

The World's Most Advanced Telescope – Webb, is Coming to Malaysia

- By: Yuan-Sen Ting, January 2023

Meet the Webb Telescope

For astronomy buffs, last year marked a significant milestone – the successful deployment of the Webb telescope. It quickly became the talk of the town in the astronomical community.

While the Hubble telescope, an old faithful, has served us brilliantly for decades, the Webb is its more advanced cousin. Its mirror, thrice the size of Hubble's, allows it to be roughly ten times as efficient. That means, in astronomical terms, what takes Hubble a decade, Webb achieves in just a year.

Furthermore, Webb specializes in infrared wavelengths, which Hubble mostly didn't cover. This focus sets the stage for two groundbreaking pursuits in modern astronomy: the hunt for signs of extraterrestrial life and the quest to find the universe's most ancient galaxies.

Finding Otherworldly Neighbors

Astronomers are keen on examining the atmospheres of exoplanets to spot organic signatures and, importantly, water. This is where Webb truly shines. Water primarily gives off infrared light, tricky to spot from Earth due to atmospheric interference. But Webb, stationed beyond our atmosphere, is perfectly positioned for such studies.

The early results have been nothing short of remarkable. NASA's unveiling of Webb's data highlighted its uncanny ability to pinpoint water vapor on exoplanets. While we had hints of water on these planets before, Webb's precision was awe-inspiring. With Webb on the lookout, it wouldn't surprise me if, in the coming decade, we find planets in habitable zones teeming with water and organic signatures.

Journey to the Beginning of Time

Besides alien hunting, Webb's prowess lies in its capacity to spot the universe's oldest (and hence, farthest) galaxies. The principle is simple: light takes time to travel. For instance, sunlight takes about 8 minutes to reach Earth. This means the sun we see now is actually 8 minutes old (yes, if the sun exploded now, we'd only know 8 minutes later).

Extending this, if a galaxy is 13 billion light-years away, the light from that galaxy took about 13 billion years to reach us. In simple terms, the farther away a galaxy is, the older it is.

Here's the kicker: due to the universe's expansion, light from these ancient galaxies gets "stretched" or redshifted, shifting from the visible spectrum into infrared. Essentially, Webb's infrared capabilities might just unveil the universe's oldest galaxies, hidden from Hubble's view.

Webb's Unexpected Discoveries

Before Webb's launch, through the Hubble telescope, our knowledge of the oldest galaxy was roughly a galaxy that appeared about 400 million years after the Big Bang. And there was only one such galaxy. But after Webb's deployment, the astronomical "archaeology team" went into overdrive. In just a week or two, several teams announced the discovery of a dozen galaxies even younger than 500 million years, shattering previous records. Now, the oldest galaxy is about 300 million years old. Some of my colleagues worked day and night on this.

Before Webb, our Hubble-informed benchmark for the oldest galaxy was one that formed about 400 million years post Big Bang. But Webb has reset the standards. Within weeks of its launch, it identified galaxies even younger than 500 million years, redefining our records. The oldest known galaxy now? A mere 300 million years post Big Bang. This rapid series of discoveries was so astonishing that it felt like the golden age of space exploration all over again.

These findings are not just academic footnotes. They challenge our understanding of the universe's early days. While the astronomy community expected Webb to surpass Hubble in finding older galaxies, the sheer volume of this discovery was beyond expectations. The early appearance of a "galaxy baby boom" challenges some other astronomical observations, such as the so-called re-ionization phenomenon of the universe. In simple terms, if there were a significant number of early galaxies, their radiation should have influenced the early universe's gas. This conflicts with current studies on re-ionization, so Webb's recent observations have forced astronomers to revisit theories about galaxy formation and evolution.

Webb is Coming

Speaking of which, let's return to the title of my article.

We are organizing the first astronomy conference, sponsored by the International Astronomical Union (IAU), in Kuala Lumpur from February 6 to 10 (for details visit jwstmalaysia.com). This conference will host many international big names in astronomy, focusing on Webb's discoveries and the formation of ancient galaxies. There will be more than 80 lectures and 170 participants. It's also the first time IAU is holding a conference in Malaysia. The last IAU meeting in Southeast Asia was 30 years ago in Indonesia.

Although this conference is for astronomical researchers, to involve the general public, we've specially invited three astronomy experts to give public lectures at the University of Malaysia on February 8th (Wednesday) at 2:30 pm. This event is free and open to everyone. Whether you understand astronomy or not, love it or not, you're welcome to experience the beauty of astronomy. Interested individuals can register at jwstmalaysia.com under "Public Talk."

A Brief Interlude

Two years ago, my regular astronomy discussions graced the pages of Sin Chew Daily. I intended to take a short hiatus before diving back in. However, these past two years have been a whirlwind. Leading a team of more than ten researchers, drafting proposals, securing funding, and organizing not only this conference but also the Global Malaysian Astronomers Conference (GMAC) in 2023, have kept me on my toes. My column may have been silent, but I've been anything but idle. I genuinely hope our upcoming conference rekindles the public's fascination with the universe.

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Independent School, received his Ph.D. in Astronomy from Harvard University in 2017, and later became a NASA Hubble Scholar, as well as a postdoctoral researcher at Princeton University and the Institute for Advanced Study in Princeton.