over the last 20 years; its proper motion has been determined and is similar to that of the other knots. A total of 8 knots can be distinguished in HH39 surrounded by diffuse nebulosity. High resolution spectroscopy of the Hα and [N II] emission lines shows the spatial variation of the radial velocity structure over the largest knots (HH39 A and C). Distinct differences in excitation and velocity structure between the knots are apparent. The observations are compatible with the knots being high velocity ejecta from R Mon, decelerated by interaction with ambient material and with bow shocks on their front surfaces.

NEW HERBIG-HARO OBJECTS FOUND BY A NEW METHOD

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1. INTRODUCTION

So far discoveries of Herbig-Haro objects were done mainly by either of two different methods. The first relies on their non-stellar appearances on direct photographs, followed by low-dispersion slit spectroscopy; this is the most standard method. But sometimes only the former step is made; then picked-up objects are possible HH objects (e.g. Gyul'budagyan 1982, and Reipurth 1985). The second is based on objective-prism observations in the red with Schmidt telescopes. We have invented a third method to find new HH objects. This utilizes Schmidt telescopes, too, but can reach a fainter limiting-magnitude than that obtained with objective-prism observations.

2. OBSERVING TECHNIQUE

The observing technique consists in taking double exposures on a 103aF emulsion alternately through RG 645 and RG 610 filters with a small displacement. The band by the former filter is half as wide as that by the latter, hence twice longer exposure is applied to it. Then most celestial objects, including reflection nebulae and normal galaxies, produce two images of equal brightness side by side, whereas in HH objects the image through RG 645 is brighter than that through RG 610 by a factor of about 1.7 on the average due to their prominent emission-lines concentrated on the former band.

3. RESULTS AND SOME FOLLOW-UP OBSERVATIONS

The 105/150-cm Kiso Schmidt has been used to apply this method. We have

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hitherto found 18 objects (13 around and towards the southeast of M42, two in NGC 2264, two in NGC 1499, and one in NGC 7822). They are listed in Table I.

TABLE I

Objects	α (1950)	δ	Confirmation	Identification
NGC 1499-1	$3^h57^m09^s$	+36°02!3	HH (Okayama)	
2	3 57 13	+36 02.5	HH (Okayama)	Gyul'budagyan 8
M42-1	5 31 05	-06 31.6	HH (Curtis)	Reipurth 17a-d
2	5 31 34	-04 46.8		
3	5 32 45	-06 31.6	HH (Curtis)	
4	5 32 55	-04 42.1		
5	5 32 57	-05 05.9		Haro 6a, Reipurth 19a
6	5 33 00	-05 05.8		Haro 5a, Reipurth 19b
7	5 33 02	-06 28.9		Reipurth 22
8	5 33 14	-06 25.4	HH (Curtis)	Reipurth and Sandell B
9	5 33 41	-05 06.5	HH (Curtis)	Reipurth 31
10	5 33 43	-05 06.0		Reipurth 32
11	5 33 57	-06 25.0		Reipurth 40, Takaba *et al.*'s CO wing
12	5 34 20	-06 51.7		Reipurth 45
13	5 36 57	-07 28.3		Nebulosity around Haro 4-255
NGC 2264-1	6 38 17	+10 18.0	HH (AAT)	
2	6 38 19	+09 49.4		
NGC 7822-1	23 59 13	+66 52.1	HH (Okayama)	

Two sorts of follow-up observations have been done for the objects in the table. One is an objective-prism observation in the red with the Curtis Schmidt telescope (61/91-cm) at Cerro Tololo. A deep plate was taken for the M42 region, and could confirm the HH nature of four of the objects.

The other is low-dispersion slit spectroscopy. A Cassegrain spectrograph with an image intensifier was used on the 188-cm reflector at the Okayama Astrophysical Observatory (reciprocal dispersion 116 A/mm). This has confirmed the HH classification of three of the objects. In addition, NGC 2264 No. 1 has been shown to be a bona fide HH object through Cassegrain spectroscopy obtained with the 3.9-m AAT (Walsh 1985). The object has a chain structure characteristic of HHs; it is composed of three knots in line (Figure 1c). An IRAS source 06382+1017 is located nearly between two of them, and, therefore, presumably excites the HH object.

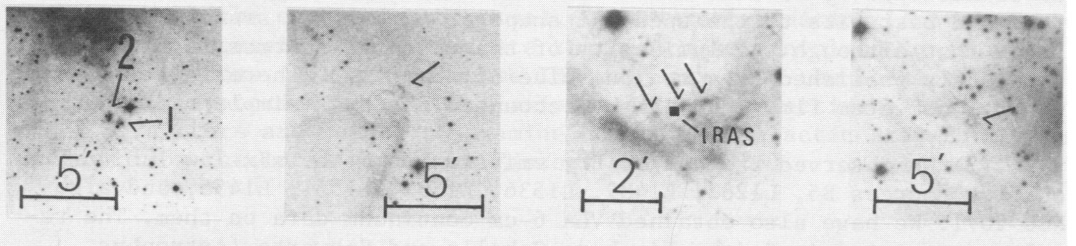

Figure 1a NGC 1499-1 and 2 Figure 1b M 42-3 Figure 1c NGC 2264-1 Figure 1d NGC 2264-2

Fig. 1

We are extending our searches by this technique to other star-forming regions. We are also continuing with follow-up observations to confirm the HH nature of the rest of the objects in Table I.

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IR LINE AND CONTINUUM EMISSION FROM BIPOLAR OUTFLOW SOURCES

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Most of our understanding of BPF's is based on observations of the neutral and ionized gas in bright, high luminosity sources. Data on low luminosity ($L \lesssim 30\ L_\odot$) objects has now become more available (e.g. Frerking and Langer, Astrophys. J. 256, 523, 1982) permitting a test of models at this end of the luminosity range. We have performed a series of multi-wavelength observations, emphasizing low luminosity objects.

(1) First, we have obtained revised values of L using the IRAS data base at the NRL IRAS Data Reduction Center, and we have produced a revised plot of MV(CO) vs. L. (Mozurkewich, Schwartz and Smith, Astrophys.

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