

**OBSERVATIONS IN SUPPORT OF THE NON-VARIABILITY
OF BORRELLY'S STAR**

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Abstract

Photoelectric and spectroscopic observations indicate that BD $-10^{\circ} 62$, or Borrelly's star, is a normal G3 dwarf and is non-variable.

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1. Introduction

On November 3, 1871, Alphonse Borrelly, a French astronomer working at Marseilles Observatory, noted a star of magnitude 6 or 7 at $\alpha = 00^{\text{h}} 17^{\text{m}} 17.68^{\text{s}}$, $\delta = -10^{\circ} 10' 10.1''$. By November 8 the star was of magnitude 8 and on the 24th, magnitude 10. He noted that the magnitude then remained unchanged into January of 1872.

There is still a tenth magnitude star in the position recorded by Borrelly. Borrelly's star is at the location of the star BD $-10^{\circ} 62$. It has been checked frequently by 19th and 20th century astronomers as recounted by Joseph Ashbrook (1980). Ashbrook pointed out that although the star had been observed by several observers on many occasions, there were to date no known photoelectric or spectroscopic data.

With this fact in mind, the authors made arrangements to conduct a series of observations with the aim of determining the spectral classification and photoelectric magnitude of Borrelly's star along with any noted variation if, indeed, such was present.

2. Observations

During the months of August and September, 1981, the authors made arrangements with Dr. Arthur Hoag, Director of the Lowell Observatory in Flagstaff, Arizona, to obtain a spectral plate of Borrelly's star. On the night of October 20, 1981, a IIA-D plate was exposed using the 1.88m telescope of the United States Naval Observatory in Flagstaff, by Drs. Fred Vebra and Harry Guetter. The exposure was 59 minutes, and examination of the plate by Vebra and Guetter yielded a spectral classification of G3V. They were also able to obtain photoelectric data for the same night and found the following values:

$V = \text{magnitude } 10.29 \pm 0.01$, $B-V = +0.74$, and $U-B = +0.28$.

In order to search for short term variation in the light output of Borrelly's star, the authors were given use of the 0.4m telescope at the Braeside Observatory in Flagstaff. Observations on the nights of October 23, 24, 25, and 26, 1981, were undertaken using the 0.4m telescope with an EMI Starlight 1 photometer, using an uncooled EMI 9924A photomultiplier tube operated at 950 volts through a 1mm Schott GG-495 filter which provides the V bandpass for the system. The nearby stars SAO 128726 and SAO 128724 were used as comparison and check star alternately. Mean coefficients of extinction and

transformation were applied with the aid of a Z80-based microcomputer to reduce the observations to zero atmosphere and transform to the standard V of the UBV system according to the methods of Hall and Genet (1981). All observations were made in the sequence

$$C_1 \text{ Sky}_1 V_1 V_2 V_3 \text{ Sky}_2 C_2,$$

the recorded time of the measurement being that of the V_2 measure. The same diaphragm was employed throughout. At no point² were the comparison and check stars seen to vary one against the other by a significant amount over the standard deviation of the measurements themselves. On none of the four nights was the standard deviation higher than 0.038 magnitude in V light.

Over the four nights of the observing run, the V magnitude of Borrelly's star was found to be 10.145 with a standard deviation of 0.042 magnitude.

3. Conclusions

The authors and their collaborators find that Borrelly's star is a main sequence dwarf of spectral class G3 and of magnitude 10.15 in the V bandpass on the UBV system. It should be noted that the determination of $B-V$ by Vebra and Guetter of +0.74 is slightly red for a G3V star. We find no evidence for short term variability. The mystery of the early observations remains.

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