

OPTICS & PHOTONICS

Filming catches light in action

A new ultra-fast camera can generate a film containing dozens of frames at a speed of trillions of frames per second.

High-speed cameras capture frames on light sensors composed of semiconductors. Such cameras typically save each frame of a sequence on a separate area of the sensor. But inherent limits on the sensor's size can limit the length of a film to just a few frames.

Feng Chen of Xi'an Jiaotong University in Shaanxi, China, Lidai Wang at the City University of Hong Kong and their colleagues instead expose each frame on separate but overlapping areas of the camera sensor. Each successive frame is imprinted with a random tag before it reaches the sensor. These tags allow the image captured by the sensor to be teased apart into distinct frames.

With this technique, the camera could generate a sequence of up to 60 shots at a rate of almost 4 trillion frames per second. This allowed the team to film a light pulse as it travelled through a material.

The approach could be used to watch high-speed processes — such as the interaction between light and biological tissue in laser surgery — unfold over time.

Phys. Rev. Lett. 122, 193904 (2019)

ECOLOGY

Shark that snacks on songbirds

Tiger sharks are not picky eaters, even as babies. Youngsters of the striped sea predator snack on many species of bird, including some that live primarily on land.

Tiger sharks (*Galeocerdo cuvier*) are notorious for their ability to eat just about anything, from sea turtles to rubber tyres. Marcus Drymon at Mississippi State University in Biloxi and his colleagues analysed the stomach contents

of more than 100 tiger sharks caught off the coast of Mississippi and Alabama at various times of year. The authors found remains of land birds, such as swallows and wrens, in about 40% of the animals — nearly half of which were baby sharks.

How sharks come by land birds is not clear. Tiger sharks' consumption of land birds occurred mainly during the birds' migration season, and the researchers suspect that the sharks are snacking on migrating birds that fall into the ocean as a result of storms or fatigue.

This scavenging of land birds might offer young sharks a way to stay well fed until they learn effective hunting strategies, the scientists say.

Ecology <http://doi.org/c55f> (2019)

MATERIALS SCIENCE

Personal cooling in a portable patch

Personal air conditioning could be one step closer to reality, thanks to the advent of a flexible cooling device that can be incorporated into clothing.

Thermoelectric systems use semiconductors to pump heat from one side of a device to the other, creating a cool zone and a hot zone. Such systems can provide compact, easily adjustable cooling, but getting them to efficiently dissipate



heat has proved challenging.

Renkun Chen, Sheng Xu and their colleagues at the University of California, San Diego, addressed this problem by embedding multiple pillars of a semiconducting material between two stretchy polymer sheets. One sheet served as the hot zone, the other as the cool zone. This design conferred flexibility and insulated the hot and cold sides from each other, allowing the hot layer to dissipate its heat into the air.

The team added a flexible battery pack to the design, creating a patch (pictured) that can cool skin temperature by more than 10 °C. The use of such devices could reduce the demand for energy to power central air conditioning by 20% in typical buildings, and enhance a wearer's comfort outdoors, the authors say. *Sci. Adv.* 5, eaaw0536 (2019)



ANIMAL BEHAVIOUR

Saved from sticky end by rescue ants

A desert-dwelling ant laboriously demolishes spider webs to rescue trapped nest mates — a risky mission few prey species would tackle.

Veromessor pergandei harvester ants (pictured) thrive in colonies tens of thousands strong in the southwestern United States, and usually walk one route each day to collect seeds. Christina Kwapich and Bert Hölldobler at Arizona State University in Tempe monitored the ants' response when one of their own became ensnared in a spider web.

If the entangled ant released a chemical alarm signal, its companions rescued it, carried it back to the nest and cleaned the silk from its body. Ants also tugged on the web itself until they had destroyed it. In laboratory tests, ants needed from 30 minutes to 2 hours to demolish a single web.

The authors say that although one ant represents only a fraction of the colony, rescue attempts might promote the colony's long-term survival. This is probably in part because the loss of multiple foragers to webs every day could drastically reduce the number of seeds harvested per year. *Am. Nat.* <http://doi.org/c55d> (2019)

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