

"Long before it's in the papers"

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## Particle may combine nature's building blocks in new way

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**A newfound particle may consist of four fundamental building blocks of nature, called quarks—previously thought to group only in twos and threes, physicists say.**

The findings appear in two papers in the June 21 issue of the journal *Physical Review Letters*, and were also summarized June 17 in *Physics*, an online magazine of the American Physical Society.

“Particle physicists seem to have a pretty good handle on the fundamental particles of the universe, but there are some glaring holes in this understanding,” wrote University of Pittsburgh physicist Eric Swanson in that article.

Quarks are a good example, he added. They're the simplest known building blocks of matter, but scientists don't understand why they group together as they do—only in twos and threes, past experience shows.

Three-quark combinations are protons and neutrons—the components of the atomic nucleus, which themselves can cluster together when they form that core of the atom.

Quark pairs form short-lived particles called pions.

Now comes “the possible discovery of a new particle containing at least four quarks,” Swanson wrote. Two separate research groups “have seen evidence for this strange particle, called Zc (3900). Although the data is open to other interpretations, it's clear that our understanding of quarks has a long way to go.”

The two groups are known as the BESIII Collaboration at the Beijing Electron Positron Collider, in China, and the Belle Collaboration at the High Energy Accelerator Research Organization in Tsukuba, Japan.

Both labs smash together electrical charge-carrying particles called electrons and positrons to see what their debris contains. “Taken together, the two collaborations have uncovered 466 events that appear to have a Zc(3900) in their debris,” Swanson wrote. This particle would itself be short-lived, as it disintegrates into other particles, he noted.