Quantum physics

A light touch on quantum strangeness

Phys. Rev. Lett. **91,** 180402 (2003)

Telecommunications engineers don't normally worry about the fine details of quantum theory. Encoding information in light pulses, sending the pulses through fibre-optic networks and routing them with multiplexers and amplifiers: it all looks relatively routine. But Nicolas Brunner and co-workers say that optical telecommunications engineers are unwittingly working at the forefront of quantum information theory. Standard processes in fibre-optic networks embody fundamental features of quantum logic, they claim, and could provide engineers with a simple quantum-based formalism for understanding what happens to their light signals.

At the core of the matter are processes that depend on the polarization of light pulses. Different polarization modes travel at different speeds in optical fibres. This is equivalent to making a 'weak' measurement on a quantum system (in this case, the photons of the pulse), a measurement that minimizes the 'back action', the process through which a quantum wavefunction collapses. And the polarization-dependent signal losses that occur in optical devices such as amplifiers amount to a 'postselection' of polarization states; in essence, forcing the wavefunction to collapse into a particular state. These processes are often seen as esoteric aspects of quantum theory. Brunner *et al.*, however, point out that they happen all the time in optical networks. **Philip Ball**

Physiology

Fast food

Oikos **103,** 397–402 (2003)

Wading birds are record-breaking eaters, claim Anders Kvist and Åke Lindström. They find that, before migration, the birds can take on fuel at rates beyond those previously documented in vertebrates.

Kvist and Lindström caught individuals of 15 Swedish wader species in the autumn, just before they left for warmer climes, and provided them with an all-you-can-eat mealworm buffet. Most species could assimilate energy at more than six times their basal metabolic rate, which is unusually high for vertebrates. But the champion glutton was the red knot, *Calidris canutus* (pictured), which assimilated energy at more than 10 times its basal metabolic rate — the previous record was 7.7, in the mouse. This level of consumption allowed the birds to gain weight at almost 15% per day.

Red knot use their reserves to power an epic migration: they spend several months in transit each year, flying from the Arctic to deep in the Southern Hemisphere, and then back again. Kvist and Lindström conclude that the upper limit for energy assimilation in vertebrates has probably been underestimated, and that the limit in a particular species depends on the digestive system and the capacity to lay down fat. **John Whitfield**

JOE MCDONALD/CORBIS

Red knot — here seen eating out.

Hydrology

White Nile past

Geology **31,** 1001–1004 (2003)

The secret history of the White Nile — one of the two main tributaries of North Africa's greatest river — has been revealed using a combination of high-resolution satellite imagery and sediment-dating techniques. Martin A. J. Williams and colleagues find that a large lake, now disappeared, formed as much as 400,000 years ago and explains the tributary's unusually gentle gradient.

The White and Blue Nile feed into the Nile itself at Khartoum. The White Nile's hydrological history is known from about 15,000 years ago. But Williams *et al.* have gone back further in time by identifying the shoreline of an ancient lake from satellite images, and dating quartz grains in the relevant sediments by a method known as optically stimulated luminescence.

The result is a series of snapshots of the river's behaviour over time — which, most notably, includes a giant but quite shallow lake some 500 km long in a north–south direction, reaching almost to present-day Khartoum, and up to 70 km wide. The authors point out that there has been more than a century of speculation that such a feature once existed, to account for the White Nile's unusual flatness. The mean longitudinal gradient is a less than dizzying 1 in 75,000. **Tom Clarke**

Virology

Suppressing a terminator

Cell **115,** 319–331 (2003)

A protein called reverse transcriptase plays a crucial part in the life of retroviruses — viruses whose genomes consist of RNA rather than DNA. This enzyme (which is encoded by the viral *pol* gene) copies RNA genomes into duplex DNA, which then integrates into the DNA of the host cell, allowing more viral RNAs to be made. Marianna Orlova *et al.* now reveal another role for reverse transcriptase — and another way in which viruses can subvert host processes.

When organisms make a protein, they first copy the encoding gene into messenger RNA; that mRNA is then translated into protein. In murine leukaemia virus, a single mRNA is used to express two genes, *gag* and *pol*. But 'stop' signals at the end of *gag* would normally halt translation of this multifunctional mRNA before *pol* is reached. How can reverse transcriptase be produced?

Translation termination involves several proteins; one, eRF1, recognizes stop sequences. Orlova *et al.* now show that existing reverse transcriptase binds to eRF1. This interaction does not affect the enzyme's ability to make DNA. But it does reduce the amount of free eRF1, such that the stop signal cannot be recognized — allowing more *gag–pol* mRNA to be translated. If the interaction is blocked, the levels of *gag–pol* translated are not enough to support viral propagation. **Angela K. Eggleston**

Psychophysics

Who are you?

Proc. Natl Acad. Sci. USA **100,** 13105–13110 (2003)

The brain centres involved in recognizing faces and in processing facial expressions have long been thought of as entirely separate — partly because brain-damaged patients with 'prosopagnosia' cannot recognize faces (even their own), but can still distinguish expressions. Beatrice de Gelder *et al.* show that the two processes may, in fact, be linked.

The authors found that prosopagnosic patients were better able to recognize which face part belonged to a given face if the faces were happy or angry rather than neutral. By contrast, control subjects found the task more difficult when the faces showed emotion. Using functional magnetic resonance imaging, the team also found that, in the prosopagnosics with damage to the two typical face-recognition areas in the brain, the task activated other areas. These included the amygdala, which processes emotion, and the superior temporal sulcus, which helps deal with social interactions.

The authors conclude that activation of these areas boosts face recognition by prosopagnosics, although the exact mechanism involved is unknown. The finding also suggests that diagnosis of face-recognition disorders — and possibly the treatment of prosopagnosia — should exploit the interactions between emotional skills and impaired recognition of identity. **Helen Pearson**

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