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THE COMING SHELL PHASE OF AX MONOCEROTIS

The 6^m8 star AX Monocerotis = HD 45910 (1900.0: $\alpha = 6^{\text{h}}25^{\text{m}}12^{\text{s}}$, $\delta = +5^{\circ}56'11''$; 1972.0: $\alpha 6^{\text{h}}29^{\text{m}}03^{\text{s}}$, $\delta = +5^{\circ}53'4''$) has long been known to have strikingly variable spectrum. For example, the hydrogen lines are at times broad, shallow, and structureless; at other times they have a pronounced structure similar to that of P Cygni or a very slow nova. The absorption component of the P Cygni profile is occasionally double or even triple, with very strong, deep and rather narrow components. Moreover, a metallic shell spectrum appears at times as a transient feature.

Mrs. A.P.Cowley (1) showed that this metallic shell spectrum appears periodically (although with variable duration and intensity) with the orbital period of the system, 232.5 days. AX Monocerotis is a binary: the primary component is something like B3:IV:ep, while the secondary, visible in the visual region of the spectrum, is about K2:II:. The metallic shell spectrum always appears roughly a quarter period before conjunction with the K star in front. The metallic shell may be associated with gas streaming from the K giant to the B component. In our model of the system, soon to be published, the K star originally was the more massive component, expanded to the Roche limit, has lost a considerable part of its mass, and is now near the end of the rapid phase of mass loss. The material that flows from it first forms a disk or ring around the B star and eventually is accreted by it. The P Cygni profiles of the emission lines indicate that the process of accretion is not quiet and leads to occasional outbursts or at least vivid surface activity. The metallic shell is probably associated with the original stream rather than with the gaseous structure enveloping the B star.

Systematic observations of AX Mon may verify this model and, if it is correct in principle, they may furnish very valuable material about the mass transfer in close binary systems and about the process of accretion of the material, as well as about the interaction between the B star and the circumstellar disk or ring around it.

A very favorable time for such observations is right now. Next conjunction with the K star in front will be on May 29, 1972. According to Cowley's 1962 observations, the metallic shell lines should appear around phase 0.80

(April 13) and attain their maximum strength around May 13. This would be too late for observations. However, in most cases the shell phases seem to have come earlier. Boyarchuk and Pronik (2) observed the onset of the shell lines at phase 0.65, which will be about March 9, and in the past it came as early as phase 0.6 (February 26). Magalashvili and Kumsishvili (3) observed in four cycles a rather pronounced decrease in the U magnitude of AX Monocerotis by about $0^m.4$, while the B and V magnitudes showed little change. This phenomenon may be due to increased continuous absorption beyond the Balmer limit. The decline began around phase 0.55 (corresponding to February 15 this year), and the minima invariably occurred at phase 0.75 (April 2).

Spectroscopic and photometric observations as well as scanning the line profiles for rapid changes may be very rewarding in the coming weeks.

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References:

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- (3) Magalashvili I.L., Kumsishvili Ja. I., 1969 Bull. Abastumani No.37, 3.