**Carol’s Proposal Section - NGC 281**

In our efforts to observe the youngest stages of star formation, we will use data from the Herschel Space Observatory’s Photodetector Array Camera and Spectrometer (PACS). This instrument operates in three far-infrared (FIR) wavelength bands: 70 µm, 100 µm, and 160 µm*.* The FIR 70 µm band is ideal for directly detecting the emission from the youngest protostars, designated Class 0 and Class I, as these objects “glow” brightest at that wavelength (Ali, personal communication, 2013).

Flux densities for each protostar will be measured using small aperture photometry with a resolution of 5.2″ for point sources at 70 µm (Fischer, 2013). At this wavelength, flux densities vary from 8 mJy to 930 mJy(Fischer, 2013). The median signal of the flux densities in the form of a background annulus will be subtracted from the overall signal in order to distinguish between the true internal emission of energy of each protostar and the external emission from the surrounding interstellar medium. Flux densities will be displayed in the form of a spectral energy distribution (SED) profile. We will focus on the Rayleigh-Jeans, or rising, portion of the SED as this is where the emission from Class 0/I protostars reveals itself most readily (Ali, personal communication, 2013).

A previously defined grid of radiative transfer models based on specific characteristics of protostars, i.e. envelope densities, cavity opening angles, overall inclinations, and internal luminosities, has been used in other studies to help constrain the physical properties of protostars (Ali, 2010). Looking for a match between these models and the SEDs of our newly discovered objects will further sharpen our observations. We will use this correlation between observation and theory in an effort to further define the physical properties involved for each newly discovered protostar.

It is also possible to determine the bolometric temperature and bolometric luminosity for each protostar (Myers and Ladd, 1993). Once those values have been determined, color-magnitude diagrams will be plotted. These diagrams will be used to constrain the classification of each of the newly discovered protostars.

NGC 281 is an ideal location for the study of star formation. After the identification of the youngest protostars in NGC 281, their positions will be plotted. The distribution of these newly discovered protostars relative to the overall nebular region will help to reveal the role of the radiation from the central cluster of massive O and B stars and its impact on star formation. Results from our observations will provide new information that will help elucidate the nature of the types of star formation occurring in this region. Overall, our goal is to contribute new data that will be used to develop a more accurate model of the developmental stages of the youngest protostars.