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Continuing the systematic study of novae, carried out at Asiago since 1958, two recent galactic novae, V400 Per (1974) and V373 Sct (1975) have been observed, after the announcement of the discovery, during their decline towards minimum, with the spectrographs applied to the telescopes of 122 cm and 182 cm of the Asiago astrophysical Observatory, equipped with image-tubes.

1.- Nova V400 Per was found by Sanduleak (1974) on Nov.9,1974 as a star of 11 magnitude. Pre-discovery observations showed however that the maximum had been attained much earlier, on Sep 22 with magnitude  $\sim 8$ . The nova was moderately fast, with strong brightness fluctuations during the early decline ( fig.1 ). At the moment of the discovery the star had already reached the Orion phase and the spectrum ( fig.2) was characterized by the presence of wide emission lines of H, HeI ( $\lambda\lambda$  6678,5875, 5047, 4921 ), NII ( fifteen multiplets ), NIII, OII, FeII (mult.27,38,42,74 ), all shortward accompanied by fairly strong P Cygni absorptions. Forbidden lines were represented by the doublet of [OI] at  $\lambda$  6300 - 6364 and by the auroral line of [NII] at  $\lambda$  5755. In the infrared OI  $\lambda$  8446 was outstanding, followed by OI  $\lambda\lambda$  7775, 7957, 7982. The mean expansion velocity of the ejected shells, derived from the halfwidth of the emission bands, was :  $900 \pm 165$  km/s, while the blueshifted absorption lines gave a mean radial velocity of  $-1760 \pm 22$  km/s.

The nebular stage was reached on Jan 14 or 15, 3.75 magnitudes below maximum, with the appearance and the rapid strengthening of [OIII] lines at 5007, 4959, 4363. At this phase the absorption components were no longer visible and most of the NII, FeII and OII lines weakened or disappeared. On February the excitation was still increasing, as shown by the strengthening of the [OIII] lines, of HeII 4686, NIII 4640, [NII] 5755, compared to HeI and the Balmer lines. Later, high excitation lines of [FeVI] ( $\lambda\lambda$  5176, 5677 ) and [FeVII] ( $\lambda$  5178,  $\lambda$  6087 ) emerged and reached a moderate strength ( fig.3 ). On Jan 1976, at magnitude 16.2, the spectrum of the nova was characterized by the following broad emission lines in order of decreasing intensity : [OIII]  $\lambda\lambda$  5007,4959 ; H $\alpha$  accompanied by [NII]  $\lambda$  6548- $\lambda$  6583 fairly strong; [OII]  $\lambda$  4363 ; [NII]  $\lambda$  5755 ; H $\beta$  ; NIII  $\lambda$  4640 ; HeII 4686. Some of the lines ( in particular H $\alpha$  ) were split into two separate components or

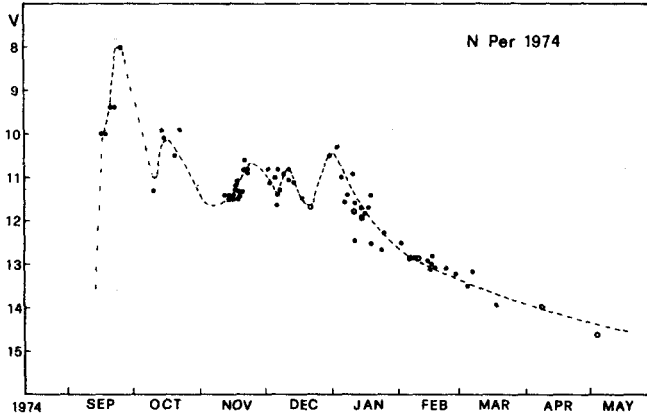


Fig.1 - Light curve of Nova Per 1974. Open circles represent Asiago observations.

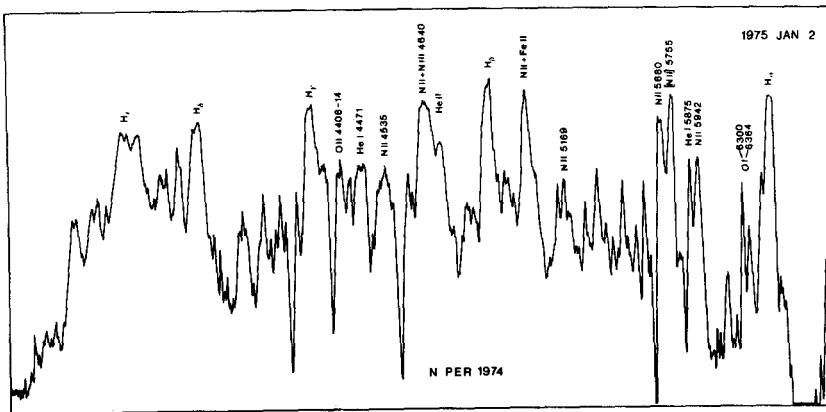


Fig.2 -Tracing of a spectrum of Nova Per 1974 in the Orion phase.

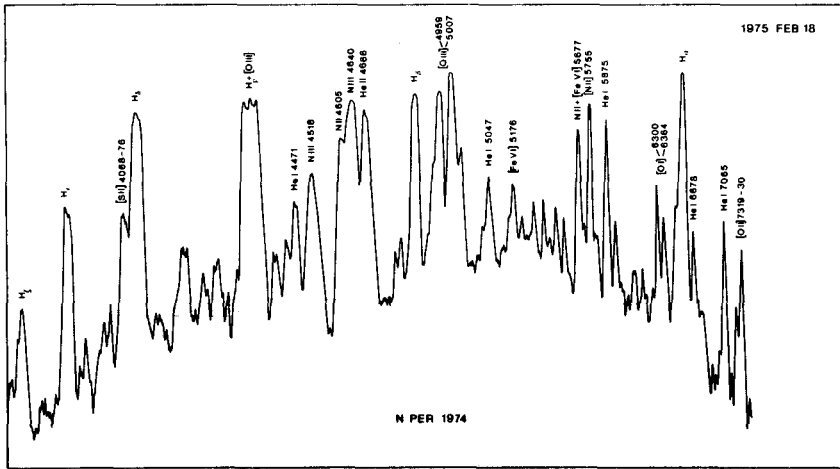


Fig.3 - Tracing of the nebular spectrum of Nova Per 1974

displayed a saddle-shaped form. The high excitation forbidden lines of FeVI and FeVII were no longer visible.

2.- Nova V373 Sct was discovered by Wild ( 1975 ) on June 15, 1975 as a star of magnitude 7.9 . Very likely the maximum was attained about one month earlier, on May 11, at visual magnitude 7.1 . During the early decline the nova displayed large brightness fluctuations ( fig.4 ). When the first spectra were taken at Asiago on June 18, the nova had already reached the Orion phase and the spectra were characterized by the presence, over a moderately strong continuum, of wide emission lines of H ( up to  $H_{15}$  ), NII, OII, FeII, HeI, all accompanied by blue - shifted absorption lines. Forbidden lines were represented by [OI]  $\lambda$ 6300-6364, [NII]  $\lambda$ 5755, [NII]  $\lambda$ 6548-83 partly blended with  $H_{\alpha}$  .(fig.5 ). In the infrared the strongest lines were those of OI at  $\lambda$ 8446, 7775 and HeI 7066, 6678.

The degree of excitation increased in July, when the nova attained the " phase 4640", characterized by the strengthening of the HeI lines and the appearance and enhancement of NIII (  $\lambda$  4640, 6469 ) and HeII (  $\lambda$ 4686). The expansion velocity derived from the halfwidth of the emission bands was of the order of one-thousand km/s , while the radial velocity of the absorption shells was about -1260 km/s. A second shell was moving with a still higher velocity, of the order of 2200 km/s.



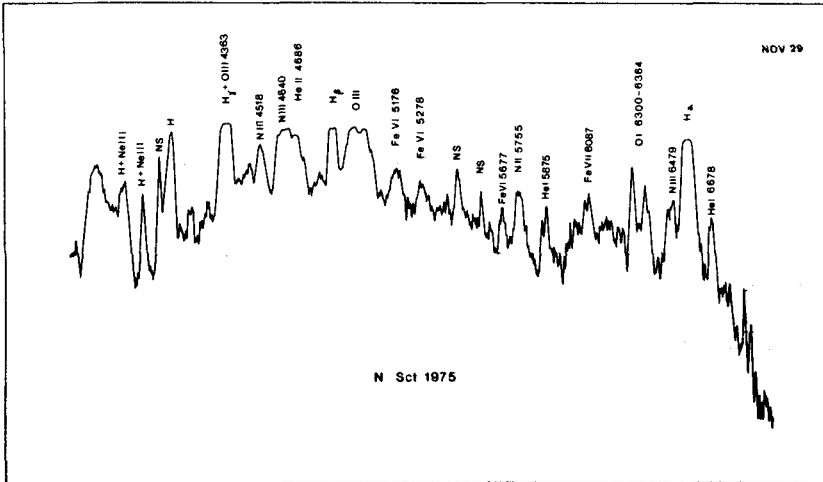


Fig.6 - Tracing of the spectrum of N Sct in the nebular stage.

The evolution was normal. The nova entered the nebular phase at the beginning of August, about three magnitudes below maximum; at the same time the continuum weakened, the absorptions disappeared and emerged the nebular spectrum with emission lines of [OIII] at  $\lambda\lambda$  5007, 4959, 4363, [NeIII] at  $\lambda\lambda$  3967, 3869, [OI] 7319-7330, [NII]  $\lambda$  5755. The HeI flash probably occurred some days earlier. HeII  $\lambda$  4686 was strengthening. In the infrared the strongest line was that of OI  $\lambda$  8446, followed by HeI  $\lambda$  10830. From Sep to Nov, while the degree of excitation was further increasing, forbidden lines of [FeI] (5146, 5176, 5677) and [FeVII] (5169, 5278, 6087) appeared and rapidly strengthened. [FeX]  $\lambda$  6374 and [AX]  $\lambda$  5535 were also weakly present, [FeX] being blended with [OI]  $\lambda$  6364 (fig.6). They soon disappeared.

The last spectrum of the Nova, obtained on August 1976, 450 days after maximum, showed the same features, with only these differences: that most of the emission bands presented a saddle-shaped profile and that no further trace of FeVI and FeVII could be seen.

In conclusion, these two recent novae, both observed after they had reached the Orion phase, look alike to one another, having both an amplitude of about 11 magnitudes, a moderately fast decline, strong brightness oscillations and a normal spectral evolution, the excitation being slightly higher in Nova Scuti.

It can be observed, comparing these novae with other novae studied at Asiago in the past years, that in general:

- a) The differences observed in the light curves and spectra at maximum and during the early decline, which at times are very significant, disappear after the nova has entered the nebular stage. The spectral evolution during this phase follows for all of the novae more or less the same track, the difference being only in the degree of excitation which in some novae may attain very high values.
- b) In most of the novae the lines present a complex structure, with a tendency to assume saddle-shaped profiles or to split into two symmetrical components. This seems to be the general rule, with very few exceptions, if any.

This is a preliminary paper on the two novae V400 Per and V373 Sct. More detailed informations with the list of the emission lines observed in the spectra at different phases and an estimate of their strength will be given in a forthcoming paper.

#### Bibliography:

- 1.-Sanduleak, N., 1974, IAU Circ. No. 2716.
- 2.-Wild, P., 1975, IAU Circ. No. 2788.

#### D I S C U S S I O N of paper by ROSINO:

APPENZELLER: In parts of your light curve of Nova Scuti 1975 there was a relatively large scatter (of about 1.5 mag.) of the individual magnitude values. Does this mean that there were real light changes of that amplitude on very short time scales?

ROSINO: Although part of the scattering of the magnitudes in the light curve may be due to inhomogeneity of the observers using different comparison stars, I think that a good part is real and that the nova had, at that time, rapid and strong brightness variations. I should like, on this occasion, to emphasize the necessity of photometric observations continued during several hours each night, in order to see, in normal novae, whether periodic or semiperiodic variations, with periods of minutes or hours, may be present.

SURDEJ: Can you comment on the appearance and disappearance of the two displaced absorption components present in the spectra of novae you observed?

ROSINO: The displaced absorption components in both novae (N Sct and N Per) were present since the beginning of the spectroscopic

observations, both of the novae being in the so-called "Orion phase". They disappeared as soon as the novae entered in the nebular stage and the continuum almost vanished. This is the usual pattern of spectral evolution in galactic novae.