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AY LACERTAE IS A CATAclySMIC VARIABLE

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The variable star AY Lac = 207.1928 was discovered by Hoffmeister (1928a). He found the star, at maximum about 15^m pg, visible only on several plates taken during late August to early September, 1927, and fainter than 16^m.5 on the rest of the available plates. The discoverer suggested that the star could be a long-period variable (Mira type, according to our current classification), a U Geminorum variable, or a Nova. The finding chart can be found in Hoffmeister (1928b). Himpel (1943) made 43 visual observations of the star in March to August, 1943. The star was invisible (fainter than 14^m.0–14^m.8) on all occasions till August 3, when the star was fainter than 14^m.8; only the last observation, of August 5, was positive, at 14^m.0 vis. Himpel claimed AY Lac to be definitely Nova-like and noted that it was invisible on existing photographic atlases and reproductions, with limiting magnitudes from 15^m.8 to 17^m. With the only one unconfirmed visual observation, we cannot consider the outburst announced by Himpel quite reliable.

Geßner (1966) studied the star on 250 Sonneberg plates spanning JD 2425200–2427300, 2436800–2438000. She found an additional brightening of the star: AY Lac was found fading from 14^m.5 on JD 2437888 (August 11, 1962) to 16^m.5 on JD 2437906 (August 29, 1962). The star could not be found on the Palomar Sky Survey prints (fainter than 20^m). Considering the outburst from Himpel (1943) real, Geßner (1966) represented the three maxima, JD 2425125 (Hoffmeister), 2430942 (Himpel), and 2437885 (Geßner), with the formula $\text{Max} = 2437885 + 1159^d/n \times E$. The fourth edition of the GCVS (Kholopov, 1985) reproduces these light elements and gives the type M:. The Downes & Shara (1993) catalogue lists the star as a non-cataclysmic variable. The on-line catalogue and atlas of cataclysmic variables (Downes *et al.*, 2003), nevertheless, lists the star with the type UG:/M and the following remark: “Although classified as M in the GCVS, Sumner (<ftp://ftp.nofs.navy.mil/pub/outgoing/aah/sequence/sumner/aylac.seq>) still considers this a possible UG”. The chart in this atlas does not identify AY Lac definitely but shows a circle with several stars inside, at the formal position of the variable (22^h22^m23^s, +50°23'29", 2000.0), to the south of the correct position (see below).

During the preparation of the electronic version of the GCVS Volume II with accurate coordinates (Samus *et al.*, 2003), we noticed that there were no red stars near the position of AY Lac and thus its cataclysmic-variable classification was very probable. The

plate stacks of the Sonneberg Observatory were studied once again. Only the two outbursts discovered by Hoffmeister (1928) and by Geßner (1966) could be confirmed, with no additional outbursts on newer plates (JD 2437936–2449625). After the date of the outburst reported by Geßner, the star is visible on two plates of the best quality, taken on JD 2437934 (September 26, 1962), near the plate limit (17^m5-18^m). Thus, the duration of the bright state of 1962 was considerable. The star is under the plate limit on more than 120 plates of the Moscow plate collection taken with the Crimean 40 cm astrograph on JD 2445642–2450371, with the typical limiting magnitude of 17^m5 . Only five Moscow plates were taken earlier. Three of them (JD 2441174–2441177) do not show the star. The two remaining plates were taken during the descending branch of Geßner’s outburst, on September 19/20, 1962 (JD 2437927). The position of AY Lac is at the very edge of these plates, and one of them apparently shows a star-like object near the plate limit ($\sim 17^m$) that may be AY Lac, whereas the second one, of poorer quality, shows nothing. We can conclude that the outbursts of AY Lac are rare phenomena.

The Sonneberg plate GB715, taken with the 40 cm ($f = 2$ m) astrograph on August 12, 1962 (JD 2437889) and clearly showing the star in outburst, was scanned and then used to measure the coordinates of AY Lac, relative to twelve neighbouring stars from the US Naval Observatory A2.0 catalogue. The position we measured ($22^h22^m22^s.1$, $+50^\circ23'40''$, J2000.0, epoch 1962.612) is probably accurate to $1-2''$ both in right ascension and in declination. Very close to this position, there is a faint (approximately 21^m) star in the POSS-II blue image. From nine GSC2.2 stars, we determined its coordinates as $22^h22^m22^s.18$, $+50^\circ23'40''0$, J2000.0, epoch 1987.792; these coordinates must have a sub-arcsecond accuracy, but we cannot be sure that they really refer to AY Lac and not to another faint star very close to AY Lac.

Figure 1 shows, approximately on the same scale, the field of AY Lac on the Sonneberg plate GB715 and in the POSS-II. The faint POSS-II star discussed in the text is not clearly visible in this reproduction.

We conclude that AY Lac is definitely a cataclysmic variable, most probably a recurrent Nova. If the brightening reported by Himpel (1943) is considered reliable, a dwarf-nova (WZ Sge) classification cannot be ruled out.

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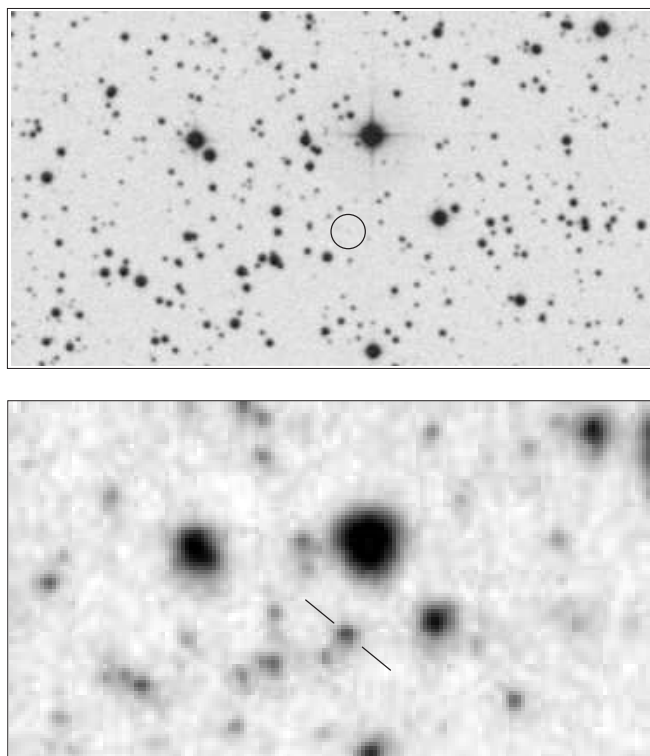


Figure 1. The field of AY Lac. Top: POSS-II (blue), 3.5×6.6 , the position of AY Lac is circled; bottom: plate GB715, the bars mark AY Lac in outburst.

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