Research highlights

ULTRATHIN FILTER COULD REDUCE NEED FOR OIL REFINERIES

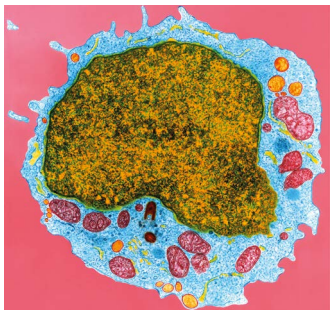
An ultrathin membrane can separate crude oil into its components using much less energy than today's refining methods.

Crude oil is a complex mix of hydrocarbons, which must be separated to produce chemicals and fuels. Refineries do so by heating the oil, a process that consumes around 15% of the world's energy. Porous membranes could separate petroleum using a fraction of that amount. But hydrocarbons pass through the pores very slowly.

To speed things up, Siyao Li, now at Queen Mary University of London, and her colleagues made several types of molecule, each with water-repelling portions and a water-attracting portion. When immersed in a water–oil mixture, these molecules clump together to form bubble-like spheres. The molecules' water-attracting portions form the sphere's outer surface, and the water-repellent portions face inwards. The team connected the spheres to make strong, flexible films that are only 30 nanometres thick.

Tests on light crude showed that the film passes small, light hydrocarbons through 100 times faster than membranes used in the past. Changing the molecules' composition would yield membranes that separate hydrocarbons of other sizes, the researchers say.

Science **377**, 1555–1561 (2022)



DELAYED COVID BOOSTER LEADS TO BETTER RESPONSE

COVID-19 vaccines don't pack their usual punch when given shortly after an infection.

People who catch SARS-CoV-2 before vaccination develop especially strong immune defences against the virus. To learn whether this 'hybrid immunity' depends on the timing between infection and boosting, Clarisa Buckner at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland, and her colleagues tracked 66 people, who had a variety of histories of vaccination and infection, after they received a third dose of an mRNA vaccine based on the virus's spike protein.

In the 60 days after boosting, most participants' antibody responses against variants old and new grew stronger. But those who had been infected less than 180 days before their boost had a weaker antibody response than did those with infections more than 180 days in the past. The latter had responses as good as those of people who hadn't been infected before the boost.

Analysis of participants' antibody-making B cells (pictured) suggested that a short window between infection and boosting left insufficient time for some of these cells to ready themselves for another tussle with the spike protein.

Cell https://doi.org/jgbm (2022)

TREE CUTTING THREATENS FUTURE OF RARE PRIMATE

An endangered lemur species that lives in Madagascar's rainforest could vanish within 25 years if deforestation on the island isn't reduced.

The Milne-Edwards's sifaka (*Propithecus edwardsi*; pictured) is threatened by climate change, habitat destruction and poaching. To understand these threats' effects, Lyubing Zhang at Sun Yat-sen University in Guangzhou, China, and her colleagues combined 34 years' worth of data on the sifaka's population in southeastern Madagascar with information about extreme climate events and human activities.

The researchers estimate that Milne-Edwards's sifakas will become extinct in about 23 years, if deforestation continues at the rate observed from 2013 to 2019, which was about 1% per year. If deforestation is lower but tropical cyclones and droughts occur frequently as a result of climate change, the sifaka population will decline by 20% in the next two decades, but extinction within the next 50 years is unlikely.

The authors call for policies to reduce deforestation and expand protected areas in Madagascar.

Biol. Conserv. **274**, 109716 (2022)

'CLEAN' HYDROGEN WOULD HELP CHINA HIT CLIMATE GOALS

China is the world's largest producer of cement, steel and other building materials, whose manufacture emits huge amounts of carbon dioxide. But an analysis now suggests that powering heavy industries with hydrogen could be a cost-effective way to reduce China's carbon emissions — and its contribution to climate change.

China aims to reach net-zero carbon emissions by 2060, but decreasing carbon output in heavy industry is challenging. Part of the answer could lie with 'clean' hydrogen, which is made with renewable energy and yields only water and energy when burnt.

Xi Yang at Harvard University in Cambridge, Massachusetts, and her colleagues used computer modelling to analyse how clean hydrogen could be used in China, and its cost-effectiveness. The team found that by 2060, clean hydrogen could supply 29% of the energy demand for steelmaking (pictured, Chinese steel mill). It also showed that China could avoid spending nearly US$2 trillion between 2020 and 2060 on other clean-energy solutions.

The study indicates that clean hydrogen could help many countries to shrink the carbon footprints of their heavy industry.

Nature Energy https://doi.org/gqwzxk (2022)

L TO R: DR GOPAL MURTI/SPL; ALAMY; QILAI SHEN/BLOOMBERG/GETTY