

one can be an expert in everything. So we have to find some way to convey those complex ideas in a manner that doesn't require years of study but that is effective enough to allow for sound judgments to be made both at the personal level and at the policy level.

Unfortunately, there is no simple, one-size-fits-all method. It would certainly help matters if people were introduced to quantum concepts at multiple points through a variety of techniques during their K–12 education, but that would require changing standards and increasing the number of teachers who have been exposed to those ideas.

Several initiatives are working to introduce more quantum mechanical topics into K–12 and undergraduate curricula. This past summer I participated in the Quantum Undergraduate Education and Scientific Training (QUEST) workshop. As the name suggests, it was aimed at quantum information science education at the undergraduate level, and several of the participants were from computer science and mathematics departments. Currently I am cofacilitating a faculty online learning community that is taking a deeper dive into some of the themes discussed at the workshop. A related initiative is the National Q-12 Education Partnership. The program, spearheaded by the White House Office of Science and Technology Policy and NSF, is compiling resources for use in the classroom. The general public and policymakers represent an entirely different cohort from those of either QUEST or the Q-12 partnership, which will necessitate yet another approach.

So what have nearly two decades of teaching quantum concepts taught me? They have taught me to be creative and to try multiple approaches. They have taught me that sometimes rigor must be sacrificed in service to the bigger picture. And much to the chagrin of family and friends at holidays and weddings, they have taught me to be annoyingly persistent. But there are few things I would rather do than talk about physics. What about you?

Reference

1. M. Sarovar, A. Ishizaki, G. R. Fleming, K. B. Whaley, *Nat. Phys.* **6**, 462 (2010).

Ian Durham

(idurham@anselm.edu)

Saint Anselm College
Manchester, New Hampshire

LETTERS

Subtle historical connections between Magritte and Einstein

In the recent letter “Einsteinian subtleties in Magritte’s *Time Transfixed*” (PHYSICS TODAY, April 2021, page 10), the author, Robert Fleck, candidly admits that “there is no evidence that [René] Magritte intended to represent . . . Einsteinian ideas in his painting” (shown below). The temptation to dismiss the whole piece as a purely subjective and arbitrary association is rather strong, but there are perhaps tenuous links that might save it from scorn.

The word *durée* in the French title of the painting, *La durée poignardée*, would have had for Magritte and his contemporaries the unmistakable association to the French philosopher Henri Bergson. Before World War I, Bergson was something of a superstar: His lectures were attended by large crowds, and just about everybody knew the buzzword *durée*.

Bergson’s *durée* is not time but rather something else: What his philosophy emphasized is that personally experienced time (*la durée*) is totally different from objective time. “Bergson sees spatialization as the hallmark of the inauthentic, mechanized time of science,” wrote a commentator,¹ and that idea

seems to fit Magritte’s picture rather well.

A mirror mechanically sends back inverted images but does not turn back time: “Reading the picture” spatially from left to right, the spectator notes that the reflection of the second candleholder is missing in the otherwise realistic representation. The locomotive, another mechanical device, irreversibly transmutes the internal energy of coal into external movement. The original thoughts that Bergson developed at length were badly damaged when Einstein’s special theory of relativity became known. To say that they were stabbed (*poignardées*) could be an eloquent image.

Jimena Canales recently published a book about a confrontation between Bergson and Einstein² that took place in April 1922. Later that year Bergson published the monograph *Durée et simultanéité* (*Duration and Simultaneity*) about Einstein’s theory. The book, if not the historical meeting, is something that Magritte might have known about. So perhaps there is a roundabout way to connect more convincingly the picture and Einstein.

Magritte commented on the association to Bergson in a letter he wrote decades after he had finished the painting and given it the title *La durée poignardée*: “You think of Bergson and Proust when you look at this painting,” he said. However, he had already discussed the title in an earlier letter he sent to his friend Marcel Mariën sometime around the painting’s production. A pen-and-ink sketch of the painting occupies the upper part of the sheet, and on the last line of text below it, Magritte asks his friend if he would like to “meditate” about it.

For avid readers of popular-science articles, trains and clocks have become suggestive of Einstein’s



TIME TRANSFIXED, by René Magritte, oil on canvas (1938), Art Institute of Chicago. (Image from Peter Barritt/Alamy Stock Photo.)

READERS' FORUM

theory of relativity, but there is no evidence of Magritte's interest in such matters. "Nevertheless, the associations between Magritte's art and Einstein's science are striking," Fleck notes in his conclusion. At that point, it seems that the linking is his own personal construct, prompted apparently by an invented English translation. But the full story might be more subtle: "Einstein Meets Magritte" was the title of a 1995 interdisciplinary conference, held in Brussels, that became the basis for a series of volumes published over the years.³ The pairing of the two names is indeed striking, even if it has not been found to be particularly productive. "I believe that Einstein and Magritte would not have much to say each to the other," drily noted Nobel laureate Ilya Prigogine during the original conference.⁴

"The chance encounter on an operating table of a sewing machine and an umbrella"⁵ became a popular quote in the history of surrealism, as bringing together widely disparate objects has been a major occupation for surrealists. The method was also adopted by Magritte,

who argued that it is the clash of images that generates ideas.

So we might recapitulate: The image came first, followed by the title and its translation, then the conference, Fleck's letter, and, finally, this note.

References

1. K. McLaughlin, in *Dictionary of Untranslatables: A Philosophical Lexicon*, B. Cassin et al., eds., S. Rendall et al., trans., Princeton U. Press (2014), p. 649.
2. J. Canales, *The Physicist and the Philosopher: Einstein, Bergson, and the Debate That Changed Our Understanding of Time*, Princeton U. Press (2016).
3. D. Aerts, ed., *Einstein Meets Magritte: An Interdisciplinary Reflection on Science, Nature, Art, Human Action and Society*, 11 vols., Springer (1999–2012).
4. I. Prigogine, in ref. 3, vol. 1, p. 100.
5. Comte de Lautréamont, *Les chants de Maldoror (The Songs of Maldoror)*, A. Lacroix (1869).

Alexandre Losev

(alosev@svr.igic.bas.bg)

Bulgarian Academy of Sciences
Sofia

► **Fleck replies:** Alexandre Losev's intriguing suggestion of a René Magritte–

Albert Einstein connection through the French philosopher Henri Bergson and his idea of "personally experienced time (*la durée*)" would, if confirmed, locate "Einsteinian subtleties in Magritte's *Time Transfixed*" more firmly within contextual, historical evidence, thereby elevating the subtle connections I point out beyond the level of mere coincidence. A more thorough search for possible links between Magritte and Einstein—such as may be recorded in the multivolume *Einstein Meets Magritte*, referenced by Losev; Magritte's *Œuvres complètes* (1979), edited by André Blavier in French; and the multivolume *René Magritte Catalogue Raisonné* (1992–2012)—certainly seems warranted.

The influence of Einstein and modern physics on other surrealists, most notably Salvador Dalí, is well documented. Both artists and scientists observe and interpret the world around us; we should not be at all surprised to find commonalities in their creations.

Robert Fleck

(flecker@erau.edu)

Embry-Riddle Aeronautical University
Daytona Beach, Florida **PT**

PRECISION MEASUREMENT GRANTS

The National Institute of Standards and Technology (NIST) anticipates awarding two new Precision Measurement Grants that would start on 1 October 2022, contingent on the availability of funding. Each award would be up to \$50,000 per year with a performance period of up to three years. The awards will support research in the field of fundamental measurement or the determination of fundamental physical constants. The official Notice of Funding Opportunity, which includes the eligibility requirements, will be posted at www.Grants.gov.

Application deadline is tentatively **February 2022**.

For details/unofficial updates see: physics.nist.gov/pmg.

For further information contact:

Dr. Joseph N. Tan, Ph.D.

NIST Precision Measurement Grants Program

100 Bureau Drive, Mail Stop 8422

Gaithersburg, Maryland 20899, U.S.A.

Email address: joseph.tan@nist.gov

NIST National Institute of
Standards and Technology
U.S. Department of Commerce

Two Part, Thermally Conductive, Electrically Insulating Silicone

MasterSil 153A0



THERMAL CONDUCTIVITY
0.93-1.08 W/(m•K)

VOLUME RESISTIVITY
>10¹⁴ ohm-cm

TENSILE LAP SHEAR STRENGTH
700-800 psi

ELONGATION
100-120%

HARDNESS
65-75 Shore A

MASTERBOND®
ADHESIVES | SEALANTS | COATINGS

Hackensack, NJ 07601, USA • +1.201.343.8983 • main@masterbond.com

www.masterbond.com