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## ASTRONOMY

### Superstar Cepheids shine light on expanding universe

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BY TOM STATLER

I recently wrote about a special type of variable stars called Cepheids. Harvard astronomer Henrietta Leavitt realized 100 years ago that their intrinsic power is correlated with the cycle of their repeating light variations.

The finding sparked a century of incredible discoveries about the universe. If you identify a Cepheid and measure its cycle time, you can read off its power from Leavitt's correlation. Then it's easy to figure out how far away it must be to look as faint as it does.

This trick allowed Harlow Shapley to map the distances of globular star clusters, revealing the immense scale of our galaxy. A decade and a half later, Edwin Hubble found Cepheids in the Andromeda Nebula and proved that his favorite is a galaxy in its own right.

But it was Hubble's landmark discovery that galaxies are moving apart from one another, that the universe is stretching, that propelled Cepheids to superstar status. To measure the stretching rate, we needed to measure the speeds and distances of galaxies.

One of the main reasons the Hubble Space Telescope was launched was to find as many Cepheids as possible in other galaxies and pin down the cosmic distance scale. It took almost 10 years, but the result was definitive.

The farther apart two galaxies are, the faster they are separating from each other. Our universe is getting

8 millionths of a percent bigger every millennium. And because light takes time to travel, we are always seeing things as they were in the past.

If we look at galaxies, say, a billion light-years away, we're seeing the universe as it was a billion years ago. That gives us the power to probe the history of the cosmic expansion.

Cepheids are too faint to see a billion light-years away. But certain types of supernova explosions can be relied on for the same trick.

Amazingly, supernova explosions in distant galaxies look about 25 percent fainter than we would have expected. This means that in the past, our universe was expanding slower than it is now.

In other words, the cosmic expansion is accelerating. The reason is unknown and is one of the most compelling questions in all of science.

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