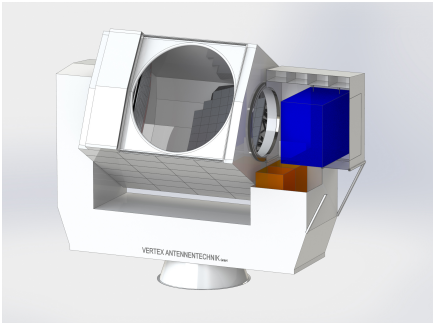
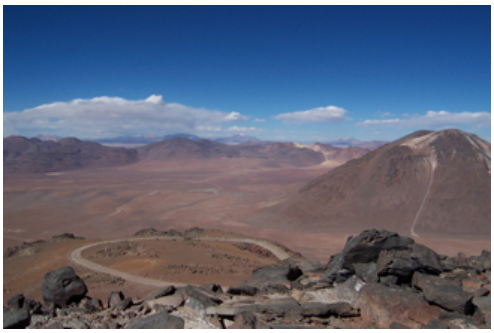


CCAT-p



CCAT-prime (**CCAT-p**) will be a 6-meter diameter, 10-micron surface precision telescope operating at submillimeter to millimeter wavelengths and sited at 5600 meters elevation on Cerro Chajnantor in the Atacama Desert of northern Chile. The novel optical design (see figure below) will deliver a high-throughput wide-field-of-view telescope capable of illuminating $>10^5$ millimeter wavelength detectors (and many more at submillimeter wavelengths) so that large areas of the sky can be scanned rapidly. The high, dry site offers superb observing conditions, yielding routine access to the 350 micron window as well as improved performance at longer wavelengths. Under the best conditions, observations in the 200 micron window will be possible. Deployment of CCAT-p on Cerro Chajnantor will provide operational experience at high very altitude, reducing risk for the future construction of a 25-meter class telescope at the high site.

The scientific goals of CCAT-p motivate its unique characteristics of wide-field, high surface accuracy, high throughput and high altitude location and are encompassed in major legacy programs:

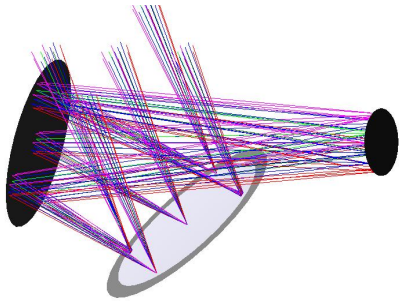
- **GEco**: "Galactic Ecology" studies in multiple spectral lines of the dynamic interstellar medium in a wide range of environments in the Milky Way, the Magellanic Clouds and other nearby galaxies;
- **SZ**: Measurement of the velocities, temperatures and transparencies of galaxy clusters via the Sunyaev-Zel'dovich effect to place new constraints on dark energy and the sum of the neutrino masses;
- **GEvo**: "Galaxy Evolution" studies of distant dusty star-forming galaxies far surpassing the Herschel Space Observatory results in source number counts and directly resolving (and characterizing) the population of faint sources responsible for most of the far infrared counts/background;
- **IM/EOR:** Intensity mapping of the [CII] 158 micron line from star-forming galaxies in the epoch of reionization at redshifts of 5 to 9 to understand the topology and timescale of reionization.

The "crossed-Dragone" design establishes the CCAT-p telescope as a next-generation Cosmic Microwave Background (CMB) platform, capable of mapping the sky some 10 times faster than current CMB facilities. While other CMB efforts focus on wavelengths longer than one millimeter, the availability of simultaneous submillimeter imaging offered by CCAT-p will allow precise separation of dust emission from the CMB signal. With its large flat focal plane, CCAT-p will be ready to exploit the anticipated future advances in detector array technologies.

CCAT-p is being constructed as a partnership of Cornell University, the Universities of Cologne and Bonn in Germany and CATC, a consortium of eight Canadian academic institutions. Researchers at additional institutes in the U.S., Canada, Germany and Chile are involved in science planning and instrument development.

The CCAT-p telescope is being designed and built by Vertex Antennentechnik GmbH of Duisburg, Germany. The construction phase is expected to lead to first light in 2021.

Half of the funding for Cornell's participation has been provided by Fred Young '64, BME '65, ME(mech.) '66, MBA '66.



Schematic layout of a crossed-Dragone telescope. Light from the sky is reflected first off a primary mirror and then off a slightly smaller secondary before reaching the instrument port on the side. This mirror combination permits a high throughput of the light over a very wide field of view and delivers a flat focal plane that will accommodate hundreds of thousands to millions of detectors. Sketch by Cornell Professor Mike Niemack.