ESOcast Episode 17: **Constructing ALMA — The World´s Largest Observatory**		
00:00 **[Visuals start]** **[Narrator]** 1. High on the Chajnantor plateau in the Chilean Andes, the first antennas of the Atacama Large Millimeter/ submillimeter Array, or ALMA for short, move in unison. Work progresses at a frantic pace in this ambitious project, which, in a few years from now, will consist of 66 antennas, working together at an altitude of 5000 metres. Once completed, ALMA will enable astronomers to study the cold Universe in unprecedented detail.		Latest ALMA footage, 3 antennas at high site Computer animation
00:34 **ESOcast intro** 2.This is the ESOcast! Cutting-edge science and life behind the scenes of ESO, the European Southern Observatory. Exploring the ultimate frontier with our host Dr J, a.k.a. Dr Joe Liske.		ESOcast introduction
00:56 **[Dr J]** 3. Hello and welcome to another episode of the ESOcast. In this episode we are going to visit the ALMA observatory in the Atacama Desert in Chile. Here, ESO, together with its international partners, is building what will become the world´s largest astronomical facility. ALMA will observe the Universe in millimetre and submillimetre wavelengths. This will allow astronomers to study both very cold objects as well as very distant objects in the early Universe. And because such observations are disturbed by water vapour in the atmosphere, ALMA's being built on one of the driest places on Earth, the Chajnantor plateau at an altitude of 5000 metres, which also makes it one of the highest astronomy sites in the		Dr J in virtual studio Slate: Episode 17: Constructing ALMA... On-Screen images: Various ALMA shots Chajnantor plane

world. ALMA will be operated at two distinct sites: First, there's the Array Operations Site up on the plateau where the antenna are actually located and then further down there's the Operations Support Facility.		
01:51 [Narrator] 4. Constructing the ALMA observatory in the arid Atacama desert and at such high altitude is no easy undertaking. Before the antennas are brought to the high site they must be assembled at the Operations Support Facility or OSF. Located at 2900 metres altitude, the OSF also serves as the control centre for the antenna array, which is located at the high site. With majestic volcanoes looming in the distance, engineers are busy integrating and verifying the various parts of the antennas and by now, many antennas at various assembly stages can be found at the OSF. Each new antenna must meet very strict requirements. The surface of each dish is accurate to much less than the thickness of a sheet of paper, and the antennas can be pointed precisely enough to pick out a golf ball at a distance of 15 km.		OSF footage Antennas at the OSF, Assembly of antennas
02:50 [Dr J] 5. In many ways the OSF has become the heart of the ALMA project. This is where the staff lives during their shifts and where much of the daily routine is going on. There are lots of meetings between various groups of scientists and engineers and there are even scientific conferences that are being held at this remote location. The OSF also houses the two transporters that are used to move the antennas. So with the scientists and engineers assembling and testing the antennas and conducting the operations at the high site, the OSF has become a rather busy and vibrant place.		Dr J in virtual studio On-screen images: People at the OSF, meetings ALMA transporters Control room
03:21 [Narrator] 6. Scientists and engineers test the ultimate performance of the complex system. Pointing and holography tests are performed round the clock and the experts make sure that only antennas fulfilling the tough ALMA specifications get the green light.		Scientists at control room Timelapse of antenna moving during pointing test Test sequence at night
03:40 [Narrator] 7. After an antenna has successfully passed all tests at the OSF, the time has come to move it up to the Array Operations Site, which lies at an altitude of 5000 metres. This was successfully done for the first		Transporter in action

time in September 2009. A giant custom-designed transporter is used to bring up the antenna. As each antenna weighs about 100 tons this is a delicate task that requires the utmost attention. Two transporters are available and they are also used to move the antennas to different positions to reconfigure the ALMA array.		
04:20 [Dr J] 8. The Array Operations Site is a place of extremes. Strong winds, low temperatures and a thin atmosphere. However, because of its extreme dryness and altitude, the site offers excellent conditions for observing the submillimetre radio waves for which ALMA was designed. In addition, Chajnantor offers plenty of space. And that's needed because, in its most extended configuration, the array of antennas measures 16 kilometres across. Despite the harsh conditions, work is ongoing to prepare the plateau for the antennas. A road network has been built and the workers are busy with various tasks to finish the construction work. All of the 192 antenna foundations have been completed and some of them are already in use. There is also the technical building, which will eventually be used to receive the data from the antennas to further process and then to transmit them to the OSF. Now as the number of antennas at the high site is constantly increasing, the project is moving into a new and important phase: that of Commissioning and Science Verification.		Dr J in virtual studio. On-screen images: AOS Workers at AOS AOS building 3 antennas at AOS
05:23 [Narrator] 9. Down at the OSF control room the tension is high as the tests are performed. The Commissioning and Science Verification process is intended to confirm that the whole facility has been taken from the stage where it was a collection of very complex parts into an instrument capable of producing images and measurements with exquisite sensitivity and precision. The antennas are placed at different positions within the array to make sure that all of their basic functions work correctly at different baselines. Currently, the antennas are located at the centre of the site, using antenna stations that will eventually form the so-called Atacama Compact Array.		Scientists at the OSF Moving antennas AOS timelapse? 3 antennas
06:07 [Dr J]		Dr J in virtual studio.

10. ALMA is rapidly moving forward and it holds a bright future for many areas of astronomy. For example, it will provide us with some unique insight into how stars and planets form, and it will be one of the premier tools to study the first stars and galaxies in the early and distant Universe. And so, many of us astronomers simply can't wait to get their hands on to this fantastic science machine! This is Dr J signing off for the ESOcast. Join me again next time for another cosmic adventure.		On-screen images: Nice ALMA footage Astronomical images or computer animation Computer animation or nice ALMA footage
06:36 [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.* *The ALMA Project is a partnership between the scientific communities of East Asia, Europe and North America with Chile.*

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