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On a recent article by Seiya Abiko

THE ARGUMENT IN Prof. Abiko’s article, “On the origins of Einstein’s light-velocity postulate,” HSPS, 33 (2003), rests on several assertions and interpretations that do not sustain scrutiny. In making them he criticizes several historians, including myself. The following lines are intended to clarify the historical facts and thereby to exonerate the historians from the mistaken charges leveled at them.¹

According to Abiko, Einstein expressed a complete rejection of the ether when, in August 1899, he wrote to Maric: “The introduction of the word ‘ether’ into theories of electricity has led to the idea of a medium whose motion we can describe, without, I believe, being able to ascribe physical meaning to this assertion.” In fact, in this sentence Einstein only questions the idea of a bulk motion of the ether (when dragged by matter). Nowhere in his letter does Einstein reject the ether. Later in the same year, he wrote about “a good idea” he had “to check what effect the relative motion of bodies with respect to the luminiferous ether has on the propagation of light in transparent bodies.” In September 1901 he still thought of a simple method “for detecting the relative motion of matter with respect to the luminiferous ether.” Even if by that time he perhaps anticipated a negative result, he still did not think that the undetectability of the ether was a priori obvious.²

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² Abiko (ref. 1), 202; Einstein to Maric, Aug 1899, in The collected papers of Albert Einstein, vol. 1 (Princeton, 1987), 225-227; 10 Sep 1899, ibid., 229-230; Einstein to Grossmann, 6? Sep 1901, ibid., 315-316. Cf. Darrigol, “The electrodynamic origins of relativity theory,” HSPS, 26:2 (1996), 241-312, on 290-293. In the translation of Einstein’s letter to Maric of Aug 1899 used by Abiko, diese Aussage (this assertion) is rendered as the pronoun “it,” which perhaps confused him to believe that the antecedent was the ether. Further in the same letter, Einstein does write about reducing electrodynamics to the motion of ions through “empty space;” but contemporary use of the latter expression meant the absence of matter, not the exclusion of the ether.
Abiko asserts that in a contemporary essay on the state of the ether in a magnetic field Einstein conceived the ether as movable and “draggable.” What Einstein actually wrote is: “During its setting up, the electric current produces in the surrounding ether a momentary motion whose nature is not yet completely known. Despite the persistence of the cause of this motion (the electric current), the motion ceases, the ether remains in a potential state and forms a magnetic field.” Anyone familiar with 19th-century ether theories recognizes here the idea that the magnetic field may be interpreted as a state of strain of the ether with a certain potential of energy. A variation of the electric current that causes the magnetic field implies a variation of the strain and thereby a local, internal motion in the ether, which has nothing to do with an eventual bulk motion caused by the displacement of a material body.3

Abiko claims that the Lorentz-Poincaré theory and Einstein’s theory of 1905 do not yield equivalent predictions for the electrodynamics of moving bodies. Yet they do, if the former is defined as a mature form of the stationary-ether theory in which the relativity principle strictly applies and the latter is defined as relativistic kinematics applied to Lorentz’s equations. The electrodynamic section of Einstein’s paper of 1905 and Poincaré’s paper of 1906 both assume the validity of the Maxwell-Lorentz equations in a given frame of reference, as well as the same expressions of the measured lengths, times, and fields in other inertial frames of reference. These shared components are sufficient to determine the outcome of any electrodynamic or optical experiment: any derivation of this outcome performed in Einstein’s theory is easily turned into an empirically equivalent derivation in the Lorentz-Poincaré theory by artificially giving to a given inertial frame a special status as that in which “true” time, space, and fields are defined, and treating the quantities referred to another inertial frame as “apparent” quantities.4

Abiko notes, correctly, that “the Lorentz-Poincaré theory lacks the kinematical part essential for the special theory of relativity” and asserts that “students of the history of special relativity have hitherto overlooked this obvious fact.” In reality, I cannot think of any serious historian of relativity who has not admitted this indeed obvious fact. The only nuance I would introduce concerns the ahistorical use of the world “essential” to qualify the role of the new kinematics in special relativity: in the early years of relativity, quite a few experts would have disagreed about the need for a new kinematics in the theory of relativity.5

5. Abiko (ref. 1), 215 (summary). In ref. 1, on 302, I wrote: “Einstein’s final viewpoint, with the redefinition of the concepts of space and time, was uniquely original.”
To specialize for a moment to myself, I observe that Abiko ascribes to me a view—a sociological approach to the history of relativity—that I introduce only to reject. It is easy to score victories in this way. But dangerous. It suggests a difficulty in finding the obvious meaning of texts. He writes: “Darrigol insists that physicists who regard Schrödinger as an inventor of quantum mechanics should acknowledge Lorentz’s and Poincaré’s shares in the creation of relativity theory.” In fact, I never intended to dictate to physicists the criteria by which they should decide credits for a given discovery. My point only was the following: if physicists, in analogy with the Schrödinger case, decided that a theoretician should always be regarded as a contributor to a given theory if he or she has obtained some basic components of this theory without yet giving its now accepted interpretation, then they should regard Lorentz and Poincaré as important contributors to relativity theory.

Abiko’s paper ends with the remark:

[Lorentz and Poincaré’s] theory involved a non-empirical problem in that they premised Maxwell’s electromagnetic theory along with the stationary ether, and, therefore, could not apply their theory to problems involving the light-quantum. Darrigol’s account falls on this point as well as on his claims that relativity theory was neither superior to, nor empirically different from Lorentz-Poincaré theory.

By asserting the empirical equivalence of Einstein’s theory and the Poincaré-Lorentz theory, I did not assume that their domains of application and the intended ranges of validity were identical. On the contrary, I wrote: “Compared to previous electron theories, the most evident characteristic of Einstein’s theory is that it rests on two general principles that do not imply anything about the structure of matter and radiation.” In saying that “The unquestionable superiority of Einstein’s approach is only a retrospective construction,” I meant that historians should clearly distinguish between contemporary and later perceptions of the differences and the relative merits of the two theories. This led me to the conclusion that “in the German culture of the first years of relativity the Poincaré-Lorentz and the Einstein views had equal chances.” I never denied that Einstein’s theory appears superior to modern commentators such as Abiko.

6. Abiko (ref. 1), 200, 213; Darrigol (ref. 2), 311.
7. Abiko (ref. 1), 214; Darrigol (ref. 2), 312.
8. Abiko (ref. 1), 214; Darrigol (ref. 2), 302, 243, 311.