Research highlights

A SIGHT BETTER: RETINA-LIKE SENSORS CAN ADJUST TO LIGHT

Smart optical sensors inspired by the human retina could improve artificial-vision systems used in autonomous vehicles and industrial manufacturing.

Machine-vision systems are networks of cameras and computers that gather and process visual information from their environment. Their applications, which include tasks such as facial recognition and quality-control inspections, require them to perceive objects in a wide range of lighting conditions. That goal is typically achieved by using intricate optical components, circuitry and algorithms that reduce the systems' efficiency and increase their complexity.

Yang Chai at the Hong Kong Polytechnic University, Jong-Hyun Ahn at Yonsei University in Seoul and their colleagues developed machine-vision sensors containing light detectors, called phototransistors, that are made from an ultrathin semiconductor material. Humans can discern objects in both dark and bright environments, because their retinas can change their light sensitivity to adapt to the illumination level. The researchers carefully designed their sensors to emulate this behaviour.

The authors' devices can perceive objects in a light-intensity range substantially wider than that of state-of-the-art sensors based on silicon. Such instruments could improve the efficiency and reduce the complexity of machine-vision technology.

Nature Electron. https://doi.org/hgj8 (2022)

OZONE-DEPLETING CHEMICAL LINKED TO OCEAN OSCILLATION

The Pacific Ocean's influence reaches up into the stratosphere. The ocean's waters affect the weather and thus the behaviour of fires in far-flung locales; these, in turn, drive emissions of a powerful ozone-depleting gas.

Atmospheric levels of methyl bromide, which is used as a pesticide, have been falling since 1999, when a treaty to protect the ozone layer phased out most production of the compound. But since then, scientists have found mysterious variations in levels of the chemical in air samples from around the world. Modelling by Melinda Nicewonger at the National Oceanic and Atmospheric Administration in Boulder, Colorado, and her colleagues suggests that these are related to the El Niño Southern Oscillation, a periodic warming and cooling of the tropical Pacific's surface waters.

The authors report that methyl bromide levels in the atmosphere can't be explained by trends in winds, ocean temperatures or natural emissions from ecosystems in the ocean or on land. Instead, they say, increased emissions of from fires — both naturally occurring and those caused by humans — during the warm El Niño phase can account for 46% of the year-to-year variation.

Geophys. Res. Lett. **49**, e2021GL094756 (2022).

DNA STRANDS KNOCK BUILDING BLOCKS INTO SHAPE

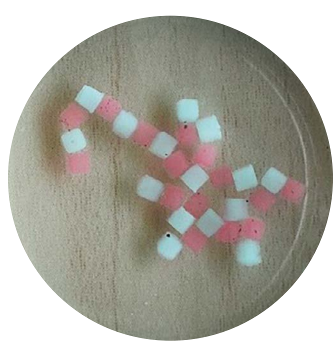
Strands of DNA can guide gel cubes large enough to be seen with the naked eye to assemble into groups (pictured).

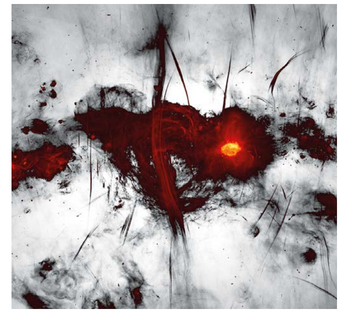
A piece of single-stranded DNA will pair up with another that has exactly the right components in the right order. Leveraging this trait, researchers have used DNA to guide miniature components to assemble into particles of various shapes. But DNA assembly techniques have mostly manipulated components that are only nanometres or micrometres in diameter.

Yohei Yokobayashi and Vyankat Sontakke at the Okinawa Institute of Science and Technology Graduate School in Onna, Japan, prepared gel blocks that were 1–2 millimetres across and had surfaces bristling with reactive molecular groups. Each molecular group reacted with the end of a DNA strand, fusing the strands to the blocks.

When shaken together in a liquid, gel blocks with matching DNA strands stuck to each other. Depending on the density of strands on their surfaces, the blocks paired up or formed aggregates big enough to pick up between two fingers. The authors could also disassemble the formations by using a specially designed single strand of DNA to displace paired DNA strands.

J. Am. Chem. Soc. **144**, 2149–2155 (2022)





GALAXY'S CENTRE HOSTS HUNDREDS OF STRANGE TENDRILS

The Milky Way's population of mysterious filaments that emit bright radio waves is at least ten times larger than scientists realized.

Radio astronomer Farhad Yusef-Zadeh co-discovered the first of these filaments in the 1980s. The structures consist of electrons travelling at nearly the speed of light, on trajectories that spiral around magnetic-field lines. Now, Yusef-Zadeh, who is based at Northwestern University in Evanston, Illinois, and his collaborators have used MeerKAT, an array of 64 antennas in South Africa's Northern Cape region, to take a series of 20 shots of the Milky Way's central region, an effort that took some 200 hours.

The resulting composite image reveals a number of striking features, including expanding shock waves generated by supernovae, or exploding stars, and almost 1,000 filaments (pictured extending from horizontal structure). The filaments' spectral features suggest that their origin is not related to supernovae.

One possible explanation is that they originated from past cycles of activity of Sagittarius A*, the supermassive black hole at the Galaxy's centre. Mysteriously, some of the filaments seem to be clustered together and evenly spaced, like the teeth of a comb.

Astrophys. J. **925**, L18 (2022)

L TO R: RICARDO FUNARI/BRAZIL PHOTOS/LIGHTROCKET VIA GETTY; OIST; I. HEYWOOD, SARAO