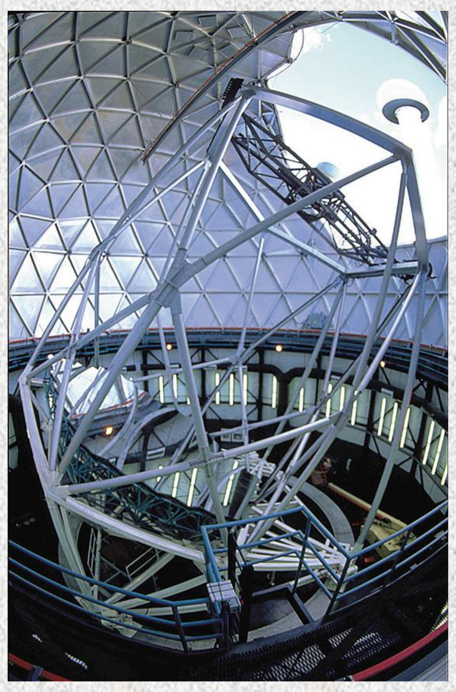
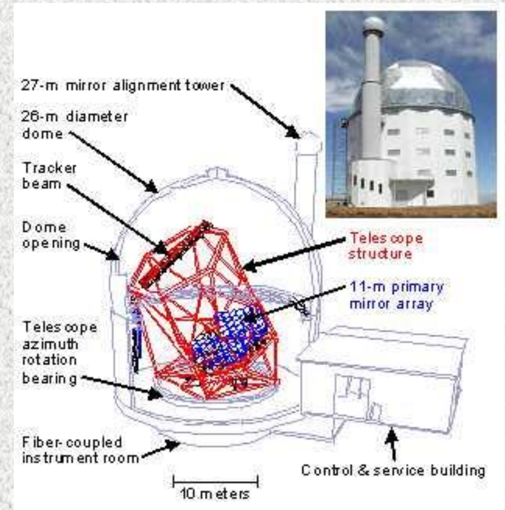
IUCAA

Modern Telescopes

SALT





.The **Southern African Large Telescope (SALT)** is the largest single optical telescope in the southern hemisphere. It is located at Sutherland, Northern Cape, in South Africa. It has a 11-metre diameter mirror, comprised of 91 identical spherical hexagonal segments. The telescope is tilted at a fixed angle of 37 degrees from the zenith, so that it moves only in azimuth, rotating into position on air bearings and remaining stationary during each observation The construction of SALT has been completed, funded by a consortium of international partners from South Africa, the United States, Germany, Poland, the United Kingdom, New Zealand and **India**. **IUCAA is one of the participating institutes in SALT consortium.**

GMRT

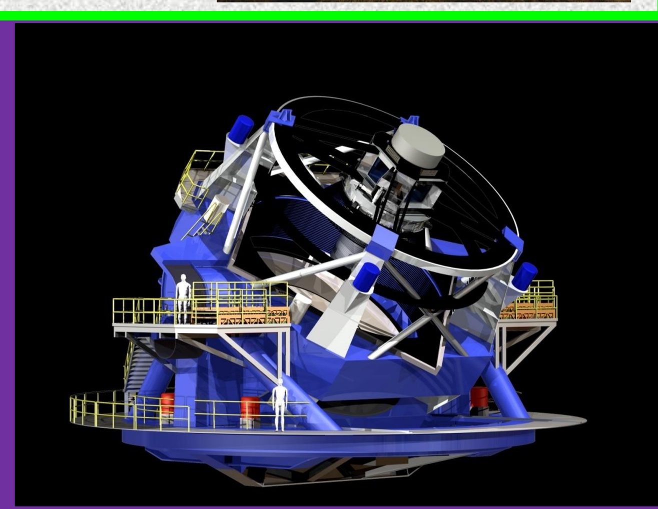
.**Giant Metrewave Radio Telescope (GMRT),** is a unique facility for radio astronomical research using the metre wavelengths range of the radio spectrum. It is located at a site about 80 km north of Pune. GMRT consists of 30 fully steerable gigantic parabolic dishes of 45m diameter each spread over distances of upto 25 km . GMRT is a very versatile instrument for investigating a variety of radio astrophysical problems ranging from our nearby Solar system to the edge of the observable Universe. **It is operated by the National Centre for Radio Astrophysics (NCRA),** Pune of Tata Institute of Fundamental Research.

The 2 main functions of telescopes are

1) To obtain images with as much angular information as possible
2) To gather as much light as possible to allow study of faint objects

On the Ground choosing the telescope site is very important because

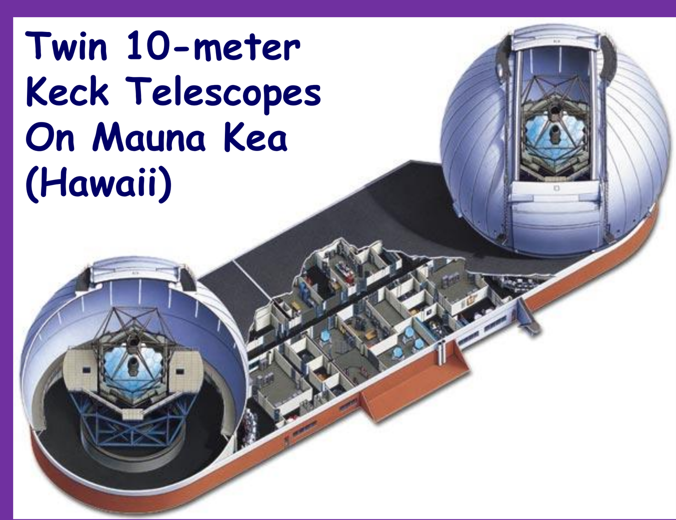
1) Dry weather is required.
2) Sky should be cloudless and clear.
3) Wind flow should be very stable to minimize blurring of images.



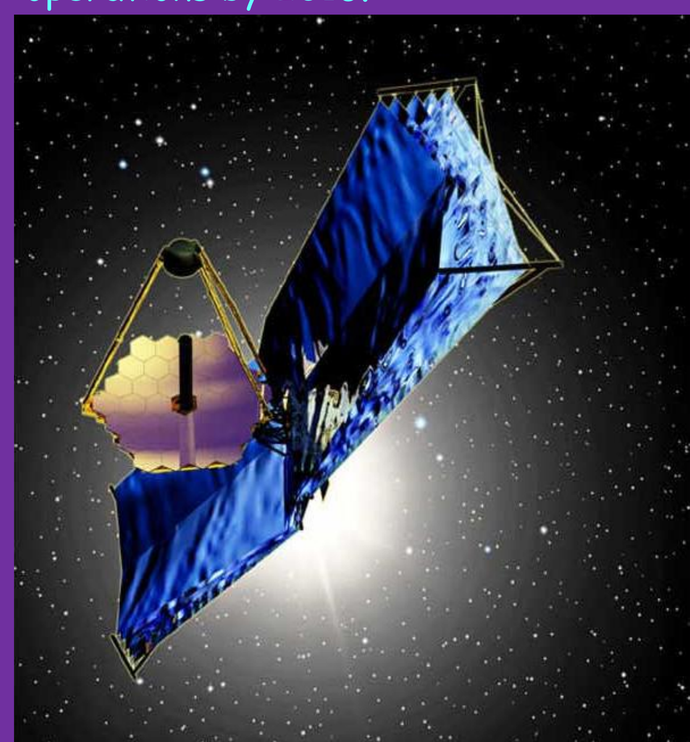
Large Synoptic Survey Telescope

The Large Synoptic Survey Telescope (LSST) is a facility which is designed for wide-field astronomical survey of our universe using an 8.4-meter ground-based telescope. From its mountaintop site in Chile, the LSST will image the entire visible sky every few nights. The LSST is scheduled to see first light in 2014, to begin doing science in 2015 and be in full survey operations by 2016.

The ESO Very Large Telescope (VLT) at the Paranal Observatory (Atacama, Chile) is one of the world's largest and most advanced optical telescopes. It comprises four 8.2-m reflecting Unit Telescopes and several moving 1.8-m Auxiliary Telescopes, the light beams of which can be combined in the VLT Interferometer (VLTI). With its unprecedented optical resolution and unsurpassed surface area, the VLT produces extremely sharp images and can record light from the faintest and most remote objects in the Universe.



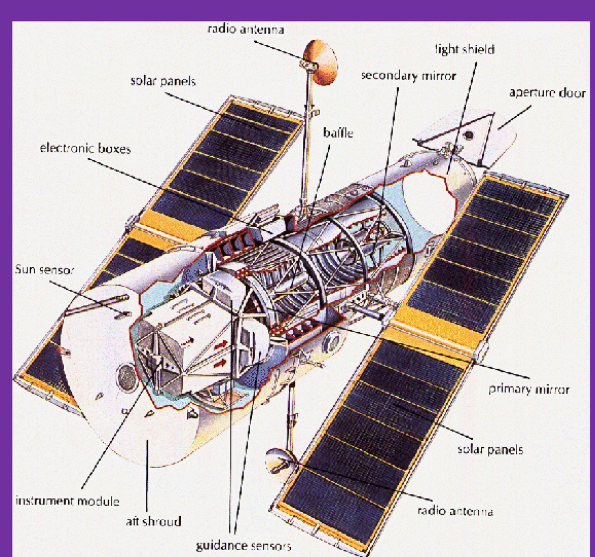
The **Twin Keck Telescopes**, are among world's largest optical and infrared telescopes. Each stands eight stories tall and weighs 300 tons, yet operates with nanometer precision. At the heart of each Keck Telescope is a revolutionary primary mirror. Ten meters in diameter, the mirror is composed of 36 hexagonal segments that work in concert as a single piece of reflective glass.

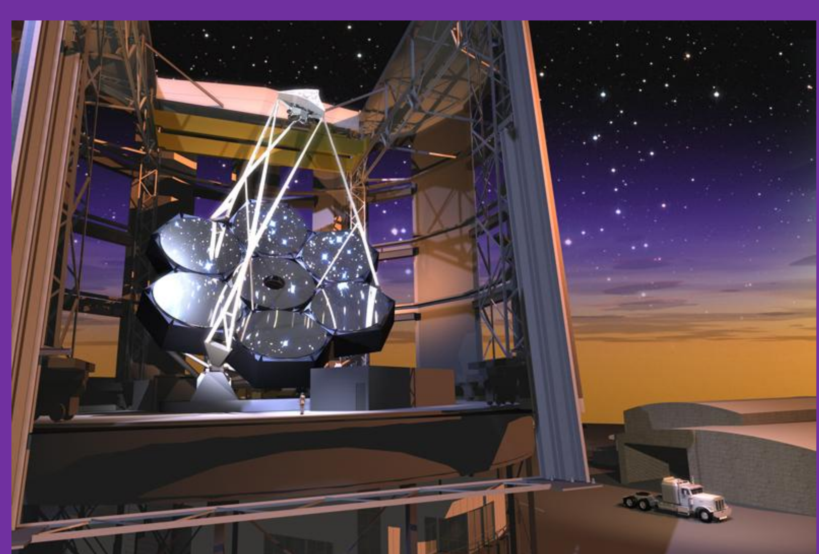


James Webb Space Telescope (JWST)

formerly known as the **Next Generation Telescope (NGST)** will look back to an extremely important period in the early history of the Universe when the first stars and galaxies began to form. While we have a fairly good understanding of the Universe in other periods, we have no observations during this time when the Universe was between 1 million and a few billion years old. NGST's studies will help us understand the shape and chemical composition of the universe, the evolution of galaxies, and the nature of unseen "dark matter."

Hubble Space Telescope (HST) Orbits 600 kilometers (375 miles) above Earth, working around the clock to unlock the secrets of the Universe. It uses excellent pointing precision, powerful optics,and state-of-the-art instruments to provide stunning views of the Universe that cannot be made using ground-based telescopes or other satellites. It has a visionary, modular design which allows the astronauts to take it apart, replace worn out equipment and upgrade instruments.

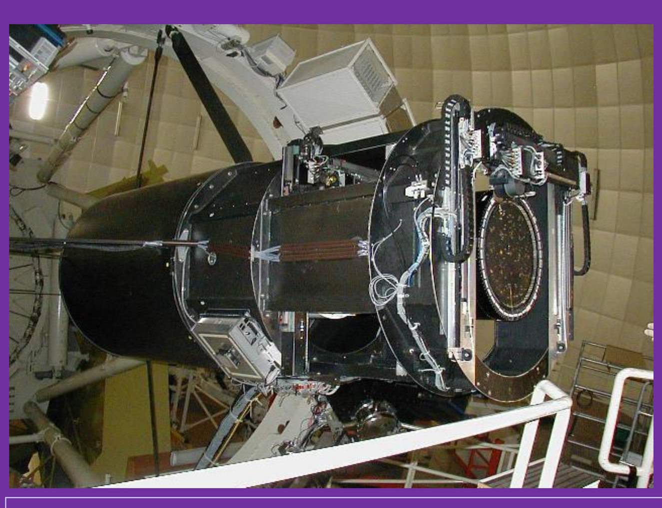




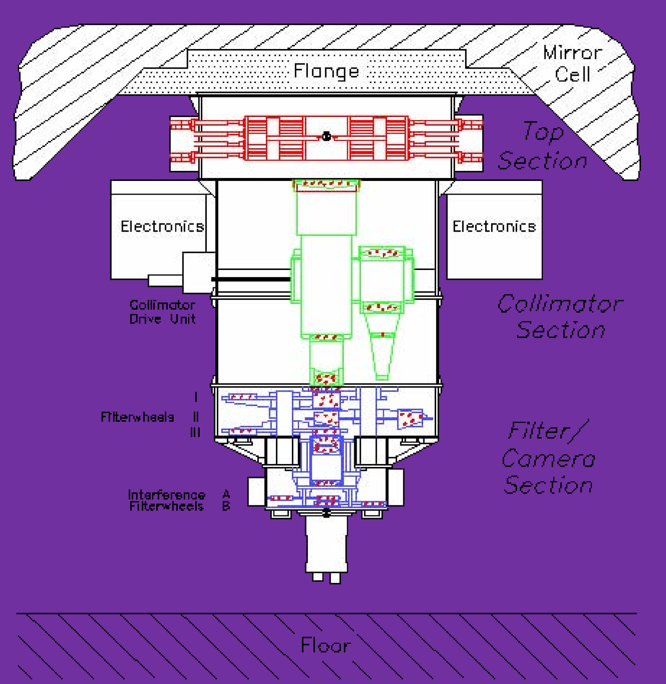
The **Giant Magellan Telescope (GMT)** will open a new window on the universe for the 21st century. Scheduled for completion around 2016, the GMT will have the resolving power of a 24.5-meter primary mirror. It will answer many of the questions at the forefront of astrophysics today and will pose new and unanticipated riddles for future generations of astronomers. The GMT will produce images up to 10 times sharper than the Hubble Space Telescope.

The **Thirty Metre Telescope (TMT)** which, once constructed, will be the largest telescope ever built and is expected to be fully operational in 2016. It is being developed by the Astronomical research groups from Canada and the United States of America. It will be made up of over 500 hexagonal mirror segments that span a 30 m diameter and will operate at both visible and infrared (IR) wavelengths employing cutting-edge adaptive optics technology. The TMT is designed so that its observations will help answer questions about the formation of stars, planets and galaxies, about dark matter and dark energy and the extrasolar planet. The Indian science community is also going to be part of TMT.

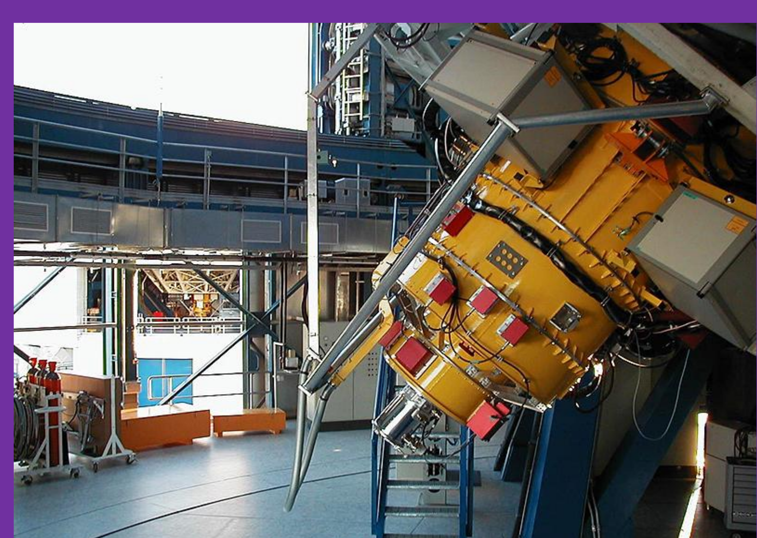
And Some Instruments.......

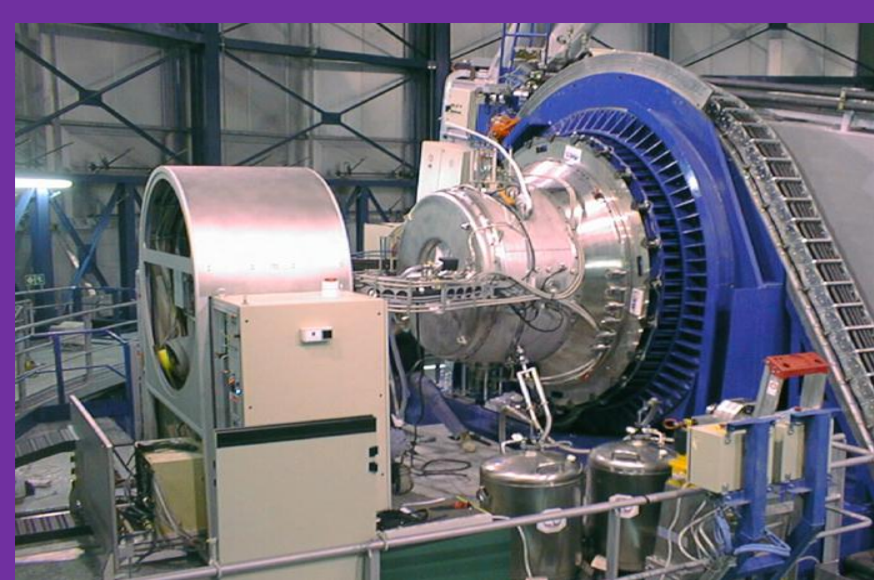


2dF is a spectrograph on the Anglo-Australian Telescope at Siding Spring, New South Wales, Australia. The **Two Degree Field system (`2dF')** is the AAT's (and arguably the world's) most complex astronomical instrument. It is designed to allow the acquisition of up to 400 simultaneous spectra of objects anywhere within a two degree field on the sky. It consists of a wide field corrector, an atmospheric dispersion compensator, a robot gantry which positions optical fibres to 0.3'' and two spectrographs each of which accepts 200 of the fibres to produce low to medium resolution spectra. At right a close-up picture of the central part of 2dF is shown. The fibre positioners and the tumbler unit (containing the field plates) can be seen at the end.



The two **FORS (Focal Reducer/low dispersion Spectrograph)** instruments are designed as focal reducers multi mode instruments for the Very Large Telescope. The wavelength range of operation is between 330nm and 1100nm. Two spatial resolutions and hence field sizes can be selected by exchange of the collimators. The resulting field of view is 6.8'x6.8' with the standard resolution collimator (SR). With the high resolution collimator (HR) the field of view will be 3.4'x3.4' for the FORS1 Tektronix CCD detector and 4.2'x4.2' for the FORS2 MIT CCD mosaic.





ISAAC-VLT Infrared Spectrometer and Array Camera

covers the 1-5μm wavelength range with the help of two cameras which are optimized for the 1-2.5μm and 2-5μm ranges.