CIRCUMSTELLAR MATTER AS DETECTED BY IRAS--SOME SYSTEMATICS

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ABSTRACT. Most of the sources noted by the Infrared Astronomical Satellite are, as expected, more or less normal cool giant stars, but a very large number of objects of earlier spectral type were also picked up. These cases must involve, in a variety of ways, circumstellar gas and dust. From a large-scale program of identification of the IRAS objects, some systematics emerge.

1. INTRODUCTION

The IRAS point-source catalogue gives values of flux density at effective wavelengths near 12, 25, 60, and 100 micrometers for almost a quarter of a million infrared sources over the entire sky. The complete identification of all of these sources, is, of course, a tremendous task, but I have been contributing towards it in two directions: (1) In about 100 25-square-degree areas mainly at higher galactic latitudes and in the northern sky identifications are being made for the stellar IRAS objects with the aid of infrared objective-prism plates taken with the Burrell Schmidt, and (2) Identifications are being attempted for all of the several thousand IRAS sources that have their maximum values of flux density at either 25 or 60 μm.

As a result, a large variety of objects have been identified. The large numbers of normal cool stars found are of little interest here, but the fact that a very substantial number of hotter objects have been detected should be of interest to this Symposium.

2. RESULTS

It appears most useful here to simply indicate the types of hot, or warm, objects that have been found in the IRAS data. Four classes may be noted:

Class A: Hot objects that have an abnormally large flux at 12 μm, declining at longer wavelengths. Most of these appear to be normal Be stars, though some unusual objects such as

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89 Her, υ Sgr, 3 Pup, and RY Sgr, as well as most of the RV Tauri stars, belong to this class.

Class B: Objects that have a higher flux at 25 μm than elsewhere in the infrared. Many of these have been termed "young, low-excitation, stellar" planetary nebulae, though in some cases the nebulae themselves are not seen. The interesting objects HD 161796 and AC Her belong to this class, as do many other emission objects of rather uncertain nature. This class contains several cool carbon Wolf-Rayet stars as well as many T Tauri stars. Also, most of the unidentified type II stellar masers are in this group.

Class C: Objects that have a higher flux at 60 μm than elsewhere in the infrared. This very diverse group contains many somewhat older planetaries, some T Tauri stars, such objects as η Car and AG Car, and even some galaxies. The enigmatic shell star β Pic, which probably has suffered envelope ejection, is a member of this group.

Class D: Objects that continue to increase in flux to 100 μm. Most of the galaxies detected by IRAS belong to this class, as do a few T Tauri stars and most of the so-called early-type "nebulous stars." It appears that many of the latter may be accidentally rather than genetically involved in the interstellar medium.

It is hoped to eventually publish in detail some of the results of this work. In the meantime, inquiries regarding identification of the IRAS sources are welcome. Finally, it is a pleasure to acknowledge that this work has been supported in part under NASA's IRAS Data Analysis Program and funded through the Jet Propulsion Laboratory.