New Particle, If Proved, Could Be A 'Huge Revolution'

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All Things Considered

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Scientists at the Fermi National Accelerator Laboratory in Illinois said this week a "bump" in their data may be evidence of a new subatomic particle — one that could change our understanding of modern physics.

Emphasis on "could. "

"I really can't emphasize that enough," physicist Brian Greene tells NPR's Linda Wertheimer. Greene, who was not involved in the research, says scientists at Fermilab are still culling more data from their experiments.

"But if it isn't something that can be washed away through more refined data," Greene says, "this would be a huge revolution."

So, What Is It?

As for what the particle might be, scientists are still speculating.

One possibility is that the particle may be evidence of a new force of nature, one that operates in only the shortest of distances between subatomic particles in individual atoms. For physicists, that's exciting news.

"We have spent many, many years investigating the known forces, and we understand them very well," Greene says. Those known forces are things like gravity, electromagnetism and the strong and weak nuclear forces that govern the motion of an atom.

But this new force, Greene says, "would suggest other processes that so far we have not yet seen."

A Collider's Last Crash

It's no accident those forces — if they exist — are still undiscovered. They're "hidden," Greene says, and it takes a massive particle collider like Fermilab's Tevatron to ferret them out.

The collider works by running subatomic particles along a 4-mile-long circular track and slamming them together at speeds very near the speed of light.

It's in the wreckage of those collisions, Greene says, that scientists "probe matter under the most extreme circumstances to try to reveal things we couldn't find in everyday life."

But the Tevatron — the machine that produces those collisions — is expected to close in September due to federal budget cuts. That gives researchers only a few months to work on replicating their results. But Greene isn't optimistic a new discovery there would encourage officials to keep it open.

At the Tevatron, he says, "we've learned about particles that make up the tiniest bits of the universe, quarks. We've learned about forces of nature. We've pushed technology to its limits in building these very machines.

"This really has been a force in American science, and it is a profound loss for it to be shut down."

Replicating The Bump

Meanwhile, reaction to Fermilab's results has been greeted with a healthy dose of skepticism from the physics community.

Those results challenge what's known as the Standard Model, a mathematical theory Greene says has been able to describe "every single result from any experiment from any accelerator around the world for decades.

"To now see that perhaps it's not right is exciting," he says, "but also has to be viewed with a very critical eye."

That will mean replicating Fermilab's results not only at the Tevatron, but also at other colliders around the world, such as the Large Hadron Collider in Geneva.

"That machine would really have the possibility to either show that it's right or wipe it out and show that it's wrong."

So if the bump is proved? Greene, a string theorist, would have a lot of new work to do. String theory, he says, relies on the idea that there are unknown forces of nature in the universe.

"I've spent my entire career imagining this very day," he says. "To have something pointing in a direction beyond the status quo? That would be incredibly exciting."