

**THE ORION VARIABLES: A SYMPHONY
OF DELICACY AND BRILLIANCE**

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Abstract

This paper is based on the author's six seasons of observing the intriguing variable stars in the Orion Nebula. It is intended to review the procedure and the constraints he has developed for observing Orion variables and to informally summarize some impressions he has obtained about these stars.

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1. Introduction

Messier 42, the Orion Nebula, is probably the most famous and thoroughly observed nonstellar object in the entire heavens. The silky wisps of nebulosity are wonderful in themselves, but the surrounding presence of dozens of bright blue stars makes the view exquisite. Many of these fine blue stars are variables and are easy to find. Recently, some AAVSO observers have claimed that it is apparently easy to estimate their light variations.

It is not, for it is this very combination of stars and nebulosity which makes visual estimates of these stars quite difficult to obtain.

Aside from individual charts for a few Orion variables set off by themselves (V351 Ori near M78 is an example), two sets of standard charts for this type of variable are offered by the AAVSO. One is the popular set for the M42 region, and the other covers a group in Corona Australis, a constellation difficult to observe from the United States.

2. Observing Procedure

In order to keep the observations as consistent as possible, it was necessary to use the same instrument for all observations. Not just the same type, or even size, of telescope, but always the same instrument should be used. I found that changing from reflector to refractor caused special problems because the lens was somewhat sensitive to the blue light of the Orion variables, and thus, with the refractor all the blue stars, including the variables, seemed to brighten. Even changing from an 8-inch reflector of one focal ratio to one which was slightly faster introduced problems of perception.

The arrangement that ultimately proved most satisfying was a 20cm f/8 reflector with a 20mm Plössl eyepiece. The resultant field was neither so large that the fainter stars were too hard to find nor so small that the comparison stars were not included. The orientation of the field seemed to be important, too. One night I experimented with different arrangements - first, with the nebula set up in the orientation familiar from photographs, and then, by moving the telescope tube, with the field rotated a quarter of a turn. Because of the new and unfamiliar orientation, I felt that both variables and comparison standards appeared to have varied in relative magnitude. It seems that when one looks at a set of stars with whose configuration one is familiar, altering the way that configuration is presented may change one's perception of relative magnitudes. I

suspect this perceptual effect may be one reason that the AAVSO recommends equatorial mounts to all their observers, since altazimuth mounts fail to keep this one aspect constant.

Frequency of observation should be determined by how often and by how much each star varies. As a general rule, however, the AAVSO recommends that each star of the Orion set be estimated every ten or fifteen minutes over a period not shorter than an hour. Again, consistency is important; if you are to take these stars seriously, the process should be repeated, if possible, each clear night.

Clouds are an obvious consideration, but I have found that there are "acceptable" and "unacceptable" clouds. The heavy cumulus clouds which often pass over Tucson at the end of a winter storm do not bother a set of Orion estimates, for between the easily noticed cumuli can be perfectly clear sky. But on the night before a storm, or on a night when a storm is passing to the north, the sky is filled with light cirrus clouds through which stars are visible. These clouds are dangerous! They are so thin that often I cannot tell whether all, part, or none of the nebula is covered by a passing cirrus cloud. So, if any cirrus is present, I cannot estimate Orion stars with any confidence.

One final constraint is altitude. If the zenith distance of the variables is greater than 65 degrees, the extinction factor becomes both pronounced and uncontrolled. Ground haze can vary during an hour or so, especially on humid nights, and therefore, the nebula should be high before observations are started.

3. Impressions

Orion variables tend to flicker, according to conventional wisdom. The General Catalogue of Variable Stars (Kukarkin *et al.* 1969) divides them into categories such as INA for an ordinary nebular variable with occasional activity, and INAS for active and strong. I found that some of the stars did not seem comfortable in their assigned classes, and for the benefit of people interested in planning an observing program, I have suggested the following classification:

MX Ori type: Over a period of a night, a week, or a season, MX Ori has a light "straight" rather than a light "curve." In six seasons of observation, five times per night on ten to fifteen nights per month, MX Ori has hardly changed more than 0.2 magnitude, from $10^{\text{m}}1$ to $10^{\text{m}}3$, and it usually sits happily at $10^{\text{m}}2$. KS Ori also behaves this way.

V372 Ori type: Unfortunately, this star's behavior represents a pattern demonstrated by twelve to fifteen of the stars I have observed. Typically, V372 Ori remains at nearly constant magnitude for days or weeks, occasionally interrupted by an apparently few hours of activity during which the star varies by several tenths of a magnitude.

NV Ori type: NV Ori is almost always doing something, and so it is this active group of variables that seems to make the entire project worthwhile. Completely unpredictable at present, NV Ori usually shows some form of variation during the course of an hour's observing, usually 0.2 - 0.3 magnitude. In my experience, NV Ori has ranged from $9^{\text{m}}6$ to $10^{\text{m}}7$ and in a single night I have seen it go through three-fourths of that range!

T Ori type: Normally, the variations of T Ori are similar in pattern to those of V372 Ori above. On rare occasions, the star plunges several magnitudes so that it is at the limit of my telescope. While at minimum it also flickers occasionally. This star shows similarities in behavior, although not in the cause of behavior, to R CrB.

V361 Ori type: In January of 1959, Leif J. Robinson made an interesting series of observations of V361 Ori (Robinson 1960). These observations showed over a magnitude of variation. My observations, done twenty years later, showed a distinct change. With just two exceptions, the star showed little variation during the six years I watched it. Quite possibly V361 Ori, along with other Orion variables, goes through long period changes in pattern.

I have put V361 Ori in a special class not because of possible long period changes, but because this star is so deeply embedded in the main part of the nebula that I believe the human eye has more difficulty in estimating its magnitude than is acceptable. Of the 22 nebular variables with which I am familiar, my observations of this one are, in my judgment, the most suspect.

4. Conclusion

Orion variables are not toys to be played with in a leisurely hour after dinner, nor do they offer an easy way of obtaining high monthly totals. (In fact, the AAVSO counts ten Orion variable observations as one observation in determining totals.) A single observation of one of these stars is more exacting and difficult to make than a corresponding observation of a Mira star. But when these stars are observed properly as a group, one feels an indescribable thrill of observing a cosmic orchestra performing to some ethereal score. The observer with interest, time, and experience, as well as a little foolhardiness, who can go out on a cold winter's night and cope with these variables, awaits a symphony of genuine brilliance.

5. Acknowledgement

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REFERENCES

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