really just an application of the general theoretical framework developed in the first part of the paper (“The Kinematic Part”). It was in the first part that special relativity was founded, with consequences extending far beyond Lorentz's electrodynamics. As Einstein later recalled, The new feature was the realization that the bearing of the Lorentz transformation transcended its connection with Maxwell's equations and was concerned with the nature of space and time in general.”

But that connection was made by Minkowski.

Mass variation was observed before Einstein's theory:

“To give just one example, we may note that prior to the advent of special relativity the experimental results of Kaufmann and others involving the variation of an electron’s mass with velocity were thought to imply that all of the electron’s mass must be electromagnetic in origin, whereas Einstein’s kinematics revealed that all mass – regardless of its origin – would necessarily be affected by velocity in the same way.”

So, if Einstein was wrong then it would mean that everyone was diverted from thinking of mass increase as being electromagnetic in origin.

By one of my papers I point out Einstein obtained $E=mc^2$ from Newtonian physics not from special relativity. So if we now add mass increase to that $E=mc^2$ from Newtonian physics we would attribute that as being due to energy from electromagnetism. (n.b. things can be mathematically modelled in different ways.)

However with acceptance of Einstein, the research went the other way:

“Thus an entire research program, based on the belief that the high-speed behaviour of objects represented dynamical phenomena, was decisively undermined when Einstein showed that the phenomena in question could be interpreted much more naturally on a purely kinematic basis.”

.i.e. research diverted in the wrong direction.

“Now, if this interpretation applied only to electrodynamics, it’s significance might be debatable...”

I would in the Newtonian physics context put it down as due to all forms of energy, where there must be connection between electromagnetic field and gravitational field and both these things contributing to the energy that when increased can be associated by mass increase.

However the route taken:

“..but already by 1905 it was clear that, as Einstein put it, “the Lorentz transformation transcended its connection with Maxwell’s equations”, and must apply to all physical phenomena in order to account for the complete inability to detect absolute motion. Once this is recognized, it is clear that we are dealing not just with properties of electricity and magnetism, or any other specific entities, but with the nature of space and time themselves.”

Really it should have been energy in all its forms not just energy connected with electricity and magnetism.

“This is the aspect of Einstein's 1905 theory that prompted Witkowski, after reading vol. 17 of *Annalen der Physik*, to exclaim: "A new Copernicus is born! Read Einstein's paper!" The comparison is apt, because the contribution of Copernicus was, after all, essentially nothing but an interpretation of Ptolemy’s astronomy, just as Einstein's theory was an interpretation of Lorentz's electrodynamics.”

The connection being made here is bad. Copernicus had the sun as centre of solar system, and Ptolemy had earth-centered system, so calling Copernicus's work as an interpretation of Ptolemy's work is bad. The connection between Copernicus system and Ptolemy system is that motion is relative. If we apply this to Lorentz theory and Einstein theory, then both theories should be relative in some way. But the mainstream ignores any such connection, and abandons Lorentz theory in favour of Einstein theory.

“Only subsequently did men like Kepler, Galileo, and Newton, taking the Copernican insight even more seriously than Copernicus himself had done, develop a substantially new physical theory. It's clear that Copernicus was only one of several people who jointly created the "Copernican revolution" in science, and we can argue similarly that Einstein was only one of several individuals (including Maxwell, Lorentz, Poincare, Planck, and Minkowski) responsible for the "relativity revolution".”

So Einstein initiated a supposed Einsteinian revolution. But Lorentz's work was before Einstein's interpretation, it could have easily then been a Lorentzian revolution.

If we think of Lorentz theory and Einstein theory being different then there was a potential for two revolutions here – Lorentzian and Einsteinian. My contention is that the mainstream then went for the wrong revolution.

“The historical parallel between special relativity and the Copernican model of the solar system is not merely superficial, because in both cases the starting point was a pre-existing theoretical structure based on the naive use of a particular system of coordinates lacking any inherent physical justification. On the basis of these traditional but eccentric coordinate systems it was natural to imagine certain consequences, such as that both the Sun and the planet Venus revolve around a stationary Earth in separate orbits. However, with the newly-invented telescope, Galileo was able to observe the phases of Venus, clearly showing that Venus moves in (roughly) a circle around the Sun. In this way the *intrinsic* patterns of the celestial bodies became better understood, but it was still possible (and still *is* possible) to regard the Earth as stationary in an absolute extrinsic sense.”

In other words to consider motion as relative; and consider motion as relative to an earth-centered system or a sun-centered system.

“In fact, for many purposes we continue to do just that, but from an astronomical standpoint we now almost invariably regard the Sun as the "center" of the solar system. Why? The Sun too is moving among the stars in the galaxy, and the galaxy itself is moving relative to other galaxies, so on what basis do we decide to regard the Sun as the "center" of the solar system?”

It means treating the Sun as a preferred frame of reference for the Solar system. It can be confused with the idea of absolute frame. But “absolute” implies there is only one frame, which is not intended. By “preferred” mean choose option of a certain frame being better than others because it makes the maths easier, but still can choose any frame to be the “preferred” frame. (There is of course a semantic problem here of not everyone using the terms to have same meaning.)

The issue becomes why treat the sun-centered system as the preferred frame of the solar system, and answers:

“The answer is that the Sun is the *inertial* center.”

I.e. treating the sun as the object with the most mass.

“In other words, the Copernican revolution (as carried to its conclusion by the successors of Copernicus) can be summarized as the adoption of *inertia* as the prime organizing principle for the understanding and description of nature. The concept of physical inertia was clearly identified, and the realization of its significance evolved and matured through the works of Kepler, Galileo, Newton, and others. Nature is most easily and most perspicuously described in terms of inertial coordinates. Of course, it remains possible to adopt some non-inertial system of coordinates with respect to which the Earth can be regarded as the stationary center, but there is no longer any imperative to do this, especially since we cannot thereby change the fact that Venus circles the Sun, i.e., we cannot change the intrinsic relations between

objects, and those intrinsic relations are most readily expressed in terms of inertial coordinates.”

If we continue this idea we have what is sometimes called Mach's principle – where we consider the average mass of the universe as defining the preferred frame of the universe. Of course with realisation of mass energy equivalence we then need to talk of mass-energy average to define the preferred frame of the universe.

“Likewise the pre-existing theoretical structure in 1905 described events in terms of coordinate systems that were not clearly understood and were lacking in physical justification. It was natural within this framework to imagine certain consequences, such as anisotropy in the speed of light, i.e., directional dependence of light speed resulting from the Earth's motion through the (assumed stationary) ether. This was largely motivated by the idea that light consists of a wave in the ether, and therefore is not an inertial phenomenon.”

OK

“However, experimental physicists in the late 1800's began to discover facts analogous to the phases of Venus, e.g., the symmetry of electromagnetic induction, the "partial convection" of light in moving media, the isotropy of light speed with respect to relatively moving frames of reference, and so on.”

These sort of experimental interpretation I dispute as having been done properly.

“Einstein accounted for all these results by showing that they were perfectly natural if things are described in terms of *inertial* coordinates - provided we apply a more profound understanding of the definition and physical significance of such coordinate systems and the relationships between them.”

Which I blame as (1) misinterpretation of experiments (2) Einstein changing his mind a lot (3) Einstein really seeming to mean define light-speed in vacuum as constant and then alter experiments to that belief (4) and other factors.

“As a result of the first inertial revolution (initiated by Copernicus), physicists had long been aware of the existence of a preferred class of coordinate systems - the inertial systems - with respect to which inertial phenomena are isotropic. These systems are equivalent up to orientation and uniform motion in a straight line, and it had always been tacitly assumed that the transformation from one system in this class to another was given by a Galilean transformation.”

OK and in such maths the speed of light in vacuum would be variable.

“The fundamental observations in conflict with this assumption were those involving electric and magnetic fields that collectively implied Maxwell's equations of electromagnetism.”

I dispute that. The maths was bodged to have light-speed as constant in vacuum.

“These equations are not invariant under Galilean transformations, but they are invariant under Lorentz transformations.”

I dispute that as well, a bit of maths manipulation and all is OK.

“The discovery of Lorentz invariance was similar to the discovery of the phases of Venus, in the sense that it irrevocably altered our awareness of the *intrinsic* relations between events.”

Just messed things up by misunderstandings being introduced by Einstein and his followers.

“We can still go on using coordinate systems related by Galilean transformations, but we now realize that only one of those systems (at most) is a truly inertial system of coordinates.”

Ah an admission that Galilean relativity still works, and I think works better than the writer thinks. By my study it takes only a bit of maths manipulation to change maths from Galilean relativity to maths of special relativity; and then to dispute that the Einstein followers have not properly understood their maths I then say physical phenomena can be studied by either bits of maths.

“Incidentally, the electrodynamic theory of Lorentz was in some sense analogous to Tycho Brahe's model of the solar system, in which the planets revolve around the Sun but the Sun revolves around a stationary Earth. Tycho's model was kinematically equivalent to Copernicus' Sun-centered model, but expressed – awkwardly – in terms of a coordinate system with respect to which the Earth is stationary, i.e., a non-inertial coordinate system.”

This is a claim and does not say how; so I deem it false.

“It's worth noting that we define inertial coordinates just as Galileo did, i.e., systems of coordinates with respect to which inertial phenomena are isotropic, so our definition hasn't changed. All that has changed is our understanding of the relations between inertial coordinate systems.”

To some extent; but to another extent the definition has changed. In Galilean-Newtonian physics time intervals are same between observers so that is what you would call isotropic, but Einstein messes up and treats them as not isotropic. So in that sense it has changed. To not point out that change and to claim there is no change is obstructive.

“Einstein's famous "synchronization procedure" (which was actually first proposed by Poincare) was expressed in terms of light rays, but the physical significance of this procedure is due to the empirical fact that it yields exactly the same synchronization as does Galileo's synchronization procedure based on mechanical inertia.”

Einstein's synchronization process is to have the clocks set so that light speed in vacuum is constant i.e. to assume light speed in vacuum as constant and then alter clocks to conform to that belief. It is not the same as Galileo physics – there for a

series of clocks moving at different speeds a slowing moving clock acting like master clock is moved around to synchronize these others clocks. The writer is just totally getting it wrong.

The next bit by the writer is totally obscure:

“To establish simultaneity between spatially separate events while floating freely in empty space, throw two identical objects in opposite directions with equal force, so that the thrower remains stationary in his original frame of reference. These objects then pass equal distances in equal times, i.e., they serve to assign inertially simultaneous times to separate events as they move away from each other. In this way we can theoretically establish complete slices of inertial simultaneity in space-time, based solely on the inertial behaviour of material objects. Someone moving uniformly relative to us can carry out this same procedure with respect to his own inertial frame of reference and establish his own slices of inertial simultaneity throughout space-time. The unavoidable intrinsic relations that were discovered at the end of the 19th century show that these two sets of simultaneity slices are not identical. The two main approaches to the interpretation of these facts were discussed in [earlier sections] The approach advocated by Einstein was to adhere to the principle of inertia as the basis for organizing our understanding and descriptions of physical phenomena - which was certainly not a novel idea.”

This bit above is so badly written that its not comprehensible, so I pass. What it is really trying to deal with is Einstein synchronization and I dealt with that in my papers - it is- where clocks are adjusted to conform to belief that light-speed is constant. No more needs to be said than that.

“In his later years Einstein observed "there is no doubt that the Special Theory of Relativity, if we regard its development in retrospect, was ripe for discovery in 1905".”

That's said to divert attention from the fact that others were working on relativity before Einstein.

“The person (along with Lorentz) who most nearly anticipated Einstein's special relativity was undoubtedly Poincare, who had already in 1900 proposed an explicitly operational definition of clock synchronization and in 1904 suggested that the ether was in principle undetectable to all orders of v/c .”

Yes, Poincare saying a lot of things about relativity before Einstein, and which later were credited to Einstein with forgetting it was Poincare.

“Those two propositions and their consequences essentially embody the whole of special relativity.”

To some extent. But I contend Einstein misunderstood these things and going back to Poincare; Poincare had a better grasp of them.

“Nevertheless, as late as 1909 Poincare was not prepared to say that the equivalence of all inertial frames combined with the invariance of (two-way) light speed were sufficient to infer Einstein's model.”

Poincare was disagreeing with Einstein in other words and pointing out from his perspective that Einstein made mistakes on these issues, from which I concur.

“He [Poincare] maintained that one must also stipulate a particular contraction of physical objects in their direction of motion. This is sometimes cited as evidence that Poincare still failed to understand the situation, ..”

Yes, and those who deem Poincare failed are making the same mistakes as Einstein; which I call the Einstein followers.

The writer from his perspective even thinks Poincare is correct and says:

“but there's a sense in which he [Poincare] was actually correct.”

OK

“The two famous principles of Einstein's 1905 paper are *not* sufficient to uniquely identify special relativity, as Einstein himself later acknowledged.”

OK, so even Einstein changed his mind. So let us summarise – Poincare disagreed with Einstein over the maths therefore Poincare's theory was slightly different to Einstein's theory initially. Then Einstein changed his mind so then his theory had to be amended to being surely closer to being Poincare's theory. But that is not acknowledged by most SR texts and they keep claiming the theory as Einstein's not making the corrections that then turn it into Poincare's theory.

“One must also stipulate, at the very least, homogeneity, memorylessness, and isotropy.”

That is three extra assumptions. Most SR texts state there are two assumptions and they miss out these three. Such Einstein followers have then been led to believe the theory which has mistakes. The theory with five assumptions is closer to being the corrected theory.

“Of these, the first two are rather innocuous, and one could be forgiven for failing to explicitly mention them, but not so the assumption of isotropy, which serves precisely to single out Einstein's simultaneity *convention* from all the other - equally viable - interpretations. . . . This is also precisely the aspect that is fixed by Poincare's postulate of contraction as a function of velocity.”

OK, so then we have Poincare's theory. Not the word “stipulate” this should also be applied to the assumption of light-speed constancy that is also only a stipulation, by that is mean the clocks can be adjusted to conform to light-speed constancy or not conformed to light-speed constancy. And when not conformed to light-speed constancy we have Galilean-Newtonian physics recovered.

However:

“In a sense, the failure of Poincare to found the modern theory of relativity was not due to a lack of discernment on his part (he clearly recognized the Lorentz group of space and time transformations), but rather to an *excess* of discernment and philosophical sophistication, preventing him from subscribing to the young patent examiner's inspired but perhaps slightly naive enthusiasm for the symmetrical interpretation, which is, after all, only one of infinitely many possibilities.”

This now reveals a total misunderstanding by the writer. Earlier we have him admitting that Poincare quote: “but there's a sense in which he [Poincare] was actually correct.” and now totally misunderstanding this admission. The quote: “but there's a sense in which he [Poincare] was actually correct.” means that Poincare was correct and Einstein was wrong. Poincare's theory being in large part the 5 assumptions that were outlined and Einstein's theory being the mere 2 assumptions. I shall now dissect what was said-

“... the failure of Poincare to found the modern theory of relativity...” - Poincare's theory is 5 assumptions and Einstein's original version of his theory was 2 assumptions; by saying Poincare failed to get modern relativity that means modern relativity is not Poincare's theory with its 5 assumptions- but that is a mistake. So modern relativity texts are mostly teaching the mistaken theory of Einstein with his 2 assumptions and not the Poincare theory with its 5 assumptions, therefore teaching a theory that Einstein admitted was wrong.

“... preventing him [Poincare] from subscribing to the young patent examiner's [Einstein] “ – as the writer pointed out Poincare was correct with his theory with 5 assumption and Einstein's theory with 2 assumptions was incorrect, so Poincare was correct in not subscribing to Einstein's theory. In fact the writer admits that Einstein changed his mind and subscribed to Poincare's theory. The over indulgence of Einstein being publicised as a genius had glossed over the fact that Einstein eventually considered the correct theory was Poincare's theory and not his theory he published in 1905. With this continuing misrepresentation – many SR (special relativity) texts are therefore teaching the wrong theory to students!!

“ Poincare recognized too well the extent to which our physical models are both conventional and provisional.”

Which is correct and called philosophy of conventionalism.

“In retrospect, Poincare's scruples have the appearance of someone arguing that we could just as well regard the Earth rather than the Sun as the center of the solar system, “

OK and that would make it a proper relativity theory; it being relative as to whether the earth moved round sun in a sun-centred system or sun moved around the earth in a earth-centred system; and then relative as to whether the speed of light in vacuum was constant or not constant.

“i.e., his reservations were (and are) technically valid,”

OK

“but in some sense misguided.”

No not misguided. If technically valid as admitted then that means is correct. Saying “misguided” is just a bluff thrown up by Einstein believers to try to ignore the truth that Poincare was more correct than Einstein; because Einstein believers want to believe the dogma of their belief in Einstein.

“Also, as Max Born remarked, to the end of Poincare’s life his expositions of relativity “definitely give you the impression that he is recording Lorentz’s work”,”

Poincare was working from Lorentz's work, so more than mere “recording”.

“..and yet “Lorentz never claimed to be the author of the principle of relativity”

Because the principle of relativity was something that Poincare added to Lorentz's work; and which Poincare was talking about before Einstein.

“but invariably attributed it [principle of relativity] to Einstein.”

Says “invariably” must mean “not always” - Lorentz could not have always attributed principle of relativity to Einstein, because Poincare was talking about it also.

“Indeed Lorentz himself often expressed reservations about the relativistic interpretation.”

That would probably be Einstein's relativistic interpretation. Poincare also had relativistic interpretation and Lorentz might not have been critical of Poincare's theory but instead critical of Einstein's.

“Regarding Born’s impression that Poincare was just “recording Lorentz’s work”, it should be noted that Poincare habitually wrote in a self-effacing manner. He named many of his discoveries after other people, and expounded many important and original ideas in writings that were ostensibly just reviewing the works of others, with “minor amplifications and corrections”. So, we shouldn’t be misled by Born’s impression.”

Max Born was an Einstein believer so presumably suffered from same mistakes as Einstein from following Einstein's 1905 theory instead of following Poincare's theory.

“Poincare *always* gave the impression that he was just recording someone else’s work – in contrast with Einstein, whose style of writing, as Born said, “gives you the impression of quite a new venture”.”

The difference was – Poincare cited his sources he was working from, and Einstein famously in his 1905 paper does not give any references. And so not giving references – Einstein can give the false impression he was being original in a “new venture.”

“Of course, Born went on to say, when recalling his first reading of Einstein’s paper in 1907, “Although I was quite familiar with the relativistic idea and the Lorentz transformations, *Einstein’s reasoning was a revelation to me... which had a stronger influence on my thinking than any other scientific experience*”.”

So obviously misled into believing a theory with 2 assumptions as per Einstein's 1905 theory when the better theory was Poincare's with 5 assumptions.

“Lorentz’s reluctance to fully embrace the relativity principle (that he himself did so much to uncover) is partly explained by his belief that "Einstein simply postulates what we have deduced... from the equations of the electromagnetic field".”

Exactly. Lorentz was doing the experiments and forming the maths. While Einstein was theorising – starting from assumptions and trying to make up the maths from those assumptions. And Poincare had the better theory from the theorising approach. While Einstein was just making a mess of things.

“If this were true, it would be a valid reason for preferring Lorentz's approach.”

OK and it is true.

“However, if we closely examine Lorentz's electron theory we find that full agreement with experiment required not only the invocation of Fitzgerald's contraction hypothesis, but also *the assumption that mechanical inertia is Lorentz covariant*.”

Nothing wrong with that its experiment leading to the maths before formed.

“It's true that, after Poincare complained about the proliferation of hypotheses, Lorentz realized that the contraction could be deduced from more fundamental principles , but this was based on yet another hypothesis, the co-called *molecular force hypothesis*, which simply asserts that all physical forces and configurations (including the unknown forces that maintain the shape of the electron) transform according to the same laws as do electromagnetic forces.”

The “molecular force hypothesis” is at least trying explain what causes the contraction. If we go by Einstein we have the maths manipulation to get the maths without physical cause as to why that maths should be.

“Needless to say, it obviously cannot follow *deductively* "from the equations of the electromagnetic field" that the necessarily *non*-electromagnetic forces which hold the electron together must transform according to the same laws.”

Forces should have the same character whatever their cause namely of being mass times acceleration. So it does follow.

“(Both Poincare and Einstein had already realized by 1905 that the mass of the electron cannot be entirely electromagnetic in origin.)”

I think what you need here is unification with gravity so not just electric and magnetic fields of electromagnetism. But such things got obscured by people following Einstein's mistakes as dogma.

“Even less can the Lorentz covariance of mechanical inertia be deduced from electromagnetic theory.”

What he says makes more sense anon.

“We still do not know to this day the origin of inertia,”

It would be due to the fields – gravity, electric and magnetic et al.

“so there is no sense in which Lorentz or anyone else can claim to have deduced Lorentz covariance in any constructive sense, let alone from the laws of electromagnetism.”

In other words, it would take more than the electric and magnetic fields as I already pointed out.

“Hence Lorentz's molecular force hypothesis and his hypothesis of covariant mechanical inertia together are simply a disguised and piece-meal way of *postulating* universal Lorentz invariance - which is precisely what Lorentz claims to have deduced rather than postulated.”

I doubt the word “universal” is appropriate. When treating the case under consideration as observers experiencing constant velocity and no acceleration then we have the usual form of the relativity principle (I.e. for inertial observers); when acceleration is non-zero things change and the Einstein believers get confused and make mistakes.

“ The whole task was to reconcile the Lorentzian covariance of electromagnetism with the Galilean covariance of mechanical dynamics, “

The choice was to fit everything (Maxwell's electromagnetism and Newtonian physics) to Lorentzian or Galilean maths; when it comes to what maths to use – its relative, provided all the mistakes in understanding of relativity are sorted out.

“and Lorentz simply recognized that one way of doing this is to assume that mechanical dynamics (i.e., inertia) is actually Lorentz covariant.”

And the other way of doing it was the Galilean.

“This is presented as an explicit postulate (not a deduction) in the final edition of his book on the Electron Theory.”

The other way of doing it was the other postulate; so have choice as to which postulate to use; a relativity between postulates.

“In essence, Lorentz’s program consisted of performing a great deal of deductive labour, at the end of which it was still necessary, in order to arrive at results that agreed with experiment, to simply *postulate* the same principle that forms the basis of special relativity.”

No, it should be recognised that there is relativity between postulates.

“(To his credit, Lorentz candidly acknowledged that his deductions were "not altogether satisfactory", but this is actually an understatement, because in the end he simply postulated what he claimed to have deduced.)”

“In contrast, Einstein recognized the necessity of invoking the principle of relativity and Lorentz invariance at the start,..”

Einstein supposedly postulated principle of relativity and constancy of light speed in vacuum. This claim above would be interpreting Einstein's light speed constancy in vacuum postulate as postulate of Lorentz invariance. But the assumption of light speed constancy in vacuum does not necessarily lead to Lorentz invariance. So its confusing things.

“.. and then demonstrated that all the other "constructive" labour involved in Lorentz's approach was superfluous, because once we have adopted these premises, all the experimental results arise naturally from the simple kinematics of the situation, with no need for molecular force hypotheses or any other exotic and dubious conjectures regarding the ultimate constituency of matter.”

The molecular force idea is to try to interpret what was causing the contraction, but it still raises problems because if considering constant velocity scenario with zero acceleration then with zero acceleration there should be no force. Doing things the way of assuming light speed constancy in vacuum having to alter time to be variable was messing up the idea of force as mass times acceleration.

“On some level Lorentz grasped the superiority of the purely relativistic approach, as is evident from the words he included in the second edition of his "Theory of Electrons" in 1916: If I had to write the last chapter now, I should certainly have given a more prominent place to Einstein's theory of relativity by which the theory of electromagnetic phenomena in moving systems gains a simplicity that I had not been able to attain. The chief cause of my failure was my clinging to the idea that the variable t only can be considered as the true time, and that my local time t' must be regarded as no more than an auxiliary mathematical quantity.”

Lorentz was only talking about one aspect of relativity theory in that statement it is erroneous by the writer to seem to think it applies to a change of mind on all aspects of relativity theory to agreement with Einstein. Besides as pointed out by writer earlier – Einstein changed his mind to agree with Poincare's theory. Maybe Lorentz still had difficulties with Poincare's theory.

“Still, it's clear that neither Lorentz nor Poincare ever whole-heartedly embraced special relativity,..”

That's from an Einstein believers point-of-view that wants to believe Einstein was correct. But as pointed out earlier by the writer – Einstein changed his mind to be in agreement with Poincare's theory. Now making claims like this one above – the writer is putting himself in the camp of believing Einstein's 1905 theory and not going along with Einstein to change mind to it being Poincare's theory.

“for reasons that may best be summed up by Lorentz when he wrote: Yet, I think, something may also be claimed in favour of the form in which I have presented the theory. I cannot but regard the aether, which can be the seat of an electromagnetic field with its energy and its vibrations, as endowed with a certain degree of substantiality, however different it may be from all ordinary matter. In this line of thought it seems natural not to assume at starting that it can never make any difference whether a body moves through the aether or not, and to measure distances and lengths of time by means of rods and clocks having a fixed position relatively to the aether.”

Still stating a belief in aether.

“This passage implies that Lorentz's rationale for retaining a substantial aether and attempting to refer all measurements to the rest frame of this aether (without, of course, specifying how that is to be done) was the belief that it might, after all, make some difference whether a body moves through the aether or not. In other words, we should continue to look for physical effects that violate Lorentz invariance (by which we now mean local Lorentz invariance), both in new physical forces and at higher orders of v/c for the known forces.”

Far as I am concerned light speed constancy in vacuum is a stipulation which means clocks and other measuring instruments are being adjusted to that stipulation and hence any effect that might be attributable to ether is wiped out by that adjustment.

“A century later, our present knowledge of the weak and strong nuclear forces and the precise behaviour of particles at $0.99999c$ has vindicated Einstein's judgement that Lorentz invariance is a fundamental principle whose significance and applicability extends far beyond Maxwell's equations, and apparently expresses a general attribute of space and time, rather than a specific attribute of particular physical entities.”

I think it based on misunderstandings that not everyone is aware that the light-speed constancy in vacuum adjustment is being made.

“In addition to the formulas expressing the Lorentz transformations, we can also find precedents for other results commonly associated with special relativity, such as the equivalence of mass and energy.”

Equivalence of mass and energy was derived by Einstein from Newtonian physics not from special relativity as dealt with by another of my papers.

“In fact, the general idea of associating mass with energy in some way had been around for about 25 years prior to Einstein's 1905 papers.”

Exactly, it had come from the context of Newtonian physics, and the Einstein believers want to confuse that issue and falsely attribute it to Einstein 1905 when it existed before him.

“Indeed, as Thomson and even Einstein himself noted, this association is already implicit in Maxwell's theory.”

OK.

“With electric and magnetic fields \mathbf{e} and \mathbf{b} , the energy density is $(e^2 + b^2)/(8\pi)$ and the momentum density is $(\mathbf{e} \times \mathbf{b})/(4\pi c)$, so in the case of radiation (when \mathbf{e} and \mathbf{b} are equal and orthogonal) the energy density is $E = e^2/(4\pi)$ and the momentum density is $p = e^2/(4\pi c)$. Taking momentum p as the product of the radiation's "mass" m times its velocity c , we have

$$mc = p = \frac{e^2}{4\pi c} = \frac{E}{c}$$

and so $E = mc^2$.”

OK. The bodge though with special relativity is that theory wants to treat light as massless particle, and the above derivation was treating light as non-zero mass m . So is not a proper fit to Einstein's relativity. But the Einstein fans try to ignore such things and bodge. So they might then invent different concepts such as effective mass, and say light is massless but has effective mass. With such playing around with words – where one moment light has no mass but another moment does is just a bodge to try to hide the flaws.

“Indeed, in the 1905 paper containing his original deduction of mass-energy equivalence, Einstein acknowledges that it was explicitly based on "Maxwell's expression for the electromagnetic energy of space". We can also mention the pre-1905 work of Poincare and others on the electron mass arising from it's energy, and the work of Hasenohrl on how the mass of a cavity increases when it is filled with radiation.”

An admission that $E = mc^2$ was derived by others before Einstein.

“However, these suggestions were all very restricted in their applicability,..”

2

Now inventing an excuse to ignore those others who derived $E=mc^2$ before Einstein by claiming they had restricted applicability of that equation. But Special relativity is also known as restricted relativity where theory had to be extended to general

relativity; so Einstein was only considering it in the restricted sense himself. So the excuse is invalid.

“... and didn't amount to the assertion of a fundamental equivalence such as emerges so clearly from Einstein's relativistic interpretation.”

That's trying to make out Einstein derived $E = mc^2$ from SR. But as dealt with in my papers Einstein derived $E = mc^2$ from Newtonian physics and then assumed that the equation applied to his special relativity; that was his “relativistic interpretation” - that an equation from Newtonian physics could be used in special relativity – his restricted theory.

“Hardly any of the formulas in Einstein's two 1905 papers on relativity were new,”

Exactly the maths had comes from others before Einstein.

“but what Einstein provided was a single conceptual framework within which all those formulas flow quite naturally from a simple set of general principles.”

In other words a supposed re-interpretation of the maths derived from others. But as noted above he eventually decided that Poincare was correct, so he decided his reinterpretation was wrong! That's something the Einstein believers want to ignore.

“Occasionally one hears of other individuals who are said to have discovered one or more aspect of relativity prior to Einstein. To take just one example, in November of 1999 there appeared in newspapers around the world a story claiming that "The mathematical equation that ushered in the atomic age was discovered by an unknown Italian dilettante two years before Albert Einstein used it in developing the theory of relativity...". The "dilettante" in question was an Italian business man named Olinto De Pretto, and the implication of the story was that Einstein got the idea for mass-energy equivalence from "De Pretto's insight". There are some obvious difficulties with this account, only some of which can be blamed on the imprecision of popular journalism.”

The problem with it is that Einstein did not cite references as to what he was working from, so we don't know if Einstein knew of De Pretto; we can guess that his friend(s) told him though.

“First, the story claimed that Einstein used the idea of mass-energy equivalence to develop special relativity, whereas in fact the idea that energy has inertia appeared in a very brief note that Einstein submitted for publication toward the end of 1905, *after* (and as a *consequence* of) the original paper on special relativity.”

Fair point, the article missed out the word “further”, should have said ““further” develop special relativity”.

“The newspaper report went on to say that "De Pretto had stumbled on the equation, but not the theory of relativity..”

De Pretto would have been working from Newtonian physics in other words.

“It was republished in 1904 by Veneto's Royal Science Institute... A Swiss Italian named Michele Besso alerted Einstein to the research and in 1905 Einstein published his own work..." Now, it's certainly true that Besso was Italian, and worked with Einstein at the Bern Patent Office during the years leading up to 1905, and it's true that they discussed physics, and Besso provided Einstein with suggestions for reading (for example, it was Besso who introduced him to the works of Ernst Mach). However, there is no evidence that Besso ever “alerted Einstein” to De Pretto’s paper.”

Yes problematic; a problem created by Einstein not citing his sources. It seems reasonable that he was informed though.

“Moreover, the idea that Einstein’s second relativity paper in 1905 (let alone the first) was in any way prompted or inspired by De Pretto's rather silly and unoriginal comments is bizarre.”

What is really “bizarre” is Einstein believers not wanting to acknowledge the work of others that infringes on supposed originality of Einstein.

“In essence, De Pretto's "insight" was the (hardly novel) idea that matter consists of tiny particles, and that these particles are agitated by their exposure to an ultra-mundane flux of hypothetical ether particles in a "shadow theory" of gravity.”

Deriving $E = mc^2$ from ether theory (Newtonian physics with ether) in other words. Einstein rejected ether as superfluous in 1905 and changed his mind in 1920s. What is really bizarre is these Einstein believers who want to go by Einstein 1905 and still reject ether.

“Supposing that these ether particles move at the speed of light (or perhaps at the “speed of electricity”, which he believed was significantly higher), De Pretto reasoned – in a qualitative way – that the mean vibrational speed of the particles of matter must approach the speed of the ether particles, i.e., the speed of light.”

OK

“He then asserted (erroneously) that the kinetic energy of a mass m moving at speed v is mv^2 , which is actually Leibniz's "*vis viva*", the living force.”

There is a problem with the “2” that has plagued Newtonian physics for a long time and caused lots of arguments between Newtonians some want the equation mv^2 and others wanted $(1/2)mv^2$.

“On this basis, De Pretto asserted that the kinetic energy in a quantity of mass m would be mc^2 , which, he did not fail to notice, is a *lot* of energy. However, this line of reasoning was not original to De Pretto.”

Now going to start saying this line of reasoning goes back a long way-

“The shadow theory of gravity was first conceived by Newton’s friend Nicholas Fatio in the 1690’s, and subsequently re-discovered by many individuals, notably George Louis Lesage in the late 18th century.”

Lesage had an interesting theory. The article is not being clear in explaining sufficiently how De Pretto work connects to Lesage et al, so when it tries to make excuses that $E = mc^2$ should be treated as per Einstein not from De Pretto's theorising it is not clear; so I dismiss it as invalid.

Anyway, admits that mass- equivalence came before Einstein:

“Of course, this is not to say that Einstein had no predecessors in working toward the genuine concept of mass-energy equivalence. Some form of this idea was already to be found in the writings of Thomson, Lorentz, Poincare, etc. (not to mention Isaac Newton, who famously asked "Are not gross bodies and light convertible into one another...?").”

“After all, the idea that the electron's mass was electromagnetic in origin was one of the leading hypotheses of research at that time. It would be like saying that some theoretical physicist today had never heard of string theory!”

“ But it’s clear that mass-energy equivalence did not inspire Einstein’s development of special relativity, because it isn’t mentioned in the foundational paper of 1905. Only a few months later did he recognize this implication of the theory, prompting him to write in a letter to his close friend Conrad Habicht as he was preparing the paper on mass-energy equivalence:

“One more consequence of the paper on electrodynamics has also occurred to me. The principle of relativity, in conjunction with Maxwell's equations, requires that mass be a direct measure of the energy contained in a body; light carries mass with it. A noticeable decrease of mass should occur in the case of radium [as it emits radiation]. The argument [which he intends to present in the paper] is amusing and seductive, but for all I know the Lord might be laughing over it and leading me around by the nose.

“These are clearly the words of someone who is genuinely working out the consequences of his *own* recent paper, and wondering about their validity, not someone who has gotten an idea from seeing a formula in someone else's paper.”

I don't see how he reads that into it; its just being desperate by someone wanting to defend their belief in Einstein.

“Of course, the most obvious proof of the independence of Einstein’s path to special relativity is simply the wonderfully lucid sequence of thoughts presented in his 1905 paper, beginning from first principles and a careful examination of the physical significance of time and space, and leading to the kinematics of special relativity, from which the inertia of energy emerges naturally.”

That's something an Einstein believer would say. Its a mess as far as I am concerned

The article mentions contributions by Lorentz, Poincare and others.

“Several other individuals are often cited as having anticipated some aspect of general relativity, although not in any sense of contributing seriously to the formulation of the theory.”

That's acknowledging the others contribution and trying to be dismissive of it.

"John Mitchell wrote in 1783 about the possibility of "dark stars" that we so massive light could not escape from them, and Laplace contemplated the same possibility in 1796. “

That idea became called black holes.

“William Clifford wrote about a possible connection between matter and curved space in 1873.”

Extend that to time, and that would be the space-time curvature of General relativity.

“Around 1801 Johann von Soldner predicted that light rays passing near the Sun would be deflected by the Sun’s gravity, just like a small corpuscle of matter moving at the speed of light (at a particular point on its trajectory). This gives a deflection of just half the relativistic value. Ironically, in accord with the German literature of the time, the parameter Soldner used to represent the “acceleration of gravity” was half the modern definition of that term, so his formulas included a factor of 2, which some people subsequently took as an indication that he had predicted the relativistic value. However, the Newtonian derivation he presented is unambiguous, and leads to the numerical value of 0.84 arc seconds, which was explicitly stated by Soldner, so there is no doubt that his prediction was half of the relativistic value.”

In my papers I explain – Newtonian physics can give the full deflection.

“Interestingly, the work of Soldner had been virtually forgotten until being rediscovered and publicized by Philipp Lenard in 1921, along with the claim that Hasenohrl should be credited with the mass-energy equivalence relation.”

Lenard was trying to discredit the priority made to Einstein on these issues.

“Similarly in 1917 Ernst Gehrcke arranged for the re-publication of a 1898 paper by a secondary school teacher named Paul Gerber which contained a formula for the precession of elliptical orbits identical to the one Einstein had derived from the field equations of general relativity. Gerber's approach was based on the premise that the

gravitational potential propagates at the speed of light, and that the effect of the potential on the motion of a body depends on the body's velocity through the potential field. His potential was similar in form to the Gauss-Weber theories. However, Gerber's "theory" was (and still is) regarded as unsatisfactory, mainly because his conclusions don't follow from his premises, but also because the combination of Gerber's proposed gravitational potential with the rest of (non-relativistic) physics results in predictions (such as $3/2$ the relativistic prediction for the deflection of light rays near the Sun) which are inconsistent with observation. In addition, Gerber's free mixing of propagating effects with some elements of action-at-a-distance tended to undermine the theoretical coherence of his proposal.”

The article is giving credit to Gerber and then trying to make very contrived dismissive attempts to Gerber's efforts. If Gerber's theory gives the same sort of maths then it merely needs a bit of tidy up.

“The writings of Mitchell, Soldner, Gerber, and others were, at most, anticipations of some of the phenomenology later associated with general relativity,..”

And if Einstein had given credit to his sources then maybe we would know more of how they fit in with general relativity; but the article tries to be dismissive that there is any connection and says:

“ but had nothing to do with the actual theory of general relativity, i.e., a theory that conceives of gravity as a manifestation of the curvature of space-time.”

The article gives an interesting mention that Grossman helped Einstein with the maths for general relativity but did not get as far as the completed theory and not want to be credited as co-discoverer.

Einstein quoted as saying: “Grossmann will never lay claim to being co-discoverer. He only helped in guiding me through the mathematical literature but contributed nothing of substance to the results.”

Hilbert and Einstein were in discussion about development of general relativity; and there is controversy as to who really got the theory first.

The article says: “how much Hilbert and Einstein learned from each other – is somewhat murky”

That's putting it mildly. The article goes into details about that and it may have been Einstein first with the equations before Hilbert.

It is interesting to note that:

“the second volume of Edmund Whittaker's book “A History of the Theories of Aether and Electricity” had just appeared [1953] , in which special relativity is attributed to Lorentz and Poincare, with barely a mention of Einstein except to say that "in the autumn of [1905] Einstein published a paper which set forth the relativity theory of Poincare and Lorentz with some amplifications, and which attracted much attention". In the same book Whittaker attributes some of the fundamental insights of general relativity to Planck and a mathematician named Harry Bateman (a former student of Whittaker's).”

Einstein's thoughts on this were: “I would not consider it sensible to defend the results of my work as being my own 'property', as some old miser might defend the few coppers he had laboriously scrapped together.”

I wonder what that is supposed to mean, a miser could scrap his few coppers together from other people; in similar way Einstein could have scrapped his ideas together from others; and if that were the case then he would not want to defend them as his ideas.

Then : “in the same year (1953), Einstein wrote to the organizers of a celebration honouring the upcoming fiftieth anniversary of his paper on the electrodynamics of moving bodies, saying “I hope that one will also take care on that occasion to suitably honour the merits of Lorentz and Poincare.””

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my comments c.RJAnderton2012