New discovery sheds light on research tool

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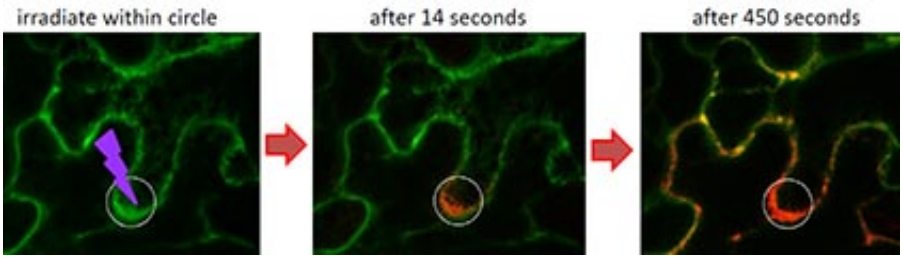

This panel shows how green fluorescent protein changes to red when irradiated and allows researchers to track the movement of proteins and organelles in cells.

Microwave ovens, penicillin and Velcro are examples of scientific discoveries made by accident. Now, Cornell researchers announce another accidental discovery: When a green fluorescent protein (GFP) is exposed to specific wavelengths of laser light, it turns red.

Students engaged in a photo-bleaching technique discovered the color change when they accidentally used a different laser wavelength to look at the GFP.

"No one had ever noticed the GFP could be converted to red under this particular wavelength under very ordinary conditions," said Maureen Hanson, professor of molecular biology and genetics and the paper's senior author.

Green fluorescent protein is used as an essential research tool to tag and

label proteins or parts of a cell so they glow green and can then be followed as they move or interact in biological pathways, according to the study published July 7 in the journal *Scientific Reports*.

Scientists engineer organisms so that certain proteins or cellular organelles will glow green to determine how fast a particular protein degrades or how fast and where a particular organelle moves around a cell. Now, researchers may use laser light to convert a subset of those marked proteins or organelles to red, to compare and further study cell parts in even greater detail. Aside from allowing for finer scale tests, the finding will save researchers the money, time and effort of creating new GFP-engineered lines of organisms for studies of dynamic processes in living cells.

"People will be able to photoconvert ordinary GFP from green to red, so if they have made an organism with GFP, they don't need to make a new one [for continued research], they can simply use the GFP in that line," Hanson said.

The discovery was made in Hanson's lab by first co-authors of the paper, Amirali Sattarzadeh, a former research associate in Hanson's lab, and Reza Saberianfar, a 2014 visiting student to Hanson's lab, who was studying with Rima Menassa, a research scientist at Agriculture and Agri Canada and the University of Western Ontario. The process was verified by Warren Zipfel, associate professor of biomedical engineering and a study co-author. Though the discovery was made in plant cells, further tests found the color shift worked in fruit fly and rat cells. "Conversion is likely to occur in any living cell if you have enough fluorescent protein in it," Hanson said.

More information: "Green to red photoconversion of GFP for protein tracking in vivo." *Scientific Reports* 5, Article number: 11771 DOI: 10.1038/srep11771