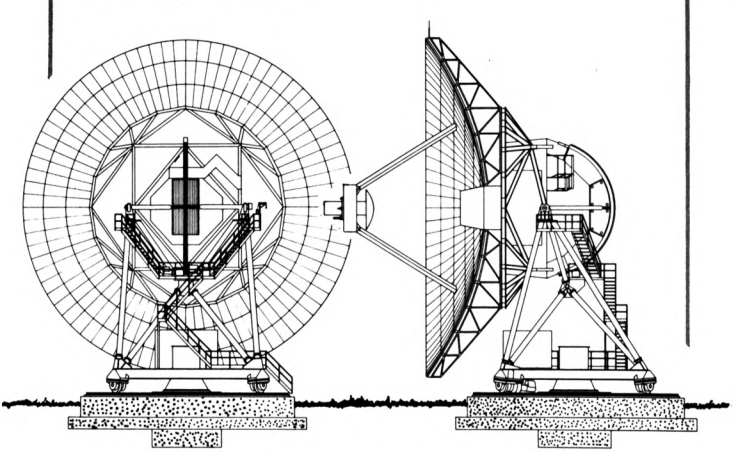
DESCRIPTION OF THE ARRAY

The Very Long Baseline Array (VLBA) synthesis radio telescope design exploits new technical innovations in the construction of large precision steerable antennas, low noise receivers, high-speed magnetic tape recordings, stable atomic frequency standards, and large fast digital computers. The feasibility of the VLBA concept has already been demonstrated through the development of sophisticated transcontinental and intercontinental long baseline interferometers.

The VLBA radio telescope will consist of ten dedicated and automated 25-meter (82-foot) diameter antennas distributed from Hawaii to St. Croix, U.S. Virgin Islands. Each antenna will be located so as to optimize image quality and will independently record the data it receives during coordinated observation of a specific radio source. Two technicians will be available at each site for local supervision, control and maintenance.

Normally each antenna element will run entirely automatically under control from the Array Operations Center (AOC) located on the campus of the New Mexico Institute of Mining and Technology (NMIMT) in Socorro, New Mexico. At the AOC the magnetic data tapes from each antenna will be correlated in a specially designed digital computer system which will be capable of nearly *one trillion* multiplications per second. Central computer processing of the recorded data from all ten antennas subsequently allows the synthesis of a single radio telescope 8000 kilometers (5000 miles) in diameter, physically the *largest* dedicated telescope on Earth.



THE NATIONAL RADIO ASTRONOMY OBSERVATORY

CHARLOTTESVILLE, VIRGINIA
SOCORRO, NEW MEXICO TUCSON, ARIZONA
GREEN BANK, WEST VIRGINIA

The National Radio Astronomy Observatory maintains and operates radio telescopes and their associated instrumentation as research facilities for the science of radio astronomy. The astronomers and students who use these telescopes come from many universities, research institutions and government laboratories. The NRAO is operated by Associated Universities, Inc., a non-profit corporation which obtains its funding under a contract with the National Science Foundation.

The NRAO maintains observing facilities at three locations. The first NRAO telescopes -- the 140-foot, the 300-foot, and the Interferometer -- were built in Green Bank, West Virginia. A 12-meter radio telescope, designed for research at millimeter wavelengths, is located on Kitt Peak near Tucson, Arizona. In 1980, the NRAO dedicated the Very Large Array (VLA) radio telescope, located 52 miles west of Socorro, New Mexico. The VLA is a wye-shaped array of 27 antennas, all of which operate together as a single interferometric radio telescope designed to provide very precise pictures of radio sources. The central administrative and scientific offices of the NRAO are located in Charlottesville, Virginia.

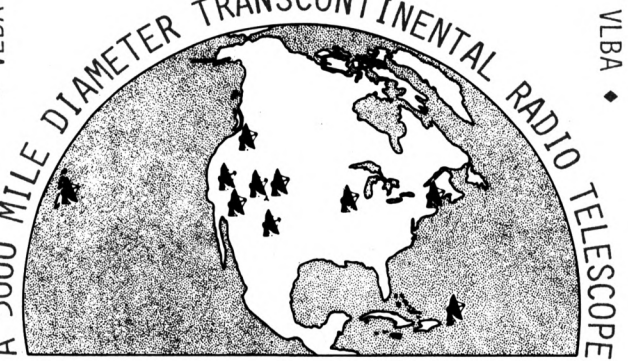
Annually, nearly 700 visiting scientists use the facilities of the NRAO for their research. This interaction between visiting scientists and Observatory staff provides a continuing vitality which serves as a catalyst for the advancement and evolution of the science of radio astronomy.

FOR FURTHER INFORMATION, CONTACT:
National Radio Astronomy Observatory
Edgemont Road
Charlottesville, VA 22903-2475 USA
Telephone: (804) 296-0211

◆ VLBA ◆ NRAO ◆ VLBA ◆ NRAO ◆ VLBA ◆

The Very Long Baseline Array

VLBA



THE NATIONAL RADIO ASTRONOMY OBSERVATORY
OPERATED BY ASSOCIATED UNIVERSITIES, INC.
UNDER CONTRACT WITH THE NATIONAL SCIENCE FOUNDATION

THE VERY LONG BASELINE ARRAY (VLBA) RADIO TELESCOPE

The VLBA is a stunning technological leap.

The Very Long Baseline Array (VLBA) radio telescope is one of the great technological breakthroughs of modern science and engineering. Its unparalleled scientific productivity will have profound implications for our understanding of the universe and its contents.

OBSERVING STAR BIRTH AND STAR DEATH

Astronomers will probe deeply into gaseous clouds where stars are being born. Observations of radio signals from molecules in cocoons surrounding the youngest stars will reveal details of the mysterious process of *stellar birth*.

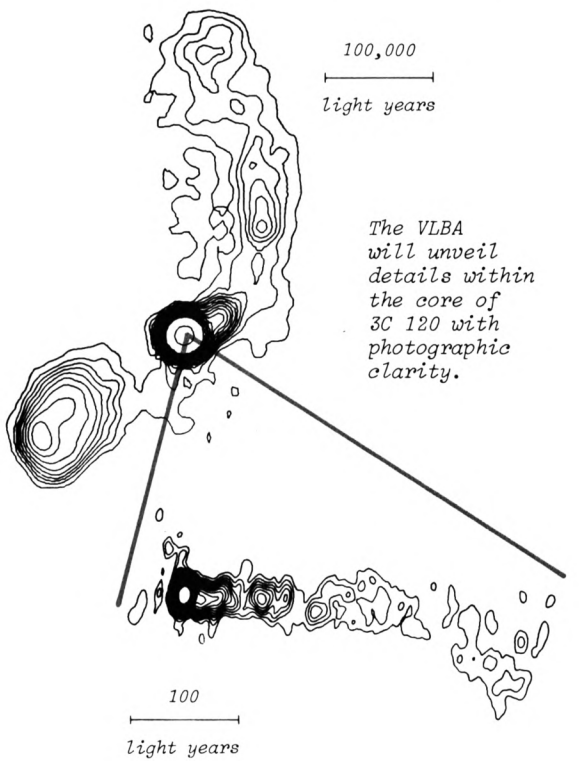
Some stars die violently in awesome supernova explosions. The VLBA will be able to perceive *star death* in distant galaxies with unparalleled clarity.

MEASUREMENT OF CONTINENTAL DRIFT

The VLBA can measure astronomical positions to an *incredible* accuracy -- a fraction of a milliarcsecond. This allows the location of the individual antennas in the array to be pinpointed to about one centimeter.

Such information will lead to the direct determination of continental drift, the earth's rate of rotation, and the wobble of its axis. Even the effect of wind on the rotation of the earth will be detectable with the VLBA.

THE RADIO GALAXY 3C 120



LOOKING INTO THE HEART OF GALAXIES AND QUASARS

The VLBA will have an *unrivaled* capability for sensing motion and fine detail within the hearts of distant galaxies and quasars. Vivid insight will be gained into the nature of the incredible and mysterious violence tearing galaxies and quasars apart.

Radio interferometers, using very long baselines, have already observed a *staggering* phenomenon in distant radio sources. Violent events at the center of quasars and radio galaxies eject blobs of radiating matter at apparent speeds greater than that of light.

The VLBA will give a detailed perspective of this violent activity so that radio 'photographs' and even radio 'movies' of these objects can be made. The true nature of the motions in and around the central *engine* powering the awesome phenomenon of the quasar will be studied.

THE SIZE OF THE UNIVERSE

Direct measurement of the distance to objects throughout our Galaxy as well as in nearby galaxies, something which is extremely difficult to do by other means, is made possible by the VLBA. These data will allow the *size* and *age* of the universe to be more accurately determined.

INTERNATIONAL COOPERATION

The VLBA project is national, and potentially international, in scope. Radio astronomers from many different institutions across the United States are involved in the design and construction process. Astronomers from all over the world will be able to use the facility.

Very Long Baseline Interferometry (VLBI) is an international science. U.S. scientists have long been leaders in the field and have helped pioneer the development of facilities throughout the world. The construction of the VLBA will *assure* the United States a leadership position for decades to come.

International participation will ensure full exploitation of this remarkable radio telescope. Antennas in other nations on five continents can be linked to the VLBA to form the largest radio telescope that can ever be spread over the planet. In the future it will be possible to link the VLBA to antennas in space, thus extending its capabilities even further.