

# Research highlights

## SOAK AND SHAPE: TREATMENT MAKES STIFF WOOD SUPPLE

A quick bath in water helps to make a sheet of treated wood as pliable as paper, allowing it to take on complex forms that have much more strength than natural wood.

In construction and craft, wood has many things going for it, but it isn't easy to shape. To make wood mouldable, Liangbing Hu at the University of Maryland in College Park and his colleagues first removed more than half of wood's stiff and water-repelling components, lignin and hemicellulose. That left soft, water-loving cellulose as the primary component.

The researchers allowed the semi-delignified wood to dry, which caused the hollow cellulose fibres to collapse. When the dried wood was dipped in water, the cellulose-rich regions quickly rehydrated, partially reopening the closed fibres and allowing the wood to be moulded or folded into various shapes that set when the wood dried.

A 3D wooden lattice produced by this process, when sandwiched between two sheets of aluminium, was strong enough to support a car more than 1,500 times its own weight. The authors hope that their protocol could help wood, a renewable resource, to compete for roles conventionally filled by plastics and metals.

*Science* **374**, 465–471 (2021)



## THE COVID VACCINE WITH A MUTED BUT DURABLE RESPONSE

Immune responses to SARS-CoV-2 decline sharply within eight months of the second jab of the Pfizer–BioNTech or Moderna vaccines, but remain relatively stable after one shot of Johnson & Johnson's vaccine.

Dan Barouch at the Beth Israel Deaconess Medical Center in Boston, Massachusetts, and his colleagues monitored levels of antibodies that can block, or 'neutralize', the coronavirus in people who had received either the one-dose Johnson & Johnson jab, which relies on a non-replicating cold virus, or two doses of the Pfizer–BioNTech or Moderna vaccines, which are based on messenger RNA.

In people who had received an mRNA vaccine, neutralizing antibodies peaked at very high levels a few weeks after the second shot. But levels dropped drastically in the six months after the second shot – and fell even further over the next two months. By contrast, antibody levels didn't rise as high early after the Johnson & Johnson vaccination, but stayed relatively stable for eight months.

Johnson & Johnson subsidiary Janssen provided funding toward the research.

*N. Engl. J. Med.* <https://doi.org/gm47r2> (2021)

## RECYCLING GIVES LITHIUM BATTERIES AN UNEXPECTED EDGE

Recycled battery materials can outperform conventional ones.

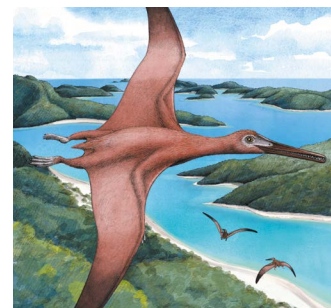
The use of lithium-ion batteries, which power everything from smartphones to electric cars, is growing rapidly, generating a huge number of spent batteries and a shortage of raw materials. These problems can be alleviated by recycling the spent devices, but the recycled materials are generally thought to be inferior to their commercial counterparts.

Yan Wang at the Worcester Polytechnic Institute in Massachusetts and his colleagues developed a way to recycle a lithium oxide material recovered from a spent battery. This material forms the battery component called a cathode, and it supplies the lithium ions that flow through the battery to generate electric current.

The team found that a battery can be charged and discharged a greater number of times before it needs replacing if it uses the recycled cathode material rather than its commercial equivalent.

Modelling and experimental analysis showed that certain structural features of the recycled material underlie this performance boost. The material (pictured) could help to make the manufacturing of lithium-ion batteries sustainable.

*Joule* <https://doi.org/g3h4> (2021)



## ANCIENT REPTILES WERE STREAMLINED FOR A SMOOTH FLIGHT

Pterosaurs were the first vertebrates to fly, ruling the skies for more than 160 million years during the time of the dinosaurs. A beautifully preserved fossil has revealed a pterosaur trick for reducing drag during flight: a curved aerodynamic profile courtesy of muscles connecting the wings to the neck.

Michael Pittman and Luke Barlow at the University of Hong Kong and their colleagues examined a pterosaur fossil from southern Germany whose bones are arranged as they would have been when the animal was alive – and that also contains preserved soft tissue. The researchers illuminated the specimen with violet laser light, which excited soft-tissue atoms preserved as minerals. These minerals then glowed pink, revealing minute structural details around the base of the neck, the shoulders and the upper arms.

Bats use fur to smooth the connection between their wings and bodies; birds use feathers. Pterosaurs apparently used muscle – possibly including the trapezius and deltoid muscles – which eased airflow over the junction and might also have provided fine wing control.

The finding will probably mean pterosaurs are depicted with a more sloped shoulder in reconstructions (pictured).

*Proc. Natl Acad. Sci. USA* **118**, e2107631118 (2021)