ESOcast Episode 36: ALMA Opens its Eyes and Reveals its First Image		
00:00 [Visuals start] [Narrator] ALMA, the world's most complex ground-based observatory, has just opened for business. The telescope is still being built, and its capabilities will continue to grow over the coming year. But even at this early stage, its images reveal a view of the Universe that is invisible to normal telescopes. Thousands of scientists from around the world have competed to be among the first to use ALMA. With it, they hope to explore some of the darkest, coldest, furthest, and most hidden secrets of the cosmos.		Visuals: Latest Chajnantor plateau footage (16+ antennas) Show Antennae image
00:38 ESOcast intro 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, aka Dr Joe Liske.		ESOcast introduction
00:58 [Narrator] Hello, and welcome to the ESOcast. In this episode, we'll get the latest news from ALMA, the Atacama Large Millimeter/submillimeter Array, as it begins its first science observations, and we reveal the first public image from ALMA: a dramatic view of galaxies that are undergoing a cosmic collision! We'll find out how astronomers around the world have been eagerly waiting to get their hands on this revolutionary telescope, and discover why this is only the beginning for the observatory.		Latest Chajnantor footage (or other recent footage e.g., control room, transporter, etc.)

01:39 [Narrator] So far, only around a third of ALMA's 66 antennas have been installed at the observatory site on the Chajnantor plateau, 5000 metres up in the Chilean Andes mountains. And yet, even before it's completed, ALMA is already the most powerful telescope of its kind. ALMA observes the Universe in light with millimetre and submillimetre wavelengths, roughly one thousand times longer than visible-light wavelengths. Using these longer wavelengths allows astronomers to study extremely cold objects in space, which appear dark through normal telescopes. In addition, they are also very useful for peering inside dense clouds of cosmic dust and for observing very distant objects in the early Universe.		Footage of antennas moving on Chajnantor. Spectrum image Submillimetre images

02:35 [Narrator] ALMA is radically different from visible-light and infrared telescopes. As well as looking at these longer wavelengths of light, it works in a totally different way. Instead of being one big telescope, ALMA uses an array of antennas spread out over distances of up to 16 kilometres. The views from each antenna are combined into one image by one of the world's fastest special-purpose supercomputers, the ALMA correlator, which can perform 17 quadrillion operations per second. Because of this, pictures from ALMA look quite unlike more familiar pictures of the cosmos. The ALMA team has been busy testing the observatory's systems over the past months, in preparation for the first round of scientific observations. One outcome of their tests is the first image published from ALMA. This image was made using only twelve antennas — fewer than will be used for the first science observations, let alone the completed observatory — and spaced much closer together as well. Both of these factors make the new image just a taster of what is to come.		ALMA staff in OSF control room Footage of ALMA working ALMA correlator footage Antennas moving in unison

04:02 [Narrator] The Antennae Galaxies are a pair of colliding galaxies with dramatically distorted shapes. While visible light shows us the stars in the galaxies, ALMA's view reveals the clouds of dense cold gas from which new stars form. Massive concentrations of gas are found not only in the hearts of the two galaxies but also in the chaotic region where they are colliding. Here, the total amount of gas is billions of times the mass of our Sun — a rich reservoir of material for future generations of stars. Observations like these will be vital in helping us understand how galaxy collisions can trigger the birth of new stars. This is just one example of how ALMA reveals parts of the Universe that cannot be seen with visible-light and infrared telescopes. Over the coming year the sharpness, speed, and quality of its observations will increase dramatically as more antennas become available and the array grows in size. But even with only part of the array in operation, this is already the best submillimetre-wavelength image ever made of the Antennae Galaxies.		HST image of Antennae Fade in ALMA observations of Antennae Pan over image, zoom into interaction region. Antennas being constructed, transported, placed onto pads, etc.
05:25 [Narrator] ALMA could accept only about a hundred or so projects for this first nine-month round of observations. Nevertheless, over the last few months, astronomers from around the world have submitted over 900 applications to use it, a record level of interest. The successful projects were chosen based on their scientific merit, their regional diversity, and also their relevance to ALMA's major science goals. Let's hear from some of the astronomers who are planning to use ALMA, and why they're so excited about this new telescope.		Footage of talks and workshops from Community Days Footage of workshops and people working on ALMA proposals

06:03 [John Richer] One of the main reasons we're building ALMA is to study the birth of the Solar System, in essence. The Solar System was formed 4.5 billion years ago and we'd like to understand how other solar systems have come into being. ALMA's got the scale, the sensitivity, and the resolution to make detailed studies of solar systems like our Sun, forming nearby in our Galaxy.		John Richer, University of Cambridge, UK
06:27 [Annie Hughes] I look at molecular clouds in nearby galaxies. Molecular clouds are where stars form. The clouds are made up of very cold gas, and studying the physical conditions in these clouds helps us to understand the star formation process. Currently we can study molecular clouds only for very nearby galaxies, out to about 30 million light-years. With ALMA we'll be able to study individual clouds in galaxies much much further out.		Annie Hughes, MPIA, Heidelberg, Germany Video clip of a nearby galaxy
06:54 [Anthony Rushton] ALMA is going to be a very important instrument to teach us about the physics that goes on around the black hole in the centre of the Milky Way galaxy. This is because all the intervening dust can obscure some of the shorter wavelength observations. So with very high angular resolution into the submillimetre band that the ALMA telescope will be able to observe at, we'll be able to look at the fine-scale structural detail around the black hole.		Anthony Rushton, Onsala, Sweden / ESO
07:19 [José Afonso] Well, we know of some galaxies that exist in the far away Universe that are only seen in certain wavelengths, so for example we know about radio galaxies that are not observed in any other wavelengths, even with the most powerful telescopes. We have been waiting for ALMA to give us the possibility to understand what these galaxies are and what is happening in them.		José Afonso, Lisbon Astronomical Observatory, Portugal
07:47 [Narrator] Building work by ALMA's partner organisations from Europe, North America and East Asia will continue during the first science observations. By 2013, the observatory will be complete, and will feature 66 antennas spread out over distances of up to 16		Recent footage from ALMA site Animation

kilometres. By unfolding its enormous observational potential ALMA will revolutionise many areas of astronomy and will provide us with profound insights into the Universe. This is Dr. J signing off for the ESOcast. Join us again next time for another cosmic adventure.		
08:28 [Outro]		ALMA boilerplate and logos: The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. 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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