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Space exploration

Science lab module joins China's Tiangong space station

Alex Wilkins

CHINA launched the second module of its Tiangong space station on 24 July, adding its first laboratory module to the station, after the 16-metre-long core module Tianhe launched in April 2021.

The new addition, which is called Wentian or "Quest for the Heavens", was launched on a Long March-5B Y3 rocket from Hainan Island, located south-west of Hong Kong, at 2.22pm local time.

"As a major spacefaring nation, China has arrived," says Quentin Parker at the University of Hong Kong. "It's only the third nation after Russia and America to have a space station and this one is spanking new. It's got all the latest technology."

As well as having the ability to perform more advanced scientific experiments in microgravity than Tianhe, Wentian adds several key features to the station. These include a 5-metre-long robotic arm, large solar panels and an airlock, which will become the main entry and exit point for future vehicles and astronauts accessing the station. In addition, Wentian has extra navigation and communication systems, as well as propulsion tools that can be used to reorient the station in case Tianhe's systems fail.

Wentian – which measures about 18 metres long and 4 metres wide, similar to Tianhe – will also serve as additional crew quarters, doubling the station's capacity from three to six astronauts.

Wentian has initially docked with Tianhe on one end, but will later detach and reorient itself using the two modules' robotic arms, reattaching to the side of Tianhe to form part of the station's eventual T-shape. "That's going to be quite interesting, but it's the kind of thing that they will have tested a lot to be confident they can do it," says David Brown at the University of Warwick, UK.

The three crew members currently in Tianhe will then enter Wentian, activating its various life-support systems and experiments. After Wentian is fully operational, another laboratory module, Mengtian, will launch in October, marking the completion of the space station's T-shape.

The frequency and variety of China's recent space launches has surprised even seasoned observers. "China's quietly now launching more rockets than anyone else into orbit," says Parker. "It did it last year, it's going to beat its own world record again this year. It's got plans for a moon base and everything else. So you know, they're quietly and methodically and carefully really going places in space."

One reason for an increased focus in China on domestic space policy and experiments is because of the geopolitical difficulty of collaborating on US-led missions, such as the International Space Station, says Parker.

"If, for example, another country wants to conduct human space flight, or wants to put an astronaut into space, they don't have to go through the US anymore," says Christoph Beischl at the London Institute of Space Policy and Law. ▮

The Wentian module blasts off on a Long March-5B Y3 rocket

LUO YUNFEI/CHINA NEWS SERVICE VIA GETTY IMAGES

Zoology

Hibernating beetles break down and regrow their muscles

SOME beetles can shed most of their muscle during the winter and rebuild it by spring without moving.

The Colorado potato beetle (*Leptinotarsa decemlineata*) can survive up to four months buried beneath the snow in Canada with temperatures dropping to -20°C. During hibernation, it slows its metabolism by as much as 90 per cent to save energy, but how it does this was poorly understood.

To investigate, Jacqueline Lebenzon at Western University in London, Canada, and her colleagues mimicked seasonal light and temperature changes in the lab and used an oxygraph to measure the amount of oxygen consumed by the insects' mitochondria – the parts of cells that convert food into energy.

To their surprise, the oxygraph's readings were zero. The researchers used microscopy to discover that there were no mitochondria to measure because the beetles had lost nearly all of them.

"It was just a really exciting discovery and a simple explanation for why their metabolism was so low. I was banking on it being a little bit more complex," says Lebenzon.

More surprisingly, the beetles had restored the mitochondria by the "spring" without eating or moving (*PNAS*, doi.org/gqh5bx).

Some insects, including moths and crickets, break down their flight muscles to save energy for reproduction, but they permanently lose the ability to fly.

"It was just a really exciting discovery and a simple explanation for why their metabolism was so low"

It is likely that the beetle can restore its flight muscles because it breaks down only the mitochondria but retains the nuclei of muscle cells and most of the protein, says Lebenzon. "We think that it would take a lot more energy to rebuild everything," she says.

The beetles begin losing mitochondria weeks before hibernation and start producing them again a few weeks after becoming dormant.

Other insects lose flight muscles when hibernating, so could use the same process, say the researchers. ▮

Luke Taylor