**Chapter 3**

*Introduction*

* This section is to include a link from the previous chapter (Dust Mass Functions and the Dust Density of the Universe), likely on the premise that we observe evolution in dust at higher redshifts.
* This will follow on to the usefulness of understanding the dust properties of galaxies over time to infer their evolution.

*Dust Properties of DSFGs*

Interstellar dust plays a crucial role in the formation of galaxies as dust grains are the site of molecule formation like molecular hydrogen, H2, the primary fuel for star formation (Kennicutt & Evans 2012). H2 is the most abundant molecule in the Universe but is difficult to observe directly unless originating from energetic environments. Alternatives include observing less abundant molecules such as CO and using conversion factors to estimate the mass of molecular hydrogen, or observing dust emission to estimate dust masses (as in the previous chapter) and assuming gas-to-dust ratios (e.g. Saintonge+2013) to convert these into estimates for the total gas mass in a high-redshift galaxy (e.g. Eales+2012; Scoville+2014). Such studies have shown that galaxies at high redshift contain a higher fraction of gas than galaxies today (Scoville+2016,2017; Tacconi+20??; Millard+20??), showing that direct observations of dust emission are useful in our understanding of how galaxies grow and evolve. It is important to note, however, that studies that make these links between dust emission and the evolution of galactic properties make the basic assumption that properties of the dust remain constant with redshift.

Identifying Dusty Star Forming Galaxies (DSFGs) from wide-field blind surveys (e.g. Smail+1997; Casey+2014; Magnelli+2019) is a popular method for constraining the dust-obscured contribution of the cosmic star formation rate density (CSFRD)