The Tachyon Nexus
An Educational Resource on Tachyons and Time Travel

By Robert Ehrlich

This article describes a website called The Tachyon Nexus (no relation to Tachyon Nexus Inc.), which includes reliable information about the controversial subjects of time travel and faster-than-light particles known as tachyons. This compendium of various resources should be of great value both to students seeking to learn about these subjects or to high school teachers or college professors wishing to include them in their teaching on special or general relativity.

There have been numerous articles (Bokor, 2015; Ehrlich, 2003; Feldman, 1974; Nemiroff et al., 2016; Saxena, 1977; Shivalingaswamy & Rashmi, 2014; Swetman, 1972) on the hypothetical tachyon in physics education journals, including one in The Physics Teacher (Kreisler, 1975). In fact, the very first article on the subject in 1962 appeared in an education journal (Bilaniuk et al., 1962) because it was regarded as too speculative for the research journal to which it was originally submitted.

Most theorists today regard faster-than-light tachyons as being nonexistent for many reasons, not the least of which is the possibility they might allow you to send messages back in time, and they might even make the universe unstable! Despite these obnoxious properties, there is another type of tachyon that is commonly used in field theories, including the one behind the Higgs boson. Of course, the existence of the faster-than-light tachyon is a matter for experiment to decide, despite the skeptical opinions of theorists. There have been previous searches for tachyons, and one claim in 2011 regarding faster-than-light neutrinos was later retracted when researchers discovered a loose cable in the timing circuit. However, such negative searches cannot rule out tachyons any more than negative searches for ET can rule out the existence of intelligent aliens. Thus, the status of tachyons continues to be unsettled as of now.

Even if tachyons are in the hypothetical realm, suspended between fact and fiction, there is considerable value in bringing science fiction topics into physics courses (Dark, 2005; Freedman & Little, 1980; McBride, 2016; Singh, 2014; Smith, 2009). This is especially true in courses for liberal arts majors and for the sort of science fiction topics that might be considered science facts someday. By adding elements of controversy and speculation to teaching about well-established theories such as relativity, we show students that physics is a living enterprise and much remains unsettled. Hypothetical entities like tachyons or wormhole time machines can be more stimulating for students to read about than well-established entities like the Higgs boson because they can imagine themselves making the great discovery that establishes their existence—and who knows, maybe they will! Tachyons are an especially tantalizing possibility because Albert Einstein ruled out faster-than-light particles in his first relativity paper, and who would not like to disprove something Einstein said?

There are further reasons for bringing science fiction into physics courses and for physics students and faculty to read science fiction on their own. It is noteworthy, for example, that both Gerald Feinberg, the very physicist who gave the name tachyons to faster-than-light particles, and I were first aware of the topic through science fiction stories (Milburn, 2019). Moreover, astrophysicist J. Richard Gott (2002) has shown that science fiction writers have been surprisingly prescient in exploring ideas that have proven to be topics of serious investigation of time travel by scientists. As a prime example, 10 years before the theory of relativity was published, H. G. Wells wrote his epic novel The Time Machine, in which the protagonist discusses what would later be called worldlines through four-dimensional spacetime. There is no evidence that Hermann Minkowski got these ideas about time being the fourth dimension from reading or hearing about Wells’s novel, but it is certainly within the realm of possibility.

As is well known, the topics of time travel and faster-than-light speeds are closely connected. This connection is well established in popular imagination, through A. H. Reginald Butler’s famous limerick (Shapiro, 2006, p. 113), several popular television series, and many movies. One-way time travel to the future is certainly possible based on the time-dilation effect, even though it will be a while before spaceships achieve the speeds needed to have a space-traveling twin age, much less a stay-at-home twin. Time travel to the past, however, like tachyons, remains controversial in physics, but there have been many papers writ-
ten about it, and some of the world’s leading physicists, including Stephen Hawking (2018), have remained open to its possibility, despite their original skepticism.

Many students will try to learn about subjects like tachyons and time travel by browsing the internet, which can be quite risky given the many questionable websites dealing with such controversial subjects. Web browsing to learn about tachyons is particularly risky, given the considerable amount of nonsense connected to so-called tachyon energy and tachyon healing and the many commercial products that have given the word a bad name. Aside from the reasonably accurate Wikipedia page on tachyons, there is a complete absence of websites that treat the subject in a serious way. Similarly, a search for serious websites dealing with time travel in physics that go beyond an article on the subject yields little beyond a Wikipedia page as well. For this reason, I have created The Tachyon Nexus, a (not always serious) website where both physics students and physics teachers can learn more about the subjects of tachyons and time travel. The website includes slide presentations, 76 frequently asked questions and answers about tachyons and time travel, the up-to-date status of current research on tachyons, and links to other websites. The website also includes a blog where users can launch discussions about issues related to tachyons. As someone who has been hunting the tachyon for more than 2 decades (Ehrlich, 2022), I believe I have built a website that is correct, accessible to both students and teachers, and not excessively biased. I do, however, plead guilty to believing that the world of physics may be in for one big surprise in the coming years concerning the existence of tachyons.

References


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