

A Super String Challenge for Leonard Susskind

Terry Bollinger

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<https://youtu.be/LPrqp0ETFms&lc=UgyBLuwhb8ljQZvUGZ14AaABAq>

A Comment on Dr. Brian Keating's short post:

Lenny Susskind: String Theory Wars (Mar 22, 2023)

<https://youtu.be/LPrqp0ETFms>

The Mar 2023 short is an excerpt from Keating's Nov 2020 long Susskind interview:

Lenny Susskind: My Black Hole War with Hawking! (Nov 17, 2020)

<https://youtu.be/YJUskAl8mzw>

This comment is also available there, with the Susskind included (as here) at the top:

https://youtu.be/YJUskAl8mzw&lc=UgznIl8d-q_sxltIkgN4AaABAq

Susskind on Nov 17, 2020 (<https://youtu.be/YJUskAl8mzw?t=17m10s>):

"String theory is a contribution to science, or a contribution to anti-science, that takes place on the blogosphere, and I do from time to time read some of it. I think is very, very destructive. How is it destructive? It's foolish, it's silly, largely the people don't know what the hell they're talking about... and especially, if you read the commentary that comes after the things that the blogger says, they can be imbecilic — they can truly be imbecilic. What does it do, and what is its net effect? I think it adds to the the sense that you can't trust scientists."

Professor Susskind, you are old enough to know that "super" string theory — what you are talking about — originated as a hypothesis that the well-proven 1960s string-like excited hadron (e.g., proton, neutron, or meson) states generalize down *20 orders of magnitude* (!) to the Planck scale, nominally to explain hypothesized spin-2 gravitons.

I'm sure you also recall that this original *hadronic* string theory died out not because it was wrong but because it proved to be a trivial side effect of the then-new quark theory. The unexpectedly linear strong force flux tubes linking bola-like quarks were the "strings" that gave quantized higher-spin states in the excited hadron states seen in accelerators.

You are also old enough to recall the "It's all just math at the bottom" S-matrix theory that dominated before quarks came along. Do you remember how one of the justifications of S-matrix theory was that the mysterious but well-documented hadronic string vibrations *must* be glimpses of the underlying mathematical structure of the universe?

The "super" string hypothesis grabbed that math-at-the-bottom idea with a vengeance. Asserting that there were no possible forces-and-particles explanations for the vibrations directly supported the idea that the hadronic vibration data from accelerators was a tantalizing glimpse at the postulated pure-math infrastructure of the universe

The problem with the pure-math hadronic strings hypothesis was that quark theory showed that, far from being pure-math abstractions, hadronic strings used forces and energy to bind particles together. The string-like vibrations seen in accelerators thus were nothing more than the tiniest possible examples in our universe of ordinary string-like behaviors occurring in normal space-time.

What should have happened at that point was a bit of honesty.

Folks should have said, "Oops, we made an error! Hadronic strings are *not* pure math, after all! So, to stay scientifically linked to experimental physics, we must propose new particles and a new, strong-like but astronomically more powerful linear (and thus non-gravity) force to bind the new particles together at Planck scales. Only by making these additions can we correctly generalize the hadronic strings data down to Planck scales."

The "super" jump (20 orders of magnitude!) was a legitimate hypothesis back then. The problem is that once quark theory wiped the springboard for this pure-math jump out of existence, disproving "super" strings should have taken no more than about five papers. These papers should have pointed out the inadmissibility of an extension that ignores the need for new particles and forces to match the well-proven hadronic strings data.

Instead, "super" string speculations separated from experimental physics and became 50 years of purely paper-based speculation. I'm unaware of "super" strings ever predicting anything genuinely testable. The one *negative* exception was the 2020 HAWC compilation of cosmic ray data that showed Planck scale "super" strings are too big and clumsy to accommodate the smoothness of space under the Poincaré symmetries and Einstein's good-old special relativity.

Dr. Brian Keating, I don't use or read Twitter, so I have no idea who said what in late 2020 to provoke Professor Susskind's comments. I initially responded to your short as if this was a conversation you just had with him. That's my bad for being too trusting of the lack of timestamps in YouTube shorts, which seem designed to encourage controversy by keeping old arguments fresh. Lesson learned: I'll be more cautious in the future.

Professor Susskind, old interview or not, if you should happen to read this, I cannot get around the implication from your remarks that you would classify everything I just said as another example of imbecilic anti-science social media ranting in the comments section. One problem: You are old and experienced enough to know that what I just said accurately describes "super" string history.

So if you're feeling adventurous, let's have a discussion somewhere. Or, even simpler, post your corrections as a comment. After all, if I said something wrong, and since I'm known to be a bit persuasive on such issues, you should let folks know your recollection of the origins and consequence of this once-bold hypothesis. That's what science is. It's your move if you want it. Otherwise, I stand firmly behind everything I just said.

Conversely, if you *can't* correct what I just said, why not take the far more productive path of admitting the original "super" string hypothesis was simply wrong? More than many folks, you could encourage physics to move on to something more productive.

For example, while you know how negatively I feel about your recent reinterpretation of Einstein's worst-ever paper in your ER-EPR hypothesis, at least that is a move in a new direction and gives something new to discuss. Where it gets even more interesting is when folks start to consider thoughts such as, wow, maybe some of our concepts as simple as "length" are a lot more complicated than we think, allowing causality to proceed in ways that fit perfectly with special relativity, but not with our space-and-time neural architectures. The most brutal assumptions to overcome are those built into your brain.

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