ty spike in the space density of Lyman break galaxies.

Our distant protoclusters are unique laboratories for studying the most extreme overdense regions in the early Universe and crucial locations for tracing the formation and evolution of clusters and galaxies. We are in the process of analyzing more than 100 confirmed Lyα emitting galaxies that lie within our protoclusters and in addition we are obtaining observations with other facilities, including the Advanced Camera for Surveys on the *HST* to find and study the various other populations of galaxies expected within the protoclusters. A detailed study of the morphologies and SEDs of protocluster members between $z \sim 4$ and $z \sim 1$ will be used to trace the history of *galaxy assembly* and *star formation*.

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ESO and NSF Sign Agreement on ALMA

Green Light for World's Most Powerful Radio Observatory

(From ESO Press Release 04/03, 25 February 2003)

On February 25, 2003, the European Southern Observatory (ESO) and the US National Science Foundation (NSF) signed a historic agreement to construct and operate the world's largest and most powerful radio telescope, operating at millimetre and sub-millimetre wavelengths. The Director General of ESO, Dr. Catherine Cesarsky, and the Director of the NSF, Dr. Rita Colwell, acted for their respective organizations.

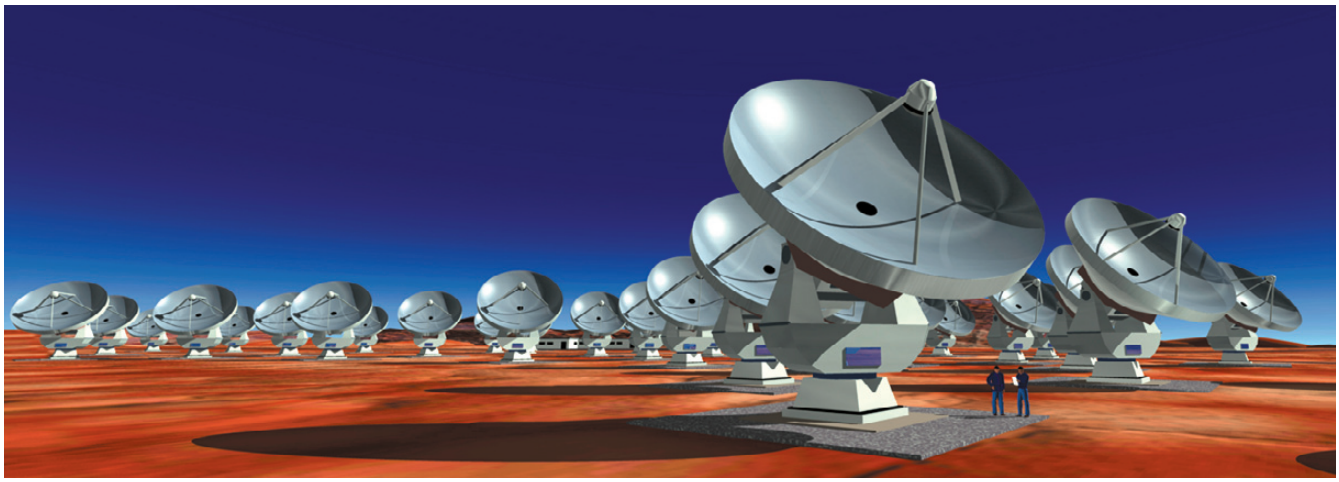
Known as the Atacama Large Millimeter Array (ALMA), the future facility will encompass sixty-four interconnected 12-metre antennae at a unique, high-altitude site at Chajnantor in the Atacama region of northern Chile.

ALMA is a joint project between Europe and North America. In Europe, ESO is leading on behalf of its ten member countries and Spain. In North America, the NSF also acts for the National Research Council of Canada and executes the project through the National Radio Astronomy Observatory (NRAO) operated by Associated Universities, Inc. (AUI).

The conclusion of the ESO-NSF Agreement now gives the final green light for the ALMA project. The total cost of approximately 650 million Euro is shared equally between the two partners.

Dr. Cesarsky is excited: "This agreement signifies the start of a great project of contemporary astronomy and astrophysics. Representing Europe, and in collaboration with many laboratories and institutes on this continent, we together look forward towards wonderful research projects. With ALMA we may learn how the earliest galaxies in the Universe really looked like, to mention but one of the many eagerly awaited opportunities with this marvellous facility."

"With this agreement, we usher in a new age of research in astronomy", says Dr. Colwell. "By working together in this truly global partnership, the international astronomy community will be able to ensure the research capabilities needed to meet the long-term demands of our scientific enterprise, and that we will be able to study and understand our universe in ways that have previously been beyond our vision".



Artist's view of the Atacama Large Millimeter Array (ALMA), with 64 12-m antennae.

The recent Presidential decree from Chile for AUI and the agreement signed in late 2002 between ESO and the Government of the Republic of Chile recognize the interest that the ALMA Project has for Chile, as it will deepen and strengthen the co-operation in scientific and technological matters between the parties.

A joint ALMA Board has been established which oversees the realization of the ALMA project via the management structure. This Board met for the first time on February 24–25, 2003, at NSF in Washington and witnessed this historic event.

The Atacama Large Millimeter Array (ALMA) will be one of astronomy's most powerful telescopes – providing unprecedented imaging capabilities and sensitivity in the corresponding wavelength range, many orders of magnitude greater than anything of its kind today.

ALMA will be an array of 64 antennas that will work together as one telescope to study millimetre and sub-millimetre wavelength radiation from space. This radiation crosses the critical boundary between infrared and microwave radiation and holds the key to understanding such processes as planet and star formation, the formation of early galaxies and galaxy clusters, and the formation of organic and other molecules in space.

"ALMA will be one of astronomy's premier tools for studying the universe", says Nobel Laureate Riccardo Giacconi, President of AUI (and former ESO Director General (1993–1999)). "The entire astronomical community is anxious to have the unprecedented power and resolution that ALMA will provide."

The President of the ESO Council, Professor Piet van der Kruit, agrees: "ALMA heralds a break-through in sub-millimetre and millimetre astronomy, allowing some of the most penetrating studies of the Universe ever made. It is safe to predict that there will be exciting scientific surprises when ALMA enters into operation."

Timeline for ALMA

- June 1998: Phase 1 (Research and Development)
- June 1999: European/American Memorandum of Understanding
- February 2003: Signature of the bilateral Agreement
- 2004: Tests of the Prototype System
- 2007: Initial scientific operation of a partially completed array
- 2011: End of construction of the array

Further Reading About ALMA

More information on the ALMA project can be found in earlier issues of *The Messenger* (March 1996; March 1998; December 1998; June 1999; and March 2002), and on the following websites:

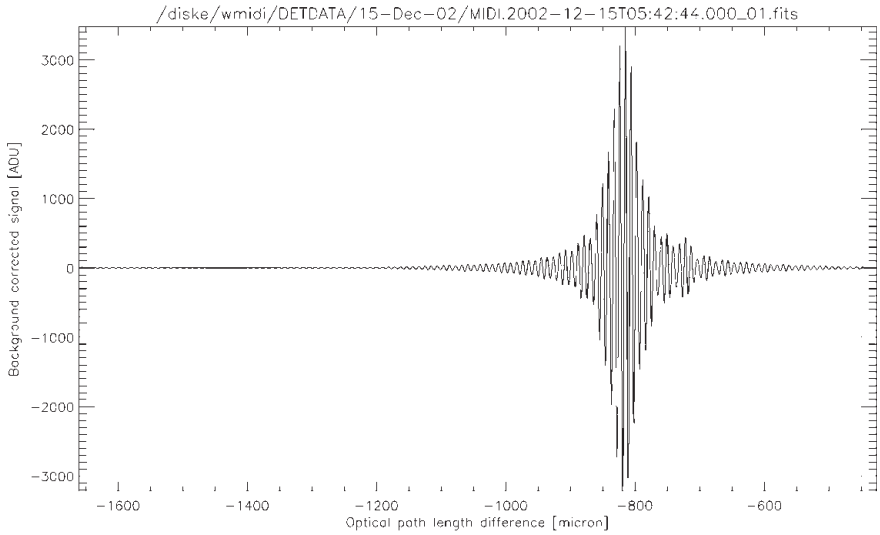
http://www.eso.org/projects/alma/
http://www.alma.nrao.edu

New Vistas Open with MIDI at the VLT Interferometer

"FIRST FRINGES" IN MID-INFRARED SPECTRAL REGION WITH TWO VLT TELESCOPES

Following several weeks of around-the-clock work, a team of astronomers and engineers from Germany, the Netherlands, France and ESO has successfully performed the first observations with the MID-Infrared interferometric instrument (MIDI), a new, extremely powerful instrument just installed in the underground laboratory of the VLT Interferometer (VLTI) at the Paranal Observatory (Chile).

In the early morning of December 15, 2002, two of the 8.2-m VLT unit telescopes (ANTU and MELIPAL) were pointed towards the southern star Epsilon Carinae and the two light beams were directed via the complex intervening optics system towards MIDI. After a few hours of tuning and optimization, strong and stable interferometric fringes were obtained, indicating that all VLTI components – from telescopes to the new instrument – were working together perfectly. Two more stars were observed before sunrise, further proving the stability of the entire system.



The upper image shows the "first fringes" of the star Epsilon Carinae, as obtained at VLTI with the new MIDI instrument at the mid-infrared wavelength of 8.7 µm.
The photograph at the bottom shows the group responsible for the MIDI installation and first tests, taken inside the VLT Control Building, right after the successful "First Fringes" in the early morning of December 15. From left to right: Front row (sitting/kneeling) Julio Navarrete, Lorena Faundez, Markus Schoeller, Andrea Richichi – Back row (standing) Francesco Paresce, Andres Pino, Nico Housen, Uwe Graser, Olivier Chesneau, Christoph Leinert, Andreas Glindemann, Walter Jaffe, Sebastien Morel, Richard Mathar, Pierre Kervella, Eric Bakker.

More details can be found in ESO press release PR 25/02 of 18 December 2002.