

## Three Edward Witten Quotes on Superstrings

Terry Bollinger

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<https://youtu.be/bKapsdchWj0&lc=UgxqmQJzO4v5OjdVSU54AaABAq>

A Comment on the [Closer To Truth](#) post:

*Edward Witten - What are Breakthroughs in Science?* (Mar 22, 2023)

<https://youtu.be/bKapsdchWj0?t=11m36s>

**11:36** EW *"If [super]string theory had not been discovered, ... I would have no idea where to begin in reconciling quantum mechanics and gravity."*

A more precise description would be: "Superstring theory is an extreme generalization of a 1960s hypothesis, S-matrix pure-math string vibration physics, that was entirely disproven and abandoned in the 1970s." Extreme generalizations of already-disproven hypotheses don't typically qualify as "discoveries," though other more apt terms exist.

Dr. Witten, I realize this is old history for you, but for others, here's the story: In the 1960s, the dominant hypothesis for explaining all the particles emerging from accelerators was to assume everything became pure math at about the scale of protons. That sounds silly these days due to the phenomenal success of quark theory, but at the time, it was a popular, even "required," hypothesis. Also, protons, neutrons, mesons, and other hadrons displayed remarkable spin excitations whose associated math closely resembled what one would expect from quantized string vibrations. There was genuine — and at the time, well-founded — excitement that these string-like vibrations exposed the "pure math" structure beneath particles.

Alas, such hopes fell by the wayside when folks realized the presence of string-like math was due to the presence of, well... strings. More specifically, it was due to the strong force flux tubes that bind quarks together. Flux tubes behave far more like bungee cords than electric or gravitational forces. The source of the string-vibration equation was not math but vibrations of the universe's tiniest strings: strong force flux tubes binding quarks.

To this day, no one working in superstring theory gives a straight answer if you ask what superstrings are "made of." Real strings, hadronic strings, are composed of actual energy in the form of the strong force. In sharp contrast, superstrings sprang from the false hope that string vibration math *did not need conventional physics* to exist. This idea was interesting in the 1960s but thoroughly disproven by the late 1970s.

**11:46** EW *"It's... unnatural to ignore ... there's an extremely rich theory ... that ... doesn't just make it possible for gravity and quantum mechanics to work together, but ... forces them upon you."*

A more straightforward explanation is that since the Regge trajectory excitations of flux tube strings increment by units of 2 spins, which is the same number of spin units in Fierz's and Pauli's ancient and troubled 1939 graviton hypothesis, all that's being "forced upon you" is the use of 2 spin units. Since that is the number of spin units needed to

create a boson-based force that at least mimics gravity, it's unsurprising that the quantization of spinning strings easily leads to graviton-like false echoes. That's interesting, but not nearly as strong as "forces them upon you."

I'm calling this Fierz-Pauli spin-2 boson-mediated force a gravity-like force because it assumes bosons travel over a magically "flat" spacetime. Remove that artificial constraint, curve the spacetime, and voila!... you get back Einstein's topological gravity, with the boson-mediated force becoming nothing more than a conventionally quantized force riding *on top* of gravity's deliciously subtle geometric manipulations of reality and time.

[12:22](#) EW *"Generally speaking, the critics don't seem to try very hard to work on [or suggest any] competing theory [of quantum gravity]."*

Let's flip that around: If *you*, Dr. Witten, were unfamiliar with any quantum gravity theories and tried to answer your question, what would you pick? Would your *only* possible answer be a 20-orders-of-magnitude extension of the 1960s math hypothesis that was profoundly disproven in the 1970s by the advent of quark theory and the realization that hadronic strings were never pure math? Would you propose it knowing that, at best, it results in nothing more than a spin-2 boson-mediated attractive force that sits on top of a flat spacetime that, if curved, *still* recreates Einstein's topological gravity, even in the presence of this pseudo-gravity?

Perhaps a better answer would be, "No one knows, so perhaps folks should try harder to come up with completely new ideas."

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