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Science fact: Scientists achieve 'Star Trek'-like feat

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NEW YORK (AP) -- Scientists have pulled off a startling trick that looks like the "Beam-me-up, Scotty" technology of science fiction.

In an Austrian laboratory, scientists destroyed bits of light in one place and made perfect replicas appear about three feet away.

They did that by transferring information about a crucial physical characteristic of the original light bits, called photons. The information was picked up by other photons, which took on that characteristic and so became replicas of the originals.

The phenomenon that made it happen is so bizarre that even Albert Einstein didn't believe in it. He called it spooky.

In addition to raising the rather fantastic notion of a new means of transportation, the trick could lead to ultra-fast computers.

The experiment is reported in Thursday's issue of the journal Nature by Anton Zeilinger and colleagues at the University of Innsbruck in Austria. Another research team, based in Rome, has done similar work and submitted its report to another journal.

The work is the first to demonstrate "quantum teleportation," a bizarre shifting of physical characteristics between nature's tiniest particles, no matter how far apart they are.

Scientists might be able to achieve teleportation between atoms within a few years and molecules within a decade or so, Zeilinger said.

The underlying principle is fundamentally different from the "Star Trek" process of beaming people around, but could teleportation be used on people? Could scientists extract information from every tiny particle in a person, transfer it to a bunch of particles elsewhere, and assemble those particles into an exact replica of the person?

There's no theoretical problem with that, several experts said. But get real.

"I think it's quite clear that anything approximating teleportation of complex living beings, even bacteria, is so far away technologically that it's not really worth thinking about it," said IBM physicist Charles H. Bennett. He and other physicists proposed quantum teleportation in 1993.

There would just be too much information to assemble and transmit, they say. Even if it were possible someday, it would be so expensive that "probably it's just as cheap to send the real

person," said Benjamin Schumacher of Kenyon College in Gambier, Ohio.

Besides, Schumacher said, teleportation would "kill you and take you apart atom by atom so you could be reassembled at the other end, one hopes. It doesn't seem like a good idea to me."

Much more likely, experts said, is using teleportation between tiny particles to set up quantum computers. These devices would use teleportation to sling data around, and they could solve certain complex problems much faster than today's machines.

In the new work, scientists transferred the trait of "polarization" between photons. Light behaves like both a photon particle and as a wave. A light wave has peaks and troughs like an ocean wave, and polarization refers to the directions in which these peaks and troughs point. Photons retain this trait. To transfer the polarization between photons, the researchers used a phenomenon called entanglement, which a disbelieving Einstein derided. Since then, however, it's been shown to be real.

When two photons are entangled, "they have opposite luck," said IBM's Bennett. Whatever happens to one is the opposite of what happens to the other. In particular, their polarizations are the opposite of each other.

Here's how the Austrians took advantage of that:

Call three photons A, B and C, and assume the goal is to transmit A's polarization to C. The researchers created B and C as entangled photons. Then they entangled B with A.

That second step destroyed A, but not before B took on the opposite of A's original state. This change meant B's entangled partner, C, had to change polarization to remain the opposite of B's. So C's polarization ended up the same as A's used to be. The polarization was transmitted.

The process worked only 25 percent of the time because of how the experiment was set up. It's possible to go to 75 percent and scientists will shoot for that, Zeilinger said.

If the notion of entanglement leaves your head spinning, don't feel bad. Zeilinger said he doesn't understand how it works either.

"And you can quote me on that," he said.

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- Univ. Prof. Dr. Anton Zeilinger
- IBM - Quantum Teleportation

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