OPTICAL AND FAR-INFRARED PROPERTIES OF UM SURVEY EMISSION-LINE GALAXIES

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1. INTRODUCTION

For the University of Michigan (UM) survey, the Curtis Schmidt telescope at CTIO is used with Kodak IIIa-J plates and the 1°.8 objective prism to detect emission-line galaxies (ELGs) and quasars. Line emission is the primary selection criterion. The quasar sample has been investigated by Lewis, MacAlpine, and Weedman (1979) and by MacAlpine and Feldman (1982) while a study of the ELGs was begun by Lewis (1983). Here, we report on a more extensive analysis of the 172 ELG candidates in the UM Lists IV (MacAlpine and Lewis 1978) and V (MacAlpine and Williams 1981) areas.

2. OBSERVATIONS

For each galaxy, B and V photometry was obtained at the McGraw-Hill Observatory (MHO) 1.3-meter telescope. Images were recorded on an RCA CCD.

The ELGs were observed spectroscopically using a Reticon, an RCA CCD, or a GEC CCD at the MHO 1.3-meter or 2.4-meter telescopes. Data were also obtained with the Image Dissector Scanner at the KPNO 2.1-meter telescope.

To provide high-sensitivity far-infrared (FIR) data, scans from the IRAS survey were co-added at the locations of every ELG candidate.

3. RESULTS

Complete data compilations, analyses, and conclusions from this work will be reported elsewhere (e.g., Salzer and MacAlpine 1988; Salzer, MacAlpine, and Boroson 1988). Here, we discuss a few general results.

The UM survey is highly effective at selecting faint, dwarf ELGs. The median apparent magnitude of the sample is B=16.9, and the

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distribution stays relatively flat through B=18.5. By comparison, the Markarian sample peaks around B=15.5. This trend is also reflected in the luminosity and size distributions. Half the UM ELGs are fainter than M_B=-18.0, whereas the Markarian galaxies display a strong peak near M_B=-20. In addition, UM galaxies have a median measured diameter of only 9.1 kpc (not including 12 unresolved objects; for H_o=75 km/s/Mpc; measuring to 25.5 mag/sq. arcsec).

The UM ELGs show a broad range of physical characteristics, by means of which we classified them into natural groups. Formally derived space densities for the different classes suggest that Seyfert 2 galaxies are 8.9±4 times more prevalent than Seyfert 1's. Line ratio diagnostic diagrams show that the UM ELGs (excluding Seyfert galaxies) segregate into natural groups along or near the line defined by models of Dopita and Evans (1986) for HII regions with differing metallicities. From this, we derived a metallicity-luminosity relationship in which oxygen abundance increases roughly linearly with increasing luminosity over the range $-13>M_B>-21$.

Comparisons of optical and FIR data show that about 87% of UM ELGs brighter than B=17.5 are detected in the co-added IRAS scans. However, our results also indicate that FIR data alone are not sufficient for effective Seyfert galaxy selection. A color-color diagram plotting the spectral index between 25 and 60 μm against that between 60 and 100 μm shows that the "warmest" region is occupied by a variety of UM ELG types and a minority of the Seyferts in the sample. Finally, the UM ELG FIR luminosity function, compared with that for a complete sample of IRAS galaxies, suggests that 30-40% of the IRAS sample can be accounted for by ELGs like those in the UM survey.

4. ACKNOWLEDGEMENTS

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