

1: Hans C. Ohanian | W. W. Norton & Company

About Hans C. Ohanian Hans Ohanian studied physics at Berkeley and at Princeton, where he worked on relativity with John A. Wheeler. He has taught at Rensselaer Polytechnic Institute, Union College, the University of Rome, and the University of Vermont.

Reply to Hans C. Ohanian A response to Hans C. To start, Hans C. As I noted in my Preface: I certainly appreciate that, but Ohanian questions the reliability of some such sources. He gives just one example: Ohanian did not mention why I quoted Forsee. This book is among several that are routinely neglected by nearly all writers on the history of relativity; we do not know which parts of it echo anything that Einstein, Maric, or Besso told Hans Albert, or what Hans Albert in turn told Forsee, or clearly which parts are merely imaginative. Accordingly, what I wrote in my book is: Sources are not equally reliable, of course, so to that end I systematically used brief qualifiers to convey various degrees of credibility: For evidence read this. Moreover, no other work in this field cites quotations more accurately. The Human Failings of Genius It is perplexing that Ohanian complains about my use of Forsee, who at least did interview Hans Albert Einstein and who did write what I quoted Forsee as writing "while, at the same time, Ohanian consciously includes in his own book quotations that he recognizes as apocryphal. He quotes Einstein as saying: Also, Ohanian echoes the apocryphal quotation: Wann halt Baden-Baden an diesem Zug? This is all just wrong, it is speculative fiction based on misreadings of historical sources, as I explained in my article: Let me take this opportunity to debunk also another cute, false quotation that nowadays spreads. When I wrote Kinematics, I collected and painstakingly inspected many alleged quotations and traced their origins in order to determine whether or not to include them in my book. The roots of this apocryphal quotation begin in , when Alexander Moszkowski published his book Einstein: Einblicke in seine Gedankenwelt. Moszkowski had various conversations with Einstein at around Brose, who rendered the lines above as Einstein, The Searcher, p. In quick succession his mind disburdened itself of the abundance of ideas that has stored themselves up in the work of the preceding years, and these ideas signify more to us than a definite stage in the development of an individual. A Life, in In that book, Brian wrote: In a letter to his son, he said of that period: Ohanian is not alone, several other writers also echo the false quotation, including: I explain the evolution of this one quotation because my recent work Science Secrets focuses on that: My point is just that when Ohanian insinuates that my handling of sources leaves something to be desired, well, he is just barking up the wrong tree. Moving on, consider another tree. The problem is that Einstein did not read English at all. At the bottom of this reply, as evidence, I have included a list of more than a hundred articles and books, throughout more than a century, in many journals, in which various theorists and experimenters have proposed ways to measure the one-way speed of light and others have systematically refuted such proposals. For example, Ohanian himself formulated such a proposal in which promptly generated a flurry of submissions to the American Journal of Physics arguing that Ohanian was mistaken. The search for one-way measurements of the speed of light has been so full of rebuttals and retractions that in John D. Norton compared it to the old quest for a perpetual motion machine. Now, in his review of my book, Ohanian alludes to several methods for measuring the speed of light. Ohanian notes that I did not discuss Roemer in my book, so let me do so here. Later in the year, Roemer saw that the same moon took longer to reappear. He therefore inferred correctly that the additional delay arose because Earth, orbiting the sun, had moved farther away from Jupiter, and therefore, sunlight reflected from Io had to travel a greater distance to reach Earth then. This might seem to be a one-way measurement because there is no clock on Jupiter or Io, and light is not sent from Earth to Io and back. Therefore, various writers, including Z. Augustynek , G. Brown , L. Essen , and now Ohanian, have claimed that Roemer indeed measured the one-way speed of light. Such claims have been criticized, for example, by Reichenbach , Scott-Iversen , Kerlov , Salmon , Torretti , and others, and more recently by Max Jammer Thus we are confronted with an equivalent problem: Ohanian wants us to set up a stationary clock in space, and have it mark an orbital departure time of Earth and its return, to give us its speed. But still, suppose we could somehow overcome that problem too, after all, Ohanian is merely talking about an imaginary clock, not any real experiment. But then

we reach the main problem: If we assume a constant speed, then we have adopted a similar convention as assuming the equality of light speeds in opposite directions. But now the situation is worse, because we know that Earth travels at different speeds throughout the year, and in different directions. You know that Roemer used eclipses of the satellites of Jupiter, and sought how much the event fell behind its prediction. But how is this prediction made? So for the velocity of light a value is adopted, such that the astronomic laws compatible with this value may be as simple as possible. They constitute an unusual but entirely consistent way of representing and accounting for empirical relations. Next, Ohanian mentions that Arthur Stanley Eddington was more meticulous than Einstein inasmuch as Eddington acknowledged that in principle it is possible to synchronize clocks by transporting chronometers. Ohanian does not mention, however, that Eddington recognized that such a procedure involves a convention equivalent to that of assuming that light speeds are equal in opposite directions. In , Eddington explained: Neither statement is by itself a statement of observable fact, nor does it refer to any intrinsic property of clocks or of light; it is simply an announcement of the rule by which we propose to extend fictitious time-partitions through the world. I would be glad to learn of a way to measure the one way speed of light, and in my Kinematics book I even describe a proposal. But until any such proposal has been executed in an actual experiment, I just cannot say that the isotropy of light rays is a matter of experimental fact. It is unusual that Ohanian wants to ground relativity physics on dynamics rather than kinematics. As I showed in my book, it was precisely the transition from explanations based on forces to explanations based instead on possible and actual measurements of spaces and times that led physicists to develop and accept relativity theory. Physicists realized that calculations of force presuppose measurements of positions, displacements, and time intervals, that dynamics depends on kinematics. His disagreements with Einstein have led Ohanian to endorse H. Ohanian is welcome to cultivate such theoretical preferences, but I do not think that experiments make such views necessary, and I know of no physicists who have yet adopted his views. Indeed, there are multiple simpler ways in which Einstein could have proceeded. My task was not to blame Einstein for not knowing shortest paths when he first formulated the Lorentz transformations, but only to trace what he actually did.

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Hans C. Ohanian received his B.S. from the University of California, Berkeley, and his Ph.D. from Princeton University, where he worked with John A. Wheeler. He has taught at Rensselaer Polytechnic Institute, Union College, and the University of Vermont.

8: Physics by Hans C. Ohanian

Hans C. Ohanian He has taught at Rensselaer Polytechnic Institute, Union College, and the University of Vermont. He is the author of several textbooks spanning all undergraduate levels: Physics, Principles of Physics, Relativity: A Modern Introduction, Modern Physics, Principles of Quantum Mechanics, Classical Electrodynamics, and, with Remo.

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