**Astronomers push the edges of final frontier, find farthest galaxy**

By Associated Press, adapted by Newsela staff 03/13/2016

WASHINGTON, D.C. — Astronomers say they have discovered a hot, star-popping galaxy, the most distant ever found. The newly discovered galaxy dates from a time when the universe was a mere toddler of about 400 million years old.

By using a different technique — one that some scientists doubt — a team of astronomers was able to look back to a time they had thought was impossible with today's technology. With the Hubble Space Telescope, they found the extremely bright galaxy about 13.4 billion light-years away, according to a study published Thursday in Astrophysical Journal. A light-year is about 5.8 trillion miles. Stars and galaxies are so far away that their distance is measured in light-years. To put it another way, it took 13.4 billion years for the light of this galaxy to reach us.

**Seeing What No One Has Seen Before**

The new galaxy, called GN-z11, shatters old records for distance and time in a big way. Until a new space telescope is launched, it may remain the farthest galaxy that can be seen for years, the team of astronomers said.

Astronomers were able to produce a photo of this galaxy. It appears darkish red and fuzzy. In fact, the galaxy is so hot it is bright blue, but the light has traveled so long and far that it has shifted to the very end of the color spectrum, to longer wavelengths of dark red. And that fuzziness hides that the galaxy was forming new stars at a rate that's 10 times faster than our Milky Way, said study co-author Gabriel Brammer. He is an astronomer at the Space Telescope Science Institute.

"It really is star-bursting," Brammer said. "We're getting closer and closer to when we think the first stars formed."

**Looking Back Through Time And Space-** He added, "There's not a lot of actual time between this galaxy and the Big Bang."

If we were back in time and near this galaxy, we would see "blue, stunning, really bright young stars," said study co-author Garth Illingworth. He is with the University of California, Santa Cruz. All around us would be "very messy-looking objects" that are newly forming galaxies. Generally, galaxies look like neat spirals.

Astronomers measure the distance an object by calculating how much the light changes from blue to red, which is called redshift. The phenomenon of redshift is a result of the expansion of the universe after the Big Bang. Every distant object in the universe appears to be moving away from us and as a result its light is stretched to longer, redder wavelengths. The newly discovered galaxy has a redshift of 11.1. Until this discovery, the previous highest redshift was 8.68, which shows it was formed about 580 million years after the Big Bang. For a long time, astronomers were just trying to reach a redshift of 9, about 550 million years after the Big Bang. But the new discovery blew all that out of the water, surprising the team that found it, said study lead author Pascal Oesch of Yale.

**Hello, Spock? Are You Out There?-** Astronomer Richard Ellis at the European Southern Observatory found the previous record-far galaxy. He questioned the new discovery. Oesch's team used a new method for measuring distance. Ellis, though, said that the light signatures used by Oesch's teams are "noisier and harder to interpret" and may be confused with competing nearby stars or galaxies. For GN-z11 to be seen so clearly, it would have to be three times brighter than typical galaxies, he said.

Oesch said the team made sure "this was as clean as possible a measurement." He said the technique they used is starting to become standard.

**Understanding How Our History Began-** But Oesch, Brammer and Illingworth said not to expect new discoveries farther and older than this one. Hubble has been pushed to its limit. Only when the next NASA space telescope is launched and operating, probably in 2019, will astronomers see farther.

Harvard astronomer Dimitar Sasselov called the discovery exciting and interesting. "Seeing and understanding the first galaxies and the first stars is an essential part" of the story of how the world began.