# DIFFUSE INTERSTELLAR BANDS: A MAJOR PROBLEM IN ASTRONOMICAL SPECTROSCOPY

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The unidentified diffuse interstellar absorption bands are observed in near-UV, visible and near-IR spectra recorded towards stars that lie behind interstellar clouds. Their origin is the longest standing problem in astronomical spectroscopy, dating back to the 1930s when Merrill and co-workers made the first systematic studies. Over three hundred bands have now been discovered and are described as being diffuse because their widths are greater than those observed for atoms and small molecules along the same lines of sight. Although there has been debate historically as to whether the carriers are large gas phase molecules or are associated with the dust grains which cause the extinction of starlight, most researchers consider the former to be more likely with much current interest focussed on electronic transitions of large polycyclic aromatic hydrocarbon molecules. Evidence considered to be in favour of large molecules as carriers includes the invariance of the absorption wavelengths and narrowness of some of the bands, the discovery of fine structure within some of the narrower bands, the lack of polarisation structure across a band, and the fact that optical emission bands of the Red Rectangle nebula have wavelengths close to some diffuse band absorption wavelengths, with emission band profiles that appear molecular in form. Recent observational results on Red Rectangle emission and diffuse interstellar bands recorded at very high signal-to-noise towards binary stars will be described, together with proposed interpretations of these data.