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# Surfer-Physicist's Unified Theory Leads to Fame, Backlash

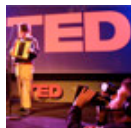
By Kim Zetter 02.27.08 | 12:00 AM



A. Garrett Lisi has largely avoided traditional academic appointments, preferring to do his physics research in between surfing, snowboarding and working odd jobs.

*Photo: Courtesy A. Garrett Lisi*

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Freelance physicist A. Garrett Lisi made headlines last year when he published his "Exceptionally Simple Theory of Everything" to an online wiki. The theory purports to be a blueprint of the universe, showing how all of the particles and forces of the universe are connected.

Lisi, who is speaking at the [TED conference in Monterey, California](#) this week, rejects string theory -- currently the dominant model of the universe. Instead, his [unification theory](#) places all known particles and the four fundamental forces of nature (electromagnetic, the strong force, the weak force and gravity) onto an exceptionally complex 248-point mathematical model known as E8 that was formulated in the late 19th century. Lisi's

schema uses 228 points of the model, with 20 points left over for what he predicts will belong to 20 as-yet-undiscovered particles. His theory met with enthusiastic media coverage, but to date, the scientific community has been far more skeptical about the validity of Lisi's model.

Lisi left academia after obtaining his Ph.D. in 1999, and since then has been working odd jobs to support himself while spending the rest of his time working on physics, surfing and snowboarding.

Wired.com interviewed him by e-mail before his appearance.

**Wired:** Your entire career has been focused, in essence, on your rejection of string theory. What do you have against strings and extra dimensions?

**Garrett Lisi:** It's more accurate to say my career (or, often, lack of one) has been focused on doing what I wanted. There are a lot of good things about string theory, and it's great that some people want to work on it. But, to me, it seemed too disconnected from real particle physics and gravitation. It seemed unlikely that many of these string constructions could ever be experimentally tested, or connected up with the real world. So I set off to follow my own interests.

**Wired:** Please explain in layman's terms why the gravitational force fits this model when it has so resolutely resisted fitting other models except, presumably, string theory?

**Lisi:** The way gravity fits came from recent research in the Quantum Gravity community. This research provided a framework in which gravity could be treated as one of the other three forces, while still agreeing with Einstein's general relativity. When this was combined with a description of the Higgs field, it all fell into place perfectly. I was shocked to see it work so well; but that shock quickly diffused into excitement, which then congealed into a physics paper.

**Wired:** If your theory is proven correct, what will the implications be? What will we know about the universe and how it works other than that its structure is incredibly beautiful and ordered?

**Lisi:** For me, it would be enough to know that the fundamental structure of the universe is incredibly beautiful. I don't think there would be any practical implications within our lifetime. (Physicist Richard) Feynman put it the best when he said: "Physics is like sex. Sure, it may give some practical results, but that's not why we do it."

**Wired:** Will it be able to tell us anything about the Big Bang or about [Neil Turok's multiple Big Bangs](#)? If not, will it at least be able to explain some of the confounding mysteries of *Lost*?

**Lisi:** If this theory turns out to be true about nature, it will certainly provide some new insights into the conditions of the universe shortly after the big bang. It might also lead to interesting speculation on multiple universes. As to resolving the (mysteries) in *Lost* . . . I'm afraid the workings of J.J. Abrams' mind falls outside the predictive capacity of any coherent theory.

**Wired:** Your model predicts the existence of 20 mysterious and as-yet-undiscovered particles. Have you been able to calculate masses for those mysterious particles that would help researchers find them?

**Lisi:** These suggested particles are not so mysterious -- they would be a lot like the Higgs particle, but with color charges that keep them in bound states. I haven't yet solved the problems required to predict their masses, but they would still be recognizable if detected. Of course, if a bunch of particles are detected that are clearly not any of these 20, then this theory is in trouble. And if the Large Hadron Collider (scheduled to go online later this year in Switzerland) finds superparticles or other evidence for strings, I'm going to have to pay out some bets.

**Wired:** Tell us about your decision to pursue your research independently. Why, after getting your Ph.D., did you decide to mostly avoid academic teaching and research positions?

**Lisi:** It is extraordinarily difficult, even in academia, to find a job that will let you do whatever you want with your time. If you are determined to spend your time following your own interests, you pretty much have to do it on your own. After my Ph.D., there just weren't any positions open to support the research I wanted to do. And, of course, the surfing and windsurfing in Maui is amazingly good. I did the best I could to make my daydreams happen -- and that didn't put me in an office.

**Wired:** You're used to working in isolation. But this is a theory that's being developed in the wiki tradition with input from others. Have there been any exciting and noteworthy contributions from others to further the theory?

**Lisi:** Sure, I've made all my physics open source, and documented it as well as possible. I've got a personal wiki, [Differential Geometry](#), where I work on ideas out in the open. Many people have taken ideas from my work and run with them, to advance their own, which is good to see. The biggest help with the theory that I've received from others has been from mathematicians, who have provided answers to some of the trickier aspects of E8 group theory. And there has been practical help as well: friends who have offered me places to stay, or donated support, and there's even a surfboard shaper making me a new board -- from 42 Surfboards.

**Wired:** A media storm ensued last year after *New Scientist* published a piece about your theory. Since then you've been hailed a genius and likened to Einstein. But you've also received some [pretty sharp ridicule](#). Does it worry you that so much could be riding on this for you personally? Do you regret putting your ideas out there for public consumption before they were fully formed?

**Lisi:** The comparisons to Einstein really aren't well justified -- he accomplished much more in physics than I ever possibly will. This story has been sensationalized in the media, which has been quite stressful. Although, the media spectacle has also been [pretty amusing](#) at times.

Some of the harsher personal criticism is an unfortunate but understandable backlash. I try to pull what I can from useful criticism, but most of it has been from people encountering unfamiliar mathematics and being confused by it. I'm not worried about being portrayed as amateurish, because I'm not an amateur, and my work reflects that.

As it develops, this theory may or may not turn out to be true about nature, but it's a solid beginning founded on well-established mathematics. I thought the theory was well enough along to present it to the greater community, get some feedback, and develop it from there.

**Wired:** You've no doubt received a lot of interesting correspondence from people who interpret your findings to support their own beliefs about various things. What have been some of the wilder e-mails and comments you've received?

**Lisi:** After this story broke, I awoke to Pandora's Inbox. I received the oddest e-mails you can imagine: Hundreds espousing their own grand Theories of Everything which they conceived while on acid, many from readers of Kabbala, mystic incantations, religious revelations, astrology . . . you wouldn't believe some of it. Some of the e-mail has been rather charming and random, such as poems, songs, funny pictures and encouragement. The only thing I haven't received yet is a theory of everything expressed through interpretive dance -- I'm still waiting for that one. I swear never again to complain that a paper I published didn't get enough attention.

**Wired:** You said recently: "Since E8 is perhaps the most beautiful structure in mathematics, it is very satisfying that nature appears to have chosen this geometry." Did nature have a choice? Could the E8 framework be the result of an evolutionary process of trial and error that adapted until the universe got it right or do you think that beautiful structure was "ready made"? I guess the equivalent philosophical question for this would be, which came first -- the mathematics or the forces?

**Lisi:** This is a very unusual aspect of this theory. The largest simple exceptional Lie group, E8, is a unique structure in mathematics. If this structure turns out to be fundamental to how the universe works, then it seems to indicate our universe is not one that exists in a landscape of other possibilities. It would mean our universe is exceptional, and perhaps singular. Of course, it is philosophically questionable to consider other universes to begin with, since we're only aware of one. But, whether this theory works perfectly or not, it is undoubtedly true that the fundamental nature of our universe can be described by mathematics.

**Wired:** What's the connection, if any, between the board sports you pursue and your interest in physics?

**Lisi:** Surfing and snowboarding are what I do for fun -- to get out and play in nature. We live in a beautiful universe, and I wish to enjoy it and understand it as best I can. And I try to live a balanced life. Surfing is simply the most fun I know how to have on this planet. And physics, and science in general, is the best way of understanding how everything works. So this is what I spend my time doing. I do what I love, and follow my interests. Shouldn't everyone?