provides the origin for the long-lived oscillatory signals in pigment–protein complexes[6–8]. Indeed, in the correct parameter regime, when electronic transitions become approximately resonant with strongly coupling vibrational motion, they can begin to exchange energy — just like nearly resonant coupled pendula. This exchange can be coherent and the electronic dynamics can then exhibit the (relatively) long lifetime of the vibrational coherence.

This can arise through two closely related processes. The interaction between the probing laser fields and the electronic transitions may lead to the creation of ground-state vibrational wave packets whose motion is subsequently probed by a second pair of lasers[6]. Another possibility involves the same pair of laser pulses exciting an electronic coherence, which then couples to a vibrational motion with an equal energy difference. A second pair of laser pulses then probes this coupled dynamics, which can inherit the coherence of the vibrational motion[7]. This process, in particular, may suggest that vibrations can assist electronic coherence and thus explain the functionality of the system under investigation. The dominant process in the PSII experiments performed by Romero *et al.*[1] remains to be determined by a more detailed theoretical analysis.

Regardless of the outcome, however, these results indicate a universal mechanism underpinning the origin of the long-lived oscillations in both energy and charge-transfer resulting from the coherent coupling of electronic and vibrational motion. Explaining the consequences of this interplay for fundamental biological processes remains an exciting topic of future research at the interface of quantum mechanics and biology[9]. ❒

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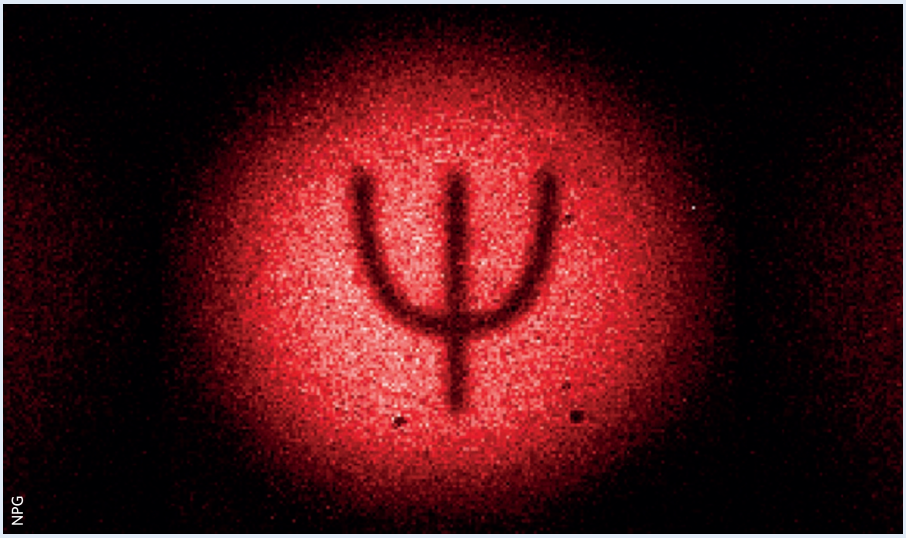
QUANTUM PHYSICS

The other sight

Shadow play may be a source of entertainment for children, but it can also be considered an imaging technique. The shape of an object can be determined by shining light on it, and then looking at where the light was blocked — a strategy extensively used in radiography. But Gabriela Barreto Lemos and colleagues have now demonstrated that an object can be imaged by looking at light that never even interacted with it (*Nature* http://dx.doi.org/10.1038/nature13586; 2014) — all by exploiting the laws of quantum physics.

In their experiment, the researchers generated two pairs of entangled photons using two equal spontaneous parametric down-conversion events. One of the four produced photons interacted with the object to be imaged, and was subsequently aligned and made indistinguishable from its counterpart in the other pair. The image was then reconstructed by making the two remaining photons, which never touched the object, interfere with each other. The two original photons, including the only photon that physically interacted with the sample, were simply discarded.

The principle works because quantum interference between two alternatives emerges only if there is no information available to distinguish them. And what matters is not whether this information is actually gathered, but merely the possibility of it being acquired. In the experiment, if the first photon had interacted with the object, in principle it would have been distinguishable from its counterpart in the other pair — ruling out interference between the remaining two photons. Thus, the presence or absence of interference is exactly what permits the observation.


NPG

This basic scheme can be turned into an imaging technique by repeating the four-photon experiment for every spatial point in the object plane. The area in which interference takes place delineates the object — a pattern etched on a silica plate — which is placed in the path of one of the discarded photons.

This is more than simply an intriguing test of quantum theory. In standard imaging techniques, one needs to tune the frequency of radiation such that it optimizes the contrast for both the object and the detector. Here, this is no longer the case as the two are decoupled; the detected photon need not 'see' the object and the photon interacting with the object need not be detected. Indeed, the silica plate in the experiment was completely transparent to the wavelength of light forming the image.

FEDERICO LEVI

Correction

In the News & Views 'The other sight' (*Nature Physics* **10,** 622; 2014), we mistakenly described the experiment reported by Gabriela Barreto Lemos *et al.* (*Nature* **512,** 409–412; 2014) as a four-photon experiment. It is, in fact, a two-photon experiment.