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Photon Switch On Leading Edge Of More Powerful Computers

ScienceDaily (Nov. 23, 2001) — Researchers at the University of Toronto have discovered a "switch" involving the manipulation of a photon that may lead to the creation of an optical transistor and usher in a new era of more powerful computers.

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"This switch allows a photon - the smallest unit of light -- to influence the flow of other photons in the same way that transistors inside a PC control the flow of electrons," says Aephraim Steinberg, physics professor and co-author of a paper published in *Physical Review Letters* this fall. "It will be necessary if future generations of computers become reliant on photons instead of electrons."

Steinberg, along with PhD students Kevin Resch and Jeff Lundeen, discovered the switch when they shone one strong beam and two weak beams of light on a special optical crystal. When two photons -- one from each weak beam --

approached the crystal simultaneously, they collided and prevented each other from passing through, thereby switching each other off. When a single photon shot out from only one beam without another photon to switch it off, it passed through the crystal unimpeded. "This allows us to manipulate photons so they can transmit data in a computer - a task that was previously almost impossible," Resch says.

"By using a switch to manipulate photons, optical transistors can be created which could pave the way to a new generation of quantum computers and solve problems that traditional computers would have difficulty with," Resch says, including database searches and the ability to crack codes on the Internet. "This switch might serve as the fundamental basis needed to turn quantum computing into a reality," Steinberg adds.

The study was funded by the Natural Sciences and Engineering Research Council, the Canadian Foundation for Innovation and Photonics Research Ontario.

Adapted from materials provided by [University Of Toronto](#).

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