

Einstein and Michelson-Morley

On opening up the August 1982 issue of *PHYSICS TODAY* (page 45) the approximately 50 000 members worldwide of The American Physical Society and related societies came across an article entitled "How I created the theory of relativity," printed under the name of Albert Einstein and translated by Yoshimasa A. Ono from a Japanese publication. Since this article was published in their trade magazine, there was no reason for physicists to doubt its authenticity. The article has taken on a life of its own among some physicists and certain historians of science,¹ and that has prompted the following warning about the authenticity of the purported Einstein article.

Because everything carrying the name of Einstein reverberates forever in the literature, it is important to note that Einstein never wrote this article. It is a doubtful translation into English of a publication in 1923 by the Japanese physicist Jun Ishiwara, which itself was a reconstruction from now lost notes that Ishiwara took when Einstein gave an impromptu talk "in simple terms" on 14 December 1922 at Kyoto University in Japan. As far as we know Ishiwara never sent Einstein a copy of the text of his article for approval prior to its publication in Japanese. In fact, it is reasonable to conjecture that a chief goal of the translator was to forge a close connection between Einstein's thinking leading to the special relativity theory and the 1887 Michelson-Morley interferometer experiment. [For further comment on the possibility of such a connection, see John Stachel's article on page 45.]

In Ishiwara's first publication of his account, in February 1923 in the magazine *Kaizo*,² he took care to insert the following caveat in front of his rendition of Einstein's talk, a caveat missing from the *PHYSICS TODAY* article: "This is not something that Professor Einstein wrote himself. What I have written is a translation in my own words of the gist of what the professor related to the students at the end of a

welcoming party at Kyoto University on 14 December of last year. If there is any defect in my recollection or my understanding, this is my responsibility, and I must apologize both to Professor Einstein and to the reader. Nevertheless, I have sought to publish this believing that such an address can only be heard from the professor's own mouth, and cannot be found in any of the books now circulating, and that it is thus precious and noteworthy. With this understanding, I ask for the generous indulgence of both the professor and the reader." (Unless otherwise noted, all translations are by Shigehisa Kuriyama, a Japanese student of the history of science at Harvard University.) Ishiwara himself omitted this caveat when he collected Einstein's lectures into a book that was published under his own name.³

There are two problems to be considered:

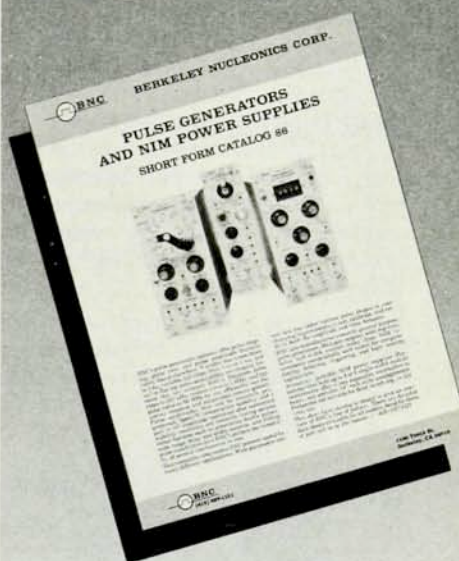
► How safe is it to use as archival evidence even Ishiwara's Japanese article claiming to give the "gist" of Einstein's talk?

► How trustworthy is Ono's translation of the Ishiwara article?

A direct reply to the first question has been offered in a textual analysis by Osamu Kamei, professor of physics at Ochanomizu University, Tokyo, who is also a bilingual translator of scientific works.⁴ Kamei points out that the usual problems of translation are, in the case of translations into Japanese, and again from Japanese, compounded by the enormous structural difference between the Western languages and Japanese. In this particular case there was added the difficulty of furnishing on the spot a simultaneous running translation in Japanese to an audience comprising mostly lay people and students. Kamei writes that "Ishiwara may have been able to jot down several words for each sentence." These jottings would have been the basis of Ishiwara's subsequent publication.

The two most problematical sentences of the original Ishiwara report of Einstein's Kyoto address are, as it

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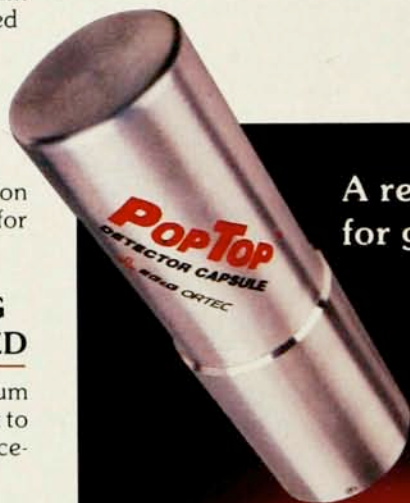
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happens, on a subject of interest for the historian of science. According to Kamei they are also the most problematical passages in Ono's version. They run as follows: "When, however, I was still a student with such ideas in me and I learned of the astonishing results of Michelson's experiment, I came to feel that if these results were acknowledged as fact, then our ideas about the motion of the Earth relative to the ether were probably wrong. In other words, this was the first path that guided me toward what is now called the principle of special relativity; from that time I came to think that although the Earth revolves around the Sun, this movement could not be known by experiments with light."

What is striking is that except for the role of Armand Fizeau's experiment, missing in Einstein's Kyoto lecture is his often repeated stress on such key elements of his thinking toward the special theory of relativity as the symmetries in electromagnetic induction, stellar aberration and his 1895 thought experiment of pursuing a beam of light.⁵

Instead this passage emphasizes the Michelson-Morley experiment, despite the fact that without exception and from early days to the end, a crucial connection of this sort is not borne out by any of the many consistent first-hand accounts Einstein himself gave of

this experiment.⁶

I turn next to Ono's particular translation of Ishiwara's article. Leaving aside the inappropriateness of publishing such an article under Einstein's name, Ono's translation of Ishiwara's article contains substantive errors; for example, Ono writes, "[The Michelson-Morley experiment] was the first path which led me to the special theory of relativity." The correct translation of Ishiwara's account is, however, "[The Michelson-Morley experiment], then, was the first step which led me toward what is now called the principle of special relativity." Not the least problem here is of course that there is a substantial difference between the theory of relativity and the principle of relativity.

Why would Ono want to enlarge greatly the step of which Ishiwara wrote? I can suggest a reason for this, as well as for the way the article as a whole was presented. Ono did his translation for the most part at Case Western University at the suggestion of the late Robert S. Shankland while Shankland himself was at Case. In his later years Shankland had steadfastly tried⁷ to make the Michelson-Morley experiment the direct crucial link to Einstein's own thinking in 1905, despite historical evidence to the contrary.⁶

Essential to the task of the historian of science are trustworthy historical documents. This case illustrates that



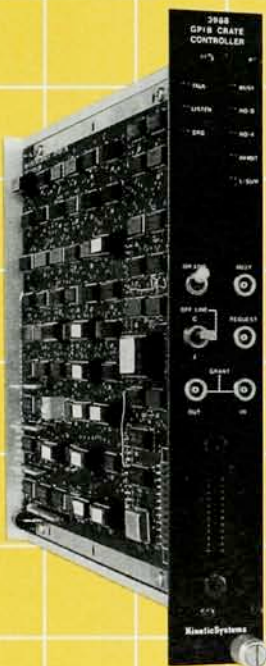
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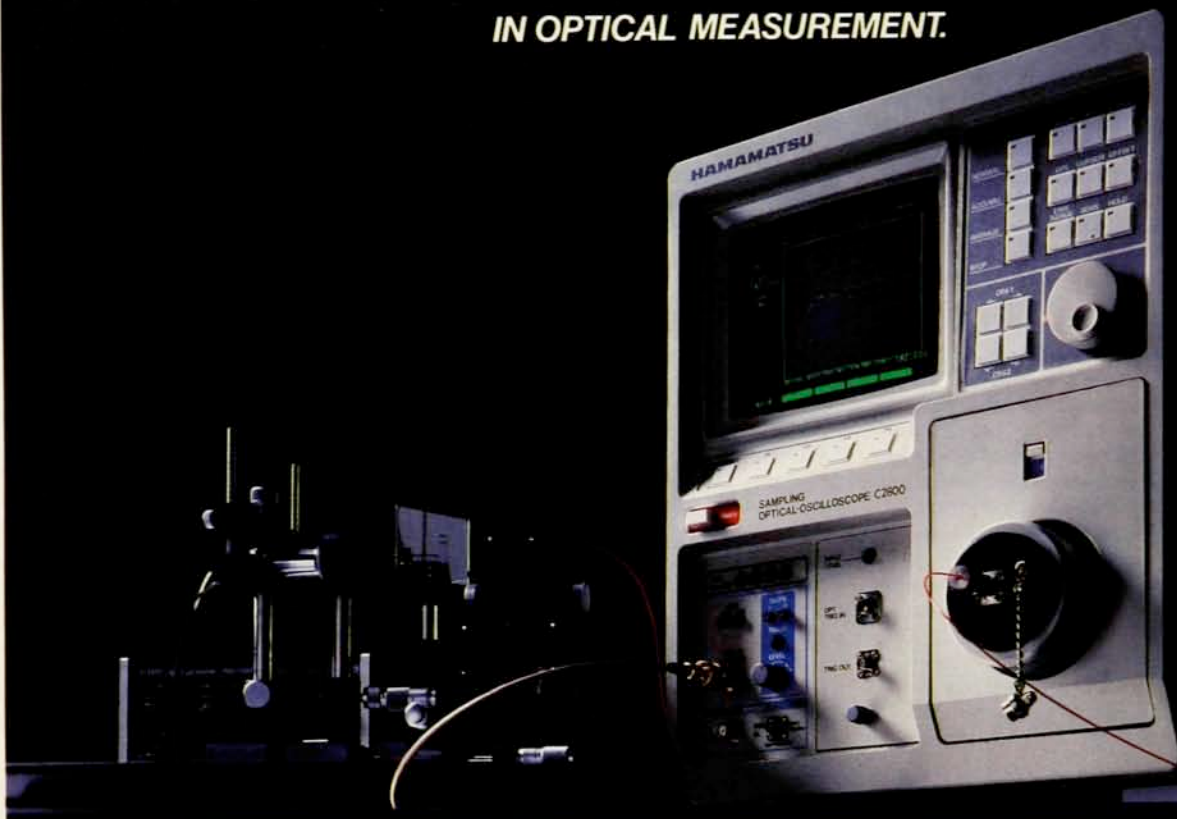
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we constantly need to remind ourselves, and our students, of the good old saying *Caveat emptor*.

References

1. For example, it is included in *History of Physics: Readings from PHYSICS TODAY*, S. Weart, M. Phillips, eds., AIP, New York (1985), p. 243.
2. J. Ishiwara, Kaizo, February 1923.
3. J. Ishiwara, *Einstein Kyōzyū-Kōen-roku* [The Record of Professor Einstein's Addresses], Tokyo (1923; reprinted by Tokyo-Tosho, Tokyo, 1971), p. 78.
4. O. Kamei, "Marginal notes to record of Einstein's addresses," unpublished manuscript of July 1985.
5. A. I. Miller, *Albert Einstein's Special Theory of Relativity: Emergence (1905) and Early Interpretations (1905-1911)*, Addison-Wesley, Reading, Mass. (1981).
6. See G. Holton, *Isis* 60, 133 (1969); reprinted in G. Holton, *Thematic Origins of Scientific Thought: Kepler to Einstein*, Harvard U.P., Cambridge, Mass. (1973), p. 361.
7. For example, see R. S. Shankland, *Appl. Opt.* 12, 2280 (1973).

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Peaceful alternatives to SDI

Einstein may have understood why Pugwash might not succeed in its mission of having concerned scientists from all parts of the world discuss the implications of nuclear war with a view to better informing and influencing world political leaders. To understand the political-military-industrial complex and the weapon system procurement maze is to understand the near-impossible task Pugwash, International Physicians for the Prevention of Nuclear War and others are facing. Einstein said,¹ on the danger of war, "It directly concerns every person. . . . We cannot leave it to generals, senators and diplomats to work out a solution over a period of generations." And in the last 41 years over 16 million people have been killed by wars, 400 000 per year.²

On the assumption that world leaders do comprehend the nuclear holocaust they are fueling, which will consume them, we can understand that they are damned if they arm, and damned if they don't. For every good reason to limit arms, the militarists of the world can create, if necessary, new reasons not to. Even though nuclear war can effectively destroy the world—

18 000 megatons is equivalent to 4 tons of TNT under everyone's bed—this alone is for them insufficient reason to disarm. Add to it all the hundreds of other good reasons to disarm; world leaders have shown for 40 years that they still cannot do it. World scientists and physicians, then, must no longer limit themselves to informing and influencing. They must now solve the problem that has proven too difficult for world leaders. We in the scientific community will have to show explicitly how it can be done without the world's killing itself in the process.

Despite the scare tactics used by experienced manipulators of public opinion, such as references to a "focus of evil," and despite the very tempting trillion-dollar SDI, we must show that there are other initiatives than weapon systems, and that trillions could be better spent for mankind and world peace.

From my own work I have found that there are alternative approaches that would considerably enhance national security from its present state, that would create a world in which poverty, malnutrition, ignorance and disease could be eliminated from the underdeveloped world, and in which peacetime industry would probably fully employ the developed world. (Consider what the great population of the Third World does not have.) I have found that it is possible to design an arms regulation plan that incorporates perfect perceived equality, closure of windows of vulnerability, force modernization and the structure for a perfectly balanced reduction to zero.

There are nonmilitary alternatives to President Reagan's request. I call upon the leadership of the American Institute of Physics and its member societies to respond to the President and search out these alternatives. He has called upon us for a means to render nuclear weapons "impotent and obsolete." In particular I call upon the American Association of Physics Teachers, where others, like myself teaching about nuclear war, may also have discovered alternatives. Those scientists who have signed off SDI research must also believe there are better ways. Shown alternatives, world opinion can require that world leaders choose them, and subsequently put their efforts into the enhancement of mankind worldwide. Or must we kill hundreds of millions of each other before we can establish friendly relations? If there were no nuclear weapons there would be no need for SDI.

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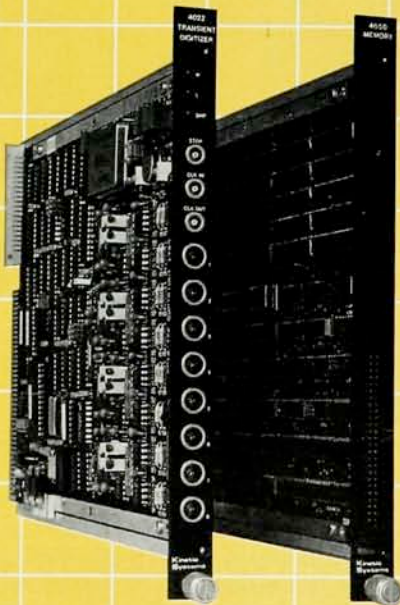
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