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o And. THE OVERALL BEHAVIOUR OF THE SHELL

The bright Be star o And (1 And, HR 8762, HD 217675 - 6, BD+41^{o}4664, SAO 52609, IDS 23019 + 4219) has been observed for over 90 years. Throughout this period numerous observers detected highly variable spectrum, photometric changes and substantial range of radial velocity of this star. Much effort has been devoted to period searching in these data. In the present note the summary of the known history of the shell development is given.

Schmidt (1959) suggested that the shell of o And reappears with the period 31 years. This period was advocated by Pasinetti (1967, 1968), and once again, after the outburst in 1975, by Fracassini and Pasinetti (1975). In a detailed analysis based on critical evaluation of the homogeneous material Gulliver, Bolton and Poeckert (1980) have shown that the behaviour of the shell is far less orderly than described by previous authors and is probably non periodic.

Their conclusion is supported by the fact that another shell has been developed since the end of 1980 (Bossi et al., 1982, Baade et al., 1982). On the high-dispersion spectrogram taken February 1, 1983 by Dr. V. Umlenski with the 2m RCC telescope of the Rožen Observatory, Bulgaria, both hydrogen and metallic shell is clearly seen. Most of the lines show asymmetrical profiles. This finding was confirmed also by Barker (1984).

With the aid of published material and plates taken at Crimea Observatory by Dr. S. Kříž in 1965, by many observers at Ondřejov Observatory in 1968 - 1982 and by Dr. V. Umlenski at Rožen Observatory, the known history of the shell development can be summarized. This is depicted in Figure 1. Due to the limited size of the figure not all observations are included, but provisions were made to reproduce the shell behaviour of o And as reliably as possible. The shell strength is defined as in the paper by Gulliver et al. (1980): 0, normal B-type spectrum; 0.5, very weak hydrogen shell; 1.0 - 1.5, weak to moderate hydrogen shell; 2.0 , strong hydrogen shell (but no metallic lines); 2.5 - 3.0, weak to moderate metallic shell lines.

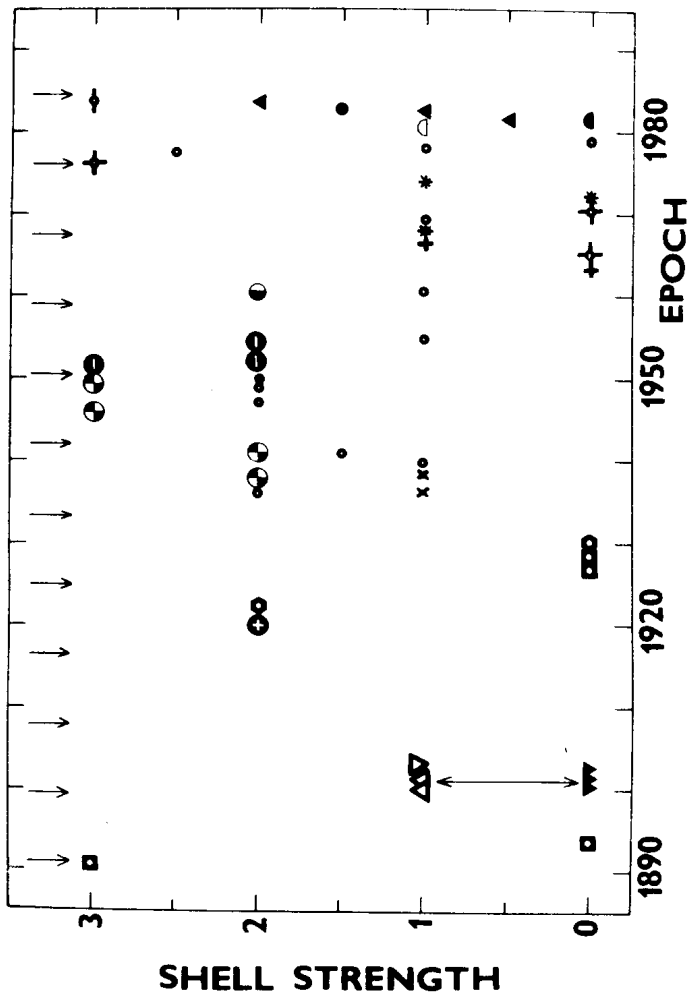

Figure 1. History of the shell development of o And. Following symbols are used:

▲ 1, ● 3, ▼ 4, ⭘ 5, ✱ 7, ◓ 8,
∘ 9, ⊕ 11, ▽ 13, ✚ 14, ◠ 17, ◐ 18
◒ 20, ⊖ 21, ✖ 22, ◘ 23, △ 24,
Crimea and Ondřejov Observatories, Rožen Observatory.
The numbers are explained in the reference list.

Recently, Harmanec (1984) stressed the possible connection of the presence of the hydrogen shell and the orbital motion of the closer visual companion to o And. He disclosed that the recorded hydrogen-shell episodes seem to occur with the 3100-day periodicity and he stated that the observed angular separation of the pair and the parallax of o And are in excellent agreement with a similar (8.5 years) period.

This period is indicated by arrows in the upper part of Figure 1. It is readily seen that the behaviour of the hydrogen shell is too complicated to be expressed by simple periodic process.

The hydrogen shell of o And is the subject of the variability on even shorter time-scale than mentioned so far. To give few examples Gulliver et al. (1980) noted temporary increase of shell strength from November 1976 to January 1977; Poeckert and Gulliver (1980) and Gulliver (1980) reported a short-lived hydrogen shell from May 1980 to August 1980. Also variations on day time-scale are definitely present (Gulliver et al., 1980, Hubert-Delplace and Hubert, 1979). The overall picture is also influenced by the inaccurate description of the old spectra. Note the difference of the description of the same spectrograms by Wright (1902) and Campbell (1928) depicted by the abscissa in the lower part of Fig. 1.

It seems that the period proposed by Harmanec (1984) is in better agreement with metallic-shell events (4 coincidences, in 5 cases the observations are not available, in 3 cases the metallic shell was not observed). One should try to find more archival plates in order to have the recorded history of o And as complete as possible. This would help to solve the puzzle of o And.

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