SPECTRAL MORPHOLOGY IN THE OPEN CLUSTER NGC 2287

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As part of a long range program on spectral classification in open clusters we have obtained high quality spectrograms (39 A mm^{-1} and 125 A mm^{-1} both 1.2mm wide) of 35 stars in NGC 2287.

The classification revealed the presence of one He-weak star, three Hg-Mn stars, one star with weak K line, one cool Ap star, a composite spectrum, eight double line spectra and five more suspected.

The complete paper will be published in the October 1979 issue of the PASP.

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DISCUSSION

TRIMBLE: I just wanted to remark that your spectroscopic binaries are not separate from the rest of the main sequence, contrary to what is sometimes advertised.

LEVATO: Well, they are not separated, because the sequence is almost vertical, so what you are going to get is the stars pushed up and there is not going to be a shift in this way.

TRIMBLE: Well, that is what I am trying to say. You cannot identify spectroscopic binaries that way.

LEVATO: No, I am not identifying the stars by their position in the HR diagram. I am identifying them because of the appearance of the spectra. Of course, we must expect that if we have a double-line binary with the same spectrum, it is going to lie 0.75 mag above the main sequence. But we decided not to correct these observations because the secondary spectrum is, in some cases, not very precise. We cannot, for example, determine luminosity classes for the secondary spectrum. So, we prefer to have the radial velocity evidence to try to determine an orbit, and in this way, to have a better idea about the companions. I can tell you that this investigation has been made without knowing any of the parameters of the stars: we classify the spectra independently of them. As an example, we classified star No. 1; later, when we went to the ADS Catalog, we found this star listed with a companion with $\Delta m=0$ and 2.5 arcsec separation. We also had written on the observing sheet that both stars were on the slit, and we classified it as B8.5V+B9: without knowing these facts.

LYNGA: The idea is that nobody else has found out from the scatter of the main sequence that these stars are binaries.

TRIMBLE: Well, precisely.

SEGGEWISS: I missed one point. Are there no normal single line stars in that cluster up to 10 mag? Or did you not mention the normal stars?

LEVATO: Normal, single-line stars? There is an A0 star with an observed V=9.3 mag which is single and normal. (Laughter). There are also two other A0 stars around B=10 that are also single and normal. After talking with Dr. Mermilliod we believe in our identifications.

RAJAMOHAN: You said that the companion of the Hg-Mn star is a B9 normal star with broad lines. Could you have misclassified it as normal, since it's rotational velocity is so high?

LEVATO: Generally members of close binaries do not have large rotational velocity except those of very short period, but there is a great difference between the narrow lines of the Hg-Mn star and the B9 normal star. So, it is very easy to recognize both line spectra. In this case the rotation of the B9V star is $\sim$ 90 km s^{-1}.

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MERMILLIOD: In addition to what Dr. Levato said, when we identified the binaries in the photometric HR diagram, nearly all stars showed a pronounced binary effect. They are 0.7 mag above the main sequence, especially in the *B*, *U-B* diagram.

LYNGA: Well, I think we are all looking forward to the time when you collect all these studies of spectral types in clusters and compare between the clusters. You expect to do that?

LEVATO: Yes. There are some results already, but they are not very well established yet because they are based only on the stars we have observed at Kitt Peak with Helmut Abt. But there are some very interesting results concerning the rotation of stars with abnormal spectra. For example, in young clusters like the Orion association, if you plot the distribution of the rotational velocities of the abnormal spectra you get something like a Gaussian distribution with a broad maximum around 100-200 kms^{-1}. These are all the abnormal stars: Si, Am, He, etc. In the older clusters all of the abnormal spectra treated in the same way show a maximum around 50 kms^{-1}. Dr. Abt suggests as a tentative conclusion that perhaps a large rotational velocity is not a necessary condition for a peculiar star to be formed. You get peculiarities because of other physical parameters. For example, belonging to close binary systems, in the case of Am stars; magnetic fields, in the case of Si stars; etc. Later, after you get the peculiarity, the rotational velocity slows down due to magnetic or tidal braking. We hope to have 60 clusters with the proper data in the near future, and perhaps it's not going to be enough. But it will be very interesting to try and learn if the low rotational velocity comes before or after the peculiarity.

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