# II. THE DISK COMPONENT

## INTRODUCTION TO THE SESSION

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The main purpose of this session is to gather observational data which should ultimately yield a better understanding of the relationships between the interstellar matter and the stars in our Galaxy. Ideally we would like to know how the Galaxy evolves in this respect and in particular to understand quantitatively the laws of star formation: What is the relation between star formation and the density of gas? (for a study of this kind see Guibert, Lequeux, and Viallefond, Astron. Astrophys. 68, 1, where Schmidt's law is rediscussed); Does the Initial Mass Function (IMF) vary within the Galaxy? (for recent studies see Burki, Astron. Astrophys. 57, 135, and Puget, Serra, and Ryter, this Symposium). We are obviously still far from being able to give definitive answers to these questions, but I hope that we will obtain at least a better understanding of the basic ingredients: the distribution of interstellar matter and of young stars.

There are many ways of obtaining the galactic distribution of interstellar matter, most of which will be covered today:

- The 21-cm line gives the distribution of atomic hydrogen(Kerr).

- The distribution of the molecular component is indirectly derived from the distribution of the CO millimeter line emission and from the distribution of other molecules such as OH, $H_2CO$, and CH (Solomon, Cohen, Scoville, et al.) A big problem remains here in the conversion of CO intensities to $H_2$ masses, a conversion which is probably not more accurate than a factor 3 or more.

- Interstellar extinction and far-infrared radiation give (provided a grain model is adopted) the distribution of the dust and indirectly of the gas (Lÿnga, Puget).



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- The distribution of interstellar matter in all forms can also be inferred from the $\gamma$-ray surveys (Paul) although hypotheses must be made on the flux of cosmic rays in various parts of the Galaxy.

- The distribution of heavy elements (mostly O) in all forms can be derived from low-energy X-ray absorption studies. Few new data have been obtained, and this will not be discussed at this Symposium.

Turning now to young stellar populations, data on their local distribution, formation rate and initial mass function are obtained from optical studies of young stars (Humphreys) and of HII regions (Sivan). Only radio and IR observations can yield data for the entire Galaxy. Surveys of OH-IR stars will be described by Oort at this meeting; Puget will discuss far-IR and near-IR surveys of the galactic plane. These surveys also provide very interesting new insights into star formation as a function of galactocentric distance. Other information comes from radio observations of HII regions and from the thermal continuum (Lockman; additional data will be presented by Downes and by Mezger), and also from radio studies of pulsars, supernova remnants and the non-thermal continuum (Wielebinski, Taylor).

The most interesting result of all these studies is that there is a very large rate of star formation at 5 kpc from the galactic center, in the region where there is also a concentration of gas. The rate is so high that the lifetime of the gas against astration is only a few $10^8$ years, so that the gas has to be replenished by some mechanism; there are also some indications that the IMF could be different in this region, with relatively less very massive stars formed. These results obviously have a very strong bearing on galactic evolution.