**Overview**

In February 2004, Cornell University and the California Institute of Technology signed an agreement that will lead to the construction and operation of a 25 meter class, Far Infrared/Submillimeter telescope to be located at very high altitude in the Andean highlands of the Atacama Desert, in northern Chile. Scheduled for completion by the beginning of the next decade, this telescope will be the highest altitude astronomical facility, as well as the largest and most sensitive of its type on Earth.

**Science Case: the Assembly of Galaxies**

How did the Universe evolve from this: 

1. Map of the sky obtained by the Wilkinson MAP satellite. It displays variations in the Cosmic Microwave Background Radiation, which originated when the Universe was a mere 300,000 years old.

2. Computer generated rendition of the filamentary nature of the Large-scale distribution of galaxies in the Universe at the present time, 13 billion years after the Big Bang (credit: MPIfAP).

3. Image of two colliding galaxies, on their way to merge into a single system. Galaxy mergers are thought to have been far more frequent events in the early Universe than they are today. As a result, the rate of star formation activity – stimulated by the merger process – was many times more intense billion of years ago than it is now. (Credit: B. Whitmore)

4. The main driver of cosmic evolution is gravity: density fluctuations in the early Universe are amplified by gravity → stars and galaxies form, Galaxies merge, form clusters and evolve into larger clusters & structures.

5. The first episodes of star formation produced much dust (grains of Carbon and Silica compounds mixed with ices). Dust absorbs optical radiation and rere-emits it as far Infrared light. The expansion of the Universe shifts that radiation even farther to the Infrared. Thus, the detection and study of primeval galaxies relies on our ability to build sensitive far Infrared telescopes and detectors.

6. Existing Far Infrared telescopes are limited in resolution, sensitivity, quality of their sites, or a lot of the above. See, for example, the image of 2 primeval galaxies obtained by the J.C. Maxwell Telescope at Mauna Kea. Most features in image are due to noise (Credit: JCM).

The science case indicates that a high sensitivity, large field of view, Far Infrared telescope will decisively impact our understanding of primeval galaxies, star and planetary formation and primeval Solar System objects.

**Science Case: Planetary Disks**

1. Planets form within the dense dust cocoons surrounding young stars. The dusty environment settles into flattened disks, and particle accretion eventually leads to the formation of the seeds that will turn into planetary objects. Observations of the dusty disks need to be made at Infrared wavelengths. Image at a wavelength of 0.87 mm of the circumstellar disk of the star Vega. The location of the star is indicated by the 5-pointed feature superimposed on the map. Notice the lack of detail (Credit: JCM).

**Science Case: Interacting Galaxies**

Interacting galaxies are known to stimulate prodigious episodes of star formation activity, known as "starbursts". They are thought to be precursors in the formation of supermassive black holes. The detailed study of these objects requires inspection of their far infrared emission. (Image credit: J. Hibbard)

2. Artist's rendition of the circumstellar disk of Vega, as it would be seen by the Atacama Telescope at a wavelength of 0.2 mm. Morphological perturbations produced by planets would be easily detectable.