

INFRARED PHOTOMETRY OF V 1057 CYGNI

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SUMARIO

En el Observatorio Astronómico Nacional, del Instituto de Astronomía de la Universidad Nacional Autónoma de México en San Pedro Mártir, B. C. se han obtenido datos fotométricos en el infrarrojo, en el sistema *JHKL* del extraordinario objeto V 1057 Cygni de la nebulosa Norteamérica.

La fotometría infrarroja apoya la hipótesis de que el gran aumento de brillo que tuvo V 1057 Cygni es una manifestación del mismo fenómeno que causó también el gran aumento de brillo que tuvo años atrás FU Orionis.

At San Pedro Mártir Observatory, University of Mexico, we have performed infrared photometry of the object V 1057 Cygni, presumably embedded in the North America Nebula. The observations, on the *JHKL*-system, were made in September 1971 with the photometric equipment used on earlier occasions by us (cf. Mendoza 1968), attached to the 152-cm. photometric telescope.*

The observational data are listed in Table 1. The columns of this Table contain, first, the *K*-magnitude; second through fourth, the *J-K*, *H-K* and *K-L* color indices, respectively; and last, the number of the nights during which the object was observed. The probable error of a single observation is also given in Table 1, just below the observational data.

TABLE 1
Infrared Photometry of V 1057 Cygni

<i>K</i>	<i>J-K</i>	<i>H-K</i>	<i>K-L</i>	<i>n</i>
4.63 ±0.03	1.33 ±0.05	0.50 ±0.04	0.66 ±0.03	3

TABLE 2
Multicolor Photometry of four Stars

<i>Object</i>	<i>V</i>	<i>U-V</i>	<i>B-V</i>	<i>V-R</i>	<i>V-I</i>	<i>V-J</i>	<i>V-H</i>	<i>V-K</i>	<i>V-L</i>	<i>Sp</i>
V 380 Ori	10.31	+0.29	+0.52	+0.73	+1.41	+2.11	+3.11	+4.23	+5.57	A1:
FU Ori	8.94	+2.41	+1.41	+1.22	+2.17	+3.04	+3.80	+4.35	+5.13	F2:I-II
α Cyg	1.25	-0.14	+0.09	+0.11	+0.21	+0.25	+0.30	+0.36	+0.47	A2 Ia
V 1057 Cyg	9.47	+1.81	+1.23	+1.21	+2.35	+3.51	+4.34	+4.84	+5.50	A1:I-II

The results of the infrared photometry for V 1057 Cygni combined with those of the *UBVRI* photometry obtained earlier by Mendoza (1971a) are shown in Table 2. The columns of this Table contain, first, the name of the object; second, the *V*-magnitude; third, through tenth the *U-V*, *B-V*, *V-R*, *V-I*, *V-J*, *V-H*, *V-K* and *V-L* color indices, respectively; and last, the spectral type (cf. Mendoza 1971a). For comparison purposes, we also have given similar data on V 380 Orionis, FU Orionis and α Cygni. Notice that the *UBVRI* and *JHKL* photometries for V 1057 Cygni were obtained two months apart. However, it should be noted that a visual estimate of the *V*-magnitude and an additional measurement of the Λ -index (Mendoza 1971b) do not indicate an appreciable change, if any, in the *VRI* spectral region for V 1057 Cygni.

* Property of the University of Arizona, operated under the direction of the Instituto de Astronomía of the Universidad Nacional Autónoma de México through an agreement between both universities.

The data given in Table 2 can be used to derive total energy fluxes (Mendoza 1970). The resulting spectral energy-curves for V 1057 Cygni, α Cygni, V 380 Orionis and FU Orionis are illustrated graphically in Figure 1. The photometric errors are such that the general features shown in this Figure should not be appreciably affected by them. The three T-Tauri-like objects, namely V 380 Ori, FU Ori and V 1057 Cygni, show infrared excesses. Another way to illustrate this circumstance is by the $(R-I, K-L)$ array (cf. Mendoza 1969) which is given in Figure 2 for the objects listed in Table 2.

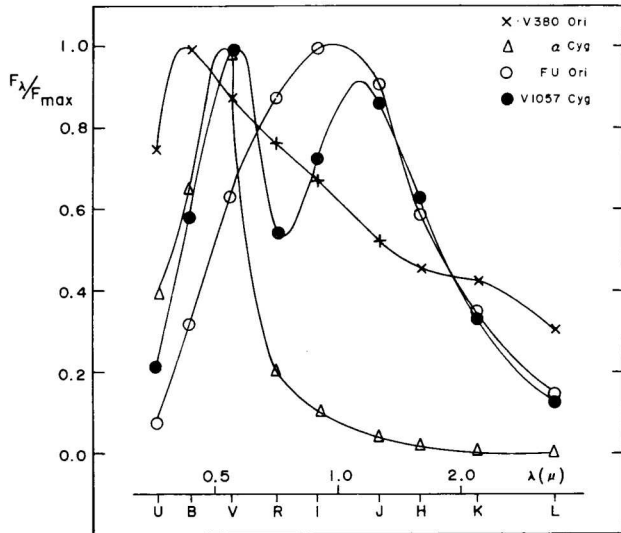


Fig. 1.—The spectral energy-curves for V 380 Orionis, FU Orionis, α Cygni and V 1057 Cygni.

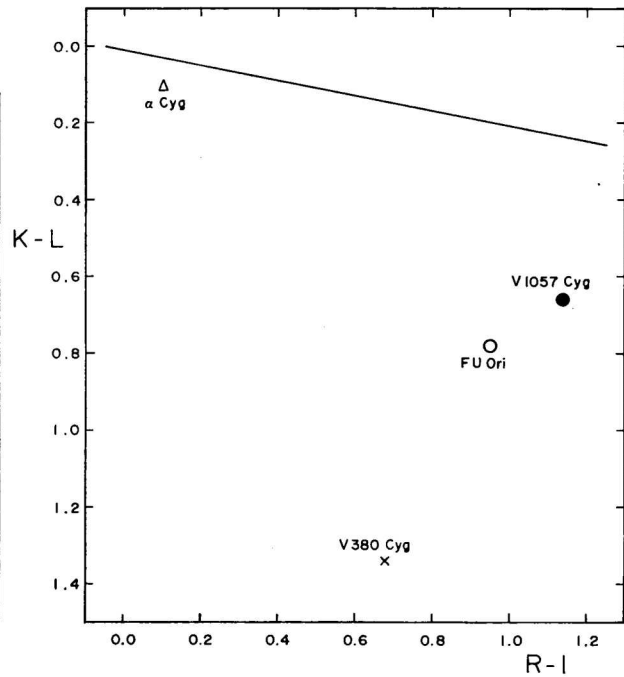


Fig. 2.—The $(R-I, K-L)$ array for the objects listed in Table 2. The straight line represents the locus of "normal" stars. The scatter around this line is represented by α Cygni, approximately. The farther a point lies below the straight line, the more infrared excess the object has.

The spectral energy-curves and the position in the $(R-I, K-L)$ diagram of V 1057 Cygni and FU Orionis, are sensibly similar. Therefore, we may say that, there is sufficient evidence to expect that the brightening of V 1057 Cygni is a manifestation of a similar event that caused the brightening of FU Orionis.

REFERENCES

- Mendoza, E. E., 1968, *Ap. J.*, **151**, 977.
 ———. 1969, *Pub. Depto. Astron. Univ. de Chile*, No. 7, 106.
 ———. 1970, *Mem. Soc. Roy. Sc. de Liège*, XIX, 319.
 ———. 1971a, *Ap. J. (Letters)*, **169**, L117.
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ERRATUM

In the paper "Infrared Photometry of V 1057 Cygni" (Bol. Obs. Tonantzintla y Tacubaya 6, 135, 1971) Table 2 should be changed.

This correction is due to a typographical error in the V magnitude of V 1057 Cygni. Also Figure 1 carries out this error. The correct Figure is given below. We are indebted to Mrs. N. Morrison for pointing out this mistake.

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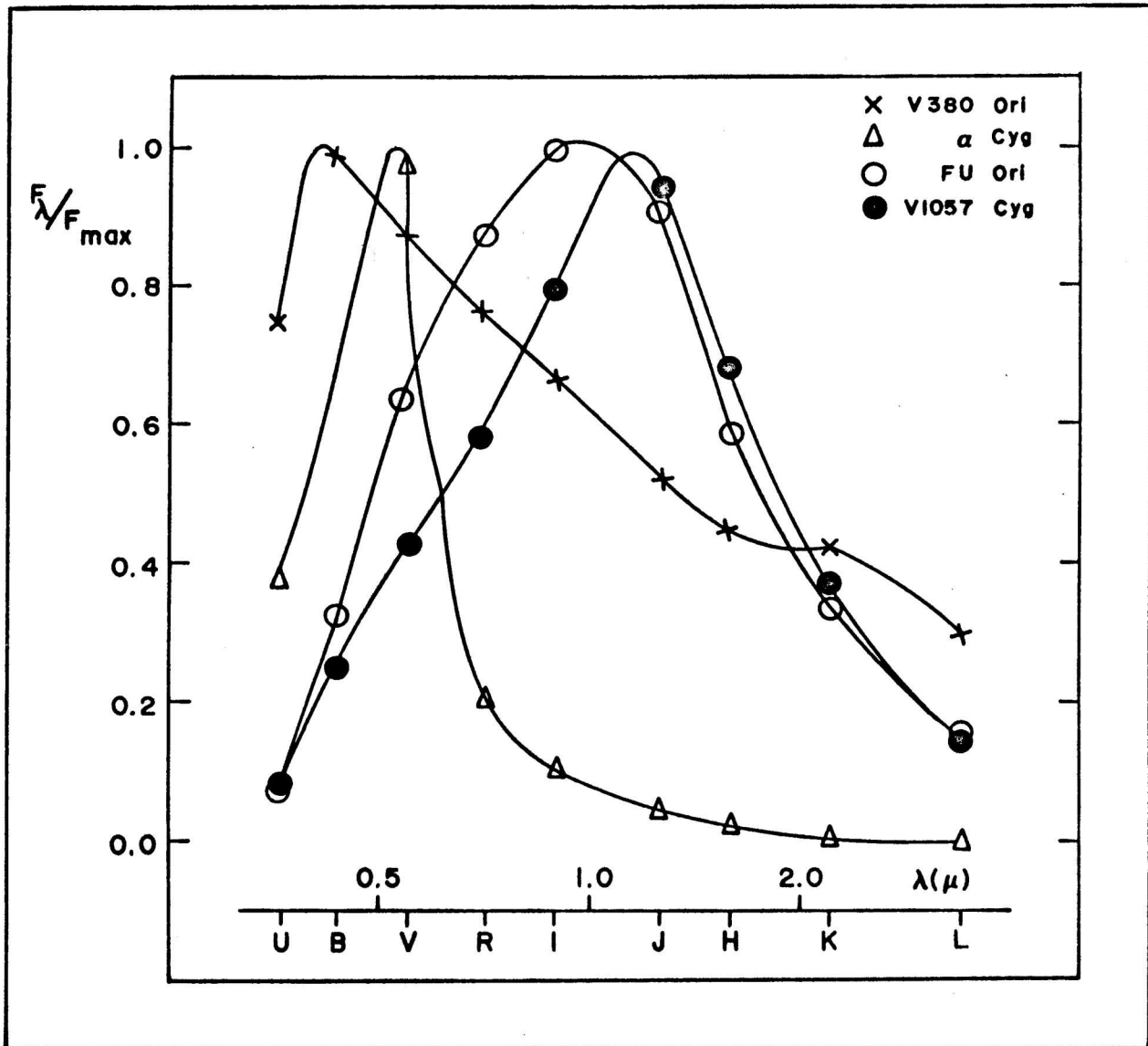


Fig. 1.- The spectral energy-curves for V 380 Orionis, FU Orionis, α Cygni and V 1057 Cygni.