ESOcast Episode XX: **The Most Distant Galaxy Ever Measured**		
00:00 [Visuals start] [Narrator] 1. An international team of astronomers using ESO's Very Large Telescope has measured the distance to the most remote galaxy so far. This is the first time that astronomers have been able to confirm that they are observing a galaxy as it was in the era of reionisation — when the first generation of brilliant stars was making the young Universe transparent and ending the cosmic Dark Ages.		**Images:** Zoom on galaxy Simulation of era of reionisation
00:32 ESOcast intro 2. This is the ESOcast! Cutting-edge science and life behind the scenes at ESO, the European Southern Observatory. Exploring the ultimate frontier with our host Dr J, a.k.a. Dr Joe Liske.		ESOcast introduction
00:53 [Dr J] 3. Hello and welcome to the ESOcast. In this episode we are going to find out how a team of astronomers used ESO's Very Large Telescope, the VLT, to confirme that a galaxy that had previously been spotted in images from the NASA/ESA Hubble Space Telescope is in fact the most distant object that is ever been identified in the Universe.		Dr. J in studio ESOcast slate VLT footage, zoom on galaxy
01:13 [Narrator] 4. Studying these first galaxies is extremely difficult; they are very faint and small and by the time their dim light gets to Earth it falls mostly in the infrared part of the spectrum because it has been stretched by the expansion of the Universe.		Galaxies animation Redshift/space stretching animation

01:31 [Dr J] 5. To make matters worse, at this very early time, less than a billion years after the Big Bang, the Universe was not completely transparent. It was filled with hydrogen which acted kind of like a fog and absorbed the ultraviolet radiation from the young galaxies. So, holding the record for having measured the redshift of the most distant object in the Universe is not just a trophy to hang on the wall, it does have important astrophysical implications. This is the first time that we've managed to obtain spectroscopic observations of a galaxy from the era of reionisation , in other words from the time when the Universe was still clearing out the hydrogen fog.		Dr. J in studio Animation of era of reionisation showing "foggy" early Universe with galaxies. VLT footage Simulation of era of reionisation
02:15 [Narrator] 6. Despite the difficulties of finding these early galaxies, the new Wide Field Camera 3 on the NASA/ESA Hubble Space Telescope discovered several very good candidate objects earlier in 2010. They were thought to be galaxies shining in the early Universe at redshifts greater than eight, but confirming the distances to such faint and remote objects is an enormous challenge and can only reliably be done using spectroscopy from very large ground-based telescopes.		Visuals of HUDF WFC3/IR with candidate objects marked
02:48 [Dr J] 7. The team was excited to find that if you combine the huge light collecting power of the VLT, with the sensitivity of its infrared spectroscopic instrument, SINFONI, and if you then use a very long exposure time you just might be able to detect the faint glow from one of these very remote objects and then go on to measure its distance.		Dr. J in studio VLT footage SINFONI footage
03:10 [Narrator] 8. A 16 hour exposure with the VLT and SINFONI of the galaxy UDFy-38135539 did indeed show the very faint glow from hydrogen at a redshift of 8.6, which means that this light left the galaxy when the Universe was only about 600 million years old. This is the most distant galaxy ever reliably confirmed.		VLT footage Zoom away from galaxy
03:38 [Dr J] 9. One of the puzzling things about this discovery is that the ultraviolet radiation emitted by the galaxy does not actually seems to be strong enough to be able to clear out the hydrogen fog around the galaxy.		Dr. J in studio Visual of HUDF WFC3/IR

03:50 10. So one possible explanation is that there must be other galaxies, probably fainter and less massive neighbours, that helped ionise the hydrogen in the region of space around the galaxy, thus making it transparent. Without this additional help the brilliant light from the main galaxy would have been trapped in the surrounding hydrogen fog and it could not have even started its 13 billion-year journey towards Earth.		Animation of era of reionisation, showing galaxies nearby UDFy-38135539 clearing a region of the hydrogen fog.
04:15 [Dr J] 11. Studying the era of reionisation and the formation of the first galaxies is really pushing the capability of current telescopes and instruments to the limit. But, this will be exactly the type of science that ESO's European Extremely Large Telescope will excel at. Once operational, this will be the largest optical and infrared telescope in the world. This is Dr J signing off for the ESOcast. Join me again next time for another cosmic adventure.		Dr. J in studio E-ELT animation
04:44 [Outro]		ESOcast is produced by ESO, the European Southern Observatory. ESO, the European Southern Observatory, is the pre-eminent intergovernmental science and technology organisation in astronomy designing, constructing and operating the world's most advanced ground-based telescopes.

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