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BRIGHTENING OF HERBIG-HARO OBJECT NO. 1

Slow time variations have been observed or suspected in the structure of several Herbig-Haro Objects for which long series of direct photographs of uniform quality and adequate scale are available. The best-documented case is HH 2 = Haro 12a (Herbig, *Non-Periodic Phenomena in Variable Stars*, p. 75, 1968).

I wish here to call attention to a new example: the brightening of one portion of the brightest known Object, HH 1 = Haro 11a, also near NGC 1999. This Object has the form of a 4" x 8" ellipse, elongated in about p.a. 130°. The best 120-inch direct plates show that there are 3 or 4 very sharp nuclei within this small area, together with considerable nebulous structure. In 1959-60, when the first 120-inch plates were obtained, the two star-like nuclei at the northwest end of this Object were very faint. They must also have been very faint (although unresolved) on 36-inch (Crossley) reflector plates extending back to 1946 because in those years HH 1 always appeared as a slightly diffuse star with only a very short, curved nebulous tail extending for 5" toward the northwest (Herbig, *Ap.J.* 113, 697, 1951). At some time between 1962 and 1968, during the only large gap in the Lick plate series, one or both of the close pair of faint nuclei (separation 1") at the northwest end of this Object underwent a large increase in brightness. A very slight further rise may have taken place between 1968 and 1973. As a consequence, the northwest end of HH 1 -- formerly the faint end -- now dominates the structure, and appears at Crossley scale (39"/mm) like a star of $m_{pg} \approx 16.0$ with a nebulous appendage to the southeast, in the opposite sense as before.

Possibly this brightening is related to the changes in the integrated spectrum of HH 1 that were noted by Böhm, Perry, and Schwartz (Ap.J. 179, 149, 1973) between 1955 and 1969.

The gradual changes in the structure of the nearby Object HH 2 (described in 1968) continue. Nucleus H is now the brightest point in HH 2 at about $m_{pg} = 16.2$. This came about as the result of a slow, steady increase since its initial rise from invisibility prior to 1953. Nucleus A itself has disappeared except for an appendage, or possibly another nucleus, slightly north of the original position of A; this feature is now about mag. 18.0. There have been only small changes in the other nuclei of HH 2 since 1968.

I am very indebted to Mr. E. A. Harlan, who has obtained all of the Crossley plates in this series since 1968.

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