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## Photos bring space station down to earth

Stargazer, doctor of astrophysics, promoter of astronomy and vlogger — there are many facets to Liu Boyang, but the most high-profile is his role as a documenter of China's space station.

In March, Liu began making preparations for his plan to document and share the development of the station to "help more people learn about the development of China's aerospace sector."

"If you haven't witnessed the changes, it's hard to imagine that the space station flying above our heads can transform like a robot," he said.

Since April 19, he has captured every configuration of the station, called Tiangong, on film.

In April last year, the country officially kicked off Tiangong's in-orbit construction with the launch of the station's core module, Tianhe.

The station has a basic three-module configuration consisting of Tianhe and two lab modules, Wentian and Mengtian. The labs are designed to be versatile, capable of accommodating 25 experimental cabinets for scientific exploration.

As a full-time employee at WeMedia, the 32-year-old has spent months taking photos of the station this year, but his passion for astronomy goes back much further.

Born in 1990 in Erdos, Inner Mongolia autonomous region, Liu visited a number of museums with his parents before he entered primary school and found that he had a special liking for planetariums. In 1996, Liu's parents gave him an important gift — an entry-level foldable telescope that cost them two months' salary.

At senior high school, he joined the astronomy club and became one of its leaders, a role that required him to give lectures to other members. To make his lectures more interesting, Liu read many astronomy books and searched the internet for information.

He recalled that during a stargazing trip with the club, he used the school's only large aperture reflecting telescope to observe the stars. "Astronomy does not live in books, but in real life. Every moment, teams around the world are making new discoveries, which allows us to feel the progress we're making," he said.

In 2007, Liu's growing curiosity prompted him to major in astronomy at Peking University, and he later pursued doctoral studies at the University of Western Australia.

As he studied for his doctorate, he began to promote astronomy on his social media platforms. "We live in an era of the rapid development of science and technology, and it is very interesting to share what we are going through."

In addition to popularizing astronomy, an idea to photograph artificial celestial bodies gradually took shape. In 2020, he was surprised to learn that foreign photographers were taking close-up images of the International Space Station from the ground and decided to try his hand.

However, photographing moving objects in space from the ground is not as simple as press-



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ing the shutter button. Optical tracking software is needed to control telescope tracking. But the only software Liu was able to find was either outdated or insufficiently designed to function properly.

On March 18, he swung into action as he didn't want to miss the best opportunity to record the construction of Tiangong and decided to develop an optical tracking program himself.

On April 19, with his self-developed program, Liu captured clear, close-up images of China's space station for the first time on the outskirts of Hengshui city, Hebei province, despite a number of failures along the way.

Chasing the space station was no easy task for Liu and his team, technically or financially.

Tiangong's configuration changes with the completion of each launch mission and the ideal conditions for observing and photographing its transit from the ground are limited.

In the search for better shooting conditions, Liu has made 50 trips to carefully selected locations in 10 cities across the country, largely at his own expense. He waits patiently for a few minutes when the space station zips across the night sky.

This year, he traveled into the desert and onto plateaus and almost got lost in the wild without a phone signal, but he said that those experiences were "no big deal". Since then, the stories and videos he's shared have garnered media attention and subscribers have flocked to his accounts on platforms, including the Chinese online video-sharing platform Bilibili.

His subscriber base there grew from 2,000 in April to 100,000 at the end of September and so far, he has shot 26 clear, close-up images of Tiangong.

The station is set to get busy exploring space science and technology in the coming years, as the recently launched Shenzhou-XV mission completed the last stage of construction, kicking off the first stage of use and development.

In addition to promoting astronomy, Liu is participating in the 6.8m Expanding Aperture Segmented Telescope project at Peking University and hopes his work will have scientific research and engineering value.