New research uncovers the secrets of photosynthesis that could help develop computer technology

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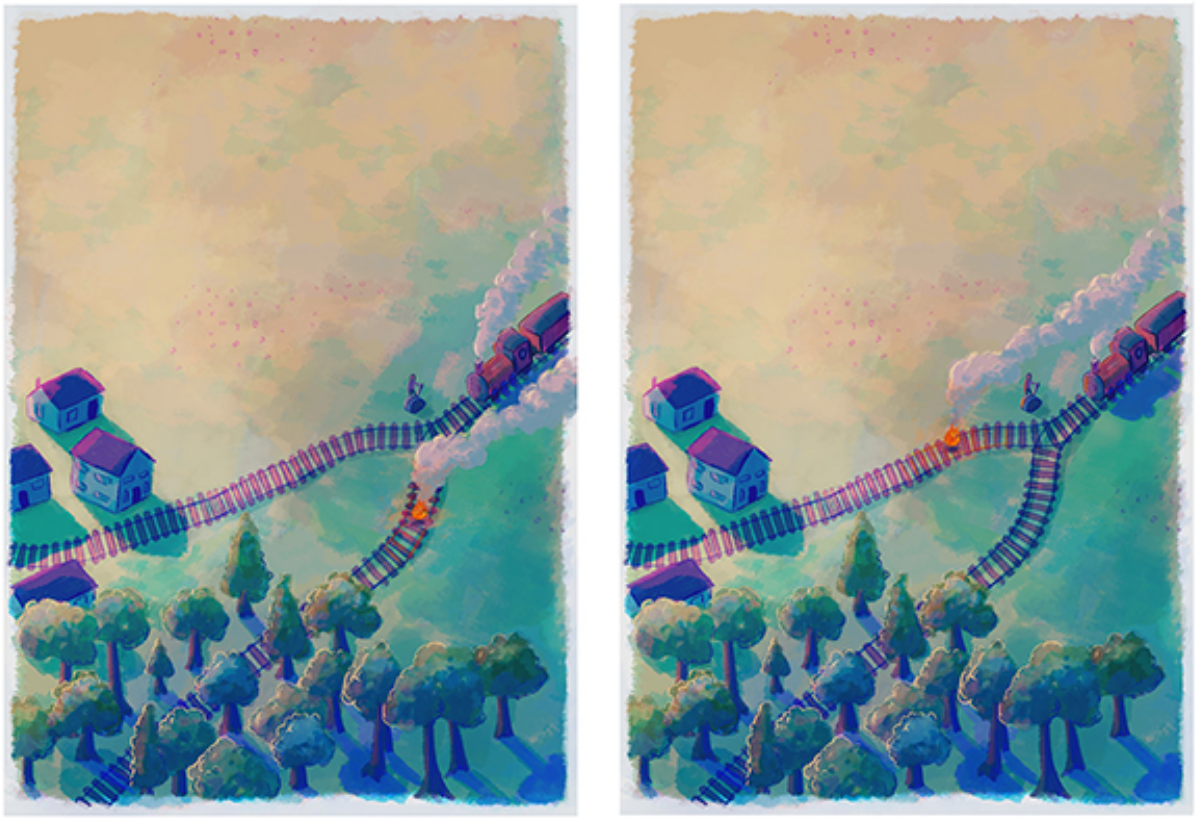

Illustrating how the destination of an electron (represented by the train) can be directed following application of an ultra-fast mid-infrared pulse (represented by the fire). Credit: Helen Towrie at the CLF

Scientists at the University of Sheffield have published new research illuminating how energy is transferred in molecules - something that could influence new molecular technologies for the future.

Energy and charge transfer is what drives photosynthesis and any solar-to-chemical or electrical-to-chemical energy conversion.

Working with collaborators at the Science and Technology Facilities Council (STFC) Central Laser Facility (CLF), Professor Julia Weinstein and Dr Anthony Meijer studied a new 'fork' molecule that can direct the destination of an electron in a precise manner when a particular infrared light pulse is applied.

The key finding of the work, published in *Nature Chemistry*, is that scientists can direct energy transfer via light at a molecular level.

Professor Weinstein said: "Previous research has enabled us to switch electron transfer on or off. What makes our research so exciting is that, via our synthetic molecule, we can now direct the path of an electron in a very specific and controlled way."

Electron transfer is an important part of many natural processes, including the light harvesting process by which plants create and store energy through photosynthesis.

Professor Weinstein explains: "In creating this 'molecular fork', we now have the ability to model natural molecular processes, such as photosynthesis. If we can replicate how energy is stored and utilised, then we have the basis to develop exciting new molecular technologies for the future.

"From new ways of capturing and storing the energy coming to us from the Sun, to developing new forms of computing technology, this research

opens up some exciting new opportunities."

The ability to direct charge along one of several pathways can be used for information storage and retrieval in computing, using low-energy red light.

More information: Milan Delor et al. Directing the path of light-induced electron transfer at a molecular fork using vibrational excitation, *Nature Chemistry* (2017). DOI: 10.1038/nchem.2793

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